jeeinfo
Your JEE Guide

ISC Class XII · Biology Paper 1 (Theory)

Sample Question Paper 4 · 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 the passage of sperms in the human male is: (a) rete testis → seminiferous tubules → epididymis → vasa efferentia → vas deferens (b) seminiferous tubules → epididymis → rete testis → vasa efferentia → vas deferens (c) seminiferous tubules → vasa efferentia → rete testis → epididymis → vas deferens (d) seminiferous tubules → rete testis → vasa efferentia → epididymis → vas deferens	1
	(ii) A woman who carries the gene for haemophilia marries a normal man. The probability that any son of theirs is haemophilic is: (a) 1 (b) $\frac{1}{2}$ (c) 0 (d) $\frac{1}{4}$	1
	(iii) In the lac operon, the gene y codes for: (a) permease (b) transacetylase (c) β-galactosidase (d) the repressor	1

	(iv) Which class of antibody can cross the placenta? (a) IgE (b) IgM (c) IgG (d) IgA	1
	(v) Which of the following is an alien species that has caused harm to native species in India? (a) Mangifera indica (mango) (b) Azadirachta indica (neem) (c) Parthenium hysterophorus (carrot grass) (d) Ficus benghalensis (banyan)	1
	(vi) Given below are two statements marked Assertion and Reason. Read both the statements carefully and choose the correct option. **Assertion:** Seeds formed by apomixis are genetically identical to the parent plant. **Reason:** In apomixis, the embryo develops from a diploid cell without meiosis and fertilisation. (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:** In humans, the sex of a child is decided by the mother. **Reason:** Women produce two kinds of eggs, some carrying an X and some 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
	(viii) Name the funnel-shaped part of the Fallopian tube closest to the ovary.	1
	(ix) What is a chasmogamous flower?	1
	(x) How many base pairs are there in the DNA of bacteriophage lambda (λ)?	1
	(xi) What forms the core of a nucleosome?	1
	(xii) Expand VNTR.	1
	(xiii) Name the natural vector used to transfer genes into dicot plants.	1
	(xiv) Name one genus of fungus that causes ringworm in humans.	1
	(xv) Name the yeast that produces statins, which lower blood cholesterol.	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.

	(xvi) Name the natural method of contraception in which a couple avoids coitus from day 10 to day 17 of the menstrual cycle.	1
	(xvii) What shape of growth curve does a population show when resources are unlimited?	1
	(xviii) Name the type of interaction between a sea anemone and the clownfish that lives among its tentacles.	1
	(xix) The anticodon of a tRNA is 3′–UAC–5′. Which codon does it read, and which amino acid does it carry?	1
	(xx) What is the recessive form of the flower position studied by Mendel in the garden pea?	1

Section B (14 marks)

2.	State two differences between spermatogenesis and oogenesis in humans.	2
3.	What is pleiotropy? Explain with the example of phenylketonuria. **OR** What is polygenic inheritance? Explain with the example of human skin colour.	2
4.	What is a nucleosome? About how many base pairs of DNA does a typical nucleosome contain?	2
5.	How is Agrobacterium tumefaciens used to introduce desired genes into plants?	2
6.	How does vaccination protect a person against a disease? Name one vaccine made by recombinant DNA technology. **OR** Name two common allergens. Which class of antibody is produced in an allergic reaction, and which chemicals cause its symptoms?	2
7.	How is population density estimated (a) for plants such as grass in a field, (b) for tigers in a national park?	2
8.	Give two reasons why tropical regions have greater biodiversity than temperate regions.	2

Section C (21 marks)

9.	Draw a pyramid of energy for an ecosystem with four trophic levels. Why can a pyramid of energy never be inverted? **OR** Draw a labelled diagram of a replication fork, showing the leading and lagging strands.	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.

10.	Explain the cause of sickle-cell anaemia, how it is inherited and why carriers do not suffer from the disease.	3
11.	Describe the technique of agarose gel electrophoresis used to separate DNA fragments.	3
12.	Describe the role in the immune system of (a) the bone marrow and thymus, (b) the spleen, (c) the lymph nodes.	3
13.	State three advantages that seeds give to flowering plants. **OR** Describe pollination by water in Vallisneria and in sea grasses such as Zostera. Why are water-pollinated flowers not brightly coloured?	3
14.	What is interspecific competition? Explain with the example of the Abingdon tortoise. What is competitive release?	3
15.	For (a) typhoid and (b) pneumonia, name the pathogen, state how it is spread and give one symptom.	3

Section D (15 marks)

16.	(a) Explain the mechanism of sex determination in (i) humans, (ii) birds, (iii) honey bees. *[3]* (b) Why can a son never inherit haemophilia from his father? *[2]*	5
17.	(a) Describe the main steps of DNA fingerprinting. *[3]* (b) Give two applications of DNA fingerprinting. *[2]* **OR** (a) Describe the two approaches and the methods used in the Human Genome Project. *[3]* (b) What are single nucleotide polymorphisms, and why are they useful? *[2]*	5
18.	(a) Describe the structure of a seminiferous tubule and the cells around it. *[2]* (b) Name the accessory glands of the human male reproductive system and state the role of their secretions. *[3]* **OR** (a) Explain the narrowly utilitarian, broadly utilitarian and ethical reasons for conserving biodiversity. *[3]* (b) What is co-extinction? Give an example. *[2]*	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) **(d)** seminiferous tubules → rete testis → vasa efferentia → epididymis → vas deferens. *Working:* Sperms leave the tubules through the rete testis and vasa efferentia to the epididymis, and then the vas deferens.

(ii) **(b)** $\frac{1}{2}$. *Working:* Sons get their X chromosome from the mother, who has one normal and one affected X.

(iii) **(a)** permease. *Working:* z codes for β-galactosidase, a for transacetylase and i for the repressor.

(iv) **(c)** IgG. *Working:* IgG passes from mother to foetus and gives passive immunity.

(v) **(c)** Parthenium hysterophorus (carrot grass). *Working:* Introduced weeds such as Parthenium, Lantana and water hyacinth spread at the expense of native species.

(vi) **(a)** Both Assertion and Reason are true, and Reason is the correct explanation for Assertion. *Working:* No reduction division or fusion of gametes takes place, so there is no new combination of genes.

(vii) **(d)** Both Assertion and Reason are false. *Working:* All eggs carry an X chromosome; the father's sperm, carrying X or Y, decides the sex. Both statements are false.

(viii) The infundibulum.

(ix) A flower that opens, with its anthers and stigma exposed.

(x) 48 502 base pairs.

(xi) An octamer of histone proteins (two each of H2A, H2B, H3 and H4).

(xii) Variable number tandem repeat.

(xiii) The Ti plasmid of Agrobacterium tumefaciens.

(xiv) Microsporum (or Trichophyton or Epidermophyton).

(xv) Monascus purpureus.

(xvi) Periodic abstinence (the rhythm method).

(xvii) J-shaped (exponential growth).

(xviii) Commensalism.

(xix) 5′–AUG–3′; methionine.

(xx) Terminal (axial is dominant).

Section B (14 marks)

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

2. One primary spermatocyte gives four sperms, but one primary oocyte gives one ovum and polar bodies (1). Spermatogenesis begins at puberty and continues throughout life; oogenesis begins before birth, and primary oocytes stay arrested in prophase I until puberty (1).

3. A single gene affecting several phenotypic traits (1). In phenylketonuria a mutation in the gene for the enzyme phenylalanine hydroxylase causes mental retardation and reduced hair and skin pigmentation (1).

OR A trait controlled by three or more genes, each adding a small effect, giving continuous variation (1). If skin colour is controlled by three genes A, B and C, AABBCC is darkest, aabbcc lightest, and genotypes with three dominant alleles are intermediate (1).

4. A unit of chromatin in which negatively charged DNA is wrapped around a positively charged histone octamer (1). About 200 base pairs (1).

5. Its Ti plasmid normally transfers a piece of DNA that turns plant cells into tumour cells (1). The plasmid is modified so that it no longer causes disease but still transfers the desired gene into the plant's DNA (1).

6. A weakened or killed pathogen, or its proteins, is introduced; the body makes antibodies and memory B and T cells, so a later infection meets a quick, strong response (1). The hepatitis B vaccine made in yeast (1).

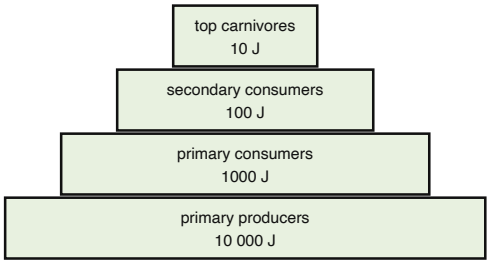
OR Dust, pollen, mites or animal dander (any two) (1). IgE; histamine and serotonin released from mast cells (1).

7. (a) By measuring percentage cover or biomass, since counting individuals is not practical (1). (b) Indirectly, from pugmarks and faecal pellets (1).

8. Tropical areas have remained relatively undisturbed for millions of years, allowing long evolutionary time for species diversification (1). Their environment is less seasonal and more constant, and they receive more solar energy, which supports greater productivity (1).

Section C (21 marks)

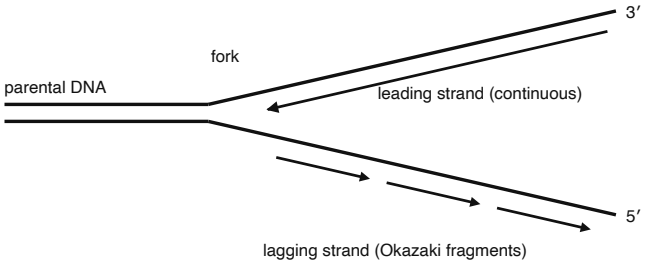
9. Pyramid with producers at the base, then primary, secondary and tertiary consumers, the energy falling about tenfold at each level (2).



At each step much of the energy is lost as heat in respiration, so a higher level always has less energy than the one below (1).

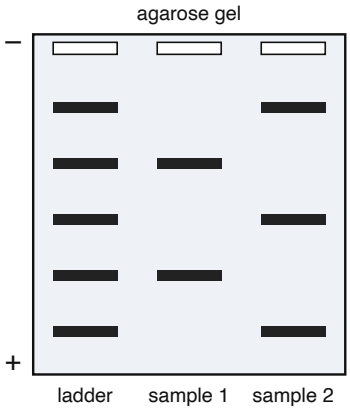
OR Diagram showing the parental double helix opening at the fork, the leading strand made continuously and the lagging strand made as Okazaki fragments, each in the 5′ → 3′ direction (3).

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



10. A point mutation in the gene for the β-globin chain changes GAG to GUG, so the sixth amino acid, glutamic acid, is replaced by valine (1). It is autosomal recessive: only Hb^sHb^s individuals show the disease, in which red cells become sickle-shaped at low oxygen (1). Carriers (Hb^AHb^s) have one normal allele and enough normal haemoglobin (1).

11. DNA fragments are loaded into wells and an electric field is applied; being negatively charged, they move towards the anode (1). The agarose gel acts as a sieve, so smaller fragments move farther (1). The DNA is stained with ethidium bromide and seen as orange bands in UV light; the bands can be cut out and the DNA eluted (1).



12. (a) Primary lymphoid organs: lymphocytes are produced in the bone marrow, and T-lymphocytes mature in the thymus (1). (b) The spleen filters blood, trapping blood-borne micro-organisms, and stores erythrocytes (1). (c) Lymph nodes trap micro-organisms and antigens in the lymph, which activate the lymphocytes there (1).

13. They have food reserves to nourish the young seedling until it can photosynthesise (1). They can remain dormant through unfavourable conditions and can be dispersed to new habitats (1). Being formed by sexual reproduction, they bring new genetic combinations (variation) (1).

OR In Vallisneria the female flowers reach the water surface on long stalks, and the male flowers or pollen released on the surface are carried passively by currents to them (1). In sea grasses the female flowers stay under water, and long ribbon-like pollen grains are carried inside the water to them (1). Such flowers do not need to attract animals, so they lack colour and nectar (1).

14. Two species that need the same limited resource reduce each other's fitness (1). On the Galapagos Islands the Abingdon tortoise became extinct within a decade after goats were introduced, because goats were more efficient at browsing (1). When a competitively superior species is removed, the range of the other species expands dramatically: competitive release (1).

15. (a) Salmonella typhi; contaminated food and water (½ + ½); sustained high fever (39–40 °C), stomach pain, weakness; confirmed by the Widal test (½). (b) Streptococcus pneumoniae or

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

Haemophilus influenzae; droplets or aerosols from an infected person, or sharing glasses and utensils (½ + ½); the alveoli fill with fluid, causing breathing problems, fever and chills; in severe cases lips and finger nails turn grey to bluish (½).

Section D (15 marks)

16. (a) (i) Females are XX and males XY; the sperm (X or Y) decides the sex (1). (ii) Females are heterogametic (ZW) and males homogametic (ZZ), so the egg decides the sex (1). (iii) Haplodiploidy: fertilised eggs (diploid) become females and unfertilised eggs (haploid) become males (1). (b) The gene is on the X chromosome (1); a son receives his X from his mother and only a Y from his father (1).

17. (a) DNA is isolated and cut with restriction enzymes, and the fragments are separated by gel electrophoresis (1). They are transferred to a membrane such as nitrocellulose (blotting) and hybridised with a labelled VNTR probe (1). Autoradiography shows the band pattern, which is compared between samples (1). (b) Any two: identifying criminals in forensic cases; settling disputed parentage; studying genetic diversity and evolution of populations (2).

OR (a) Expressed sequence tags (ESTs) identified the genes expressed as RNA; sequence annotation sequenced the whole genome, coding and non-coding (1). DNA was broken into fragments and cloned in hosts using BAC and YAC vectors (1). The fragments were sequenced by automated sequencers based on Sanger's method and assembled with computers using overlapping regions (1). (b) Sites where single bases differ between individuals; about 1.4 million were found in humans (1). They help locate genes linked to diseases and trace human history (1).

18. (a) It is lined by male germ cells (spermatogonia), which form sperms, and Sertoli cells, which nourish them (1). Between the tubules lie Leydig (interstitial) cells, which secrete androgens, and immunocompetent cells (1). (b) A pair of seminal vesicles, the prostate and a pair of bulbourethral glands (1½). Their secretions form the seminal plasma, rich in fructose, calcium and some enzymes; the bulbourethral secretion also lubricates the penis (1½).

OR (a) Narrowly utilitarian: people get direct benefits such as food, firewood, fibre and medicines from nature (1). Broadly utilitarian: ecosystem services such as oxygen production, pollination and flood control (1). Ethical: every species has an intrinsic value and we have a moral duty to pass on biodiversity (1). (b) When a species becomes extinct, the species that depend on it obligatorily also become extinct (1). E.g. when a host fish becomes extinct, its unique parasites also die out; or a plant and its specific pollinator (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.