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Your JEE Guide

MP Board Class XII · Biology

Sample Question Paper 1 · 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 ovary of a flower develops into the: (a) embryo (b) fruit (c) seed (d) endosperm	1
	(ii) The number of chromosomes in a human sperm is: (a) 23 (b) 46 (c) 44 (d) 22	1
	(iii) A heterozygous tall pea plant (Tt) is crossed with a dwarf plant (tt). The expected ratio of tall to dwarf offspring is: (a) 1 : 2 : 1 (b) all tall (c) 3 : 1 (d) 1 : 1	1
	(iv) Which of the following diseases is caused by a virus? (a) ascariasis (b) typhoid (c) common cold (d) malaria	1
	(v) Which of the following is commonly used as a cloning vector? (a) a ribosome (b) a plasmid (c) a mitochondrion (d) a lysosome	1

	(vi) The cuckoo laying its eggs in a crow's nest is an example of: (a) mutualism (b) competition (c) brood parasitism (d) commensalism	1
2.	**(i)** *Fill in the blanks:* The pollen grain represents the male _____ of a flowering plant.	1
	(ii) The fusion of a male gamete with the two polar nuclei is called _____.	1
	(iii) The copying of genetic information from DNA into mRNA is called _____.	1
	(iv) AIDS is caused by the _____.	1
	(v) The thermostable enzyme used in PCR is _____ polymerase.	1
	(vi) The number of individuals of a species per unit area is called its population _____.	1
3.	**(i)** *Write True or False:* Pollination by insects is called entomophily.	1
	(ii) Thomas Hunt Morgan carried out his work on linkage using Drosophila.	1
	(iii) Antibiotics are effective against viral infections.	1
	(iv) Restriction enzymes cut DNA at specific recognition sequences.	1
	(v) A lichen is an example of mutualism between a fungus and an alga.	1
	(vi) The Amazon rain forest has low biodiversity.	1
4.	Match each organism in column A with its importance in column B:	5

Column A	Column B
(i) Rhizobium	(a) nitrogen fixation in root nodules
(ii) Saccharomyces cerevisiae	(b) bread-making and alcohol production
(iii) Penicillium notatum	(c) malaria
(iv) Plasmodium	(d) penicillin
(v) Bacillus thuringiensis	(e) Bt toxin against insect pests

5.	**(i)** *Answer in one word or one sentence:* Name the hormone that maintains pregnancy.	1
	(ii) Who is called the father of genetics?	1
	(iii) Name the cells that produce antibodies.	1
	(iv) What does r stand for in the population growth equation dN/dt = rN?	1
	(v) Name one method of ex-situ conservation.	1

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6.	Why is the endosperm of a flowering plant triploid?	2
7.	State two functions of the placenta.	2
8.	What is sex-linked inheritance? Give one example in humans.	2
9.	What is a codon? Name the start codon and one stop codon.	2
10.	Distinguish between innate and acquired immunity.	2
11.	What are restriction enzymes? Name one and give its recognition sequence.	2
12.	What is a biodiversity hotspot? Name one hotspot that includes part of India.	2
13.	Draw a labelled diagram of a mature embryo sac of an angiosperm. **OR** Draw a labelled diagram of a human sperm.	3
14.	State Mendel's law of independent assortment and explain it with a dihybrid cross. **OR** Explain codominance with the help of the ABO blood groups.	3
15.	Explain the role of microbes in the primary and secondary treatment of sewage. **OR** Describe how biogas is produced, naming the microbes involved.	3
16.	Explain competition, predation and parasitism, with one example of each. **OR** Draw the exponential and logistic growth curves of a population and explain the difference between them.	3
17.	Describe the process of spermatogenesis, stating the chromosome number at each stage. **OR** Describe the process of oogenesis in the human female.	4
18.	Explain the working of the lac operon of E. coli with diagrams. **OR** Describe the process of translation.	4
19.	Describe the main steps of recombinant DNA technology. **OR** Explain how Bt cotton protects itself against insect pests.	4
20.	Describe the four major causes of the loss of biodiversity (the "evil quartet"). **OR** Describe the life cycle of the malarial parasite Plasmodium.	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) **(b)** fruit. *Working:* The ovules become seeds and the ovary wall becomes the pericarp.

(ii) **(a)** 23. *Working:* Sperms are haploid.

(iii) **(d)** 1 : 1. *Working:* This is a test cross.

(iv) **(c)** common cold. *Working:* Typhoid is bacterial, malaria protozoan and ascariasis is caused by a roundworm.

(v) **(b)** a plasmid. *Working:* Plasmids replicate independently in bacteria and carry inserted genes.

(vi) **(c)** brood parasitism. *Working:* The crow incubates and raises the cuckoo's young.

Question 2

(i) gametophyte.

(ii) triple fusion.

(iii) transcription.

(iv) human immunodeficiency virus (HIV).

(v) Taq (DNA).

(vi) density.

Question 3

(i) True.

(ii) True.

(iii) False: they act on bacteria.

(iv) True.

(v) True.

(vi) False: it has the greatest biodiversity on earth.

4. (i) – (a) nitrogen fixation in root nodules; (ii) – (b) bread-making and alcohol production; (iii) – (d) penicillin; (iv) – (c) malaria; (v) – (e) Bt toxin against insect pests

Question 5

(i) Progesterone.

(ii) Gregor Mendel.

(iii) Plasma cells formed from B-lymphocytes.

(iv) The intrinsic rate of natural increase.

(v) Seed banks (or zoos, botanical gardens, cryopreservation).

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6. It forms from the primary endosperm nucleus (1), which results from the fusion of one haploid male gamete with the two haploid polar nuclei (triple fusion) (1).

7. It supplies oxygen and nutrients to the embryo and removes carbon dioxide and wastes (1). It acts as an endocrine tissue, producing hormones such as hCG, hPL and progesterone (1).

8. Inheritance of genes carried on the sex chromosomes, mostly the X chromosome (1). Colour blindness or haemophilia (1).

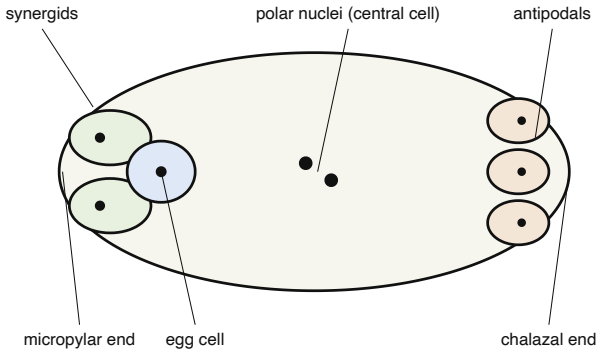
9. A sequence of three bases in mRNA that codes for one amino acid (1). Start: AUG; stop: UAA, UAG or UGA (1).

10. Innate immunity is present from birth and is non-specific (barriers, phagocytes) (1). Acquired immunity develops after meeting a pathogen, is specific and has memory (1).

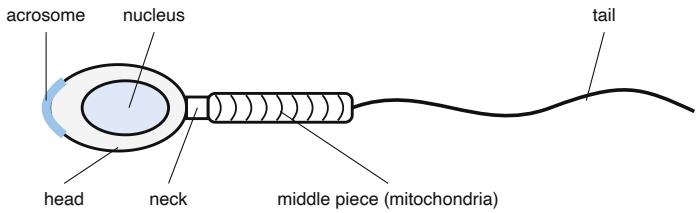
11. Enzymes that cut DNA at specific palindromic sequences (molecular scissors) (1). EcoRI, which recognises 5′–GAATTC–3′ (1).

12. A region with very high species richness and many endemic species, which is under threat (1). The Western Ghats and Sri Lanka, the Himalaya, or Indo-Burma (1).

13. Diagram showing the egg apparatus (egg cell and two synergids with filiform apparatus), the central cell with two polar nuclei and the three antipodal cells (3).



OR Diagram showing the head with acrosome and nucleus, the neck, the middle piece with mitochondria and the tail (3).



14. When two pairs of traits are combined in a hybrid, the segregation of one pair is independent of the other (1). RRYY × rryy gives RrYy (round yellow) in F_1; F_1 forms four kinds of gametes RY, Ry, rY, ry in equal numbers (1). F_2: round yellow, round green, wrinkled yellow, wrinkled green in the ratio 9 : 3 : 3 : 1 (1).

OR The gene I has three alleles: I^A, I^B and i (1). I^A and I^B each produce a different sugar on the red blood cells, and i produces none (1). In I^AI^B both are expressed, giving blood group AB: both alleles are dominant (codominant) (1).

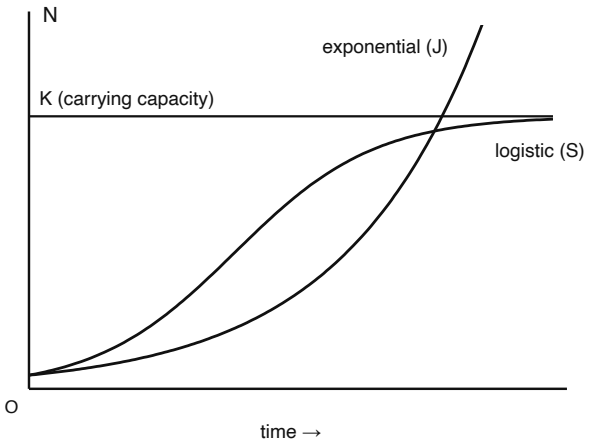
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15. Primary treatment removes floating debris and settles grit physically; no microbes are used (1). In secondary treatment the effluent is aerated so that aerobic microbes grow as flocs and consume the organic matter, lowering the BOD (1). The settled activated sludge is digested by anaerobic bacteria, which produce biogas (1).

OR Cattle dung is mixed with water into a slurry in a digester (1). Anaerobic bacteria break down the organic matter, and methanogens such as Methanobacterium produce mainly methane (1). The gas collects under a floating cover and is used for cooking and lighting; the spent slurry is a manure (1).

16. Competition: both species are harmed when they need the same limited resource, e.g. the Abingdon tortoise and goats (1). Predation: one species kills and eats the other, e.g. a tiger and a deer (1). Parasitism: one lives on or in the other and harms it, e.g. Cuscuta on hedge plants (1).

OR Curves (1):

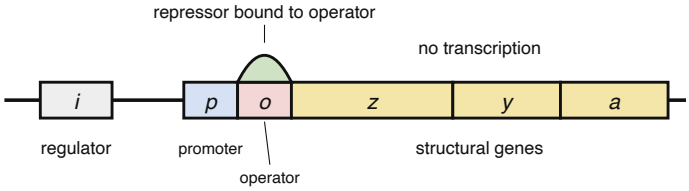


Exponential growth (J-shaped) occurs when resources are unlimited, dN/dt = rN (1). Logistic growth (S-shaped) levels off at the carrying capacity K when resources are limited, dN/dt = rN(K – N)/K (1).

17. Spermatogonia (2n = 46) in the seminiferous tubules multiply by mitosis; some grow into primary spermatocytes (2n) (1). Each primary spermatocyte completes meiosis I to form two secondary spermatocytes (n = 23) (1). These complete meiosis II to form four spermatids (n) (1). Spermatids change into sperms (spermiogenesis), which are released (spermiation) (1).

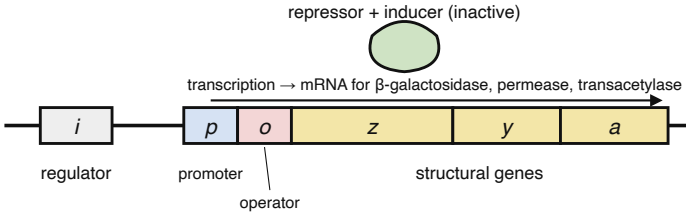
OR Oogonia formed in the foetal ovary begin meiosis and stay arrested in prophase I as primary oocytes (1). At puberty a primary oocyte in a growing follicle completes meiosis I, giving a large secondary oocyte and a first polar body (1). The secondary oocyte is released at ovulation (1). It completes meiosis II only when a sperm enters, forming the ovum and a second polar body (1).

18. The operon has a regulator gene i, a promoter, an operator and structural genes z, y and a (1). Without lactose, the repressor made by i binds the operator and blocks transcription (1).



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Lactose (inducer) binds the repressor so that it cannot bind the operator; RNA polymerase transcribes z, y and a (1).



This is negative regulation by the repressor (1).

OR Amino acids are activated and attached to their specific tRNAs (charging) (1). The ribosome binds the mRNA at AUG and the initiator tRNA (methionine) pairs with it (1). Charged tRNAs enter in turn according to the codons, and peptide bonds join the amino acids as the ribosome moves along (1). At a stop codon, release factors free the polypeptide (1).

19. Isolation of DNA and cutting it, and the vector, with the same restriction enzyme (1). Amplification of the gene of interest, for example by PCR, and joining it into the vector with DNA ligase (1). Introducing the recombinant DNA into a competent host and selecting the transformants (1). Growing the host on a large scale in a bioreactor and recovering the product by downstream processing (1).

OR Genes such as cryIAc and cryIIAb from Bacillus thuringiensis are introduced into cotton (1). The plant makes the Bt toxin as an inactive protoxin (1). In the alkaline gut of the insect larva it becomes active (1). It binds to the midgut cells and makes pores, so the cells swell and burst and the insect dies (1).

20. Habitat loss and fragmentation, e.g. clearing of tropical rain forests (1). Over-exploitation, e.g. the extinction of Steller's sea cow and the passenger pigeon (1). Alien species invasions, e.g. the Nile perch in Lake Victoria, or Parthenium and water hyacinth (1). Co-extinctions, e.g. a host fish and its specific parasites (1).

OR Sporozoites enter the human body when an infected female Anopheles mosquito bites (1). They multiply in liver cells and then in red blood cells, which burst and release haemozoin, causing chills and high fever (1). Some parasites form gametocytes, which are taken up by a mosquito during a blood meal (1). Fertilisation and development occur in the mosquito's gut, and sporozoites move to its salivary glands (1).

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