

Student Name: \_\_\_\_\_



# **BIOLOGY 2020**

## **Unit 3**

### **Key Topic Test 1 – Plasma Membranes**

Recommended writing time\*: 45 minutes

Total number of marks available: 45 marks

#### **QUESTION BOOK**

\* The recommended writing time is a guide to the time students should take to complete this test. Teachers may wish to alter this time and can do so at their own discretion.

**Conditions and restrictions**

- Students are permitted to bring into the room for this test: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the room for this test: blank sheets of paper and/or white out liquid/tape.
- No calculator is allowed in this test

**Materials supplied**

- Question and answer book of 9 pages.

**Instructions**

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

**Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic communication devices into the room for this test.**

**SECTION A – Multiple-choice questions**

**Instructions for Section A**

Select the response that is **correct** for the question. A correct answer scores 1; an incorrect answer scores 0. Marks are not deducted for incorrect answers. If more than 1 answer is completed for any question, no mark will be given.

**Question 1**

The fluid component of the plasma membrane is made up of

- A. a lipid bilayer with proteins molecules creating a rigid mosaic
- B. a flexible protein bilayer that has cholesterol molecules increasing fluidity
- C. a rigid bilayer of phospholipids containing flexible cholesterol molecules
- D. a flexible layer of phospholipids which proteins can move through

**Question 2**

The phospholipid molecule arranges itself into a bilayer because

- A. the molecule has two hydrophilic tails
- B. the heads are polar and hydrophilic, and the tails are non-polar and hydrophobic
- C. water is a polar molecule and like dissolves in like
- D. the heads contain lipids and fatty acid tails are phosphate based

**Question 3**

Sterols in the membrane of plant cells play an important role in decreasing flexibility and permeability of the membrane. In an animal cell the molecule that does this is

- A. transport proteins
- B. phospholipids
- C. cholesterol
- D. polar heads and non-polar tails

**Question 4**

The plasma membrane contains many different forms of proteins that have specific functions based on the three dimensional shape of the protein. Carrier proteins are one form of protein that are responsible for the transport of molecules across the phospholipid bilayer.

Carrier proteins are different from channel proteins in that

- A. carrier proteins change shape
- B. channel proteins are made from amino acids that are organised into nonpolar holes
- C. carrier proteins transport large proteins through endocytosis
- D. channel proteins transport large molecules while carrier proteins transport small molecules

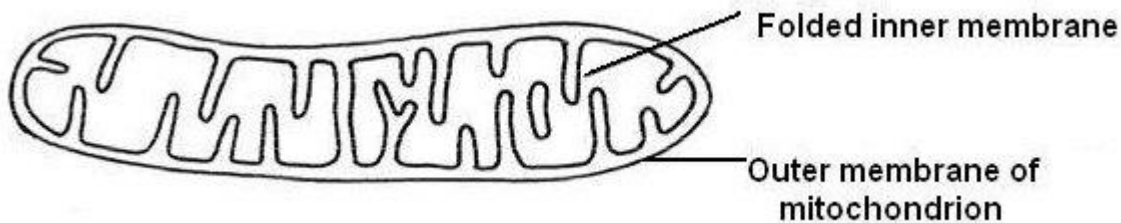
**Question 5**

Membranes are an important cellular semi permeable barrier that allows cells to control the movement of substances into and out of the cell or organelle. This barrier is effective because

- A. the membrane has polar and non-polar components that stop the movement of molecules
- B. the gaps in the membrane allow oxygen to leak in and out
- C. the membrane has recognition proteins that have carbohydrates attached to recognise molecules and facilitate entry
- D. hydrophilic heads stop the movement of water-soluble molecules and hydrophobic tails stop the movement of lipids into the cell forming an effective barrier

**Question 6**

Organelles are surrounded by a membrane in Eukaryotic cells. One such organelle is the mitochondria which is important for ATP production. Molecules important to mitochondrial function need to be moved into and out of the mitochondria. Water, pyruvate (a large molecule produced by the breakdown of glucose in glycolysis), oxygen, and carbon dioxide all need to be moved through the mitochondrial membranes



These molecules move into and out of the mitochondria via

- A. carrier molecules only
- B. carrier and channel proteins only
- C. carrier and channel proteins by diffusion through the phospholipid bilayer
- D. osmosis, diffusion and endocytosis

**Question 7**

If the membranes of the mitochondria were ruptured, the production of ATP would cease. This is because

- A. ATP production could not be controlled and would increase until the mitochondria ruptures
- B. the molecules required for ATP production could not be transported to the correct place
- C. the broken membrane would get in the way of ATP production
- D. the broken membrane would no longer have the proteins required for the ETC

### Question 8

Ions are essential for the functioning of various processes within cells. An example of this is found in neurons where sodium and potassium ions move across the membrane in so called sodium potassium pumps. These pumps require ATP. This is because

- A. sodium and potassium are ions which cannot cross the membrane
- B. the ions are being moved against a concentration gradient
- C. all carrier proteins require ATP
- D. the ions are large molecules that enter via endocytosis which requires ATP

### Question 9

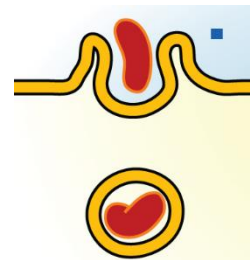
Transport of proteins out of a cell requires the following organelles

- A. ribosomes, rough endoplasmic reticulum, Golgi
- B. rough endoplasmic reticulum, Golgi, mitochondria, vesicles
- C. rough endoplasmic reticulum, exocytosis, Golgi, secretory vesicles
- D. ribosome, endoplasmic reticulum, Golgi , vacuoles

### Question 10

When a white blood cell, such a neutrophil, encounters a bacterial pathogen phagocytosis can occur. Phagocytosis is a form of active transport because

- A. vesicle formation requires ATP
- B. the cytoskeleton is broken down to form blebs
- C. the pathogen is larger than the white blood cell, so energy is needed to move the pathogen to the lymph node
- D. the enzymes that break down the pathogen require ATP to work



### Question 11

The role of the Golgi is

- A. protein synthesis and transport
- B. as a modification and packaging system for proteins
- C. protein transport and lipid manufacture
- D. the site of ribosome production

### Question 12

Transport vesicles are different to secretory vesicles as

- A. secretory vesicles move proteins to the Golgi for secretion
- B. transport vesicles move proteins to the rough endoplasmic reticulum for synthesis
- C. transport vesicles move secretory vesicles into position for exocytosis
- D. secretory vesicles are released from the Golgi while transport proteins are released from the endoplasmic reticulum

**Question 13**

Exocytosis is a type of transport that moves substances out of a cell. Exocytosis is required as

- A. proteins are too large to move through protein channels
- B. bacteria are too large to be moved into a white blood cell any other way
- C. large amounts of nutrient need to be imported out of the cell for proper functioning
- D. secretory vesicles are too small to be effective transport vessels

**Question 14**

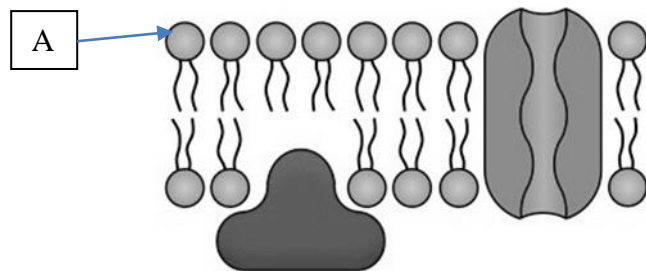
Some viruses enter a cell by hijacking the cell mediated endocytosis process. They do this by interacting with the receptors on the surface of the membrane and initiating endocytosis causing a vesicle to form around the virus. The organelle that would be involved with this method of entry is the

- A. Golgi
- B. smooth endoplasmic reticulum
- C. secretory vesicle
- D. mitochondria

**Question 15**

The part of the plasma membrane labelled A in the diagram is

- A. a fatty acid
- B. hydrophobic
- C. lipophobic
- D. nonpolar



**SECTION B - Short-answer questions**

**Instructions for Section B**  
Answer **all** questions in the space provided. Write using a blue or black pen.

**Question 1**

The definition of osmosis is the movement of water from an area of high concentration to an area of low concentration through a semi permeable membrane.

- a. In this context what does semi permeable mean?

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2 marks

- b. What properties of a membrane allow it to be semi permeable?

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2 marks

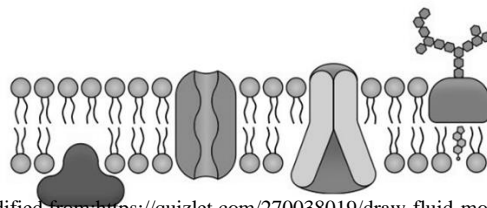
- c. In a saltwater solution water is constantly being lost to the environment due to the higher concentration of salt ions outside of the cell. How do cells move ions into the extracellular environment in this situation?

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2 marks

- d. The phospholipid bilayer shown below is described as fluid mosaic model. Name the structure that



Modified from <https://quizlet.com/270038019/draw-fluid-mosaic-model-diagram/>

- i) Acts to decrease fluidity and permeability

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- ii) Acts as a recognition molecule

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iii) Acts to move glucose into the cell

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iv) Acts to move ions down concentration gradient

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1 + 1 + 1 + 1 = 4 marks

Total 10 marks

**Question 2**

The semi permeable membrane controls the movement of molecules based on a variety of factors including size and polarity.

a. Describe how each of the molecules listed cross the semi permeable membrane

Type of Molecule	Example	Method of crossing membrane
Ions		
Large polar		
Small nonpolar		
Small polar		

8 marks

b. Proteins are very large molecules which cannot cross the plasma membrane by the methods described above. Name the process for moving proteins out of a cell and explain why mitochondria are involved in this type of transport

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2 marks

c. Engulfment of bacteria by white blood cells involves a specialised form of endocytosis. Name this process.

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1 mark

Total 11 marks



**Question 3**

When transporting a protein through a cell before undergoing exocytosis, there are several different organelles involved.

- a. Explain the difference between secretory vesicles and transport vesicles. Name the organelle involved in producing each one to transport proteins

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4 marks

- b. Name and provide the role for 3 organelles apart from the secretory and transport vesicles involved in protein transport out of a cell.

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3 marks

- c. Why does a protein need to be transported through a cell within a vesicle?

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2 marks

Total 9 marks

**END OF KEY TOPIC TEST**