jeeinfo
Your JEE Guide

ISC Class XII · Biology Paper 1 (Theory)

Sample Question Paper 7 · Session 2026-27

Time allowed: 3 hours (plus 15 minutes reading time) **Maximum marks: 70**

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission.
This is an original practice paper written to the CISCE 2027 specimen paper format; it is not issued by CISCE.

General instructions:

1. You are allowed an additional fifteen minutes for only reading the question paper. You must NOT start writing during the reading time.
2. The paper has eighteen questions in all. Answer all questions.
3. There are four sections: A, B, C and D. Internal choices have been provided in two questions each in Sections B, C and D.
4. Section A consists of one question with twenty subparts of one mark each.
5. While answering Multiple Choice Questions in Section A, you are required to write only one option as the answer.
6. Section B consists of seven questions of two marks each. Section C consists of seven questions of three marks each. Section D consists of three questions of five marks each.
7. Diagrams should be drawn wherever necessary, using a pencil only.
8. The intended marks for questions are given in brackets [ ].

Section A (20 marks)

1.	**(i)** The correct sequence of stages in the development of a dicot embryo is: (a) heart-shaped → globular → proembryo → mature embryo (b) proembryo → globular → heart-shaped → mature embryo (c) globular → proembryo → heart-shaped → mature embryo (d) proembryo → heart-shaped → globular → mature embryo	1
	(ii) A man heterozygous for an autosomal dominant disorder marries a normal woman. The probability that their child will be affected is: (a) $\frac{1}{4}$ (b) $\frac{3}{4}$ (c) $\frac{1}{2}$ (d) 0	1
	(iii) DNA fingerprinting compares individuals using differences in: (a) the genetic code (b) histone genes (c) rRNA genes (d) repetitive (satellite) DNA	1
	(iv) Which of the following diseases is spread mainly through droplets from an infected person? (a) pneumonia (b) typhoid (c) ascariasis (d) malaria	1

	(v) In a grassland the producers trap 50 000 J of energy. By the 10 per cent law, the energy available to the tertiary consumers is: (a) 50 J (b) 5 J (c) 5000 J (d) 500 J	1
	(vi) Given below are two statements marked Assertion and Reason. Read both the statements carefully and choose the correct option. **Assertion:** In humans, the father determines the sex of the child. **Reason:** Males produce two kinds of sperms, carrying either an X or a Y chromosome. (a) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion. (b) Both Assertion and Reason are true, but Reason is not the correct explanation for Assertion. (c) Assertion is true and Reason is false. (d) Both Assertion and Reason are false.	1
	(vii) Given below are two statements marked Assertion and Reason. Read both the statements carefully and choose the correct option. **Assertion:** White blood cells from a blood sample can be used for DNA fingerprinting. **Reason:** Mature human red blood cells have a nucleus. (a) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion. (b) Both Assertion and Reason are true, but Reason is not the correct explanation for Assertion. (c) Assertion is true and Reason is false. (d) Both Assertion and Reason are false.	1
	(viii) Which part of a seed develops from the outer integument?	1
	(ix) What is the development of a fruit without fertilisation called?	1
	(x) Which pituitary hormone stimulates the Leydig cells to secrete androgens?	1
	(xi) Expand hnRNA.	1
	(xii) What is the distance between two consecutive base pairs in a DNA double helix?	1
	(xiii) Name the sugar present in RNA.	1
	(xiv) Name a virus that is used, after being disarmed, as a vector to transfer genes into animal cells.	1
	(xv) Expand BAC.	1
	(xvi) Name the pathogen that causes amoebiasis.	1
	(xvii) Which lymphocytes produce antibodies?	1
	(xviii) Name the interaction in which both species are harmed.	1

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CISCE paper.

	(xix) About what percentage of the earth's land area is covered by all the biodiversity hotspots together?	1
	(xx) In which year was the Earth Summit on biodiversity held at Rio de Janeiro?	1

Section B (14 marks)

2.	For normal fertility, what proportions of the sperms in an ejaculate should (i) have normal shape and size, (ii) show vigorous motility?	2
3.	Why are X-linked recessive disorders such as colour blindness much more common in males than in females?	2
4.	State two differences between DNA replication and transcription. **OR** A diploid human cell has 6.6×10^9 base pairs. Calculate the total length of its DNA, and explain why the DNA must be packaged.	2
5.	Why must a cloning vector have (i) an origin of replication, (ii) a selectable marker?	2
6.	Name the pathogen that causes ascariasis. State two symptoms of the disease and how it spreads.	2
7.	Explain the mutualism between the fig tree and its wasp. **OR** How do predators help maintain the species diversity of a community? Give an example.	2
8.	State the two key concepts of Darwin's theory of evolution.	2

Section C (21 marks)

9.	Describe the process of DNA replication, including the roles of the origin of replication, DNA polymerase and DNA ligase.	3
10.	Two parents with normal health have a child with sickle-cell anaemia. Explain how this is possible, and calculate the probability that their next child will have the disease.	3
11.	What is transformation of bacteria? How are bacteria transformed with a plasmid carrying an ampicillin-resistance gene selected? **OR** Describe the stages of downstream processing of a product made in a bioreactor.	3
12.	Describe three harmful effects of tobacco smoking on the body.	3

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CISCE paper.

13.	Explain how biodiversity is conserved in situ, with three examples. Give two methods of ex-situ conservation. **OR** How does species diversity change with latitude? Support your answer with the example of birds, and give one reason for the trend.	3
14.	Describe oogenesis in the human female, from the oogonium to the ovum.	3
15.	Name the microbe that produces each product and state one use: (a) penicillin, (b) lipases, (c) pectinases.	3

Section D (15 marks)

16.	A population grows logistically, with r = 0.5 per year and carrying capacity K = 1000. (a) Calculate dN/dt when N = 100, N = 500 and N = 1000. *[3]* (b) At what population size is the growth rate fastest? *[1]* (c) Why is the logistic model more realistic than the exponential model? *[1]*	5
17.	(a) Describe the structure of the human placenta and state its functions. *[3]* (b) What is the umbilical cord, and what is its role? *[2]* **OR** (a) Distinguish between albuminous and non-albuminous seeds, with two examples of each. *[2]* (b) How is seed dormancy useful to a plant? *[1]* (c) What are false fruits and parthenocarpic fruits? Give one example of each. *[2]*	5
18.	(a) State three goals of the Human Genome Project. *[3]* (b) What is bioinformatics? *[1]* (c) Name one non-human organism whose genome has been completely sequenced. *[1]* **OR** (a) How are transgenic animals used to test the safety of vaccines and chemicals? *[2]* (b) Explain the principle of ELISA, and why PCR can detect an infection that ELISA might miss. *[3]*	5

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CISCE paper.

Answers and Marking Scheme

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

Section A (20 marks)

Question 1

(i) **(b)** proembryo → globular → heart-shaped → mature embryo. *Working:* The zygote forms the proembryo, which passes through globular and heart-shaped stages.

(ii) **(c)** $\frac{1}{2}$. *Working:* Aa × aa gives Aa and aa in equal numbers.

(iii) **(d)** repetitive (satellite) DNA. *Working:* The number of tandem repeats (VNTRs) differs from person to person.

(iv) **(a)** pneumonia. *Working:* Typhoid spreads through contaminated food and water, malaria by mosquitoes and ascariasis through contaminated soil, water or vegetables.

(v) **(a)** 50 J. *Working:* 50 000 → 5000 → 500 → 50 J.

(vi) **(a)** Both Assertion and Reason are true, and Reason is the correct explanation for Assertion. *Working:* All eggs carry X; the sperm decides whether the zygote is XX or XY.

(vii) **(c)** Assertion is true and Reason is false. *Working:* Mature human RBCs lack a nucleus; leucocytes have one, so they provide DNA.

(viii) The testa (outer seed coat).

(ix) Parthenocarpy.

(x) Luteinising hormone (LH, also called ICSH in males).

(xi) Heterogeneous nuclear RNA.

(xii) 0.34 nm (3.4 Å).

(xiii) Ribose.

(xiv) A retrovirus.

(xv) Bacterial artificial chromosome.

(xvi) Entamoeba histolytica.

(xvii) B-lymphocytes (through plasma cells).

(xviii) Competition.

(xix) Less than 2%.

(xx) 1992.

Section B (14 marks)

2. (i) At least 60% (1). (ii) At least 40% (1).

3. Males have only one X chromosome, so a single recessive allele shows its effect (1). Females need the allele on both X chromosomes; with one, they are only carriers (1).

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CISCE paper.

4. Replication copies both strands, while transcription copies only one strand (the template) of a segment of DNA (1). Replication uses DNA polymerase and deoxyribonucleotides; transcription uses RNA polymerase and ribonucleotides (1).

OR $6.6 \times 10^9 \times 0.34 \times 10^{-9}$ m ≈ 2.2 m (1). This is far longer than the nucleus (about 10^{-6} m across), so the DNA is coiled round histones into nucleosomes and further folded (1).

5. (i) Replication starts at the ori, so the vector and the gene linked to it are copied in the host (1). (ii) It allows host cells that have taken up the vector (transformants) to be identified and selected (1).

6. Ascaris, the intestinal roundworm (½). Internal bleeding, muscular pain, fever, anaemia or blockage of the intestine (any two) (1). Eggs passed in faeces contaminate soil, water and plants, and a healthy person is infected through contaminated water, vegetables or fruit (½).

7. Each fig species is pollinated only by its own partner wasp species (1). The female wasp pollinates the fig flowers while looking for places to lay eggs, and the developing seeds feed the wasp larvae (1).

OR By feeding on prey, they reduce the intensity of competition among the prey species (1). When the predatory starfish Pisaster was removed from an intertidal community, more than ten invertebrate species became extinct within a year because of competition (1).

8. Branching descent: all organisms are related, descended from common ancestors (1). Natural selection: individuals with useful variations survive and leave more offspring, so these variations become more common (1).

Section C (21 marks)

9. Replication begins at the origin, where the two strands unwind to form a replication fork (1). DNA-dependent DNA polymerase adds deoxyribonucleotides in the 5′ → 3′ direction, continuously on one template and discontinuously on the other (1). The short fragments on the discontinuous strand are joined by DNA ligase (1).

10. Sickle-cell anaemia is autosomal recessive; both parents must be carriers, Hb^AHb^s (1). $Hb^AHb^s \times Hb^AHb^s$ gives $Hb^AHb^A : Hb^AHb^s : Hb^sHb^s = 1 : 2 : 1$ (1). Probability of an affected child = ¼ (1).

11. The uptake of foreign DNA by a bacterial cell (1). The cells are spread on agar containing ampicillin (1); only those that have taken up the plasmid can grow and form colonies (1).

OR The product is separated from the culture and purified (1). It is formulated with suitable preservatives (1). For drugs, the formulation goes through clinical trials, and strict quality control testing is needed for each product (1).

12. Nicotine stimulates the adrenal gland to release adrenaline and noradrenaline, raising blood pressure and heart rate (1). Smoke increases carbon monoxide in the blood, reducing the oxygen it can carry (1). Smoking is associated with cancers of the lung, mouth and throat, bronchitis, emphysema, coronary heart disease and gastric ulcer (1).

13. Species are protected in their natural habitats (½), in biosphere reserves, national parks and sanctuaries, and in sacred groves protected by local communities (1½). Ex-situ: zoological parks,

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CISCE paper.

botanical gardens and wildlife safari parks; seed banks and cryopreservation of gametes (1).

OR Diversity generally decreases from the equator towards the poles (1). Colombia, near the equator, has nearly 1400 species of birds, New York at 41° N about 105, and Greenland at 71° N only 56 (1). The tropics have remained relatively undisturbed for millions of years, giving a long time for species to evolve, and they receive more solar energy (1).

14. Oogonia formed in the foetal ovary enter meiosis I and stay arrested in prophase I as primary oocytes (1). At puberty, a primary oocyte in a growing follicle completes meiosis I, forming a large secondary oocyte and the first polar body; the secondary oocyte is released at ovulation (1). When a sperm enters, it completes meiosis II, forming the ovum and the second polar body (1).

15. (a) Penicillium notatum; an antibiotic that kills many bacteria (1). (b) Microbial lipases are added to detergents to remove oily stains (1). (c) Pectinases from fungi are used with proteases to clarify fruit juices (1).

Section D (15 marks)

16. (a) dN/dt = rN(K – N)/K: at N = 100, 0.5 × 100 × 0.9 = 45 per year (1); at N = 500, 0.5 × 500 × 0.5 = 125 per year (1); at N = 1000, 0 (1). (b) At N = K/2 = 500 (1). (c) Resources are always limited in nature, so growth slows as the population nears the carrying capacity (1).

17. (a) Finger-like chorionic villi of the embryo interdigitate with the uterine tissue, forming a structural and functional unit between the embryo and the mother (1). It supplies oxygen and nutrients to the embryo and removes carbon dioxide and excretory wastes (1). It also acts as an endocrine tissue, producing hCG, hPL, oestrogens and progestogens (1). (b) A cord that connects the foetus to the placenta (1); its blood vessels carry substances to and from the foetus (1).

OR (a) Albuminous seeds keep part of the endosperm, e.g. wheat, maize, barley, castor (1); non-albuminous seeds use it up completely during embryo development, e.g. pea, groundnut (1). (b) It lets the seed survive unfavourable conditions until conditions suit germination (1). (c) In false fruits the thalamus also contributes to the fruit, e.g. apple, strawberry, cashew (1); parthenocarpic fruits develop without fertilisation, e.g. banana (1).

18. (a) Any three: 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; transfer related technologies to other sectors; address the ethical, legal and social issues (3). (b) The use of computers to store, analyse and interpret biological data such as DNA sequences (1). (c) Any one: E. coli, yeast, Caenorhabditis elegans, Drosophila, rice, Arabidopsis (1).

OR (a) Transgenic mice are used to test the safety of vaccines (such as polio) before they are used on humans (1). Animals made more sensitive to toxic substances are used to test the toxicity of chemicals, giving results sooner (1). (b) ELISA is based on the antigen–antibody reaction: it detects the antigens of a pathogen or the antibodies made against it (1½). PCR amplifies even very small amounts of the pathogen's nucleic acid, so it can detect an infection before the body has made enough antibodies or antigens to detect (1½).

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CISCE paper.