IB Style Test Topic 1: Cell biology

Multiple choice questions

1. Which of the following is the correct sequence of the four phases of mitosis?

    A. Prophase, anaphase, metaphase, telophase
    B. Anaphase, prophase, metaphase, telophase
    C. Prophase, metaphase, anaphase, telophase
    D. Prophase, metaphase, telophase, anaphase

2. How did Pasteur's experiment with sterile broth in open flasks demonstrate the principle that cells only come from pre-existing cells?

    A. By demonstrating that sterile broth would not ferment in contact with air alone.
    B. By demonstrating that the air contained microbes
    C. By demonstrating that broth would not ferment if sterile
    D. By demonstrating that sterile broth fermented in contact with air

3. Emergent properties are found in some biological systems. Which of the following properties is necessary for emergent properties to occur?

    A. The system Is evolving
    B. The system is complex
    C. Cells or tissues are differentiated
    D. Cells or tissues interact to function as a unit

4. Which of the following organelles are surrounded by a single membrane?

    I Ribosome
    II Rough endoplasmic reticulum
    III Chloroplast
    IV Lysosome

    A. I and III only
    B. II and IV only
    C. I and II only
    D. I, II and IV only

5. Which of the following are properties of cholesterol found in plasma membranes?

I Reduces permeability of the membrane to hydrophilic ions
II Acts as a channel for ion movement
III It is amphipathic
IV Reduces fluidity of the membrane

A. I and III only
B. II and IV only
C. I and IV only
D. I, III and IV only

6. Which of the following are properties of phospholipids?

I They have a hydrophilic phosphate head
II They form a bilayer in water
III They are amphipathic
IV They have a hydrophobic fatty acid region

A. All of the above
B. II and IV only
C. I and II only
D. I, II and IV only

7. The medium in which a donor organ for transplant is bathed in an isotonic medium, a solution of the same concentration as the cell cytoplasm. Why?

A. The donated organ requires oxygen
B. The organ must take up minerals from the solution
C. The organ is delicate
D. The organ must not lose or gain water

8. Which of the following can cause the formation of a primary tumour, or cancer?
I Oncogenes
II Mutagens
III Proto-oncogenes
IV Metastasis

A. All of the above
B. II and IV only
C. I and II only
D. I, II and III only

9. Which of the following events happens during mitosis in a plant cell?
   A. Condensation of chromosomes
   B. Cell wall formation
   C. Sister chromatids attach to each other at the centromere
   D. Chloroplasts duplicate

10. Which statement best describes the movement of water molecules in osmosis?
   A. From a dilute to a more concentrated solution across a membrane
   B. From a concentrated solution to a dilute solution across a membrane
   C. From a dilute to a concentrated solution across a membrane using energy from ATP
   D. From a concentrated solution to a dilute solution using energy from ATP.

Structured answer questions

11. The following image shows cells in the root tip of a garlic bulb.
    Identify and label clearly one cell in prophase and one cell in anaphase. (2 marks)

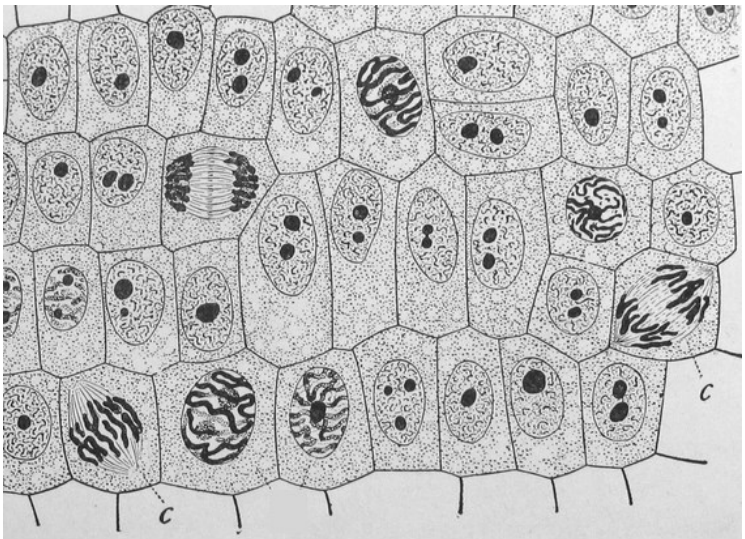

Image (public domain) Wilson, Edmund B. (1900) The cell in Development and Inheritance (2nd ed.), New York City: The Macmillan Company

12. Calculate the mitotic index of the tissue in the diagram above. Show your working.
    There are 32 cells clearly visible. (2 marks)

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13. Outline how the mitotic index can be used in the diagnosis of cancer? (1 mark)

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14. List two sources of stem cells that can be used in therapeutic treatment. (2 marks)

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15. Outline two similarities between the structure of prokaryote cells and eukaryote cells. (2 marks)

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16. Outline the role of cyclins in living cells (2 marks)

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17. Describe one type of cell which is atypical to the concept of cell theory. (2 marks)

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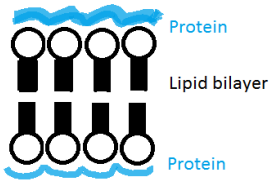
18. The Davson-Danielli model of the membrane structure proposed a layer of protein on the outside edges of membranes. Biological evidence caused them to refine their model and later the Singer-Nicholson model became accepted as a better model of membrane structure.
Describe one piece of evidence that falsified the Davson-Danielli model in support of the Singer-Nicholson model (3 marks)



Danielli & Davson model

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19. Define the term "cell differentiation". (1 mark)

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20. Explain the evidence which supports the endosymbiotic theory of the evolution of the eukaryotic cell (3 marks)

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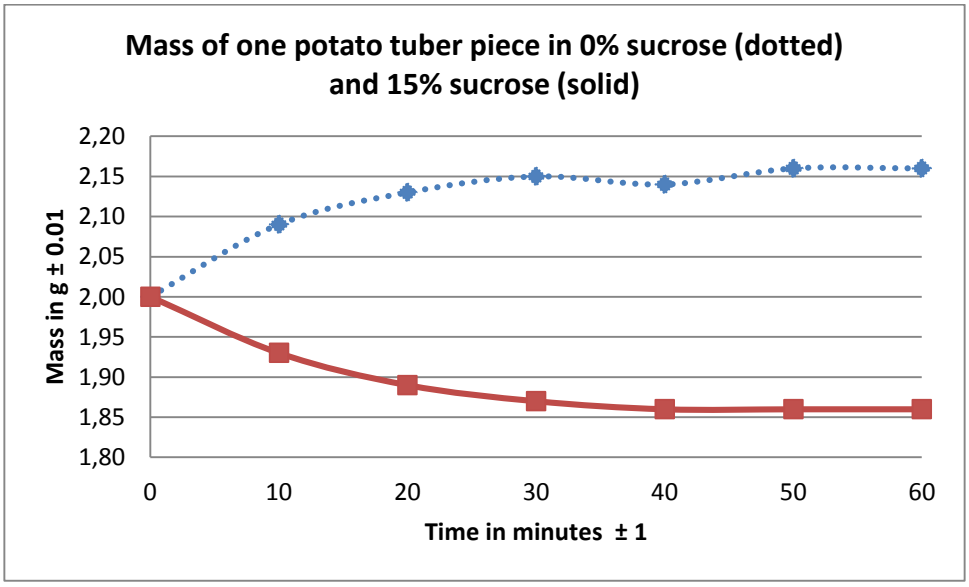
21. Eukaryote cells contain organelles which each have specific functions. Complete the table below, to identify the missing organelle names and the missing functions.
(4 marks)

Organelle	Structure	Function
Nucleus	Large structure surrounded by a double membrane with DNA and proteins inside.	Contains the cell's DNAand is the site of DNA replication
Golgi apparatus	A stack of four or more flattened membrane disks	....
.....	A round organelle with a single membrane containing digestive enzymes.	Digestion of molecular debris inside the cell.
.....	An organelle with a double membrane. The outer membrane makes the shape of the organelle but the inner membrane folds into cristae	....

22. The graph below represents the mass change over 60 minutes of two potato tuber "chips" in distilled water (dotted line) and 15% sucrose (solid line). The chips were cylinders of 5 cm length and 1 cm diameter.



a. Calculate the percentage loss in mass of the potato chip in 15% sucrose at 20 minutes.
(2 marks)

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b. Compare the results in 15% sucrose with those in distilled water. (2 marks)

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c. Explain why the potato chip in distilled water gained mass. (2 marks)

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d. State two variables that should be controlled to give valid results in this experiment. (2 marks)

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e. Suggest why data collection was stopped at 60 minutes? (2 marks)

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f. Explain two ways that the experiment could be improved so that the data collected would have more validity. (4 marks)

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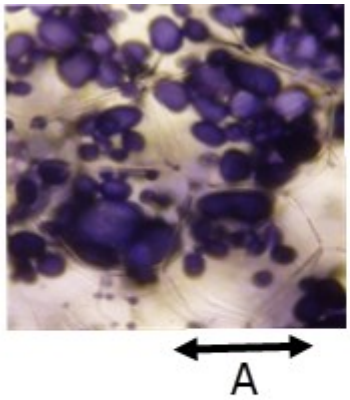
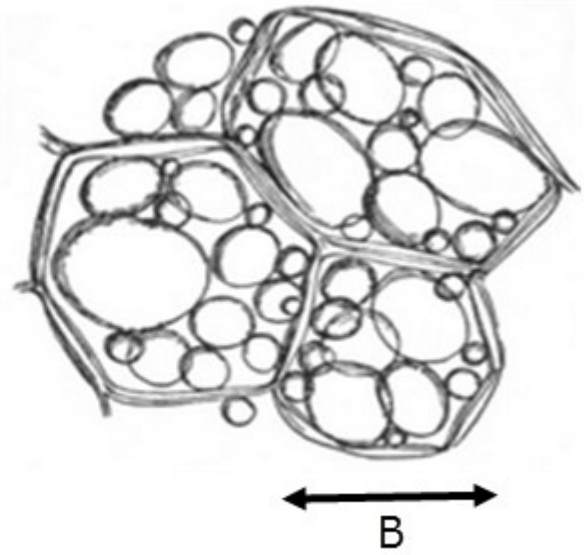
g. The images below show potato cells from the experiment containing starch grains.
The true size of the cell labelled A was measured to be 300µm across.
Measure the image size of the microscope image and the student's diagram then calculate the magnification of each image. Show your working. (4 marks)





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