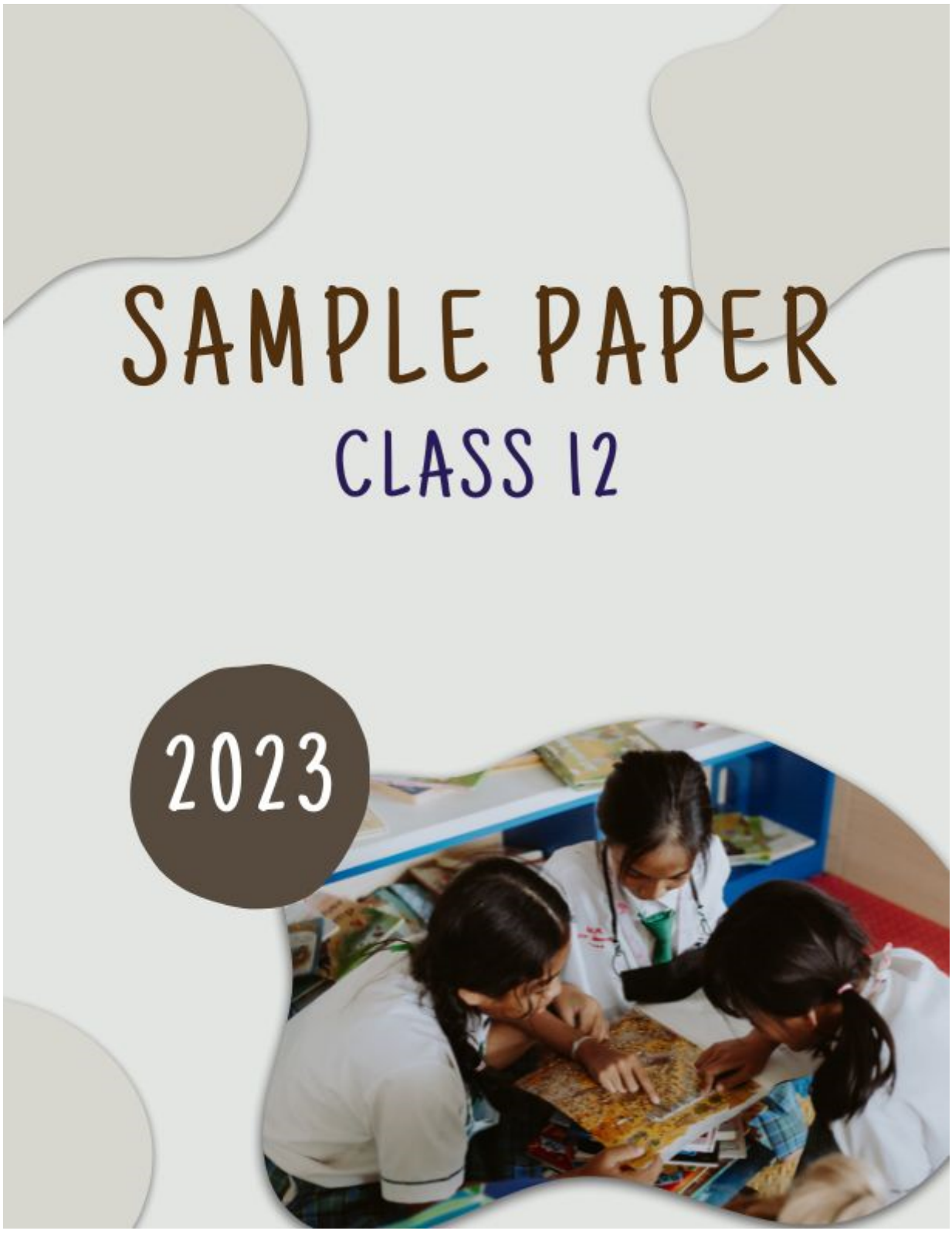
Class 12 Sample Paper 2023 Solution



Practice Questions – Marking Scheme
Session 2022-23
CLASS XII
BIOLOGY (044)

Q.No	Question	Marks
	SECTION A	
1	(b) inhibiting ovulation and implantation	1
2	(c) only Q, R and S	1
3	(b) 30%	1
4	(b) only Q	1
5	(c) reduced levels of oxygen in the blood	1
6	(c) only P and R	1
7	(d) dead organic matter	1
8	(a) only P	1
9	(c) only Q and R	1
10	(b) only P and R	1
11	(b) Q	1
12	(b) productivity	1
	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	
13	(c) A is true, but R is false.	1
14	(d) A is false, but R is true.	1
15	(a) Both A and R are true, and R is the correct explanation for A.	1
16	(d) A is false, but R is true.	1
	SECTION B	
17	(a) 0.5 marks each for the following: - sterile females with rudimentary ovaries - short stature and underdeveloped feminine character (b) 0.5 marks each for the following: - category: chromosomal disorders/aneuploidy - cause: failure of segregation of chromatids during cell division cycle	2
18	1 mark each for the following: (a) Well P contains the uncut vector whereas well Q contains the vector cut by a restriction enzyme. (b) The vector in well Q has been cut by a restriction enzyme that has two	2

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	sites whereas the vector in well R has been cut either by different enzymes or by one enzyme that has more than two sites.	
19	(a) 0.5 marks each for the following: - metastasis - Pepsin is produced mainly by the stomach cells, so the tumor may have metastasised from the stomach to the liver. (b) malignant tumors *[0.5 marks]* (c) They will disrupt the normal functioning of the liver cells. *[0.5 marks]* *[Accept any other valid answer]*	2
20	(a) bone marrow OR preserved embryonic stem cells from Reena's umbilical cord *[1 mark]* (b) 0.5 marks each for the following: - Stem cells are capable of differentiating into all types of tissues and organs. - Replacing the damaged nerve cells with healthy nerve cells that have differentiated from the stem cells can help in treating the diseased condition.	2
21	1 mark each for: - dry weight - Water content, as part of fresh (or wet) weight can be different due to seasonal or ecosystem variations. **OR** 1 mark each for the following: - Very few decomposers can break down chitin present in the hard outer coverings, so the decomposition would be slow. - Soil submergence in marshy areas would lead to anaerobic decomposition which is slower than aerobic decomposition. *[Accept any other valid answer]*	2
SECTION C		
22	(a) 0.5 marks for each of the following: - Menstruation results in breakdown of the endometrial wall of the uterus. - In case of fertilisation, the foetus needs the endometrial wall as the womb and so in case of pregnancy continues to sustain and menstruation does not happen. (b) 1 mark for each correct answer as follows:	3

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	- rupture of Graafian follicle - release of ovum	
23	(a) inbreeding depression *[1 mark]* (b) 1 mark each for correct name and explanation: - self incompatibility - The pollen of a plant is not allowed to germinate on the stigma of the same flower or on a different flower of the same plant due to pollen-pistil interaction.	3
24	(a) that DNA is the genetic material and not proteins *[1 mark]* (b) - X: ^{35}S amount in supernatant *[0.5 marks]* - Y: ^{32}P amount in supernatant *[0.5 marks]* - Reason: When agitated in a blender, the bacteriophages separated from the cells. The supernatant so formed had a high content of ^{35}S but there was also some ^{32}P which may have not yet transferred their genetic material to bacterial cells. *[1 mark]*	3
25	(a) 0.5 marks for each of the following steps: - $q^2 = 0.25$, so $q = 0.5$ - $p + q = 1$ So, $p = 1 - 0.5 = 0.5$ - So, population that consists of carriers (Ss) = $2pq = 2 \times 0.5 \times 0.5 = 0.5$ - Carrier individuals in a population of 1000 individuals = $0.5 \times 1000 =$ 500 individuals (b) 0.5 marks for each of the following: - No, it cannot be used. - The Hardy-Weinberg principle takes into account only diploid organisms/organisms with two alleles for a trait.	3
26	(a) 0.5 marks for each of the following: - reverse transcription of the viral RNA to cDNA. - this is the only process that is not normally carried out by the animal cell (b) If the viral DNA continues to stay in the cytoplasm, it can get degraded by enzymes in the cytoplasm. *[1 mark]* (c) If the concentration of antigen/antibodies in the sample used is not sufficient to give a positive result. *[1 mark]*	3

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	[Accept any other valid answer] **OR** 1 mark each for the following: (a) Anaerobic bacteria would not use the oxygen in the wastewater, thus the BOD would not reduce. (b) Anaerobic conditions need to be maintained as biogas-producing bacteria are strict anaerobes. (c) The slurry will mainly be rich in nitrogen and phosphorus as the carbon in the sludge would be used in the formation of methane and carbon dioxide.	
27	(a) 0.5 marks for each of the following: - As the bacteria starts to grow, it uses up the oxygen in the system. - After a while, the oxygen gets used up and anaerobic respiration begins which leads to the formation of lactic acid, causing a decrease in the pH. (b) 0.5 marks for identification and 0.5 marks for the reason for any TWO of the following: - Oxygen delivery system: After the starter culture is added, oxygen is also added which will need a delivery system. - Stirrer: Once oxygen is added, the system would need to be mixed thoroughly so that oxygen is available throughout the bioreactor. - Sterilization unit: Milk needs to be sterilised before addition of the starter culture to remove any other microorganisms already present in it. *[Accept any other valid answer]*	3
28	(a) 1 mark for any ONE of the following reasons such as: - low incident solar radiation results in low productivity - extremely cold conditions do not favour survival of many species (b) 1 mark for any ONE of the following reasons such as: - greater competition between species - greater climatic variations - harsh climatic conditions for many species (c) In cryopreservation, low temperature conditions are used to preserve biological constructs. *[1 mark]*	3
SECTION D		
29	(a) 0.5 marks each for the following:	4

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	- parent with purple kernel - Pp - parent with yellow kernel – pp (b) Complete answer: **P** | **p** **P** | PP | Pp **p** | Pp | pp - 1 mark for correctly identifying genotypes of the parents in the cross - 1 mark for drawing the correct Punnett square. (c) 0.5 marks each for the following: - genotypic ratio: 1:2:1 OR 1PP:2Pp:1pp - phenotypic ratio: 3:1 OR 3 plants with purple kernel: 1 plant with yellow kernel **OR** (c) 0.5 marks each for the following: - test cross with a plant having yellow kernels/homozygous recessive. - The percentage of dominant and recessive phenotypes in the progeny of a test cross can help identify the unknown genotype of the parent.	
30	(a) 1 mark each for the following: - active immunity - Since he used matter from lesions, it is likely to be the antigen which was then inoculated into the boy for protection against cowpox and building a memory response against smallpox (b) 0.5 marks each for the following: - Vaccination can provide active immunity if antigenic proteins of a pathogen or the inactivated/weakened pathogen (vaccine) are introduced into the body. - For example, the COVID-19 vaccine or polio vaccine contains an antigen that when injected in the body initiates an antibody response. - Vaccination can also provide passive immunity if pre-formed antibodies or antitoxins are injected into an individual. - For example, in case of snake bites, patients are injected with antibodies against the snake venom. *[Accept any other valid examples]*	4

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	OR (b) 1 mark each for the following: - passive immunization - Passive immunization involves injecting an individual with pre-formed antibodies rather than the antigen itself which is responsible for the generation of a memory response.	
	SECTION E	
31	(a) 0.5 marks each for the following: - The viral RNA is isolated and converted to a dsDNA structure. - The dsDNA so formed is inserted into an appropriate vector (*Agrobacterium* or viral vector). - The vectors are then introduced into the host plant where it transcribes the mRNA for this gene. - Whenever the virus infects the plant and injects its RNA into the host plant, the host plant transcribes the viral RNA. - The mRNA produced from the vector binds to the transcribed viral RNA. - This prevents the viral RNA from being transcribed and therefore survives in the host plant without infecting the plant. (b) 1 mark each for the following: - RNAi or RNA interference - RNAi helps in in-vitro silencing of a gene/set of genes so that they lose their function. **OR** (a) 1 mark each for each of the following step explained in a diagram: - From the amino acid sequence, the gene for growth hormone needs to be synthesized chemically. - The gene of interest is cut using a restriction enzyme and the same restriction enzyme is used to cut the vector within the *lac* gene. - The gene obtained is inserted into the vector using a ligase. - These are transformed into *E.coli* cells/host cells for production. (b) 0.5 marks each for the following: - In recombinants, since the *lac* gene is inactivated, after insertion of the gene of interest, it does not produce the β-galactosidase enzyme which results in colourless colonies when a chromogenic substrate is added. - In non-recombinants, since the *lac* gene is still active, it produced the enzyme β-galactosidase which results in blue colonies when a chromogenic substrate is added.	5

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32	(a) 1 mark for the following: - AUG UAC GGC AUG ACA UGG - (b) 0.5 marks each for the following: - yes - since the mRNA begins with a start codon *[No marks are to be awarded if the reason is not mentioned]* (c) 0.5 marks each for the following: - MET-TYR-GLY-MET-THR-TRP - tRNA sequence: UAC (d) Only methionine will remain in the amino acid sequence as the second codon will get converted to a stop codon. *[1 mark]* *[No marks to be awarded if stop codon is not mentioned]* (e) 0.5 marks each for the following: - point mutation - guanine is getting converted to another base, thymine, resulting in the loss of the gene **OR** (a) 1 mark for each of the following: - man R - The percentage of similarity of DNA fragments between the child and the men is highest in man R. (b) DNA profiling/DNA fingerprinting (c) 1 mark each for the following: - Each individual has a unique pattern of mini-satellites or repeated DNA called VNTRs. - This can be used to identify an individual using DNA from any body part/fluid. (d) - twins/monozygotic twins *[0.5 marks]* - The DNA profiles of men Q and S are the same which is possible only if they come from the same zygote/if they are identical twins. *[1 mark]*	5
33	(a) 0.5 marks for each correct name: - embryo - endosperm	5

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	(b) 1 mark for each correct answer: - The embryo is represented by the entire pea seed. - The endosperm is consumed by the developing embryo and cannot be identified as such. (c) 1 mark each for mentioning the following: - The pollen grain needs to be transferred to the stigma. Hence, the smaller size of the male gametophyte makes movement easier. - The ovule develops into the seed and supports the growing embryo. The supporting cells provide nourishment to the growing embryo. **OR** (a) 0.5 marks each for the following: - After 1st meiotic division - 23 chromosomes - Reason - 1st meiosis/reductional division results in halving of the chromosome content in the primary spermatocytes. - After 2nd meiotic division - 23 chromosomes - Reason - The 2nd meiotic division is similar to mitosis/equational division where there is no reduction in the number of chromosomes. *[Accept any other valid answer]* (b) (i) formation of the sperm from secondary spermatocytes does not happen OR differentiation of the spermatocyte into head, neck, tail and middle piece does not happen (b) (ii) low sperm count (c) - degenerate/degrade *[0.5 marks]* - Since the secondary oocyte and the ovum retain bulk of the cytoplasm that contains the nutrients for survival, the polar bodies are not likely to survive for long and therefore degenerate. *[1 mark]*	

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