NOVICATE ACADEMY

STUDENT NAME: _____

NOVICATE ACADEMY

TOPIC TEST – UNIT 3 QUESTION BOOKLET

CELL BIOLOGY AND BIOLOGICAL MOLECULES

Total Marks: 45 marks

Reading Time: 5 minutes

Writing Time: 45 minutes

Test conditions and restrictions

- Students are permitted to have in their possession while completing this test: pens, pencils, highlighters, erasers, sharpeners and rulers, clear water bottle, snacks if medically permitted.
- Students are NOT permitted to have in their possession for this test: blank sheets of paper, white out/correction pens AND any electronic devices other than those permitted.

Materials supplied

- Question booklet
- MCQ answer sheet

Instructions

- Print your name in the space provided on the top of the front page.
- All written responses must be in English.

Multiple Choice Questions (MCQs)

Instructions for MCQs:

Select the response that is **most correct** for the question. A correct answer scores 1 mark, an incorrect answer scores 0 marks. There are no marks dedicated for incorrect answers. In the situation that more than 1 answer is selected for any question, no mark will be given.

Question 1: Phagocytes are a specialised cell found in the body that are able to break down and digest other unwanted cellular material. Which organelle is most likely responsible for this property?

A. Smooth endoplasmic reticulum

B. Lysosome

C. Nucleus

D. Mitochondria

Question 2: Which of the following is true regarding ribosomes?

A. Ribosomes are commonly found on the surface of the smooth endoplasmic reticulum

B. Ribosomes are involved in fat and steroid production

C. Bacteria, animals and plants have ribosomes

D. Protein synthesis cannot occur in free-floating ribosomes, only in ribosomes on the rough endoplasmic reticulum

<u>Question 3</u>: Which of the following correctly describes the stage of the protein secretory pathway shown below

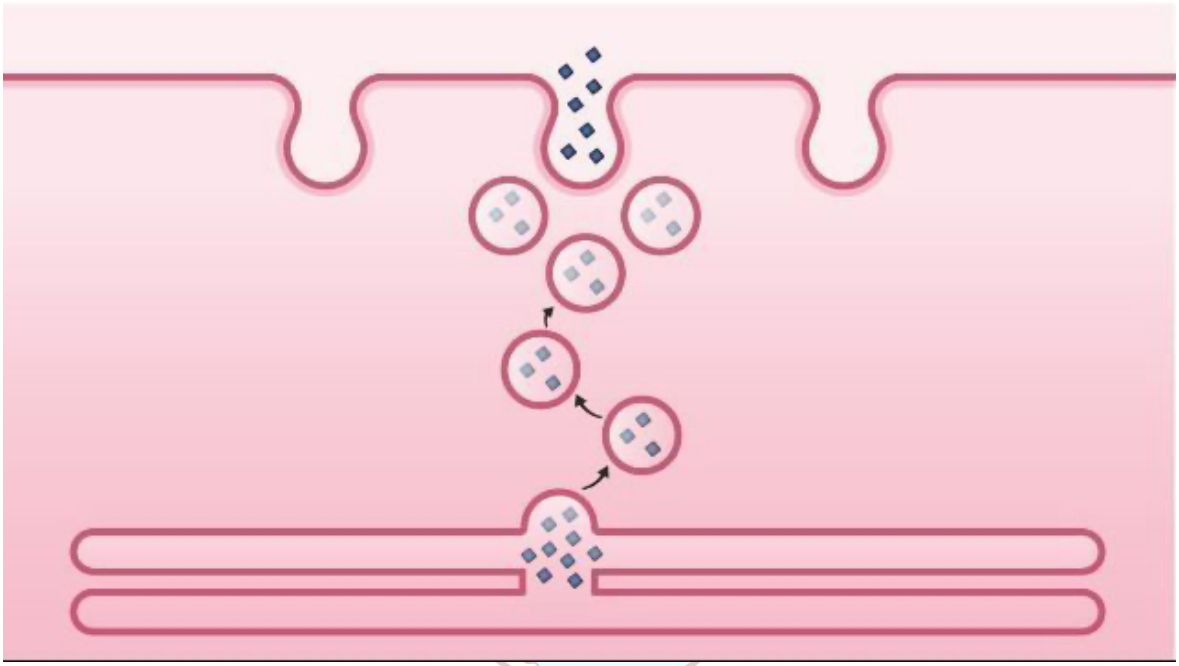

Image from https://www.technologynetworks.com/immunology/articles/endocytosis-and-exocytosis-differences-and-similarities-334059

A. Diffusion through the phospholipid bilayer

B. Packaging of the proteins by the Golgi body

C. Secretion of the proteins through exocytosis

D. Osmosis of the proteins across the cell membrane

Use the following information to answer questions 4, 5 and 6

VCE 3/4 Biology students decided to set up an experiment to determine the importance of the high SA:V ratio in cells. They used agar cubes of varying dimensions and coated them in a pH indicator. They then placed them in a solution of vinegar (note that vinegar has a low pH). The extent of diffusion of the vinegar into the agar cubes was measured through a colour change. The results of the experiment are included below.

Agar cube dimension (cm/side)	**Surface area (cm^2)**	**Volume (cm^3)**	**Percent diffusion (%)**
0.1	0.06	0.001	100
0.5	1.5	0.125	92
1	6	1	84

<u>Question 4:</u> What is the SA:V ratio of the agar cube with sides of 1cm?

A. 600:1

B. 60:1

C. 6:1

D. 3:1

Question 5: **The students concluded that cells must be very small to be compatible with life. Why is this?**

A. There is a smaller SA:V ratio, increasing the efficiency of ion movement

B. There is a larger SA:V ratio, allowing for cell to cell communication

C. There is a smaller SA:V ratio, increasing waste expulsion from cells

D. There is a larger SA:V ratio, promoting the movement of nutrients

Question 6: **Why did the agar cube with 1 cm sides have a smaller diffusion percentage compared to the agar cube with 0.5 cm sides?**

A. There is an inefficient movement of the vinegar into the 1 cm cube

B. It has a lower volume, therefore less space for the for the vinegar to enter the cube

C. It has a higher volume, therefore the movement of vinegar is faster but stops abruptly

D. None of the above

Question 7: **An athlete has been training hard for the next Olympics. 30 minutes into training, what energy source is the athlete's body likely to be using the most?**

A. Lipid stores in their adipose tissue

B. Glucose in their blood from their last meal

C. Glycogen stores

D. Protein

Question 8: **Human cells do not have a cell wall; however, plant and fungal cells are generally known to have cell walls. Which of the following is correct regarding cell walls?**

A. Cell walls provide structural integrity and help regulate the movement of ions

B. Cellulose, a type of starch, is a digestible component of plant cell walls that are important for human nutrition

C. Chitin is a polymer that is made of amino acid monomer units

D. Chitin and cellulose are polymers that make up different cell walls

Question 9: **Which of the following is false regarding eukaryotes and prokaryotes?**

A. Prokaryotes are chemically simple, whereas eukaryotes are chemically complex

B. Compartmentalisation is seen is eukaryotes, not prokaryotes

C. Protists are single-celled eukaryotes

D. The circular DNA of prokaryotes is arranged into chromosomes, similar to the linear DNA of eukaryotes

Question 10: **An image of a eukaryote is given below.**

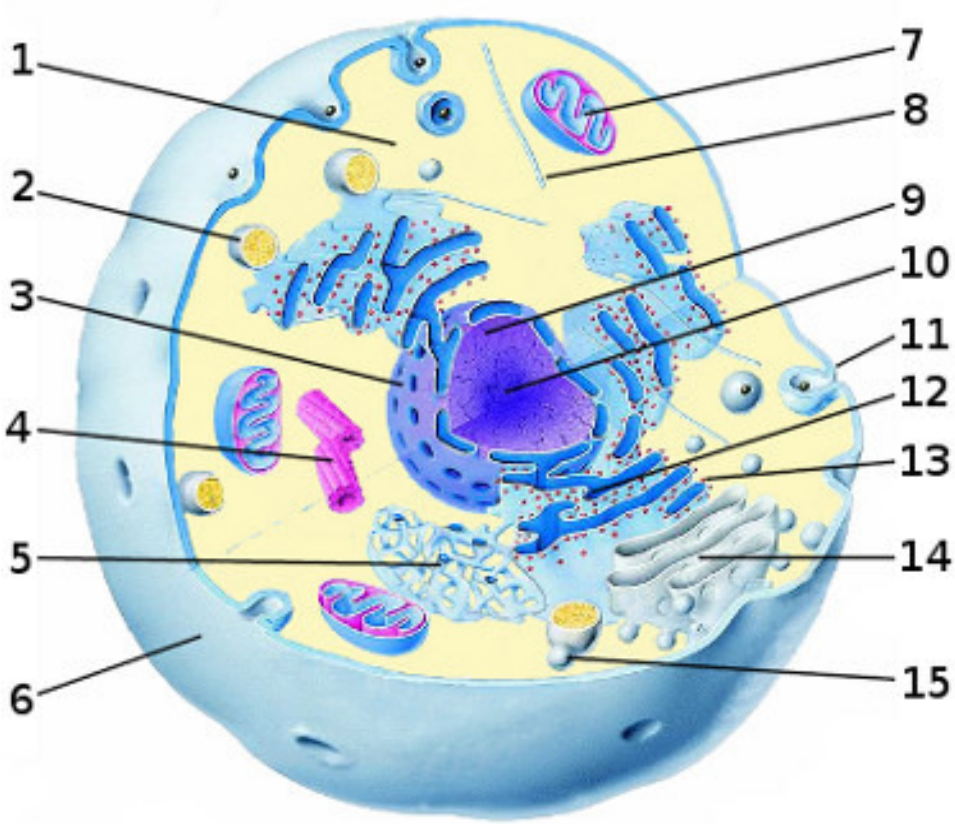

Image from https://www.free-anatomy-quiz.com/generalcell1.html

Select which structure is also found in prokaryotes.

A. 3

B. 6

C. 7

D. 14

Short Answer Questions (SAQs)

Instructions for SAQs:

Answer all questions in the spaces provided. Do not write outside the page borders. Any written text outside the borders will not be read.

Question 1: **[3 marks]**

Explain how the arrangement and composition of phospholipids create a semi-permeable membrane. (3 marks)

Question 2: **[4 marks]**

The secretion of certain proteins is highly regulated within the body in what is known as the regulated secretory pathway.

A. Give one reason for this regulation. (1 mark)

B. Insulin is a protein that is secreted by pancreatic beta cells, which allows for glucose (mostly from the diet) to be taken up into cells to use as energy. Given this information, give an example of a time cells may upregulate the secretion of insulin. (1 mark)

C. Describe the function of the Golgi complex in the pathway of insulin production. (2 marks)

Question 3: **[2 marks]**

Mitochondria have their own specific coenzymes, as do chloroplasts. These specialised coenzymes enable both mitochondria and chloroplasts to perform their function within the same plant cell.

A. What is the name given to the phenomenon that allows for different organelles to perform different functions in the same cell? (1 mark)

B. Mitochondria and chloroplasts are both vital organelles. What feature allows for maximal efficiency of reactions within these organelles? (1 mark)

Question 4: **[7 marks]**

Scientists want to observe cells and certain elements of cells.

A. State the correct type of microscopy, either light or electron, needed to view the following structures.

i. A cell in its entirety (1 mark)

ii. Mitochondria (1 mark)

B. The scientists observe a structure that automatically orients itself into two arranged layers in an aqueous environment. Describe one function of this structure. (1 mark)

C. The scientists observe a cell that has large vacuoles, a cell wall and displays turgidity. However, the cell has no chloroplasts. What could this cell be and why? (2 marks)

D. As humans age, their energy production decreases. Explain how their energy production decreases over time. Name the cellular structure involved. (2 marks)

Question 5: **[5 marks]**

An image of a cell has been provided below.

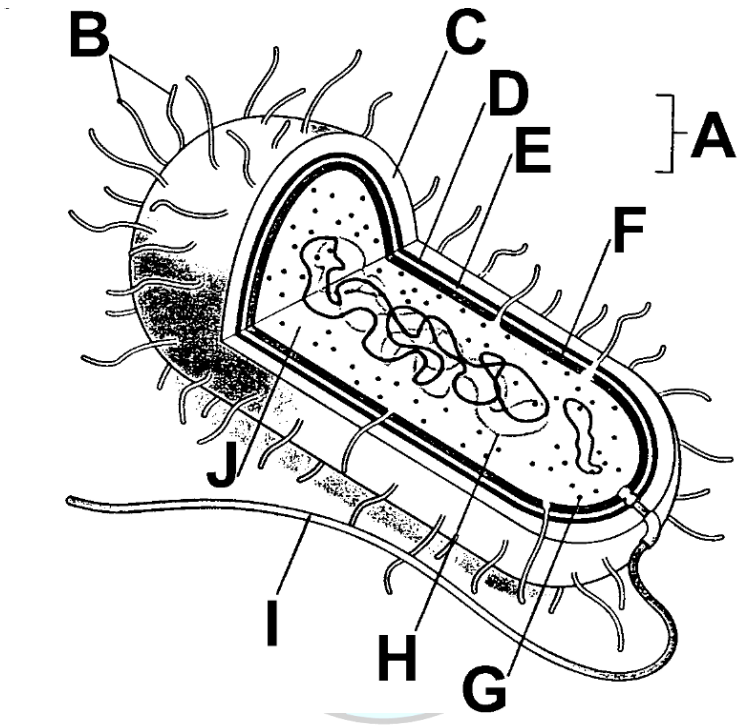

Image from https://www.easynotecards.com/notecard_set/71211

A. Justify what type of cell this is and include two reasons in your answer. Refer to the structures shown with both their name and corresponding labelled letter. (3 marks)

B. **A similar looking cell to what was observed in the diagram was observed under a microscope. It was found to have many ribosomes and mitochondria. Explain whether this type of cell is the same or different to the one in the diagram. (2 marks)**

Question 6: **[3 marks]**

Viruses are not considered living organisms. Justify why viruses are not considered living organisms. Refer to the characteristics of life in your answer. (3 marks)

Question 7: **[5 marks]**

A group of VCE Biology students want to investigate the characteristics of carbohydrates.

A. **Sketch a disaccharide molecule and label the joining bond with the specific bond type. (2 marks)**

B. **Give one example of a monomer found in polysaccharides. (1 mark)**

C. **Glycogen is the form of energy storage used in humans. Describe how the structure of glycogen supports the function provided. (2 marks)**

Question 8: **[3 marks]**

As many humans age over time, they develop fatty deposits in their blood vessels which can lead to heart disease later in life. The blood that travels through these blood vessels has a significant amount of water.

A. **State why these fatty deposits do not dissolve over time. (2 marks)**

B. **Provide one strategy to prevent heart disease. (1 mark)**

Question 9: **[3 marks]**

A student is examining multiple different cells. The results of their investigation is provided below.

	Mitochondria	Nucleus	Chloroplasts
Cell A	**Present**	**Present**	**Present**
Cell B	**Present**	**Present**	**Absent**
Cell C	**Absent**	**Absent**	**Absent**

Identify Cell A, B and C. (3 marks)

END OF TOPIC TEST