

**HSSC-I ANNUAL EXAMINATION – 2026****PREDICTED PAPER****SUBJECT:** BIOLOGY (Pre-Medical) | NEW CURRICULUM  
(NCP 2022-23)**VARIANT:** EASY VARIANT**Time Allowed:** 3 Hours 10 Minutes**Total Marks:** 85**SECTION A:** MCQs (20 marks) **SECTION B:** Short Questions  
(40 marks) **SECTION C:** Long Questions (25 marks)**NOTE:** Attempt all MCQs. Answer as per instructions.**SECTION A – MULTIPLE CHOICE QUESTIONS (MCQs)**

Q.1 Choose the correct answer. Each question carries **ONE (1) mark**. Total: **20 marks**. Circle the correct option on the answer bubble sheet.

1. **[Ch.6]** Gram positive bacteria stain:  
(A) Pink (B) Purple/violet (C) Red (D) Blue-green  
*Expected: 85% | Ans: (B)*
2. **[Ch.6]** Cyanobacteria are also known as:  
(A) Blue-green algae (B) Green algae (C) Red algae (D) Brown algae  
*Expected: 83% | Ans: (A)*
3. **[Ch.6]** Binary fission is a mode of reproduction in:  
(A) Viruses (B) Bacteria (C) Fungi (D) Protists  
*Expected: 91% | Ans: (B)*
4. **[Ch.6]** Flagella in bacteria is made of:  
(A) Actin (B) Tubulin (C) Flagellin (D) Myosin  
*Expected: 78% | Ans: (C)*
5. **[Ch.7]** Which of the following is a fungal disease?  
(A) Malaria (B) Ringworm (C) Tuberculosis (D) Typhoid  
*Expected: 88% | Ans: (B)*
6. **[Ch.7]** Plasmodium causes:  
(A) Typhoid (B) Cholera (C) Malaria (D) Dengue  
*Expected: 95% | Ans: (C)*
7. **[Ch.7]** Fungi are:  
(A) Autotrophs (B) Heterotrophs (C) Both (D) Chemotrophs  
*Expected: 86% | Ans: (B)*
8. **[Ch.7]** Cell wall of fungi is made of:  
(A) Cellulose (B) Peptidoglycan (C) Chitin (D) Lignin  
*Expected: 90% | Ans: (C)*
9. **[Ch.7]** Bread mold is caused by:  
(A) Aspergillus (B) Rhizopus (C) Penicillium (D) Mucor  
*Expected: 82% | Ans: (B)*
10. **[Ch.8]** Bryophytes are also called:  
(A) Amphibians of plant kingdom (B) Vascular plants (C) Seed plants (D) Flowering plants  
*Expected: 85% | Ans: (A)*
11. **[Ch.8]** Mosses belong to division:  
(A) Pteridophyta (B) Bryophyta (C) Coniferophyta (D) Anthophyta  
*Expected: 83% | Ans: (B)*

- 1 **[Ch.8]** Gymnosperms bear seeds:
2. (A) Inside fruit (B) Naked (not enclosed in fruit) (C) In capsules (D) In cones only  
*Expected: 87% | Ans: (B)*
- 1 **[Ch.8]** Xylem transports:
3. (A) Food (B) Water and minerals (C) Both (D) CO<sub>2</sub>  
*Expected: 94% | Ans: (B)*
- 1 **[Ch.8]** Ferns belong to:
4. (A) Bryophyta (B) Pteridophyta (C) Gymnosperms (D) Angiosperms  
*Expected: 86% | Ans: (B)*
- 1 **[Ch.9]** Porifera are commonly known as:
5. (A) Jellyfish (B) Sponges (C) Corals (D) Flatworms  
*Expected: 88% | Ans: (B)*
- 1 **[Ch.9]** Arthropoda have:
6. (A) Soft body (B) Exoskeleton (C) Endoskeleton (D) No skeleton  
*Expected: 91% | Ans: (B)*
- 1 **[Ch.9]** Coelom is a:
7. (A) Body cavity filled with fluid (B) Type of tissue (C) Organ system (D) None of these  
*Expected: 84% | Ans: (A)*
- 1 **[Ch.9]** Which phylum includes humans?
8. (A) Arthropoda (B) Echinodermata (C) Chordata (D) Mollusca  
*Expected: 95% | Ans: (C)*
- 1 **[Ch.9]** Earthworm belongs to phylum:
9. (A) Annelida (B) Nematoda (C) Platyhelminthes (D) Mollusca  
*Expected: 89% | Ans: (A)*
- 2 **[Ch.10]** Transpiration occurs mainly through:
0. (A) Stomata (B) Roots (C) Stem (D) Lenticels  
*Expected: 91% | Ans: (A)*

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## SECTION B – SHORT QUESTIONS

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Q.2 – Q.7 Each question has **TWO parts** with internal choice. Each part carries **2 marks**. Total: **40 marks**. Answer in 3–5 lines.

**Q.2 Answer EITHER (a) OR (b):**

- (a) **[Ch.8]** Differentiate between gymnosperms and angiosperms.

■ **Expected: 89%**

*Answer: Gymnosperms have naked seeds not enclosed in fruit (e.g., pine, cycad). Angiosperms have seeds enclosed in fruit (flowering plants, e.g., mango, rose). Angiosperms have flowers; gymnosperms do not.*

- (b) **[Ch.8]** What is alternation of generations in plants?

■ **Expected: 81%**

*Answer: Alternation of generations refers to the life cycle alternating between a haploid (gametophyte) stage that produces gametes and a diploid (sporophyte) stage that produces spores. Both stages are multicellular.*

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**Q.3 Answer EITHER (a) OR (b):**

- (a) **[Ch.9]** What are the characteristics of phylum Chordata?

■ **Expected: 90%**

*Answer: Chordates have: notochord (at least in embryo), dorsal hollow nerve cord, pharyngeal gill slits (at some stage), and post-anal tail. They include fish, amphibians, reptiles, birds, and mammals.*

- (b) **[Ch.9]** What is metamorphosis? Differentiate between complete and incomplete.

■ **Expected: 82%**

*Answer: Metamorphosis is the transformation from larva to adult. Complete metamorphosis (holometabolism) has 4 stages: egg → larva → pupa → adult (e.g., butterfly). Incomplete (hemimetabolism) has 3: egg → nymph → adult (e.g., grasshopper).*

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**Q.4 Answer EITHER (a) OR (b):**

(a) [Ch.9] What are the main features of phylum Arthropoda?

■ Expected: 85%

*Answer: Arthropoda features: exoskeleton (chitin), jointed appendages, segmented body, open circulatory system, compound eyes, and ventral nerve cord. Largest animal phylum including insects, crustaceans, spiders.*

(b) [Ch.10] What is transpiration? What factors affect it?

■ Expected: 91%

*Answer: Transpiration is the loss of water vapor from aerial parts of a plant, mainly through stomata. Factors affecting it: light intensity, temperature, humidity, wind speed, and water availability.*

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**Q.5 Answer EITHER (a) OR (b):**

(a) [Ch.10] Describe the cohesion-tension theory of water ascent.

■ Expected: 87%

*Answer: Water molecules are cohesive (stick together by H-bonds) and adhesive (to xylem walls). Transpiration creates tension (negative pressure) that pulls water up the xylem from roots in a continuous column — cohesion-tension theory.*

(b) [Ch.10] What is the role of guard cells in stomatal opening?

■ Expected: 89%

*Answer: When guard cells absorb water, they become turgid and bow outward, opening the stomatal pore. When they lose water, they become flaccid and close the pore. K<sup>+</sup> ions regulate guard cell water content.*

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**Q.6 Answer EITHER (a) OR (b):**

(a) [Ch.11] Describe the role of liver in digestion.

■ Expected: 88%

*Answer: Liver produces bile (containing bile salts and pigments) that emulsifies fats into smaller droplets, increasing surface area for lipase action. It also detoxifies substances and regulates blood glucose.*

(b) [Ch.11] What is the role of pancreatic juice in digestion?

■ Expected: 87%

*Answer: Pancreatic juice (from pancreas into small intestine) contains: amylase (digests starch), lipase (digests fats), proteases (trypsin, chymotrypsin — digest proteins), and bicarbonate (neutralizes stomach acid).*

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**Q.7 Answer EITHER (a) OR (b):**

(a) [Ch.11] What are villi and microvilli? What is their function?

■ Expected: 90%

*Answer: Villi are finger-like projections of small intestinal wall. Microvilli are further projections on villi cells (forming brush border). Both increase surface area for absorption of digested nutrients into blood and lymph.*

(b) [Ch.12] Describe the double circulation in humans.

■ Expected: 93%

*Answer: In double circulation, blood passes through the heart twice per complete circuit: (1) Pulmonary circulation: right heart → lungs → left heart (oxygenation). (2) Systemic circulation: left heart → body → right heart (oxygen delivery).*

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**Q.8 Answer EITHER (a) OR (b):**

(a) [Ch.12] What is the ABO blood group system?

■ Expected: 89%

**Answer:** ABO system (Landsteiner) classifies blood by antigens on RBCs: A (antigen A), B (antigen B), AB (both antigens, universal recipient), O (no antigens, universal donor). Plasma contains corresponding antibodies.

(b) [Ch.12] What are the components and functions of blood?

■ Expected: 86%

**Answer:** Blood has: RBCs (carry O<sub>2</sub> via hemoglobin), WBCs (immune defense), Platelets (clotting), Plasma (transports nutrients, hormones, CO<sub>2</sub>, proteins). It also regulates temperature and pH.

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**Q.9 Answer EITHER (a) OR (b):**

(a) [Ch.13] Differentiate between active and passive immunity.

■ Expected: 92%

**Answer:** Active immunity: body produces its own antibodies in response to an antigen (infection or vaccine) — long-lasting. Passive immunity: ready-made antibodies are transferred (e.g., breast milk, injection) — temporary.

(b) [Ch.13] What is the role of B and T lymphocytes in immunity?

■ Expected: 90%

**Answer:** B lymphocytes produce antibodies (humoral immunity). T lymphocytes: helper T cells activate immune response, cytotoxic T cells directly kill infected cells, memory T cells provide long-term immunity (cell-mediated immunity).

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## SECTION C – LONG QUESTIONS (DETAILED ANSWER)

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Q.8 – Q.12 Each question has internal choice. Each carries 5 marks. Total: 25 marks. Answer in detail with diagrams where required.

**Q.8 [Ch.1] Compare and contrast plant and animal cells. Describe the role of the cell membrane using the fluid mosaic model.**

■ Expected: 85%

**Answer:**

- Plant cells have: cell wall (cellulose), large central vacuole, chloroplasts, plasmodesmata.
- Animal cells have: centrioles, small/no vacuoles, no cell wall, no chloroplasts, may have lysosomes.
- Both have: nucleus, mitochondria, ribosomes, ER, Golgi, plasma membrane.
- FLUID MOSAIC MODEL (Singer & Nicolson, 1972):
  - - Phospholipid bilayer: hydrophilic heads face outward, hydrophobic tails face inward.
  - - Fluid: phospholipids can move laterally (not flip-flop).
  - - Mosaic: proteins scattered throughout (integral = span bilayer; peripheral = on surface).
  - - Cholesterol: maintains membrane fluidity at varying temperatures.
  - - Glycoproteins and glycolipids: cell recognition, immune response.
- Functions of membrane: selective permeability, active transport (Na<sup>+</sup>/K<sup>+</sup> pump), endocytosis/exocytosis, signal transduction.

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**Q.9 [Ch.11] Explain the process of digestion in humans, mentioning the roles of different organs and enzymes.**

■ Expected: 90%

**Answer:**

- Digestion converts large food molecules into absorbable monomers.
- MOUTH: salivary amylase (ptyalin) begins starch digestion → maltose; food → bolus → swallowed.
- ESOPHAGUS: peristalsis moves food to stomach.
- STOMACH: gastric glands secrete HCl (pH 2; kills bacteria, activates pepsinogen) and pepsin (protein → peptides). Produces chyme.
- SMALL INTESTINE: main site of digestion and absorption.

- - Duodenum: bile (liver via gallbladder) emulsifies fats; pancreatic juice (amylase, lipase, trypsin, chymotrypsin, bicarbonate).
- - Intestinal juice: maltase, sucrase, lactase, peptidases.
- - Brush border enzymes complete digestion.
- - Villi and microvilli absorb products into blood (sugars, amino acids) and lymph (fatty acids, glycerol).
- LARGE INTESTINE: water and mineral absorption; vitamin K synthesis by bacteria; formation and expulsion of feces.
- LIVER: produces bile; detoxification; glycogen storage; blood protein synthesis.
- PANCREAS: both exocrine (digestive enzymes) and endocrine (insulin, glucagon) functions.

**Q.10 [Ch.8] Describe the classification and characteristics of major plant divisions with examples.**

■ Expected: 83%

**Answer:**

- Plant kingdom (Kingdom Plantae): multicellular, eukaryotic, autotrophic (photosynthetic), mostly terrestrial.
- BRYOPHYTA (mosses, liverworts, hornworts): non-vascular; no true roots/stems/leaves; moist habitats; gametophyte dominant; reproduce by spores. Ex: Marchantia, Funaria.
- PTERIDOPHYTA (ferns): vascular; true roots/stems/leaves; no seeds; sporophyte dominant; spores for reproduction. Ex: Dryopteris, Pteris.
- GYMNOSPERMS: vascular; produce naked seeds (not enclosed in fruit); wind-pollinated; cones. Ex: Pinus (pine), Cycas (cycad), Ginkgo.
- ANGIOSPERMS (Anthophyta): vascular; seeds enclosed in fruit; flowers; double fertilization; most diverse plant group.
- - Monocots: one cotyledon, parallel veins, fibrous root (e.g., wheat, corn, grasses).
- - Dicots: two cotyledons, net veins, taproot (e.g., rose, pea, mango).
- Alternation of generations: gametophyte (haploid) ↔ sporophyte (diploid) in all plant life cycles.

**Q.11 [Ch.4] Explain the process of photosynthesis including light reactions and the Calvin cycle.**

■ Expected: 91%

**Answer:**

- Photosynthesis:  $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$  (in chloroplasts).
- Chloroplast structure: double membrane; grana (thylakoid stacks) for light reactions; stroma for dark reactions.
- LIGHT REACTIONS (thylakoid membrane):
  - - Photosystems I and II absorb light energy.
  - - Photolysis of water:  $\text{H}_2\text{O} \rightarrow 2\text{H}^+ + 2\text{e}^- + \frac{1}{2}\text{O}_2$  ( $\text{O}_2$  released as byproduct).
  - - Electrons move through electron transport chain → ATP synthesis (photophosphorylation).
  - - NADP<sup>+</sup> reduced to NADPH.
  - - Products: ATP, NADPH,  $\text{O}_2$ .
- DARK REACTIONS / CALVIN CYCLE (stroma):
  - -  $\text{CO}_2$  fixation by RuBisCO enzyme:  $\text{CO}_2 + \text{RuBP} (5\text{C}) \rightarrow 2 \times 3\text{-PGA} (3\text{C})$ .
  - - 3-PGA reduced using ATP and NADPH to form G3P.
  - - G3P used to: synthesize glucose; regenerate RuBP.
  - - 3 turns of cycle → 1 G3P net gain; 6 turns → 1 glucose.

**Q.12 [Ch.1] Describe the structure of a eukaryotic cell with reference to its organelles and their functions.**

■ Expected: 92%

**Answer:**

- Plasma membrane: phospholipid bilayer with embedded proteins; selective permeability; fluid mosaic model (Singer & Nicolson, 1972).
- Nucleus: double membrane; contains DNA (chromosomes); nucleolus synthesizes rRNA; controls cell activities.

- Mitochondria: double membrane; site of aerobic respiration; cristae (inner folds) increase surface area; produce ATP.
  - Ribosomes: 80S in eukaryotes (60S + 40S); site of protein synthesis; free or attached to rough ER.
  - Endoplasmic Reticulum: Rough ER (has ribosomes; protein synthesis/transport) and Smooth ER (lipid synthesis, detoxification).
  - Golgi apparatus: modifies, packages, sorts proteins/lipids into vesicles; forms lysosomes.
  - Lysosomes: contain hydrolytic enzymes; intracellular digestion; 'suicide bags' (autolysis).
  - Vacuoles: store water, food, or waste; central vacuole in plant cells provides turgor pressure.
  - Cell wall (plants only): cellulose; structural support and protection.
  - Chloroplasts (plants): double membrane; thylakoids (grana) for light reactions; stroma for Calvin cycle.
  - Centrioles (animals): form spindle fibers during cell division.
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★ **Good Luck!** ★

*AI Prediction — Based on FBISE NCP 2022-25 Analysis*

*Probability ≠ Guarantee. Study full syllabus.*