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Your JEE Guide

MP Board Class XII · Biology

Sample Question Paper 6 · 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:* Pollen grains land on and germinate on the: (a) anther (b) ovary (c) style (d) stigma	1
	(ii) Which of the following is a surgical method of contraception in males? (a) tubectomy (b) vasectomy (c) condom (d) CuT	1
	(iii) Mendel's law of segregation is also called the law of: (a) independent assortment (b) linkage (c) purity of gametes (d) dominance	1
	(iv) The most abundant antibody in human blood is: (a) IgG (b) IgA (c) IgM (d) IgE	1
	(v) Roquefort cheese is ripened by the growth of: (a) a specific fungus (b) Rhizobium (c) Lactobacillus (d) a virus	1

	(vi) Which ecological pyramid is inverted in many aquatic ecosystems? (a) the pyramid of energy (b) all of them (c) none of them (d) the pyramid of biomass	1
2.	**(i)** *Fill in the blanks:* Coconut water is _____ endosperm.	1
	(ii) The menstrual phase usually lasts _____ days.	1
	(iii) Crossing an F_1 hybrid with its recessive parent is called a _____ cross.	1
	(iv) Okazaki fragments are joined together by the enzyme _____.	1
	(v) Malaria is transmitted by the female _____ mosquito.	1
	(vi) In the logistic growth equation, K stands for the _____.	1
3.	**(i)** *Write True or False:* In most angiosperms, pollen grains are shed at the two-celled stage.	1
	(ii) Sertoli cells secrete testosterone.	1
	(iii) A dihybrid test cross with unlinked genes gives a 1 : 1 : 1 : 1 ratio.	1
	(iv) In eukaryotes, transcription and translation take place in the same cell compartment.	1
	(v) Ascaris is a protozoan parasite.	1
	(vi) Lantana is an invasive alien weed in India.	1
4.	Match each contraceptive method in column A with its type in column B:	5

Column A	Column B
(i) Condom	(a) copper-releasing IUD
(ii) CuT	(b) natural method
(iii) Saheli	(c) surgical method in males
(iv) Vasectomy	(d) barrier method
(v) Lactational amenorrhoea	(e) oral contraceptive pill

5.	**(i)** *Answer in one word or one sentence:* Name the female reproductive part of a flower.	1
	(ii) Name the cells of the testis that secrete androgens.	1
	(iii) What is the copying of DNA to form new DNA called?	1
	(iv) Name one disease against which a recombinant vaccine produced in yeast is used.	1

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	(v) What is the variation of genes within a species called?	1
6.	What is pollen viability? How are pollen banks useful?	2
7.	What is ovulation? Which hormone triggers it?	2
8.	Why is Drosophila well suited to genetic studies? Give two reasons.	2
9.	State the role of the σ (sigma) and ρ (rho) factors in transcription in bacteria.	2
10.	Name one disease spread by each of the Aedes mosquito and the Anopheles mosquito.	2
11.	What is a palindromic nucleotide sequence? Give one example.	2
12.	What is meant by the carrying capacity of a habitat?	2
13.	Describe the structure of a mature pollen grain. **OR** What is double fertilisation? Why is it unique to flowering plants?	3
14.	State the chromosomal theory of inheritance. What evidence links genes with chromosomes? **OR** What is a mutation? Distinguish between a point mutation and a frameshift mutation.	3
15.	What are biocontrol agents? Describe three examples. **OR** Describe the medical uses of cyclosporin A, statins and streptokinase, naming the organism that produces each.	3
16.	What is resource partitioning? Explain with MacArthur’s study of warblers. **OR** State Gause’s competitive exclusion principle and give an example of competitive release.	3
17.	Describe the phases of the menstrual cycle. **OR** Describe the structure of a Graafian follicle and the changes that follow ovulation.	4
18.	Explain how DNA is packaged in eukaryotic chromosomes. **OR** Describe the methods used in the Human Genome Project.	4

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19.	Describe the steps of the polymerase chain reaction and give two of its applications. **OR** Explain how RNA interference is used to produce pest-resistant plants.	4
20.	Explain the latitudinal gradient of species diversity and give three hypotheses that explain it. **OR** What are biodiversity hotspots? Name the hotspots that include parts of India and explain why they are important.	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) **(d)** stigma. *Working:* The stigma is the receptive surface of the pistil.

(ii) **(b)** vasectomy. *Working:* A small part of the vas deferens is removed or tied.

(iii) **(c)** purity of gametes. *Working:* Each gamete receives only one allele of a pair.

(iv) **(a)** IgG. *Working:* IgG also crosses the placenta.

(v) **(a)** a specific fungus. *Working:* The fungus gives it its particular flavour.

(vi) **(d)** the pyramid of biomass. *Working:* The small, fast-reproducing phytoplankton have less standing biomass than the fish that feed on them.

Question 2

(i) free-nuclear.

(ii) 3 to 5.

(iii) test.

(iv) DNA ligase.

(v) Anopheles.

(vi) carrying capacity.

Question 3

(i) True: in over 60% of angiosperms.

(ii) False: Leydig cells secrete it; Sertoli cells nourish the germ cells.

(iii) True.

(iv) False: transcription is in the nucleus and translation in the cytoplasm.

(v) False: it is a roundworm (helminth).

(vi) True.

4. (i) – (d) barrier method; (ii) – (a) copper-releasing IUD; (iii) – (e) oral contraceptive pill; (iv) – (c) surgical method in males; (v) – (b) natural method

Question 5

(i) The pistil (carpel).

(ii) Leydig (interstitial) cells.

(iii) Replication.

(iv) Hepatitis B.

(v) Genetic diversity.

6. The period for which pollen grains remain able to germinate and fertilise (1). Pollen stored for years in liquid nitrogen (–196 °C) can be used in crop-breeding programmes (1).

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7. The release of the secondary oocyte from the Graafian follicle of the ovary (1). A surge of luteinising hormone (LH) (1).

8. Any two: it completes its life cycle in about two weeks; a single mating produces many offspring; it can be grown easily on simple medium; males and females are easily told apart; it shows many visible hereditary variations (1 + 1).

9. The σ factor binds to RNA polymerase and helps start transcription at the promoter (1). The ρ factor helps end transcription at the terminator (1).

10. Aedes: dengue or chikungunya (1). Anopheles: malaria (1).

11. A sequence of base pairs that reads the same on the two strands when both are read in the same direction (5′ → 3′) (1). E.g. 5′–GAATTC–3′ / 3′–CTTAAG–5′, the EcoRI site (1).

12. The maximum population of a species that the resources of a habitat can support (1). Population growth slows and levels off as this limit is approached (1).

13. The pollen grain has a two-layered wall: a hard outer exine of sporopollenin with germ pores, and a thin inner intine of cellulose and pectin (1½). When mature it contains a large vegetative cell with a big irregular nucleus and food reserves, and a small spindle-shaped generative cell floating in its cytoplasm (1½).

OR One male gamete fuses with the egg (syngamy) to form the diploid zygote (1). The other fuses with the two polar nuclei (triple fusion) to form the triploid primary endosperm nucleus (1). Two fusions take place in each embryo sac, which happens only in angiosperms (1).

14. Genes are located on chromosomes, which are the carriers of heredity (1). Like genes, chromosomes occur in pairs, segregate at gamete formation and assort independently (1). Sutton and Boveri noted this parallel behaviour; Morgan's work on Drosophila confirmed it (1).

OR A sudden heritable change in the DNA sequence (1). A point mutation changes a single base pair, as in sickle-cell anaemia (1). Insertion or deletion of one or two bases shifts the reading frame from that point onward, changing all later codons (frameshift) (1).

15. Organisms used to control pests and diseases instead of chemicals (1). Ladybird beetles control aphids and dragonflies control mosquitoes (1). Bacillus thuringiensis controls butterfly caterpillars; Trichoderma controls plant pathogens; baculoviruses control insects (1).

OR Cyclosporin A, from the fungus Trichoderma polysporum, suppresses the immune system in organ-transplant patients (1). Statins, from the yeast Monascus purpureus, lower blood cholesterol (1). Streptokinase, from Streptococcus, dissolves blood clots in patients who have had a heart attack (1).

16. When competing species avoid competition by using resources differently, e.g. at different times or in different places (1). MacArthur studied five closely related warbler species living on the same tree (1). They avoided competition because each fed in a different part of the branches (1).

OR Two closely related species competing for the same resources cannot coexist indefinitely; the inferior one is eventually eliminated (1½). When a dominant barnacle (Balanus) was removed from the Scottish coast, the smaller barnacle Chthamalus expanded its distribution (1½).

17. Menstrual phase (days 1–5): the endometrium breaks down and is shed with blood (1). Follicular phase: follicles grow under FSH and LH, and oestrogen rebuilds the endometrium (1).

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Ovulation (about day 14): an LH surge releases the ovum (1). Luteal phase: the corpus luteum secretes progesterone to maintain the endometrium; without fertilisation it degenerates and the cycle restarts (1).

OR The mature follicle has a large fluid-filled cavity, the antrum, surrounded by theca layers (1). The secondary oocyte, with its zona pellucida, lies to one side surrounded by granulosa cells (1). At ovulation the follicle ruptures and releases the oocyte (1). The remains of the follicle form the corpus luteum, which secretes progesterone (1).

18. DNA, which is negatively charged, is wrapped round a positively charged octamer of histone proteins to form a nucleosome of about 200 base pairs (1). Nucleosomes form a “beads on a string” chromatin fibre (1). This coils further into solenoids and looped domains, helped by non-histone proteins (1). Loosely packed, active chromatin is euchromatin; densely packed, inactive chromatin is heterochromatin (1).

OR Two approaches were used: identifying all expressed genes (expressed sequence tags) and sequencing the whole genome (sequence annotation) (1). Total DNA was broken into fragments and cloned in hosts using vectors such as BAC and YAC (1). The fragments were sequenced by automated sequencers based on Sanger’s method (1). Overlapping sequences were aligned by computer programs and genes were assigned to chromosomes (1).

19. Denaturation: the double-stranded DNA is heated to separate the strands (1). Annealing: two primers bind to complementary sequences on the strands (1). Extension: Taq polymerase extends the primers; repeated cycles copy the DNA about a billion times (1). Applications: early diagnosis of infections and genetic disorders; amplifying genes for cloning; DNA fingerprinting (any two) (1).

OR RNAi is a cellular defence in which a complementary double-stranded RNA binds to and silences a specific mRNA (1). Nematode-specific genes were introduced into tobacco plants using Agrobacterium (1). The plants produced sense and antisense RNA, which formed dsRNA (1). This silenced the mRNA of the nematode Meloidogyne incognita, so it could not survive in the roots (1).

20. Species diversity generally decreases from the equator towards the poles, e.g. Colombia has nearly 1400 bird species while Greenland has 56 (1). Tropical regions have remained relatively undisturbed for millions of years, giving long time for diversification (1). Their environment is less seasonal and more predictable, encouraging niche specialisation (1). They receive more solar energy, which supports higher productivity (1).

OR Regions with very high species richness and a high degree of endemism, which are also under threat (1). Western Ghats and Sri Lanka, Indo-Burma and the Himalaya (1). All the hotspots together cover less than 2% of the earth’s land area (1). Strict protection of hotspots could reduce ongoing mass extinctions by almost 30% (1).

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