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Your JEE Guide

MP Board Class XII · Biology

Sample Question Paper 5 · Session 2026-27

Time allowed: 3 hours **Maximum marks: 70**

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This is an original practice paper written to the MPBSE 2027 sample question paper pattern; it is not issued by MPBSE.

General instructions:

1. All questions are compulsory.
2. Questions 1 to 5 are objective questions (28 in all): choose the correct option, fill in the blanks, true/false, match the columns and answer in one word or sentence. Each sub-question carries 1 mark.
3. Questions 6 to 12 are very short answer questions of 2 marks each. Answer each in about 30 words.
4. Questions 13 to 16 are short answer questions of 3 marks each. Answer each in about 75 words.
5. Questions 17 to 20 are long answer questions of 4 marks each. Answer each in about 120 words.
6. Internal options are given in questions 13 to 20.
7. Draw neat and labelled diagrams wherever necessary.

1.	**(i)** *Choose the correct option and write it:* The number of nuclei in a typical mature embryo sac is: (a) 8 (b) 7 (c) 4 (d) 6	1
	(ii) In humans, the acrosome of the sperm is formed from the: (a) mitochondria (b) nucleus (c) centriole (d) Golgi apparatus	1
	(iii) A man with blood group O marries a woman with blood group AB. Their children can have the blood groups: (a) A, B, AB or O (b) A or B (c) AB only (d) O only	1
	(iv) The causative agent of typhoid is: (a) Plasmodium vivax (b) a rhinovirus (c) Salmonella typhi (d) Entamoeba histolytica	1
	(v) In gel electrophoresis, DNA fragments move towards the: (a) well (b) centre of the gel (c) cathode (d) anode	1

	(vi) The concept of "evil quartet" is related to: (a) population growth (b) pollination (c) loss of biodiversity (d) transcription	1
2.	**(i)** *Fill in the blanks:* The hard outer layer of the pollen grain is made of _____.	1
	(ii) The first milk secreted by the mother after childbirth is called _____.	1
	(iii) In humans, a child with genotype XX develops as a _____.	1
	(iv) The DNA strand with polarity 3′ → 5′ that acts as the template in transcription is the _____ strand.	1
	(v) HIV attacks the helper _____-lymphocytes.	1
	(vi) The interaction in which one organism benefits and the other is harmed by living on or in it is _____.	1
3.	**(i)** *Write True or False:* In most flowering plants, the embryo sac develops from one of the four megaspores.	1
	(ii) Fertilisation in humans takes place in the ovary.	1
	(iii) Thalassemia and sickle-cell anaemia are both Mendelian disorders.	1
	(iv) Interferons are produced by bacteria.	1
	(v) EcoRI is obtained from Escherichia coli.	1
	(vi) Species diversity decreases as we move from the equator towards the poles.	1
4.	Match each term in column A with its description in column B:	5

Column A	Column B
(i) Geitonogamy	(a) pollen goes to another flower of the same plant
(ii) Xenogamy	(b) more than one embryo in a seed
(iii) Autogamy	(c) fruit develops without fertilisation
(iv) Parthenocarpy	(d) pollen goes to the stigma of the same flower
(v) Polyembryony	(e) pollen goes to a flower of a different plant

5.	**(i)** *Answer in one word or one sentence:* Name the part of the ovule through which the pollen tube usually enters.	1
	(ii) At what stage does the human embryo show 8 to 16 blastomeres?	1
	(iii) What is the genotype of a pure dwarf pea plant?	1
	(iv) Name the protein coat of a virus.	1

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	(v) Name the country near the equator that has nearly 1400 species of birds.	1
6.	What is the function of the two synergids and of the antipodal cells in an embryo sac?	2
7.	Distinguish between oogenesis and spermatogenesis in the number of gametes formed from one mother cell.	2
8.	What is linkage? Who first studied it?	2
9.	What is splicing? Why is it needed in eukaryotes?	2
10.	What is autoimmunity? Give one example of an autoimmune disease.	2
11.	What is a recombinant DNA molecule? Which enzyme joins its parts?	2
12.	Write two features of the biodiversity of India.	2
13.	Explain wind pollination and three adaptations of wind-pollinated flowers. **OR** Why are some seeds called albuminous and others non-albuminous? Give one example of each.	3
14.	Explain incomplete dominance with the example of flower colour in snapdragon. **OR** Explain the inheritance of the ABO blood groups as an example of multiple alleles.	3
15.	Distinguish between benign and malignant tumours. Name two methods used to detect cancer. **OR** What are primary and secondary lymphoid organs? Give two examples of each.	3
16.	What is brood parasitism? Explain with an example and state the adaptation that helps it. **OR** Explain the importance of predators in nature, with an example.	3
17.	Describe the process of fertilisation and implantation in humans. **OR** Describe the structure of a seminiferous tubule, with the roles of its cells.	4
18.	Explain the experiment of Meselson and Stahl. **OR** Explain the experiment of Griffith on Streptococcus pneumoniae and what it showed.	4

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19.	What is a cloning vector? Describe its essential features. **OR** Describe the process of agarose gel electrophoresis used to separate DNA fragments.	4
20.	Explain the four major causes of biodiversity loss, with one example of each. **OR** What is a sacred grove? Name two regions of India where they are found and explain their importance.	4

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Answers and Marking Scheme

Marks for each step are shown in brackets. Any correct alternative method gets full credit.

Question 1

(i) **(a)** 8. *Working:* Eight nuclei in seven cells (the central cell has two polar nuclei).

(ii) **(d)** Golgi apparatus. *Working:* Its enzymes help the sperm penetrate the ovum.

(iii) **(b)** A or B. *Working:* ii × I^AI^B gives I^Ai and I^Bi.

(iv) **(c)** Salmonella typhi. *Working:* It is a bacterium spread through contaminated food and water.

(v) **(d)** anode. *Working:* DNA is negatively charged.

(vi) **(c)** loss of biodiversity. *Working:* It names the four major causes of biodiversity loss.

Question 2

(i) sporopollenin.

(ii) colostrum.

(iii) girl (female).

(iv) template.

(v) T.

(vi) parasitism.

Question 3

(i) True: monosporic development.

(ii) False: it takes place in the Fallopian tube.

(iii) True.

(iv) False: they are produced by virus-infected cells.

(v) True: from the RY13 strain.

(vi) True.

4. (i) – (a) pollen goes to another flower of the same plant; (ii) – (e) pollen goes to a flower of a different plant; (iii) – (d) pollen goes to the stigma of the same flower; (iv) – (c) fruit develops without fertilisation; (v) – (b) more than one embryo in a seed

Question 5

(i) The micropyle.

(ii) The morula.

(iii) tt.

(iv) Capsid.

(v) Colombia.

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6. Synergids, with the filiform apparatus, guide the pollen tube into the embryo sac (1). Antipodal cells are thought to nourish the embryo sac (1).

7. One primary spermatocyte forms four sperms (1). One primary oocyte forms one ovum and two (or three) polar bodies (1).

8. The tendency of genes on the same chromosome to be inherited together (1). Thomas Hunt Morgan, working with Drosophila (1).

9. Removal of introns from the hnRNA and joining of the exons (1). Eukaryotic genes are split genes, and only exons code for the protein (1).

10. A condition in which the immune system attacks the body's own cells (1). Rheumatoid arthritis (1).

11. A DNA molecule formed by joining DNA from two different sources, e.g. a gene and a vector (1). DNA ligase (1).

12. India has only about 2.4% of the world's land area but about 8.1% of its species diversity (1). It is one of the 12 mega-diversity countries, with many endemic species (1).

13. Pollen is carried from anther to stigma by wind (anemophily), e.g. grasses and maize (1). Pollen grains are light and non-sticky (1). Stamens are well exposed and the stigma is large and feathery to trap pollen; flowers have a single ovule and are often packed into inflorescences (1).

OR Albuminous seeds keep part of the endosperm, as it is not completely used by the embryo, e.g. wheat, maize, castor (1½). Non-albuminous seeds have no endosperm left, as it is used up in embryo development, e.g. pea, groundnut (1½).

14. Neither allele is fully dominant, so the heterozygote has an intermediate phenotype (1). RR (red) × rr (white) gives Rr (pink) in F_1 (1). F_2: red : pink : white = 1 : 2 : 1, the same as the genotypic ratio (1).

OR One gene, I, has three alleles: I^A, I^B and i (1). A person carries any two, giving six genotypes (1). These give four blood groups: A (I^AI^A, I^Ai), B (I^BI^B, I^Bi), AB (I^AI^B) and O (ii) (1).

15. Benign tumours stay at their original site and cause little damage (1). Malignant tumours grow rapidly, invade surrounding tissues and spread by metastasis (1). Detection: biopsy, blood and bone-marrow tests, X-rays, CT or MRI (any two) (1).

OR Primary lymphoid organs are where lymphocytes form and mature: bone marrow and thymus (1½). Secondary lymphoid organs are where lymphocytes interact with antigens and multiply: spleen, lymph nodes, tonsils, Peyer's patches (1½).

16. One species lays its eggs in the nest of another species, which incubates and rears the young (1). The cuckoo (koel) lays its eggs in a crow's nest (1). Its eggs resemble the crow's eggs in size and colour, so they are not detected and thrown out (1).

OR Predators pass energy to higher trophic levels and keep prey populations under control (1). They help maintain species diversity by reducing competition among prey species (1). E.g. removal of the starfish Pisaster from an intertidal community led to the extinction of more than ten invertebrate species (1).

17. A sperm reaches the ovum in the ampullary region of the Fallopian tube; contact with the zona pellucida induces changes that block other sperms (1). The secondary oocyte completes

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meiosis II, and the sperm and ovum nuclei fuse to form the zygote (1). The zygote divides as it moves to the uterus, forming the morula and then the blastocyst (1). The trophoblast attaches to the endometrium and the blastocyst becomes embedded in it: implantation (1).

OR Each testicular lobule has one to three highly coiled seminiferous tubules (1). They are lined by spermatogonia, which form sperms by spermatogenesis (1). Sertoli cells nourish the developing germ cells (1). Leydig (interstitial) cells between the tubules secrete androgens (1).

18. E. coli was grown for many generations in a medium containing $^{15}NH_4Cl$, so its DNA became heavy (1). The cells were transferred to a medium with normal $^{14}NH_4Cl$, and DNA was extracted after each generation and centrifuged in a CsCl density gradient (1). After one generation the DNA was of hybrid (intermediate) density (1). After two generations there were equal amounts of hybrid and light DNA, proving semi-conservative replication (1).

OR Live S strain bacteria killed mice; live R strain bacteria did not (1). Heat-killed S strain bacteria did not kill mice (1). A mixture of heat-killed S and live R bacteria killed mice, and live S bacteria were found in them (1). Some “transforming principle” from the dead S bacteria changed the R bacteria into the S form (1).

19. A DNA molecule, such as a plasmid, used to carry foreign DNA into a host cell and multiply it (1). Origin of replication (ori), where replication starts and which controls the copy number (1). Selectable marker, such as an antibiotic-resistance gene, to identify transformants (1). Cloning sites: single recognition sites for restriction enzymes, preferably within a marker gene so that insertional inactivation can be used (1).

OR The cut DNA fragments are loaded into wells in an agarose gel (1). An electric field is applied and the negatively charged fragments move towards the anode, smaller ones moving farther through the gel’s pores (1). The gel is stained with ethidium bromide and viewed in UV light, showing orange bands (1). The bands of interest are cut out and the DNA eluted for use (1).

20. Habitat loss and fragmentation: tropical rain forests once covered 14% of the earth’s land surface but now cover no more than 6% (1). Over-exploitation: Steller’s sea cow and the passenger pigeon became extinct (1). Alien species invasions: the Nile perch in Lake Victoria wiped out many cichlid fish species (1). Co-extinctions: when a host fish becomes extinct, its unique parasites also die out (1).

OR Tracts of forest set aside and protected by local communities for religious reasons (1). Khasi and Jaintia Hills in Meghalaya, Aravalli Hills of Rajasthan, Western Ghats of Karnataka and Maharashtra, Sarguja, Chanda and Bastar areas of Madhya Pradesh (any two) (1). They are refuges for many rare and threatened plants (1) and are an example of in-situ conservation with community support (1).

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