Biology

HSC Board Exam February–March 2027 – Practice Paper

Practice Question Paper

Time: 3 hours **Max. Marks: 70**

(1) The question paper is divided into four sections.
(2) Section A: Q. No. 1 contains ten multiple choice type questions carrying one mark each. Q. No. 2 contains eight very short answer type questions carrying one mark each.
(3) Section B: Q. No. 3 to Q. No. 14 are twelve short answer-I type questions carrying two marks each. (Attempt any eight)
(4) Section C: Q. No. 15 to Q. No. 26 are twelve short answer-II type questions carrying three marks each. (Attempt any eight)
(5) Section D: Q. No. 27 to Q. No. 31 are five long answer type questions carrying four marks each. (Attempt any three)
(6) Figures to the right indicate full marks.
(7) Draw neat and well-labelled diagrams wherever necessary.
(8) For each MCQ, the correct answer must be written along with its alphabet, e.g. (a) ..... / (b) ..... . Evaluation will be done for the first attempt only.
(9) Start answers to each section on a new page.

SECTION A – Q.1 Select and write the correct answer for the following multiple choice type of questions. **[10]**

(i) The flowers of a tree are dull coloured, have a strong fragrance, secrete abundant nectar and produce a large amount of edible pollen grains. These flowers are most likely pollinated by _____.

(a) insects (b) birds
(c) bats (d) wind

(ii) In birds, the sex of the offspring is decided by the _____.

(a) sperm, because the male is heterogametic (ZW) (b) egg, because the female is heterogametic (ZW)
(c) sperm, because the male is XY (d) temperature at which the egg is incubated

(iii) During DNA replication, the short Okazaki fragments formed on the lagging strand are joined together by the enzyme _____.

(a) helicase (b) primase
(c) DNA ligase (d) topoisomerase

(iv) In a root, water that moves only through the cell walls and intercellular spaces, without crossing any cell membrane, is said to follow the _____ pathway.

(a) symplast (b) apoplast
(c) transmembrane (d) vacuolar

(v) The valve that guards the opening between the left atrium and the left ventricle of the human heart is the _____.

(a) tricuspid valve (b) bicuspid (mitral) valve
(c) pulmonary semilunar valve (d) aortic semilunar valve

(vi) The salt-retaining hormone aldosterone is secreted by the _____.

(a) zona glomerulosa of the adrenal cortex (b) zona fasciculata of the adrenal cortex
(c) adrenal medulla (d) posterior pituitary

(vii) Dengue fever is transmitted from one person to another by the bite of the female _____ mosquito.

(a) *Anopheles* (b) *Culex*
(c) *Aedes* (d) *Musca*

(viii) The restriction enzyme *Eco*RI cuts the sequence 5′-GAATTC-3′ between G and A on both strands. The single-stranded sticky end left on each fragment has the bases _____.

(a) 5′-AATT-3′ (b) 5′-GAAT-3′
(c) 5′-TTAA-3′ (d) 5′-CTTAAG-3′

(ix) An interaction between two species in which one species is harmed while the other is neither benefited nor harmed is called _____.

(a) commensalism (b) amensalism
(c) predation (d) protocooperation

(x) Which one of the following is an **ex-situ** method of conserving biodiversity?

(a) National park (b) Wildlife sanctuary
(c) Seed bank (d) Biosphere reserve

SECTION A – Q.2 Answer the following questions. **[8]**

(i) Name the hormone whose presence in urine is detected by a home pregnancy test kit.

(ii) The flipper of a seal, the wing of a bat and the arm of a human have the same basic bone plan but perform different functions. Name the type of evolution indicated.

(iii) Name the plant growth regulator whose effect of delaying senescence (ageing) of leaves was reported by Richmond and Lang (1957).

(iv) What is the normal blood pressure of a healthy adult human?

(v) Name the part of the human brain that acts as the thermoregulatory centre of the body.

(vi) Name the bacterium that is inoculated into milk to prepare Indian curd.

(vii) Who proposed the ten percent law of energy transfer in a food chain?

(viii) The karyotype of a short-statured female shows 45 chromosomes – 44 autosomes and a single X chromosome. Name the disorder.

SECTION B Attempt any EIGHT of the following questions. (2 marks each) **[16]**

Q.3 In a flower, the anthers shed pollen two days before the stigma of the same flower becomes receptive. Name this condition and explain how it favours cross-pollination. Give one example.

Q.4 The human placenta is formed of tissues from two different individuals. (a) Name the foetal part and the maternal part of the placenta. (b) The placenta also acts as an endocrine tissue. Name any two hormones secreted by it and state why they are needed.

Q.5 In cattle, the alleles for red coat (R) and white coat (W) are co-dominant; the heterozygote (RW) is roan. A roan bull is crossed with a white cow. Work out the genotypes and phenotypes of the calves using a checkerboard and give the phenotypic ratio.

Q.6 Explain why red-green colour blindness is seen far more often in men than in women.

Q.7 Write the three stop codons of the genetic code. Why is AUG called the initiation codon?

Q.8 A storm carries a few birds from a large mainland population to a distant island, where they start a new population. After many generations, the allele frequencies on the island are very different from those on the mainland. Name this phenomenon and explain why such change is more marked in small populations.

Q.9 Early in the morning, a gardener cuts the stem of a well-watered potted plant a few centimetres above the soil. After some time, xylem sap is seen oozing out of the cut stump. (a) Name and define the pressure responsible. (b) Could this pressure alone lift water to the top of a 40 m tall tree? Give a reason.

Q.10 Plant P flowers only when it gets 15 hours of light and 9 hours of darkness each day. Plant Q flowers only when it gets 9 hours of light and 15 hours of darkness; Q fails to flower if its dark period is interrupted by a brief flash of light. Classify P and Q on the basis of photoperiod and explain the effect of the light flash on Q.

Q.11 After a heavy lunch, a person rests quietly in a chair. His heart rate slows down and digestion goes on actively. (a) Name the division of the autonomic nervous system that is now dominant and state its other name based on its origin. (b) State its effect on the (i) bronchi, (ii) peristalsis of the gut and (iii) pupil of the eye.

Q.12 A farmer growing paddy wants to reduce the use of chemical nitrogen fertilizer. Suggest any two biofertilizers suitable for paddy fields and explain how each one helps the crop.

Q.13 A child has severe combined immunodeficiency (SCID) caused by a defective gene in the bone-marrow cells. Doctors remove some of the child's bone-marrow cells, introduce a normal copy of the gene into them using a vector and return the cells to the child. (a) Name this method of gene delivery and this form of gene therapy. (b) Will the child's future children inherit the corrected gene? Give a reason.

Q.14 What are biodiversity hotspots? Name any two hotspots that include parts of India.

SECTION C Attempt any EIGHT of the following questions. (3 marks each) **[24]**

Q.15 A farmer sows seeds of a lemon tree. Many of the seeds each give rise to two or three seedlings, and all these seedlings are exactly like the mother tree. (a) Name this condition and explain how the extra embryos arise. (b) Why are these seedlings identical to the mother tree? (c) State one use of this to a fruit grower.

Q.16 Draw a neat labelled diagram of a human sperm. Write the function of the acrosome and the middle piece.

Q.17 In a population of 4000 people in Hardy–Weinberg equilibrium, 360 are albino (aa), albinism being an autosomal recessive trait. Write the Hardy–Weinberg equation and calculate (a) the frequency of allele a, (b) the frequency of allele A and (c) the number of carriers (Aa) in the population.

Q.18 In the morning, the K^+ ion content of the guard cells of a leaf rises sharply and the stomata open. Explain this according to the proton transport (K^+ pump) theory of Levitt. What happens to the stomata at night?

Q.19 A farmer grows gram (a legume) in a field and then grows wheat in the same field the next season without adding urea. (a) Explain how the gram crop adds nitrogen to the soil and write the overall reaction of biological nitrogen fixation. (b) Name the two steps of nitrification by which ammonia in the soil is changed to nitrate, with the bacteria involved.

Q.20 Explain how carbon dioxide is transported from the tissues to the lungs by blood.

Q.21 Describe the transmission of a nerve impulse across a chemical synapse.

Q.22 A pathologist examines two tumours. Tumour X is enclosed in a connective tissue capsule and grows slowly at its site of origin. Cells of tumour Y grow rapidly and are also found in lymph nodes far away from the original site. (a) Identify X and Y and name the process seen in Y. (b) Name the type of cancer that arises from (i) epithelial tissue and (ii) connective tissue. (c) How does immunotherapy help a cancer patient?

Q.23 What is micropropagation? Write the main steps involved in it and any two advantages.

Q.24 Explain the steps by which human insulin was produced using recombinant DNA technology. Why is insulin made this way preferred?

Q.25 A few yeast cells are introduced into a flask containing a limited amount of nutrient medium, which is not renewed. Draw the curve expected when the number of yeast cells is plotted against time and label its phases. Explain the term 'carrying capacity'. Why is this model of growth considered more realistic than exponential growth?

Q.26 Draw a pyramid of energy for a grassland ecosystem with four trophic levels. Why is the pyramid of energy always upright?

SECTION D Attempt any THREE of the following questions. (4 marks each) **[12]**

Q.27 Draw a neat labelled diagram of a mature embryo sac of an angiosperm just before fertilization. With what does each of the two male gametes fuse, and what is the ploidy of each product? Why is this process called double fertilization? State one significance.

Q.28 A woman has a regular 28-day menstrual cycle. Answer the following, naming the hormones involved: (a) Which phase is she in on day 3, and why does the endometrium break down? (b) On day 10, which ovarian hormone is rising, what is its source and what is its effect on the uterus? (c) What event takes place on about day 14, and which hormone triggers it? (d) On day 22, which structure secretes progesterone, what does progesterone do, and what happens to this structure if fertilization does not occur?

Q.29 *E. coli* cells growing in a medium without lactose make almost no β-galactosidase. Within minutes of adding lactose to the medium, they start making it. Explain this with the help of the lac operon, using a labelled diagram.

Q.30 Draw a labelled diagram of a normal electrocardiogram (ECG) of one cardiac cycle. Explain what the P wave, QRS complex and T wave represent. Write one use of an ECG.

Q.31 Draw a neat labelled diagram of a myelinated neuron. Explain how the resting membrane potential is maintained in a neuron.

All the best for your exam!