CHAPTER 2: CELL STRUCTURE AND FUNCTIONS

LEARNING OUTCOMES

2.1 Prokaryotic and eukaryotic cells

a) State the three principles of cell theory
b) Explain the structures of prokaryotic and eukaryotic cells
c) Illustrate and compare the structures of prokaryotic and eukaryotic cells (plant & animal cells)

2.2 Structures & Functions: Cell Membrane and Organelles

a) Show the detailed structures of typical plant and animal cells and state the organelles present
b) Explain the structures and functions of the following organelles:
c) nucleus, rough endoplasmic reticulum @ ER, smooth ER, Golgi body, lysosome, ribosome, mitochondria, chloroplast and centriole
d) Show the structure of plasma membrane based on Fluid Mosaic Model
e) Explain the structure of the plasma membrane and the functions of each of its components

2.3 Cells are grouped into tissues

a) Describe animal tissues and plant tissues
b) Explain the following types of cells and tissues
   i. Animal cells and tissues:
      Epithelial cells (simple squamous, simple cuboidal, simple columnar, stratified squamous); Nerve cell (motor neuron), Muscle cells (smooth, striated, cardiac); Connective tissues (compact bone, hyaline cartilage, blood)

   ii. Plant cells and tissues:
      Meristem, parenchyma, collenchyma, sclerenchyma, xylem, phloem

2.4 Cell Transport

a) Overview the various transport mechanisms across the membrane
b) Explain the various transport mechanisms across the membrane
   i. Passive transport:
      Simple diffusion, facilitated diffusion, osmosis

   ii. Active transport:
      Sodium-potassium pump; Bulk transport (endocytosis, exocytosis)

STRUCTURED QUESTIONS

1. **FIGURE 1** shows the prokaryotic cell.

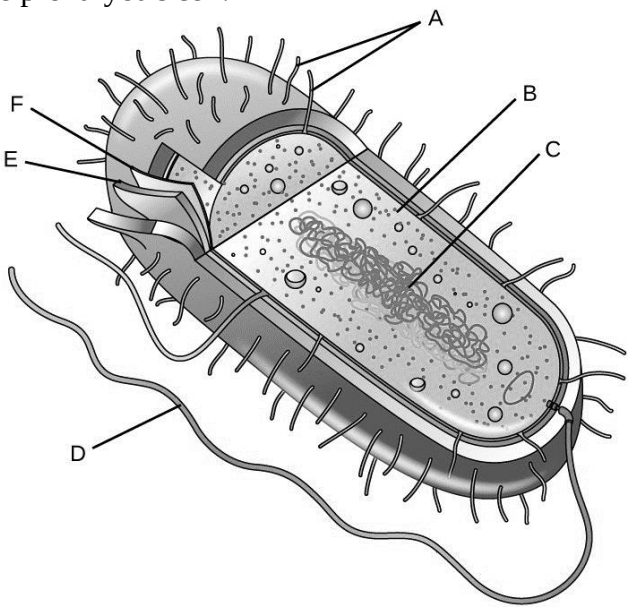

FIGURE 1

a) Name the structure B, C, E and F.

[3 *marks*]

_____

_____

_____

b) State the function of structure A and D.

[2 *marks*]

_____

_____

c) How does the structure E differ with plant.

[1 *mark*]

_____

d) List the differences between prokaryotic and eukaryotic cells

[5 *marks*]

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2. **FIGURE 2** shows two different types of eukaryotic cells.

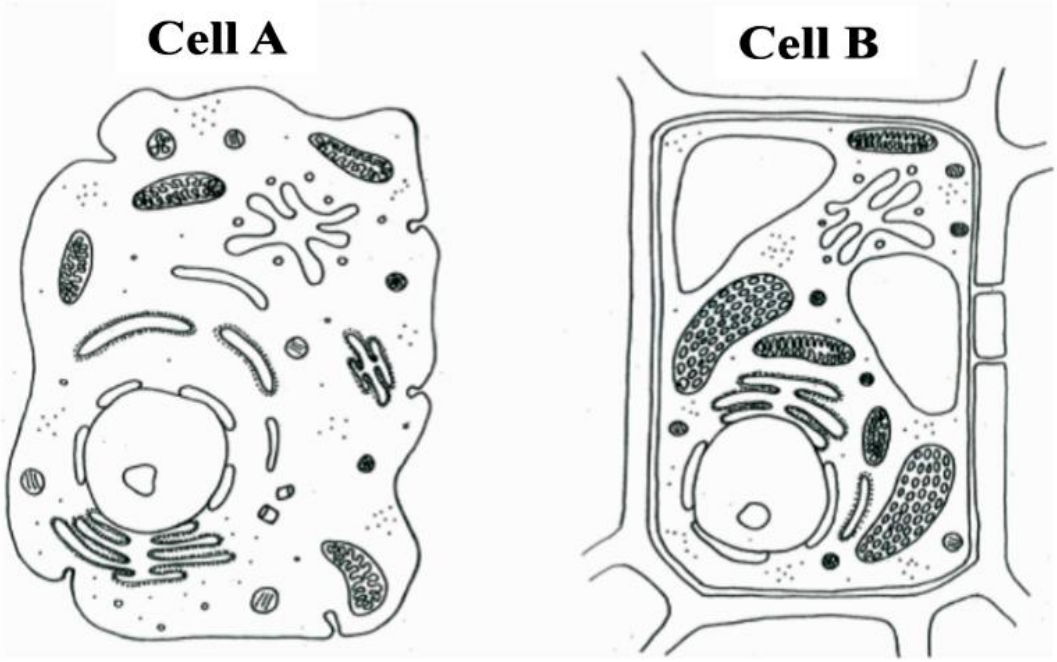

FIGURE 2

a) Which cell represents a plant cell? Give **TWO** reasons for your answer.

[*3 marks*]

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_____

_____

b) With the help of the above diagram, list out the differences between plant and animal cells.

[5 *marks*]

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3. **FIGURE 3** below shows the structure of an animal cell.

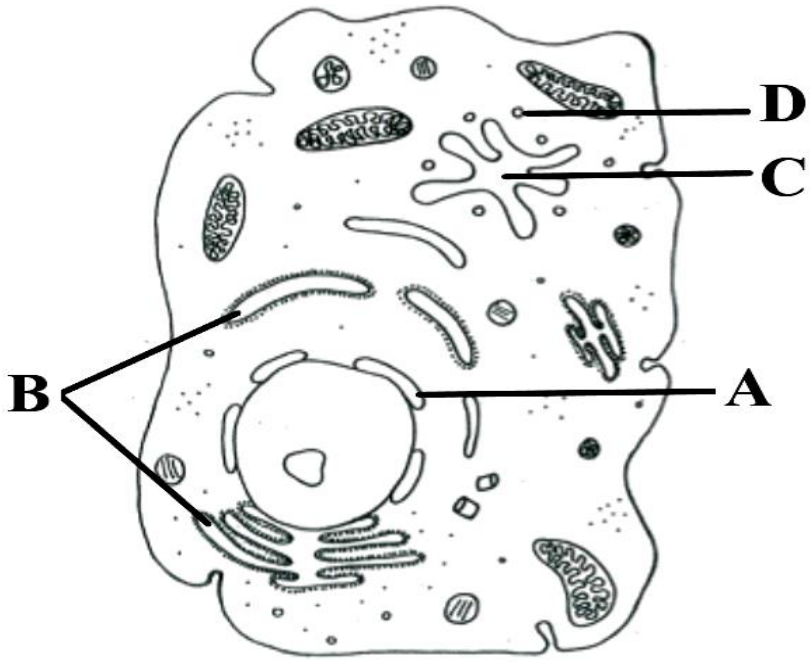

FIGURE 3

a) Identify structures **A, B and C**

[3 *marks*]

_____

_____

_____

b) What is the relationship between:

i. Ribosomes and structure **B**?

[2 *marks*]

_____

_____

ii. Structure **B** and **C** in a protein-secreting cell?

[3 *marks*]

_____

_____

_____

c) State one function of the centriole and lysosome found in animal cells.

[2 *marks*]

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4. **FIGURE 4** shows the plasma membrane model.

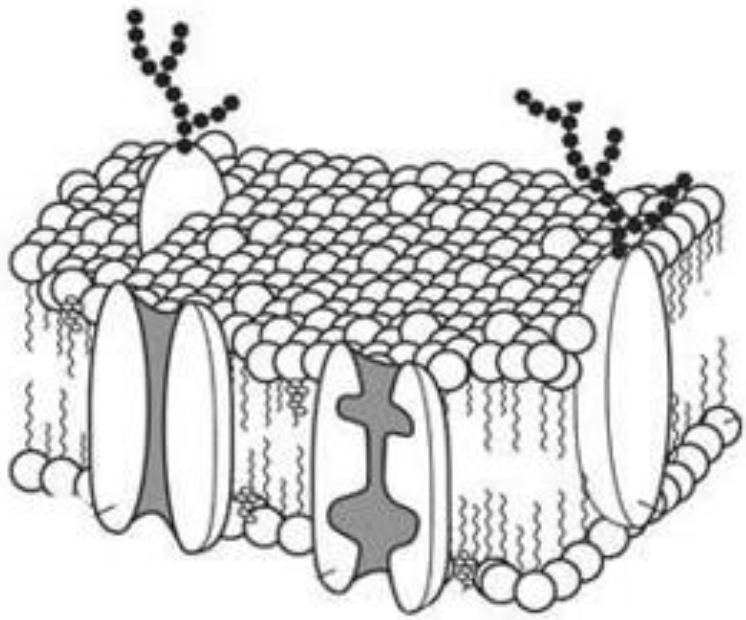

FIGURE 4

a) Name the model in **FIGURE 4**

[1 *mark*]

_____

b) Explain why the model is described as in (a)

[2 *marks*]

_____

_____

c) Explain how the phospholipid molecules form a double layer in a cell

[3 *marks*]

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_____

_____

d) Explain the important of the hydrophobic areas in the membrane.

[3 *marks*]

_____

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e) Cell membranes also contain protein molecules. State FOUR function of these protein molecules.

[4 *marks*]

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5. **FIGURE 5** shows an organelle

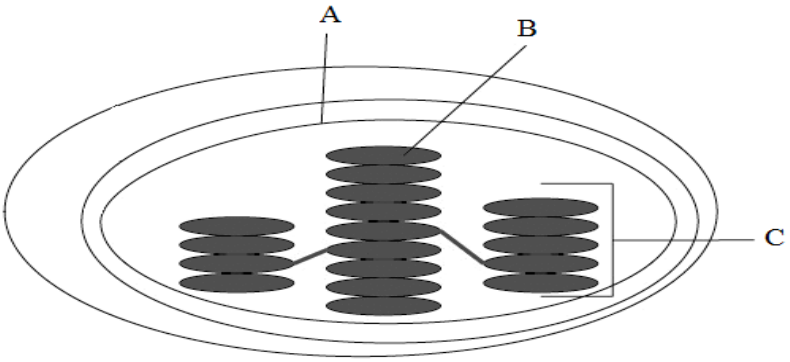

FIGURE 5

a) Name the structures labeled A, B and C

[3 *marks*]

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_____

_____

a) State the function of the organelles.

[1 *mark*]

_____

b) Give **TWO** structures that the above organelle and mitochondria have in common.

[2 *marks*]

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6. **FIGURE6** shows the repeating units of compact bone.

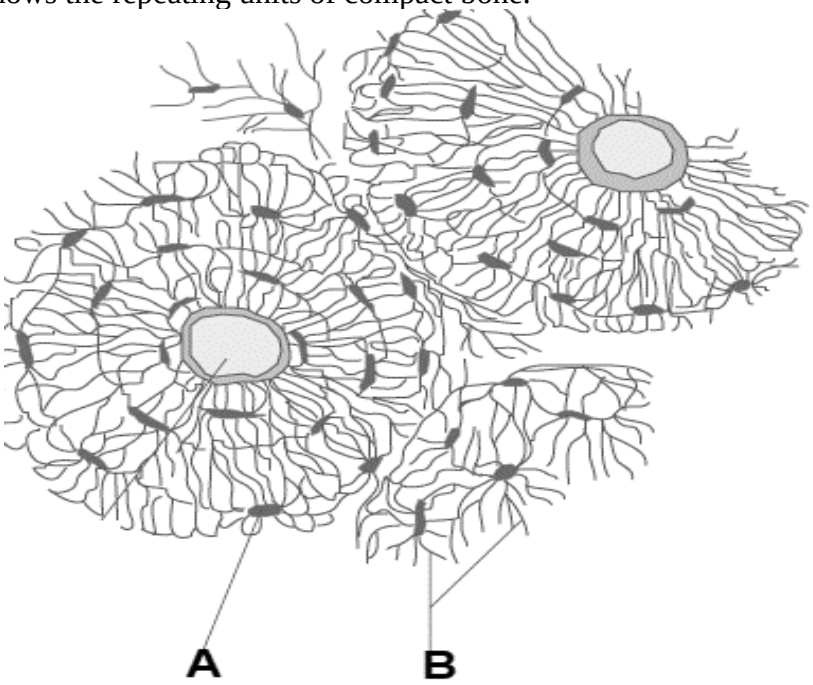

FIGURE 6

a) Name the structures labelled A and B.

[2 *marks*]

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_____

b) What is the name of the repeating units of compact bone?

[1 *mark*]

_____

c) Give **THREE** functions of bones.

[3 *marks*]

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7. **FIGURE 7** shows a type of muscle tissue.

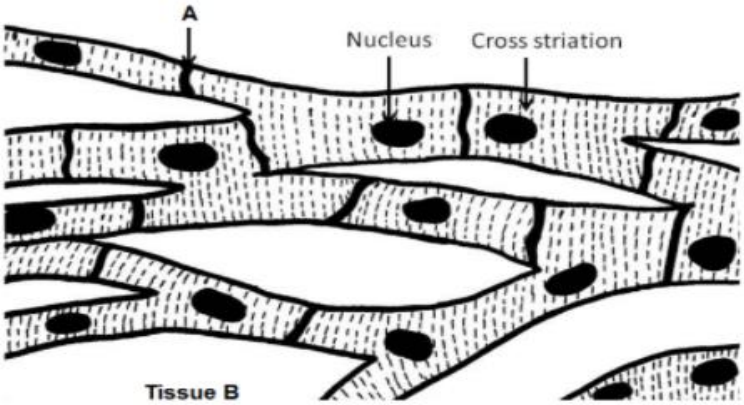

FIGURE 7

a) Identify tissue B. Give your reason.

[2 *marks*]

_____

_____

b) Name the structure labelled A.

[1 *mark*]

_____

c) Give **THREE** differences between tissue B and muscle tissue lining the small intestine.

[3 *marks*]

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8**. FIGURE 8** shows the longitudinal sections of two supporting tissues in plants.

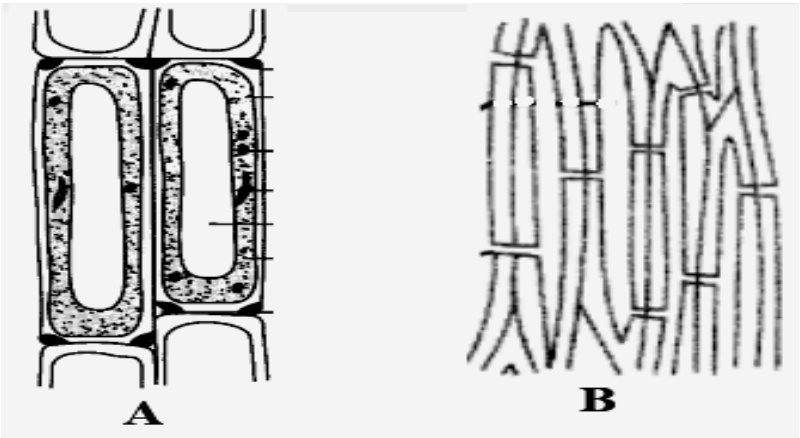

FIGURE 8

a) Name tissue **A** and **B**.

[*2 marks*]

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_____

b) Suggest **TWO** reasons why tissue A is more suitable to act as supporting tissue in petioles and midrib of leaves of herbaceous plants.

[*2 marks*]

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c) Differentiate the structures B with parenchyma tissues.

[3 *marks*]

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9. **FIGURE 9** shows an animal cell and a plant cell immersed in hypertonic solutions.

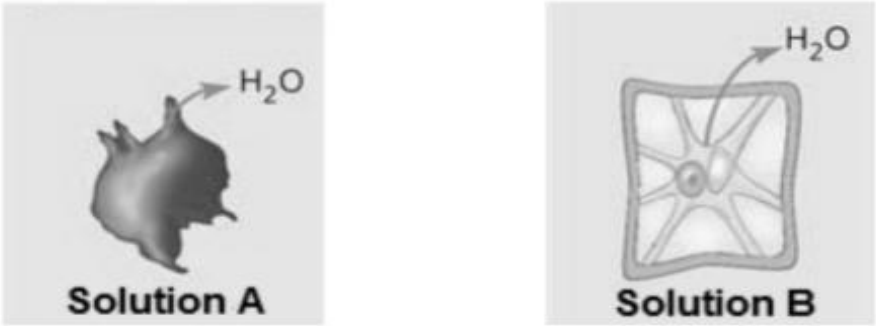

FIGURE 9

a) Define osmosis

[2 *marks*]

_____

_____

b) By using specific terms, describe what happen to animal cell and plant cell in the solution above.

[2 *marks*]

_____

_____

c) Before immersed in the solution, the plant cell has solute potential -2200 kPa and pressure potential 1000 kPa while solution B has water potential -1800 kPa.

i. Calculate the water potential of the plant cell.

[2 *marks*]

ii. Calculate the water potential at equilibrium between plant cell and solution B.

[2 *marks*]

10. **FIGURE 10** shows transport mechanism of molecules across plasma membrane.

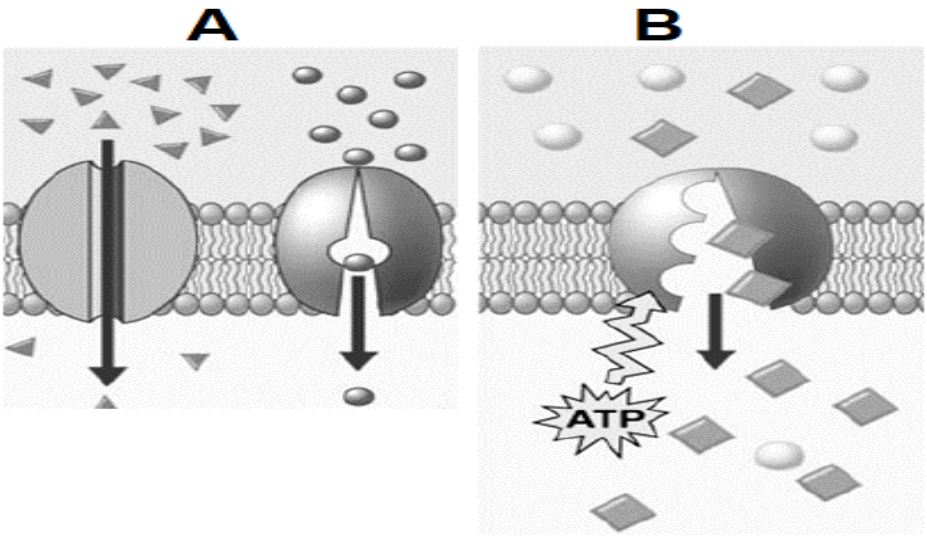

FIGURE 10

a) Name the mechanism A and B.

[2 *marks*]

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b) Compare between mechanism B with facilitated diffusion

[3 *marks*]

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c) Explain the mechanism of active transport based on sodium potassium pump.

[6 *marks*]