केन्द्रीय विद्यालय संगठन / KENDRIYA VIDYALAYA SANGATHAN
हैदराबाद संभाग / HYDERABAD REGION

QUESTION BANK OF MULTIPLE-CHOICE QUESTIONS 2021-22

CLASS: XII SUBJECT: BIOLOGY

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S. No	Name of the Teacher	Designation & Name of the KV	Name of the Chapter
1	Mrs. KARNI PADMASRI	PGT (BIOLOGY), KV, Malkapuram, Visakhapatnam	Sexual Reproduction in Flowering Plants
2	Mrs. VELALA KALYANI	PGT (BIOLOGY), KV, Waltair, Visakhapatnam	Human Reproduction
3	Mr. RAMU M.	PGT (BIOLOGY) KV, Srikakulam	Reproductive Health
4	Dr. M. RAYAPPA	PGT (BIOLOGY), KV, INS Kalinga, Visakhapatnam	Principles of Inheritance and Variation
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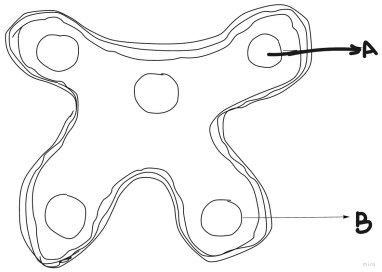
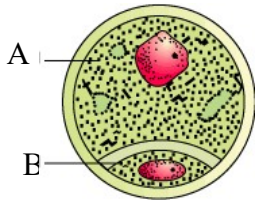
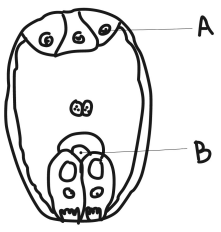
6	Mr. C H M S KUMAR	PGT (BIOLOGY), KV No. 1 Nausenabagh, Visakhapatnam	Human Health and Disease
7	Mr. MURALI KRISHNA	PGT (BIOLOGY), KV No. 2 Srivijayanagar, Visakhapatnam	Microbes in Human Welfare
8	Dr. S VIJAYA KUMAR	PGT (BIOLOGY), KV No. 1 Srivijayanagar, Visakhapatnam	Biotechnology : Principles and Processes Biotechnology and its Applications
9	Dr. T SAI BABU	PGT (BIOLOGY), KV NAD, Visakhapatnam	Organisms and Populations
10	Mrs. T L PRASANNA KUMARI	PGT (BIOLOGY), KV Khammam, Khammam	Biodiversity and Conservation

Sexual reproduction in flowering plants

1.	The function of tapetum in microsporangium is. a) It nourishes the developing pollen grains. b) It performs the function of protection. c) It helps in dehiscence of anther to release pollen grains. d) It undergoes meiotic divisions to form microspore tetrads.	1
2.	Identify 'A' and 'B' in the given diagram of a transverse section of a young anther.  a) A- Tapetum, B- Sporogenous tissue b) A- Sporogenous tissue, B- Tapetum c) A-Connective, B- Epidermis d) A- Endothecium, B-Tapetum	1
3.	The egg apparatus in the embryo sac consists of a) Two synergids and one egg cell b) One synergid and two egg cells c) Central cell d) Only two egg cells	1
4.	Which of the following statements is true for a filiform apparatus? a) It is located at the chalazal end. b) It is located at the micropylar end. c) They play an important role in guiding the pollen tubes into the synergid. d) Both (b) and (c)	1
5.	Identify 'A' and 'B' in the following diagram of a mature pollen grain.	1

	.  a) A- Generative cell B- Vegetative cell b) A- Vegetative cell B- Generative cell c) A- Nacuole B- Nucellus d) A- Nucleus B- Vacuole	
6.	Match the terms in column I with the items in column II. (1) Autogamy — (A)Transfer of pollen grains from anther to stigma of the same flower (2) Geitonogamy — (B)Transfer of pollen grains from anther to stigma of flower of another plant of similar type. (3) Xenogamy — (C)transfer of pollen grains from the anther to the stigma of another flower of the same plant a) 1-A, 2-C,3-B b) 1-A, 2-B,3-C c) 1-C, 2-B, 3-A d) 1-B,2-A, 3-C	1
7.	Study the diagram given below and choose the correct option against 'A' and 'B'  a) Ovule; A-Egg; B-Polar body b) Embryo sac; A-Antipodals; B-Egg	1

	c) Anther; A-Endothecium; B-Connective d) Stigma; A-Central cell; B-Antipodals	
8.	Which of the following statements is correct about the majority of angiosperms? a) Egg has five antipodal cells b) Reduction division occurs in the megaspore mother cells. c) A small central cell is present in the embryo sac d) Egg has filiform apparatus	1
9.	Choose the odd one out: Vegetative cell, intine, synergids, germ pore a) Germ pore b) Synergids c) Exine d) Vegetative cell	1
10.	In the given diagram label the part 'A' and state its function  a) Suspensor -Protects the radicle b) Root cap - Gives protection to the plant c) Cotyledon - Contains reserved food material that are used by embryo d) Coleoptile -gives protection to the radicle	1
11.	The meiocyte of rice has 24 chromosomes. The number of chromosomes in its endosperm is a) 24 b) 12 c) 48	1

	d) 36	
12.	The common function of nucellus and cotyledons is a) Reproduction b) Pollination c) Nourishment d) Both (b) and (c)	1
13.	A bilobed dithecous anther has 500 microspore mother cells per microsporangium. How many male gametophytes can this anther produce? a) 10,000 b) 25,000 c) 20,000 d) 8,000	1
14.	Choose the correct order of stages of development of a dicotyledonous embryo. a) Zygote→ embryo →globular embryo →heart shaped embryo b) Zygote→ globular embryo →mature embryo c) Embryo →proembryo →mature embryo →globular embryo d) Zygote→ proembryo→ globular embryo →mature embryo	1
15.	The thick fruit wall is also called a) Theca b) Pericarp c) Pomocarp d) None of these	1
16.	Match the items in column I with the items in column II.	1

Column I	Column II
A) Remains of nucellus in a seed	1) scutellum
B) Formation of seed without fertilisation	2) perisperm
C) Cotyledon in the seeds of	3) polyembryony

	<table><tr><td>grasses</td><td></td></tr><tr><td>D) Occurrence of more than one embryo in a seed</td><td>4) Apomixis</td></tr></table> a) A-1, B-2, C-3, D-4 b) A-2, B-1, C-4, D-3. c) A-2, B-4, C-1, D-3 d) A-4, B-3, C-1, D-2	
17.	Which of the following is not a method to prevent autogamy in plants? a) Pollen release and stigma receptivity are not synchronised b) Anther and stigma are placed at different positions c) Self-incompatibility d) Bisexual flowers	1
18.	The microspores are generally formed in a cluster of a) 4 b) 3 c) 2 d) 5	1
19.	Choose the incorrect statement. a) The hollow foliar structure that encloses the leaf primordia in a grass embryo is called coleoptile b) In apple, the thalamus also contributes to fruit formation and becomes edible. c) In Zostera, the pollen grains are long and ribbon-like and released inside the water. d) Sepals and petals are concealed in entomophilous flowers	1
20.	The type of tissue present in the fertilised ovules of an angiosperm plant to supply food and nourishment to the developing embryo is a) Tapetum b) Sporogenous tissue c) Endosperm	1

	d) Synergids	
21.	**Assertion:** There are a few species of plants in which fruits develop without fertilisation **Reason**: Parthenocarpic fruits are seedless a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	**1**
22.	**Assertion**: In apomixis plants of new genetic variations are not produced. **Reason**: In apomixis, reductional division takes place. a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	**1**
23.	**Assertion**: Megaspore mother cell undergoes meiosis to produce four haploid megaspores. **Reason**: Female gametophyte is produced from a single megaspore. a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	**1**

24.	**Assertion**: The pollen grain represents male gametophyte. **Reason**: Pollen grains are shed at four celled stage. a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	**1**
25.	**Assertion**: Exine is made up of sporopollenin. **Reason**: Pollen grains are well preserved as fossils. a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	**1**
26.	**Assertion**: As the seed matures, its water content is reduced and seeds become relatively dry (10-15% moisture by mass) **Reason**: Micropyle facilitates the entry of oxygen and water into the seed during germination. a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	**1**
27.	**Assertion**: Chasmogamous flowers produce assured seed set. **Reason**: Chasmogamous flowers do not open at all. a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct	**1**

	explanation of assertion. c)Assertion is true but reason is false d) Both assertion and reason are false	
28.	**Assertion**: Generally, each sporogenous cell is a potential pollen of a microspore mother cell. **Reason**: Each cell of the sporogenous tissue is capable of giving rise to a microspore tetrad. a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	**1**
29.	**Assertion:** Perisperm is the residual endosperm present in seeds. **Reason:** Endosperm is developed from the antipodal cell of the embryo sac. a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	**1**
30.	**Assertion**: Geitonogamy involves a pollinating agent **Reason**: Genetically geitonogamy is similar to autogamy. a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	**1**
31.	**Read the following and answer any four questions from 31(i) to 31(v):** Apomixis is a mode of reproduction which does not involve formation of	1x5=5

	zygote through gametic fusion. It is therefore akin to asexual reproduction. In plants apomixis commonly mimics sexual reproduction but produces seeds without fertilisation. Eg. some species of Asteraceae and grasses. Apomixis can be introduced in hybrid varieties. Scientists are busy in identifying genes for apomixis so that they can be introduced in hybrid varieties.	
i)	In many laboratories, active research is on to comprehend the genetics of apomixis as; a) Apomixis generates genetically different individuals b) Apomixis is the method to produce seeds without fertilisation c) Hybrid plants are directly formed by apomixis d) Transfer of apomictic genes into hybrid varieties that shall prevent hybrid vigour loss over the years	1
ii)	Apomixis is a form of a) Vernalisation b) Parthenogenesis c) Parthenocarpy d) None of the above	1
iii)	In plants, apomixis pertains to plant development a) From root cuttings b) From cuttings of stem c) Without gametic fusion d) Fusion of gametes	1
iv)	_____ produces seeds without fertilisation a) Asteraceae b) Fabaceae c) Solanaceae d) liliaceae	1
v)	**Assertion**: In apomixis plants of new genetic sequence are produced. **Reason**: In apomixis, two individuals of the same genetic sequence meet. a) Both assertion and reason are true and the reason is the correct	1

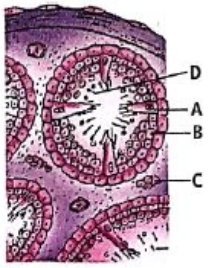
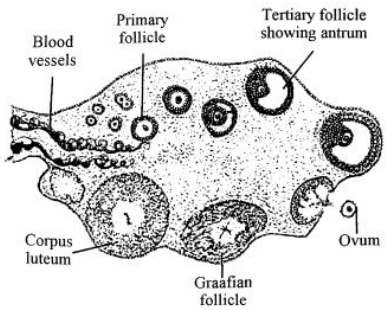
	explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	
32.	**<u>Read the following and answer any four questions from 32(i) to 32(v) given below:</u>** The endosperm makes the main source of food for the embryo. Generally, the endosperm nucleus divides after the division of the zygote, but in several cases the endosperm is formed to a great extent even before the first division of the zygote. There are three general types of endosperm formation:(a) nuclear type (b) cellular type and (c) helobial type. The endosperm is usually triploid but haploid endosperm is also found. Endosperm may either be completely consumed by the developing embryo before seed maturation or it may persist in mature seed.	1x5=5
i)	One of the following is an example of seed with persistent endosperm a) Pea b) Groundnut c) Gram d) castor	1
ii)	Significance of endosperm development that precedes embryo formation a) To nourish the growing embryo b) To enhance seed development. c) To nourish the ovule developing into a seed. d) To provide nutrition to the embryo sac.	1
iii)	If the endosperm of a dicot plant contains 30 chromosomes, find the number of chromosomes present in the root cells of the plant a) 40 b) 10 c) 20 d) 15	1

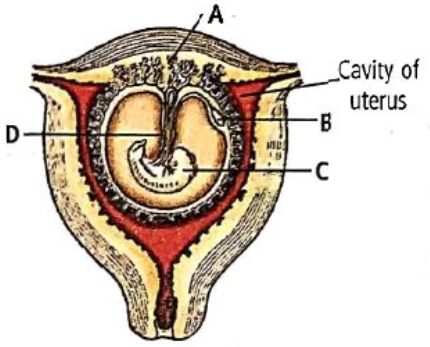
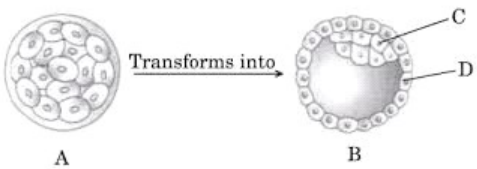
iv)	The endosperm nucleus is a) Tetraploid b) Triploid c) Diploid d) Haploid	1
v)	**Assertion**: Nuclear endosperm is formed by subsequent nuclear division without wall formation. **Reason**: Tender coconut water is an example of such an endosperm where the endosperm remains nuclear throughout the development of the fruit. a) Both assertion and reason are true and the reason is the correct explanation of assertion. b) Both assertion and reason are true but the reason is not the correct explanation of assertion. c) Assertion is true but reason is false d) Both assertion and reason are false	1

HUMAN REPRODUCTION

1.	The region outside seminiferous tubule is called interstitial space which contains all except a. immunologically active cells b. blood vessels c. sertoli cells d. leydig cells	1
2.	Decline of which hormone during menstrual cycle results in the degeneration of corpus luteum a. Progesterone b. estrogen c. both 1 and 2 d. LH	1
3.	How many sperms and ova will be produced from 50 primary spermatocytes and 50 oocytes respectively a. 200 sperms,50 ova b. 100 sperms, 200 ova c. 100 sperms, 50 ova d. 50 sperms, 100 ova	1
4.	For normal fertility in males a. atleast 60% sperms should have normal shape and size and atleast 40% should show vigorous motility* b. 40% sperms should be normal shape and size and vigorous motility c. 60% sperms with normal and shape and size and remaining 40% with high motility d. 40% with normal shape and size and 60%with high motility	1
5.	Which pituitary hormone regulates sertoli cells a. estrogen b. progestrone c. FSH* d. LH	1
6.	Which one of the following hormones is responsible for uterine contractions during parturition?	1

<table>
<tr><td></td><td>a. relaxin
b. vasopressin
c. oxytocin
d. prolactin</td><td></td></tr>
<tr><td>7.</td><td>In human foetus the limbs and digits develop after:
a. 8 weeks
b. first trimester
c. 5th month
d. 12 weeks</td><td>1</td></tr>
<tr><td>8.</td><td>Foetal ejection reflex in human female induces
a. release of hormones from placenta
b. growth and development of ovarian follicles
c. release of oxytocin from maternal pituitary
d. release of prolactin from pituitory</td><td>1</td></tr>
<tr><td>9.</td><td>Which of the following dipictss the correct pathway for transport of sperms?
a. rete testes epididymis vasdeferens vasa efferentia
b. rete testes vasdeferens vasa efferentia epididymis
c. rete testes vasa efferentia epididymis vas deferens
d. rete testes vas deferens epididymis vasa efferentia</td><td>1</td></tr>
<tr><td>10.</td><td>. Which of the following statements are correct regarding menstrual cycle?
a. LH induces rupturing of graffian follicle
b. proliferative phase is characterized by increased production secretion of progesterone
c. corpus luteum secretes large amount of estrogen
d. both FSH and LH attain peak level at secretory phase</td><td>1</td></tr>
<tr><td>11.</td><td>Match the columns and find the correct option
<table>
<tr><td></td><td>I</td><td>II</td></tr>
<tr><td>A</td><td>Proliferative phase</td><td>i. Break down of endometrial lining</td></tr>
<tr><td>B</td><td>Secretary phase</td><td>ii. Follicular phase</td></tr>
<tr><td>C</td><td>menstruation</td><td>iii. Luteal phase</td></tr>
</table>
a. A-ii, B –iii, C-I</td><td>1</td></tr>
</table>

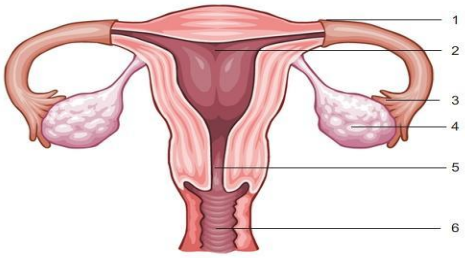
	b. A-I, B-iii C-ii c . A-iii, B-ii. C-I d. A-iii, B-I, C- ii	
12.	Given below diagram refers to the T. S. of testis showing somniferous tubules.  A,B,C,and D in the above figure represent a. A-Sertoli cells, B-Secondary spermatocytes C-interstitial cells D-sperms b. A- interstitial cells B-Spermatogonia C- Sertoli cells D-Sperms c. A-Sertoli cells B-spermatozoa C-- interstitial cells D-Sperms d. A-Sertoli cells B- Spermatogonia C- interstitial cells D-Sperms	1
13.	Match between the following parts of the sperm and their function and choose the correct option Column I column II A. head 1. enzymes B. middle piece 2. sperm motility C. acrosome 3. energy D. tail 4. genetic material a. A-2, B-4, C-1,D-3 b. A-4, B-3,C-1 D-2 c. A-4,B-1,C-2,D-3 d. A-2,B-1,C-3,D-4	1
14.	Identify the wrongly labeled part  a. primary follicle	1

	b. ovum c. graffian follicle d. corpus luteum	
15.	Urethral meatus refers to the a. urinogenital duct b. opening of vas deferens into urethra c. external opening of urinogenital duct d. muscles surrounding urinogenital duct	1
16.	In the given diagram find out A, B , C and D  A B C D a. umbilical cord placental villi yolk sac embryo b. yolk sac umbilical cord embryo placental villi c. placental villi yolk sac embryo umbilical cord d. placental villi embryo yolk sac umbilical cord	1
17.	Study the given diagram A is the embryonic stage that gets transformed into B ,which in turn gets implanted in the endometrium in human females.  Identify A,B and its parts C and D a. A- Morula, B-blastomere, C- blastula D-inner cell mass b. A- blastula, B-gastrula, C- trophoblast, D-inner cell mass c. A-morula B- blastocyst C- stem cells D-trophoblast	1

	d. A- blastocyst B-trophoblast C-stem cells D-morula	
18.	A human female has maximum number of primary oocytes in her ovaries a. at birth b. just prior to puberty c. early fertile years d. middle age of fertile years	1
19.	Hormones secreted by placenta to maintain pregnancy are a. hCG, hPL , progestogen, prolactin b. hCG , progestogen, oestrogen, glucocorticoids c. hCG , hPL , progestogen, oestrogen d. hCG ,hPL , oestrogen, relaxin, oxytocin	1
20.	Read the following statements. I. Each testes has 25 compartments called testicular lobules. II. Each testicular lobule contains one to three highly coiled seminiferous tubules in which sperms are produced. III. Sertoli cells provide nutrition to testicles IV. Sertoli cells are activated by FSH Which of above statements are incorrect? a. I and II b. only I c. II and IV d. III and IV	1
21.	Assertion: Menstruation only occurs if the released ovum is not fertilized Reason: Lack of menstruation may be indicative of pregnancy a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	1
22.	Assertion: Menstrual phase is followed by luteal phase Reason: During follicular phase the pituitary hormones gradually increase a. Assertion and reason both are correct statements and reason is correct	1

	explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	
23.	Assertion: The embryo at 8 to 16 blastomeres is called morula Reason: The morula continuously divides to transform into trophoblast a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	1
24.	Assertion: The secretions of acrosome help the sperm enter into the cytoplasm of the ovum through zona pellucida Reason: This induces the completion of mitotic division of secondary oocyte a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	1
25.	Assertion: Placenta acts like endocrine tissue and produces hormones like LH and FSH Reason: Increased production of hormones is essential for fetal growth a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	1
26.	Assertion: Major organ systems are formed by the end of first trimester Reason: Stem cells have the potency to give rise to all tissues and organs	1

	a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	
27.	Assertion: The endometrium undergoes cyclical changes during menstrual cycle Reason: The perimetrium exhibits strong contractions during parturition a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	1
28.	Assertion: All copulations do not lead to pregnancy Reason: Fertilisation can occur only if sperm and ovum reach ampullary isthmic junction simultaneously a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	1
29.	Assertion: cilia lining fallopian tube help to pick up and push the ovum into oviduct Reason: cilia show their movement towards uterus a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	1

30.	Assertion: corpus luteum secretes female hormone progesterone Reason: After ovulation the ruptured follicle turns into corpus luteum a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d . Assertion is wrong statement but reason is correct statement	1
31	Read the following and answer the i to v questions: Human female reproductive system consists of a pair of ovaries, accessory glands, ducts associated with formation of gametes and production of sex hormones. Study the figure and answer the following questions  	
I.	Which of the following is correct for labelled part 3 a. connects ovary to uterus b. collects ovum from ovary c. secretes sex hormones d. both band c	1
ii.	Identify correctly matched pair a. 2–uterus b. 3-ovary c. 5-vagina d,6-endometrium	1
iii.	iii. Which of the following is incorrect for 4 a. they occur in pairs b. both release 2 eggs every cycle c. they contain gamete mother cells d. they produce eggs only during reproductive phase	1

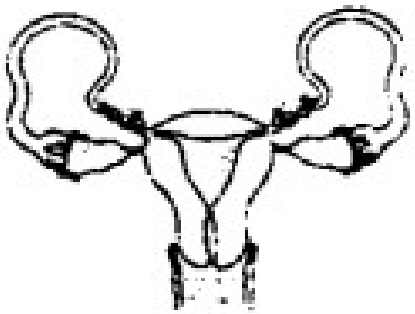
iv.	Which structure receives egg after fertilization a. 4 b. 6 c. 2 d. 8	1
v.	Assertion Infundibulum is funnel shaped part closer to ovary Reason: The edges of infundibulum helps in collection of ovum after ovulation a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	1
32. i.	. In mammals, the first part of oogenesis starts in the germinal epithelium, which gives rise to the development of ovarian follicles, the functional unit of ovary. Oogenesis consists of several sub processes: oocytogenesis ootido genesis, and finally maturation to form an ovum Folliculogenesis is a separate sub process that accompanies all three oogenetic sub processes . Which cell division is involved in the formation of secondary oocyte? a. Mitosis b. Meiosis I c. Amitosis d. Meiosis II	1 1
ii.	Number of chromosomes in first polar body of humans a. 23 b. 46. c. 21 d. 1	1
iii.	At fetal life which of the following female germ cells are found a. oocytes b. primary oocyte	1

	c. oogonia d. secondary oocytes	
iv.	At puberty only –number of primary follicles are left in each ovary a. 10,000-25000 b. 20000 -30000 c. 60,000 -80,000 d. 8,000-10,000	1
v	Assertion: In human beings ovum is released from ovary at ootid stage Reason: The secondary oocyte divides into unequal daughter cells, a large ootid and a small polar body a. Assertion and reason both are correct statements and reason is correct explanation for assertion b. Assertion and reason both are correct statements but reason is not correct explanation for assertion c. Assertion is correct statement but reason is wrong statement d. Assertion is wrong statement but reason is correct statement	1

REPRODUCTIVE HEALTH

1)	Given below are four methods and their modes of action in achieving contraception. Select their correct matching from that four options. Method — Mode of action (a) The pill [ ] (i) prevents sperms reaching cervix (b) Condom [ ] (ii) prevents implantation (c) Vasectomy [ ] (iii) prevents ovulation (d) Copper- T [ ] (iv) semen contain no sperms (A) a- (iii), b- (iv), c-(i), d- (ii) (B) a- (ii), b- (iii), c-(i), d- (iv) (C) a- (iii), b- (i), c-(iv), d- (ii) (D) a- (iv), b- (i), c-(ii), d- (iii) Ans: (C) a- (iii), b- (i), c-(iv), d- (ii)	1
2)	Amniocentesis is a method to: 1. Detect genetic disorders in an unborn baby 2. Prenatal sex determination 3. Medical termination of pregnancy 4. Fertilize the egg (a)) 1,2 and 3 are correct (b) 1 and 2 are correct (c) 2 and four are correct (d) 1 and 3 are correct	1
3)	Intensely lactating mothers do not generally conceive due to the (a) suppression of gonadotropins (b) hyper secretion of gonadotropins. (c) Suppression of gametic transport (d) suppression of fertilisation.	

4) Which part of the figure is being cut and tied in the below showing in particular ?



(a) Ovary

(b) Uterine

(c) Ovarian duct

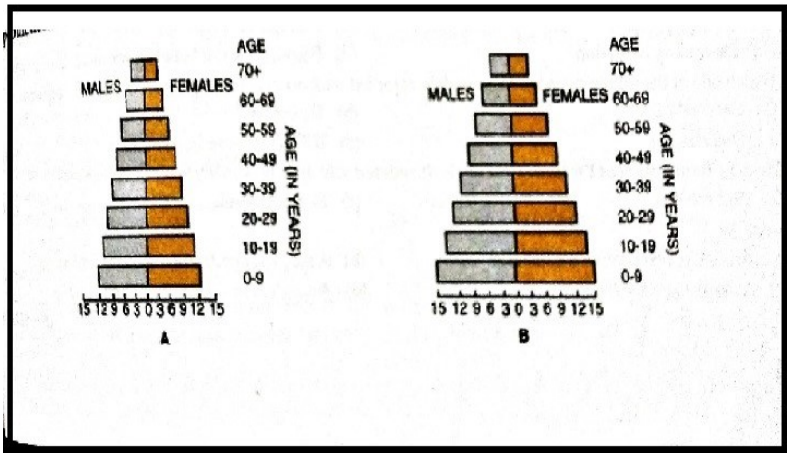
(d) Vas deferens

5) Match the sexually transmitted diseases (column-i) with their causative agent (column-ii) and select the correct option?

Column-i	Column -ii
1. gonorrhoea	(i) HIV
2. syphilis	(ii) Neisseria)
3. genital warts	(iii) Treponema
4. AIDS	(iv) Human Papilloma virus

	1	2	3	4
(a)	(ii)	(iii)	(iv)	(i)
(b)	(iii)	(iv)	(i)	(ii)
(c)	(iv)	(ii)	(iii)	(i)
(d)	(iv)	(iii)	(ii)	(i)

6) A country whit high rate of population growth took measures to reduce it. The figure bellow shows sex pyramids of population – A and B twenty years apart. Select the correct interpretation about them



(a) "A " is more recent and shows slight reduction in growth rate

(b) "B" is earlier pyramid and shows stabilised growth rate

(c) B " is more recent and showing that the population is very young

(d) A" is earlier pyramid and no change had occurred in the growth rate

7) Which of the following approaches does not give the defined action of contraceptive?

(a)	Vasectomy	Prevents spermatogenesis
(b)	Barrier methods	Prevent fertilization
(c)	Intra-uterine devices	Increases phagocytises of sperms, suppress sperm motility and fertilizing capacity of sperms
(d)	Hormonal contraceptives	Prevent /related entry of sperms, prevent ovulation and fertilization

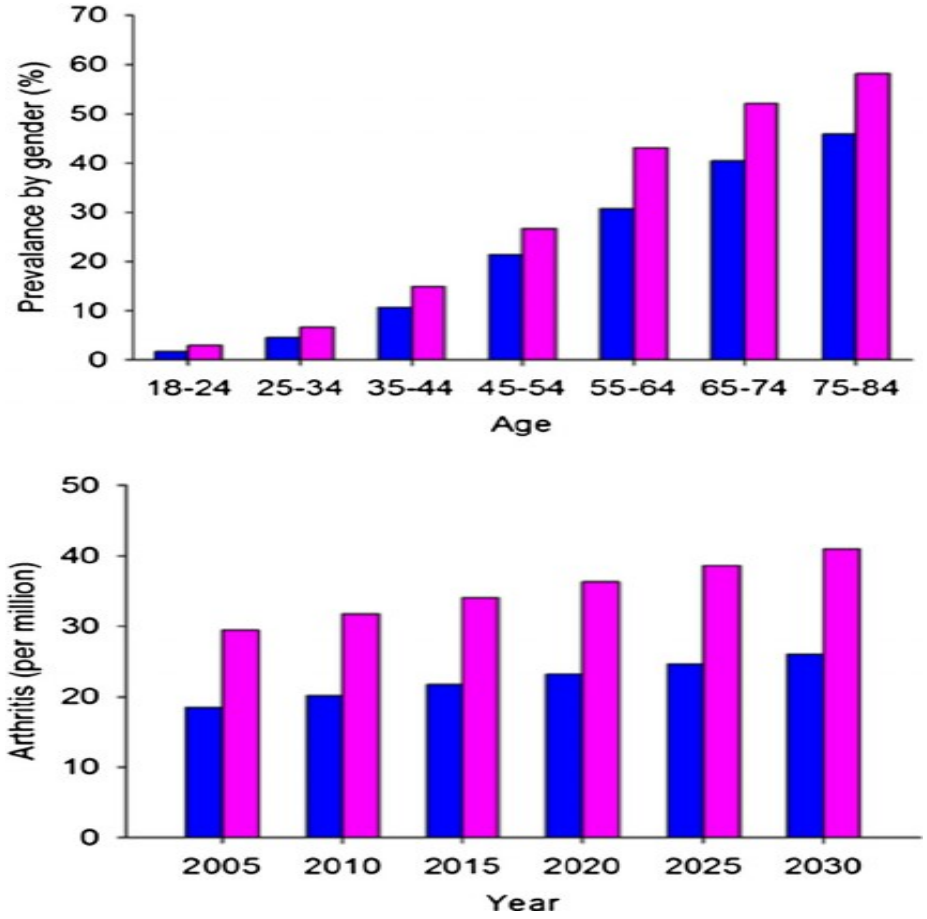
8) Amniocentesis is a technique used to

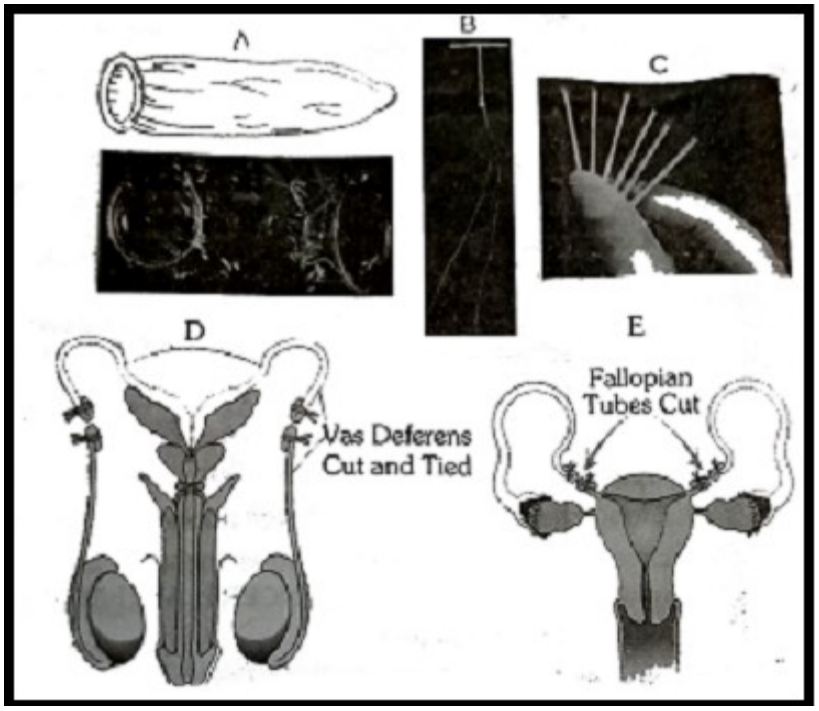
(a) determine errors in amino acid metabolism in embryo

(b) pin point specific cardiac ailments in embryo

(c) determine any hereditary genetic abnormality in embryo

(d) all of these.

9)	Prevalence of arthritis by age group for US men (blue) and women (pink) in 2003 – 2005 (top panel) and current and projected prevalence of arthritis for US men and women (bottom panel). The graphs are based on data from the Centres for Disease Control website.  From the above diagram, what exactly we get inference? (a) Arthritis increases as the age increases. (b) Arthritis decreases as the age increases (c) Arthritis increases as the age increases in men and women (d) Arthritis decreases as the age increases in men and women	
10)	Cu ions released from copper releasing intrauterine devices (IUDs) (a) Prevent ovulation (b) make uterus unsuitable for implantation (c) decrease phagocytosis of sperms (d) suppress sperm motility.	

11)	Which of the following is incorrect regarding vasectomy? (a) Irreversible sterility (b) No sperm occurs in seminal fluid (c) No sperm occurs in epididymis (d) Vasa deferentia are cut and tied	
12)	Progestin- estradiol combined contraceptive pills inhibit ovulation by: (a) Negative feedback on the release of estrogen from ovary required for follicular development in follicular phase (b) Preventing the uterine physiological and morphological changes required for implantation (c) Inhibiting the secretion of FSH and LH that are necessary for ovulation (d) Both (a) and (c)	
13)	Which of the following contraceptive methods has poor reversibility? (a) copper –T (b) implants (c) vasectomy/ tubectomy (d) barrier method 	
14)	Which of the following birth control measures can be considered as the safest? (a) The rhythm method (b) The use of physical barriers (c) Termination of unwanted pregnancy (d) Sterilization techniques	

15)	Which of the following statements is correct regarding vasectomy? (a) It prevents the production of sperm in the testes. (b) It prevents the production of semen. (c) It prevents the movement of sperm into the urethra. (d) It prevents a man from having an erection.	
16)	Progesterone pill helps in preventing pregnancy by not allowing (a) Ova formation (b) fertilization (c) implantation (d) none of these.	
17)	The first case of IVF-ET technique success, was reported by (a) Louis joy Brown and Banting Best (b) Patrick Steptoe and Robert Edwards (c) Robert Steptoe and Gilbert Brown (d) Baylis and Starling Taylor	
18)	**Which technique is used to detect AIDS?** a. Northern blot and ELISA b. Immunoblot and ELISA c. Western blot and ELISA d. Southern blot and ELISA	
19)	Which of the following represents the correct match of a sexually transmitted disease with its pathogen? (a) Syphilis-Treponema pallidum (b) Gonorrhoea-Entamoeba histolytica (c) Urethritis-Bacillus anthracis (d) Softsore-Bacillus brevis	
20)	The technique called Gamete Intra Fallopian Transfer (GIFT) is recommended for those females (a) who cannot produce an ovum (b) who cannot retain the foetus inside uterus (c) who cannot provide suitable environment for fertilisation (d) all of these	
21)	**Assertion:** Second trimester abortion are much more complicated	1

	Reason: After 12 weeks the foetus becomes intimately associated with the maternal tissues. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
22)	**Assertion:** Reusable contraceptives are not full proof method of contraception. **Reason:** Diaphragms, cervical caps and vaults are barrier methods which prevent conceptions by blocking through cervix. They are reusable. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
23)	**Assertion:** Introduction of sex education in schools be encouraged. **Reason:** This will encourage children to believe in myths about sex related aspects. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
24)	**Assertion: 'Saheli** 'is an oral pill which has high contraceptive value and very little side effects **Reason:** It contains progestin, with no estrogen and non- steroidal preparation centchroman (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct	1

	explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
25)	**Assertion:** Lactational amenorrhea is a natural method of contraception. **Reason:** Ovulation does not take place during the period of intense lactation following child birth. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
26)	**Assertion:** Transfer of an ovum collected form a donor into the fallopian tube of another female who cannot produce an ovum**.** **Reason:** Transfer of early embryos with up to 8 blastomeres into the fallopian tube of the female is called ZIFT (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
27)	**Assertion:** Syphilis, gonorrhoea and AIDS are some common STDs **Reason:** STDs are transmitted through sexual intercourse**.** (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
28)	**Assertion:** Coitus interrupts has a high failure rate for a method of contraception. **Reason:** The Pre-ejaculate fluid secreted by bulbourethral glands is known to	1

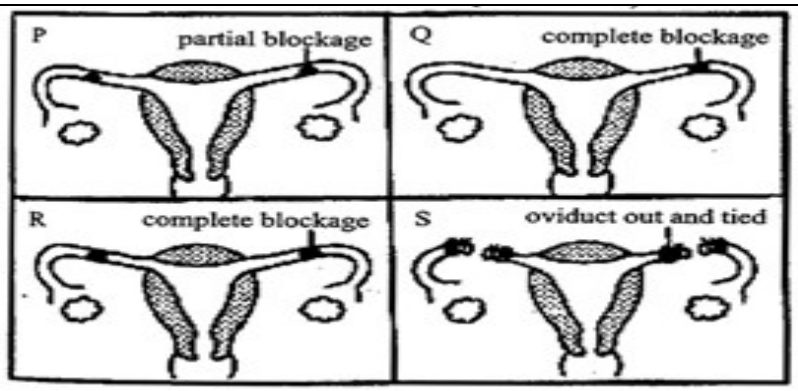
	have sperms. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
29)	**Assertion:** Amniocentesis is often missemployed. **Reason:** Amniocentesis is meant for determining the genetic disorders in the foetus, but it is being used to determine the sex of the foetus, leading to death of the normal female foetus. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
30)	**Assertion:** Rapid decline in death rate, MMR and IMR have lead to a staggering rise in population. **Reason:** Such an alarming growth rate has lead to an absolute scarcity of even the most basic requirements, i. e. food and shelter. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
31)	***Read the following and answer the questions from 31(i) to 31(v) given below:*** Natural methods work on the principle of avoiding chances of ovum and sperms meeting. **Periodic abstinence** is one such method in which the couples avoid or abstain from coitus from day 10 to 17 of the menstrual cycle when ovulation could be expected. As chances of fertilisation are very high during this period, it is called the fertile period. Therefore, by abstaining from coitus during this	

	period, conception could be prevented. **Withdrawal or coitus interruptus** is another method in which the male partner withdraws his penis from the vagina just before ejaculation so as to avoid insemination. **Lactational amenorrhea** (absence of menstruation) method is based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactation following parturition. Therefore, as long as the mother breast-feeds the child fully, chances of conception are almost nil. In **barrier methods**, ovum and sperms are prevented from physically meeting with the help of barriers. Such methods are available for both males and females. **Condoms** are barriers made of thin rubber/ latex sheath that are used to cover the penis in the male or vagina and cervix in the female, just before coitus so that the ejaculated semen would not enter into the female reproductive tract. This can prevent conception. '**Nirodh'** is a popular brand of condom for the male. Use of condoms has increased in recent years due to its additional benefit of protecting the user from contracting STIs and AIDS. Both the male and the female condoms are disposable, can be self-inserted and thereby gives privacy to the user. **Diaphragms, cervical caps and vaults** are also barriers made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus. They prevent conception by blocking the entry of sperms through the cervix. They are reusable. Spermicidal creams, jellies and foams are usually used along with these barriers to increase their contraceptive efficiency	
(i)	There are different contraceptive methods to avoid conceiveness. There are different tools /devices acting as contraceptive devices. Which of the above the following picture denotes implants and copper related devices**.**	1

	(a) A and B (b) C and B (c) C and A (d) D and E	
(ii)	Name the type of permanent contraceptive method in males from the above picture? (a) Vasectomy (b) Tubectomy (c) Implants (d) Diaphragm	1
(iii)	Which of the following contraceptive devices help in reducing the sperm motility? (a) Diaphragm (b) Condom (c) Implants (d) Copper T	1
(iv)	Which of the following contraceptive device come under barrier method? (a) Diaphragm (b) IUDs (c) Implants (d) Copper T	1
(v)	**Assertion:** Contraceptives are methods to prevent unwanted pregnancies. **Reason:** Unwanted pregnancies can only be prevent by using oral contraceptives. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
32)	***Read the following and answer the questions from 32(i) to 32(v) given below:*** A discussion on reproductive health is incomplete without a mention of	

	infertility. A large number of couples all over the world including India are infertile, i. e. , they are unable to produce children inspite of unprotected sexual co-habitation. The reasons for this could be many–physical, congenital, diseases, drugs, immunological or even psychological. In India, often the female is blamed for the couple being childless, but more often than not, the problem lies in the male partner. Specialised health care units (infertility clinics, etc.) could help in diagnosis and corrective treatment of some of these disorders and enable these couples to have children. However, where such corrections are not possible, the couples could be assisted to have children through certain special techniques commonly known as assisted reproductive technologies **(ART).** In vitro fertilisation **(IVF–fertilisation** outside the body in almost similar conditions as that in the body) followed by embryo transfer **(ET)** is one of such methods. In this method, popularly known as test tube baby programme, ova from the wife/donor (female) and sperms from the husband/donor (male) are collected and are induced to form zygote under simulated conditions in the laboratory. The zygote or early embryos (with upto 8 blastomeres) could then be transferred into the fallopian tube **(ZIFT–zygote intra fallopian transfer**) and embryos with more than 8 blastomeres, into the uterus (IUT – intra uterine transfer), to complete its further development. Embryos formed by in-vivo fertilisation (fusion of gametes within the female) also could be used for such transfer to assist those females who cannot conceive. Transfer of an ovum collected from a donor into the fallopian tube **(GIFT – gamete intra fallopian transfer)** of another female who cannot produce one, but can provide suitable environment for fertilisation and further development is another method attempted. **Intra cytoplasmic sperm injection (ICSI)** is another specialised procedure to form an embryo in the laboratory in which a sperm is directly injected into the ovum. Infertility cases either due to inability of the male partner to inseminate the female or due to very low sperm counts in the ejaculates, could be corrected by **artificial insemination (AI)** technique. In this technique, the semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus **(IUI – intra-uterine insemination**) of the female. Though options are many, all these techniques require extremely high precision handling by specialised professionals and	

	expensive instrumentation. Surgical methods, also called sterilisation, are generally advised for the male/female partner as a terminal method to prevent any more intervention blocks gamete transport and thereby prevent conception. Sterilisation procedure in the male is called **'vasectomy'** and that in the female, 'tubectomy'. In vasectomy, a small part of the vas deferens is removed or tied up through a small incision on the scrotum (Figure 4. 4a) whereas in **tubectomy**, a small part of the fallopian tube is removed (Figure 4. 4b) or tied up through a small incision in the abdomen or through vagina. These techniques are highly effective but their reversibility is very poor.	
(i)	A woman unable to conceive after many years of regular unprotected coitus went to specialized clinic. On complete examination, woman was found to be normal while male partner was diagnosed with infertility. Male partner is unable to copulate the female, The Couple was advised to opt for assisted reproductive technology (ART). (a) ZIFT – zygote intra fallopian tube transfer (b) IUI – intra uterine insemination (c) AI - artificial insemination (d) GIFT – gamete intra fallopiantube transfer	1
(ii)	Test tube baby means a baby born when (a) It is developed in the test tube. (b) It is develops from a non- fertilized egg (c) The ovum is fertilized externally and thereafter implanted in uterus (d) It is developed by tissue culture method.	1
(iii)	Tubectomy is sterilization process in females and in tubectomy a small fallopian tube is cut and tied, hence there is no possibility of fertilisation. The following diagram shows the uterine tubes of four women (P, Q, R, S)	1

	 (a) P and Q (b) Q and R (c) R and S (d) S and P	
(iv)	Choose the correct statement regarding the ZIFT procedure. (a) Ova collected from female are transferred to the fallopian tube to facilitate zygote formation (b) Zygote is collected from a donor are transferred to the fallopian tube (c) Zygote is collected from a donor are transferred to the uterus (d) Ova collected from female donor are transferred to the uterus	1
(v)	**Assertion:** In tubectomy, a small part of fallopian tubes is cut and tied up**.** **Reason: :** In vasectomy, a small part of vas deferens is cut and tied up. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1

Principles of Inheritance and variation.

1.	Which of the following combination of chromosomes number represents the correct sex determination pattern in honey bee? a) Males=32, Females=16 b) Males=16, Females=32 c) Males=31, Females=32 d) Females=32, Males=30	1
2.	Which of the following pairs is wrongly matched? a) Starch synthesis in Pea plant: Multiple alleles b) ABO Blood groups: Co-dominance c) Flower colour in snapdragon: Incomplete Dominance d) T. H. Morgan : Linkage	1
3.	The disorder caused due to the absence of one X-chromosome i. e. 45 with XO such females are sterile. Identify the syndrome a) Turner's syndrome b) Down's syndrome c) Klinefelter's syndrome d) Edward syndrome	1
4.	The study of family history about the inheritance of a particular trait in several generations of a family a) Hybridization b) Mutations c) Aberrations d) Pedigree analysis	1
5.	The phenomenon in which an allele of one gene suppresses the expression of an allele of another gene is known as a) Dominance b) Inactivation c) Epistasis d) Suppression	1
6.	If one parent has blood group A and other parent has blood group B the off springs have which blood group	1

	a) A,B only b) O only c) B only d) A,B,AB,O	
7.	Which of the following possess Homogametic male? a) Plants b)Birds c) Insects d) Man	1
8.	Which of the following statements indicates the Parallelism in Genes and Chromosomes? I) They occurs in pairs II) They segregate during the gamete formation III) They shows linkage IV) The independent pairs segregate independently a) (I) and (III) b) (II) and (III) c) (I),(III) and (III) d) (I),(II) and (IV)	1
9.	A cross between an organism with unknown genotype and a recessive parent is used to determine whether the individual is Homozygous (or) Heterozygous trait a) Test Cross b) Dihybrid Cross c) Pedigree Analysis d) Back Cross	1
10.	The Royal disease is a) Colour Blindness b) Mongolism c) Hemophilia d) Sickle cell anemia	1
11.	Which of the following Amino acid substitution is responsible for causing Sickle call anemia? a) Valine is substituted by Glutamic acid in the globin chain at the sixth position	1

	b) Valine is substituted by Glutamic acid in the Beta-globin chain at the seventh position c) Glutamic acid is substituted by valine in the Globin chain at the sixth position d) Glutamic acid is substituted by Valine in the Beta-chain at the sixth position	
12.	Which of the following will not result in variations among the siblings? a) Independent assortment b) Crossing over c) Linkage d) Mutations	1
13.	The diagrammatic representation of a Chromosome in the cell a) Homo type b) Karyotype c) Holo type d) Idiogram	1
14.	Name the inborn error of metabolism that is inherited as an Autosomal recessive trait, The disease is characterized by the absence of phenylalanine hydroxylase in affected individual a) Thalassemia b) Phenyl ketonuria c) Sickle cell anemia d) Colour blindness	1
15.	The mechanism that causes a Gene to move from one linkage group to another is called a) Inversion b) Duplication c) Translocation d)Crossing over	1
16.	Parents having genotype IA IB would show the blood group as AB. This is because of a) Pleiotrophy b) Co dominance c) Segregation d) Incomplete Dominance	1

17.	The Chromosome movement during meiosis has been worked out and noted that behavior of genes was parallel to the behavior of chromosomes a) Schledien b) Morgan c) Sturtevant d) Sutton and Boveri	1
18.	There are more than two alleles governing the one character a) Co dominance b) Epistasis c) Multiple alleles d) Dominance	1
19.	The classical example of point mutations a) Hemophilia b) Sickle cell anemia c) Phenylketonuria d) Cystic fibrosis	1
20.	It is an Autosomal disorder that is caused by the trisomy of 21st chromosome a) Turner's syndrome b) Edward syndrome c) Klinefelter's syndrome d) Down's syndrome	1
21)	**Assertion:** Monogenes produce continues variation in the expression of traits **Reason:** Monogenic inheritance controls the quantitative traits (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
22)	**Assertion:** The persons with Klinefelter syndrome are sterile males. **Reason:** Klinefelter syndrome is due to trisomy. (a) Both assertion and reason are true, and reason is the correct explanation of assertion.	1

	(b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
23)	**Assertion:** In Pigeon males are homogenetic and female are hetrogemetic. **Reason:** In pigeons, males have ZZ sex chromosomes, and females have ZW sex chromosomes. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d)Both assertion and reason are false.	
24)	**Assertion:** The law of Independent Assortment can be studied by means of Dihybrid cross. **Reason:** The law of Independent assortment is applicable only to linkages. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
25)	**Assertion:** Down's syndrome is the genetic disorder caused due to the presence of additional copy of X chromosome. **Reason:** Both X chromosomes passes into single egg due to non-disjunction during oogenesis. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
26)	**Assertion:** In human beings 23 pairs of chromosomes are present in the diploid	1

	cells. **Reason:** 22 pairs of chromosomes are equal in male and female. But, one pair of sex chromosomes are common in male and female. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
27)	**Assertion:** In Snapdragon flower, a cross made between true breeding white and red coloured flowers produces a pink colored flower in F_1 generation. **Reason:** This happens due to Incomplete dominance. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
28)	**Assertion:** A change in nitrogen base at the third position of a codon causes change in the expression of Codon **Reason:** A Codon is mostly read by all the three nitrogen bases (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
29)	**Assertion:** Phenylpyruvic acid is excreted through urine in case of phenylketonuria **Reason:** The affected individual lacks enzyme phenylalanine hydroxylase. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct	1

	explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
30)	**Assertion:** The Turner's syndrome is caused due to absence of one X or Y chromosome. **Reason:** Such individuals shows masculine as well as the feminine development (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
31)	*Read the following and answer the questions from 31(i) to 31(v) given below:* Haemophilia is a genetic disorder of rare blood condition where people do not have the clotting factor which enables their blood to clot when bleeding. It's an inherited disease that's usually passed from mother to son. Haemophilia has been called a "royal disease". This is because the haemophilia gene was passed from Queen Victoria, who became Queen of England in 1837, to the ruling families of Russia, Spain and Germany. Queen Victoria's gene for hemophilia was caused by spontaneous mutation. Of her children, one son, Leopold, had haemophilia, and two daughters, Alice and Beatrice, were carriers. Beatrice's daughter married into the Spanish royal family. She passed the gene to the male heir to the Spanish throne. Queen Victoria's other daughter, Alice, had a carrier daughter, Alix. Alix became Empress Alexandra at her marriage to Russia's Czar Nicholas in 1894. Their son, born in 1904 and named Alexis, inherited haemophilia from his mother. Haemophilia is a recessive disorder and it can be only appear in a generation if mother is carrier for disease and father has haemophilia or both parents have haemophilia.	
(i)	Haemophilia is a/ an _____ disease. (a) X linked (b) Autosomal dominant (c) Autosomal recessive (d) Y linked	1

(ii)	If the mother is carrier and father is normal than the chances of having normal son would be (a) 0 % (b) 25 % (c) 50 % (d) 75%	1
(iii)	If the maternal grandfather of a boy is haemophilic, maternal grandmother is normal and father is normal then what are the chances that he could have haemophilia disease? (a) 25 % (b) 50 % (c) 75% (d) 0%	1
(iv)	If haemophilia is not present in a population than sudden appearance of haemophilia in a population would be due to (a) Recombination (b) Mutation (c) Replication (d) None of these.	1
(v)	**Assertion:** Haemophilia is a genetic disorder of rare blood condition where people do not have the clotting factor. **Reason:** Due to low thromboplastin concentration. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
32)	*Read the following and answer the questions from 32(i) to 32(v) given below:* According to Mendel, one gene control the expression of one character only the ability of a gene to have multiple phenotypic affect because it influences a number of characters is an exception. The gene having a multiple phenotypic affect because of its ability to control two or more characters can be seen in cotton. In cotton, a gene for the lint also influences the height of plant, size of ball, number of ovules and viability of the seeds	
(i)	Genes with multiple phenotypic effects are known as (a) hydrostatic genes (b) duplicate genes (c) pleiotropic genes (d) complimentary genes	1

(ii)	Which of the following disorder is an example of genes with multiple phenotypic effects? (a) phenylketonuria (b) heamophilia (c) sickle cell anaemia (d) both a and c	1
(iii)	Which of the following is an example of gene with multiple phenotypic affect? (a) Drosophila white eye mutation (b) Kernel colour in wheat (c) Height in human beings (d) Skin colour in human beings	1
(iv)	Which of the following statements is not correct regarding genes with multiple phenotypic effect? (a) It is not essential that all the traits are equally influenced (b) Occasionally a number of related changes are caused by a gene (c) It occurs due to effect of gene on two or more inter related metabolic pathways (d) None of these	1
(v)	**Assertion:** In a garden pea plant the gene which controls the flower colour also controls the colour of the seed coat and presence of red spots in the leaf axils **Reason:** A pleiotropic gene influences more than one trait (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1

MOLECULAR BASIS OF INHERITANCE

	(ASSERTION REASONING BASED QUESTIONS)	
1.	Sickle cell anemia is caused a) When valine is replaced by glutamic acid in beta polypeptide chain b) When glutamic acid is replaced by valine in beta polypeptide chain c) When glutamic acid is replaced by valine in alpha polypeptide chain d) When valine is replaced by glutamic acid in alpha polypeptide chain	1
2.	Arrange the following events in the order of synthesis of a protein i) A peptide bond forms ii) A tRNA matches its anticodon to the codon in the A- site iii) The movement of second tRNA complex from A-site to P-site iv) The large subunit attaches to the small subunit and the initiator tRNA fits in the P-site v) A small subunit binds to the mRNA vi) The activated amino acid tRNA complex attaches the initiation codon on mRNA a) iv, v, iii, ii, i, vi b) iv, vi, v, ii, I, iii c) v, iv, iii, ii, vi, I d) v, vi, iv, ii, i, iii	1
3.	Read the following and select the correct statement/statements. (a) 23 s RNA act as a enzyme in prokaryotes. (b) In prokaryotes DNA is monocistronic (c) Francis Crick proposed the Central Dogma of Molecular biology. (d) In Eukaryotes three types of RNA polymerases are present. (a only, a and b, a and c, a and d)	1
4.	The significant aspect of reverse transcription is (a) the flow information from DNA to RNA (b) the flow information from RNA to DNA (c) the flow information from RNA to proteins (d) both a and c	1
5.	Match the names of scientists in column I with their achievements in column II and choose the correct answer given below	

	Column I **Column II** A) Watson and Crick P) DNA fingerprinting B) R. W. Holley Q) Decipher genetic code C) Marshal Nirenberg R) Double helix of DNA D) Jacob and Monod S) Clover model of tRNA E) Alec Jeffrey T) Lac operon concept (A) (B) (C) (D) (E) a) R S P T Q b) R S Q T P c) R Q P T S d) R T S P Q	
6.	The base pairs of DNA double helix is given below. Select the suitable mRNA strand that derived from transcription is 3^1-ATTTCC-5^1 5^1-TAAAGG-3^1 (a)UAAAGG (b)CUUUCC (c)GAAAGG (d) CCUUUC	1
7.	Match the codons with their respective amino acids and choose the correct answer. A UUU 1. Serine B GGG 2. Methionine C UCU 3 Phenylalanine D AUG 4 Glycine E AUG 5 Proline A B C D E a) 3 4 1 5 2 b) 3 1 4 5 2 c) 3 4 5 1 2 d) 2 4 1 5 2 e) 2 4 1 3 5	1
8.	Select the two correct statements out of the four (l-IV) given below about Lac	

	operon. I. Glucose or galactose may bind with the repressor and inactivate it. II. in the absence of lactose the repressor binds with the operator region III. The z-gene codes for region IV. This was elucidated by Francois Jacob and Jacques Monad The correct statement are: (a) II and III (b) I and III (c) II and IV (d) I and II	1
9.	DNA finger printing is a technique in molecular biology. Arrange the following steps in sequence. 1) Blotting of DNA fragment to nitro cellulose. 2) Digestion of DNA by restriction endonuclease. 3) Deletion of DNA by restriction endonuclease. 4)Isolation of DNA, 5) separation of DNA fragments by electrophoresis. a) 4 2 1 5 3 b) 3 1 4 5 2 c) 4 3 5 1 2 d) 2 4 1 5 2 e) 4 2 5 1 3	1
10.	Which of the following does not take part in stabilizing the cloverleaf model of the tRNA? a) Base stacking b) Base and sugar-phosphate backbone interaction c) Ionic bond d) Hydrogen bond	1
11.	mRNA bearing multiple ribosomes is known as_____ a) Small subunit-mRNA-initiator tRNA complex b) mRNA ribosome complex c) Polyamine-ribosome complex d) Polysome	1

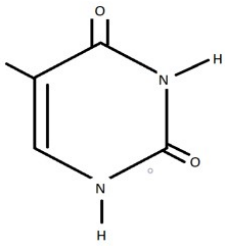
12.	Which of the following will form a palindromic sequence? a) ATTGCAAT b) AGTCCTGA c) GTTCCAAG d) GTTGGAAC	1
13.	What were the main criteria taken under consideration for the experiment by Hershey and Chase? a) DNA contains phosphorus, protein contains sulfur b) Protein contains phosphorus, DNA contains sulfur c) Both DNA and protein contains phosphorus and not sulphur d) Both DNA and protein contains sulfur and not phosphorus	1
14.	Which of the following is not a part of a nucleotide? Which of the following is not a part of a nucleoside? a) Ester linkage, Deoxyribose sugar b) Phosphate group, Base c) Base, Glycosidic linkage d) Hydrogen bond, Phosphate	1
15.	What were the main criteria taken under consideration for the experiment by Hershey and Chase? a) DNA contains phosphorus, protein contains sulphur b) Protein contains phosphorus, DNA contains sulphur c) Both DNA and protein contains phosphorus and not sulphur d) Both DNA and protein contains sulfur and not phosphorus	1
16.	Which of the following combination is a correct observation for the transformation experiment performed by Griffith? a) Type IIIS (living) + mouse = dead b) Type IIIS (heat killed) + mouse = dead c) Type IIR (living) + mouse = dead d) Type IIIS (heat killed) + type IIR (living) + mouse = living	1
17.	Replication fork is the junction between the two _____ a) Unreplicated DNA b) Newly synthesized DNA c) Newly separated DNA strands and newly synthesized DNA strands	1

	d) Newly separated DNA strands and the unreplicated DNA	
18.	Pick the correct pair with respect to primers used in DNA replication. a) RNA primer- for prokaryotes only b) DNA primer-for eukaryotes only c) DNA primer- for both prokaryotes and eukaryotes d) RNA primer- for both prokaryotes and eukaryotes	1
19.	Given in *E. coli*. *lac* **operon, pick up the correct statement:** The structural gene is **polycistronic** as it has three genes (***z, y & a***). **a) i)** ***y*** codes for **β-galactosidases** which catalyze the hydrolysis of lactose (a disaccharide) into glucose and galactose. **ii)** ***z*** codes for **β-galactoside permease**, a transport protein that pumps lactose into the cell. **iii)** ***a*** codes for **β-galactoside transacetylase,** which transfers an acetyl group to galactose. iv) Only *z & y* are required for lactose catabolism. **b) i)** ***z*** codes for **β-galactosidases** which catalyze the hydrolysis of a disaccharide. **ii)** ***y*** codes for **β-galactoside permease**, a transport protein that pumps lactose into the cell. ***iii) a*** codes for **transacetylase,** which transfers an acetyl group to galactose. iv) Only *a & y* are required for lactose catabolism. C) **i)** ***z*** codes for **β-galactosidases** which catalyze the hydrolysis of lactose (a disaccharide) into glucose and galactose. **ii)** ***y*** codes for **β-galactoside permease**, a transport protein that pumps lactose into the cell. **iii)** ***a*** codes for **β-galactoside transacetylase,** which transfers an acetyl group to galactose. iv) Only *z & y* are required for lactose catabolism. d) ***i)*** ***z*** codes for **β-galactosidases** which catalyze the hydrolysis of	1

	lactose (a disaccharide) into glucose and galactose. ***ii) a*** codes for **β-galactoside permease**, a transport protein that pumps lactose into the cell. ***iii) y*** codes for **β-galactoside transacetylase,** which transfers an acetyl group to galactose. iv) Only *z & y* are required for lactose catabolism.	
20.	For the translation to be initiated which of the following does not occur? a) Ribosome recruitment to the mRNA b) Positioning of ribosome on 'GUG' c) Addition of charged tRNA to the A site d) Binding of the large and small subunits of the ribosome	1
21)	**Assertion**: Transcription is the mode in which DNA passes its genetic information to RNA. **Reason**: Transcription takes place in the cytoplasm of eukaryotic cells.	1
22)	**Assertion**: Enzymes required for DNA replication are efficient enzymes **Reason**: They can polymerise large number of nucleotides in very short time	1
23)	**Assertion**: The two strands of DNA are antiparallel **Reason**: Only antiparallel polynucleotides form a stable double helix.	1
24)	**Assertion (A):** DNA replication occurs in small replication forks and not in its entire length. **Reason(R):** Replication of DNA does not initiate randomly and DNA polymerases on their own cannot initiate replication.	1
25)	**Assertion (A):** tRNA is called an 'adapter' **Reason(R):** tRNA on one hand bind to a specific amino acid and on the other hand reads the codon of the amino acid bound to it through its anticodon	1
26)	**Assertion (A):** : The double helical structure of the DNA present on saliva, hair follicles, bones, blood and sperm serve as a useful tool in the forensic studies. This can be done as the DNA from an individual's tissue shows the same degree of polymorphism **Reason(R):** Polymorphism arises due to Recombination	1
27)	**Assertion (A):** The DNA dependent DNA polymerases catalyses the polymerization reaction in 5' → 3' direction. **Reason(R):** The DNA polymerase enzymes can initiate the process of	1

	replication on their own.	
28)	**Assertion (A):** The viruses were cultivated on a medium containing radioactive Uranium (U) by Alfred Hershey and Martha Chase. **Reason(R):** Alfred Hershey and Martha Chase wanted to figure out that it was the protein from the bacteriophage that was entering into the bacteria.	1
29)	**Assertion (A):** The anticodon loop of the tRNA contains bases that are complementary to the codes. **Reason(R):** The stop codons are UAA, UAG and UGA.	1
30)	Several decades ago, the "one gene-one enzyme" hypothesis was in vogue. It seemed straight forward that a single protein gene coded for a single protein. In prokaryotic organisms (bacteria), this was easy to show. The known bacterial genes had a defined starting and stopping place and the DNA letters in between spelled out a discrete amino acid sequence. The eukaryotes (organisms with a nucleus; everything from yeast, to plants, to humans) do not have a simple gene structure. Our protein genes are broken up into a series of "exons" (the parts that code for protein) and "introns" (non-coding intervening sequences). To make a protein, the gene is first transcribed into RNA, then the introns are spliced out, the exons are stitched together, and the remainder is translated into protein. Even though complex, the one gene-one enzyme hypothesis was still applied to eukaryotic protein genes. **Assertion (A): Researchers first identified parts of genes that are spliced out of mRNA and not included in the final protein product by observing that not all of the original gene hybridizes to the cognate mRNA. These regions are called Introns.** **Reason(R):** Scientists first observed that some areas of genes are removed before mRNA translation by visualizing that not all of a gene hybridizes with its cognate mRNA, and hence there are pieces that are spliced out and not used. (A) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (B) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (C) Assertion is true but the Reason is false.	1

	(D) Assertion and Reason are false	
Q31	DNA: More than just a super hard drive *Bill Gates, one of the founders of Microsoft, declared, 'DNA is like a computer program but far, far more advanced than any software ever created. '* Actually, DNA is far more complicated than simply coding for proteins, as we are discovering all the time. [1] For example, because the DNA letters are read in groups of three, it makes a huge difference which letter we start from. E. g. the sequence GTTCAACGCTGAA … can be read from the first letter, GTT CAA CGC TGA A … but a totally different protein will result from starting from the second letter, TTC AAC GCT GAA … This means that DNA can be an even more compact information storage system. This partly explains the surprising finding of The Human Genome Project that there are 'only' about 35,000 genes, when humans can manufacture over 100,000 proteins. : Bacteria and yeast are the most commonly used hosts for the process of cloning in Human Genome Project. Not all types of fungi can be used for this process. But yeast and bacterium can be employed. Both BAC (Bacterial Artificial Chromosomes) and YAC (Yeast Artificial Chromosomes) act as a suitable vector for the process of cloning in HGP whereas bacteria and yeast act as the host for cloning in HGP. The methodologies for the HGP are involved in two major processes. One among them is ESTs (Expressed Sequence Tags). It is used to identify all the genes that are expressed as RNA in HGP. When one base pair is stacked over the other in a helical fashion, the DNA will be stable. A right-handed curving fashion is seen in the DNA. When repeating structures are present, the DNA will not be stable. The sum of Purines, A and G, is equal to the sum of Pyrimidines, C and T (i. e. , A+G = C+T). Adenine and Thymine form a double hydrogen bond. Likewise, Guanine and Cytosine form a triple hydrogen bond. The resistance showed by thymine towards all the photochemical mutations is what makes the DNA more stable.	
Q31 (i)	Which is the correct complementary strand for AGAATTCGC? a) CTCCGGATA b) GAGGCCTAT c) TCTTAAGCG	1

	d) GTGGCCATA	
Q31 (ii)	Which of the following methodology is used to identify all the genes that are expressed as RNA in Human Genome Project (HGP)? a) Sequence Annotation b) Expressed Sequence Tags c) Karyotyping d) Ammonification.	1
Q31 (iii)	Which of the following is a suitable host for the process of cloning in Human Genome Project (HGP)? a) Virus b) All types of fungi c) Bacteria d) Protozoan	1
Q31 (iv)	Which of the following ensures the stability of the helical structure of a DNA? a) Presence of repetitive structures of a DNA code b) Stacking of one base pair over the other c) Presence of aneuploidy d) Occurrence of chromosomal rearrangements	1
Q31 (v)	The presence of which base makes the DNA more stable? a) Adenine b) Cytosine c) Thymine d) Guanine OR What is name of this nitrogenous base?  a) Adenine b) Cytosine c) Thymine d) Guanine	1
	CASE STUDY –II	
Q32	Prokaryotic Transcriptional Activators and Repressors	

	The organization of prokaryotic genes in their genome is notably different from that of eukaryotes. Prokaryotic genes are organized, such that the genes for proteins involved in the same biochemical process or function are located together in groups. This group of genes, along with their regulatory elements, are collectively known as an operon. The functional genes in an operon are transcribed together to give a single strand of mRNA known as polycistronic mRNA. Transcription of prokaryotic genes in an operon is regulated by two types of DNA binding proteins known as activators and repressors. Activators bind to the promoter, the site of transcription initiation, and aid in the binding of RNA polymerase, the key enzyme involved in transcription. Repressors bind to operators, short regulatory sequences in the operon between the promoter and the genes, and inhibit the binding of RNA polymerase to the promoter. A structural pre-requisite for activators and promoters is that they should be able to exist in two alternate conformations, one where they can bind to the DNA and one where they cannot. Another characteristic feature specific to activators is that they have two binding surfaces to simultaneously bind to both RNA polymerase and DNA. This recruitment of the two molecules brings the polymerase closer to the promoter and aids in its binding. Activators have no catalytic role to play in transcription and their function is limited to facilitating the binding of the enzyme and DNA. In the absence of an activator, RNA polymerase can still bind to DNA and show low levels of expression. If a repressor is present in this system, then the basal expression of that gene is prevented. Regulation of the expression of prokaryotic genes is largely dependent on the nutrient availability and requirements of the organisms. These nutrients control the binding of activators and repressors to the operon and ensure that only the required set of genes is expressed. Operons are usually either inducible or repressible. Inducible operons, such as the bacterial *lac* operon, are normally "off" but will turn "on" in the presence of a small molecule called an inducer (e. g. , allolactose). When glucose is absent, but lactose is present, allolactose binds and inactivates the *lac* operon repressor—allowing the operon to generate enzymes responsible for lactose metabolism.	

	Repressible operons, such as the bacterial *trp* operon, are usually "on" but will turn "off" in the presence of a small molecule called a corepressor (e. g. , tryptophan). When tryptophan—an essential amino acid—is abundant, tryptophan binds and activates the *trp* repressor—preventing the operon from making enzymes required for its synthesis. For example, the presence of tryptophan in a cell leads to its binding to a repressor which prevents the transcription of the trp operon and subsequent production of tryptophan.	
Q32 (i)	Which of the following statements is true about gene regulation in bacteria? A. Activator proteins bind near promoters and increase efficiency of translation B. Small-molecule "sensors" usually bind DNA and change its 3D structure allosterically. C. Genes with related functions are often grouped together and have a single start codon. D. Repressor proteins block transcription by binding to operator sequences. E. Enhancers are commonly used to regulate transcription.	1
Q32 (ii)	Repressors are active only when they are at the proximity of the RNA polymerase as they directly associate with the pre-initiation complex. State whether this is true or false. A) True B) False	1
Q32 (iii)	In bacteria, transcription is initiated by DNA Polymerase. A) True B) False	1
Q32 (iv)	In addition to the RNA Polymerase, there are also a number of DNA-Binding proteins that facilitate the process of transcription. A) True B) False	1
Q32 (v)	**Assertion:** The expression of Tryptophan operon is dependent of the availability of Tryptophan in culture media. **Reason**: **the presence of tryptophan in a cell leads to its binding to a repressor which prevents the transcription of the trp operon and subsequent production of tryptophan**	1

	(A) Assertion **and the** Reason **are true and the** Reason **is a correct explanation of the** Assertion**.** **(B) Assertion and** Reason **are true but the** Reason **is not a correct explanation of the** Assertion**.** **(C)** Assertion **is true but the** Reason **is false.** **(D) Assertion and** Reason **are false**	

TERM – I

ANSWER KEYS WITH HINTS/ SOLUTIONS

Sexual Reproduction in flowering Plants

1)	**Ans. (b)**	**1**
2)	**Ans. (b)**	**1**
3)	**Ans. (a)**	**1**
4)	**Ans. (d)**	**1**
5)	**Ans. (b)**	**1**
6)	**Ans. (a)**	**1**
7)	**Ans. (b)**	**1**
8)	**Ans. (b)**	**1**
9)	**Ans. (b)**	**1**
10)	**Ans. (c)**	**1**
11)	**Ans. (d)**	**1**
12)	**Ans. (c)**	**1**
13)	**Ans. (d)**	**1**
14)	**Ans. (d)**	**1**
15)	**Ans. (b)**	**1**
16)	**Ans. (c)**	**1**
17)	**Ans. (d)**	**1**
18)	**Ans. (a)**	**1**
19)	**Ans. (d)**	**1**
20)	**Ans. (c)**	**1**
21)	a) Both assertion and reason are true and the reason is the correct explanation of	1

	assertion. (Explanation: fruits that are developed without fertilisation remain seedless)	
22)	c) Assertion is true but reason is false (Explanation: variation in apomixis does not arise because of single parent involvement. Sometimes the diploid egg directly give rise to embryo)	1
23)	b) Both assertion and reason are true but the reason is not the correct explanation of assertion. (Explanation: both the statements are true. One MMC gives four megaspores. Female gametophyte is developed from a single megaspore so it is called monosporic development)	1
24)	c) Assertion is true but reason is false. (Explanation: Another name for a pollen grain is male gametophyte. Pollen grains are released either in 2 celled or 3-celled stage from the anther.)	1
25)	a) Both assertion and reason are true and the reason is the correct explanation of assertion. (Explanation: because of the sporopollenin in the exine pollen grains form into fossils)	1
26)	b) Both assertion and reason are true but the reason is not the correct explanation of assertion. (Explanation: after fertilisation ovules transform into seed and lose water. When the seeds are soaked in water, water enters the seed though the opening called micropyle)	1
27)	d) Both assertion and reason are false (Explanation: fully opened flowers are called chasmogamous flowers. They tend to prefer cross pollination therefore assured seed set is not possible.)	1
28)	a) Both assertion and reason are true and the reason is the correct explanation of assertion. (Explanation: each sporogenous cell produce a microspore mother cell and each microspore mother cell produces four microspores or pollen grains)	1

29)	d) Both assertion and reason are false (Explanation: perisperm is the persistent nucellus found in a seed. Endosperm is formed from the primary endosperm nucleus)	1
30)	b) Both assertion and reason are true but the reason is not the correct explanation of assertion. (Explanation: Transfer of pollen grains from one flower to the other flower of the same plant. So, it is nothing but autogamy. Since transfer of pollen is taking place between two flowers, some agency of pollination is required)	1
31)		
i)	d. (Explanation: production of hybrid seeds is very expensive)	1
ii)	b. (Explanation: production of individuals without fertilisation)	1
iii)	c. (Explanation: embryo directly develops from diploid egg)	1
iv)	a.	1
v)	d. Both assertion and reason are false (Explanation: single parent generate apomictic seeds)	1
32)		
i)	d. (Explanation: As the zygote develops into an embryo endosperm ensures nutritive supply)	1
ii)	a.	1
iii)	c. (Explanation: root cells are diploid)	1
iv)	b. (Explanation: Endosperm is formed by the fusion between a diploid secondary nucleus + male gamete)	1
v)	a. Both assertion and reason are true and the reason is the correct explanation of assertion. (Explanation: tender coconut water represents free nuclei)	1

HUMAN REPRODUCTION

1)	c	
2)	a	
3)	a	
4)	a	
5)	c	
6)	c	
7)	a	
8)	c	
9)	c	
10)	a	
11)	a	
12)	d	
13)	b	
14)	c	
15)	c	
16)	C	
17)	C	
18)	A	
19)	C	
20)	B	
21)	Ans. b reason is not correct explanation for assertion because it is is explaining about reason for pregnancy but not related to menstrual cycle.	1
22)	Ans. d because menstrual phase is followed by follicular phase	1
23)	Ans. a both assertion and reason explain about morula	1
24)	Ans. c because it completes 2^{nd} meiotic division by then	1
25)	Ans. d because placenta does not produce FSH and LH, they are pituitary hormones	1
26)	Ans. a because stem cells are capable of producing all tissues.	1

27)	Ans. c because myometrium helps in strong contractions during parturition and perimetrium helps in protection	1
28)	Ans. a because fertilization can only occur when both male and female gametes reach ampullary isthmic junction where fertilization take place.	1
29)	Ans. a because once ovulation is done the cilia try to push the egg towards oviduct.	1
30)	Ans. b because as per the statement of assertion reason should explain about the hormone produced by corpus luteum.	1
31. i.	Ans. a because it is the fimbriae that collects ovum after ovulation	1
ii.	Ans. a, c they are correctly labelled	1
iii.	Ans. b because either of the ovaries release only one egg at a time	1
iv.	Ans. c uterus receives fertilized egg	1
v.	Ans. a infundibulum contains fimbriae with cilia which helps to collect ovum	1
32. i.	Ans. b primary oocytes undergo 1^{st} meiotic division to form secondary oocyte	1
ii.	Ans. a because it is formed after 1^{st} meiotic division	1
iii.	Ans. b oogonia in fetus undergo mitotic division and form primary oocytes	1
iv.	Ans. c because large number of follicles degenerate from birth to puberty	1
v.	Ans. c because it is released in the form of secondary oocyte.	1

REPRODUCTIVE HEALTH

1	Ans**: (**C) a- (iii), b- (i**), c**-(iv**), d**- (ii)	1
2	Ans: (b) 1 and 2 are correct. Amniocentesis is the sex determinative test based on generic pattern.	1
3	(a) suppression of gonadotropins	1
4	Ans: (c) Ovarian duct	1
5	Ans: (a)	1
6	Ans : (a) "A " is more recent and shows slight reduction in growth rate	1
7	Ans. (a) vasectomy – prevents spermatogenesis.	1
8	Ans: (c) determine any hereditary genetic abnormality in embryo	1
9	Ans**: (c) Arthritis** increases as the age increases in men and women	1
10	Ans: (d) suppress sperm motility.	1
11	Ans: (c) No sperm occurs in epididymis	1
12	Ans: (c) Inhibiting the secretion of FSH and LH that are necessary for ovulation	1
13	Ans: (c) vasectomy / tubectomy	1
14	Ans: (d) Sterilization techniques	1
15	(c) It prevents the movement of sperm into the urethra.	1
16	Ans: (a) ova formation	1
17	Ans: (b) Patrick Steptoe and Robert Edwards	1
18	Ans: Southern blot and ELISA	1
19	Ans: (a) Syphilis-Treponema pallidum	1
20	Ans: (a) who cannot produce an ovum	1
21)	**Ans.** (a) Explanation: - MTP means medical termination of pregnancy and it is also called induced abortion and it was legalized in 1971 and it is to be done to avoid unwanted pregnancies. It is generally to be done in first trimester (first three months) and it is risky in second trimester.	1
22)	**Ans.** (b) Explanation: - Diaphragms, cervical caps and vaults are barrier methods which prevent conceptions by blocking through cervix. They are reusable. No	1

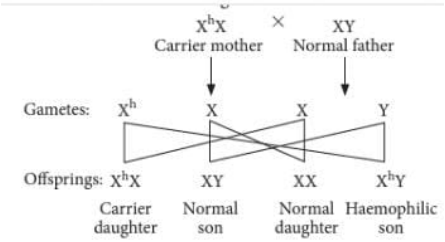
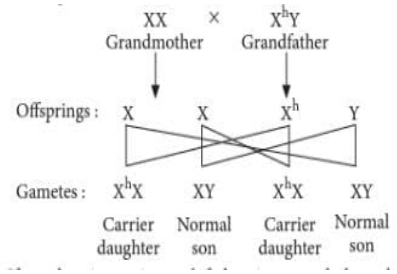
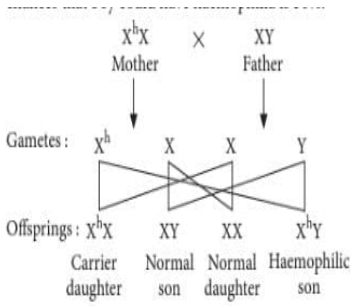
	guarantee for any type of contraceptive method	
23)	**Ans.** (c) Explanation: - Introduction of sex education in schools should be encouraged to provide right information to the young children and to discourage them from believing in myths and having misconceptions about sexrelated aspects. Proper information about reproductive organs, adolescence and related changes, safe and hygienic sexual practices, sexually transmitted diseases (STDs), AIDS, etc	1
24)	**Ans.** (a) Explanation: - Saheli 'is an oral pill which has high contraceptive value and very little side effects And it contains progestin, with no estrogen and non- steroidal preparation. Saheli pill is a once for a week.	
25)	**Ans. (a**) Explanation: - Lactational amenorrhea is a natural method of contraception. Ovulation does not take place during the period of intense lactation following child birth	1
26)	**Ans. (**b) Explanation: - Both are true but, **it** is not correct explanation.	1
27)	**Ans. (b**) Explanation: - Syphilis, gonorrhea and AIDS are some common STD diseases and STDs are transmitted not only through sexual intercourse and also by blood transfusion and by contaminated blades.	1
28)	**Ans.** (b) Explanation: - Coitus interrupts has a high failure rate for a method of contraception.	1
29)	**Ans(a)** **Explanation: -**Amniocentesis (amniotic fluid test or AFT) is a medical procedure used in prenatal diagnosis of chromosomal abnormalities and fetal infections, and also for sex determination, in which a small amount of amniotic fluid, which contains foetal tissues, is sampled from the amniotic sac surrounding a developing foetus, and then the foetal DNA is examined for genetic abnormalities.	1

30)	**Ans.** (b) Explanation: -here is rapid decline in Infant Mortality Rate (IMR) and Maternal Mortality Rate (MMR) The recent World Bank data puts the MMR for India reported in 2015 at 174 per 100, 000 live births, which is a significant decline from the 215 figure that was reported in 2010.	1
31)	**CONTRACEPTIVE METHODS:**	
(i)	**Ans.** (b) C and B–C is diagram of implants and B is the diagram of copper T	1
(ii)	**Ans.** (a) Vasectomy – a small vas deferens is cut and tied.	1
(iii)	**Ans.** (b) Copper T- suppress the sperms motility.	1
(iv)	**Ans. (a)** Diaphragm –one kind of barrier method device	1
(v)	**Ans.** (c) Contraceptives can be broadly grouped into natural, barrier, IUDs, oral contraceptives, injectables, implants and surgical methods.	1
32)	**INFERTILITY AND STERILISATION METHODS**	
(i)	**Ans.** (c) AI - artificial insemination- In this technique, the semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus	1
(ii)	**Ans.** (c) The ovum is fertilized externally and thereafter implanted in uterus	1
(iii)	**Ans.** (c) R and S – in case of R diagram the two fallopian tubes were blocked and there is no possibility of release of ovum and in case of S diagram ,the both fallopian tubes were cut and tied . hence in both case there is no fertilization.	1
(iv)	**Ans.** (b) Zygote is collected from a donor are transferred to the fallopian tube	1
(v)	**Ans.** (b) both are true, but reason is not correct explanation	1

Principles of Inheritance and Variation

1.	b – The sex determination in Honey bee males contains XO type and females contain XX Type sex chromosomes	1
2.	a – Many genes influences one character it is the wrongly matched	1
3.	a- Turner's syndrome	1
4.	d-Study of family history for a particular trait for several generations is called Pedigree analysis	1
5.	c- One gene suppresses the action of another gene is called EPISTASIS	1
6.	d- Co-dominance means both the alleles expresses equally their trait	1
7.	b- Male birds ZZ (Homogametic), Female birds (Heterogametic)	1
8.	d- The linked genes does not show parallelism	1
9.	a- The F1 generation crossed with the recessive parent to test the homo(or)hetero zygosity	1
10.	c- Hemophilia occurs in the Royal family of England so it is called as Royal disease	1
11.	d	1
12.	c- Linked genes does not cause variations due to low recombination frequency of the chromosomes	1
13.	d	1
14.	b-Phenyl hydroxylase enzyme is absent due to inheritance of autosomal recessive trait which converts the phenylalanine to tyrosin so it accumulates the phenyl pyruvic acid and its derivatives	1
15.	c- The gene which moves from one linkage group to another is called translocation	1
16.	b- Both the genes expresses their trait equally	1
17.	d- Chromosomal theory of inheritance	1
18.	c- There are more than 2 or 3 alleles which expresses one character e. g. -Pea plant	1
19.	b	1
20.	d- Sometimes due to Non-dysjunction additional copy of chromosome added to the deployed number it causes the Down syndrome	1
21)	**Ans. a** - The genes in which dominant allele expresses the complete trait are	1

	called mongenic Eg: TT (or) Tt for tallness in pea plant. This type of inheritance is called monogenic inheritance or qualitative inheritance which produces discontinuos variations in the progeny.	
22)	**Ans. b** - Klinefelter syndrome is caused due to the presence of an additional copy of X chromosome resulting into a Karyotype of 47 chromosomes (XXY)	1
23)	**Ans. a** - In the pegions males have, homogametic ZZ chromosomes and females have ZW chromosomes (heterogametic)	1
24)	**Ans. c** - The law of independent assortment states that two factors of each character assort or separate independent of the factors of other characters at the time of gamete formation and get randomly rearranged in the offspring producing both parental and new combinations of traits. The principle of law of independent assortment is applicable to only those factors or genes which are either located distantly on the same chromosome or occur on different chromosomes.	
25)	**Ans. a** - Down's syndrome is an autosomal aneuploidy caused by the presence of an extra chromosome number 21. Both the chromosomes of the pair 21 pass into a single egg due to non-disjunction during oogenesis.	1
26)	**Ans. b** - In human beings 23 pairs of chromosomes are present in diploid cells 22 pairs of autosomes are equal in male and female but one pair of sex chromosomes are different in them. The male contains XY and the female contains XX chromosomes.	1
27)	**Ans. a** – Incomplete dominance. The dominant gene is unable to express its character fully. This happens due to incomplete dominance of allele over the other.	1
28)	**Ans. d** – According to the wobble hypothesis only the first two position of a triplet Codon on mRNA have a precise pairing with the bases of tRNA anti codon. The pairing of third position of codon may be ambiguous varies according to the nucleotide present in this position. Thus, a single tRNA type is able to recognize two or more codons differing only in their base, the same is called wobble position.	1
29)	**Ans. a** – The enzyme for the conversion of phenylalanine to tyrosine is phenylalanine hydroxylase is missing or absent. It is needed to breakdown the	1

	essential amino acid phenylalanine.	
30)	**Ans. d** – Turner's syndrome occurs due absence of XX chromosome. Individuals having a single XX chromosome 2A+XO (45)2A+XO (45) have female sexual differentiation but ovaries are rudimentary. Other associated phenotypes of this condition are short stature, webbed-neck, broad chest, lack of secondary sexual characteristics and sterility.	1
31)		
(i)	**Ans. a**: Haemophilia is a sex-linked disease; it is an inherited disease that usually passed from mother to son	1
(ii)	**Ans. c**: If the mother is the carrier and father is normal than the chances of having normal son would be 50%  	1
(iii)	**Ans. b**: If the maternal grandfather of a boy is haemophilic than her mother will be carrier  If the mother is the carrier and the father is normal than the chances that boy could have haempohilia is 50%  	1
(iv)	**Ans. b**: Haemophilia is caused by a mutation or change in one of the genes that provides instructions for making clotting factor proteins needed to form a	1

	blood clot. This change or mutation can prevent the clotting protein from working properly or to be missing altogether	
(v)	**Ans. a**	1
32)		
(i)	**Ans. c**	1
(ii)	**Ans. d**: The ability of a gene to have multiple phenotypic effects because it influences a number of characters simultaneously is known as pleiotropy. In human beings, pleiotropy is exhibited by syndromes i. e Sickle cell anaemia and Phenylketonuria.	1
(iii)	**Ans. a**: Kernel colour in wheat, height in human beings and skin colouration are examples of polygenic inheritance i. e inheritance controlled by three or more genes. In drosophila, white eye mutations pleiotropic effect, it causes depigmentation in many parts of the body.	1
(iv)	**Ans. d**	1
(v)	**Ans. a**	1

MOLECULAR BASIS OF INHERITANCE

Q No.	ANSWER	WEIGHTAGE
1.	(b) When glutamic acid is replaced by valine in beta polypeptide chain	1
2.	(d) v, vi, iv, ii, i, iii	1
3.	(a) 23 s RNA act as a enzyme in prokaryotes (d) In Eukaryotes three types of RNA polymerases are present.	1
4.	(b) the flow information from RNA to DNA	1
5.	(b) R S Q T P	1
6.	(a) UAAAGG	1
7.	(a) 3 4 1 5 2	1
8.	(c) II and IV	1
9.	e) 4 2 5 1 3 1. Isolation of DNA 2. Digestion of DNA by restriction endonuclease. 3. Separation of DNA fragments by electrophoresis. 4. Blotting of DNA fragment to nitrocellulose. 5. Deletion of hybridised DNA by autoradiography.	1
10.	(c)Three types of interactions stabilize the L-shaped structure of the tRNA. The first is hydrogen bonds between the bases to form the helical parts of the tertiary structure of the tRNA molecule. Second the interaction between the bases and the respective sugar phosphate backbone. Finally, the additional stabilization is provided by the base stacking between the two extended regions of base pairing	1
11.	(d) A single ribosome contacts around so nucleotides on mRNA whereas the due to the large density of ribosome it allows one ribosome per 80 nucleotides. Thus, a typical mRNA could be very long (example: 1000 nucleotides). Therefore, more than one ribosome can attach to the mRNA forming a structure known as polyribosome or polysome	1

12.	(a) The complementary sequence of ATTGCAAT is TAACGTTA. Thus, when the first is read from left to right and the later read from right to left the sequence of the bases is exactly the same. This is the criteria for a sequence to be palindromic.	1
13.	(a) DNA contains phosphorus in phosphodiester linkage and do not contain any sulphur. DNA is primarily composed of phosphate, nucleotide bases and deoxyribose sugar. Whereas proteins are composed of sulfur containing amino acids.	1
14.	(d) Hydrogen bond, Phosphate Nucleotides are phosphate esters of a five-carbon sugar, either ribose of 2'-deoxyribose. The nitrogenous base is covalently linked to the C1 carbon of this pentose sugar to form the nucleotide. Hydrogen bond is made by the bases to hold the two strands of DNA together and is not a part of the nucleotide. A nucleoside is the deoxyribose sugar linked to the base with a glycosidic linkage. Addition of phosphate at the 5'-carbone leads to the formation of the nucleotide	1
15.	(a) DNA contains phosphorus in phosphodiester linkage and do not contain any sulphur. DNA is primarily composed of phosphate, nucleotide bases and deoxyribose sugar. Whereas proteins are composed of sulfur containing amino acids.	1
16.	(a) Type IIIS strain means a smooth strain of pneumococci which is virulent in nature. If this strain is injected alive in a mouse it is bound to develop the disease and thus fall dead.	1
17.	(d) As both the strands of DNA occur simultaneously the two template strands undergo separation. The junction between the newly separated DNA strands and the unreplicated DNA is known as the replication fork.	1
18.	(d)Short oligonucleotides of RNA are required by DNA polymerase for the synthesis of both leading and lagging strands of DNA due to the requirement of free 3' end for DNA synthesis. As formation of oligonucleotides of DNA-	1

	by-DNA polymerase also requires a free 3' end thus, DNA primers are not applicable for the synthesis of new strands of DNA during replication.	
19.	(C) ***i)*** ***z*** codes for **β-galactosidases** which catalyze the hydrolysis of lactose (a disaccharide) into glucose and galactose. ***ii) y*** codes for **β-galactoside permease**, a transport protein that pumps lactose into the cell. ***iii) a*** codes for **β-galactoside transacetylase, which** transfers an acetyl group to galactose. iv) Only *z & y* are required for lactose catabolism.	1
20.	(c) For translation to be successfully initiated, three events must occur. First, the ribosome must be recruited to the mRNA. Second, a charged tRNA must be placed into the P site of the ribosome. Third, the ribosome must be precisely positioned over the start codon (AUG or GUG).	1
21)	**Ans. C** transcription takes place in the membrane-bounded nucleus,	1
22)	**Ans. A** An enzyme is a molecule that speeds up a reaction. In the case of DNA reproduction, enzymes not only speed up the reaction, they are necessary for DNA reproduction. One half of the strand is then used as a template to build a new strand of DNA. The enzyme helicase is responsible for splitting DNA along the base pairs.	1
23)	**Ans. A** The nitrogen bases can only pair in a certain way: A pairing with T and C pairing with G. Due to the base pairing, the DNA strands are complementary to each other, run in opposite directions, and are called antiparallel strands.	1
24)	**Ans. B** Replication of DNA occurs in small replication fork, because DNA is a such a long molecule that the separation of the two strands along its entire length requires a very high amount of energy. The DNA polymerase enzymes cannot initiate the process of replication on their own. The process of replication will also not randomly occur on any strand of the DNA, specific regions will be present. These regions are called as the origin of replication.	1
25)	**Ans. A** Since tRNA on one hand bind to a specific amino acid and on the	1

	other handreads the codon of the amino acid bound to it through its anticodon, it is called an 'adapter'.	
26)	**Ans. C** The double helical structure of the DNA present on saliva, hair follicles, bones, blood and sperm serve as a useful took in the forensic studies. This can be done as the DNA from an individual's tissue shows the same degree of polymorphism. These polymorphic characters are inheritable from parents to their children. Polymorphism, i. e. variation at genetic level, arises due to mutations. It forms the basis of genetic mapping og human genome and DNA-fingerprinting. DNA polymorphism refers to an inheritable mutation that is observed in a population at a high frequency	1
27)	**Ans. C** The direction for DNA dependent DNA polymerases to catalyse the polymerisation reaction is the 5' → 3' direction. But, in this direction of polarity, a discontinuity can be observed. These discontinuous strands of DNA can then be linked together with the help of DNA ligases. But, in the direction of 3' → 5' in the DNA, the replication process can be seen to be continuous.	1
28)	**Ans. D** Alfred Hershey and Martha Chase wanted to figure out whether it was the protein from the bacteriophage that was entering into the bacteria or if it was the DNA. So, they cultured the bacteriophage in a medium containing radioactive phosphorous. In this medium they observed that the radioactive DNA was present in the virus but not the radioactive protein. This is because, protein doesn't contain phosphorous but on the contrary, the DNA does	1
29)	**Ans. B** The stop codons are UAA, UAG and UGA. These codons are absent in the tRNA molecules. tRNA possesses an amino acid acceptor end which is the site for binding the amino acids. Finally, the anticodon loop of the tRNA contains bases that are complementary to the codes.	1
30)	**Ans. A** Introns are regions included in genes that are not actually part of the final protein generated. Scientists first observed that some areas of genes are removed before mRNA translation by visualizing that not all of a gene hybridizes with its cognate mRNA, and hence there are pieces that are spliced out and not used. Note that splicing of introns, like all other post-transational modifications, only occurs in eukaryotes. The function of intron	1

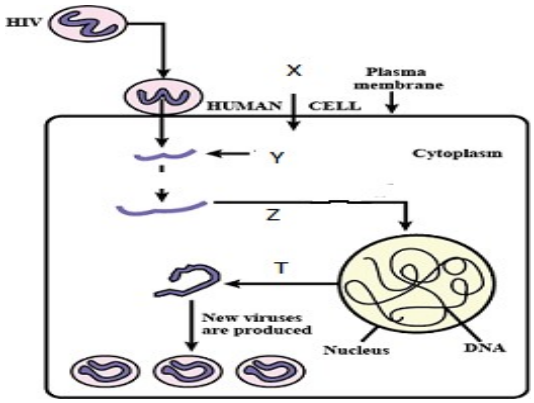
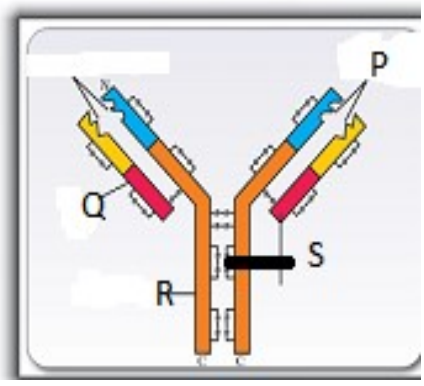
	regions is thought to be mostly regulatory.	
31)		
(i)	**Ans. C** Adenine and Thymine form a double hydrogen bond. Likewise, Guanine and Cytosine form a triple hydrogen bond. So, the correct complementary strand for AGAATTCGC is TCTTAAGCG.	1
(ii)	**Ans. B** The methodologies for the HGP are involved in two major processes. One among them is ESTs (Expressed Sequence Tags). It is used to identify all the genes that are expressed as RNA in HGP.	1
(iii)	**Ans. C**: Bacteria and yeast are the most commonly used hosts for the process of cloning in Human Genome Project. Not all types of fungi can be used for this process. But yeast and bacterium can be employed.	1
(iv)	**Ans. B** When one base pair is stacked over the other in a helical fashion, the DNA will be stable. A right-handed curving fashion is seen in the DNA. When repeating structures are present, the DNA will not be stable. Aneuploidy is in relevance to the abnormality in the number of chromosomes. When chromosomal rearrangements occur, deletion, duplication, translocations and inversions may occur. There will not be any stability.	1
(v)	**Ans. C** Thymine and Uracil are similar in their structures. The key difference between them is the presence of a methyl group attached to the 5^{th} carbon atom. Cytosine will have only one amino group in it whereas, guanine will have an attached imidazole group to it.	1
32)		
(i)	**Ans. D** Repressor proteins block transcription by binding to operator sequences.	1
(ii)	**Ans. B** A repressor is a protein that turns off the expression of one or more genes. The repressor protein works by binding to the gene's promoter region, preventing the production mRNA. Repressors respond to external stimuli to prevent the binding of activating transcription factors.	1
(iii)	**Ans. B** Bacterial transcription is the process in which a segment of bacterial DNA is copied into a newly synthesized strand of messenger RNA (mRNA) with use of the enzyme RNA polymerase.	1
(iv)	Ans. A Transcription is carried out by an enzyme called RNA polymerase and a number of accessory proteins called transcription factors.	1

	Transcription factors can bind to specific DNA sequences called enhancer and promoter sequences in order to recruit RNA polymerase to an appropriate transcription site.	
(v)	Ans. A: the presence of tryptophan in a cell leads to its binding to a repressor which prevents the transcription of the trp operon and subsequent production of tryptophan	1

TERM – II

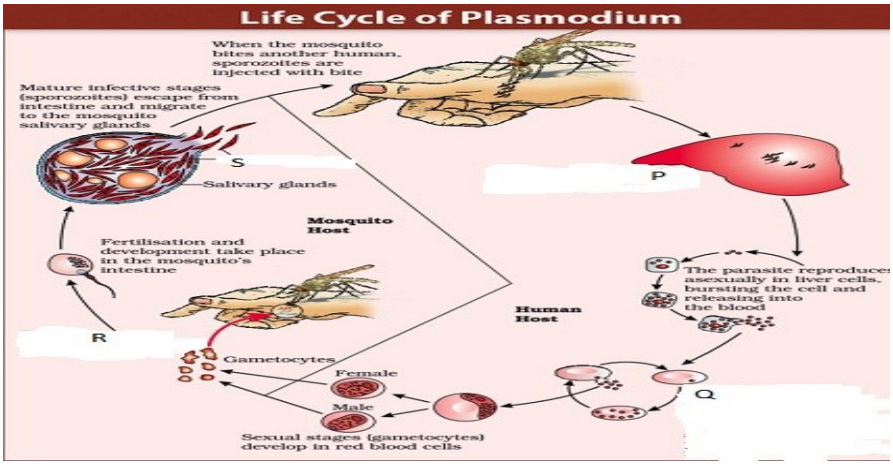
HUMAN HEALTH AND DISEASE

1)	One of the choices is the correct sequences of infectious Agent and Diseases with Vector. a. Name of Disease — Causative Agent — Vector b. Typhoid- — Salmonella typhi- — Mosquito c. Malaria- — Rhinovirus- — Anopheles mosquito d. Chicken gunia- — Flavis virus - — Helminthes e. Filariasis — Wucheraria malai — Female Culex mosquito	1
2)	The Gametocytes of the Malarial parasites are developed in one of the following organs in the hosts? a. Livercells---Human host b. Salivary glands –Anopheles female mosquito c. RBC ----Human host d. Intestine ---Anopheles female mosquito	1
3)	The fungal Disease caused by Ring worm is spread by one of the following causative organism : i) Ascaris lumbricoides — ii). Microsporum iii) Entamoeba histolytica — iv). Epidermophyton a. i and iv b. ii and iv c. i and iii d. ii and iii	1
4)	The Presence of various Barriers in Innate immunity is to prevent of Pathogen entering through different corners in our body. Some of the cells represented are located in different barriers. Identify them according to their location. i)Skin ii) PMNL iii)Tears iv) Interferons v) Mucous a. i) and iii) – Physiological Barrier b. ii) and iv) – Cellular Barrier c. i) and v) -- Physical Barrier d. i) and iv) -- Cytokine Barrier	1

5)	Identify the correct sequence of HIV life cycle from the Depicted diagram.  a. New viral RNA is produced by the infected cell, Viral DNA incorporates into host cell, Viral RNA is introduced into cell, Virus infects normal cell. b. Virus infects normal cell, Viral RNA is introduced into cell, Viral DNA incorporates into host cell, New viral RNA is produced by the infected cell c. Virus infects normal cell, Viral DNA incorporates into host cell, Viral RNA is introduced into cell, New viral RNA is produced by the infected cell. d. New viral RNA is produced by the infected cell, Virus infects normal cell, Viral RNA is introduced into cell, Viral DNA incorporates into host cell.	1
6)	A Cartoon of Antibody is displayed below with unlabeled parts. Identify the parts?  	1

	a. (P)Antigenbinding site (Q) Disulphide bridge R) Light chain (S) Heavy chain b. (P)Disulphide bridge (Q)) Heavy chain R) Light chain (S) Antigen binding site c. (P) Antigen binding site (Q) Light chain (R)Heavy chain S) Disulphide bridges d. (P) Disulphide bridges (Q) Light chain (R) Antigen binding site(S) Heavy chain.	
7)	Withdrawal symptoms are not shown by: a. Stimulants b. Sedatives c. Hallucinogens d. opiates	1
8)	Which of the following is correct for LSD, Morphine, and Hashish respectively? a. Cleviceps, Papever somniferum,Cannbis. b. Cleviceps, Cannabis,Papever somniferous c. Cleviceps, Cannabis,Rawolfia d. Cleviceps, Papever somniferous ,Cannabis	1
9)	Which one of the following statement is correct regarding Psychotropic drugs specified? a. Hashish causes after thought perception and hallucination. b. Barbiturates causes relaxation and temporary euphoria. c. Opium stimulates Nervous system and causes Hallucination. d. Morphine leads to Delusions and disturbed emotions.	1
10)	Match the Column I AND II P) Malaria i) Plasmodium Q) Ringworm ii) Rhino virus R) Cold iii) Retrovirus S) AIDS iv) Filarial worm T) Elephentasis v) Microspore a. P-i), Q- iii), R-ii), S-iv) , T-v) b. P-i) Q-iv) R-ii), S-iii) T-v) c. P-i), Q-v), R-ii), S-iii), T-iv)	

	d. D) P-ii),Q-v) , R-iii), S-iv) , T-I)	
11)	Identify the wrongly matched pair: a. Typhoid - Widaltest b. Plague- Viral Disease c. Malignant malaria-Plasmodium d. D) Common cold –Rhino virus.	1
12)	The Normal cells of human body have genes called cellular oncogenes which are present in inactive form but certain mutations may transfer these cells into a. Photo oncogenes b. B) Oncogenes c. C) Neogenes d. D) Carcinogens	1
13)	The Latest method of Treatment of cancer with Biological modifications is known as known as: a. Radiotherapy b. Chemotherapy c. Immunotherapy d. Surgery	1
14)	Heroine is a depressant, odorless, bitter and crystalline compound.it is extracted from latex of : a. Cannabis sativa b. Claviceps purperia c. Papever somniferum d. Atropa bellodona	1
15)	The Inflammation of lower limbs in Filariasis is due to.. a. Bite of female culex mosquito b. Blockage of Blood vessels c. Deforestation of Genital organs d. Blockage of lymph vessels	1
16)	Cancer cells are Damaged by radiations while others are not due to cancer cells: a. Being starved b. Being different in nature c. Immature and undergoing rapid division	1

	d. Mature and undergoing rapid division	
17)	A Cartoon of Malarial parasite life cycle is given with marked letters P, Q,R,and S, Identify the correct sequence from the choice given below.  a. P) Parasites reach the liver through blood, Q) Red blood cells burst to release Toxicants known as Sporozoin. R)Female mosquito takes up gametocytes with blood meal , S) Sporozoites b. P) Parasites reach the liver through blood, Q)Sporozoites R) Red blood cells burst to release Toxicants known as Sporozoin. c. P) Parasites reach the liver through blood, Q) Female mosquito takes up gametocytes with blood meal R). Sporozoites S). Red blood cells burst to release Toxicants known as Sporozoin. d. P) Sporozoites Q). Red blood cells burst to release Toxicants known as Sporozoin. R). Parasites reach the liver through blood D). Female mosquito takes up gametocytes with blood meal	1
18)	The Yellowish fluid colostrum secreted by mammary glands of lactation has abundant antibodies (Ig A) to protect the infant. This type of immunity is called a. Passive immunity b. active immunity c. Acquired immunity d. Auto Immunity	1
19)	Which of the following responses is responsible for rejection of Kidney Graft? a. Cell Mediated Immune Response b. Auto immune Response	1

	c. Humoral Immune Response d. Inflammatory Immune Response	
20)	Use of Anti Histamines and Steroids give a quick relief from : a. Allergy b. Nausea c. Cough d. Head ache	1
21)	**Assertion:** Virus infected cells secrete protein called interferon which protect Non-infected cells from further viral infection. **Reason:** Interferons prevent replication of viruses by directly interfering with Their ability to replicate with an infected cell. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
22)	**Assertion:** It is true that when male mosquito bites there is no chance of infection Of malaria. **Reason: Female** anopheles mosquito is responsible for malaria transmission. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. **(d)** Reason is true and Assertion is false.	1
23)	**Assertion:** When some organ in our body fails to function, Transplantation is successful from any donor. **Reason:** The Body is able to differentiate self and Non self and the cell medicated immune response is responsible for graft rejection. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of	1

	assertion. (c) Assertion is true but reason is false. (d) Reason is true and Assertion is false.	
24)	**Assertion:** Allergy is due to the release of chemicals like histamine and serotonine from mast cells. **Reason:** Excessive secretions of mast cells is the result of Allergy. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
25)	**Assertion:** Drugs like amphetamines, benzodiazepines are normally used as medicines to help patients cope with mental illness like depression and Insomnia. **Reason:** Therefore these drugs are very useful to the mankind in all aspects. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
26)	**Assertion:** Vaccination is the only way to develop antibodies. **Reason:** Antibodies can be formed naturally and artificially also. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Reason is true but Assertion is false	1
27)	**Assertion:** Alveoli of lungs get filled with fluid. **Reason:** Vaccination provide active immunity against typhoid. (a) Both assertion and reason are true, and reason is the correct explanation of	

	assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
28)	**Assertion:** Warts and Black moles on our body are belongs to Benign tumors. **Reason:** The Malignant tumors on the other hand are the mass of proliferating Neoplastic tumors. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
29)	**Assertion:** *Papaver somnife*rum is cultivated to obtain drugs **Reason:** Morphine is obtained from its latex (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
30)	Assertion**:** Immuno suppressant medicines are provided after organ Transplantation Reason**:** To suppress B-cells and T-cells (a) Both assertion and reason are true and reason is correct explanation for Assertion (b) Both assertion and reason are true but reason is not correct explanation for Assertion (c)Assertion is correct statements but reason is not correct statements (d) Reason is correct statements but assertion is not correct statements.	1

31)	***Read the following and answer all the five questions from 11(i) to 11 (v) given below*** The Disease caused by filarial worm *Wuchereria bancroft*, also known as *Filarial bancroft* and *W. vmalayi*. these nematodes, commonly called human filarial worms, are endoparasites and are commonly found in the lymphatic vessel and lymph nodes of human beings particularly in the growing regions man is the only definitive host of *W. boncrofti* , while a large number of mosquito act as secondary hosts. In India culex mosquito is responsible for the transmission of Filariasis.	
(i)	Identify the Diseases transmitted by mosquitoes. (a) Elephentasis, malaria, dengue (b) *Wuchereria, Ascarises, Teaniasis* (c) AIDS, Syphilis, Filariasis (d) Filariasis, dengue, typhoid.	1
(ii)	This Disease can be transmitted during the day if the parasitic worms are sucked by: (a) Anopheles sp (b) Culex sp (c) Houseflies (d) Ades sps	1
(iii)	Identify the Digenetic parasite from the following**:** (a) Ascaris, Taenia (b) Plasmodium , wuchereria (c) Entamoeba, wuchereria (d) Plasmodium Microsporum	1
(iv)	Filarial worm is an endoparasite infected in one of the following organs: (a) Blood vessels (b) Urinary vessels (c) Lymph vessels (d) All the above	1

(v)	**Assertion:** Elephantiasis is an example of mosquito-borne disease **Reason:** The causative worms block the flow of lymph in the body due to their accumulation in the lymph nodes. (a) Both assertion and reason are true and reason is correct explanation for Assertion (b) Both assertion and reason are true and reason is not correct explanation for Assertion (c) Assertion is correct statement but reason is false (d) Reason is correct statements but assertion is false.	1
32)	***Read the following passage and answer questions from 12(i) to 12(v) given below:*** A Group of teenagers were involved in drug abuse. They used syringes and needles to inject drugs. They indulged in this habit when they became adults. Administration of drugs through needles became a piece of cake for them chetan was the most drug abuser amongst and used to take part in high profile parties.in a span of time he started losing weight and suffered persistent diarrhea. He developed constant low fever used to catch frequent infections. When he consulted a doctor suggested for HIV test and showed +Ve for AIDS after Diagnoses. Based on the above information answer the following questions:	
(i)	Select the incorrect statement: a) AIDS is a disorder of cell mediated immune system of the body. b)AIDS is caused by Human immune deficiency Disorder c) AIDS patients suffer from Severe combined immunodeficiency Disorder. d) AIDS is not observed on 1st December as world AIDS Day.	1
(ii)	How do you think Chetan gets HIV? a) Through transmission of HIV infected blood. b)Sexual intercourse with an infected partner c) Sharing towel with infected friend. d) Use of contaminated needles and syringes to inject drugs.	1

(iii)	How can AIDS be prevented? (a) Blood test for HIV of blood donor before transfusion to a patient. (b)Use of Disposal needles for injection of medicines and vaccination (c) Having safe and protected sex with partner by using condoms. (d)All the above	1
(iv)	What is the best Diagnostic method for AIDS? (a)ELISA (b)WIDAL (c) AMES (d) PAPS	
(v)	**Assertion:** After getting into the body of a person, the HIV enters macrophages. **Reason:** Here RNA is replicated to form viral DNA by Reverse Transcription mechanism. (a) Both assertion and reason are correct and reason is the correct explanation for assertion. (b)Both assertion and reason are correct but reason is not correct explanation for assertion (c) Assertion is correct statement but reason is wrong. (d) Reason is correct statement but assertion wrong.	1 1

Microbes in Human Welfare

1)	The gut of ruminants containing a) Halophiles b) Acidophiles c) Methenogenes d) All above	1
2)	Saccharomyces cerevisiae is used a) Baking b) Bleaching c) Biofuel d) None of the above	1
3)	Bacillus thuringiensis is used for a) Fermentation of beer b) Bio pesticide c) Antibiotic d) Pesticide	**1**
4)	Example of a natural insect repellant a) Citronella oil b) Coconut oil c) Linseed oil d) Rapseed oil	1
5)	Antibiotics are the most effective on a) Bacteria b) Virus c) Fungi d) Algae	1
6)	Which of the following microbes are used for the commercial production of citric acid? a) Xanthomonas citri b) Asparagine c) Asparagus d) Aspergillus	1
7)	Which of the following is widely used as a successful biofertiliser in Indian rice	1

	field? a) Rhizobium b) Acacia arabica c) Acalypha indica d) Azolla pinnata	
8)	Which of the following is a non-symbiotic biofertiliser? (a) VAM (b) Azotobacter (c) Anabaena (d) Rhizobium	1
9)	Vitamin whose content increases following the conversion of milk into curd is (a) Vitamin C (b) Vitamin D (c) Vitamin B12 (d) Vitamin E	1
10	BOD of wastewater is estimated by measuring the amount of (a) Total organic matter b) Biodegradable organic matter (c) Oxygen evolution (d) Oxygen consumption	1
11	Which one of the following is not a nitrogen-fixing organism? (a) Anabaena (b) Nostoc (c) Azotobacter (d) Pseudomonas	1
12	Mycorrhiza does not help the host plant in (a) Enhancing its phosphorus uptake capacity (b) Increasing its tolerance to drought (c) Enhancing its resistance to root pathogens (d) Increasing its resistance to insects	1
13	Which of the following antibiotics was extensively used to treat American soldiers wounded in World War 11?	1

	(a) Neomycin (b) Bacitracin (c) Chloramphenicol (d) Penicillin	
14	Integrated Pest Management (IPM) discourages the excessive used of (a) Biological methods (b) Chemical pesticides (c) Mechanical methods (d) all	1
15	Organic farming does not include (a) Green manures (b) Chemical fertilisers (c) Farmyard manures (d) Compost	1
16	Enzyme which has the fibrinolytic effect is (a) Protease (b) Amylase (c) Lipase (d) Streptokinase	1
17	Monascus purpureus is a yeast commercially used in the production of (a) citric acid (b) Ethanol (c) Blood cholesterol lowering statins (d) Streptokinase for removing clots from blood vessels	1
18	The purpose of biological treatment of waste water is to (a) Reduce BOD (b) Increase BOD (c) Reduce sedimentation (d) Increase sedimentation	1
19	Methanogens do not produce (a) Oxygen (b) Methane (c) Hydrogen sulphide	1

	(d) Carbon dioxide	
20	Bacillus thuringiensis (Bt) strains have been used for designing novel (a) Biofertiliser (b) Bio-metallurgical techniques (c) Bio-mineralisation process (d) bio-insecticidal plants	1
21)	**Assertion:** Besides curdling of milk, LAB also improve its nutritional quality by increasing vitamin-B12. **Reason:** LAB, when present in human stomach, check disease causing microbes. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
22)	**Assertion:** Vitamins B2 is found in cereals, green vegetables, brewer's yeast, egg white, milk and liver. **Reason:** It can be commercially produced by some yeasts. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
23)	**Assertion:** easts such as Saccharomyces cerevisiae are used in baking industry. **Reason:** Carbon dioxide produced during fermentation causes bread dough to rise by thermal expansion. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false.	1

	(d) Both assertion and reason are false.	
24)	**Assertion:** Lichen is important for chemical industries. **Reason:** Litmus and Orcein are formed from lichens. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
25)	**Assertion:** Beer and wine are called soft liquors while gin, rum, etc. are hard liquors. **Reason:** Beer and wine are made without distillation. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
26)	**Assertion:** Energy value of biogas is lower than that of organic matter. **Reason:** Biogas minimises the chances of spread of fecal pathogens (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
27)	**Assertion:** The kneaded flour shows leavening, when yeast is added to it. **Reason:** Enzymes secreted by yeast cause leavening. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false.	1

	(d) Both assertion and reason are false.	
28)	**Assertion:** Secondary treatment of sewage is also called biological treatment while primary treatment is called physical treatment. **Reason:** Primary sewage treatment depends only upon sedimentation properties of materials present in sewage and filtration. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
29)	**Assertion:** After 24 hours, toddy becomes unpalatable. **Reason:** The fermentation of toddy is continued by naturally occurring yeasts. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
30)	**Assertion:** All microbes cause diseases **Reason:** All microbes are harmful (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
31)	***Read the following and answer the questions from 11(i) to 11(v) given below:*** Biogas is a mixture of gases (containing predominantly methane) produced by the microbial activity and which may be used as fuel. You have learnt that microbes produce different types of gaseous end-products during growth and metabolism. The type of the gas produced depends upon the microbes and the	

	organic substrates they utilise. In the examples cited in relation to fermentation of dough, cheese making and production of beverages, the main gas produced was CO2. However, certain bacteria, which grow anaerobically on cellulosic material, produce large amount of methane along with CO2 and H2. These bacteria are collectively called methanogens, and one such common bacterium is Methanobacterium. These bacteria are commonly found in the anaerobic sludge during sewage treatment. These bacteria are also present in the rumen (a part of stomach) of cattle. A lot of cellulosic material present in the food of cattle is also present in the rumen. In rumen, these bacteria help in the breakdown of cellulose and play an important role in the nutrition of cattle. Do you think we, human beings, are able to digest the cellulose present in our foods? Thus, the excreta (dung) of cattle, commonly called gobar, is rich in these bacteria. Dung can be used for generation of biogas, commonly called gobar gas.	
(i)	Which one is involved in biogas production? (a) *Strptococcus* (b) *Methanococcus* (c) *Thermococcus* (d) *Halococcus*	1
(ii)	In biogas the maximum constituent is (a) Butane (b) Propane (c) Methane (d) Ethane	1
(iii)	In the process of fermentation the chief gas produced is (a) CO_2 (b) CH_4 (c) SO_2 (d) CO	1
(iv)	The spent slurry of biogas plant (a) Used as fertilizer (b) In bio gas production (c) Alcohol making	1

	(d) To produce STP	
(v)	besides dung the weed that can be used in biogas production is (a) *Solariumn nigrum* (b) *Eichornia crassiper* (c) *Parthenium hysterrophorus* (d) *Hydrilla*	1
32)	***Read the following and answer the questions from 12(i) to 12(v) given below:*** The very familiar beetle with red and black markings – the Ladybird, and Dragonflies are useful to get rid of aphids and mosquitoes, respectively. An example of microbial biocontrol agents that can be introduced in order to control butterfly caterpillars is the bacteria Bacillus thuringiensis (often written as Bt). These are available in sachets as dried spores which are mixed with water and sprayed onto vulnerable plants such as brassicas and fruit trees, where these are eaten by the insect larvae. In the gut of the larvae, the toxin is released and the larvae get killed. The bacterial disease will kill the caterpillars, but leave other insects unharmed. Because of the development of methods of genetic engineering in the last decade or so, the scientists have introduced B. thuringiensis toxin genes into plants. Such plants are resistant to attack by insect pests. Bt-cotton is one such example, which is being cultivated in some states of our country. You will learn more about this in chapter 12. A biological control being developed for use in the treatment of plant disease is the fungus Trichoderma. Trichoderma species are free-living fungi that are very common in the root ecosystems. They are effective biocontrol agents of several plant pathogens. Baculoviruses are pathogens that attack insects and other arthropods. The majority of baculoviruses used as biological control agents are in the genus *Nucleopolyhedrovirus*. These viruses are excellent candidates for species-specific, narrow spectrum insecticidal applications. They have been shown to have no negative impacts on plants, mammals, birds and fish or even on non-target insects. This is especially desirable when beneficial insects are being conserved to aid in an overall integrated pest management (IPM) programme, or when an ecologically sensitive area is being treated.	
(i)	The following is very familiar beetle with red and black markings and is used to get rid of aphids	

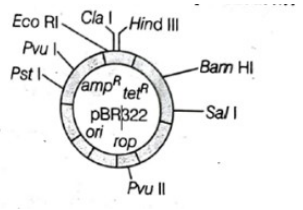
	(a) Dragon fly (b) Blister beetle (c) Lady bird (d) Praying mantis	1
(ii)	Biological control of pest is (a) Expensive (b) Self perpetuating (c) Polluting (d) Poisonous	1
(iii)	We need to replace chemical pesticides by some other ways as (a) These are costly (b) Non-biodegradable (c) Problematic storage (d) Destroy plants	1
(iv)	Cochineal insect is used as bio herbicide to control the overgrowth of (a) Weeds (b) Cacti (c) *Eichorrnia* (d) Scale insects	1
(v)	A common biochemical agent for the control of plant disease is (a) *Glomus* (b) *Trichoderma* (c) *Bacillus Thuringiensis* (d) *Baculovirus*	1

Biotechnology: Principles and Processes

1)	Which of the following should be chosen for best yield if one were to produce a recombinant protein in large amounts? a. Laboratory flask of largest capacity b. A stirred-tank bioreactor without in-lets and out-lets c. A continuous culture system d. Any of the above	1
2)	A bacterial cell was transformed with a recombinant DNA molecule that was generated using a human gene. However, the transformed cells did not produce the desired protein. Reasons could be: a. Human gene may have intron which bacteria cannot process b. Amino acid codons for humans and bacteria are different c. Human protein is formed but degraded by bacteria d. All of the above	1
3)	Which of the following steps are catalysed by Taq DNA polymerase in a PCR reaction? a. Denaturation of template DNA b. Annealing of primers to template DNA c. Extension of primer end on the template DNA d. All of the above	
4)	The role of DNA ligase in the construction of a recombinant DNA molecule is a. Formation of phosphodiester bond between two DNA fragments b. Formation of hydrogen bonds between sticky ends of DNA fragments c. Ligation of all purime and pyrimidine bases d. None of the above	1
5)	Significance of 'heat shock' method in bacterial transformation is to facilitate: a. Binding of DNA to the cell wall b. Uptake of DNA through membrane transport proteins c. Uptake of DNA through transient pores in the bacterial cell wall d. Expression of antibiotic resistance gene	1

6)	An antibiotic resistance gene in a vector usually helps in the selection of: a. Competent bacterial cells b. Transformed bacterial cells c. Recombinant bacterial cells d. None of the above	1
7)	Which of the following contributed in popularising the PCR (polymerase chain reactions) technique? a. Easy availability of DNA template b. Availability of synthetic primers c. Availability of cheap deoxyribonucleotides d. Availability of 'Thermostable' DNA polymerase	1
8)	While isolating DNA from bacteria, which of the following enzymes is not required? a. Lysozyme b. Ribonuclease c. Deoxyribonuclease d. Protease	1
9)	The most important feature in a plasmid to serve as a vector in gene cloning experiment is: a. Origin of replication (ori) b. Presence of a selectable marker c. Presence of sites for restriction endonuclease d. Its size	1
10)	In agarose gel electrophoresis, DNA molecules are separated on the basis of their: a. Charge only b. Size only c. Charge to size ratio d. All of the above	1
11)	Which of the following is not required in the preparation of a recombinant DNA molecule? a. Restriction endonuclease	1

	b. DNA ligase c. DNA fragments d. *E.coli*	
12)	'Restriction' in Restriction enzyme refers to: a. Cleaving of phosphodiester bond in DNA by the enzyme b. Cutting of DNA at specific position only c. Prevention of the multiplication of bacteriophage by the host bacteria d. All of the above	1
13)	Which of the given statements is correct in the context of visualizing DNA molecules separated by agarose gel electrophoresis? a. DNA can be seen in visible light b. DNA can be seen without staining in visible light c. Ethidium bromide stained DNA can be seen in visible light d. Ethidium bromide stained DNA can be seen under exposure to UV light	1
14)	The transfer of genetic material from one bacterium to another through the mediation of a viral vector is termed as: a. Transduction b. Conjugation c. Transformation d. Translation	1
15)	Which of the following enzymes catalyse the removal of nucleotides from the ends of DNA? a. Endonuclease b. Exonuclease c. DNA ligase d. Hind – II	1
16)	Which of the following restriction enzymes produces blunt ends? a. Sal I b. Eco RV	

	c. Xho I d. Hind III	
17)	The given figure is the diagrammatic representation of the E. coli vector pBR322. Which one of the given options correctly identifies its certain component(s)? a. Ori-original restriction enzyme b. Rop-reduced osmotic pressure c. Hind lll, Eco RI-selectable markers d. ampR, tetR-antibiotic resistance genes 	
18)	What is the criterion for DNA fragments movement on agarose gel electrophoresis? a. The larger the fragment size, the farther it during gel moves b. The smaller the fragment size, the farther it moves c. Positively charged fragments move to farther end d. Negatively charged fragments do not move	
19)	PCR and restriction fragment length polymorphism are the methods for a. Study of enzymes b. Genetic transformation c. DNA sequencing d. Genetic fingerprinting	
20)	Given below is a sample of portion of DNA strand giving the base sequence on the opposite strands? What is so, special shown in it? 5'-GAATTC-3' 3'CTTAAG-5' a. Replication completed b. Deletion mutation c. Start codon at the 5' end d. Palindromic sequence of base pairs	
21)	**Assertion:** In a genetic engineering process, it is necessary to prepare sterile ambience. **Reason:** Sterile ambience inhibits the growth of undesirable microbes during manufacture of product. (e) Both assertion and reason are true, and reason is the correct explanation of assertion. (f) Both assertion and reason are true, but reason is not the correct explanation	1

	of assertion. (g) Assertion is true but reason is false. (h) Both assertion and reason are false.	
22)	**Assertion:** Golden rice is Vitamin A enriched rice variety developed through conventional breeding method. **Reason:** From wild rice varieties Beta carotene genes were transferred into cultivated rice varieties. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
23)	**Assertion:** Genetic engineering can overcome the drawbacks of traditional hybridization. **Reason:** Genetic engineering can create desired DNA sequences to meet specific requirements. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
24)	**Assertion:** A piece of DNA inserted into an alien organism generally replicate if not inserted into a chromosome. **Reason:** Chromosomes have specific sequences called 'ori'" region where DNA replication is terminated. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1

25)	**Assertion:** All Restriction enzymes produce sticky ends. **Reason:** Restriction enzymes are produced in both prokaryotic and eukaryotic organisms (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
26)	**Assertion:** DNA move from cathode to anode **Reason:** Separation DNA in gel electrophoresis is based on charge (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
27)	**Assertion:** E. coli having pBR322 with DNA insert at BamH I site cannot grow in medium containing tetracycline. **Reason:** Recognition site for BamH I is present in tet^R region of pBR322. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
28)	**Assertion:** A bacterial cell with no restriction enzymes will be easily infected and lysed by bacteriophages **Reason:** Restriction enzymes catalyse synthesis of protective coat around bacterial cell that prevents bacteriophage attack. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation	1

	of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
29)	**Assertion:** Use of chitinase enzyme is necessary for isolation of DNA from yeast cells but not in case of Spirogyra. **Reason:** Fungal cell wall is made up of chitin. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
30)	**Assertion:** Protein encoding gene is expressed in heterologous host is known as recombinant protein **Reason:** In continuous culture systems fresh medium is continuously added and spent medium is drained. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
31)	***Read the following and answer any four questions from 11(i) to 11(v) given below:*** **Natural plant genetic engineer** We have learnt the lesson of transferring genes into plants and animals from bacteria and viruses which have known this for ages – how to deliver genes to transform eukaryotic cells and force them to do what the bacteria or viruses want. The genus *Agrobacterium* has been divided into a number of species. *A. tumifaciens* causes crown gall disease and *A. rhizogenes* causes hairy root disease. *A. tumifaciens* is a soil bacterium that can genetically transform plant cells with a segment of DNA (T-DNA) from a tumor-inducing plasmid (Ti	

	plasmid) with the resultant production of a crown gall, which is a plant tumor. Virulent strains of *Agrobacterium* contain tumor-inducing (Ti) or Ri plasmids. *A. rhizogenes* contain Ri plasmid possessing different gene segments. The transferred DNA (T-DNA) is referred to as the T-region when located on the Ti or Ri plasmid. During infection with *Agrobacterium*, a piece of DNA is transferred from the bacterium to the plant cell. Similarly, retroviruses in animals have the ability to transform normal cells into cancerous cells. Retroviruses differ from most other viruses by having both DNA and RNA genomes at different times in their life cycle. However, having both types of genomes requires retroviruses to go through some molecular gymnastics to recreate a 5' promoter to synthesize the RNA genome and to synthesize a copy of the primers for synthesis of the DNA genome. In addition, retroviruses have an efficient means of integrating their DNA genome into the cell DNA. These features make retroviruses genetic engineers of cells, because they add genes to the cell genome and do not necessarily kill their host cell by replication, using instead the cellular transcription machinery to synthesize their RNA genomes.	
(vi)	T-DNA is present in (a) All bacterial cells (b) *Agrobacterium* (c) *Rhizobium* (d) None of the above	1
(vii)	The introduction of T-DNA into plants involves (a) Exposing the plants to cold for a brief period (b) Allowing the plant roots to stand in water (c) Infection of the plant by *Agrobacterium tumifaciens* (d) Altering the pH of the soil, then heat-shocking the plants.	1
(viii)	Hairy root disease is caused by (a) *Agrobacterium tumifaciens* (b) *Agrobacterium rhizogenes* (c) Both a & b (d) None of the above	1
(ix)	Which of the following convert normal cell to tumor cell in animal (a) *Agrobacterium tumifaciens*	1

	(b) *Agrobacterium rhizogenes* (c) Retroviruses (d) All of the above	
(x)	**Assertion:** *Agrobacterium* transfer complete Ti plasmid in to plant cell **Reason:** Disarmed Ti plasmid is used for genetic transformation of animal (a) If both assertion and reason are true and reason is the correct explanation of assertion. (b) Both assertion and reason are true but reason is not the correct explanation of assertion. (c) If assertion is true but reason is false. (d) If both assertion and reason are false.	1
32)	***Read the following and answer the questions from 12(i) to 12(v) given below:*** **Anti-phase system in bacteria:** Bacteria are under constant attack from bacteriophages (phages), bacterial parasites that are the most abundant biological entity on earth. To resist phage infection, bacteria have evolved an impressive arsenal of anti-phage systems. Restriction-modification (RM) systems are a ubiquitous and extremely diverse mode of anti-phage defense. They are normally made up of two activities**:** a restriction endonuclease and a methyltransferase. The restriction endonuclease recognizes short DNA motifs, usually 4- to 8-base-pairs long palindromic nucleotide sequences and cuts the bacteriophage DNA. These DNA motifs exist in both the bacterial host and invading phage, but the host protects its genome by using the methyltransferase to modify its own DNA to avoid recognition by the restriction enzyme. An invading phage is usually not methylated and will therefore be cut upon injection. RM systems are classified into four major types based their mechanism of action and subunit composition. Both type I and III systems translocate along DNA and cleave away from the recognition sites. Type II, known for their use in molecular cloning, cleave within or near the recognition site. Type IV systems lack a methylase and only contain a restriction endonuclease, which cleaves only modified DNA. The first Type II restriction endonuclease–*Hin*d II, isolated from *Haemophilus influenzae* Rd, similarly, *Eco* RI isolated from *Escherichia coli* RY 13.	
(i)	Which of the following statements is correct regarding **EcoRI** restriction	1

	endonuclease enzyme? (a) It is isolated from *Escherichia coli* RY 13. (b) Its recognition sequence is 5`-AAGCTT-3` 3`-TTCGAA-5`. (c) It produces complementary blunt ends (d) None of these	
(ii)	Following statements describe the characteristics of the enzyme restriction endonuclease. Identify the incorrect statement. (a) The enzyme recognizes a specific palindromic nucleotide sequence in the DNA. (b) The enzyme cuts DNA molecule at identified position within the DNA. (c) The enzyme binds DNA at specific sites and cuts only one of the two strands. (d) The enzyme cuts the sugar-phosphate backbone at specific sites on each strand.	1
(iii)	The term "molecular scissors" generally refers to (a) DNA polymerases (b) RNA polymerases (c) Restriction endonucleases (d) DNA ligases	1
(iv)	Which of the following enzyme(s) are produced by bacteria during bacteriophage infection (a) Restriction endo nucleases (b) Methylases (c) Restriction exo nucleases (d) Both Restriction endo nucleases and Methylases	1
(v)	**Assertion:** Genetic engineering requires both nucleases and ligases. **Reason:** DNA Ligases produce the nick in the recombinant DNA molecule. (a) If both assertion and reason are true and reason is the correct explanation of assertion. (b) Both assertion and reason are true but reason is not the correct explanation of assertion. (c) If assertion is true but reason is false. (d) If both assertion and reason are false.	1

Biotechnology and Its Applications

1)	Silencing of a gene could be achieved through the use of: a. RNAi only b. antisense RNA only c. both RNAi and antisense RNA d. none of the above	1
2)	For transformation, microparticles coated with DNA to be bombarded with gene gun are made up of a. Silver or platinum b. Silicon or platinum c. Platinum or zinc d. Gold or tungsten	
3)	The first clinical gene therapy was done for the treatment of: a. AIDS b. Cancer c. Cystic fibrosis d. SCID (Severe Combined Immuno Deficiency resulting form deficiency of ADA)	1
4)	In RNAi, genes are silenced using: a. ss DNA b. ds DNA c. ds RNA d. ss RNA	1
5)	The trigger for activation of toxin of Bacillus thuringiensis is: a. Acidic pH of stomach b. High temperature c. Alkaline pH of gut d. Mechanical action in the insect gut	1
6)	antitrypsin is: a. An antacid b. An enzyme c. Used to treat arthritis d. Used to treat emphysema	1

7)	A protoxin is: a. A primitive toxin b. A denatured toxin c. Toxin produced by protozoa d. Inactive toxin	1
8)	Choose the correct option regarding Retrovirus: a. An RNA virus that synthesises DNA during infection b. A DNA virus that synthesises RNA during infection c. A ssDNA virus d. A dsRNA virus	1
9)	Which one of the following is commonly used in transfer of foreign DNA into crop plants? a. Trichoderma harzianum b. Meloidogyne incognita c. Agrobacterium tumifaciens d. Penicillium expansum	
10)	In transgenics, expression of transgene in target tissue is determined by a. Enhancer b. Transgene c. Promoter d. Reporter	
11)	Two bacteria found to be very useful in genetic engineering experiments are a. Nitrosamines and Klebsiela b. Escherichia and Agrobacterium c. Nitrobacteria and Azotobacter d. Rhizobium and Diplococcus	
12)	The two polypeptides of human insulin are linked together by a. Phosphodiester bonds b. Covalent bonds c. Disulphide bridges d. Hydrogen bonds	
13)	Golden rice is a genetically modified crop plant where the incorporated gene is meant for biosynthesis of	

	a. Vitamin B b. Vitamin C c. omega3 d. Vitamin A	
14)	Commonly used vectors for human genome sequencing are a. T-DNA b. BAC and YAC c. Expression vectors d. T/A cloning vectors	
15)	Maximum number of existing transgenic animals is of a. Fish b. Cow c. Mice d. Pig	
16)	The Genetically Modified (GM) brinjal in India has been developed for a. Insect-resistance b. Enhancing self-life c. Enhancing mineral content d. drought-resistance	
17)	Human insulin is being commercially produced from a transgenic species of a. Rhizobium *b. Escherichia* c. Saccharomyces d. Mycobacterium	
18)	Production of a human protein in bacteria by genetic engineering is possible because a. Bacterial cell can carry out the RNA splicing reactions b. The human chromosome can replicate in bacterial cell c. The mechanism of gene regulation is identical in humans and bacteria d. The genetic code is universal	
19)	Producing a giant mouse in the laboratory was possible through a. Gene mutation b. Gene synthesis	

	c. Gene manipulation d. Gene duplication	
20)	Introduction of food plants developed by genetic engineering is not desirable because a. Economy of developing countries may suffer b. These products are less tasty as compared to the already existing products c. This method is costly d. There is danger of introduction viruses and toxins with introduced crop	
21)	**Assertion: "**Cry" proteins are named so because they are crystal proteins **Reason:** "Cry" proteins are solubilized in acidic environment of insect midgut and then release toxic core fragments after proteolytic action. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
22)	**Assertion:** The RNAi can be introduced in an organism by insertion of gene encoding complementary RNA only. **Reason:** There are no methods by which in vitro synthesized complementary RNA can be inserted in an organism to induce RNAÍ (RNA interference). (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
23)	**Assertion:** Plantibodies are animal antibodies produced in plants. **Reason:** Plantibodies are just a theoretical concept. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion.	1

	(c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
24)	**Assertion:** Human insulin can be produced into bacterial cells using biotechnology **Assertion:** To produce human insulin the A, B and C polypeptides of the human insulin are produced separately in the bacterial cells, extracted and combined by creating di sulphide bonds. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
25)	**Assertion:** The first clinical gene for ADA therapy was given to cure SCID. **Reason:** The normal gene was delivered into the patient's cells using retroviral vector (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
26)	**Assertion:** Complementary pairing between nucleotides is used to diagnose presence of a specific DNA segment in a mixture. **Reason:** DNA probes having radioactive isotopes help to detect DNA by autoradiography. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
27)	**Assertion:** ELISA test is based on antigen-antibody interactions where a	1

	pathogen can be detected by the presence of antibodies (proteins, glycoproteins, etc.) on it. **Reason:** The pathogen antibody to be identified is immobilized on the surface of specially constructed ELISA plates and is then tested. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
28)	**Assertion:** Biotechnology produces transgenic microorganisms that function as micro factories for proteins. **Reason:** Transgenic microorganisms can be developed to produce proteins of human use like insulin. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
29)	**Assertion:** Organisations like GEAC are necessary to monitor GM researches and to test the safety of introducing GM organisms for public services. **Reason:** GM researches can have unpredictable results which even can be disastrous when genetically modified organisms are introduced into the ecosystem. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
30)	**Assertion:** Rice Tec's patent of Basmati is an example of bio piracy **Reason:** Rice Tec developed semi-dwarf varieties of Basmati by using Indian	1

	Basmati rice lines. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
31)	***Read the following and answer the questions from 11(i) to 11(v) given below:*** **COVID-19 molecular diagnosis** Many diagnostic tests for coronavirus disease 2019 (COVID-19) are available so far. These tests are largely based on two different techniques, 1) reverse transcription polymerase chain reaction (RT-PCR) – the current standard test for COVID-19, 2) enzyme-linked immunosorbent assay (ELISA) – quick and technically simple assays that are easily read and offer relatively high throughput. The application of nucleic acid-based testing to disease diagnosis and therapy at high accuracy and reduced cost offers revolutionary progress in human and animal genomics and this has altered the fundamental of medicine. Polymerase Chain Reaction (PCR) is a revolutionary method developed in 1983 by Kary Mullis. PCR has proved to be a valuable method and remained the most frequently used molecular technique in molecular pathology laboratories and it is an extremely versatile technique for copying DNA with the aid of DNA polymerase. PCR has variations such as reverse transcription PCR (RT-PCR) for amplification of RNA and quantitative PCR which allow for quantitative measurement of DNA or RNA molecules. The Multiplex PCR (mPCR) which is employed for the simultaneous identification of several gene sequences belonging to the same pathogen or originating from a mixture of different pathogens. Enzyme-linked immunosorbent assay (ELISA) is a labeled immunoassay that is considered the gold standard of immunoassays. This immunological test is very sensitive and is used to detect and quantify substances, including antibodies, antigens, proteins, glycoproteins, and hormones. The detection of these products is accomplished by complexing antibodies and antigens to produce a measurable result. An antibody is a type of protein produced by an individual's immune system. This protein type has	

	specific regions that bind to antigens. An antigen is a protein that can come from some foreign source and, when bound to an antibody, induces a cascade of events through the body's immune system. This interaction is utilized in ELISA testing and allows for identifying specific protein antibodies and antigens, with only small amounts of a test sample. ELISA testing is used to diagnose HIV infection, pregnancy tests, and blood typing, among others.	
(xi)	Read the given statements and select the correct option. Statement 1**:** PCR technique is helpful in detecting bacterial and viral diseases even when symptoms of the disease are not yet visible. Statement 2**:** Very low concentrations of bacteria or viruses in human body can be detected by amplification of their nucleic acids using the PCR technique. (a) Both statements 1 and 2 are correct. (b) Statement1 is correct but statement 2is incorrect (c) Statement 1 is incorrect but statement 2 is correct. (d) Both statements 1 and 2 are incorrect.	
(xii)	For effective treatment of a disease (a) Early diagnosis is required but understanding of its pathophysiology is not required (b) early diagnosis is not required but understanding of its pathophysiology is required (c) early diagnosis and understanding of its pathophysiology is required (d) Neither early diagnosis nor understanding of its pathophysiology is required.	
(xiii)	Early Covid -19 infection is detected by (a) ELISA (b) RT-PCR (c) Probe (d) All of the above	
(xiv)	In RT- PCR, RT stand for (a) Removal of Transcriptase (b) Reverse Terminator (c) Reverse Transcription (d) All of the above	

(xv)	**Assertion:** Enzyme-linked immunosorbent assay (ELISA) is an immunological test. **Reason:** ELISA is based on Antigen and antibody interaction. (a) If both assertion and reason are true and reason is the correct explanation of assertion. (b) Both assertion and reason are true but reason is not the correct explanation of assertion. (c) If assertion is true but reason is false. (d) If both assertion and reason are false	
32)	***Read the following and answer the questions from 12(i) to 12(v) given below:*** **Bio pesticide- Bt Crops** The Bt is a short form of ubiquitous soil bacterium *Bacillus thuringiensis*. This bacterium is gram positive and spore forming that forms parasporal crystals during stationary phase of its growth cycle. The synthesized crystalline proteins called 'endotoxins' are highly toxic to certain insects. They kill the insect by acting on the epithelium tissues of midgut of caterpillars. These protein often appear microscopically as distinctly shaped crystals and constitute about 20-30% of dry weight of sporulated cultures. These proteins are characterized by their insecticidal activity and are therefore grouped into four classes i.e. Lepidoptera-specific (Cry I), Lepidoptera and Diptera-specific (Cry II), Coleopteran-specific (Cry III) and Diptera-specific (Cry IV). Different strains of Bt produce more than 25 different but related insecticidal crystal proteins (ICPs). These are toxic to larvae of different insects including disease vectors and many agricultural pests. Cotton bollworms belong to the order Lepidoptera and therefore are sensitive to Bt Cry I and Cry II proteins, which are specific to them. Other beneficial insects are unaffected by these proteins. About 22 classes of Cry including 126 Cry genes have been isolated along with a Crt gene and 3 Vip (Vegetative insecticidal protein) genes. The most popular and effectively utilized are Cry 1 Ac, Cry 1 Ab in different crops.	
(i)	The genetically-modified (GM) cotton in India has been developed for (a) Insect-resistance (b) Enhancing shelf life (c) Enhancing mineral content	1

	(d) Drought-resistance.	
(ii)	Bt toxin protein crystals present in bacterium Bacillus thuringiensis, do not kill the bacteria themselves because (a) Bacteria are resistant to the toxin (b) Toxins occur as inactive protoxins in bacteria (c) Bacteria enclose toxins in a special sac (d) None of these.	1
(iii)	CryII Ab and CryI Ab produce toxins that control (a) Cotton bollworms and corn borer, respectively (b) Corn borer and cotton bollworms, respectively (c) Tobacco budworms and nematodes, respectively (d) Nematodes and tobacco budworms, respectively.	1
(iv)	Which of the following Cry gene is Lepidoptera and Diptera-specific (a) Cry I (b) Cry II (c) Cry IV (d) Cry III	1
(v)	**Assertion:** Cry proteins are insect specific and crop specific. **Reason:** Cotton bollworms belong to the order Lepidoptera and therefore are sensitive to Bt Cry I and Cry II proteins, (a) If both assertion and reason are true and reason is the correct explanation of assertion. (b) Both assertion and reason are true but reason is not the correct explanation of assertion. (c) If assertion is true but reason is false. (d) If both assertion and reason are false.	1

Organisms and Populations

1) Which of the following statements comprises niche of an organism?

(i) defined range of conditions that it can tolerate

(ii) diversity in the resources it utilises

(iii) a distinct functional role in the ecological system

(iv) habitat, the natural home of the organsism

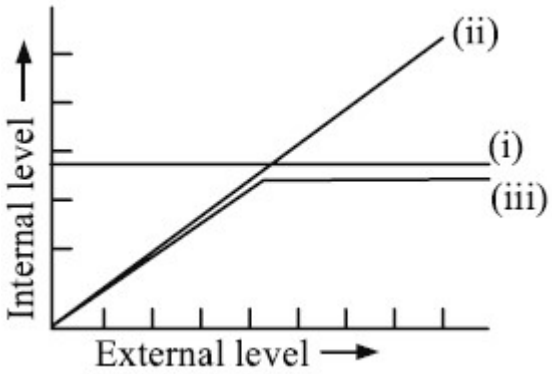
A. (i), (iii) and (iv)

B. (i), (ii), (iii) and (iv)

C. (ii), (iii) and (iv)

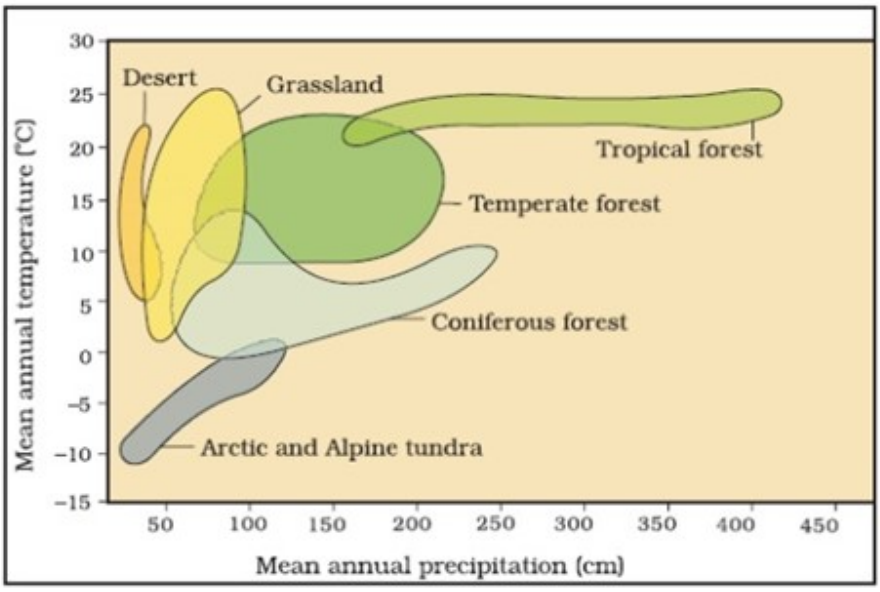
D. (i), (ii) and (iii)

2) The figure given below is a diagrammatic representation of response of organisms to abiotic factors. What do (i), (ii) and (iii) represent respectively?



	(i)	(ii)	(iii)
(a)	Conformer	Regulator	Partial Regulator
(b)	Regulator	Partial Regulator	Conformer
(c)	Partial Regulator	Regulator	Conformer
(d)	Regulator	Conformer	Partial Regulator

3) Study the following figure and answer the question. An organism which has thick layer of insulating fat under the skin is likely to be found in which of the following biomes?



a. Desert Biome

b. Grassland Biome

c. Tropical Forest

d. Arctic and Alpine tundra

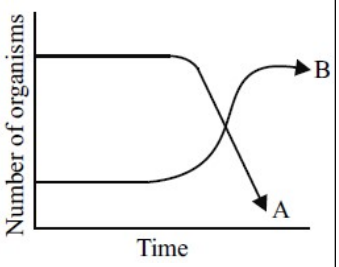
4) The following graph depicts changes in two populations (A and B) of herbivores in a grassy field. A possible reason for these changes is that:

(a) population A produced more offspring than population B

(b) population A consumed the members of population B

(c) both plant populations in this habitat decreased

(d) population B competed more successfully for food than population A.



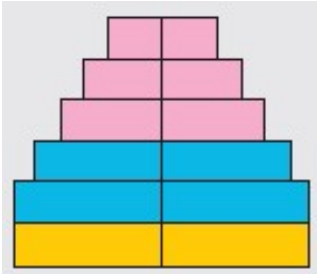
5) What type of human population is represented by the following age pyramid?

(a) Vanishing population

(b) Stable population

(c) Declining population

(d) Expanding population



6) Select the important roles of Predators?

(i) act as 'conduits' for energy transfer

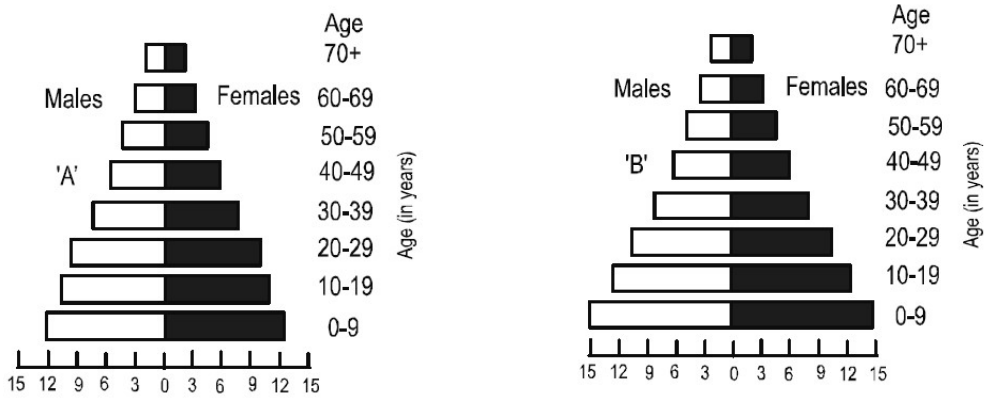
(ii) keep prey population under control

(iii) help in maintaining species diversity

(iv) reduce the intensity of competition among competing prey species

	A. (i), (iii) and (iv) B. (i), (ii), (iii) and (iv) C. (ii), (iii) and (iv) D. (i), (ii) and (iii)	
7)	Which of the following are the attributes of a population? (i) Sex ratio (ii) Natality (iii) Mortality (iv) Species Interaction A. (i), (iii) and (iv) B. (i), (ii), (iii) and (iv) C. (ii), (iii) and (iv) D. (i), (ii) and (iii)	
8)	Between which among the following, the relationships are examples of commensalism? (i) Orchid and the tree on which it grows (ii) Cattle Egret and grazing cattle (iii) Sea Anemone and Clown fish (iv) Female wasp and fig species A. (i), (iii) and (iv) B. (i), (ii), (iii) and (iv) C. (ii), (iii) and (iv) D. (i), (ii) and (iii)	
9)	Carnivorous animals lions and leopards, occupy the same niche but lions predate mostly larger animals and leopards take smaller ones. This mechanism of competition is referred to as (a) character displacement (b) altruism (c) resource partitioning (d) competitive exclusion.	
10)	Identify the desert plants adaptations: (i) Thick cuticle on their leaf surfaces (ii) Sunken Stomata	

	(iii) CAM Photosynthetic pathway (iv) Leaves modified into spines A. (i), (iii) and (iv) B. (i), (ii), (iii) and (iv) C. (ii), (iii) and (iv) D. (i), (ii) and (iii)	
11)	Which of the following equations correctly represents the exponential population growth curve? a. $\frac{dN}{dt} = rN$ b. $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$ c. $N_t = N_o e^{rt}$ d. Both (a) and (c)	
12)	Which of the following equations correctly represents Verhulst-Pearl logistic growth curve? a. $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$ b. $\frac{dN}{dt} = \frac{rN}{K}$ c. $\frac{dN}{dt} = N\left(\frac{K-N}{K}\right)$ d. $\frac{dN}{dt} = r\left(\frac{K-N}{K}\right)$	
13)	Mammals from colder climates generally have shorter ears and limbs to minimise heat loss. This law is: (a) *Allen's Rule* (b) Gause's hypothesis (c) Verhulst-Pearl Logistic Growth (d) MacArthur	
14)	If '+' sign is assigned to beneficial interaction, '–' sign to detrimental and 'O' sign to neutral interaction, then the population interaction represented by '+' '0' refers to: (a) mutualism (b) amensalism (c) commensalism (d) parasitism.	

15)	Which type of association is found in between entomophilous flower and pollinating agent? (a) Mutualism (b) Commensalism (c) Co-operation (d) Co-evolution	
16)	Which one of the following is an example of Brood parasitism? (a) The female Anopheles bites and sucks blood from humans. (b) Human fetus developing inside the uterus draws nourishment from the mother. (c) Head louse living on the human scalp as well as laying eggs on human hair. (d) The cuckoo (koel) lays its eggs in crow's nest.	
17)	A country with a high rate of population growth took measures to reduce it. The figure below shows age-sex pyramids of populations A and B twenty years apart. Select the correct interpretation about them.  Interpretations: (a) "B" is earlier pyramid and shows stabilized growth rate. (b) "B" is more recent showing that population is very young. (c) "A" is the earlier pyramid and no change has occurred in the growth rate. (d) "A" is more recent and shows slight reduction in the growth rate.	
18)	A biologist studied the population of rats in a barn. He found that the average natality was 260, average mortality 250, immigration 30 and emigration 40. The net increase in population is: a. 05 b. zero c. 10	

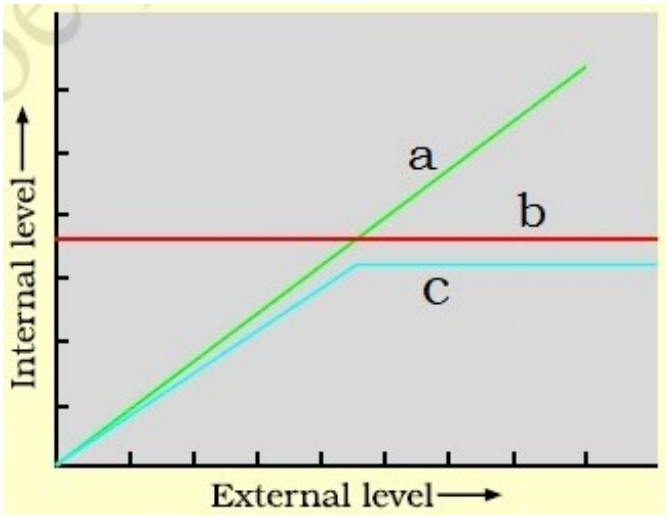
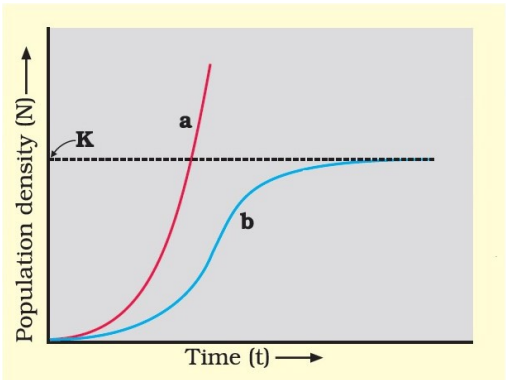
	d. 15	
19)	Which of the following is an example of indirect estimate population size? a. Counting the total number. b. Percent cover or biomass. c. Relative density measure as the number of fish caught per trap. d. Tiger census based on pug marks and fecal pellets.	

20) In the following table the ecological units are mentioned in the first column vertically and their attributes are mentioned horizontally. Choose the correct option which correctly matches the ecological units and its attribute.

Attribute → Ecological Unit ↓	Age (A)	Flow of Energy (B)	Natality (C)	Predator–prey relationship (D)
(i) Individual organism				
(ii) Population				
(iii) Community				
(iv) Ecosystem				

	(A)	**(B)**	**(C)**	**(D)**
(a)	(iv)	(ii)	(iii)	(i)
(b)	(ii)	(iii)	(i)	(iv)
(c)	(iii)	(i)	(iv)	(ii)
(d)	(i)	(iv)	(ii)	(iii)

21)	**Assertion:** You never see cattle or goats browsing on weed *Calotropis*. **Reason:** It produces poisonous cardiac glycosides. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1

22)	Observe the following Graph/Diagram and answer the question that follow:  **Assertion:** 'a' could be desert lizard, 'y' could be mouse and 'z' could be desert lizard. **Reason:** Desert lizard is both Conformer and Partial Regulator while mouse is a regulator. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
23)	Study the graph given below and answer the question that follow**:**  **Assertion:** The curve 'b' would depict the population of a species of deer if there are no predators in the habitat. **Reason:** Deer population will decrease because of competition among themselves for food. (a) Both assertion and reason are true, and reason is the correct explanation of assertion.	1

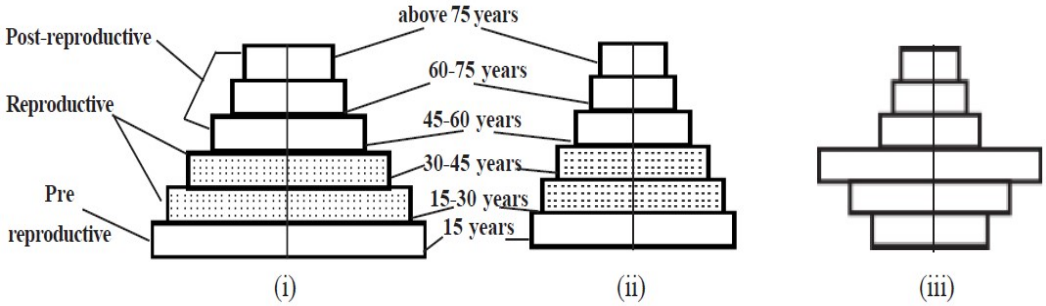
(b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.		
24)	**Assertion:** Kangaroo rat can live without drinking water. **Reason:** This is an adaptation to water scarcity in arid conditions. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
25)	**Assertion:** Humming birds are rarely found in polar regions. **Reason:** Small animals have a larger surface area relative to their volume. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
26)	**Assertion:** For most animal populations, the Verhulst-Pearl Logistic Growth model $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$ is more realistic. **Reason:** For most animal populations, resources for growth are limited. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
27)	**Assertion:** Predators help in maintaining species diversity in a community. **Reason:** Predators act as 'conduits' for energy transfer across trophic level. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation	1

	of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	
28)	**Assertion:** The interaction between sea anemone that has stinging tentacles and the clown fish that lives among them is Commensalism. **Reason:** The fish gets protection from predators which stay away from the stinging tentacles and anemone gets benefit of transporting to other places. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
29)	**Assertion:** Some plants functions as predator in nature. **Reason:** Phytophagous insects feed on plant sap. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
30)	**Assertion:** Mycorrhizal relation exists between *Boletus* and *Pinus*. **Reason:** It is a symbiotic interaction. (a) Both assertion and reason are true, and reason is the correct explanation of assertion. (b) Both assertion and reason are true, but reason is not the correct explanation of assertion. (c) Assertion is true but reason is false. (d) Both assertion and reason are false.	1
31)	***Read the following and answer the questions from 11(i) to 11(v) given below:*** One of the attribute characteristics of a population is *sex ratio*. An individual is either a male or a female but a population has a sex ratio (e.g., 60 per cent of the population are females and 40 per cent males). A population at any given time	

	is composed of individuals of different ages. If the age distribution (per cent individuals of a given age or age group) is plotted for the population, the resulting structure is called an age pyramid (Following Figure).	

For human population, the age pyramids generally show age distribution of males and females in a diagram. The shape of the pyramids reflects the growth status of the population.

Study the 3 representative figures of age pyramid relating to human population given below and answer the following question:



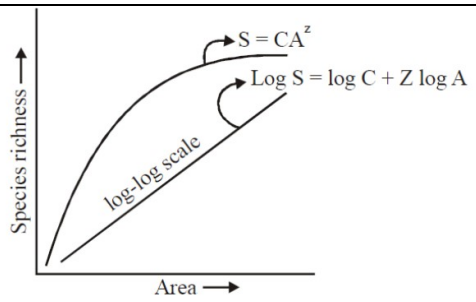
(i)	Mention the names given to the 3 kinds of age profiles (i), (ii), and (iii). (a) Expanding, Declining, Stable (b) Stable, Declining, Expanding (c) Declining, Expanding, Stable (d) Expanding, Stable, Declining	1
(ii)	Which one of them is ideal for a population? (a) Expanding (b) Stable (c) Declining (d) It differs from Population to Population	1
(iii)	How do such age-profile studies help policy makers get concerned about our	

	growing population and prepare for future planning? Say for example**:** for the year 2032, if age profile you would name as **Expanding** was prepared on the data available on January 2011. How does it help and tells policy makers in year 2011 itself that by 2032, the needs? Choose the correct option. (a) Primary schools (b) hospitals (c) old-age homes (d) institutes of higher learning	1
(iv)	A population with a large proportion of older individual than younger ones will likely to: (a) grow larger first and then decline (b) continue to grow indefinitely (c) decline (d) None of these.	1
(v)	**Assertion:** Bell shaped age pyramid represents a stable population. **Reason:** In a stable population, proportion of individuals in reproductive age group is higher than the individuals in pre-reproductive age group. (e) Both assertion and reason are true, and reason is the correct explanation of assertion. (f) Both assertion and reason are true, but reason is not the correct explanation of assertion. (g) Assertion is true but reason is false. (h) Both assertion and reason are false.	1
32)	***Read the following and answer the questions from 12(i) to 12(v) given below:*** **Species Interaction** The interactions between populations of species in a community are broadly categorised into **positive** (beneficial) and **negative** (inhibition) **interactions**. Depending upon the nature of effect on the interacting organisms. Some of the interactions are**:** Mutualism, Symbiosis, Protocooperation, Commensalism, Competition, Predation and Parasitism. Sea anemone gets attached to the shell of hermit crab. The sea anemone grows on the back of the crab, providing camouflage and protection (the sea anemone has stinging cells) and, in turn, the sea anemone is transported about	

	reaching new food sources.	
(i)	The interaction between sea anemone and crab is an example of (a) Mutualism (b) Commensalism (c) Proto cooperation (d) both (a) and (c)	1
(ii)	All the given interactions are similar to interaction between sea anemone and crab, except**:** (a) plant and animal relation for pollination (b) Association of algae and fungi in lichens (c) Association of cattle egret and grazing cattle (d) Association of fungi and roots of higher plants in Mycorrhiza.	1
(iii)	In which of the following interactions both partners are adversely affected? (a) Parasitism (b) Mutualism (c) Competition (d) Predation	1
(iv)	In relation between sea anemone and crab: (a) One benefitted other harmed (b) Both are benefitted (c) One benefitted other unaffected (d) One inhibited, other unaffected.	1
(v)	**Assertion:** Fig and wasp cannot complete their life cycle without each other. **Reason:** They show mutualistic relationship. (e) Both assertion and reason are true, and reason is the correct explanation of assertion. (f) Both assertion and reason are true, but reason is not the correct explanation of assertion. (g) Assertion is true but reason is false. (h) Both assertion and reason are false.	1

Biodiversity and Conservation

S. No.	Question	Points
1)	One out of the following is not responsible for biodiversity loss___ a. Alien species invasion b. Co-extinction c. Ex-situ conservation d. Deforestation	1
2)	The medicinal plant Rauwolfia vomitoria shows genetic variation in terms of- a. its geographic distribution b. the taste of the reserpine produced c. quantity of the reserpine produced d. the potency of the reserpine produced	1
3)	Following are the examples of recent extinctions: (i) quagga (ii) thylacine (iii) Nile perch (iv) Steller's Sea Cow a. (i), (ii) and (iii) b. (ii), (iii) and (iv) c. (i), (ii) and (iv) d. (i), (iii) and (iv)	1
4)	The most important cause of loss of biodiversity today is _____ a. habitat loss and fragmentation b. over-exploitation c. alien species invasions d. co-extinctions	1

5)	 *Fig. : Showing species area relationship* In the above graph of Species-Area relationship, Z represents- a. Area b. Regression coefficient c. Species richness d. Y-intercept	1
6)	The main difference between "Sixth Extinction" and the previous five extinctions is that the sixth extinction: _____ a. is mainly occurring on islands b. is mainly affecting plants c. is occurring at a faster rate d. does not involve human activities	1
7)	Which of the following is not a reason that accounts for greater biodiversity of tropics? a. availability of more solar energy b. more niche specialization c. more time for species diversification d. large seasonal variations in environmental factors	1
8)	The relation between species richness and area for a wide variety of taxa on a logarithmic scale is a: _____ a. rectangular hyperbola b. straight line c. sigmoid curve d. sine curve	1
9)	One of the *ex situ* conservation methods for endangered species is ____ a. wildlife sanctuaries b. cryopreservation c. biosphere reserves	1

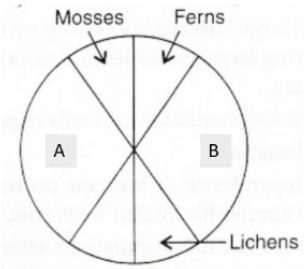
	d. National parks.	
10)	Which of the following statements is not true about biodiversity? a. The biodiversity decreases with the increasing altitude. b. The biodiversity decreases with the increasing latitude. c. The fishes show greatest biodiversity among vertebrates. d. The biodiversity of bryophytes is greater than that of angiosperms	1
11)	In India, we find mangoes with different flavours, colours, fibre content, sugar content and even shelf-life. The large variation is on account of ___ a. species diversity b. induced mutations c. genetic diversity d. hybridisation.	1
12)	What is applicable to both Lantana and Eicchornia ? a. They are on the verge of extinction due to over-exploitation by humans. b. They are alien species that became invasive in certain environments causing threat to indigenous biodiversity. c. They are mutualists and likely to undergo co-extinction in recent future. d. They are keystone species and are vital to the stability of tropical ecosystems.	1
13)	Which of the following is not an invasive species? a. *Nelumbo* (lotus) b. *Parthenium hysterophorus* c. *Lantana camara* d. *Eichhornia crassipes*	1
14)	Earth Summit at Rio-de-Janero was related to ___ a. Soil fertility b. Survey of natural resources c. Conservation of biodiversity d. Prevention of afforestation	1
15)	Biosphere reserves differ from National Parks and Wildlife sanctuaries because in the former _____	1

	a. human beings are not allowed to enter b. people are an integral part of the system c. plants are paid greater attention than the animals d. living organisms are brought from all over the world and preserved for posterity	
16)	Alexander von Humbolt described for the first time ____ a. Population growth equation b. Law of limiting factor c. Ecological biodiversity d. Species area relationships	1
17)	The hot spots of biodiversity conservation are characterized by: a. high levels of species richness and low degree of endemism b. low levels of species richness and high degree of endemism c. low levels of species richness and high degree of endemism d. high levels of species richness and high degree of endemism	1
18)	Which one of the following is not included under *in situ* conservation? a. National park b. Botanical garden c. Sanctuary d. D. Biosphere reserve	1
19)	The region of biosphere reserve, which is legally protected and where no human activity is allowed is known as _____ a. core zone b. buffer zone c. transition zone d. restoration zone	1
20)	Red data book provides data about __ a. Extinct plants only b. Endangered animals only c. Endangered plants and animals d. Extinct plants and animals	1

21)	Assertion: In tropical rain forests, soil profile is nutrient-rich. Reason: Excessive growth of micro-organisms in the soil depletes its organic content. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (c) Assertion is true but the Reason is false. (d) Assertion and Reason are false	1
22)	Assertion: Diversity observed in the entire geographical area, is called Beta diversity. Reason: Bio-diversity decreases from high altitude to low altitude. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (c) Assertion is true but the Reason is false. (d) Assertion and Reason are false	**1**
23)	Assertion: Communities that comprise of more species tend to be more stable. Reason: A higher number of species results in less animal variation in total biomass. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (c) Assertion is true but the Reason is false. (d) Assertion and Reason are false	**1**
24)	Assertion: Decrease in species diversity occurs as we ascend a high mountain. Reason: Decrease in species diversity occurs with increase in altitude due to fall in temperature. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of	**1**

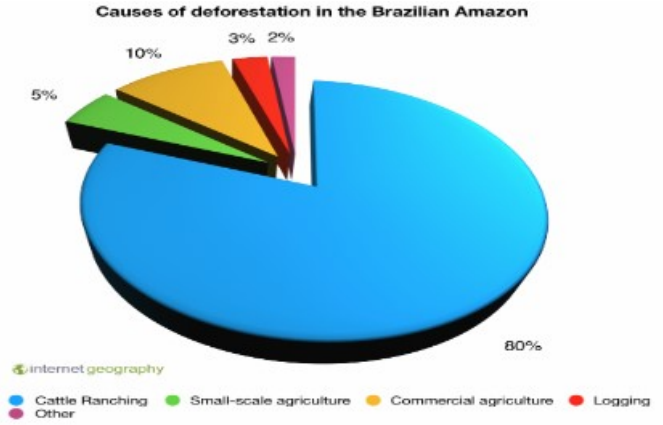
	the Assertion. (c) Assertion is true but the Reason is false. (d) Assertion and Reason are false	
25)	Assertion: A stable community should not show too much variation in productivity from year to year. Reason: A stable community must be resistant to invasions by the alien species. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (c) Assertion is true but the Reason is false. (d) Assertion and Reason are false	**1**
26)	Assertion: If the species-area relationships are analysed among very large areas like the entire continents, the value of Z i.e., slope of line lies in the range of 0.1 to 0.2. Reason: The value of Z i.e., slope of line of species area relationships lies in the range of 0.6 to 1.2 when analysis is done among small areas. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (c) Assertion is true but the Reason is false. (d) Assertion and Reason are false	**1**
27)	Assertion: Speciation is a function of time and tropical regions had got a long evolutionary time for species diversification as compared to temperate regions. Reason: Temperate regions have undergone frequent glaciations in the past whereas tropical regions have remained relatively undisturbed for millions of years. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (c) Assertion is true but the Reason is false.	**1**

	(d) Assertion and Reason are false	
28)	Assertion: Biosphere reserves are also included under the ex-situ conservation strategies. Reason: Cropping and grazing are allowed in the transition zone of the biosphere reserve. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (c) Assertion is true but the Reason is false. (d) Assertion and Reason are false	**1**
29)	Assertion: Habitat destruction is the main reason for the loss of biodiversity. Reason: This actually causes an increase in the edge area and a reduction in the core area. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (c) Assertion is true but the Reason is false. (d) Assertion and Reason are false	**1**
30)	Assertion: Steller`s sea cow becomes extinct. Reason: It is due to over exploitation by humAns. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (c) Assertion is true but the Reason is false. (d) Assertion and Reason are false	**1**
31)	*Read the following and answer the questions from 12(i) to 12(v) given below:* <u>How Many Species are there on Earth and How Many in India?</u> Let us look at some interesting aspects about earth's biodiversity based on the currently available species inventories. More than 70 per cent of all the species recorded are animals, while plants (including algae, fungi, bryophytes,	

	gymnosperms and angiosperms) comprise no more than 22 per cent of the total. Among animals, insects are the most species-rich taxonomic group, making up more than 70 per cent of the total. That means, out of every 10 animals on this planet, 7 are insects. Again, how do we explain this enormous diversification of insects? The number of fungi species in the world is more than the combined total of the species of fishes, amphibians, reptiles and mammals. It should be noted that these estimates do not give any figures for prokaryotes. Biologists are not sure about how many prokaryotic species there might be. The problem is that conventional taxonomic methods are not suitable for identifying microbial species and many species are simply not culturable under laboratory conditions. If we accept biochemical or molecular criteria for delineating species for this group, then their diversity alone might run into millions.	
(i)	Name the unlabeled areas 'a' & 'b' of the pie chart representing the biodiversity of plants showing their proportionate number of species of major taxa. (a) A-Bryophytes and B-Pteridophytes (b) A-Gymnosperms and B-Bryophytes (c) A-Angiosperms and B-Gymnosperms (d) A- Fungi and B-Angiosperms 	1
(ii)	Which of the following groups of animals show more species richness? (a) Amphibians (b) Reptiles (c) Insects (d) Mammals	1
(iii)	Why is it that prokaryotic species are not yet estimated? (a) The present methods of species estimation are not suitable. (b) Many species can not be cultured under laboratory conditions. (c) There are no suitable taxonomic methods for identifying microbial species. (d) All the above.	1
(iv)	The enormous diversity of the Insects may be because of- (a) Having chitinous exoskeleton. (b) Having jointed legs. (c) Having Open circulatory system	1

	(d) Having segmented body	
(v)	Assertion: Fungi show more diversity than the combined total of the species of fishes, amphibians, reptiles and mammals. Reason: Plants exhibit more diversity than the animals. (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion. (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion. (c) Assertion is true but the Reason is false. (d) Assertion and Reason are false	1
32)	With very few exceptions, tropics (latitudinal range of 23.5° N to 23.5° S) harbour more species than temperate or polar areas. Colombia located near the equator has nearly 1,400 species of birds while New York at 41° N has 105 species and Greenland at 71° N only 56 species. India, with much of its land area in the tropical latitudes, has more than 1,200 species of birds. A forest in a tropical region like Equador has up to 10 times as many species of vascular plants as a forest of equal area in a temperate region like the Midwest of the USA. The largely tropical Amazonian rain forest in South America has the greatest biodiversity on earth- it is home to more than 40,000 species of plants, 3,000 of fishes, 1,300 of birds, 427 of mammals, 427 of amphibians, 378 of reptiles and of more than 1,25,000 invertebrates. Scientists estimate that in these rain forests there might be at least two million insect species waiting to be discovered and named. What is so special about tropics that might account for their greater biological diversity? Ecologists and evolutionary biologists have proposed various hypotheses; some important ones are (a) Speciation is generally a function of time, unlike temperate regions subjected to frequent glaciations in the past, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification, (b) Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable. Such constant environments promote niche specialisation and lead to a greater species diversity and (c) There is more solar energy available in	

	the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity.	
(i)	Higher productivity in an area is directly proportional to _____ (a) Niche specialization (b) Desertification (c) Greater diversity (d) All	1
(ii)	One of the reasons for greater diversity in tropics may be_____ A. Less seasonal B. More constant C. Had glaciation D. Has more human intervention (a) A (b) B (c) Both A & B (d) All	1
(iii)	Study the four statements given below and choose the correct statements: A. Temperate environments are more predictable. B. Temperate regions show relatively more productivity. C. Tropics show greater diversity. D. Temperate regions were disturbed by glaciation (a) A and B (b) A and D (c) B and C (d) C and D	1
(iv)	Amazonian rain forest in South America shows greater diversity of- (a) Amphibians (b) Birds (c) Mammals (d) Fishes	1

(v)	The pie diagram shows the causes of deforestation in Amazon. The major cause for deforestation can be attributed to-  (a) for raising commercial crops (b) for industrialization (c) for raising the cattle feed (d) for logging for timber	1

TERM II

ANSWER KEY

HUMAN HEALTH AND DISEASES

HINTS & EXPLANATIONS		
1)	**Ans.** D	1
2)	**Ans. C**	1
3)	**Ans. B**	1
4)	**Ans.** A	
5)	**Ans. B**	1
6)	**Ans. C**	1
7)	**Ans.** A	1
8)	**Ans.** A	1
9)	**Ans.** B	1
10	**Ans.** C	1
11	Ans: B	
12)	**Ans.** B	1
13)	**Ans.** C	1
14)	**Ans.** C	1
15)	**Ans.** D	1
16)	**Ans.** C	1
17)	Ans: A	
18)	**Ans.** A	1
19)	**Ans.** A	1
20)	**Ans.** A	1
21)	**Ans.** A. correct answer and Reason is the correct explanation for Assertion	1
22)	**Ans.** B. Male mosquitoes do not have Biting and sucking mouth parts that cannot infect malarial parasite.	1
23)	**Ans.** A. T-lymphocytes present in our body act as CMI to tissue matching blood matching is essential to mediate grafting.	1
24)	**Ans.** D. Both assertion and reason are false. It is the exaggerated response of the immune system to certain antigen react with antibodies.	1
25)	**Ans.** C. Drugs like amphetamines, benzodiazepines are also used as drug abuse.	1

26)	**Ans.** D. Assertion statement is false because antibodies can also be developed by Naturally.	1
27)	**Ans.** B. Both the statements are true	1
28)	**Ans.** B. Benign tumors are harmless and Malignant tumors are cancerous.	1
29)	**Ans.** A. Both are correct statements and explanation	1
30)	**Ans.** B. Both are correct statements and under different context.	1
31)	**Case Study 1:-**	
(i)	**Ans.** A	1
(ii)	**Ans.** D	1
(iii)	**Ans.** B	1
(iv)	**Ans.** C	1
(v)	**Ans.** A	1
32)	**Case Study 2:-**	
(i)	**Ans.** D	1
(ii)	**Ans.** D	1
(iii)	**Ans.** D	1
(iv)	**Ans.** A	1
(v)	**Ans.** A	1

Microbes in human welfare

ANSWER KEY		
1)	Ans. c	1
2)	Ans. a	1
3)	Ans. b	1
4)	Ans. a	1
5)	Ans. a	1
6)	Ans. d	1
7)	Ans. d	1
8)	Ans. b	1
9)	Ans. c	1
10)	Ans. d	1
11)	Ans. d	1
12)	Ans. d	1
13)	Ans. d	1
14)	Ans. b	1
15)	Ans. b	1
16)	Ans. d	1
17)	Ans. c	1
18)	Ans. a	1
19)	Ans. a	1
20)	Ans. d	1
21)	Ans. b	1
22)	Ans. b	1
23)	Ans. a	1
24)	Ans. a	1
25)	Ans. b	1
26)	Ans. b	1
27)	Ans. a	1
28)	Ans. a	1

29)	Ans. a	1
30)	Ans. d	1
31)	**Case Study 1:-**	
(i)	Ans. b	1
(ii)	Ans. c	1
(iii)	Ans. a	1
(iv)	Ans. a	1
(v)	Ans. b	1
32)	**Case Study 2:-**	
(i)	Ans. c	1
(ii)	Ans. b	1
(iii)	Ans. b	1
(iv)	Ans. a	1
(v)	Ans. b	1

Biotechnology: Principles and Processes

HINTS & EXPLANATIONS		
1)	Ans. B	1
2)	Ans. A	1
3)	Ans. C	1
4)	Ans. A	
5)	Ans. C	1
6)	Ans. B	1
7)	Ans. D	1
8)	Ans. C	1
9)	Ans. A	1
10)	Ans. B	1
11)	Ans. D	1
12)	Ans. A	1
13)	Ans. D	1
14)	Ans. A	
15)	Ans. B	1
16)	Ans. B	1
17)	Ans. D	1
18)	Ans. B	1
19)	Ans. D	1
20)	Ans. D	1
21)	**Ans. (a)** Both assertion and reason are true, and reason is the correct explanation of assertion.	1
22)	**Ans. (d)** Both assertion and reason are false. Golden rice is Vitamin A enriched rice variety developed through genetic engineering.	1
23)	**Ans. (a)** Both assertion and reason are true, and reason is the correct explanation of assertion.	1
24)	**Ans. (d)** Both assertion and reason are false. **Assertion:** A piece of DNA inserted into an alien organism generally replicate if inserted into a chromosome. **Reason:** Chromosomes have specific sequences called 'ori'" region where DNA replication is initiated.	

25)	**Ans. (d)** Both assertion and reason are false. **Assertion:** Some restriction enzymes produce sticky ends and produce blunt ends **Reason:** Restriction enzymes are produced in only in prokaryotic organisms	1
26)	**Ans.** (c) Assertion is true but reason is false. **Reason:** Separation DNA in gel electrophoresis is based on size	1
27)	**Ans. (a)** Both assertion and reason are true, and reason is the correct explanation of assertion.	1
28)	**Ans.** (c) Assertion is true but reason is false. **Reason:** Restriction enzymes digest the genomic DNA of bacteriophage there by prevent the multiplication of bacteriophage in side bacteria.	1
29)	**Ans. (a)** Both assertion and reason are true, and reason is the correct explanation of assertion.	1
30)	**Ans.** (b) Both assertion and reason are true, but reason is not the correct explanation of assertion.	1
31)	**Case Study 1:-**	
(vi)	**Ans.** (b) *Agrobacterium*	1
(vii)	**Ans.** (c) Infection of the plant by *Agrobacterium tumifaciens*	1
(viii)	**Ans.** (b) *Agrobacterium rhizogenes*	1
(ix)	**Ans.** (c) Retroviruses	1
(x)	**Ans.** (d) If both assertion and reason are false. **Assertion:** Agrobacterium transfer only T-DNA in to plant cell **Reason:** Disarmed Ti plasmid is used for genetic transformation of plants	1
32)	**Case Study 2:-**	
(vi)	**Ans. (a)** It is isolated from *Escherichia coli* RY 13	1
(vii)	**Ans.** (c) The enzyme binds DNA at specific sites and cuts only one of the two strands	1
(viii)	**Ans.** (c) Restriction endonucleases	1
(ix)	**Ans.** (d) Both Restriction endo nucleases and Methylases	1
(x)	**Ans.** (c) If assertion is true but reason is false. Reason: DNA Ligases are used to join the recombinant DNA molecules.	1

Biotechnology and Its Applications

HINTS & EXPLANATIONS		
1)	Ans. C	1
2)	Ans. D	1
3)	Ans. D	1
4)	Ans. C	
5)	Ans. C	1
6)	Ans. D	1
7)	Ans. D	1
8)	Ans. A	1
9)	Ans. C	1
10)	Ans. C	1
11)	Ans. B	1
12)	Ans. C	1
13)	Ans. D	1
14)	Ans. B	
15)	Ans. C	1
16)	Ans. A	1
17)	Ans. B	1
18)	Ans. D	1
19)	Ans. D	1
20)	Ans. D	1
21)	**Ans.** (c) Assertion is true but reason is false Cry" proteins are solubilized in alkaline environment	1
22)	**Ans.** (d) The RNAi can be introduced in an organism by insertion of both sense and antisense DNA	1
23)	**Ans.** (c) Assertion is true but reason is false Plantibodies can be practically produced in plants.	1
24)	**Ans.** (c) Assertion is true but reason is false To produce human insulin the A and B polypeptides of the human insulin are produced separately in the bacterial cells, extracted and combined by creating	

	di sulphide bonds.	
25)	**Ans. (b)** Both assertion and reason are true, but reason is not the correct explanation of assertion.	1
26)	**Ans. (b)** Both assertion and reason are true, but reason is not the correct explanation of assertion.	1
27)	**Ans.** (d) Both assertion and reason are false. **Assertion:** ELISA test is based on antigen-antibody interactions where a pathogen can be detected by the presence of antibodies **antigens** (proteins, glycoproteins, etc.) on it. **Reason:** The pathogen **antigens** to be identified is immobilized on the surface of specially constructed ELISA plates and is then tested.	1
28)	**Ans. (b)** Both assertion and reason are true, but reason is not the correct explanation of assertion.	1
29)	**Ans.** (a) Both assertion and reason are true, and reason is the correct explanation of assertion.	1
30)	**Ans.** (a) Both assertion and reason are true, and reason is the correct explanation of assertion.	1
31)	**Case Study 1:-**	
(i)	**Ans.** (a) Both statements 1 and 2 are correct.	1
(ii)	**Ans.** (c) early diagnosis and understanding of its pathophysiology is required	1
(iii)	**Ans.** (b) RT-PCR	1
(iv)	**Ans.** (c) Reverse Transcription	1
(v)	**Ans.** (a) If both assertion and reason are true and reason is the correct explanation of assertion	1
32)	**Case Study 2:-**	
(i)	**Ans.** (a) Insect-resistance	1
(ii)	**Ans.** (b) Toxins occur as inactive protoxins in bacteria	1
(iii)	**Ans.** (a) Cotton bollworms and corn borer, respectively	1
(iv)	**Ans.** (b) Cry II	1
(v)	**Ans.** (a) If both assertion and reason are true and reason is the correct explanation of assertion.	1

Organisms and Populations

ANSWER KEYS/HINTS & EXPLANATIONS

12)	**Ans.** (D): Each organism has an invariably defined range of conditions that it can tolerate, diversity in the resources it utilises and a distinct functional role in the ecological system, all these together comprise its **niche**.	
13)	**Ans.** (d): Some organisms are able to maintain homeostasis by physiological (sometimes behavioural also) means which ensures constant body temperature, constant osmotic concentration, etc. They are known as regulators. A majority of animals and plants cannot maintain a constant internal environment. Their body temperature changes with the ambient temperature. These animals and plants are simply conformers. During the course of evolution, the costs and benefits of maintaining a constant internal environment are taken into consideration. Some species have evolved the ability to regulate, but only over a limited range of environmental conditions, beyond which they simply conform. They are known as partial regulators.	
14)	**Ans.** (d): Organism is a polar bear as it has thick insulating fat layer under the skin and found in Arctic and Alpine Tundra Biome.	
15)	**Ans. (d):** Both the populations are herbivorous; thus, they cannot affect each other. If the food sources for these populations A and B have decreased, then both the populations A and B would have declined. If population A have produced more offspring then the graph A should have increased. Based on the graph, population B is more successful in competing with population A, that is why number of organisms in population B increased while that in population A decreased, as they get access to limited resources.	
16)	**Ans.** (b).	
17)	**Ans.** (b).	
18)	**Ans.** (d). Species Interaction is not an attribute of Population.	
19)	**Ans.** (d): Female wasp and fig species shows example of mutualism. All other relations are examples of Commensalism.	
20)	**Ans.** (c).	
21)	**Ans.** (b). Many desert plants have a thick cuticle on their leaf surfaces and have their stomata arranged in deep pits (sunken) to minimise water loss	

	through transpiration. They also have a special photosynthetic pathway (CAM) that enables their stomata to remain closed during day time. Some desert plants like Opuntia, have no leaves – they are reduced to spines– and the photosynthetic function is taken over by the flattened stems.	
22)	**Ans.** (d).	
23)	**Ans.** (a).	
24)	**Ans.** (a).	
25)	**Ans.** (c).	
26)	**Ans.** (d).	
27)	**Ans.** (d).	
28)	**Ans.** (d): "A" is more recent and shows slight reduction in growth rate.	
29)	**Ans.** (b): Natality and immigration positively contribute to the population growth while mortality and emigration are negative factors. In the given question, The net increase in population is natality + immigration = 260 + 30 = 290 The net decrease in population is mortality + emigration = 250 + 40 = 290 Thus, net increase in population = 290 – 290 = 0	
30)	**Ans.** (d)	
31)	**Ans.** (d)	
32)	**Ans.** (a): Some plants produce highly poisonous cardiac glycosides and that is why no cattle or goats browse on these plants.	1
33	**Ans.** (d): In the given graph 'a', 'b' and 'c' represent Conformers, Regulators and Partial Regulators respectively. Desert lizard and mouse are conformer and regulator respectively.	1
34	**Ans.** (d): Curve 'a', deer population will reach enormous numbers as there is no check on the population growth due to absence of their predators.	1
35)		1

Ans. (a): Two types of adaptations are prominent in animals living in arid regions, *viz*., lowering of water loss as much as possible and adapting to arid conditions. The kangaroo rat conserves water by excreting solid urine, and can live from birth to death without even drinking water.

The camels show unique adjustments to desert conditions, being very economical in water use, tolerant to wide fluctuations in body temperature and are able to maintain blood stream moisture even during extreme heat stress.

TABLE 32.1

Water Balance in a Human and a Kangaroo Rat, a Desert Rodent

	Human (%)	Kangaroo Rat (%)
Gains		
Drinking	48	0
Free water in food	40	10
Metabolic water	12	90
Losses		
Urine	60	25
Evaporation (lungs and skin)	34	70
Feces	6	5

Source: Some data from K. Schmidt-Nielsen, *How animals work*. Cambridge University Press, 1972.

3(	**Ans.** (a): Thermoregulation is energetically expensive for many organisms. This is particularly true for small animals like shrews and humming birds. Heat loss or heat gain is a function of surface area. Since small animals have a larger surface area relative to their volume, they tend to lose body heat very fast when it is cold outside; then they have to expend much energy to generate body heat through metabolism. This is the main reason why very small animals are rarely found in polar regions.	1
3'	**Ans.** (a): For most animal populations, resources for growth are limited. So, the logistic growth model is more realistic.	1
3{	**Ans.** (b): Besides acting as 'conduits' for energy transfer across trophic levels, predators play other important roles. They keep prey populations under control. Predators also help in maintaining species diversity in a community, by reducing the intensity of competition among competing prey species.	1
3(	**Ans.** (c): Example of commensalism is the interaction between sea anemone that has stinging tentacles and the clown fish that lives among them. The fish gets protection from predators which stay away from the stinging tentacles. The anemone does not appear to derive any benefit by hosting the clown fish.	1

4(	**Ans.** (b): Few plants are predator in nature, such as carnivorous or insectivorous plants e.g., *Utricularia*, *Drosera*, etc.	1
4	**Ans.** (b): Mycorrhiza is a mutualistic or symbiotic interaction in which a fungus (e.g., *Boletus*) and a root of plant (e.g., *Pinus*) are involved. The root provides food and shelter to the fungus. The fungus helps the plant in solubilization and absorption of minerals, water uptake and protection against pathogenic fungi.	1
4		
(xi)	**Ans.** (d):	1
(xii)	**Ans.** (b):	1
(xiii)	**Ans.** (a): In **Expanding** Age Pyramid, Pre-Reproductive (Very low age) individuals are more. Hence Policy makers should build Primary Schools, provide Vaccination/ Immunisation Programs in Hospitals and other areas useful to this age individuals. If it would be **Stable**, both Pre-Reproductive and Reproductive population are high and equal in population and policy makers should focus to build the infrastructure facilities which are very much beneficial and helpful to these groups. If it would be **Declining**, Post-Reproductive age population is more and policy makers should focus on hospitals, old-age homes, developing infrastructure and other facilities to help these age people. Age pyramids show age distribution of males and females in a combined diagram. The shape of the pyramid reflects the growth status of the population whether it is growing or stable or declining. Pyramids also indicate the ratio of pre-reproductive, reproductive and post reproductive individuals in a population. Planning of health / education / transport / infra-structure / finance / food / employment can depend on the age-pyramid analysis of a population. It tells us by 2032 how many of the individuals in different age-groups shall constitute the total population. That tells policy makers in year 2011 itself that by 2032, the needs for say-Primary schools; secondary schools., institutes of higher learning in, dwelling units, roads and infra structure, hospitals, old-age homes, recreation facilities, employment workforce etc.	1

(xiv)	**Ans.** (c): A population with large number of older individuals than younger ones is likely to decline since older individuals do not take part in reproduction.	1
(xv)	**Ans.** (c): In a bell-shaped age pyramid, the number of pre-reproductive and reproductive individuals is almost equal. Post-reproductive individuals are comparatively fewer. It represents a stable population.	1
4		
(xi)	**Ans.** (d): This is an example of mutualism and this type of mutualism is also called **protocooperation.**	1
(xii)	**Ans.** (c): The relationship between sea anemone and crab is mutualism whereas relationship between cattle egret and grazing cattle is commensalism.	1
(xiii)	**Ans.** (c): Competition is the rivalry between two or more organisms for obtaining the same resource such as food, light, water, space, shelter, mate, etc. Competitors adversely affect each other.	1
(xiv)	**Ans.** (b):	1
(xv)	**Ans.** (a): Mutualism is an interaction between two organisms of different species in which both the partners are benefitted, with none of the two capable of living separately. In many species of fig trees there is a relationship with the pollinator species of wasp. The female wasp uses the fruit not only as an oviposition site but also uses the developing seeds within the fruit for nourishing its larvae. The wasp pollinates the fig inflorescence, while searching for suitable egg-laying sites. The fig returns this favour of pollination by offering the wasp some of its developing seeds, as food for the developing wasp larvae.	1

Biodiversity and Conservation

HINTS & EXPLANATIONS		
1)	**Ans.** C. Ex-situ conservation	1
2)	**Ans. D.** the potency of the reserpine produced	1
3)	**Ans. C.** (i), (ii) and (iv)	1
4)	**Ans.** A. habitat loss and fragmentation	1
5)	**Ans. B.** Regression coefficient	1
6)	**Ans. C.** is occurring at a faster rate	1
7)	**Ans.** D. large seasonal variations in environmental factors	1
8)	**Ans.** B. straight line	1
9)	**Ans.** B. cryopreservation	1
10)	**Ans.** D. The biodiversity of bryophytes is greater than that of angiosperms	1
11)	**Ans. C.** genetic diversity	1
12)	**Ans.** B. They are alien species that became invasive in certain environments causing threat to indigenous biodiversity.	1
13)	**Ans. A.** *Nelumbo* (lotus)	1
14)	**Ans. C.** Conservation of biodiversity	1
15)	**Ans.** B. people are an integral part of the system	1
16)	**Ans.** D. Species area relationships	1
17)	**Ans.** D. high levels of species richness and high degree of endemism	1
18)	**Ans.** B. Botanical garden	1
19)	**Ans.** A. core zone	1
20)	**Ans.** C. Endangered plants and animals	1
21)	**Ans.** (c) Assertion is true but the Reason is false.	1
22)	**Ans.** (d) Assertion and Reason are false	1
23)	**Ans.** (c) Assertion is true but the Reason is false.	1
24)	**Ans.** (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion.	1
25)	**Ans.** (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.	1

26)	**Ans.** (b) Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.	1
27)	**Ans.** (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion.	1
28)	**Ans.** (d) Assertion and Reason are false	1
29)	**Ans.** (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion.	1
30)	**Ans.** (a) Assertion and the Reason are true and the Reason is a correct explanation of the Assertion.	1
31)	**Case Study 1:-**	
(i)	**Ans.** (d) A- Fungi and B-Angiosperms	1
(ii)	**Ans.** (c) Insects	1
(iii)	**Ans.** (d) All the above.	1
(iv)	**Ans.** (a) Having chitinous exoskeleton.	1
(v)	**Ans.** (c) **Assertion** is true but the **Reason** is false.	1
32)	**Case Study 2:-**	
(i)	**Ans.** (c) Greater diversity	1
(ii)	**Ans.** (b) B- More constant	1
(iii)	**Ans.** (d) C and D (C- Tropics show greater diversity. D- Temperate regions were disturbed by glaciation)	1
(iv)	**Ans.** (d) fishes	1
(v)	**Ans.** (c) for raising the cattle feed	1