

**MARKING SCHEME (2023-24)**  
**Class XII**  
**044 Biology**

Q. no		Marks				
<b>Section - A</b>						
1	a) Collection of ovum	1				
2	b) A-Antipodals; B-Egg apparatus	1				
3	d) IV and VI	1				
4	b) I and III	1				
5	c) Graph C	1				
6	b) Adaptive radiation	1				
7	d) X linked Recessive	1				
8	a) A. DNA, B. H1 histone, C. Histone octamer	1				
9	b) anopheles	1				
10	b) I, III and V	1				
11	c) Recombinant DNA Technology, PCR, ELISA	1				
12	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">d)</td> <td style="width: 25%; text-align: center;">Upright</td> <td style="width: 25%; text-align: center;">Inverted</td> <td style="width: 25%; text-align: center;">Upright</td> </tr> </table>	d)	Upright	Inverted	Upright	1
d)	Upright	Inverted	Upright			
13	d) A is False but R is true.	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	c) A is true but R is false.	1				
<b>Section - B</b>						
17	<ul style="list-style-type: none"> <li>• The mother's milk during the initial days after delivery is called <b>colostrum</b>. It contains abundant antibodies (IgA) that protect the neonate against many diseases. (1)</li> <li>• It thus provides passive immunity to the new born infant. (1)</li> </ul>	2				
18	<ul style="list-style-type: none"> <li>• RNA polymerase is capable of catalysing the process of elongation. (1)</li> <li>• It associates transiently with initiation factor (sigma factor) and termination factor (rho factor) to initiate and terminate the transcription respectively. (1)</li> </ul>	2				
19	<ul style="list-style-type: none"> <li>• The symptoms indicate Pneumonia.</li> <li>• Causal organisms– <i>Streptococcus pneumoniae</i>, <i>Haemophilus influenzae</i></li> <li>• Bacteria (0.5 x 4 = 2)</li> </ul>	2				

20	(a) A: reverse transcriptase; B: DNA polymerase; C: restriction enzyme (b) viral DNA/phage DNA/ Agrobacterium tumefaciens (0.5 x 4 = 2)	2
21	<ul style="list-style-type: none"> <li>• The first law of thermodynamics states that energy is neither created, nor destroyed; it can only be converted from one form to another. In the ecosystem also solar energy is converted to chemical energy. It is neither created nor destroyed. (1)</li> <li>• The second law states that there is a natural tendency of any isolated system to move towards entropy, thus, there is some loss of energy at each step of energy flow in the form of heat. This law also stands true in ecosystem as transfer of energy in an ecosystem follows the 10 percent law. Only 10 percent of the energy is transferred to each trophic level from the lower trophic level. Some energy is lost at each step in the form of heat and some energy is also used for life processes. (1)</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>a) In a food chain, secondary consumers feed on primary consumers. In the given ecological pyramid, secondary consumers are more than primary consumers, this is possible in case secondary consumers are parasites/small size/have a rapid reproductive cycle. (1)</li> <li>b) Transfer of energy follows the 10 percent law and only 10 percent of the energy is transferred to each trophic level from the lower trophic level. The percentage of energy transferred gets lowered as we move in a food chain from one trophic level to the other because some energy is lost via Heat/respiration; some energy is also used for life processes. (1)</li> </ul>	2
<b>Section – C</b>		
22	<ul style="list-style-type: none"> <li>a) In males, LH acts on Leydig cells and causes them to release androgens, which stimulate the process of spermatogenesis (1); while the FSH acts on the Sertoli cells, which helps in spermiogenesis. (1)</li> <li>b) (i) Primary spermatocyte – 46 chromosomes (ii) Spermatid – 23 chromosomes. (1)</li> </ul>	3
23	<ul style="list-style-type: none"> <li>a) Ovulation - LH (1)</li> <li>b) Graafian Follicle- Estrogen (1)</li> <li>c) Corpus Luteum- produces progesterone (1)</li> </ul>	3
24	<ul style="list-style-type: none"> <li>a) Genes y and w are tightly linked as they show only 1.3 % recombination so chances of crossing over/ independent assortment are low. (1)</li> <li>b) Alfred Sturtevant used the frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes and ‘mapped’ their position on the chromosome. (1)</li> </ul>	3

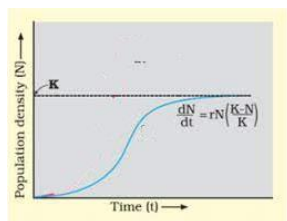
	c) Genetic maps are used as a starting point in the sequencing of whole genomes as in the case of Human Genome Sequencing Project. (1)	
25	<ul style="list-style-type: none"> <li>• In a collection of moths in unpolluted area, more white-winged moths on trees would survive than dark-winged or melanised moths. However, in the polluted area, more dark-winged moths would survive i.e., the proportion will be reversed.</li> <li>• The predators will spot a moth against a contrasting background. In a polluted area, the tree trunks become dark due to industrial smoke and soot. Under this condition the white-winged moth cannot survive due to predators, dark-winged or melanised moth will survive. In unpolluted area, thick growth of almost white-coloured lichen will cover the trees - in that background the white winged moth will survive but the dark-coloured moth will be picked out by predators.</li> <li>• Lichens cannot grow in areas that are polluted. Hence, moths that will be able to camouflage themselves, i.e., hide in the background, will survive. No variant will be completely wiped out. It is an example of process of Evolution by natural selection.</li> </ul>	3
26	<p>a) The BOD test measures the rate of uptake of oxygen by microorganisms in a sample of water. It is thus an indicator of pollution level of the water. (1) Biological treatment or Secondary treatment (1)</p> <p>b) Sample C is most polluted because it has highest BOD level among the three samples of water. (1)</p>	3
27	<p>a) Bt toxin gene can be isolated from bacterium <i>Bacillus thuringiensis</i> and using rDNA techniques it is introduced in the genome of the conventional variety. The gene would express an insecticidal protein. This would provide the plant resistance to the corn borer, without the need of insecticide. Spray of insecticide will not be needed. (1)</p> <p>b) cryIAb – It is a Bt toxin gene isolated from <i>Bacillus thuringiensis</i> which codes for toxic insecticidal protein. The activated toxin due to alkaline pH of the gut solubilizes the crystals. The active toxin binds to the surface of mid-gut epithelial cells and creates pores that cause swelling and lysis and eventually cause death of the insect. (1)</p> <p>c) This toxic insecticidal protein exists as an inactive protoxin form in the bacterium but once an insect ingests the inactive toxin, it is converted into an active form of toxin due to alkaline pH of the gut which solubilizes the crystals. (1)</p> <p style="text-align: center;"><b>OR</b></p> <p>a) Haemophilia (1)</p> <p>b) Factor VIII received from donor's blood may carry pathogens leading to infection and may elicit immune response/allergy which can be overcome by recombinant human factor VIII. (1)</p> <p>c) Haemophilia is a X- chromosome linked recessive genetic disorder and it follows criss- cross pattern of inheritance. (1)</p>	3

28	<p>Ex-situ. (1)</p> <ul style="list-style-type: none"> <li>Ex-situ conservation is conservation of biological diversity outside their natural areas and is done through different methods like captive breeding, botanical garden, zoos, aquaria and gene bank etc. (1)</li> <li>It differs from the other strategy called In situ conservation. In-situ conservation is the conservation and protection of genetic resources of plant and animal species in their natural habitats itself, as in Biosphere reserves, National Parks and sanctuaries etc. (1)</li> </ul>	3
----	--	---

**Section – D**

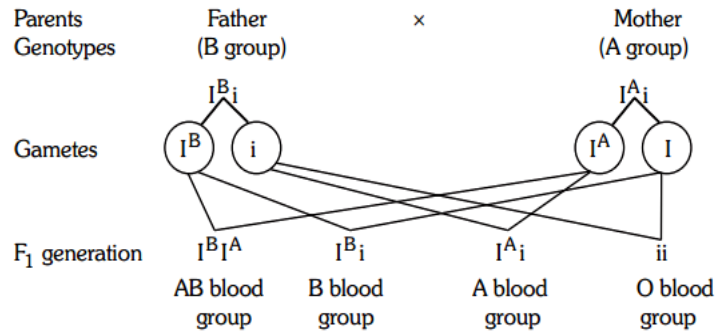
29	<p>a) Using <i>Agrobacterium</i> vectors (1)</p> <p>b) Infection by viruses having RNA genomes or mobile genetic elements (transposons) (1)</p> <p>c) Being complimentary, one RNA strand of the newly introduced ds RNA will bind to already existing mRNA of the host cell which will result in silencing of this mRNA of for translational purposes. (RNA interference)</p> <p>Parasite will thus not be able to survive in the transgenic host. (1)</p> <p style="text-align: center;"><b>OR</b></p> <p>c) It is used for development of pest resistant plants. A nematode <i>Meloidegryne incognita</i> infects the roots of Tobacco plants and causes a great reduction in yield. To prevent this infestation RNA interference technique is used which involves silencing of mRNA due to a complimentary dsRNA molecule that binds to and prevents translation of the mRNA.</p>	4
----	---	---

30	<p>a) Exponential or geometric growth pattern (1)</p> <p>b) <math>N_t = N_0 e^{rt}</math> (1)</p> <p>Where <math>N_t</math> = population density after time <math>t</math>  <math>N_0</math> = Population density at time zero  <math>r</math> = intrinsic rate of natural increase  <math>e</math> = the base of natural logarithms</p> <p>c)</p> <div data-bbox="427 1496 710 1713" data-label="Figure"> </div> <p>J – shaped growth curve (1+1)</p> <p style="text-align: center;"><b>OR</b></p> <p>c) Logistic growth - sigmoid shape, will be obtained. (1)</p> <p>In the logistic growth, the population increases at the onset and continues exponentially till the mid when the resources are utilized at maximum level. The graph becomes stationary when the population exceeds its carrying capacity.</p>	4
----	--	---



		(1)
31	<p>i) Administration of progestogens or progestogen estrogen combinations or IUDs within 72 hours of coitus. (1)</p> <p>ii) Progestogens alone or in combination with estrogen inhibit implantation as well as alter the quality of cervical mucus to prevent the entry of sperms. (1)</p> <p>IUDs increase the phagocytosis of sperms within the uterus, suppress sperm motility and fertilising capacity of sperms. (1)</p> <p>iii) No, STDs can be prevented by use of condoms. (1)</p> <p>iv) Gonads are endocrine glands and thus cannot be removed from the body. (1)</p> <p style="text-align: center;"><b>OR</b></p> <p>a)</p> <p>i) Inability to produce a normal egg. - <b>GIFT (Gamete Intra Fallopian Transfer)</b>: This technique involves the transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce one. (1)</p> <p>ii) Low Count of Sperm. - <b>ICSI (Intra Cytoplasmic Sperm Injection)</b>: In this technique, sperm is directly injected into the ovum; in the laboratory. (1)</p> <p>iii) Blocked Fallopian tube- <b>ET (Embryo Transfer)</b>: it involves transferring blastocyst into the uterus and this is called Intra-Uterine Transfer (IUT). (1)</p> <p>b) MTPs are essential in certain cases where continuation of pregnancy could be harmful or even fatal either to mother or to the foetus both. (1) It is also permissible in cases of rapes. (1)</p>	5
32	<p>a) 3' RNA- AUG UUA GGG UUU UAG 5' (1)</p> <p>Polypeptide chain - methionine- leucine -glycine –phenylalanine (1)</p> <p>b) because introns are spliced off during the processing of HnRNA. (1)</p> <p>c) From bacteria to human a genetic code will code for same amino acid e.g. UUU will code for Phenylalanine in all organisms. Some exceptions to this rule have been found in mitochondrial codons and in some protozoans. (1)</p> <p>d) Glycine has two codons because the genetic code is degenerate, that means a single amino acid can be coded by more than one codon. (1)</p> <p>e) Presence of 2' – OH groups at every nucleotide and Uracil instead of thymine makes RNA less stable. (1)</p> <p style="text-align: center;"><b>OR</b></p>	5

- a) **ABO blood group** in humans is an example of multiple allelism and codominance because the blood group is controlled by three alleles  $I^A$ ,  $I^B$ , and  $i$ .  $I^A$  and  $I^B$  alleles are dominant alleles and  $i$  is a recessive allele. So when  $I^A$  and  $I^B$  come together in the offspring they both are expressed co-dominantly. (2)
- b) A cross is carried out between heterozygous father (for blood group B) and heterozygous mother (of blood group A) to get four children with different blood groups. (3)



33

- a)
- Physical barriers- skin, mucus, digestive tract.
  - Physiological barriers- sweat, saliva, tears, and acid secreted in the stomach.
  - Cellular barriers- leukocytes, monocytes, natural killer cells, and macrophages.
  - Cytokine barriers- interferons. (2)
- b) **Benign tumors and malignant tumors**
- Benign tumors- remain confined to their original location and do not spread to other parts of the body and cause little damage.
- Malignant tumor cells grow very rapidly, invading and damaging the surrounding normal tissues of other organs.
- Malignant tumors are lethal as cancer cells move from the tumor to new sites through the blood to form secondary tumors.
- This invasion of cancer cells from one part to other parts by the body fluids is called metastasis. (3)
- OR**
- a) The characteristics of acquired immunity are:
- Antigenic specificity - It is the ability of the host cells to recognize an antigen specifically as a unique molecular entity and distinguishing it from another antigen.
  - Immunological memory - It is the ability of the host cells to remember antigens or pathogens, tumor cells, tissues of immunological self.
  - It is of two types – antibody mediated and cell mediated. (3)
- b) It can be acquired from
- a vaccine
  - exposure to an infection or disease (2)

5