Additional Practice Question Paper
Class XII (044 Biology)
2023-24

Maximum Marks: 70 **Time: 3 hours**

General Instructions:

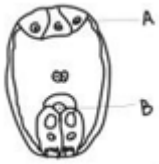
(i) All questions are compulsory.

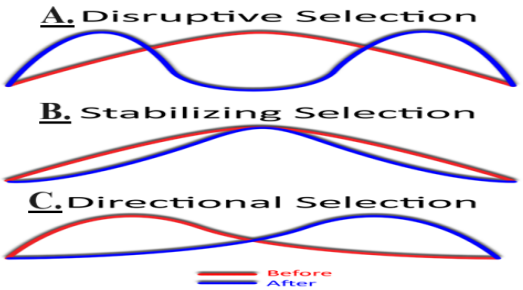
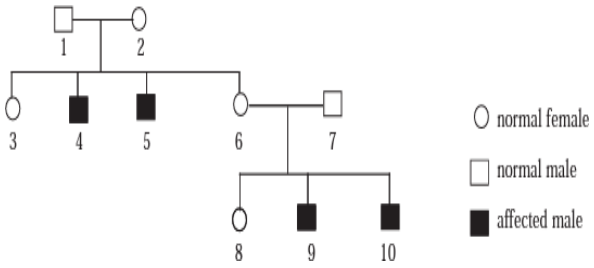
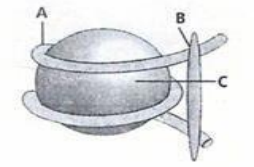
(ii) The question paper has five sections and 33 questions. All questions are compulsory.

(iii) Section – A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section – C has 7 questions of 3 marks each; Section – D has 2 case-based questions of 4 marks each; and Section – E has 3 questions of 5 marks each.

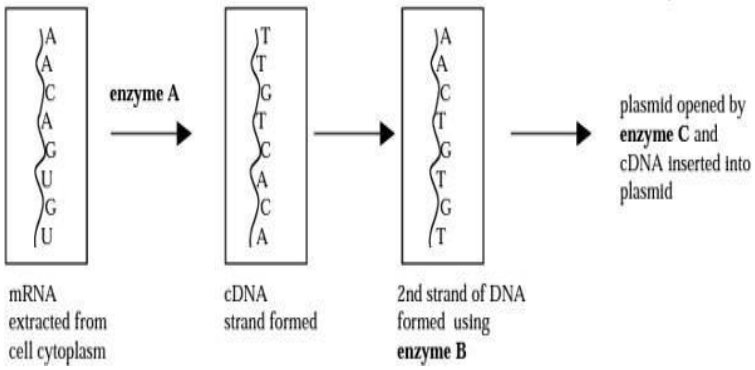
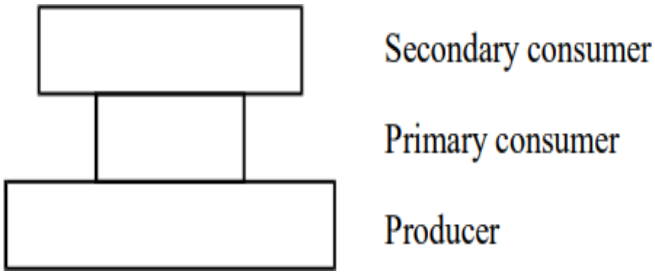
(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

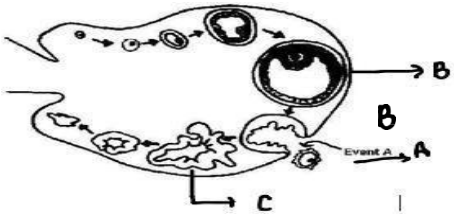
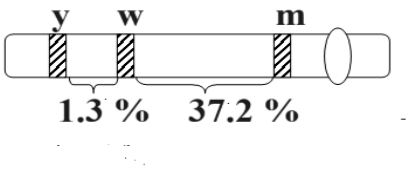
(v) Wherever necessary, neat and properly labeled diagrams should be drawn

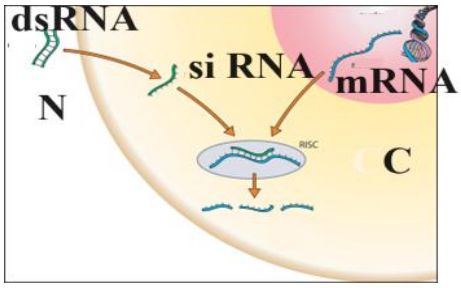
Section - A		
Q. no	**Question**	**Marks**
1	The fimbriae help in: a) Collection of ovum b) Collection of sperm c) Fertilization of sperm and ovum d) Maturation of sperm	1
2	Study the given diagram and choose the correct option against 'A' and'B' a) A-Egg apparatus; B-Polar body b) A-Antipodals; B-Egg apparatus c) A-Synergids; B- Egg apparatus d) A-Central cell; B-Antipodals 	1
3	Which of the following statements about Untranslated regions is/are true? I. present on rRNA II. present on mRNA at 3' position only III. present on mRNA at 5' position only IV. present on mRNA at both 3' and 5'position V. not required in translation process. VI. required for efficient translation process. a) I only b) II and V c) III and VI d) IV and VI	1
4	Which of the following statements regarding sex determination are true? In addition to autosomes – I. Male grass hoppers have one less sex chromosome than females. II. Male birds have one more sex chromosome than female. III. Number of sex chromosomes is equal in male and female birds. IV. Male grass hoppers have one additional sex chromosome than females.	1

	V. Male and female grass hoppers have the same number of sex chromosomes. a) I and II b) I and III c) II and IV d) III and V	
5	Fossil records show that the size of the black bears in Europe increased during each glacial period. Which of the following graphs represents this case?  a) Graph A b) Graph B c) Graph C d) None of the above	1
6	The process of evolution of different species in a geographical area starting from a point and radiating to other areas of geography is called – a) Founder effect b) Adaptive radiation c) Convergent evolution d) Saltation	1
7	The family tree below shows the inheritance of Duchenne Muscular Dystrophy (DMD) in a family. The pattern of inheritance in DMD is  a) Autosomal Dominant b) Autosomal Recessive c) X linked Dominant d) X linked Recessive	1
8	Identify A, B and C in the given diagram.  a) A. DNA, B. H1 histone, C. Histone octamer b) A. Histone octamer, B. DNA, C.H1 histone c) A. DNA, B. Histone octamer, C. H1 histone d) A. Histone octamer, B. H1 histone, C. DNA	1

<table>
<tr><td>9</td><td>Introduction of Gambusia fish in a pond checks the growth of:
a) water hyacinth
b) anopheles
c) dragonfly
d) house-fly</td><td>1</td></tr>
<tr><td>10</td><td>Restriction enzymes cut the strand of DNA –
I. a little away from the centre of palindrome sites
II. closer to the centre of palindrome sites
III. between the same two bases on the opposite strands
IV. between the different bases on the same strands
V. and leave single stranded portions at the ends
VI. and do not leave the single stranded portions at the ends
a) I, III and VI
b) I, III and V
c) I, IV and VI
d) II, IV and V</td><td>1</td></tr>
<tr><td>11</td><td>Which of the following techniques serves the purpose of early diagnosis of a disease?
a) Recombinant DNA Technology, Serum Analysis, ELISA
b) Urine analysis, Serum Analysis, ELISA
c) Recombinant DNA Technology, PCR, ELISA
d) PCR, Serum Analysis, Urine analysis</td><td>1</td></tr>
<tr><td>12</td><td>Which of the following is possible in an aquatic ecosystem?
<table><tr><th></th><th>Pyramid of numbers</th><th>Pyramid of biomass</th><th>Pyramid of energy</th></tr><tr><td>a)</td><td>Inverted</td><td>Upright</td><td>Inverted</td></tr><tr><td>b)</td><td>Upright</td><td>Upright</td><td>Upright</td></tr><tr><td>c)</td><td>Inverted</td><td>Inverted</td><td>Inverted</td></tr><tr><td>d)</td><td>Upright</td><td>Inverted</td><td>Upright</td></tr></table></td><td>1</td></tr>
<tr><td colspan="3">Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
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.</td></tr>
<tr><td>13</td><td>Assertion: Perisperm is the protective covering of seed which helps in its dispersal.
Reason: A ripened ovary wall forms a pericarp which functions as a fruit wall.</td><td>1</td></tr>
<tr><td>14</td><td>Assertion: In the process of transcription, template strand with polarity 3′ → 5′ plays a major role.
Reason: DNA dependent RNA polymerase catalyses the polymerization in only one direction, that is 5′ → 3′.</td><td>1</td></tr>
<tr><td>15</td><td>Assertion: Sickle cell anemia is an autosomal recessive trait.
Reason: It is transmitted from parents to the offsprings even when one partner is the carrier for the disease.</td><td>1</td></tr>
</table>

16	**Assertion:** Plasmids and bacteriophages are used as cloning vectors in rDNA technology**.** **Reason:** They have low copy number of their genome within the bacterial cell.	1
	Section B	
17	Consuming mother's milk for the first few days is important for the baby not just for energy, but also for other reasons. Elaborate.	2
18	In bacteria, how are all three steps of transcription catalyzed by a single RNA polymerase?	2
19	A patient was complaining of fever, chills, cough and headache. His lips and fingernails turned grey. What diagnosis would you make? Name the two causal organisms and state the category to which these pathogens belong.	2
20	In an effort to mass produce a useful protein, scientists extracted a precise section of mRNA from the cytoplasm of cells which naturally produced the protein. The mRNA strand was then used as a template to enzymatically synthesise a strand of complementary DNA (cDNA).  a) Identify the enzymes A, B and C. b) Plasmid was used as a vector in this investigation. Name another vector that can be used here.	2
21	Explain how the ecosystem follows the first and the second law of thermodynamics. **OR** a) Study the ecological pyramid of numbers given below and suggest some situations in which it is applicable.  b) Give two reasons why the percentage of energy transferred to consumers generally gets lowered as we move in a food chain from one trophic level to the other.	2

Section – C		
22	a) Explain how pituitary hormones influence the activity of Leydig cells and Sertoli cells present in human testes. b) The Spermatogonia has 46 chromosomes in a human male. Give the number of chromosomes in a (i) Primary spermatocyte and (ii) Spermatid.	3
23	The figure below shows the sequence of changes within the ovary that occur during the menstrual cycle.  a) Name the process A. Name the hormone that plays an important role during this event. b) Identify B and name the hormone that regulates the maturation of B. c) Identify and write the function of C.	3
24	 **y - yellow body** **w - white eye** **m - miniature wing** **in *Drosophila*** Above figure indicates the percentage of recombination between 2 pairs of genes – y and w; w and m. On the basis of this data what conclusion can you draw - a) Which two of these genes are tightly linked? Justify your answer. b) Which scientist used such data of the frequency of recombination between gene pairs on the same chromosome to prepare genetic maps and how? c) How are genetic maps useful?	3
25	The figure given below shows white winged and dark winged moth present on a tree trunk with variable lichen growth (a) in unpolluted area and (b) in polluted area. Which variety of moth is likely to survive in these two conditions? Justify your answer.  (a) (b)	3

26	a) Why is it important to measure biochemical oxygen demand (BOD) of the effluent? At what stage of sewage treatment is this testing done? b) BOD level of three samples of water labelled as A, B and C are 60 mg/L, 20 mg/L and 500 mg/L respectively. Which sample of water is most polluted?	3
27	When two different varieties– a conventional variety and a GM crop of corn crop were grown in a field, it was noticed that corn borers attacked only the conventional variety. a) Suggest a suitable treatment using genetic engineering approach for damage control in the conventional variety. Justify your approach. b) Name the gene associated for development of GM crop for the control of this pest. Explain its impact on the insect pest? c) How does it not harm the source from which it is taken? **OR** Factor VIII protein is a very useful protein for blood clotting in the human body. If deficient, it can either be plasma derived or can be made as a genetically engineered recombinant protein. a) Name a genetic disease that may be treated using recombinant human factor VIII. b) Before recombinant human factor VIII was available, this disease was treated with factor VIII received from donated blood. Give two possible advantages of using recombinant human factor VIII instead of it being obtained from donated blood, to treat this disease. c) What is unique feature in inheritance pattern of the disease as mentioned in part (a) above.	3
28	Which bio conservation strategy is used when the endangered species are removed from the unsafe or threatened habitat and placed under human care? How is this strategy different from the other strategy of bio-conservation?	3
	Section – D	
29	Given below is an image showing a special situation in which a dsRNA from a source has been introduced into a host cell.  N - Nematode specific gene C- Cell of Tobacco plant a) How can dsRNA of nematode specific gene be introduced into the host cell as shown in the figure given above? b) What can be the source of dsRNA for this process? c) What will be the impact of this interaction between dsRNA and mRNA on the mRNA and entire cellular machinery of host plant?	4

<table>
<tr><td></td><td>OR
c) What is the economic importance of the technique shown in the above figure? Justify your statement.</td><td></td></tr>
<tr><td>30</td><td>In a huge culture flask with unlimited supply of nutrient medium, bacteria were grown. Their population kept on increasing as they were dividing by binary fission.
a) What type of growth pattern will be seen in this population?
b) Write the equation which can be used to calculate the population size after time t, when the initial population size of the bacteria is represented by N and population size after time t is represented by N_t.
c) Draw a growth curve to depict the growth in the population size when growth in the population size is plotted over time. What will be the shape of this growth curve?
OR
c) If instead of providing the unlimited supply of culture medium in a huge flask, it is provided only in a very small test tube, then what will be the pattern of growth and the shape of the growth curve? Depict diagrammatically also.</td><td>4</td></tr>
<tr><td colspan="3">Section - E</td></tr>
<tr><td>31</td><td>A couple had unprotected intercourse.
i) Which are the two possible emergency contraceptives that can be used to avoid pregnancy in such a case?
ii) What is the basic principle of each of these?
iii) Will these contraceptive devices provide protection to the couple from STDs as well? Justify your answer.
iv) Removal of gonads cannot be considered as a contraceptive option. Justify.
OR
Consider the following three possible diagnoses for infertility and answer the trailing questions.
(i) Inability to produce a normal egg.
(ii) Low Count of Sperm.
(iii) Blocked Fallopian tube
a) Suggest and explain different methods of ART based on clinical examination for the above cases.
b) What are the legally acceptable reasons that allow MTPs to be carriedout?</td><td>5</td></tr>
<tr><td>32</td><td>The table below shows some of the 64 available codons and their associated amino acids.
<table>
<tr><th>Codon</th><th>Amino acid</th></tr>
<tr><td>AGG</td><td>arginine</td></tr>
<tr><td>CAG</td><td>glutamine</td></tr>
<tr><td>GGG</td><td>glycine</td></tr>
<tr><td>GGU</td><td>glycine</td></tr>
<tr><td>GUU</td><td>valine</td></tr>
<tr><td>UUA</td><td>leucine</td></tr>
<tr><td>UCA</td><td>serine</td></tr>
<tr><td>UUU</td><td>phenylalanine</td></tr>
</table></td><td>5</td></tr>
</table>

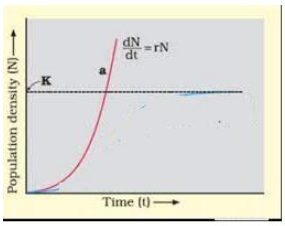
	The diagram below shows the coding strand of a length of DNA with its bases indicated. **T A C A A T C C C A A A A TC** a) Write down the base sequence of a length of the mature RNA that would be transcribed from this DNA. b) In a eukaryotic cell, the base sequence of the mRNA might be different from the sequence of the HnRNA. Explain why. c) 'Genetic code is nearly universal'. Explain this statement. d) Explain why glycine has two codons in the above table. e) Give reasons why RNA is less stable than DNA. **OR** a) ABO blood group in humans is an example of multiple allelism and Co-dominance. Justify. b) A couple who has blood groups A and B have four children. Each child has a different blood group. Explain with the help of crosses to show how this is possible.	
33	a) Innate immunity is a non-specific type of defense and consists of four types of barriers. Categorize these barriers and give one example for each. b) Differentiate between benign and malignant tumors? Which one is lethal and why? **OR** a) State three characteristics of acquired immunity. b) List the different ways by which it can be attained by humans.	5

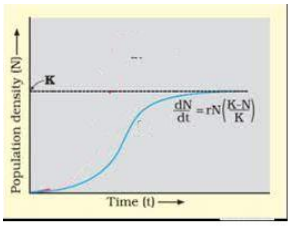
MARKING SCHEME (2023-24)
Class XII
044 Biology

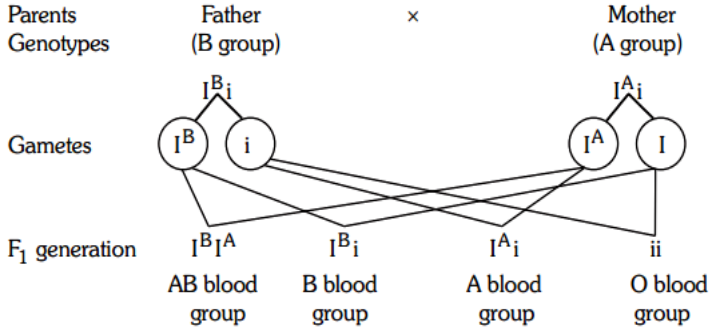
Q. no		Marks
	Section - A	
1	a) Collection of ovum	1
2	b) A-Antipodals; B-Egg apparatus	1
3	d) IV and VI	1
4	b) I and III	1
5	c) Graph C	1
6	b) Adaptive radiation	1
7	d) X linked Recessive	1
8	a) A. DNA, B. H1 histone, C. Histone octamer	1
9	b) anopheles	1
10	b) I, III and V	1
11	c) Recombinant DNA Technology, PCR, ELISA	1
12	d) Upright | Inverted | Upright	1
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
	Section - B	
17	• The mother's milk during the initial days after delivery is called **colostrum**. It contains abundant antibodies (IgA) that protect the neonate against many diseases. (1) • It thus provides passive immunity to the new born infant. (1)	2
18	• RNA polymerase is capable of catalysing the process of elongation. (1) • It associates transiently with initiation factor (sigma factor) and termination factor (rho factor) to initiate and terminate the transcription respectively. (1)	2
19	• The symptoms indicate Pneumonia. • Causal organisms– *Streptococcus pneumoniae, Haemophilus influenzae* • Bacteria (0.5 x 4 = 2)	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	a) 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) b) 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) **OR** 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) 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)	2
Section – C		
22	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) b) (i) Primary spermatocyte – 46 chromosomes (ii) Spermatid – 23 chromosomes. (1)	3
23	a) Ovulation - LH (1) b) Graafian Follicle- Estrogen (1) c) Corpus Luteum- produces progesterone (1)	3
24	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) 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)	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	• 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. • 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. • 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.	3
26	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) b) Sample C is most polluted because it has highest BOD level among the three samples of water. (1)	3
27	a) Bt toxin gene can be isolated from bacterium *Bacillus thuringiensis* 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) b) cryIAb – It is a Bt toxin gene isolated from *Bacillus thruingiensis* 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) 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) **OR** a) Haemophilia (1) 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) c) Haemophilia is a X- chromosome linked recessive genetic disorder and it follows criss- cross pattern of inheritance. (1)	3

28	Ex-situ. (1) • 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) • 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)	3
Section – D		
29	a) Using *Agrobacterium* vectors (1) b) Infection by viruses having RNA genomes or mobile genetic elements (transposons) (1) 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) Parasite will thus not be able to survive in the transgenic host. (1) **OR** c) It is used for development of pest resistant plants. A nematode *Meloidegyne incognita* 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.	4
30	a) Exponential or geometric growth pattern (1) b) $N_t = N_0 e^{rt}$ (1) Where Nt = population density after time t N_0 = Population density at time zero r = intrinsic rate of natural increase e = the base of natural logarithms c)  J – shaped growth curve (1+1) **OR** c) Logistic growth - sigmoid shape, will be obtained. (1) 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.	4

	 (1)	
31	i) Administration of progestogens or progestogen estrogen combinations or IUDs within 72 hours of coitus. (1) 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) IUDs increase the phagocytosis of sperms within the uterus, suppress sperm motility and fertilising capacity of sperms. (1) iii) No, STDs can be prevented by use of condoms. (1) iv) Gonads are endocrine glands and thus cannot be removed from the body. (1) **OR** a) i) Inability to produce a normal egg. - **GIFT (Gamete Intra Fallopian Transfer)**: This technique involves the transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce one. (1) ii) Low Count of Sperm. - **ICSI (Intra Cytoplasmic Sperm Injection)**: In this technique, sperm is directly injected into the ovum; in the laboratory. (1) iii) Blocked Fallopian tube- **ET (Embryo Transfer)**: it involves transferring blastocyst into the uterus and this is called Intra-Uterine Transfer (IUT). (1) 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)	5
32	a) 3' RNA- AUG UUA GGG UUU UAG 5' (1) Polypeptide chain - methionine- leucine -glycine –phenylalanine (1) b) because introns are spliced off during the processing of HnRNA. (1) 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) 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) e) Presence of 2' – OH groups at every nucleotide and Uracil instead of thymine makes RNA less stable. (1) **OR**	5

	a) **ABO blood group** in humans is an example of multiple allelism and codominance because the blood group is controlled by three alleles IA, IB, and i. IA and IB alleles are dominant alleles and i is a recessive allele. So when IA and IB 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