**HERITAGE COLLEGE**

A CHRISTADELPHIAN SCHOOL

*ADELAIDE, AUSTRALIA*

STAGE 1 BIOLOGY

FORMATIVE SACE TEST

# TOPIC: MEMBRANE & TRANSPORT

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# TOPIC: CELL BIOLOGY

**Multiple Choice Answer Sheet** **Name:** _____

1. Show your answer to each question by drawing a bubble over the correct answer like this:

2. No marks can be awarded for a question that has more than one answer. If you change your mind, ensure that your final choice of answer is perfectly clear by crossing out your previous choice like this:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1** | J | K | L | M | **8** | J | K | L | M |
| **2** | J | K | L | M | **9** | J | K | L | M |
| **3** | J | K | L | M | **10** | J | K | L | M |
| **4** | J | K | L | M | **11** | J | K | L | M |
| **5** | J | K | L | M | **12** | J | K | L | M |
| **6** | J | K | L | M | **13** | J | K | L | M |
| **7** | J | K | L | M | | | | | |

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# TOPIC: MEMBRANE & TRANSPORT

**Name:** _____

**Section A: Multiple-Choice Questions (select the most correct answer)**

1. The following is not true of animal cells:

   J they have a defined nucleus
   K they produce their own energy
   L they have small temporary vacuoles
   M they have a phospholipid bi-layer enclosing them

2. Compared to Eukaryotic cells, prokaryotic cells

   J are often less complex.
   K are often much larger.
   L contain more DNA.
   M contain more organelles.

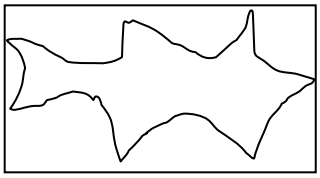
3. The following are products of cell respiration:

   J $C_6H_{12}O_6$; energy
   K $C_6H_{12}O_6$; $O_2$.
   L energy; $O_2$
   M energy; $H_20$; $CO_2$

4. Cellular respiration mainly occurs in the following organelle

   J Rough ER
   K chloroplast
   L mitochondria
   M ribosome

For questions 5-6 refer to the following diagram of a cell that has been placed in stressful conditions.



5. Which statement best describes this cell:

   J it has become turgid

   K it has become flaccid

   L no change has taken place

   M it will recover easily

6. This cell has most likely been placed in a

   J hypotonic solution

   K hypertonic solution

   L isotonic solution

   M lake of molten lava

7. The following is not an example of active transport

   J facilitated diffusion

   K endocytosis

   L exocytosis

   M ion pump

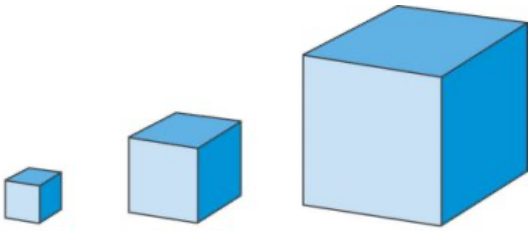
8. If the cubes represent plant cells, which cell(s) have the most useful surface area to volume ratio?

   J a)

   K b)

   L c)

   M a) and c) work out to be the same



a) b) c)

9. Useful energy in an ATP molecule is stored

   J in bonds between the phosphate groups

   K in bonds within the base *adenine*

   L in the electrical current it contains

   M in bonds between the sugar and base

10. In a phospholipid molecule the fatty acid ends are described as

    J hydrolytic

    K hydroponic

    L hydrophilic

    M hydrophobic

11. A channel molecule aids in

    J cellular respiration

    K cellular photosynthesis

    L cellular transport

    M cellular lysis

12. Which of the following types of molecules would you not likely find in a cell plasma membrane at any given point?

    J water

    K protein

    L lipids

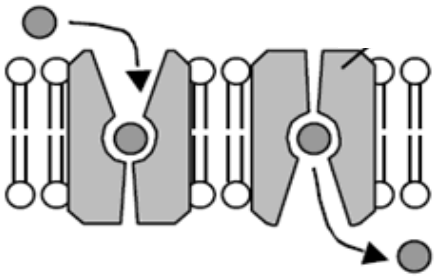
    M nucleic acids

**Section B: Short Answer**

1. White blood cells are often responsible for getting rid of harmful bacteria in your body. Explain clearly (with a diagram) how this illustrates phagocytosis.

(3)

2. Examine the following diagram.



a) What type of transport is shown here?

_____

(1)

b) Will this movement likely be related to concentration gradient? Explain.

_____

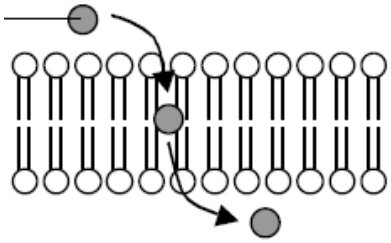
(2)

c) What type of molecule would you expect to need this type of transport?

_____

(1)

3. Examine the following diagram.



a) What type of transport is shown here?

_____

(1)

b) Will this movement likely be related to concentration gradient? Explain.

_____

(2)

c) What type of molecule would you expect to need this type of transport?

_____

(1)

4. Explain why we call our model of the cell membrane the 'FLUID MOSAIC' model?

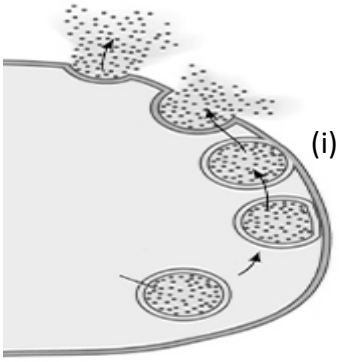
_____

_____

_____

(2)

5. Examine the diagram of a cell below (I have only included half of it in the diagram).




a) What is happening to the cell membrane at (i)?

_____

(1)

b) What type of transport is occurring here?

_____

(1)

c) Give one example in the human body where a certain type of cell would use this type of transport, and WHY?

_____

(2)

6. Draw a diagram that clearly includes the following: a) *phospholipid bi-layer; b) an ion pump transport protein; c) an Na+1 ion being moved; d) ATP and ADP involved in the transport*

**Section C: Extended Response**

*Write your answer on the answer sheet provided. You should spend about 12-15 minutes on this section, about 3-5 minutes planning and 9-10 minutes writing. An 'A' level performance will show a clear, well-expressed answer that is well organised, relevant to the question, and demonstrates a deep and broad level of understanding.*

1. Energy in the cell is made available in the form of a special molecule that acts like a 'rechargeable battery'.

   **Describe** (in words only):

   - What this molecule is, and how it is able to deliver 'energy' for use around the cell;
   - The process of how it becomes 'recharged' in the cell so it can be used again.

(15)

*Numeric marking breakdown:*

*/3 marks = neatness; communication*

*/12 marks = content; 2 marks for a well stated point*

**Extended Response Answer Sheet**

Stage 1 Biology – Formative Test

# Membrane & Transport - ANSWERS

**Section A – MC**

| | |
|---|---|
| 1 – K | 2 – J |
| 3 – M | 4 – L |
| 5 – K | 6 – K |
| 7 – J | 8 – J |
| 9 – J | 10 – M |
| 11 – L | 12 – M |

**Section B – Short Answer**

1 –
You should be drawing a picture of a white blood cell with its membrane forming around the smaller bacteria, ready to wrap totally around it and an engulf it in a vesicle made from its own membrane. This vesicle is then inside the white blood cell. *The cell membrane itself is moved and manipulated by the cytoskeleton attaching to it and pulling it in different directions to change its shape.

2 – a
Passive – facilitated diffusion

2 – b
Yes – the substance can only move from and area of high concentration to an area of low concentration since there is no ATP being used to help it go against a gradient.

2 – c
A type of molecule that was either too big or had chemical properties that prevented it from moving through the phospholipid bi-layer on its own. Eg. Water.

3 – a
Passive transport – simple diffusion

3 – b
Yes – the substance can only move from and area of high concentration to an area of low concentration since there is no ATP being used to help it go against a gradient.

3 – c
A small molecule that does not have an overall charge to it – making it able to simply pass through the phospholipid molecules. Eg. Dissolved gasses like oxygen or carbon dioxide

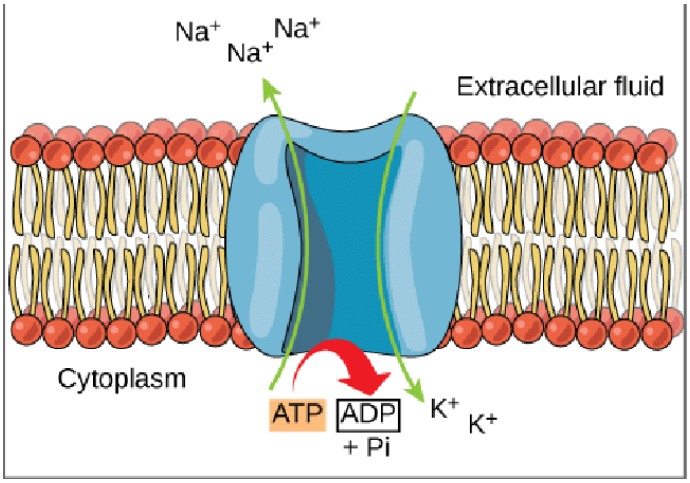
4 –
Fluid = the membrane is very flexible and dynamic as it can change shape and composition
Mosaic = it is made up from a combination of many different molecules packed together

5 – a
The cell membrane is fusing with the membrane of the vesicle that has approached the edge of the inside of the cell.

5 – b
Active transport; exocytosis

5 – c
Any cell in the human body that is responsible for releasing chemicals that it has made into the blood stream – eg. Cells that produce hormones, etc.  to be delivered to other parts of the body.

6 –
Something similar to this diagram (ignore the K+ ions):



**Section C – Extended Response**

*Tips!*

- *Do not give introductions and conclusions in these types of questions – just get right into answering them*
- *Give a new paragraph for each dot point*
- *Answer the question in the order it is given*

**Model Answer:**

ATP (Adenosine triphosphate) is a special molecule found in all cells which can be described as the energy currency of the cell. It is made up of a ribose sugar, a base (adenine), and three phosphate groups bonded to each other. There is useful energy stored in the bond between the last two phosphate groups. When the last phosphate group is 'broken' off a small amount of energy is released which is then harnessed by the cell to do 'work' – such as pumping some molecule out of the cell against a concentration gradient. ATP molecules can moved all over the cell in order to provide the cell with small 'packets' of useful energy wherever they are needed to do work.

When one ATP molecule breaks off its last phosphate to provide this energy, it becomes ADP (adenosine diphosphate). In order to be used again in the cell, it must have a phosphate added back on. Cellular respiration in the mitchondria is the process that recharges ADP to ATP by adding a phosphate back on, so it can be used again by the cell. Energy from the glucose in cellular respiration is stored in the bond between the last two phosphates of ATP. In this way ATP is like a rechargeable battery – when the phosphate is broken off and releases energy for use by the cell, it can then be recharged for use again and again.