EXAM PAPERS PRACTICE

IB Biology SL

Cells: Origin & Ultrastructure

Answers

"We will help you to achieve A Star "

Answer 1

The correct answer is **C** because:

- The resolution of a beam of electrons is much higher than that of light, allowing much higher useful magnifications
  - Magnification is the process of making smaller objects appear larger
  - Resolution is the ability to distinguish between two points on an object

The other options in the table all have the electron microscope with a lower magnification or resolution than the light microscope which is incorrect.

Answer 2

The correct answer is **D** because ribosomes are too small to be seen by a light microscope. They do not have a high enough **resolution** to be able to view smaller organelles. They can be viewed using an electron microscope.

A, **B** and **C** are all correct because they are much larger and therefore can be viewed with a light microscope even though it has a lower magnification and resolution than the electron microscope.

Answer 3

The correct answer is **B** because prokaryotic cells divide by binary fission in order to reproduce asexually.

A is incorrect because only eukaryotic cells divide by mitosis. The process is different because of the different structures of the cells, such as the fact that prokaryotic cells do not have a nucleus.

C is incorrect because prokaryotic cells carry out asexual reproduction which does not involve the process of fertilisation. Fertilisation, when the gametes fuse, is exclusive to sexual reproduction.

D is incorrect because only eukaryotic cells carry out meiosis. Also, meiosis is the process used to make gametes that are used in sexual reproduction, and prokaryotic cells do not carry out this process.

Answer 4

The correct answer is **B** because:

- Animal cells do not have a cell wall, but all cells have a membrane
- Animal and bacterium cells have DNA; the DNA in an animal cell will have a linear structure and be found in the nucleus, in a bacterium it is circular and found in a region of the cytoplasm
- All cells need to synthesise proteins, so both have ribosomes

A is incorrect because animal cells do not have a cell wall.

C is incorrect as animal cells do not have a capsule.

D is incorrect as animal cells do not have a capsule or a cell wall.

Answer 5

The correct answer is **A** because:

- The DNA in prokaryotic cells is found in a circular form
- The DNA is not found inside a nuclear membrane
- Prokaryotic ribosomes are smaller (70S) than those of eukaryotes
- They are surrounded by a cell wall made of murein/peptidoglycan

B is incorrect as centrioles are found in eukaryotic cells. They are involved in organising the mitotic spindle during mitosis to separate **chromatids.** Prokaryotes do not contain 80S ribosomes, as those are only found in eukaryotic cells.

C is incorrect as the smooth endoplasmic reticulum is a membrane-bound organelle involved in the synthesis of lipids, steroids and carbohydrates.

D is incorrect as the cell wall in a prokaryotic cell is made of peptidoglycan (or murein), not cellulose.

Answer 6

The correct answer is **C** because an electron microscope does not have a resolution as small as 0.05 nm.

All the other statements are correct descriptions of either a light microscope or an electron microscope.

Answer 7

The correct answer is **C** because:

- The nucleus, chloroplast and mitochondrion all have a double membrane.
    - A nucleus is surrounded by a double membrane, which connects directly with the lumen of the rough endoplasmic reticulum.
    - A chloroplast has a double membrane: the outer and inner membrane.
    - A mitochondrion has a double membrane. The inner membrane is folded to form structures called the cristae, which contains many of the structures needed to synthesise ATP.

A, **B** and **D** are incorrect because endoplasmic reticulum and lysosomes have single membranes.

Answer 8

The correct answer is **C** because:

- Eukaryotic cells contain two types of endoplasmic reticulum in the cytoplasm: the rough endoplasmic reticulum (RER) and the smooth endoplasmic reticulum (SER).
- The DNA in eukaryotic cells is wound around proteins called **histones** to make chromatin that forms the chromosomes.
- No eukaryotic cells are less than 1 μm in diameter. They usually range between 10-100 μm in diameter, whilst prokaryotic cells usually range between 0.1-5 μm in diameter.

Answer 9

The correct answer is **D** because structure I is the cytoplasm and structure IV is the cell membrane. All cells, including prokaryotic cells, contain these structures.

A is incorrect because the cell membrane would also be present in prokaryotes. **B** is incorrect because structure II is likely to be a chloroplast. After the nucleus and vacuole, the chloroplast is the next biggest organelle. It could also be a mitochondrion, another membrane-bound organelle like the chloroplast. Prokaryotic cells do not contain membrane-bound organelles. **C** is incorrect for the same reason and because structure III is the vacuole. The vacuole stores the cell sap, it is surrounded by the tonoplast, which is a membrane.

Answer 10

The correct answer is **D** because structure I is the cytoplasm and structure IV is the cell membrane. All cells, including prokaryotic cells, contain these structures.

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Answer 11

The correct answer is **A**. The clue here is the **single circular chromosome**, a characteristic of **prokaryotic cells**. The chromosome is first replicated and each copy moves to a different end of the cell. The cell then divides into two genetically identical daughter cells. Cell division in all prokaryotic cells (e.g. bacteria) occurs via binary fission.

B is incorrect because cytokinesis only refers to the final stage of cell division in **eukaryotic cells** (after the replication and division of DNA) during which the cytoplasm of a single cell divides into two daughter cells. **C** and **D** are incorrect because these are two cell division processes that produce new cells (mitosis) and gametes (meiosis) in **eukaryotes**, so they must involve linear, not circular, chromosomes.

Answer 12

The correct answer is **A**. The clue here is the **single circular chromosome**, a characteristic of **prokaryotic cells**. The chromosome is first replicated and each copy moves to a different end of the cell. The cell then divides into two genetically identical daughter cells. Cell division in all prokaryotic cells (e.g. bacteria) occurs via binary fission.

B is incorrect because cytokinesis only refers to the final stage of cell division in **eukaryotic cells** (after the replication and division of DNA) during which the cytoplasm of a single cell divides into two daughter cells. **C** and **D** are incorrect because these are two cell division processes that produce new cells (mitosis) and gametes (meiosis) in **eukaryotes**, so they must involve linear, not circular, chromosomes.

Answer 13

The correct answer is **D** because products of metabolism (such as enzymes) can work intracellularly (inside the cell) or extracellularly (outside the cell).

A is incorrect because lysosomes contain hydrolytic enzymes and are responsible for breaking down waste material in cells. **B** and **C** are incorrect because many products of metabolism (eg. enzymes) can work internally (eg. enzymes that catalyse intracellular reactions) or externally (eg. digestive enzymes like salivary amylase).

Answer 14

The correct answer is **D** because:

- A micrometer (μm) is 1000 times smaller than 1 mm
- Alveoli and white blood cells are microscopic structures that would need to be measured in μm
- A nanometer (nm) is 1000 times smaller than 1 μm
- The width of cell walls would be measured in nm as this is a very thin structure that surrounds a cell

A and **B** are incorrect because alveoli are microscopic structures, so measuring in mm would not give high enough precision. **C** is incorrect because measuring the width of cell walls in μm would not provide a measurement with a high enough precision.

Answer 15

The correct answer is **C** because this structure is the cell membrane, which is responsible for controlling the exchange of substances into and out of cells (including palisade mesophyll cells).

A is incorrect because this structure could either be the chloroplast itself or the chloroplast membrane (although in this case it is not clear whether the label is pointing at the inner or outer membrane). **B** is incorrect because this structure is the cell wall of the palisade mesophyll cell. **D** is incorrect because this structure is a thylakoid (multiple thylakoids form stacks of disks referred to as grana, several of which can be seen in the electron micrograph).