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Your JEE Guide

MP Board Class XII · Biology

Sample Question Paper 7 · 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:* After fertilisation, the integuments of the ovule develop into the: (a) pericarp (b) endosperm (c) embryo (d) seed coat	1
	(ii) The part of a sperm that contains enzymes to penetrate the ovum is the: (a) neck (b) tail (c) acrosome (d) middle piece	1
	(iii) Which of the following is an example of codominance? (a) skin colour in humans (b) AB blood group in humans (c) tall and dwarf pea plants (d) pink flowers in snapdragon	1
	(iv) Which of the following is NOT a sexually transmitted infection? (a) typhoid (b) genital herpes (c) gonorrhoea (d) syphilis	1
	(v) In India, the Genetic Engineering Approval Committee (GEAC) decides on: (a) the import of hybrid seeds only (b) the price of medicines (c) the safety of releasing GM organisms for public use (d) patents on traditional knowledge only	1

	(vi) An interaction in which one species benefits and the other is unaffected is: (a) commensalism (b) amensalism (c) competition (d) mutualism	1
2.	**(i)** *Fill in the blanks:* The transfer of pollen grains from the anther to the stigma is called _____.	1
	(ii) The outer layer of cells of the blastocyst is called the _____.	1
	(iii) The alleles of a gene occupy the same _____ on homologous chromosomes.	1
	(iv) The two strands of DNA are held together by _____ bonds between the bases.	1
	(v) Elephantiasis is caused by filarial worms of the genus _____.	1
	(vi) The "evil quartet" describes the four major causes of biodiversity _____.	1
3.	**(i)** *Write True or False:* Polyembryony is common in citrus fruits.	1
	(ii) In human males, spermatogenesis begins at puberty.	1
	(iii) Down's syndrome is caused by a mutation in a single gene.	1
	(iv) tRNA is called the adapter molecule.	1
	(v) The Bt toxin kills the cotton plant that produces it.	1
	(vi) Zoological parks are an example of in-situ conservation.	1
4.	Match each scientist in column A with the work in column B:	5

Column A	Column B
(i) Gregor Mendel	(a) semi-conservative replication of DNA
(ii) Thomas Hunt Morgan	(b) laws of inheritance
(iii) Watson and Crick	(c) discovery of penicillin
(iv) Meselson and Stahl	(d) linkage in Drosophila
(v) Alexander Fleming	(e) double helix model of DNA

5.	**(i)** *Answer in one word or one sentence:* What is the ploidy of the zygote?	1
	(ii) Name the hormone, secreted by the placenta, that is detected in pregnancy tests.	1
	(iii) What is the genotype of a person with blood group O?	1
	(iv) In which bacterium was the lac operon first studied?	1

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	(v) Which insect pest is controlled by the protein coded by the gene cryIAb?	1
6.	Name the cells of the egg apparatus and state where it lies in the embryo sac.	2
7.	What is colostrum? Why is it important for the newborn?	2
8.	What are multiple alleles? Give one example.	2
9.	What is a replication fork? What is the leading strand?	2
10.	Name the two kinds of specific immune response produced by lymphocytes.	2
11.	Why must bacterial cells be made competent before transformation? How is this done?	2
12.	What is co-extinction? Give one example.	2
13.	What are apomixis and polyembryony? How does polyembryony arise in Citrus? **OR** What is the role of the tapetum? Why is the exine of pollen important?	3
14.	A plant heterozygous for round, yellow seeds (RrYy) is crossed with a plant with wrinkled, green seeds (rryy). Work out the genotypes and phenotypes of the offspring and their ratio. **OR** Explain the mechanism of sex determination in birds and in honey bees.	3
15.	Name the vectors used to transfer genes into (a) plant cells, (b) animal cells. Why are pathogen-based vectors “disarmed” first? **OR** What are genetically modified crops? Give three of their advantages.	3
16.	Write the equation for exponential population growth and its integrated form. Why does it not continue indefinitely in nature? **OR** State two limitations of ecological pyramids.	3
17.	Describe the development of the human embryo from implantation to about the end of the first trimester. **OR** Describe the methods of birth control, with one example of each.	4
18.	Why did Mendel choose the garden pea for his experiments? State the two laws he derived from his monohybrid crosses. **OR** A colour-blind man marries a woman who is homozygous for normal vision. Show the expected genotypes of their children, and the chance that a son of one of their daughters is colour blind.	4

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19.	Describe how gene therapy was used to treat adenosine deaminase (ADA) deficiency. Why is the treatment not permanent? **OR** Why are conventional methods unable to detect diseases early? Describe two techniques of molecular diagnosis.	4
20.	Describe the main methods of ex-situ conservation. **OR** What does the IUCN Red List (2004) show about recent extinctions? Name two animals that have recently become extinct.	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)** seed coat. *Working:* The ovule as a whole becomes the seed.

(ii) **(c)** acrosome. *Working:* The acrosome caps the head of the sperm.

(iii) **(b)** AB blood group in humans. *Working:* Both I^A and I^B are fully expressed.

(iv) **(a)** typhoid. *Working:* Typhoid spreads through contaminated food and water.

(v) **(c)** the safety of releasing GM organisms for public use. *Working:* It also judges the validity of GM research.

(vi) **(a)** commensalism. *Working:* + / 0.

Question 2

(i) pollination.

(ii) trophoblast.

(iii) locus.

(iv) hydrogen.

(v) Wuchereria.

(vi) loss.

Question 3

(i) True.

(ii) True.

(iii) False: it is caused by an extra copy of chromosome 21.

(iv) True: it reads the codon and carries the matching amino acid.

(v) False: it is made as an inactive protoxin and becomes active only in the alkaline gut of the insect.

(vi) False: they are ex-situ.

4. (i) – (b) laws of inheritance; (ii) – (d) linkage in Drosophila; (iii) – (e) double helix model of DNA; (iv) – (a) semi-conservative replication of DNA; (v) – (c) discovery of penicillin

Question 5

(i) Diploid (2n).

(ii) Human chorionic gonadotropin (hCG).

(iii) ii.

(iv) Escherichia coli.

(v) The corn borer.

6. The egg cell and two synergids (1). At the micropylar end of the embryo sac (1).

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7. The yellowish milk secreted during the first few days after childbirth (1). It contains antibodies (IgA) that give the baby passive immunity (1).

8. More than two alternative forms of a gene in a population, though an individual carries only two (1). The gene I for ABO blood groups, with alleles I^A, I^B and i (1).

9. The Y-shaped region where the two strands of DNA separate during replication (1). The new strand that is made continuously, in the 5′ → 3′ direction, towards the fork (1).

10. Humoral (antibody-mediated) immunity, by B-lymphocytes (1). Cell-mediated immunity, by T-lymphocytes (1).

11. DNA is hydrophilic and cannot easily pass through the cell membrane (1). Cells are treated with a divalent cation such as Ca^{2+}, incubated with the DNA on ice and given a brief heat shock at 42 °C (1).

12. When a species becomes extinct, the species that depend on it obligatorily also become extinct (1). When a host fish becomes extinct, its unique parasites also die out (or a plant and its specific pollinator) (1).

13. Apomixis is the formation of seeds without fertilisation (1). Polyembryony is the presence of more than one embryo in a seed (1). In Citrus, some nucellar cells around the embryo sac divide and develop into embryos (1).

OR The tapetum, the innermost layer of the microsporangium, nourishes the developing pollen grains (1). The exine is made of sporopollenin, which resists high temperature, strong acids, alkalis and enzymes (1). So pollen survives harsh conditions and is well preserved as fossils (1).

14. Gametes of RrYy: RY, Ry, rY, ry; of rryy: ry (1). Offspring: RrYy (round yellow), Rryy (round green), rrYy (wrinkled yellow), rryy (wrinkled green) (1). Ratio 1 : 1 : 1 : 1 (1).

OR In birds, females are heterogametic (ZW) and males homogametic (ZZ), so the egg decides the sex of the chick (1½). In honey bees, fertilised eggs (diploid) develop into females and unfertilised eggs (haploid) into males: haplodiploidy (1½).

15. (a) The Ti plasmid of Agrobacterium tumefaciens (1). (b) Retroviruses (1). They are modified so that they no longer cause disease (tumours or illness) but can still deliver genes into the host (1).

OR Plants whose genes have been altered by genetic engineering (1). Any two: tolerance to drought, cold, salt or heat; less need for chemical pesticides; fewer post-harvest losses; more efficient use of minerals; better nutritional value (2).

16. $dN/dt = rN$, where r is the intrinsic rate of natural increase (1). Integrated form: $N_t = N_0 e^{rt}$ (1). Resources are limited, so competition increases and growth slows as the population nears the carrying capacity (1).

OR They do not take into account the same species belonging to two or more trophic levels (1½). They assume a simple food chain, which seldom exists in nature, and they do not include saprophytes (1½).

17. After implantation, finger-like chorionic villi grow and, with the uterine tissue, form the placenta (1). The inner cell mass differentiates into the ectoderm, mesoderm and endoderm, which give rise to all the tissues and organs (1). By the end of the first month the heart forms (1).

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By the end of the first trimester most major organ systems, the limbs and the external genital organs are well developed (1).

OR Natural methods: periodic abstinence, coitus interruptus, lactational amenorrhoea (1). Barrier methods: condoms, diaphragms, cervical caps (1). IUDs, e.g. CuT, Multiload 375, LNG-20; oral pills, e.g. Saheli; injections and implants (1). Surgical methods: vasectomy in males and tubectomy in females (1).

18. Pea has many clearly contrasting characters; it is self-pollinating but can be cross-pollinated easily; it has a short life cycle and produces many seeds (2). Law of dominance: in a hybrid, one factor of a pair (dominant) expresses itself (1). Law of segregation: the two factors of a pair separate in gamete formation, so each gamete gets only one (1).

OR $X^cY \times XX$: daughters X^cX (carriers, normal vision) and sons XY (normal) (2). A carrier daughter (X^cX) married to a normal man gives sons X^cY and XY in equal numbers (1). So each of her sons has a 50% chance of being colour blind (1).

19. ADA deficiency is caused by deletion of the gene for adenosine deaminase, which is needed for the immune system (1). Lymphocytes from the patient's blood were grown in culture, and a functional ADA cDNA was introduced into them using a retroviral vector (1). The cells were returned to the patient (1). Lymphocytes are not immortal, so the infusion must be repeated; a permanent cure would need the gene in bone-marrow cells at early embryonic stages (1).

OR Pathogens can be detected by conventional tests only after their numbers have become high and symptoms appear (1). PCR amplifies even very small amounts of pathogen DNA or RNA (1½). ELISA detects antigens or antibodies through the antigen–antibody reaction (1½).

20. Zoological parks, botanical gardens and wildlife safari parks keep threatened species away from their natural habitats (1). Gametes of threatened species can be preserved for long periods by cryopreservation (1). Seed banks store seeds of many varieties of commercially important plants (1). Eggs can be fertilised in vitro and plants propagated by tissue culture (1).

OR It records the extinction of 784 species in the last 500 years (1), including 338 vertebrates, 359 invertebrates and 87 plants (1). Any two: dodo (Mauritius), quagga (Africa), thylacine (Australia), Steller's sea cow (Russia), and three subspecies of tiger: Bali, Javan and Caspian (2).

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