

<b>MARKING SCHEME (2022-23)</b>		
<b>CLASS XII</b>		
<b>BIOLOGY (044)</b>		
Q.No.	Question	Marks
<b>SECTION - A</b>		
1	(b) Zygote or early embryo upto 8 blastomeres	1
2	(c) a) - iii, b) - iv, c) - ii, d) - i	1
3	(a) Lysine and Arginine	1
4	(a) common set of characters in groups of different ancestry	1
5	(c) Preformed Antibodies, Passive	1
6	(d) AIDS	1
7	(a) High , High	1
8	(b) No growth, growth	1
9	(b) $dN/dt = r N$	1
10	(b) commensalism	1
11	(c) Detritus; Grazing food chain respectively	1
12	(d) Seed Bank	1
	<p><b>Question No. 13 to 16 consist of two</b> statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:</p> <p>A. Both A and R are true and R is the correct explanation of A            B. Both A and R are true and R is not the correct explanation of A            C. A is true but R is false            D. A is False but R is true</p>	
13	(a) Both A and R are true and R is the correct explanation of A	1
14	(a) Both A and R are true and R is the correct explanation of A	1
15	(c) A is true but R is false	1
16	(a) Both A and R are true and R is the correct explanation of A	1
<b>SECTION – B</b>		
17	(a) A –Pituitary gland; B: Ovary( $\frac{1}{2} \times 2 = 1$ Mark) (b) Endometrium of the uterus regenerates through proliferation. (1 Mark)	2

<p>18</p>	<div style="text-align: center;"> <p>Parents (Inflated, green pods) × (Constricted, yellow pods)</p> <p>Genotypes FFGG ffg</p> <p>Gametes FG fg</p> <p>F<sub>1</sub> generation FfGg (All Inflated green pods)</p> </div> <p>Making the correct punnett square (1 mark)                  Phenotype - All Inflated green pods (½ mark)                  Genotype –FfGg (½ mark)</p>	<p>2</p>
<p>19</p>	<p>(a) Allergy, the exaggerated response of the immune response to certain antigens present in the environment is called allergy. (1 Mark)</p> <p>(b) Doctors would administer drugs like antihistamines, adrenaline and steroids (any one) to reduce the symptoms. (1 Mark)</p>	<p>2</p>
<p>20</p>	<p>(a) Palindromic sequences (0.5), endonuclease enzyme (½ Mark)</p> <p>(b) Restriction enzymes can make complementary cut counterparts forming sticky ends for recombination DNA / RDNA technology/ to facilitate ligation of vector and foreign DNA.(1 Mark)</p>	<p>2</p>
<p>21</p>	<p>(a) Inverted pyramids of biomass are seen in aquatic conditions where a small standing crop of phytoplankton supports a large standing crop of zooplankton/fish/In terrestrial ecosystem where a large number of insects are feeding on the leaves of a tree. (1 Mark)</p> <p>(b) No, the Pyramid of energy is always upright, and can never be inverted because when energy flows from one trophic level to the next trophic level some amount of energy is always lost as heat at each step. (1 Mark)</p> <p style="text-align: center;"><b>OR</b></p> <div style="text-align: center;"> <p style="text-align: center;">Trophic Level 2 Insects</p> <p style="text-align: center;">Trophic level 1 Tree</p> </div> <p>(a) Inverted pyramid because a large number of insects feed on one tree.                  (b) No, the Pyramid of energy is always upright, and can never be inverted because when energy flows from one trophic level to the next trophic level some amount of energy is always lost as heat at each step.</p> <p style="text-align: right;">(1 x 2 = 2 marks)</p>	<p>2</p>

**SECTION – C**

22	<p>(a) Scrotum: The testes are situated outside the abdominal cavity within a pouch called scrotum. The scrotum helps in maintaining the low temperature of the testes (2–2.5 degree celsius lower than the normal internal body temperature) necessary for spermatogenesis.</p> <p>(b) Leydig cells: The regions outside the seminiferous tubules called interstitial spaces, contain small blood vessels and interstitial cells or Leydig cells. Leydig cells synthesize and secrete testicular hormones called androgens.</p> <p>(c) Male accessory glands: The male accessory glands include paired seminal vesicles, a prostate and paired bulbourethral glands. Secretions of these glands constitute the seminal plasma which is rich in fructose, calcium and certain enzymes. The secretions of bulbourethral glands also help in the lubrication of the penis.</p> <p style="text-align: right;">(1 x 3 = 3 marks)</p>	3
23	<p>(a) Corn: <b>Wind</b>. Numerous flowers are packed in an inflorescence; the tassels seen in the corn cob are the stigma and style which wave in the wind to trap pollen grains.</p> <p>(b) Water hyacinth: <b>Insects or wind</b>. In water hyacinth the flowers emerge above the level of water and are pollinated by insects or wind as in most of the land plants.</p> <p>(c) Vallisneria: <b>Water</b>, In Vallisneria - the female flower reaches the surface of water by the long stalk and the male flowers or pollen grains are released onto the surface of water. They are carried passively by water currents; some of them eventually reach the female flowers and the stigma.</p> <p style="text-align: right;">(<math>\frac{1}{2} \times 6 = 3</math> Marks)</p>	3
24	<p>(a) x to x' is 5' ————— &gt; 3' (<math>\frac{1}{2}</math> Mark) No more amino acids will be added (<math>\frac{1}{2}</math> Mark)</p> <p>(b) GCA (<math>\frac{1}{2}</math> Mark) Anticodon is CGU (<math>\frac{1}{2}</math> Mark)</p> <p>(c) The untranslated regions are required for an efficient translation process. (<math>\frac{1}{2}</math> Mark) They are present before the initiation codon at the 5' – end and after the stop/termination codon, at the 3' – end (<math>\frac{1}{2}</math> Mark)</p>	3
25	<p>(a) Sum Total of All the Allele Frequencies is 1: Let there be two alleles A and a in a population. The frequencies of alleles A and a are 'p' and 'q' respectively. (<math>\frac{1}{2}</math> Mark)</p> <p>The frequency of AA individuals in a population is <math>p^2</math> and it can be explained that the probability that an allele A with a frequency of p would appear on both the chromosomes of a diploid individual is simply the product of the probabilities, i.e., <math>p^2</math>.</p> <p>Similarly, the frequency of aa is <math>q^2</math> and that of Aa is 2pq.</p> <p style="text-align: right;">(<math>\frac{1}{2}</math> Mark)</p>	3

	<p><math>p^2 + 2pq + q^2 = 1</math>, where <math>p^2</math> represents the frequency of homozygous dominant genotype, <math>2pq</math> represents the frequency of the heterozygous genotype and <math>q^2</math> represents the frequency of the homozygous recessive. (1 Mark)</p> <p>(b) Factors that affect Hardy–Weinberg equilibrium:</p> <ul style="list-style-type: none"> <li>(i) Gene migration or gene flow</li> <li>(ii) Genetic drift</li> <li>(iii) Mutation</li> <li>(iv) Genetic recombination</li> <li>(v) Natural Selection (Any 2) (<math>\frac{1}{2} + \frac{1}{2} = 1</math> mark)</li> </ul>	
26	<p>An antibody molecule consists of four polypeptide chains, two are long called heavy (H) chains while other two are short called light (L) chains. Both are arranged in the shape of Y. Hence, the antibody is represented as <math>H_2 L_2</math>.</p> <div data-bbox="386 730 841 1075" data-label="Diagram"> </div> <p>(Diagram with Labels –          Light chain (<math>\frac{1}{2}</math> mark), Heavy Chain (<math>\frac{1}{2}</math> Mark)          Types of Antibody –          IgA, IgM, IgE, IgG (1 mark awarded when all 4 types are stated)          IgA – Lactating Mother to protect their infant (<math>\frac{1}{2}</math> Mark)          Ig E – To protect from allergen (<math>\frac{1}{2}</math> Mark)</p> <p style="text-align: center;"><b>OR</b></p> <p>(a) When a female <i>Anopheles</i> mosquito bites an infected person, the parasites enter the mosquito's body as <b>gametocytes</b> (<math>\frac{1}{2}</math> mark). It leads to <b>fertilization and development in the gut</b> (<math>\frac{1}{2}</math> Mark) of the mosquito and undergoes further development to form <b>sporozoites</b> that are <b>stored in salivary glands</b> (<math>\frac{1}{2}</math> Mark) until their transfer to human body. In the human body – the <b>sporozoites reach the liver and reproduce asexually</b> (<math>\frac{1}{2}</math> Mark), bursting the cells and releasing them into the <b>RBCs as gametocytes</b> (<math>\frac{1}{2}</math> Mark).  <i>(Labeled diagram explaining the mentioned stages can also be considered)</i></p>	3

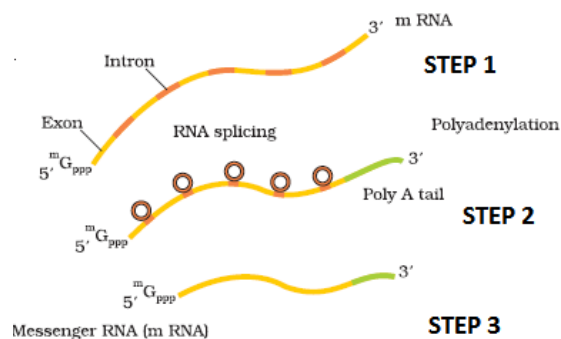
	(b) The <b>rupture of RBCs releases a toxic substance called haemozoin</b> , (1/2 Mark) which is responsible for the chill and high fever.	
27	<p><b>(a) No bands will be obtained as/All DNA will be seen in the well only;</b> (½ Mark)</p> <p>DNA fragments being <b>negatively charged</b> will <b>not move towards -ive end/ cathode</b>. DNA being negatively charged <b>will remain stationed at the positive end/ anodeend</b> of the agar block; (1 Mark)</p> <p><b>(b)</b></p> <p>(a) Position of the positive terminal/ end/ anode and the negative terminal/ end/ cathode was inter-changed (½ Mark)</p> <p>(ii) The fragment with least base pairs will get separated faster and move faster to the anode end. (1 Mark)</p>	3
28	<p>Impacts of loss of biodiversity on the ecosystem:</p> <p>(a)</p> <p>(i) Decline in plant production</p> <p>(ii) Lowered resistance to environmental perturbations such as drought</p> <p>(iii) Increased variability in certain ecosystems – processes such as plant productivity, water use, pest and disease cycles. (½ x 3 = 1 ½ marks)</p> <p>(b)</p> <p>(i) Habitat loss and fragmentation</p> <p>(ii) Over-exploitation</p> <p>(iii) Alien invasive species</p> <p>(iv) Co-extinctions. (Any three - ½ x 3 = 1½)</p>	3
<b>SECTION –D</b>		
29	<p>(a) X- linked (½ Mark), Recessive trait (½ Mark)</p> <p>(b) 100% (1 Mark)</p> <p>(c) XY OR <u>XY</u>, 2. <u>XX</u>, 3. <u>XY</u>, 4. XX (½ x 4 =2 Marks)</p> <p style="text-align: center;"><b>OR</b></p> <p>The possibility of the female getting the trait is less. (1 Mark)</p> <p>The female will get the trait only if the mother is at least a carrier and the father is affected. (1 Mark)</p>	4
30	<p>(a) Concentration of nicotine is maximum at 10 minutes/ conc. of nicotine increases steadily in the blood to reach 45mg/cm<sup>3</sup> (1 Mark)</p> <p>(b) The Concentration of CO will increase resulting in reduced</p>	4

	<p>concentration of haemboundoxygen.(1 Mark)</p> <p>(c) Nicotine results in stimulating the adrenal gland which results in release of adrenaline / nor - adrenaline in the blood resulting in increase of blood pressure and heart rate. (2 Marks)</p> <p style="text-align: center;"><b>OR</b></p> <p>(c) Chemical carcinogens present in tobacco smoke are the major cause of lung cancer.(1 Mark)</p> <p>The cigarette smoke irritates the air passages of the lungs causing them to produce mucus which causes cough resulting in enlarging air spaces/ reduce surface area/lose their elasticity (any point can be mentioned) thus difficulty in breathing causing emphysema.</p> <p>(1 Mark)</p>	
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**SECTION –E**

31.	<p>i) During copulation (coitus) semen is released by the penis into the vagina (insemination).</p> <p>ii) The motile sperms swim rapidly, pass through the cervix, enter into the uterus and finally reach the ampullary region of the fallopian tube.</p> <p>iii) The ovum released by the ovary is also transported to the ampullary region where fertilization takes place.</p> <p>iv) Fertilisation can only occur if the ovum and sperms are transported simultaneously to the ampullary region. This is the reason why not all copulations lead to fertilisation and pregnancy.</p> <p>v) The process of fusion of a sperm with an ovum is called fertilisation.</p> <p>vi) During fertilisation, a sperm comes in contact with the zona pellucida layer of the ovum and induces changes in the membrane that block the entry of additional sperms. Thus, it ensures that only one sperm can fertilise an ovum.</p> <p>vii) The secretions of the acrosome help the sperm enter into the cytoplasm of the ovum through the zona pellucida and the plasma membrane.</p> <p>viii) This induces the completion of the meiotic division of the secondary oocyte.</p> <p>ix) The second meiotic division is also unequal and results in the formation of a second polar body and a haploid ovum (ootid).</p> <p>x) Soon the haploid nucleus of the sperms and that of the ovum fuse together to form a diploid zygote.</p> <p>(<math>\frac{1}{2} \times 10 = 5</math>)</p> <p style="text-align: center;"><b>OR</b></p>	5
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	<p>Trace the development of a megaspore mother cell to the formation of mature embryo sac in a flowering plant.</p> <p>The process of formation of megaspores from the megaspore mother cell is called megasporogenesis.</p> <ol style="list-style-type: none"> <li>i) Ovules generally differentiate a single megaspore mother cell (MMC) in the micropylar region of the nucellus. It is a large cell containing dense cytoplasm and a prominent nucleus. The MMC undergoes meiotic division to form megaspores.</li> <li>ii) In a majority of flowering plants, one of the megaspores is functional while the other three degenerate. Only the functional megaspore develops into the female gametophyte (embryo sac). This method of embryo sac formation from a single megaspore is termed monosporic development.</li> <li>iii) The nucleus of the functional megaspore divides mitotically to form two nuclei which move to the opposite poles, forming the 2-nucleate embryo sac.</li> <li>iv) Two more sequential mitotic nuclear divisions result in the formation of the 4-nucleate and later the 8-nucleate stages of the embryo sac.</li> <li>v) These mitotic divisions are strictly free nuclear, that is, nuclear divisions are not followed immediately by cell wall formation.</li> <li>vi) After the 8-nucleate stage, cell walls are laid down leading to the organisation of the typical female gametophyte or embryo sac.</li> <li>vii) Six of the eight nuclei are surrounded by cell walls and organised into cells; the remaining two nuclei, called polar nuclei are situated in the large central cell.</li> <li>viii) Three cells are grouped together at the micropylar end and constitute the egg apparatus. The egg apparatus, in turn, consists of two synergids and one egg cell. The synergids have special cellular thickenings at the micropylar tip called filiform apparatus.</li> <li>ix) Three cells are at the chalazal end and are called the antipodals.</li> <li>x) The large central cell, as mentioned earlier, has two polar nuclei. Which come to lie below egg apparatus. Thus, a typical angiosperm embryo sac, at maturity, though 8-nucleate is 7-celled. (<math>\frac{1}{2} \times 10 = 5</math>)</li> </ol>	
32	<p>(a) The hnRNA undergoes processes called <b>capping and tailing followed by splicing</b>. In capping, an unusual nucleotide is added to the 5' end of hnRNA methyl guanosine triphosphate. In tailing, adenylate residues (about 200–300) are added at 3' end in a template independent manner. Now the hnRNA undergoes a process where the introns are removed and exons are joined to form mRNA called splicing. (<math>\frac{1}{2} \times 6 = 3</math> marks )</p>	5



- (b) The process of translation will not happen, thus the polypeptide synthesis is stopped/ hampered. (1 Mark)

The reason for the above is:

RNA polymerase I transcribes rRNAs which is the cellular factory for protein synthesis. (½ Mark)

RNA polymerase III helps in transcription of tRNA which is the adaptor molecule/ that transfers amino acids to the site of protein synthesis. (½ Mark)

OR

- (a) When the active site of enzyme permease present in the cell membrane of a bacterium has been blocked by an inhibitor, the lactose is not transported into the cell (1 Mark). As lactose is the inducer, the lac operon will not be switched on. (1Mark)
- (b) Since the repressor protein synthesized by the i gene is abnormal, it will not bind to the operator region of the operon (1 Mark), resulting in a continuous state of transcription process (1 Mark)
- (c) No (½ Mark), because galactose is not an inducer/ it is a product of lactose metabolism (½ Mark)

33.

- (a) You can easily grow a large quantity of the bacteria/no ethical issues/have plasmids/ can easily transform (any 1)
- (b) PCR will not amplify the gene. (½ Mark)  
If the polymerase enzyme denatures at low temp, it will not be able to withstand **high temperature which is essential for separating/opening/unwinding/ denaturing DNA** strand to open. Thus subsequent step of **extending the primers using the nucleotides provided in the reaction and the genomic DNA as template will not occur.**(1½ Marks)
- (c) Positive effect: oil spills can be treated and the environment becomes better/ cleaner/ water becomes more potable/ safe for aquatic forms/ safe for water birds like sea gulls. (any one 1)

5

Negative effect: the bacteria can mutate/ can harm other organisms/ can conjugate with other non-virulent forms and make them super bugs with detrimental effect/ unpredictable/ for a longer duration it may reduce the dissolved oxygen and leading to mortality of aquatic organisms (any one 1)

**OR**

- (a) Species III is least susceptible (1 Mark)
- (b) Bt toxin **protoxins are converted into an active form in the gut** which solubilises the toxin crystals.  
The **activated toxin binds to the surface of midgut epithelial cells** and **create pores** that **cause cell swelling and lysis** and eventually cause death of the insect (2 Marks)
- (c) Insect **species I and II have alkaline gut pH** which **solubilises the insecticidal protein crystals of protoxin and makes it active.**  
Species **III has an acidic** and the **protoxin continues to remain in an inactive form** doing no harm to insect species III (2 Marks)