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Your JEE Guide

CBSE Class XII · Biology (044)

Sample Question Paper 2 · Session 2026-27

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

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This is an original practice paper written to the official CBSE 2026-27 design; it is not issued by CBSE.

General instructions:

1. All questions are compulsory.
2. The question paper has five sections and 33 questions.
3. Section A has 16 questions of 1 mark each; Section B has 5 questions of 2 marks each; Section C has 7 questions of 3 marks each; Section D has 2 case-based questions of 4 marks each; and Section E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labelled diagrams should be drawn.

Section A

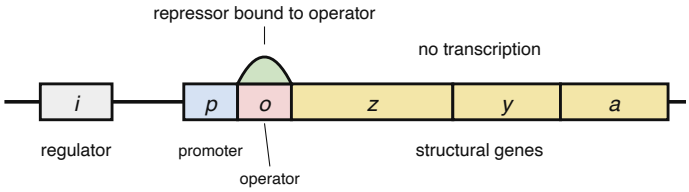
1.	After fertilisation, the ovary of a flower develops into the: (A) fruit (B) endosperm (C) seed coat (D) seed	1
2.	The endosperm of an angiosperm seed is: (A) haploid (B) tetraploid (C) diploid (D) triploid	1
3.	The acrosome of a human sperm: (A) contains the haploid nucleus (B) provides energy for movement (C) contains enzymes that help in fertilisation of the ovum (D) forms the tail	1
4.	The Leydig cells of the testis secrete: (A) oxytocin (B) androgens (C) FSH (D) LH	1
5.	Which of the following is a natural method of contraception? (A) Cu-T (B) vasectomy (C) oral pills (D) lactational amenorrhoea	1
6.	A person with the karyotype 47, XXY has: (A) haemophilia (B) Klinefelter's syndrome (C) Turner's syndrome (D) Down's syndrome	1

7.	In a double-stranded DNA molecule, adenine makes up 30% of the bases. The percentage of cytosine is: (A) 40% (B) 30% (C) 20% (D) 70%	1
8.	The codon AUG: (A) codes for methionine and also acts as the initiator codon (B) codes for no amino acid (C) is a stop codon (D) codes for valine	1
9.	Darwin's finches of the Galapagos Islands illustrate: (A) analogous organs (B) genetic drift only (C) convergent evolution (D) adaptive radiation	1
10.	Typhoid fever is confirmed by the: (A) Pap smear (B) ELISA test (C) Widal test (D) Mantoux test	1
11.	The large holes in Swiss cheese are due to CO_2 produced by: (A) Propionibacterium sharmanii (B) Saccharomyces cerevisiae (C) Lactobacillus (D) Aspergillus niger	1
12.	Which of the following is the most important cause of the loss of biodiversity? (A) natural calamities (B) habitat loss and fragmentation (C) alien species invasion (D) co-extinctions	1
13.	**Assertion (A):** Haemophilia is seen far more often in males than in females. **Reason (R):** The gene for haemophilia is X-linked recessive, and males have only one X chromosome. (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.	1
14.	**Assertion (A):** Ribosomes are the site of protein synthesis. **Reason (R):** Prokaryotic ribosomes are of the 70S type. (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.	1
15.	**Assertion (A):** Baker's yeast is used to make bread dough rise. **Reason (R):** Yeast produces lactic acid during fermentation of the dough. (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.	1

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16.	**Assertion (A):** Cancer cells show contact inhibition. **Reason (R):** Contact with other cells inhibits the uncontrolled growth of normal cells. (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.	1

Section B

17.	What is a false fruit? Give one example. Why are parthenocarpic fruits seedless? **OR** Describe any two devices that flowering plants have evolved to discourage self-pollination.	2
18.	Draw a labelled diagram of a human sperm. State the function of its middle piece.	2
19.	The figure shows the lac operon of E. coli growing in a medium without lactose. Why are the structural genes not transcribed? What changes when lactose is added?  **OR** What is a cistron? Distinguish between monocistronic and polycistronic structural genes.	2
20.	Draw a labelled diagram of an antibody molecule. Why is it represented as H_2L_2?	2
21.	Explain the “rivet popper hypothesis” proposed by Paul Ehrlich. **OR** What are sacred groves? Name two regions of India where they are found.	2

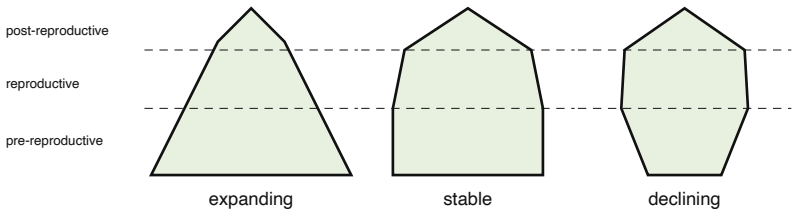
Section C

22.	Describe the formation of pollen grains from a microspore mother cell, and the structure of a mature pollen grain at the time of shedding.	3
23.	Explain the role of the foetal ejection reflex and of oxytocin in parturition. Why is colostrum important for the newborn?	3
24.	Expand ZIFT, GIFT and ICSI, and briefly describe each technique.	3

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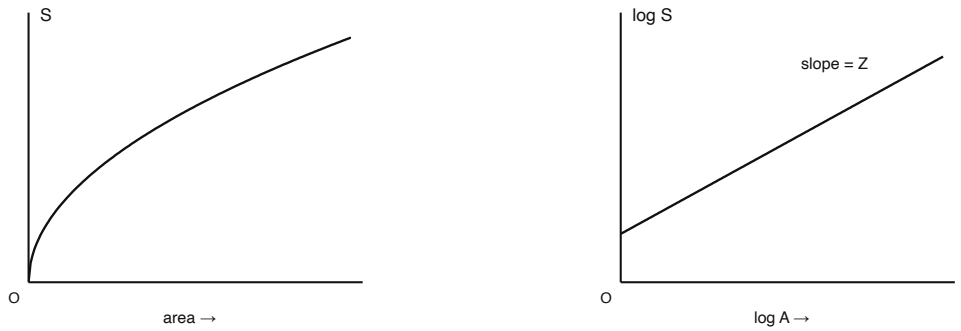
25.	In snapdragon, a red-flowered plant (RR) is crossed with a white-flowered plant (rr). Work out the F_1 and F_2 generations. Why are the phenotypic and genotypic ratios of the F_2 the same?	3
26.	State any three salient features of the genetic code.	3
27.	Distinguish between the primary and the secondary immune responses. Which cells are responsible for each?	3
28.	What are methanogens? Where are they found? Explain how they are used to produce biogas.	3

Section D

29.	**Case study.** An ecologist compared the age structure of three populations and drew the following age pyramids.  (i) Which pyramid represents a growing population? *[1]* (ii) What does an age pyramid of a human population show? *[1]* (iii) Which pyramid shows a declining population? Give a reason. *[2]* **OR** (iii) In a laboratory population of 40 fruit flies, 4 died during one week. Calculate the death rate. *[2]*	4
30.	**Case study.** Insulin used for diabetes was earlier extracted from the pancreas of slaughtered cattle and pigs. In 1983 Eli Lilly, an American company, prepared two DNA sequences corresponding to the A and B chains of human insulin and introduced them into plasmids of E. coli to produce the insulin chains. In the human body, insulin is first made as a pro-hormone containing an extra stretch called the C peptide. (i) How are the A and B chains of insulin linked together? *[1]* (ii) What happens to the C peptide during the maturation of insulin? *[1]* (iii) Why was insulin from animal sources not ideal? What was the advantage of the method used by Eli Lilly? *[2]* **OR** (iii) What is gene therapy? Describe the treatment given for adenosine deaminase (ADA) deficiency. *[2]*	4

Section E

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31.	(a) Describe the stages of spermatogenesis in human males. (b) What is the role of the Sertoli cells? (c) How many sperms are formed from one primary spermatocyte? **OR** (a) Describe the development of the endosperm and the embryo after fertilisation in an angiosperm. (b) Distinguish between albuminous and non-albuminous seeds, giving one example of each.	5
32.	(a) Describe the experiment of Hershey and Chase which proved that DNA is the genetic material. (b) Give two reasons why DNA is a better genetic material than RNA. **OR** (a) State two goals of the Human Genome Project. (b) List three salient features of the human genome it revealed. (c) What are SNPs?	5
33.	The graphs show the relationship between the area explored and the number of species (S) found in it.  (a) Who described this relationship, and what is it called? Write its logarithmic form. (b) What is the usual range of Z for small areas, and how does it change when very large areas such as whole continents are compared? (c) Name the four causes of biodiversity loss known as the “evil quartet”. **OR** (a) How was penicillin discovered, and who established its potential as an antibiotic? (b) Name the source organism and one use of each of: streptokinase, cyclosporin A and statins.	5

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Answers and Marking Scheme

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

Section A

1. **(A)** fruit. *Working:* The ovules become seeds and the ovary becomes the fruit.

2. **(D)** triploid. *Working:* It develops from the primary endosperm nucleus formed by triple fusion.

3. **(C)** contains enzymes that help in fertilisation of the ovum. *Working:* The acrosome is a cap-like structure filled with enzymes.

4. **(B)** androgens. *Working:* The interstitial (Leydig) cells synthesise and secrete androgens.

5. **(D)** lactational amenorrhoea. *Working:* Absence of menstruation during intense breastfeeding; effective only up to about six months after parturition.

6. **(B)** Klinefelter's syndrome. *Working:* An extra X chromosome in a male.

7. **(C)** 20%. *Working:* A = T = 30%, so G + C = 40% and C = 20%.

8. **(A)** codes for methionine and also acts as the initiator codon. *Working:* AUG has a dual function.

9. **(D)** adaptive radiation. *Working:* Many varieties with different beaks evolved from an original seed-eating ancestor.

10. **(C)** Widal test. *Working:* The Widal test detects antibodies against Salmonella typhi.

11. **(A)** Propionibacterium sharmanii. *Working:* A textbook example of microbes in food processing.

12. **(B)** habitat loss and fragmentation. *Working:* Habitat loss and fragmentation is the most important of the "evil quartet".

13. **(A)** Both A and R are true, and R is the correct explanation of A. *Working:* One recessive allele on the single X is enough to make a male haemophilic; a female must be homozygous.

14. **(B)** Both A and R are true, and R is not the correct explanation of A. *Working:* Both are true, but the size of the ribosome does not explain why it is the site of translation.

15. **(C)** A is true but R is false. *Working:* A is true. R is false: the dough rises because of the CO_2 released by yeast.

16. **(D)** A is false but R is true. *Working:* A is false: cancer cells have lost contact inhibition and keep dividing. R is true.

Section B

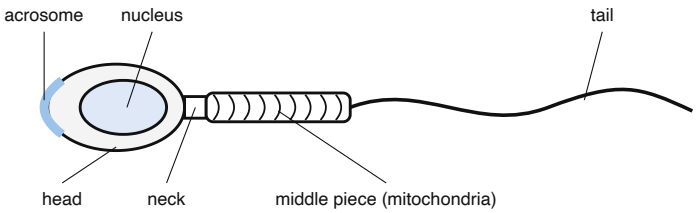
17. A fruit in which the thalamus also contributes to fruit formation, e.g. apple, strawberry or cashew (1). Parthenocarpic fruits develop without fertilisation, so no seeds are formed (1).

OR Any two: pollen release and stigma receptivity are not synchronised; anther and stigma are placed at different positions; self-incompatibility, a genetic mechanism that prevents pollen of the

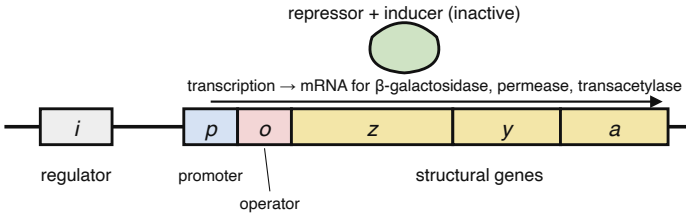
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same flower from germinating on its stigma; production of unisexual flowers (1 + 1).

18. Diagram with head, acrosome, nucleus, neck, middle piece and tail (1½), as shown below. The middle piece has many mitochondria, which provide energy for the movement of the sperm (½).

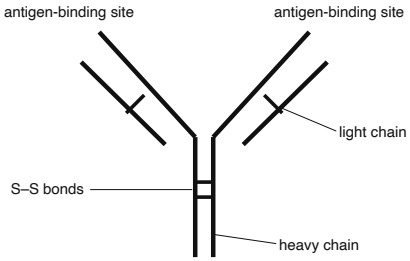


19. The repressor protein, made by the i gene, binds to the operator and prevents RNA polymerase from transcribing the operon (1). Lactose (the inducer) binds the repressor and inactivates it, so RNA polymerase can transcribe the z, y and a genes (1).



OR A cistron is a segment of DNA that codes for a polypeptide (1). A monocistronic structural gene codes for one polypeptide and occurs mostly in eukaryotes; a polycistronic one codes for several and occurs mostly in bacteria (1).

20. Diagram with heavy chains, light chains, antigen-binding sites and disulphide bonds (1), as shown below. Each antibody has two heavy (H) and two light (L) polypeptide chains, hence H_2L_2 (1).



21. An ecosystem is compared to an aeroplane and its species to the rivets holding it together (½). Losing a few rivets (species) may not affect flight safety at first, but as more are lost the plane becomes dangerous (1). Losing rivets on the wings (key species that drive major ecosystem functions) is a far more serious threat (½).

OR Tracts of forest set aside by communities, in which all the trees and wildlife are venerated and given total protection (1). Any two: Khasi and Jaintia Hills (Meghalaya), Aravalli Hills (Rajasthan), Western Ghats of Karnataka and Maharashtra, Sarguja, Chanda and Bastar areas of Madhya Pradesh (1).

Section C

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22. Each microspore mother cell (pollen mother cell) undergoes meiosis to form a cluster of four haploid microspores, the microspore tetrad (1). Microspores separate and develop into pollen grains. A mature pollen grain has a large vegetative cell with abundant food reserve and an irregularly shaped nucleus, and a small generative cell (1). The generative cell divides mitotically to form two male gametes; in over 60% of angiosperms pollen is shed at the two-celled stage (1).

23. Signals from the fully developed foetus and the placenta induce mild uterine contractions, called the foetal ejection reflex (1). This triggers the release of oxytocin from the maternal pituitary, which causes stronger uterine contractions, and these stimulate further oxytocin release, leading to expulsion of the baby (1). Colostrum contains antibodies (IgA) that give the newborn passive immunity (1).

24. ZIFT, zygote intrafallopian transfer: a zygote or early embryo (up to 8 blastomeres) formed in vitro is transferred into the fallopian tube (1). GIFT, gamete intrafallopian transfer: an ovum from a donor is transferred into the fallopian tube of a female who cannot produce ova but can provide conditions for fertilisation (1). ICSI, intracytoplasmic sperm injection: a sperm is injected directly into the ovum in the laboratory to form an embryo (1).

25. F_1: Rr, all pink (1). F_2: RR red : Rr pink : rr white = 1 : 2 : 1 (1). R is incompletely dominant over r, so the heterozygote has its own (intermediate) phenotype, and each genotype shows a distinct phenotype (1).

26. Any three, 1 mark each: the code is a triplet, with 61 codons coding for amino acids and 3 stop codons; one codon codes for only one amino acid (unambiguous and specific); some amino acids are coded by more than one codon (degenerate); the code is read continuously without punctuation; it is nearly universal; AUG codes for methionine and also acts as the initiator codon.

27. The primary response is produced on the first encounter with a pathogen and is of low intensity (1). The secondary (anamnestic) response, on a later encounter with the same pathogen, is highly intensified because the body remembers the first encounter (1). Both are carried out by B-lymphocytes, which produce antibodies, and T-lymphocytes, which help B cells; memory cells formed in the primary response give the secondary response (1).

28. Bacteria, such as Methanobacterium, that grow anaerobically on cellulosic material and produce large amounts of methane with CO_2 and H_2 (1). They are found in anaerobic sludge during sewage treatment and in the rumen of cattle, so cattle dung (gobar) is rich in them (1). In a biogas plant, a slurry of dung is fed into a concrete tank, 10–15 feet deep, with a floating cover; the cover rises as the bacteria produce gas, which is piped out for cooking and lighting, and the spent slurry is used as fertiliser (1).

Section D

29. (i) The expanding (triangular) pyramid.
(ii) The age distribution: the proportion of individuals in the pre-reproductive, reproductive and post-reproductive age groups (males and females are usually plotted on the two sides).
(iii) The urn-shaped one: there are fewer pre-reproductive individuals than reproductive ones, so the population will shrink in the future. **OR** Death rate = 4/40 = 0.1 individuals per fruit fly per week.

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30. (i) By disulphide bridges.
(ii) It is removed.
(iii) Animal insulin caused allergy or other reactions to the foreign protein in some patients. The chains made separately in E. coli were extracted and combined by creating disulphide bonds, giving human insulin without the need to remove a C peptide. **OR** Gene therapy corrects a genetic defect by introducing a normal gene into the person's cells. For ADA deficiency, lymphocytes from the patient's blood are grown in culture, a functional ADA cDNA is introduced into them using a retroviral vector, and they are returned to the patient. As these cells are not immortal, the infusion has to be repeated periodically.

Section E

31. (a) Spermatogonia (2n) on the inner wall of the seminiferous tubules multiply by mitosis; some become primary spermatocytes (2n) (1). A primary spermatocyte completes meiosis I to form two secondary spermatocytes (n), which complete meiosis II to form four haploid spermatids (1). Spermatids are transformed into spermatozoa by spermiogenesis, and the sperm heads, embedded in Sertoli cells, are finally released (spermiation) (1). (b) Sertoli cells provide nutrition to the germ cells (1). (c) Four (1).

OR (a) The primary endosperm nucleus divides repeatedly to form a free-nuclear endosperm, which later becomes cellular; the coconut water is free-nuclear endosperm and the white kernel is cellular endosperm (1). Endosperm develops before the embryo so that the embryo is nourished (½). The zygote forms the proembryo and then the globular, heart-shaped and mature embryo (1½). (b) Albuminous seeds retain part of the endosperm, e.g. wheat, maize, castor (1); in non-albuminous seeds the endosperm is completely consumed before the seed matures, e.g. pea, groundnut (1).

32. (a) Some bacteriophages were grown on a medium with radioactive phosphorus (^{32}P), labelling their DNA; others on radioactive sulphur (^{35}S), labelling their protein (1). The labelled phages were allowed to infect E. coli; the viral coats were then removed by blending and the bacteria separated by centrifugation (1). Bacteria infected with ^{32}P phages were radioactive while those infected with ^{35}S phages were not, so DNA, not protein, entered the bacteria and is the genetic material (1). (b) The 2′-OH group in RNA makes it reactive and easily degraded, while DNA is chemically less reactive and more stable; uracil in RNA is replaced by the more stable thymine in DNA; double-stranded DNA can be repaired, and it mutates more slowly than RNA (any two, 2).

OR (a) Any two: identify all the approximately 20 000–25 000 genes in human DNA; determine the sequence of the 3 billion base pairs; store this information in databases; improve tools for data analysis; address the ethical, legal and social issues (2). (b) Any three: the genome contains 3164.7 million bases; the average gene has 3000 bases, the largest (dystrophin) 2.4 million; about 30 000 genes; 99.9% of bases are the same in all people; less than 2% of the genome codes for proteins; chromosome 1 has the most genes and the Y chromosome the fewest (2). (c) Single nucleotide polymorphisms: single-base DNA differences between individuals; about 1.4 million were located (1).

33. (a) Alexander von Humboldt; the species–area relationship (1). $\log S = \log C + Z \log A$, where Z is the slope of the line (regression coefficient) and C the Y-intercept (1). (b) Z usually lies

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between 0.1 and 0.2 (1); for very large areas the slope is much steeper, about 0.6 to 1.2 (1). (c) Habitat loss and fragmentation, over-exploitation, alien species invasions and co-extinctions (1).

OR (a) Alexander Fleming, working on Staphylococcus bacteria, noticed a mould growing in an unwashed culture plate around which the bacteria could not grow; the chemical, penicillin, was produced by the mould Penicillium notatum (1). Its full potential as an antibiotic was established later by Ernest Chain and Howard Florey (1). (b) Streptokinase, from Streptococcus, is a “clot buster” used to remove blood clots in patients with myocardial infarction (1). Cyclosporin A, from the fungus Trichoderma polysporum, is an immunosuppressive agent used in organ-transplant patients (1). Statins, from the yeast Monascus purpureus, lower blood cholesterol (1).

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