CLASS IX – SCIENCE PRACTICE PAPER (2026-27)

Step-by-Step Solutions and Marking Scheme

Chapter 2: Cell – The Building Block of Life | Max. Marks: 40

SECTION A – Objective Questions (1 mark each)

Q1 **[1 mark]**

The classical Cell Theory has three statements: all organisms are made of one or more cells; the cell is the basic unit of structure and function; all cells arise from pre-existing cells.

A well-defined nucleus is not present in every cell (bacterial cells have only a nucleoid), so (D) is not part of the theory.

Answer: (D)

Q2 **[1 mark]**

In Fig. 1, P is the eyepiece, Q the objective lens, R the stage, S the mirror and T the fine adjustment knob.

The slide is placed on the **stage (R)** and the final sharp focus is obtained with the **fine adjustment knob (T)**.

Answer: (B)

Q3 **[1 mark]**

Prokaryotic cells have no membrane-bound nucleus or organelles; their DNA lies in the nucleoid. They are usually unicellular, 1–10 µm in size, and have ribosomes.

Answer: (B)

Q4 **[1 mark]**

Cristae fold the inner membrane and increase its surface area, so more chemical reactions for energy production can take place.

Answer: (B)

Q5 **[1 mark]**

Step 1: 3 mm = 3 × 1000 = 3000 µm.

Step 2: Size of one cell = diameter of field ÷ number of cells = 3000 ÷ 15 = 200 µm.

Answer: (C) 200 µm

Q6 **[1 mark]**

In Fig. 2, the cell in P has swollen (water entered: hypotonic solution), the cell in Q is unchanged (isotonic) and the cell in R has shrunk (water left the cell).

The cell shrinks only when the outside solution has higher solute concentration (hypertonic). So only solution R.

Answer: (C)

Q7 **[1 mark]**

The cell membrane pulls away and the inner content shrinks, but the rigid cell wall maintains the shape of the plant cell.

Answer: (B)

Q8 **[1 mark]**

Mitochondria and plastids have their own DNA and ribosomes, so they can make some of their own proteins. This is similar to certain bacteria.

Answer: (B)

Q9 **[1 mark]**

Assertion: true. Mature red blood cells live about 120 days.

Reason: true. Without a nucleus they cannot repair or divide, which explains the short life. R explains A.

Answer: (A)

Q10 **[1 mark]**

Assertion: true. Mitosis gives two genetically identical daughter cells.

Reason: false. In mitosis each daughter cell gets the *same* number of chromosomes as the parent. Halving of chromosome number happens in meiosis.

Answer: (C)

SECTION B – Very Short Answer Questions (2 marks each)

Q11 **[2 marks]**

Any two points (1 mark each):

• **Diffusion** is the net movement of particles (solid, liquid or gas) from higher to lower concentration. **Osmosis** is the movement of water only.

• Diffusion occurs without a membrane. Osmosis occurs across a selectively permeable membrane.

• In osmosis, water moves from the region of more water and less solute (dilute solution) to the region of less water and more solute (concentrated solution).

Q12 **[2 marks]**

(a) (1 mark) The process is **osmosis**. Water moves **into** the potato cells from the surrounding plain water, so the weight increases from 20 g to 23 g.

(b) (1 mark) Change in weight = 17 − 20 = −3 g. Percentage change = (3 ÷ 20) × 100 = **15% decrease**.

The 20 per cent salt solution is more concentrated than the cell contents, so water moves out of the potato cells through the cell membrane by osmosis (salt molecules do not pass).

Q13 **[2 marks]**

(a) Ribosomes (1 mark): sites of protein synthesis; they are present free in the cytoplasm or attached to the endoplasmic reticulum.

(b) Golgi apparatus (1 mark): modifies, sorts and packages proteins and lipids into vesicles for transport, secretion or lysosome formation.

Q14 **[2 marks]**

Option A:

Advantage (1 mark): more space for haemoglobin, so the cell can carry a larger amount of oxygen to the cells of the body.

Disadvantage (1 mark): it cannot repair or divide itself, so its lifespan is short (about 120 days).

Option B:

Leucoplasts (1 mark): colourless plastids that store food material such as starch, oils or proteins.

Chromoplasts (1 mark): plastids with yellow, orange or red pigments that give bright colours to flowers and fruits, attracting pollinators and fruit-eating animals that help in seed dispersal.

SECTION C – Short Answer Questions (3 marks each)

Q15 **[3 marks]**

Any three differences (1 mark each):

• Nucleus: prokaryotic cells have a primitive nucleus (nucleoid) without a membrane; eukaryotic cells have a well-defined, membrane-bound nucleus.

• Organelles: absent in prokaryotic cells; present (membrane-bound) in eukaryotic cells.

• Size: typical diameter 1–10 µm in prokaryotic cells; 10–100 µm in eukaryotic cells.

• Number of cells in an organism: usually unicellular in prokaryotes; unicellular or multicellular in eukaryotes.

Q16 **[3 marks]**

(i) (1 mark) P = cell wall, Q = large central vacuole, R = chloroplast.

(ii) (1 mark) S = nucleus, T = mitochondrion.

(iii) (1 mark) Any two: cell wall, chloroplast, large central vacuole.

Q17 **[3 marks]**

Option A:

Step 1 (1 mark): A mitochondrion is surrounded by two membranes: a smooth, porous outer membrane and an inner membrane.

Step 2 (1 mark): The inner membrane is folded into cristae, which increase the surface area for chemical reactions and energy production.

Step 3 (1 mark): Glucose and other molecules are broken down in cellular respiration and the energy released is stored as ATP, the energy currency used for most cellular activities.

Option B:

Step 1 (1 mark): A mature plant cell has a large central vacuole filled with cell sap. It stores water, minerals, sugars and waste.

Step 2 (1 mark): The stored water maintains pressure inside the cell, keeping the plant cell firm.

Step 3 (1 mark): When water is not enough, the vacuole loses water, the cells become less firm and the plant wilts.

SECTION D – Case-Based Questions (4 marks each)

Q18 **[4 marks]**

(i) (1 mark) An exact copy of the bacterium's DNA (synthetic DNA).

(ii) (1 mark) DNA controls the structure and activities of a cell: the cell grew and divided according to the instructions of the inserted DNA.

(iii) (1 mark) No. Only the DNA was synthetic; the other parts (cytoplasm and cell membrane) were taken from an already existing living cell.

(iv) (1 mark) The nucleoid.

Q19 **[4 marks]**

(i) (1 mark) 2.4 mm = 2.4 × 1000 = **2400 µm**.

(ii) (1 mark) Size of one cell = 2400 ÷ 16 = **150 µm**.

(iii) (1 mark) Total magnification = eyepiece × objective = 10 × 40 = **400X**.

(iv) (1 mark) Apparent size = 150 µm × 400 = 60,000 µm = 60,000 ÷ 1000 = **60 mm** (6 cm).

SECTION E – Long Answer Question (5 marks)

Q20 **[5 marks]**

Option A:

(i) (1 mark) X = mitosis; Y = meiosis.

(ii) (1 mark) Each daughter cell in X has **4** chromosomes (same as the parent). Each daughter cell in Y has **2** chromosomes (half of the parent).

(iii) (1 mark) Mitosis (X). It produces new cells identical to the parent cell and is important for growth, repair and maintenance of tissues.

(iv) (1 mark) In the testes of males and the ovaries of females.

(v) (1 mark) Meiosis halves the chromosome number in the gametes (here 2 each). When two gametes fuse during fertilisation, the original number (2 + 2 = 4) is restored.

Option B:

(i) (1 mark) X forms 2 daughter cells; Y forms 4 daughter cells.

(ii) (1 mark) Each new cell gets the same DNA and the same number of chromosomes as the parent cell, so genetic information is largely maintained across body cells.

(iii) (1 mark) Meiosis produces gametes with varied combinations of genetic material, creating variation and diversity; so children resemble their parents but are not exactly the same.

(iv) (1 mark) Uncontrolled cell divisions can form tumours and cells with an abnormal number of chromosomes.

(v) (1 mark) Genetic disorders, developmental problems or distinctive physical features, early pregnancy loss or reduced fertility (any one).

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