BIOLOGY

PERFECT

SCORE

MODULE

FORM 4

NAME: _______________________________________
FORM: _______________________________________
2.1 Cell Structure and Function

2.2 Cell Organisation

2.3 Appreciating the Uniqueness of the Cell

### Quick Notes & Revisions

<table>
<thead>
<tr>
<th>Organelles</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nucleolus</td>
<td></td>
</tr>
<tr>
<td>2. Nucleus</td>
<td></td>
</tr>
<tr>
<td>3. Ribosomes</td>
<td></td>
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<tr>
<td>4. Vesicles</td>
<td></td>
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<tr>
<td>5. Rough Endoplasmic Reticulum</td>
<td></td>
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<tr>
<td>6. Golgi apparatus</td>
<td></td>
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<tr>
<td>7. Smooth Endoplasmic Reticulum</td>
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<tr>
<td>8. Mitochondrion</td>
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<tr>
<td>9. Vacuole</td>
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<td>10. Cytoplasm</td>
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<td>11. Lysosome</td>
<td></td>
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<tr>
<td>12. Centriole</td>
<td></td>
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<tr>
<td>13. Plasma membrane</td>
<td></td>
</tr>
</tbody>
</table>
Comparing & Contrasting Animal Cells and Plant Cells

Formation of Interstitial Fluid

HOMEOSTASIS

<table>
<thead>
<tr>
<th>Maintenance of a steady state in the internal environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>The steady state is the optimum level for all body functions</td>
</tr>
<tr>
<td>Organ systems interact with one another to maintain a stable internal environment</td>
</tr>
</tbody>
</table>
**Homeostasis and temperature control**

- **Body temperature rises above normal**
  - Nervous system signals dermal blood vessels to dilate and sweat glands to secrete
  - Body heat is lost to its surroundings

- **Body temperature drops below normal**
  - Nervous system signals dermal blood vessels to constrict and sweat glands to remain inactive
  - Body heat is conserved

**Hypothalamic set point**
- Normal body temperature: 37°C (98.6°F)
- If body temperature continues to drop, nervous system signals muscles to contract involuntarily
- Muscle activity generates body heat
- Body temperature drops toward normal
- Body temperature rises toward normal
- Body heat is conserved
OBJECTIVES QUESTIONS

1. Diagram shows an organelle of a cell.

Which of the following processes occurs in this organelle?
A Photosynthesis
B Synthesis of protein
C Synthesis of enzyme
D Generation of energy

2. The following information refers to organelle M.

- Contain hydrolytic enzymes
- Digest complex organic molecule and eliminate worn out organelle

What is organelle M?
A Lysosome
B Nucleus
C Golgi apparatus
D Endoplasmic reticulum

3. Diagram shows structure X.

Which of the following organelles contains structure X?
A Nucleus
B Ribosomes
C Mitochondria
D Golgi apparatus

4. Which of the following structures is only found in animal cells?
A Plasma membrane
B Chloroplast
C Endoplasmic reticulum
D Centriole

5. Diagram shows four levels of cell organisation.

Which is the level of the blood in the Diagram?
A P
B Q
C R
D S

6. A group of tissues with specific function forms P.

Which of the following can be represented by P?
A Tendon
B Heart
C Blood
D Neurone

7. Which of the following is a tissue?
A Skin
B Flower
C Blood
D Leaf

8. Diagram shows organelle in a cell.

What is the organelle?
A Chloroplast
B Mitochondria
C Golgi apparatus
D Rough endoplasmic reticulum
9. Diagram shows an animal muscle tissue.

Which of the following is the function of the muscle tissue when it contracts?
A. Moves the bones
B. Pumps blood to all parts of the body
C. Detects stimulus and transmits impulse
D. Peristaltic movement along the digestive tract

10. Diagram shows a plant cell.

What is organelle L?
A. Ribosome
B. Golgi body
C. Rough endoplasmic reticulum
D. Smooth endoplasmic reticulum

11. Diagram shows the structure of rough endoplasmic reticulum.

What is the function of the ribosomes?
A. Synthesis of lipids
B. Synthesis of proteins
C. Production of ATP
D. Transport of protein

12. The following information refers to organelle P.

- Consists of two layers of membrane
- The inner membrane folded to form cristae

13. Which of the following cells have a high density of mitochondria?
I. Sperm cells
II. Flight muscle cells in birds and insects
III. Palisade mesophyll cell
IV. Liver cell
A. I and II only
B. I, II and III only
C. II and III only
D. I, II and IV only

14. The following information are features of an organelle in a cell.

- Spherical or oblong shaped
- Smooth outer membrane and folded inner membrane

Which of the following organelle has features as stated above?
A. Vacuole
B. Nucleus
C. Chloroplast
D. Mitochondria

15. Diagram shows two cells, X and Y, which are stained with dilute iodine solution.

Which of the following explains why cell Y does not possess blue-black structure when it stained with iodine solution?
A Cell Y does not possess centrioles
B Cell Y does not possess chloroplasts
C Cell Y does not possess plasma membrane
D Cell Y does not possess nucleus and cytoplasm

16. Diagram shows an animal cell

What are P, Q and R?

<table>
<thead>
<tr>
<th>P</th>
<th>Q</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Chloroplast</td>
<td>Rough endoplasmic reticulum</td>
</tr>
<tr>
<td>B</td>
<td>Nucleus</td>
<td>Mitochondrion</td>
</tr>
<tr>
<td>C</td>
<td>Rough endoplasmic reticulum</td>
<td>Mitochondrion</td>
</tr>
<tr>
<td>D</td>
<td>Mitochondrion</td>
<td>Nucleus</td>
</tr>
</tbody>
</table>

17. Which organelle is responsible for modifying proteins to extracellular enzymes?
A Mitochondrion
B Rough endoplasmic reticulum
C Golgi apparatus
D Smooth endoplasmic reticulum

18. Pancreatic cells secrete hormones. Which organelle is found in high density in pancreatic cells?
A Mitochondrion
B Lysosome
C Golgi apparatus
D Smooth endoplasmic reticulum

19. Diagram shows organelle P in a plant cell.

What is the function of P?
A Store excreted substances
B Store product of photosynthesis
C Store dissolved oxygen
D Store water and minerals

20. Figure shows structure of an animal cell.

Choose the correct match.

<table>
<thead>
<tr>
<th>Organelle</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A P</td>
<td>Synthesizing protein</td>
</tr>
<tr>
<td>B Q</td>
<td>Generating energy</td>
</tr>
<tr>
<td>C R</td>
<td>Transporting protein to other part of the cell</td>
</tr>
<tr>
<td>D S</td>
<td>Modifying synthesized protein</td>
</tr>
</tbody>
</table>

21. Diagram shows five different cells observed under a microscope.

Which of the cells are animal cells?
A K, L and M
B J, K and N
C J, K and M
D L, M and N
22. Which of the following cells involved in human immunity system?

- [A] T-Cell
- [B] B-Cell
- [C] Macrophage
- [D] Red blood cell

23. Which cells are involved in the transport of water?

- [A] Tubules
- [B] Nephrons
- [C] Collecting ducts
- [D] Bowman's capsule

24. The following information shows the organs in human body.

- [●] Oesophagus
- [●] Stomach
- [●] Small intestine

Which system consists of the organ?

- [A] Excretory system
- [B] Digestive system
- [C] Reproductive system
- [D] Respiratory system

25. Diagram shows a cross section of an organ in human.

Which of the following is main function of the organ?

1. Osmoregulation
2. Regulating the body temperature
3. Regulating the blood glucose level
4. Excretory organ

- [A] I and II
- [B] I and III
- [C] II and IV
- [D] III and IV

26. Diagram shows a blood test conducted by Mr. Ahmad.

If Mr. Ahmad undergoes the test 30 minutes after taking breakfast, predict the results of his blood test.

- [A] The blood glucose level is maintained constant
- [B] The blood glucose level will decrease
- [C] The blood glucose level will increase
- [D] Glucagon will stimulate to convert glycogen into glucose
STRUCTURE QUESTIONS

1. **Diagram 1** shows one type of cell which is observed under electron microscope.

   ![Diagram 1](image)

   (a)(i) Name structure labelled P and Q. [2 marks]
   
   P: ..............................................................................................................................
   
   Q: ..............................................................................................................................

   (ii) P and Q involve in enzyme synthesis process. Describe the role of P and Q in the process. [3 marks]

   ........................................................................................................................................
   
   ........................................................................................................................................
   
   ........................................................................................................................................

   (b)(i) Another student observed an onion epidermis cell under the light microscope. Draw a labelled diagram of the cell that can be observed [2 marks]

   ![Diagram](image)

   (ii) State one difference between the structure of cell in **Diagram 1** and cell that can be observed in (b)(i). [1 mark]

   ........................................................................................................................................
(c) Structure R is removed from the cell. Explain what happen to the growth of the cell. [2 marks]

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(d) Explain why meristematic cell has abundant of organelle S compare to the cheek cell. [2 marks]

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2. **Diagram 2.1** shows organelles Q, R and S that are found in a plant cell.

(a)(i) Name R. [1 mark]

………………………………………………………………………………………………

(ii) State the function of organelles Q and S. [2 marks]

Q: ……………………………………………………………………………………………

S: ……………………………………………………………………………………………
(b)(i) Name the part where organelles Q are abundantly found in plant. [1 mark]

(ii) Explain the role of organelle Q to the plant. [3 marks]

(c) Diagram 2.2 shows four levels of cell organisation in plant

(i) Complete Table 1 by naming Level 2 and Level 3. [2 marks]

<table>
<thead>
<tr>
<th>Level</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cells</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>System</td>
</tr>
</tbody>
</table>

Table 1

(ii) The cells undergo process X to become specific cells that perform a certain function. Name process X. [1 mark]

(iii) What is the function of the structure in level 2? [2 marks]
3. **Diagram 3** shows the cell organisation in human system.

![Diagram 3](image)

(a) Name cell P and tissue Q. \([2 \text{ marks}]\)

- Cell P: ………………………………………………………………………………………
- Tissue Q: ………………………………………………………………………………………

(b) State one function of tissue P and Q \([2 \text{ marks}]\)

- Tissue P: ………………………………………………………………………………………
- Tissue Q: ………………………………………………………………………………………

(c) Based on Diagram 3, explain the organisation and function of a stomach. \([2 \text{ marks}]\)

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(d)(i) The structure in level R is one of the human body systems. Name the system. \([1 \text{ mark}]\)

………………………………………………………………………………………………
(ii) State one function of the system in 1(d)(i). [1 mark]
…………………………………………………………………………………………………………………………………………………………

(iii) State two other organs which form the system in level R [2 marks]
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(e) Gastric glands produce hydrochloric acid. Describe the role of hydrochloric acid in the chemical process that occurs in the stomach. [2 marks]
…………………………………………………………………………………………………………………………………………………………

4. Diagram 4 shows human’s cheek cell observed through an electron microscope. K and L are the organelles in the pancreatic cell while structure S can be found in the nucleus of the cell.

![Diagram 4](image)

(a)(i) Name the structure labelled K and L. [2 marks]
K : …………………………………………………………………………………………………………………………………………………
L : …………………………………………………………………………………………………………………………………………………

(ii) Structure S are made up of DNA molecules. Draw and label the basic unit of DNA in the space provided [2 marks]
(iii) Structure S is an important structure that carries genetic information.
What is structure S? [1 mark]

(b) Explain how organelles K and L are involved in synthesising specific extracellular enzyme. [3 marks]

(c) Exposure to radiation will cause the gene mutation in the pancreatic cell. Explain how this would affect the digestion of polypeptide in the duodenum. [3 marks]
ESSAY QUESTIONS

1(a) **Diagram 1.1** shows the asexual reproduction carried out by *Amoeba sp.*

![Diagram 1.1](image)

Describe the process shown in **Diagram 1.1** [4 marks]

(b) *Amoeba sp.* is a unicellular organism which lives in fresh water environment. Although *Amoeba sp.* is made up of only a single cell, it can perform all living processes.

Explain the living process that enable *Amoeba sp.* to survive in fresh water which is hypotonic to the cytoplasmic fluid of *Amoeba sp.* [6 marks]

(c) **Diagram 1.2** shows a human organ which is involved in regulating body temperature.

![Diagram 1.2](image)

Based on **Diagram 1.2**, explain how the animal tissues are organised to form the organ in **Diagram 1.2** and their roles in regulating body temperature during a hot day. [10 marks]
2. **Diagram 2.1** shows negative feedback mechanism in a regulation of blood sugar level.

![Diagram 2.1](image)

(a)(i) Based on **Diagram 2.1**, explain briefly the meaning of negative feedback mechanism. [2 marks]

(ii) Describe how hormone X and hormone Y regulate the glucose. [5 marks]
3 Movement of Substances across the Plasma Membrane

3.1 Movement of Substances across the Plasma Membrane

3.2 Movement of Substances across the Plasma Membrane in Everyday Life

3.3 Appreciating the Movement of Substances across the Plasma Membrane
OBJECTIVES QUESTIONS

1. Distilled water diffuses into a potato strip and causes it to increases in mass. What is the process involved?
   A Facilitated diffusion
   B Simple diffusion
   C Active transport
   D Osmosis

2. Diagram shows a substance moves across the phospholipid bilayer of a plasma membrane. What is the substance?
   A Oxygen
   B Glucose
   C Sodium ion
   D Amino acid

3. Diagram shows the structure of a plasma membrane. Which structure A, B, C and D, enable vitamin E can pass through it?

4. Which is the process involving the movement of calcium ion from soil into root hair of a plant?
   A Osmosis
   B Simple diffusion
   C Active transport
   D Facilitated diffusion

5. Diagram shows the movement of molecule M across the plasma membrane through process X. What is process X?
   A Osmosis
   B Simple diffusion
   C Active transport
   D Facilitated diffusion

6. Diagram shows the movement of molecule X across the plasma membrane through process Y. What is process Y?
   A Osmosis
   B Simple diffusion
   C Active transport
   D Facilitated diffusion

7. Diagram shows the structure of the plasma membrane based on Fluid Mosaic Model. What is X?
   A Carrier protein
   B Pore protein
   C Phospholipid
   D Glycoprotein
8. What is the condition of the solution that has higher concentration of water compared to other solution?
   A Hypotonic solution
   B Hypertonic solution
   C Isotonic solution
   D Concentrated solution

9. The cucumber slices are immersed in 0.1% sucrose solution. After 3 hours, the cucumber slices are found to be turgid and hard. Identify which of the following statements explains this phenomenon.
   A The cucumber cell wall prevents it from shrinking
   B The cell sap is hypotonic towards the sucrose solution
   C The high concentration of the cell sap in the vacuole causes water to diffuse in
   D The cell wall of cucumber allows the sucrose molecules to diffuse into the cell

10. Diagram shows the apparatus set up that causes process X to occur. What is process X?
    A Osmosis
    B Plasmolysis
    C Simple diffusion
    D Facilitated diffusion

11. Diagram shows the condition of plant cell that was first immersed in 20% sucrose solution for 30 minutes and then in distilled water for 30 minutes. Which of the correct sequence of the changes in the cell?
    A P \rightarrow R \rightarrow Q
    B Q \rightarrow P \rightarrow R
    C P \rightarrow Q \rightarrow R
    D Q \rightarrow R \rightarrow P

12. Diagram shows the condition of mustard green when put in solution X. What is solution X?
    A Distilled water
    B 30% sucrose solution
    C 5% sucrose solution
    D 1% sucrose solution

13. Diagram shows the condition of spinach cell after being immersed in a solution. What is the phenomenon shown by the spinach cell?
    A Turgid
    B Crenation
    C Plasmolysis
    D Deplasmolysis

14. Potato strips were placed in 5%, 15% and 30% sucrose solution respectively. The initial mass of the potato strips is 1.40 g. Which of the following should be the final mass of the potato strips in 30% sucrose solution?
15. Why does salted fish can be kept after a few months?

A  The growth of bacteria is inhibited  
B  The pH of the solution used is low  
C  The water content in the fish is maintained  
D  Water molecules enter the fish cells by osmosis

16. Diagram shows an osmometer.

What will happen to the level of the concentrated salt solution in the glass tube after 30 minutes?

A  Increases and then decreases  
B  Decreases and then increases  
C  Increases and then stops  
D  Decreases and the stops

17. The graph shows the result of an experiment to determine the concentration of the cell sap of potato.

At which point A, B, C, or D, the concentration of sucrose solution is hypertonic to the cell sap of potato?

18. Diagram shows changes in the length of potato strips when immersed in different concentrations of sugar solution.

Which of the following statement explained the graph?

A  The potato strip is firm at R  
B  The potato strip is immersed in hypertonic solution at P  
C  Water diffuses into and out of the cell at equal rate at Q  
D  The osmotic pressure in the potato strip is higher than the osmotic pressure of sugar solution at R
1. **Diagram 1** shows a plasma membrane.

   ![Diagram 1](plasma_membrane_diagram.png)

   **Diagram 1**

   (a) Match the label A, B and C with their proper function. [2 marks]

<table>
<thead>
<tr>
<th>Label</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Allow the movement of large molecules</td>
</tr>
<tr>
<td>B</td>
<td>Help cells recognize each other</td>
</tr>
<tr>
<td>C</td>
<td>Ensure stability, flexibility and rigidity</td>
</tr>
</tbody>
</table>

   (b)(i) Give the characteristics of structure labelled D. [1 mark]

   …………………………………………………………………………………………………

   (ii) Based on the answers in b (i), state the effects of the characteristics stated above to structure D. [1 mark]

   …………………………………………………………………………………………………

   …………………………………………………………………………………………………

   (c)(i) Name a substance that can pass through the structure labelled C and explain its importance to living organisms. [2 marks]

   …………………………………………………………………………………………………

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(ii) If structure C is broken, how will material in (c)(i) be transported? [2 marks]

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(d) Explain the effect of the respirational poison towards the transportation of substance across the plasma membrane. [2 marks]

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(e) Explain why the structure of the plasma membrane is considered a fluid mosaic model. [2 marks]

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2. Diagram 2.1 shows the three process of the movement of substances across the plasma membrane, P, Q and R.

![Diagram 2.1](image)

Diagram 2.1

(a)(i) Label the major component that form the plasma membrane in Diagram 2.1 using letter T [1 mark]
(ii) Explain the role of part labelled in (a)(i) for the movement of substances across the plasma membrane [2 marks]

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(b) Describe how the substances across the plasma membrane through process P [3 marks]

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(c) Compare the process of the movement of substances across the plasma membrane between Q and R.

Similarity. [1 mark]

………………………………………………………………………………………………

Differences [2 marks]

<table>
<thead>
<tr>
<th></th>
<th>Q</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

(d) **Diagram 2.2** shows an herbaceous plant before and after its roots was immersed in a solution containing metabolic poison such as cyanide.
3. Diagram 3.1 shows the experiment to study the movement of substances across the Visking tubing.

(a) Name the process that causes the level of sucrose solution in the capillary tube change. [1 mark]

(b) A laboratory test shows that at the end of the experiment, the distilled water in the beaker did not consist of sucrose. Explain why. [2 marks]
(c) **Diagram 3.2** shows the condition of red blood cell in three different concentration of solutions.

<table>
<thead>
<tr>
<th>Solution X</th>
<th>Solution Y</th>
<th>Solution Z</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Solution X" /></td>
<td><img src="image2" alt="Solution Y" /></td>
<td><img src="image3" alt="Solution Z" /></td>
</tr>
</tbody>
</table>

**Diagram 3.2**

(i) State the condition of the red blood cells in: [2 marks]

Solution Y: …………………………………………………………………………………

Solution Z: …………………………………………………………………………………

(ii) Explain what happen to the red blood cell in solution Z [3 marks]

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(iii) The red blood cell in solution Z is replaced with a plant cell. Does the plant cell burst as the red blood cells did?

Explain why [2 marks]

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4. **Diagram 4.1** shows two strips of mustard green stem after 20 minutes immersed into two different solutions P and Q.

![Diagram 4.1](image4)
Based on Diagram 4.1,

(i) State the type of solution Q. [1 mark]
………………………………………………………………………………………………..

(ii) Explain how solution Q affects the condition of the cells in the strip of mustard green. [2 marks]
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(iii) If strip from solution Q is transferred into solution P, explain what will happen to the cells in the strip after 20 minutes. [3 marks]
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………………………………………………………………………………………………..

(b) Diagram 4.2 shows the red blood cells in different concentrations of solution.

![Diagram 4.2: Red blood cells X in 3% sodium chloride solution after 30 minutes and Red blood cells Y in 0.1% sodium chloride solution after 30 minutes.]

Diagram 4.2

Explain the differences between the process experienced by the red blood cell X and Y after being immersed in the respective solution for half an hour. [3 marks]
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………………………………………………………………………………………………..
………………………………………………………………………………………………..

(c) Vinegar is a natural preservative that can be used to preserve fruits and vegetables to be kept longer. Explain how the vinegar is effective in the preservation of mangoes. [3 marks]
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………………………………………………………………………………………………..
………………………………………………………………………………………………..
………………………………………………………………………………………………..
5 **Diagram 5.1** shows the movement of substances P, Q and R through plasma membrane.

![Diagram 5.1](image)

a(i) Name the type of transport involved for substances P and Q. [2 marks]

Solution P: ……………………………………………………………………………………………
Solution Q: ……………………………………………………………………………………………

(ii) Give one example of substances Q and R. [2 marks]

Solution Q: ……………………………………………………………………………………………
Solution R: ……………………………………………………………………………………………

(iii) Compare the transport process involving particles Q and R. [3 marks]

Similarities:
………………………………………………………………………………………………
………………………………………………………………………………………………

Differences:
………………………………………………………………………………………………
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(iv) Based on **Diagram 5.1** explain the characteristic of plasma membrane [3 marks]

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………………………………………………………………………………………………
………………………………………………………………………………………………
(b) **Diagram 5.2** shows a method for preserving fish.

**Diagram 5.2**

Explain the food above can be kept longer. [2 marks]

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ESSAY QUESTIONS

1. For cells to continue their life’s processes, the concentrations of ion inside the cells must be kept at a different level from the concentration outside the cells. To maintain these concentrations, the cell must allow certain substances to enter and leave.

Diagram 1.1 shows plasma membrane consist of phospholipid bilayer.

(a)(i) Diagram 1.1 shows two different type of movement of substances across the plasma membrane. State the two types of movement of substances shown in Diagram 1.1 [2 marks]
(ii) State two examples in daily life which is the two types of movement of substances stated in (a)(i) is used. [2 marks]
(iii) Compare and contrast the two types of movement of substances stated in (a)(i). [6 marks]
(b) **Diagram 1.2** shows the process of movement of $K^+$ ion into the cell and ion $Na^+$ out of the cell.

![Diagram 1.2](image)

**Diagram 1.2**

Explain the mechanism of sodium-potassium pump that shows in Diagram 1.2. [10 marks]

2. **Diagram 2.1** shows the condition of a pot plant after being treated with too much fertiliser.

![Diagram 2.1](image)

(a)(i) Draw a labelled plant cell to show each of the condition in A and B. [4 marks]
(ii) Explain the phenomenon that occurs in **Diagram 1.1** above [5 marks]
(b) Explain a suitable method by which mango can be preserved for a long period. [5 marks]
(c) Describe the structure of the plasma membrane using the fluid mosaic model [6 marks]
3(a) **Diagram 3.1** shows three types of transport process P, Q and R across the plasma membrane.

![Diagram 3.1]

Explain process P, Q and R with suitable examples. **[10 marks]**

(b) **Diagram 3.2** shows the changes of red blood cells in solution A and B.

![Diagram 3.2]

Explain what happen to red blood cells in solution A and B. **[6 marks]**

(c) **Diagram 3.3** shows leeches which is an ectoparasitic organism which feed on animals’ blood.

![Diagram 3.3]
Explain how does table salt can be used to detach leeches from the human skin or to kill the leeches. [4 marks]

4 Based on the following statement, explain the importance of plasma membrane for the survival of living organism. [4 marks]

(a)(i) Movement of substances across the plasma membrane in the cell is important for the continuity in life of organisms. The process helps to maintain a constant internal environment.

(ii) **Diagram 4.1** shows two types of transport of substances through plasma membrane.

![Diagram 4.1](image)

Explain the types of transport of substances through plasma membrane shown in **Diagram 4.1** [6 marks]

(b) A student carry out the experiment to determine the concentration of an external solution which is isotonic to the cell sap. The student immersed the potato strips in a different concentration of sugar in 30 minutes time.

**Diagram 4.2** shows graph plotted to shows the change in mass against concentration of solution.
(i) Based on the graph in **Diagram 4.2**, state the concentration of the solution that is isotonic to the cell sap. [1 mark]

(ii) Explain what happened to the cell at point P, Q and R. [9 marks]
4 CHEMICAL COMPOSITION OF THE CELL

4.1 Chemical Composition of the Cell
4.2 Carbohydrates
4.3 Proteins
4.4 Lipids
4.5 Enzymes
4.6 The Importance of Chemical Composition of the Cell

CLASSIFICATION OF CARBOHYDRATES

<table>
<thead>
<tr>
<th>Carbohydrates</th>
<th>Physical Properties</th>
<th>Compositional Properties</th>
<th>Diagrammatic Representation</th>
<th>General Formula</th>
<th>Common Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saccharides (Sugars)</td>
<td>* Low molecular weight</td>
<td>** Simple sugars</td>
<td>(CH₂O)ₙ, When n = 3 to 7</td>
<td>C₁₂H₂₂O₁₁</td>
<td>Fructose, Galactose, Ribose sugar</td>
</tr>
<tr>
<td></td>
<td>* Soluble in water</td>
<td>** Double sugars</td>
<td></td>
<td></td>
<td>Maltose, Sucrose Lactose</td>
</tr>
<tr>
<td>Polysaccharides (Complex sugars)</td>
<td>* High molecular weight</td>
<td>** Multiple sugars</td>
<td>Glycosidic bond</td>
<td></td>
<td>Starch, Glycogen Cellulose, Lipidin, Chitin</td>
</tr>
</tbody>
</table>

QUICK NOTES & REVISIONS
- PRIMARY STRUCTURE: Amino acids are joined, forming polypeptide chains.
- SECONDARY STRUCTURE: Polypeptide chains may form helices or β-pleated sheets.
- TERTIARY STRUCTURE: Polypeptides fold, forming specific shapes. Folds are stabilized by bonds, including hydrogen bonds and disulfide bridges.
- QUATERNARY STRUCTURE: Two or more polypeptides assemble to form larger protein molecules. The hypothetical molecule here is a tetramer, made up of four polypeptide subunits.
General Characteristics of Enzymes

- speed up the rates of biochemical reaction in the cells
- Only a small amount of enzyme is needed to catalyze a lot of substrate
- very specific – each class of enzyme will catalyze only one particular reaction
- Not used up or destroyed in the reactions that they catalyse, but can be reused again
- Catalyse reversible reaction
- Many enzymes are only able to work in the presence of a coenzyme (or cofactor)

### Differences between saturated and unsaturated fats

<table>
<thead>
<tr>
<th>Saturated fats</th>
<th>Aspects that are different</th>
<th>Unsaturated fats</th>
</tr>
</thead>
<tbody>
<tr>
<td>All covalent bonds between carbon atoms are single (C-C)</td>
<td>Type of chemical bond</td>
<td>Existence of double covalent bonds between carbon atom (C=C)</td>
</tr>
<tr>
<td>Less reactive</td>
<td>Reactivity</td>
<td>More reactive because due to the double bonds</td>
</tr>
<tr>
<td>More tightly packed together</td>
<td>Packaging of the fat molecule</td>
<td>Less tightly packed due to the double bonds</td>
</tr>
<tr>
<td>Solid (fat)</td>
<td>State of matter at room temperature</td>
<td>Liquid (oil)</td>
</tr>
<tr>
<td>Mainly from animal products: red meat, chicken skin, butter &amp; coconut oil</td>
<td>Source</td>
<td>Mainly from plants: vegetable oils, palm oil, corn oil and olive oil</td>
</tr>
<tr>
<td>Increase level of “bad” cholesterol</td>
<td>Effects on blood cholesterol level</td>
<td>Increase levels of “good” cholesterol</td>
</tr>
</tbody>
</table>
OBJECTIVES QUESTIONS

1. Which of the following is an organic compound?
   A Protein
   B Lipid
   C Water
   D Nucleic acid

2. Which type of carbohydrate can be found abundantly in liver cells?
   A Starch
   B Maltose
   C Glucose
   D Glycogen

3. Diagram shows a basic unit of a chemical compound in a living cell.

   ![Diagram]

   Which chemical compound has the unit shown?
   A Lipid
   B Protein
   C Lactic acid
   D Nucleic acid

4. Which of these carbohydrates is insoluble in water?
   A Starch
   B Maltose
   C Glucose
   D Galactose

5. Diagram shows three main classes of carbohydrates.

   ![Diagram]

   What are X, Y and Z?

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Disacharides</td>
<td>Sucrose</td>
<td>Fructose</td>
</tr>
<tr>
<td>B</td>
<td>Disacharides</td>
<td>Fructose</td>
<td>Cellulose</td>
</tr>
<tr>
<td>C</td>
<td>Disacharides</td>
<td>Galactose</td>
<td>Sucrose</td>
</tr>
<tr>
<td>D</td>
<td>Disacharides</td>
<td>Glucose</td>
<td>Galactose</td>
</tr>
</tbody>
</table>

6. Which combination of two monosaccharides below will produce sucrose?
   A Glucose + Lactose
   B Glucose + Fructose
   C Glucose + Glucose
   D Fructose + Lactose

7. Which of the following represents the hydrolysis of polypeptides?
   A Polypeptides → water + dipeptides
   B Dipeptides → water + polypeptides
   C Dipeptides + water → polypeptides
   D Polypeptides + water → dipeptides
8. The following information refers to the function of substance K is cell.

- Medium for biochemical reactions in cells
- Maintaining osmotic pressure of cells

What is substance K?

A Lipid  
B Water  
C Protein  
D Enzyme

9. Diagram shows the structure of protein molecule.

What is the type of the level of organization of this protein?

A Primary structure  
B Secondary structure  
C Tertiary structure  
D Quaternary structure

10. Which process involved to convert amino acids into dipeptide?

A Condensation  
B Plasmolysis  
C Hydrolysis  
D Assimilation

11. Diagram shows a type of molecular structure of protein.

What is the example of protein for this structure?

A Hormone  
B Haemoglobin  
C Silk  
D Antibiotics

12. Diagram shows a type of molecular structure of protein.

What is the type of the structure?

A Primary structure  
B Secondary structure  
C Tertiary structure  
D Quaternary structure

13. Diagram shows a biochemical reaction in a cell.

What is substance P?

A Monoglyceride  
B Diglyceride  
C Triglyceride  
D Glyceride

14. Diagram shows the hydrolysis process of a fat molecule.
15. Diagram shows the ‘lock and key’ hypothesis of enzyme reaction of lipase.

Which of the following is represented by X, Y and Z?

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Enzyme</td>
<td>Enzyme-substrate-complex</td>
</tr>
<tr>
<td>B</td>
<td>Lipid</td>
<td>Lipase</td>
</tr>
<tr>
<td>C</td>
<td>Lipase</td>
<td>Lipid</td>
</tr>
<tr>
<td>D</td>
<td>Substrate</td>
<td>Enzyme</td>
</tr>
</tbody>
</table>

18. Diagram shows the optimum pH of enzyme in its reaction.

What is enzyme P?

A Erepsin
B Rennin
C Pepsin
D Trypsin

19. Diagram shows a mechanism of enzymes reaction.

Which statement can be deduced from the diagram?

A Enzyme is denatured at 50°C
B Enzyme action is specific
C Enzyme is destroyed at the end of the reaction
D Enzyme reaction can be inhibited by heavy metals
20. Diagram shows an experiment to study the action of pepsin on protein.

The contents of the test tube are a mixture of 2 ml egg albumen suspension, 1 ml of pepsin solution and three drops of 0.1M hydrochloric acid. The albumen suspension turns clear after 20 minutes.

Which step can reduce the time taken for the egg albumen suspension to turn clear?

A. Increase the volume of egg albumen suspension to 4 ml
B. Increase the volume of 1% pepsin to 2 ml
C. Replaced the hydrochloric acid with 0.1M sodium hydroxide
D. Increase the temperature of water bath to 45°C

21. Diagram is a graph showing the effects of temperature on the rate of enzyme reaction.

If the temperature is increased further, which curve A, B, C or D will be the shape of the curve after 30°C?

22. The following are four structures that can be found in the cell.

![Diagram showing Golgi apparatus, Ribosome, Transport Vesicle, and Rough Endoplasmic Reticulum (RER)]

Choose the correct arrangement for the production of extracellular enzyme.

A. Ribosome → RER → Golgi apparatus → Transport vesicle
B. Golgi apparatus → Ribosome → Transport vesicle → RER
C. Ribosome → RER → Transport vesicle → Golgi apparatus
D. RER → Ribosome → Transport vesicle → Golgi apparatus

23. A manager of animal skin processing factory intends to increase their productivity.

Suggest the best method to remove the hair and clean the animal skin.

Immerse in enzyme

A. Immerse in boiling water
B. Immerse in enzyme
C. Immerse in vinegar
D. Expose under direct sunlight

24. Diagram shows a shirt with blood stain to be washed with a detergent containing enzyme at different temperatures.

What is the most suitable enzyme and temperature to be used?

<table>
<thead>
<tr>
<th>Enzyme</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Lipase</td>
</tr>
<tr>
<td>B</td>
<td>Protease</td>
</tr>
<tr>
<td>C</td>
<td>Amylase</td>
</tr>
<tr>
<td>D</td>
<td>Protease</td>
</tr>
</tbody>
</table>
1. **Diagram 1.1** shows the structure of a type of nucleic acid.

   ![Diagram 1.1](image)

(a) Based on **Diagram 1.1**, name the type of nucleic acid as shown. [1 mark]

(b) Draw and label a basic unit of structure shown in **Diagram 1.1**. [2 marks]

(c) Explain the role of structure in **Diagram 1.1** in determining the characteristics of organisms [3 marks]

(d) Name another type of nucleic acid. [1 mark]
(e)(i) Complete the structure in **Diagram 1.2**. [2 marks]

![Diagram 1.2](image)

(ii) State the component that determines the characteristics of an organism. [1 mark]

…………………………………………………………………………………………………………………………

2. **Diagram 2** shows types of polysaccharide found in a living organism.

![Diagram 2](image)

(a) Name the elements that made up the compound above? [1 mark]

…………………………………………………………………………………………………………………………

(b) State the basic unit which form a compound P, Q and R [1 mark]

…………………………………………………………………………………………………………………………
(c) Name compound P, Q and R. [2 marks]

P: ………………………………………………………………………………………………

Q: ……………………………………………………………………………………………..

R: ……………………………………………………………………………………………

(d) Suspension P in Diagram 2 is added with saliva. Explain how P can be broken down into disaccharides. [3 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

(e) A group of student carried out a Benedict test to determine type of carbohydrates. A result obtained as follows:

Food samples | Observation
--- | ---
A | Brick red precipitate is formed
B | Brick red precipitate is formed
C | No change

(i) Explain why there is a different observation between food sample A and food sample C. [2 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

(ii) Describe how the student able to obtain a positive observation for food sample C. [3 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
3. **Diagram 3.1** below shows the formation of an organic substance F.

![Diagram 3.1](image)

(a)(i) Identify structure X and Y. [2 marks]

M: ............................................................................................................................
X: ............................................................................................................................

(ii) State the process Q. [1 mark]

............................................................................................................................

(b) **Diagram 3.2** below shows two types of fats A and B?

![Diagram 3.2](image)

(i) State the types of fats based on the **Diagram 3.2** [2 marks]

Type A: ........................................................................................................................
Type B: ........................................................................................................................

(ii) Describe the differences between fats A and B. [3 marks]

............................................................................................................................
............................................................................................................................
............................................................................................................................
............................................................................................................................
(c) **Diagram 3.3** shows various types of organic substances.

![Diagram 3.3](image)

(i) Identify the importance of the above organic substances. *[3 marks]*

<table>
<thead>
<tr>
<th>Organic substances</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td></td>
</tr>
</tbody>
</table>

(ii) Predict what will happen if some parts of the nucleotide in structure G is damaged. *[1 mark]*

………………………………………………………………………………………………

4. **Diagram 4.1** shows an enzyme reaction undergone by a disaccharide molecule.

![Diagram 4.1](image)

(a) Name the hypothesis related to the enzyme reaction in **Diagram 4.1**. Explain the hypothesis. *[3 marks]*
Name the hypothesis: ………………………………………………………………………

Explanation:
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

(b) Name the process [1 mark]
………………………………………………………………………………………………

(c) Based on Diagram 4.1, explain process P. [2 marks]
………………………………………………………………………………………………
………………………………………………………………………………………………

(d) Diagram 4.2 shows the involvement of a few organelles in the production of an extracellular enzyme.

![Diagram 4.2]

(i) Name organic compound Y. [1 mark]
………………………………………………………………………………………………

(ii) Draw the basic unit of compound Y in the box provided. [2 marks]

(iii) Explain how amino acid is synthesized based on the information in organic compound Y. [3 marks]
5. Diagram 5 shows structures of protein. The protein structures can be classified into four levels J, K, L and M based on organization of their structures.

![Diagram 5](image)

(a)(i) Label amino acid and peptide bond in J. [2 marks]

X: .................................................................
Y: .................................................................

(ii) Name the protein structures of L and M. [2 marks]

L: .................................................................
M: .................................................................

(b)(i) Name the organelle in the cell where the protein is synthesized? [1 mark]

...........................................................................................................................................

(ii) Name the process P in the following reaction. [1 mark]

...........................................................................................................................................

(iii) By using the letters J, K, L and M, which protein structure represented? [2 marks]

Enzyme : ............................................................................................................................
Haemoglobin : .................................................................................................................
(c) Based on the following statement, explain why food is kept in refrigerator? [3 marks]

All enzymes are protein. Enzymes are sensitive to temperature

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

(d) A branded washing machine is provided with temperature regulator. A housewife uses the detergent containing enzyme at 40°C to wash the clothes. Using the information given, explain why? [2 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………

6. **Diagram 6.1** shows mechanism action of sucrase.

![Diagram 6.1](image)

(a)(i) Label X, Y and Z in Diagram 6.1. [2 marks]

(ii) Complete the diagram in the box provided in Diagram 6.1 to complete the mechanism of the enzyme reaction. [1 mark]

(b) Based on **Diagram 6.1**, state two characteristic of enzyme. [2 marks]

1. ……………………………………………………………………………………………

2. ……………………………………………………………………………………………
(c) The effect of different enzyme concentration on the rate of enzymatic reaction can be seen on the graph in **Diagram 6.2**

![Diagram 6.2](image)

(i) Based on the graph in **Diagram 6.2**. explain the reaction of enzymes. [3 marks]

(ii) If the concentration of enzyme increases, draw a line ( -------- ) to show the enzyme activity in **Diagram 6.2** [1 mark]

(d) During Hari Raya, fermented glutinous rice (tapai pulut) is one of famous meal in our country. It is produce by using food processing methos that involves an enzyme. Name the enzyme and explain how the enzyme act. [3 marks]
ESSAY QUESTIONS

1 Diagram 1.1 shows two different structures of proteins X and Y.

![Diagram 1.1](image1.png)

(a) Using suitable example, explain how the protein structure are formed. [4 marks]

(b) Diagram 1.2 shows two boxes of detergent powder containing enzyme which are effective in removing stains in clothes.

![Diagram 1.2](image2.png)

Suggest examples of specific enzymes other than used in the detergent powder and how they are used in various fields in our daily life. [6 marks]

2(a) Based on the following statement:

Enzymes which are isolated from cells can function outside the cells. Enzymes can be used as catalysts in industries. The use of enzymes in industrial processes is known as enzyme technology

(i) List the general characteristics of enzymes. [4 marks]
(ii) Using suitable examples, discuss the uses of enzymes in industrial processes and our daily life. [6 marks]
(b) **Diagram 2** shows the organelles involved during the synthesis and secretion of an enzyme in an animal cell.

Based on **Diagram 2**, explain how extracellular enzyme are produced by emphasizing the role of P, Q, R and S. **[10 marks]**

3. **Diagram 3.1** shows three stages in an enzyme reaction.

(a) Based on diagram above, explain the lock and key hypothesis in the mechanism of enzyme reaction. **[8 marks]**

(b) **Diagram 3.2** shows the types of complex molecules.
Based on **Diagram 3.2**, explain [4 marks]

(i) The formation of molecules X
(ii) The breakdown of molecule Y

(c) Starch, protein and lipid can be hydrolysed by the enzymes X, Y and Z respectively

![Diagram 3.3](image)

**Diagram 3.3**

Based on the Diagram 3.3, name X, Y and Z and explain how the changes in pH affects enzyme activity. [4 marks]
5

CELL DIVISION

5.1 Mitosis

5.2 Meiosis

5.3 Appreciating the Movement of Chromosomes during Mitosis and Meiosis

QUICK NOTES & REVISIONS

MITOSIS

G2 OF INTERPHASE

PROPHASE

PROMETAPHASE

METAPHASE

ANAPHASE

TELOPHASE AND CYTOKINESIS

QUICK NOTES & REVISIONS
EFFECTS OF UNCONTROLLED MITOSIS

Benign tumors are generally self-contained and localized and have a well-defined perimeter. They grow slowly, expanding outward from a central mass. They are dangerous when they compress surrounding tissues. A benign tumor near a blood vessel could restrict the flow of blood; in the abdomen it could impair digestion; in the brain it could cause paralysis.

a) Benign Tumour

b) Malignant Tumour

Healthy cells with few cancerous cells

Multiplication of cancerous cells

Metastasized cells
Cloning by Embryo Splitting

Embryo is split to form two half-embryos

Embryos are transferred to an unrelated surrogate mother

Pregnancy is monitored by ultrasound

Sheep gives birth to identical twins

Dolly: The Cloning of a Sheep, 1996

- Adult Finn Dorset ewe
- Nucleus removed from a donor cell
- Donor cells removed from mammary gland
- Donor cells starved
- Low-nutrient culture medium
- Enucleated egg cell
- Fertilization
- Electrical pulses
- Cell division
- Embryo implanted
- Surrogate mother

Donor cell (arrested growth cycle)

Finn Dorset lamb ("Dolly")

Egg cell donor

Adult Scottish Blackface ewes
**INTERPHASE**

**MEIOSIS I: Separates homologous chromosomes**

<table>
<thead>
<tr>
<th><strong>PROPHASE I</strong></th>
<th><strong>METAPHASE I</strong></th>
<th><strong>ANAPHASE I</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Centrosomes</td>
<td>Centromere</td>
<td>Sister chromatids remain attached</td>
</tr>
<tr>
<td>(with centriole pairs)</td>
<td>(with kinetochore)</td>
<td></td>
</tr>
<tr>
<td>Nuclear envelope</td>
<td>Spindle</td>
<td></td>
</tr>
<tr>
<td>Tetrad</td>
<td>Microtubule attached to kinetochore</td>
<td></td>
</tr>
<tr>
<td>Chromatin</td>
<td>Homologous chromosomes separate</td>
<td></td>
</tr>
</tbody>
</table>

Chromosomes duplicate

Homologous chromosomes (red and blue) pair and exchange segments; $2n = 6$ in this example

Tetrads line up

Pairs of homologous chromosomes split up

**MEIOSIS II: Separates sister chromatids**

**TELOPHASE I AND CYTOKINESIS**

<table>
<thead>
<tr>
<th><strong>PROPHASE II</strong></th>
<th><strong>METAPHASE II</strong></th>
<th><strong>ANAPHASE II</strong></th>
<th><strong>TELOPHASE II AND CYTOKINESIS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleavage furrow</td>
<td>Sister chromatids separate</td>
<td>Haploid daughter cells forming</td>
<td></td>
</tr>
</tbody>
</table>

Two haploid cells form; chromosomes are still double

During another round of cell division, the sister chromatids finally separate; four haploid daughter cells result, containing single chromosomes
OBJECTIVES QUESTIONS

1. Diagram shows a phase of mitosis in a cell.

   What is the stage before this phase?
   A Prophase
   B Metaphase
   C Anaphase
   D Telophase

2. Diagram shows telophase in a somatic cell.

   What is X?
   A Plasma membrane
   B Cell wall
   C Cell plate
   D Cleavage furrow

3. Diagram shows formation of sister chromatid during cell cycle.

   What is the number of chromosome in a gamete after the cell complete its division?
   A 3
   B 6
   C 12
   D 24

4. Diagram shows formation of structure X from vesicles in a plant cell.

   What is X?
   A Plasma membrane
   B Cell wall
   C Cell plate
   D Cleavage furrow

5. Diagram shows the phases of a cell cycle in an organism.

   What is the correct sequence of the interphase stage?
   A G1 → S → G2
   B S → G2 → M
   C G2 → M → G1
   D M → G1 → S
6. Diagram shows a phase of mitosis in an animal cell.

What is the phase?
A Prophase  
B Metaphase  
C Anaphase  
D Telophase

7. Diagram shows the number of cells produced after a cell has undergone two times of mitosis.

How many number of cells produced if mitosis occur another two times?
A 4  
B 8  
C 16  
D 32

8. Table shows two type of cells that have undergone cell division and their chromosomal numbers before and after the cell division.

<table>
<thead>
<tr>
<th>Type of cells</th>
<th>Chromosomal number</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before cell division</td>
<td>After cell division</td>
</tr>
<tr>
<td>P</td>
<td>46</td>
<td>23</td>
</tr>
<tr>
<td>Q</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>R</td>
<td>23</td>
<td>46</td>
</tr>
<tr>
<td>S</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

Which of the cell has undergone the mitosis completely?

9. Which process is used in tissue culture technique?
A Fertilisation  
B Synthesis  
C Meiosis  
D Mitosis

10. Diagram shows a cell at one stage of mitosis.

Which of the following cells is produced by the cell division?

11. A diploid sheep’s nucleus X is inserted into an ovum without nucleus of sheep Y to form zygote. The zygote is then implanted into the uterus of a surrogate mother sheep Z. What is the genetic of the lamb produced?
A Sheep X  
B Sheep Y  
C Sheep Z  
D Sheep X and sheep Y
12. Diagram shows the process of cloning a sheep.

13. Human ovum has 23 chromosomes. What is the chromosome number of a person’s cheek cells?
   A 13 chromosomes
   B 23 chromosomes
   C 46 chromosomes
   D 86 chromosomes

14. Diagram shows a schematic diagram of a reproduction of a cow.

15. Diagram shows some stages of meiosis. Which of the following stages of meiosis is the correct sequence?
   A S, R, Q, P
   B P, S, Q, R
   C R, S, P, Q
   D Q, R, P, S

16. Diagram shows the structure of a flower. Which of the following parts labelled P, Q, R, and S do meiosis take place?
   A Q and S
   B P and Q
   C Q and R
   D R and S
17. Diagram shows a cell undergoing cell division.

Which of the following is the product of cell division shown in diagram?
A Testis
B Spermatogonium
C Ovary
D Secondary oocyte

18. Which of the following human cells is produced through meiosis?
A Muscle cell
B Nerves cell
C Epithelial cell
D Secondary oocyte

19. Diagram shows several stages in meiosis.

What is the chromosome behaviour in stage P?
A Chromosome condense and thicken
B Chromosome arrange themselves around equatorial plane
C Homologous chromosomes pair together and cross-over occurs
D Homologous chromosomes separate and move to the opposite poles

20. The diploid chromosomal number of a cat is 38. If one of the homologous chromosome pairs does not separate during meiosis I, how many chromosomes can be found in one of the gametes?

I. 18
II. 19
III. 20
IV. 38
A II only
B I and II only
C I and III only
D IV only

21. Which sex chromosomes from the parents’ ovum and sperm can be found in their son?

<table>
<thead>
<tr>
<th>Sex chromosomes in the ovum</th>
<th>Sex chromosomes in the sperm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A X</td>
<td>X</td>
</tr>
<tr>
<td>B X</td>
<td>Y</td>
</tr>
<tr>
<td>C Y</td>
<td>X</td>
</tr>
<tr>
<td>D Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

22. Diagram shows some stages of meiosis in a cell.

Which of the following is the correct sequence of the stages?
A I → III → IV → II
B II → III → I → IV
C II → I → III → IV
D IV → I → III → II
STRUCTURE QUESTIONS

1. **Diagram 1.1** shows a stage of mitosis in an animal cell.

![Diagram 1.1](image)

(a) (i) Name the stage. [1 mark]

(ii) Describe the chromosomes behaviour during the stage [2 marks]

(b) If the cell in **Diagram 1.1** divided in ovary to produce a reproductive cell, draw one of the daughter cells that are produced at the end of the division. [2 marks]

(c) (i) Name structure N. [1 mark]

(ii) What happen to structure M if structure N fails to function in this division? [2 marks]
(d) **Diagram 1.2** shows an experiment carried out on animal cloning by using two different species of frogs.

Based on **Diagram 1.2**.

(i) Describe two differences of process Z between species X and species Y. 

[2 marks]

<table>
<thead>
<tr>
<th>Species X</th>
<th>Species Y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) Name the species of frog that will be produced at the end of the experiment [1 mark]

……………………………………………………………………………………………………

(iii) State one disadvantage of this method. [1 mark]

……………………………………………………………………………………………………
2. **Diagram 2.1** shows the phase of cell division in mitosis.

![Diagram 2.1](image)

(a) Arrange the phase of mitosis in **Diagram 2.1** according to the correct sequence. [1 mark]

………………………………………………………………………………………………

(b) Name phase Q and S. State the chromosomal behaviour of the named phase. [4 marks]

Phase Q:
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

Phase S:
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

(c) Explain how mitosis maintains genetic stability in an organism. [3 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

(d) **Diagram 2.2** shows cloning technique in plants.

![Diagram 2.2](image)
(i) Explain the effect on the plantlets when the environmental weather changes. [2 marks]
.................................................................................................................................
.................................................................................................................................

(ii) Explain why a shoot tip is used as explants in Diagram 2.2 [2 marks]
.................................................................................................................................
.................................................................................................................................

3. Diagram 3.1 shows the example of the cell undergoing the division of cell.

(a) How many chromosomes are there in the cell? [1 mark]
.................................................................................................................................

(b) Draw one daughter cell at the end of the cell division through:

Mitosis: [2 marks]

.................................................................................................................................

Meiosis: [2 marks]

.................................................................................................................................
(c) Explain why the chromosomes numbers are different in daughter cells of mitosis and meiosis. [2 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………

(d) Explain one difference of importance of meiosis and mitosis to organisms. [2 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………

(e) In a population of buffaloes, there are normal buffaloes and white buffaloes or known as ‘kerbau balar’. Why does it happen? [3 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

4. Diagram 4.1 shows a stage of meiosis in cell division.

(a)(i) Name the parts labelled X and Y. [2 marks]

X: ……………………………………………………………………………………………
Y: ……………………………………………………………………………………………

(ii) Name the stage of this cell division. [1 mark]

………………………………………………………………………………………………
(b)(i) Explain chromosomal behaviour in that stage. [2 marks]

..........................................................................................................................
..........................................................................................................................

(ii) State one importance of the chromosomal behaviour in 4(b)(i). [2 marks]

..........................................................................................................................

(c) Diagram 4.2 shows the process of meiosis involved in the formation of zygote.

![Diagram 4.2](image)

Explain how zygote is formed. [2 marks]

..........................................................................................................................
..........................................................................................................................
..........................................................................................................................
ESSAY QUESTIONS

1(a) **Diagram 1.1** shows a human life cycle.

(i) Based on **Diagram 1.1**, explain how meiosis can maintain the number of chromosomes in human life cycle. [4 marks]

(ii) **Diagram 1.2** shows phases in meiosis 1 and 2

**Diagram 1.2**

Explain the similarities and differences between meiosis 1 and 2 [6 marks]
(b) **Diagram 1.3 (a)** shows cloned wheats in farm A and **Diagram 1.3 (b)** shows different types of wheats in farm B.

![Diagram 1.3(a)](image)

![Diagram 1.3(b)](image)

(i) Describe the technique to produce the cloned wheats in farm A [6 marks]

(ii) Describe the advantages and disadvantages of the cloned wheat in farm A over the wheats in farm B. [4 marks]

2(a) According to the stages metaphase, anaphase and telophase in cell division, differentiate the events happening during mitosis and meiosis. [4 marks]

(b) **Diagram 2.1** is a new variety of vegetable which has a great commercial value. **Diagram 2.2** is the original parent of the plant.

![Diagram 2.1](image) ![Diagram 2.2](image)

Based on the above diagram and with your biological knowledge, explain how a farmer can propagate this variety to give a large scale of yield and at the same time maintains its quality. [4 marks]

(c) Discuss how mutation can lead to the formation of tumour. [10 marks]
3(a)(i) What is meant by cloning? [2 marks]

(ii) Describe one cloning technique to produce a commercial plant of desirable characteristics. [6 marks]

(b) Based on the following information, discuss the benefits of genetic engineering method in producing products for the society. [6 marks]

The hormone insulin used by present day diabetics is the result of genetic engineering technology. This hormone which was used to treat diabetics since 1982 is the first technological product approved for the market

(c) Diagram 3.1 shows a group of cells that is exposed to ultraviolet ray.

Diagram 3.1

The exposure drives the cell cycle malfunctions. Based on the diagram, describe effect of cell cycle malfunctions to the body. [6 marks]
<table>
<thead>
<tr>
<th>Site</th>
<th>Digestive Juice</th>
<th>Enzyme</th>
<th>pH</th>
<th>Digestive Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouth</td>
<td>Saliva</td>
<td>Amylase</td>
<td>6.5-6.8</td>
<td></td>
</tr>
<tr>
<td>Stomach</td>
<td>Gastric juice (contains mucus, hydrochloric acid,</td>
<td>HCl</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pepsin, Rennin)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pepsin</td>
<td>1.5-2</td>
<td>Proteins + water → [peptide] + peptone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rennin</td>
<td>1.5-2</td>
<td>Converts caseinogens (soluble milk) into casein (insoluble protein)</td>
</tr>
<tr>
<td>Duodenum</td>
<td>Bile (produced by liver &amp; stored in gallbladder)</td>
<td></td>
<td>7.6 –</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pancreatic juice (contains pancreatic amylase,</td>
<td>Pancreatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>trypsin and lipase)</td>
<td>amylase</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>trypsin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>lipase</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small intestine</td>
<td>Intestinal juice</td>
<td>Maltase</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lactase</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sucrase</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lipase</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

```markdown
<table>
<thead>
<tr>
<th>Enzyme</th>
<th>pH</th>
<th>Digestive Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amylase</td>
<td>6.5-6.8</td>
<td>Starch + → [maltose]</td>
</tr>
<tr>
<td>Pepsin</td>
<td>1.5-2</td>
<td>Proteins + water → [peptide] + peptone</td>
</tr>
<tr>
<td>Rennin</td>
<td>1.5-2</td>
<td>Converts caseinogens (soluble milk) into casein (insoluble protein)</td>
</tr>
<tr>
<td>Pancreatic amylase</td>
<td>7.6</td>
<td>Starch + water → [maltose]</td>
</tr>
<tr>
<td>Pancreatic trypsin</td>
<td></td>
<td>Polypeptides + water → [peptide]</td>
</tr>
<tr>
<td>Pancreatic lipase</td>
<td></td>
<td>Hydrolyses emulsified fats to [glycerol] + [fatty acids]</td>
</tr>
<tr>
<td>Maltase</td>
<td>7.6</td>
<td>Maltose + water → [maltose]</td>
</tr>
<tr>
<td>Lactase</td>
<td></td>
<td>Lactose + water → [maltose] + [maltose]</td>
</tr>
<tr>
<td>Sucrase</td>
<td></td>
<td>Sucrose + water → [maltose] + [maltose]</td>
</tr>
<tr>
<td>Lipase</td>
<td></td>
<td>Fat + water → [maltose] + [maltose]</td>
</tr>
</tbody>
</table>
```
DIGESTION IN RUMINANTS & RODENTS

Ruminants (Cows, Goat)

FLOW OF FOOD IN RUMINANT

mouth
swallow
oesophagus
- H₂O
swallow
omasum
chyme
abomasum

rumen
fermentation
reticulum

curd
regurgitation

RUMEN
OMASUM
ABOMASUM
RETICULUM
Rodents (Rabbits, Rats)

FLOW OF FOOD IN RODENTS

- mouth
- oesophagus
- stomach
- Small intestine
- caecum

Dust and watery faeces usually produced at night

Eaten again

Pass out as hard and dry faeces during the day

Re-eat the faeces to absorb more nutrient

RAT INTESTINAL SYSTEM

- liver
- stomach
- spleen
- duodenum
- jejunum
- ileum
- large intestine
- caecum

EATEN AGAIN? WHY??

- to enable the animals to absorb the products of bacterial breakdown
- allow rodent to recover the nutrients initially lost with the faeces
Photosynthesis

Photosynthesis Equation

\[
\text{Carbon dioxide} + \text{Water} \xrightarrow{\text{SUNLIGHT}} \text{Sugar} + \text{Oxygen} \\
6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2
\]

Chloroplasts are highly structured, membrane-rich organelles.

- Outer membrane
- Inner membrane
- Thylakoids
- Granum
- Stroma

(a) ©1999 Addison Wesley Longman, Inc.
Photosynthesis consists of light reaction and dark reaction.

**Light Reaction**
- Requires: Chlorophyll, sunlight, water
- Absorbs: Chlorophyll
- Breaks up: Water
- Splits: Hydrogen, Carbon Dioxide
- Forms: Oxygen, Glucose, Air/Atmosphere

**Dark Reaction**
- Combines: Hydrogen, Carbon Dioxide
- Forms: Water, Glucose
- Goes: Oxygen

---

**Similarities between light reaction & dark reaction**
- Both processes are catalysed by enzymes.
- Both take place in chloroplast.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Light reaction</th>
<th>Dark reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of reaction</td>
<td>Is a photolysis reaction using light energy</td>
<td>Is a series of biochemical reactions which does not require light</td>
</tr>
<tr>
<td>Input of raw material</td>
<td>H2O &amp; sunlight</td>
<td>CO2 &amp; chemical energy</td>
</tr>
<tr>
<td>Product output</td>
<td>O2 released &amp; H goes into dark reaction</td>
<td>Carbohydrate/glucose &amp; H2O</td>
</tr>
<tr>
<td>Location of process</td>
<td>In the granum membrane</td>
<td>In the stroma</td>
</tr>
<tr>
<td>Absorption of light</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>When does it happen?</td>
<td>Only in the presence of light</td>
<td>Only after the light reaction complete</td>
</tr>
<tr>
<td>Energy</td>
<td>Forms ATP</td>
<td>Uses ATP</td>
</tr>
</tbody>
</table>
OBJECTIVES QUESTIONS

1. Living organism can be classified based on nutritional habits. Which of the following are correct?

<table>
<thead>
<tr>
<th></th>
<th>Saprophytic</th>
<th>Parasitic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Green plants</td>
<td>Bacteria</td>
</tr>
<tr>
<td>B</td>
<td>Bacteria</td>
<td>Tapeworm</td>
</tr>
<tr>
<td>C</td>
<td>Tapeworm</td>
<td>Lice</td>
</tr>
<tr>
<td>D</td>
<td>Bacteria</td>
<td>Green plants</td>
</tr>
</tbody>
</table>

2. When 0.4 g of groundnut is completely burnt, the temperature of 20 ml of water rises from 30 °C to 70°C. The specific heat capacity of water is 4.2 Jg°C. Calculate the energy value of the groundnut.
A 1400 Jg⁻¹
B 3400 Jg⁻¹
C 8400 Jg⁻¹
D 7620 Jg⁻¹

3. The following information shows the results of an experiment to determine the energy value of cashew nuts.

<table>
<thead>
<tr>
<th>Volume of water used (cm³)</th>
<th>20.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass of cashew nuts (g)</td>
<td>0.40</td>
</tr>
<tr>
<td>Initial temperature of water (°C)</td>
<td>30.0</td>
</tr>
<tr>
<td>Final temperature of water (°C)</td>
<td>70.0</td>
</tr>
</tbody>
</table>

[Specific heat of water = 4.2 Jg°C]

Calculate the energy value of the cashew nuts
A 0.1 kJ/g
B 8.0 kJ/g
C 0.84 kJ/g
D 8.4 kJ/g

4. Table 1 shows the data of an experiment to determine the content of vitamin C in pineapple juice.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Volume of sample needed to decolorize 1 ml DCFH solution (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1% ascorbic acid</td>
<td>1.0 1.0 1.0</td>
</tr>
<tr>
<td>Pineapple juice</td>
<td>2.5 2.7 2.6</td>
</tr>
</tbody>
</table>

Calculate the concentration of vitamin C in the pineapple juice.
A 0.26 mg/ml
B 2.60 mg/ml
C 0.38 mg/ml
D 3.80 mg/ml

5. Diagram shows the structure of a villus in the ileum.

Which of the following carry large amounts of glucose and fat-soluble vitamins?

<table>
<thead>
<tr>
<th></th>
<th>Glucose</th>
<th>Fat soluble vitamins</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>P</td>
<td>Q</td>
</tr>
<tr>
<td>B</td>
<td>Q</td>
<td>P</td>
</tr>
<tr>
<td>C</td>
<td>R</td>
<td>S</td>
</tr>
<tr>
<td>D</td>
<td>S</td>
<td>R</td>
</tr>
</tbody>
</table>
6. Diagram shows the apparatus set up to
determine the energy value in a peanut.

Which is the purpose of using
thermometer in this experiment?
A To stabilize water temperature
B To measure the change of water
temperature
C To measure the temperature of
peanut
D To measure the temperature of the
boiling tube

7. Diagram shows a section of human
digestive system.

Which of the parts labelled A, B, C or
D secretes enzyme for digestion of fat?

8. The following information refers to the
function of substance K is cell.

- Medium for biochemical
  reactions in cells
- Maintaining osmotic
  pressure of cells

What is substance K?
A Lipid
B Water
C Protein
D Enzyme

9. Diagram shows the human digestive
system.

Which of the following organs A, B, C
or D secretes hydrochloric acid?

10. Diagram shows structures X and Y in
the villus.

Hydrolysis of the food classes are
represented by the symbols below:

Which of the following products will
be absorbed into structure X and Y?
11. Diagram shows part of alimentary canal.

Which of the following diseases will be suffers by this individual?
A Diabetes mellitus, hypertension
B Hypertension, osteoporosis
C Osteoporosis, gastritis
D Gastritis, cancer

12. Diagram shows parts of digestive system. In which part is haemorrhoids usually found?

13. Constipation is due to faeces being in the large intestine for too long. What type of food can help to overcome constipation?
A Food with fat-soluble vitamins like vegetables
B Food that is rich in carbohydrates
C High fibrous food like vegetables
D Food rich in proteins and vitamins

14. Diagram shows a diet that is always taken by an individual.

15. Which enzyme is needed during the digestion of plants in ruminants?
A Lactase
B Sucrase
C Amylase
D Cellulase

16. Diagram shows a digestive system of a rodent.

Which part A, B, C or D a beneficial bacteria can be found?

17. Diagram shows the stomach of a cow.

Which of the parts A, B, C or D is the true stomach of the cow?
18. Diagram shows part of the human digestive system.

Which of the following is secreted by organ X when the blood sugar level is low?
A  Insulin
B  Glycogen
C  Glucagon
D  Trypsin

19. The following information is about amino acids.

Excess amino acids cannot be stored in the body and are broken down in the liver through process K

What is process K?
A  Absorption
B  Assimilation
C  Deamination
D  Defecation

20. Diagram shows a child suffering from a disease.

Which of the following foods should be taken often by the child to recover from the disease?

21. The following chemical equation shows the reaction of photolysis of water in photosynthesis.

\[ \text{light} \quad \frac{2H_2O}{\text{chlorophyll}} \rightarrow 4[H] + 4e^- + O_2 \]

What will happen to this process if there is low light intensity?
A  More glucose is produced
B  Less oxygen is released
C  Rate of starch production increases
D  Rate of photolysis of water increases

22. The following statements are the effects of mineral deficiency in a plant.

- Stunted growth
- Yellow patches on leaves (Chlorosis)

What is the mineral?
A  Calcium
B  Zinc
C  Phosphorus
D  Nitrogen

23. The apparatus in the diagram was set up to investigate the effect of light intensity on the rate of photosynthesis. The experiment is repeated a few times by adjusting the distant between lamp and Hydrilla sp.
Which of the following is true about this experiment?
A  The number of bubbles is used to represent the rate of photosynthesis
B  The light intensity is decreased progressively by bringing the light bulb bearer to Hydrilla.
C  The results show that the number of bubbles per minute increases as the distance between the light bulb and Hydrilla
D  The rate of photosynthesis decreases with light intensity

24. Diagram shows a section of a leaf.

Which is the adaptation of the structure X to optimize photosynthesis?
A  Reduction of carbon dioxide
B  Photolysis of water
C  Synthesis of glucose
D  Synthesis of starch

25. Diagram shows the structure of a chloroplast seen under an electron microscope.

Name the process that occurs in S.
A  Reduction of carbon dioxide
B  Photolysis of water
C  Synthesis of glucose
D  Synthesis of starch

26. Which statement explains why plants are able to grow well in a green house?
STRUCTURE QUESTIONS

1. Diagram 1.1 shows a structure found in human intestine.

(a)(i) Name the structure shown in Diagram 1.1. [1 mark]

………………………………………………………………………………………………

(ii) How the structure named in (a)(i) is adapted to its function [2 marks]

………………………………………………………………………………………………

(b) State the function of X and Y in absorption [2 marks]

X: ………………………………………………………………………………………….

Y: ………………………………………………………………………………………….

(c) Diagram 1.2 shows a schematic diagram which represent the assimilation process in human
(i) Explain the function of liver in assimilation. [2 marks]

...................................................................................................................................................
...................................................................................................................................................
...................................................................................................................................................

(ii) Based on diagram, explain the assimilation of nutrient P. [2 marks]

...................................................................................................................................................
...................................................................................................................................................

(iii) Explain why assimilation of lipids do not occur directly in liver. [3 marks]

...................................................................................................................................................
...................................................................................................................................................
...................................................................................................................................................

2. Diagram 2 shows how digested food is transported from a villus to a liver and a body cell.

Diagram 2

(a)(i) Name process X which occurs at the villus [1 mark]

...................................................................................................................................................

(ii) Explain one adaptation of a villus for the process in (a)(i) [2 marks]

...................................................................................................................................................
...................................................................................................................................................
...................................................................................................................................................
(b) Vessel P transport digested food from the villi to the liver and vessel Q transports digested food to the body cells via lymphatic system. Name vessel P and Q. [2 marks]

Vessel P: ............................................................
Vessel Q: ............................................................

(c) Explain the difference in the concentration of glucose level in vessel P and Q. [2 marks]

..........................................................................................................................................................

(d) Other than lipid, name one other nutrient that can be found in vessel Q. [1 mark]

..........................................................................................................................................................

(e) A teenager has taken an excessive amount of protein in his daily diet. Explain how a liver functions in the regulation of excess protein. [4 marks]

..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................

3. **Diagram 3.1** shows the level in a Food Guide Pyramid for a balanced diet.

   ![Diagram 3.1](image)

(a)(i) What is a balanced diet? [2 marks]

..........................................................................................................................................................

..........................................................................................................................................................

(ii) Based on **Diagram 3.1**, state the food class in: [2 marks]

   Level 2: ...................................................................................................................................
   Level 3: .....................................................................................................................................
(iii) The levels in a food pyramid determine the amount of food that should be consumed in a diet. Why food class in level 4 should be taken in small amount? [2 marks]

(b) **Diagram 3.2** shows the daily energy requirements of various individuals.

![Diagram 3.2](image)

Explain the difference on the daily energy requirement between a very active man and a moderately active man. [2 marks]

(c) **Diagram 3.3** shows a child with one malnutrition condition.

![Diagram 3.3](image)

(i) Name the deficiency disease shown in the Diagram 3.3 and state the cause. [2 marks]

Disease: .................................................................

Cause: .................................................................
4. **Diagram 4.1** show the part of digestive system of goat.

![Diagram 4.1](image)

(a)(i) Mark (X) for the types of digestive system of a goat. [1 mark]

<table>
<thead>
<tr>
<th>Rodent</th>
<th>Ruminant</th>
</tr>
</thead>
</table>

(ii) Name the part label A, B, C and D [2 marks]

A : …………………………………..
B : …………………………………..
C : …………………………………..
D : …………………………………..

(b)(i) Name the enzyme that produced by bacteria found in D. [1 mark]

………………………………………………………………………………………………

(ii) State the function of the enzyme stated in (b)(i) [1 mark]

………………………………………………………………………………………………

(iii) Explain what happen when food enter section B. [2 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

(c) State three differences of digestive system between human and rabbit. [3 marks]

<table>
<thead>
<tr>
<th>Human</th>
<th>Rabbit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Based on the observation, explain why rabbit need to ingest their faeces whereas goat does not need to do that. [2 marks]

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………..………………

5. **Diagram 5.1** shows the cross section of the leaf of a plant. Diagram 5.2 shows a cross section of organelle M that is found in the palisade mesophyll cell. It is involved in the formation of starch in green plant.

![Diagram 5.1 and Diagram 5.2]

(a) State the role of organelle M in photosynthesis. [1 mark]

………………………………………………………………………………………………..

(b)(i) Describe the photosynthetic reaction that occurs in P. [3 marks]

………………………………………………………………………………………………..
………………………………………………………………………………………………..
………………………………………………………………………………………………..

(ii) Explain how the reaction in P is related to the reaction that occurs in Q. [2 marks]

………………………………………………………………………………………………..
………………………………………………………………………………………………..
(c) A cement factory is located near the plant and causes air pollution. Explain how the condition of the environment affects the rate of photosynthesis of the plant. [3 marks]

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………

(d) Based on the following statement, explain how this method is carried out during winter to ensure the production of crops throughout the year. [3 marks]

In countries with four seasons, plants are grown in greenhouses

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………

6. Diagram 6.1 shows a plant that undergo photosynthesis process.

![Diagram 6.1](https://example.com/diagram6.1.png)

(a) Substance X is needed during light reaction in photosynthesis process

(i) Name substance X. [1 mark]

…………………………………………………………………………………………………

(ii) Explain what happens to substance X during light reaction of photosynthesis process. [3 marks]

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………

(b) Gas Q and gas T are gaseous used and released during photosynthesis process. State in what stage these gases are used and released. [2 marks]

Gas Q: ………………………………………………………………………………………...
Gas T: ………………………………………………………………………………………...
(c) Different light intensity has different effect on the rate of photosynthesis. The uses of gas Q and production of gas T are also affected by the different light intensity. Explain what will happen if the uses of gas Q and production of gas T are at the same rate? [3 marks]

……………………………………………………………………………………………..

……………………………………………………………………………………………..

……………………………………………………………………………………………..

(d) **Diagram 6.2** below shows an example of campaign held to preserve green plant. Without plant, life will not exist on Earth. Through photosynthesis, green plant convert the energy of sunlight into chemical energy stored within organic molecules. State the importance of photosynthesis to living organism. [3 marks]
1.(a) **Table 1** shows the suitable nutrient intake foe teenagers and the aged.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Teenagers</th>
<th>The Aged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate (cal)</td>
<td>3500</td>
<td>2200</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>74</td>
<td>50</td>
</tr>
<tr>
<td>Vitamin D (mg)</td>
<td>8.3</td>
<td>5</td>
</tr>
<tr>
<td>Vitamin E (mg)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>Vitamin B (mg)</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>1200</td>
<td>800</td>
</tr>
<tr>
<td>Ferum (mg)</td>
<td>25</td>
<td>15</td>
</tr>
</tbody>
</table>

**Table 1**

Based on your biological knowledge and Table 1, explain the importance of the main nutrient for [10 Marks]

(i) Teenagers
(ii) The Aged

(b) **Diagram 1.1** and **1.2** shows the physical condition of people causes by malnutrition.

As a dietitian and need to give a health talk, discuss the effect of malnutrition and suggest ways to overcome the health problem faced by the two individual. [10 Marks]
2. **Diagram 2.1** shows the digestive system and organs associated with digestion.

![Digestive System Diagram](image)

**Diagram 2.1**

(a) Based on **Diagram 2.1**,
(i) Name the organs that are involved in the processing of food P. [3 Marks]
(ii) Explain the processes which occur to the food P until it can be used by body cells. [7 Marks]

(b) Based on the following statement, explain the role of organ R in assimilation of nutrients in foods P. [5 Marks]

> Organ R acts as checkpoint which controls the amount of nutrients released into the blood circulatory system

(c) **Diagram 2.2** shows a gastric bypass surgery is used to treat severe obesity.

![Gastric Bypass Surgery Diagram](image)

**Diagram 2.2**

- Stomach become too small
- Smaller stomach connected to the middle parts of the small intestine
Explain how the above operation can reduce excessive weight problems. [5 Marks]

3(a) **Diagram 3.1** shows the path of how digested foods are assimilated in the body.

Based on **Diagram 3.1**, explain the assimilation process of the following substances. [10 Marks]

(i) Glucose
(ii) Amino acids
(iii) Lipids

(b) **Diagram 3.2** shows the schematic diagram of reaction X and Y in the process of photosynthesis.

By using a raw materials, water and carbon dioxide, describe reaction X and reaction Y until starch is produced [6 Marks]
(c) Explain the following statement. [4 Marks]

Plants are unable to grow well if they are planted near industrial area.

4(a) **Diagram 4.1 (a)** shows the cross section of a leaf. **Diagram 4.1 (b)** shows an organelle which found abundantly in cell Y and X.

(i) Name the biochemical reaction occurs in structure labelled P and Q. [6 Marks]

(ii) Explain how the structure of the leaf are adapted to optimize the process occurs in (a)(i). [8 Marks]

(b) **Diagram 4.2** shows relationship between the rate of photosynthesis and the light intensity.

Describe how the light intensity affect the rate of photosynthesis and the limiting factors involves. [6 Marks]
5. Green plants are autotrophic which is synthesize their own food through the process of photosynthesis by using light. **Diagram 5.1** shows the schematic diagram summarising some reaction in the process of photosynthesis.

![Diagram 5.1](image)

(a) By using raw materials, water and carbon dioxide, describe reaction X and reaction Y until the starch is produced. **10 Marks**

(b) **Diagram 5.2** shows the plants are grown in greenhouses in countries with four seasons.

![Diagram 5.2](image)

**Diagram 5.2**

Based on the diagram, explain why this method is carried out to ensure production of crops throughout the year. **6 Marks**
(c) **Diagram 5.3** show the activities that cause air pollution.

![Diagram 5.3](image)

**Diagram 5.3**

Explain how air pollution may have an effect on photosynthesis. [4Marks]

6(a) **Diagram 6.1** shows a method of plant cultivation without use of soil.

![Diagram 6.3](image)

**Diagram 6.3**

Describe the method used. [4Marks]

(b) Genetically Modified Organisms (GMO) are organisms which carry the genetic information or beneficial genes from other organisms.

Nowadays, the crops such as wheat, soya bean, paddy and tomatoes are widely to be cultivated commercially as genetically modified plant.

Based on the information above, discuss the advantages and disadvantages of producing genetically modified organisms in food production. [6 Marks]
(c) **Diagram 6.2** shows a few examples of processed food.

![Processed Food Examples](image)

**Diagram 6.2**

Discuss the good effects and bad effects of processed food in your daily life. [10 Marks]
7 RESPIRATION

7.1 The Respiratory Process in Energy Production
7.2 The Respiratory Structures and Breathing Mechanisms in Humans and Animals
7.3 Gaseous Exchange across the Respiratory Surfaces and Transport of Gases in Humans
7.4 The Regulatory Mechanism in Respiration
7.5 The Importance of Maintaining a Healthy Respiratory System
7.6 Respiration in Plants

QUICK NOTES & REVISIONS

Types of Respiration

- Aerobic respiration
- Anaerobic respiration
- Cell respiration
- Gaseous exchange

RESPIRATORY STRUCTURE OF AMPHIBIANS

a) Pulmonary Respiration

Inspiration

- Nostrils open
- Buccal cavity expands

Expiration

- Nostrils close
- Glottis opens
- Buccal cavity contracts
- Lungs expand

- Buccal cavity expands
- Lungs contract

- Nostrils open
- Glottis closes
- Buccal cavity contracts

Food is also protein, fats etc. These products are converted to energy in a slightly different way but the end product is still ATP.
RESPIRATORY STRUCTURE OF INSECTS

RESPIRATORY STRUCTURE OF FISH

RESPIRATORY STRUCTURE OF HUMANS
Inhalation: Diaphragm contracts (moves down)

Expiration: Diaphragm relaxes

Inspiration:
- External intercostals contract
- Diaphragm contracts
- Chest wall and lungs expand
- Expansion of ribs moves sternum upward and outward

Expiration:
- External intercostals relax
- Internal intercostals and abdominals contract for active expiration only
- Chest cavity and lungs contract
- Ribs and sternum depress

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OBJECTIVES QUESTIONS

1. The following equation shows the process that take place in the muscle cell of an athlete while doing a vigorous activity.

\[ \text{Glucose} \rightarrow P + \text{energy} \]

What is P?
A Parasitism
B Mutualism
C Saprophytism
D Commensalism

2. Diagram shows a grass in water lodge for a week.

Which of the following is true about respiration at P?
A \( \text{Glucose} + \text{oxygen} \rightarrow \text{water} + \text{carbon dioxide} + \text{energy} \)
B \( \text{Glucose} \rightarrow \text{ethanol} + \text{carbon dioxide} + \text{energy} \)
C \( \text{Glucose} \rightarrow \text{lactic acid} + \text{energy} \)
D \( \text{Glucose} + \text{oxygen} \rightarrow \text{ethanol} + \text{carbon dioxide} + \text{energy} \)

3. Which of the following is the correct equation for the respiration in muscle cells during vigorous activities?
A \( \text{Glucose} \rightarrow \text{lactic acid} + \text{energy} \)
B \( \text{Glucose} \rightarrow \text{carbon dioxide} + \text{ethanol} + \text{energy} \)
C \( \text{Glucose} + \text{oxygen} \rightarrow \text{ethanol} + \text{carbon dioxide} + \text{energy} \)
D \( \text{Glucose} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water} + \text{ethanol} + \text{energy} \)

4. The following equation shows the fermentation that takes place in yeast.

\[ \text{Glucose} \rightarrow \text{Yeast} \rightarrow \text{Energy} + P + \text{Carbon dioxide} \]

What is value of energy produced and substance P?
A 38 ATP and Ethanol
B 38 ATP and lactic acid
C 2 ATP and Ethanol
D 2 ATP and Lactic Acid

5. Diagram shows an experiment set up used to show yeast fermentation.

Which of the following solution can be used to test the gas produced?
I. Alkaline potassium pyrogallate solution
II. Bicarbonate indicator solution
III. Iodine solution
IV. Lime water
A II and II only
B I and III only
C II and IV only
D III and IV

6. Diagram shows a model of a lungs.
What will happen in M and N when the string is pulled downwards?

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Volume increases</td>
<td>Expand</td>
</tr>
<tr>
<td>B</td>
<td>Volume decreases</td>
<td>Contract</td>
</tr>
<tr>
<td>C</td>
<td>Pressure increases</td>
<td>Expand</td>
</tr>
<tr>
<td>D</td>
<td>Pressure decreases</td>
<td>Contract</td>
</tr>
</tbody>
</table>

10. A hunter accidentally shot his friend. A bullet penetrates his chest and he died on the spot. He died because…….
   A Thoracic cavity pressure is higher than atmospheric pressure
   B Thoracic cavity pressure is lower than atmospheric pressure
   C Thoracic cavity pressure is same as atmospheric pressure
   D Thoracic cavity pressure is not change

11. Diagram shows a model of a rib cage prepared by a student to study the respiratory mechanism in humans.

Which of the following will happen if the position of the ribs is changed from situation 1 to situation 2?

I. The pressure in the lungs increases
   II. The volume of thoracic cavity decreases
   III. The rib cage moves upwards and outwards
   IV. Inhalation takes place
   A I and II only
   B III and IV only
   C I, III and IV only
   D I, II, III and IV

12. Which of the following structure increases the efficiency of the fish’s gills as a respiratory organ?
   A Blood capillary
   B Filament
   C Lamellae
   D Gill arch
13. Diagram shows the respiratory system of an insect.

What is structure N and name the substance that prevent the structure from being deflated?

<table>
<thead>
<tr>
<th></th>
<th>Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Trachea</td>
</tr>
<tr>
<td>B</td>
<td>Tracheole</td>
</tr>
<tr>
<td>C</td>
<td>Spiracle</td>
</tr>
<tr>
<td>D</td>
<td>Spiracle</td>
</tr>
</tbody>
</table>

14. The following information shows the results of an experiment to determine the carbon dioxide content in exhaled air using J-tube.

<table>
<thead>
<tr>
<th></th>
<th>Oxygen</th>
<th>Carbon dioxide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of exhaled air column</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>10 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of exhaled air column</td>
<td>Y</td>
<td>X</td>
</tr>
<tr>
<td>after treatment with potassium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hydroxide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.6 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of exhaled air column</td>
<td></td>
<td></td>
</tr>
<tr>
<td>after treatment with potassium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pyrogallate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.5 cm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The percentage of carbon dioxide content in the exhaled air is?

A. 4 %
B. 8.5 %
C. 11 %
D. 21 %

15. What process occurs between alveolus and blood capillary during gaseous exchange?

A. Osmosis
B. Diffusion
C. Facilitated diffusion
D. Active transport

16. Diagram shows a cross section of an alveolus in the lung of a mammal.

Which of the following is correct about oxygen and carbon dioxide concentrations at X and Y?

<table>
<thead>
<tr>
<th>Oxygen</th>
<th>Carbon dioxide</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>X</td>
<td>Low</td>
</tr>
<tr>
<td>Y</td>
<td>High</td>
</tr>
<tr>
<td>A</td>
<td>Low</td>
</tr>
<tr>
<td>B</td>
<td>Low</td>
</tr>
<tr>
<td>C</td>
<td>Low</td>
</tr>
<tr>
<td>D</td>
<td>High</td>
</tr>
</tbody>
</table>

17. Diagram shows structure X which is a part of the respiratory structure of human.

I. It has one-cell thick walls
II. It is covered with dense blood capillaries
III. It contains red pigments known as haemoglobin
IV. The partial pressure of carbon dioxide in X is high

Which of the following is true about structure X?

A. I and II only
B. I and III only
C. II and III only
D. III and IV only
18. Which of the following describe how carbon dioxide is transported in blood?
   I. In the form of carbon monoxide
   II. In the form of oxyhaemoglobin
   III. As carbaminohaemoglobin
   IV. As dissolved carbon dioxide in the blood plasma

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

19. The oxygen level in the blood of a mountain climber drops from its normal level during mountain climbing.
   I. pH of blood decrease
   II. breathing and ventilation rate increase
   III. Respiratory muscles contract and relax faster
   IV. Intercostal muscles contract and relax slower

   Which process occur in his respiratory system to return the oxygen level to normal?
   A  I and II
   B  II and III
   C  I and IV
   D  III and IV

20. Diagram shows the cross section of human brain.

   Based on diagram, which of the part labelled A, B, C or D is the respiratory centre in the human brain?

21. The following information is about controlling breathing in human body.

   | P | Partial pressure of carbon dioxide increases |
   | Q | Rate of breathing and rate of ventilation increase |
   | R | Central chemoreceptors in the medulla oblongata detect an increase in the level of hydrogen ions in the blood |
   | S | Nerve impulse are sent to the respiratory muscles |

Which sequence is correct?

   A  P → Q → R → S
   B  Q → S → R → P
   C  R → S → Q → P
   D  P → R → S → Q

25. Graph below shows the amount of carbon dioxide taken in and produced by a plant at different light intensities. Which of the following points A, B, C or D is the compensation point?

26. Which of the following adaptations is meant to increase the efficiency of gaseous exchange in plants?
   A  Dropping the old leaves
   B  Having a large number of leaves
   C  More stomata in the upper epidermis
   D  Having the intercellular spaces filled with fluid
STRUCTURE QUESTIONS

1. **Diagram 1.1** shows part of the structure of the plasma membrane of an animal cell.

![Diagram 1.1](image)

(a)(i) In 1972, Singer and Nicholson proposed the fluid mosaic-model to explain the structure of the plasma membrane. Give one reason why it is so called. [1 mark]

………………………………………………………………………………………………

(ii) Explain how glucose molecules from a region of higher concentration in the extracellular fluid are transported across the plasma membrane into an animal cell. [2 marks]

………………………………………………………………………………………………

(b) **Diagram 1.2** shows the respiratory structure of an organism.

![Diagram 1.2](image)

(i) Name the respiratory structure in Diagram 2.2 [1 mark]

………………………………………………………………………………………………

(ii) Where does gaseous exchange occur in the structure named in (a)(i)? [2 marks]

………………………………………………………………………………………………
(iii) Explain one adaptation of the respiratory structure in **Diagram 1.2** for efficient gaseous exchange. [2 marks]

……………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………

(iv) How does gaseous exchange occur in this organism? [2 marks]

……………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………

2 **Diagram 2** shows the exchange of respiratory gases X and Y between the alveolus, blood capillary and the body cells and the transport of gaseous.

(a)(i) Name gas X and Y. [2 marks]

Gas X : …………………………………………………………………………………………………………..
Gas Y : …………………………………………………………………………………………………………..

(ii) Explain how the alveolus is structured to increase the efficiency of gaseous exchange. [2 marks]

……………………………………………………………………………………………………………………
……………………………………………………………………………………………………………………
(b) Explain the difference between the concentration of gas X and Y in blood vessel Q. [2 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………

(c) The concentration of gas X transported in blood vessel P of a cigarette smoker is usually lower than the one in healthy individual. Explain why does this occur? [2 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

(d) In an experiment, a boy takes part in an 800 metre event track. His exhaled air was obtained three times which were taken before running, right after he finished running and 10 minutes after running to determine the percentage of carbon dioxide. Table 2.1 shows the result of the experiment.

<table>
<thead>
<tr>
<th>Percentage of carbon dioxide (%)</th>
<th>Before running</th>
<th>Right after he finishes running</th>
<th>After 10 minutes running</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4%</td>
<td>7.5%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Table 2.1

Based on Table 2.1, explain how the percentage of carbon dioxide is returned to normal after 10 minutes running. [4 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

Diagram 3.1 and Diagram 3.2 shows the tissues in the respiratory system in human and plant respectively.

Diagram 3.1

Diagram 3.2
(a)(i) State the organ in which the tissue in **Diagram 3.1** can be found. [1 mark]

………………………………………………………………………………………………

(ii) State the function of organ stated in (a)(i). [1 mark]

………………………………………………………………………………………………

(b) Explain how gaseous exchange occurs during respiration in **Diagram 3.1** and **Diagram 3.2**. [4 marks]

Gaseous exchange in **Diagram 3.1**:

………………………………………………………………………………………………

………………………………………………………………………………………………

Gaseous exchange in **Diagram 3.1**:

………………………………………………………………………………………………

………………………………………………………………………………………………

(c) State two differences between tissues in **Diagram 3.1** and **Diagram 3.2**. [2 marks]

………………………………………………………………………………………………

………………………………………………………………………………………………

(d) Smokers do not realize that they destroy their respiratory organ during smoking. Explain how this habit will affect the intake of oxygen efficiency. [4 marks]

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………
4 Diagram 4.1 shows the surface view of lower epidermis in a leaf of plant. Diagram 4.2 shows part of cross section of a woody stem.

Diagram 4.1 Diagram 4.2

(a) Label pore M and N. [2 marks]

Pore M: ……………………………………………………………………………………..
Pore N: ……………………………………………………………………………………..

(b) Explain the gas uptake for respiration through pore M and N. [4 marks]

Pore M:
………………………………………………………………………………………………
………………………………………………………………………………………………

Pore N:
………………………………………………………………………………………………
………………………………………………………………………………………………

(c) Diagram 4.3 shows a paddy plant in a paddy field.

Diagram 4.3

(i) Explain the respiration that occurs in the root cells of the paddy plant. [2 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
(ii) Based on Diagram 4.3, complete Table 4.1 by naming the products of respiration of the two organs.

<table>
<thead>
<tr>
<th>Organ</th>
<th>Leaves</th>
<th>Roots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Products of respiration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.1

(d) Diagram 4.4 shows the changes in the volume of carbon dioxide absorbed or released by a plant in different light intensity.

![Diagram 4.4](image)

If point U remains constant for a long period, explain the effect of this to living organisms. [2 marks]

The effect to living organisms:

<p>| |</p>
<table>
<thead>
<tr>
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<td></td>
</tr>
</tbody>
</table>
ESSAY QUESTIONS

1. **Diagram 1** shows the three types of organisms which have different respiration systems.

   ![Diagram 1](image1)

   **Diagram 1**

   (a) Explain how the adaptation of the respiratory systems of organism R prevents it from collapsing, when the air pressure drops. [4 marks]

   (b) Describe how the respiratory structures of R and Q were adapted to increase the efficiency of gaseous exchange. [6 marks]

   (c) Explain the similarities and differences of respiratory systems between organism’s P and Q. [10 marks]

2. (a) **Diagram 2.1** shows how a frog carries out inhalation.

   ![Diagram 2.1](image2)

   **Diagram 2.1**

   Explain the inhalation process in the frog [4 marks]

   (b) **Diagram 2.2(a)** shows the structure and respiratory surface of a grasshopper and **diagram 2.2(b)** shows the structure and respiratory surface of a human being.
(i) Explain two similar characteristics of a tracheole and an alveolus in increasing the efficiency for gaseous exchange. [4 marks]

(ii) Explain how body cells of an insect obtain oxygen from the air. [6 marks]

(c) Diagram 2.3 shows how carbon dioxide is transported in human blood in a form of bicarbonate ions (HCO$_3^-$).

- 7% of carbon dioxide is transported as dissolved carbon dioxide in blood plasma
- 23% of the carbon dioxide is transported by haemoglobin in a form of carbaminohaemoglobin
- 70% of the carbon dioxide is transported in a form of bicarbonate ions (HCO$_3^-$)

Based on Diagram 2.3 explain the transport of carbon dioxide in a form of bicarbonate ions (HCO$_3^-$) in human blood. [6 marks]

3. The following equation shows the process that takes place in the muscle cell of an athlete while doing a vigorous activity.

\[ \text{Glucose} \rightarrow \text{Lactic acid} + \text{Energy} \]

(a) Explain how this process occur in human muscle cells. [6 marks]

(b) State four differences between aerobic respiration and anaerobic respiration. [4 marks]
(c) **Diagram 3** shows gaseous exchange in an alveolus.

![Diagram 3](image)

(i) State the level of partial pressures of oxygen at P, Q and R. [3 marks]

(ii) Explain how the respiratory gases are transported in human body. [7 marks]

4 **Diagram 4.1** shows two individuals, X and Y, in two different situations.

![Diagram 4.1](image)

(a)(i) Based on information given in **Diagram 4.1**, explain the cellular respiration process that occurs in individual X and Y. [8 marks]

(ii) After completed the event, individual X experienced pain due to leg muscle fatigue. He then carries out the following actions:

- Wears a track suit
- Takes a few long breath
- Walks freely as a ‘cooling down’ activity

Explain why the individual X carries out these action [6 marks]
(b) **Diagram 4.2(a)** shows the changes of atmospheric pressure with the altitude. **Diagram 4.2(b)** shows the equipment wore by a mountain climber.

![Atmospheric Pressure vs. Altitude](image)

**Diagram 4.2(a)**

**Diagram 4.2(b)**

Explain why the mountain climber needs to wear such equipment? [6 marks]
8.1 The Abiotic and Biotic Components of the Environment
8.2 The Process of Colonisation and Succession in an Ecosystem
8.3 Population Ecology
8.4 Biodiversity
8.5 The Impact of Microorganism on Life
8.6 Appreciating Biodiversity

Abiotic and Biotic Components of the Environment

<table>
<thead>
<tr>
<th>Biotic Components</th>
<th>Abiotic Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Man</td>
<td>pH value</td>
</tr>
<tr>
<td>Animals</td>
<td>microclimate</td>
</tr>
<tr>
<td>Plants</td>
<td>Light intensity</td>
</tr>
<tr>
<td></td>
<td>temperature</td>
</tr>
<tr>
<td></td>
<td>Topography</td>
</tr>
<tr>
<td></td>
<td>humidity</td>
</tr>
</tbody>
</table>

Food Chain & Food Web

A terrestrial food chain

A marine food chain

Colonisation & Succession in Mangrove Swamps

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THE QUADRAT SAMPLING TECHNIQUE

- Used in estimating the size of plant population and immobile animal.
- A quadrat – metal, wooden frame or PVC pipe frame which form a square of a known area (1 m$^2$).
- Placed randomly in an ecosystem where sampling is carried out.

\[
\text{Frequency} = \frac{\text{number of quadrats containing the species}}{\text{number of quadrats}} \times 100\% \\
\text{Density} = \frac{\text{total number of individuals of a species in all quadrats}}{\text{number of quadrats} \times \text{quadrat area}} \\
\text{Percentage coverage} = \frac{\text{aerial coverage of all quadrats (m$^2$)}}{\text{number of quadrats} \times \text{quadrat area}} \times 100\%
\]

THE CAPTURE, MARK, RELEASE AND RECAPTURE TECHNIQUE

- Used to estimate mobile animals (small mammals, butterflies, birds and insects)
- Procedure:
  1. Animal sample is captured
  2. Marked
  3. Released
  4. Second sample captured & number of marked animal recorded.

\[
\text{Population size} = \frac{\text{(number of individuals in the first sample) \times (number of individuals in the second sample)}}{\text{number of marked individuals recaptured}}
\]
OBJECTIVES QUESTIONS

1. Diagram shows a crab with barnacles on its shell.
   What is the interaction between the crab and the barnacles?
   A Parasitism  
   B Mutualism  
   C Saprophytism  
   D Commensalism

2. Diagram shows pond ecosystem.
   Which organism labelled A, B, C or D is at the highest trophic level?

3. Diagram shows an interaction between two organisms, R and S of different species.
   Which of the following represent organism R and organism S?

<table>
<thead>
<tr>
<th>R</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Owl</td>
<td>Rat</td>
</tr>
<tr>
<td>B Shark</td>
<td>Remora fish</td>
</tr>
<tr>
<td>C Alga</td>
<td>Fungus</td>
</tr>
<tr>
<td>D Crab</td>
<td>Barnacles</td>
</tr>
</tbody>
</table>

4. Diagram shows part of nitrogen cycle in the atmosphere.
   What is bacteria X?
   A Nitrogen-fixing bacteria  
   B Nitrifying bacteria  
   C Denitrifying bacteria  
   D Purifying bacteria

5. The following are information about bacteria on legume plant.
   - Bacteria live in roots nodule of legume plant
   - Bacteria obtains glucose from the legume plant

   What is the role of bacteria in roots nodule?
   A Convert glucose to starch  
   B Fix atmospheric nitrogen to nitrate  
   C Fix ammonium compound to nitrite  
   D Convert nitrate to glucose

6. Which of the following are abiotic components in an ecosystem?
   I. Consumer  
   II. Humidity  
   III. Decomposer  
   IV. Light intensity

   A I and II only  
   B I and III only  
   C II and IV only  
   D III and IV
7. Diagram shows an interaction between owls and rats.
   A Prey-predator
   B Saprophytism
   C Commensalism
   D Mutualism

8. Diagram shows the energy flow in a food chain.
   - Energy: 50 000 kJ
   - What is the amount of energy received by the secondary consumed?
     A 50 kJ
     B 500 kJ
     C 5000 kJ
     D 50 000 kJ

9. The following Information is related to a process occur in an ecosystem.
   - The pioneer species is replaced by a new species which is more adapted to the habitat
   - The process occurs gradually over a long period of time
   - The process end with a climax community

   What is the process?
   A Colonization
   B Competition
   C Succession
   D Evolution

10. Diagram shows the root structure of a mangrove plant.
   What is structure Y?
   A Knee root
   B Buttress root
   C Pneumatophore
   D Prop root

11. Which of the following is the correct sequence in the process of plant succession in a mangrove swamp?
   A Avicennia sp. → Soneratia sp → Rhizophora sp.
   B Avicennia sp. → Rhizophora sp. → Bruegera sp.
   C Soneratia sp. → Bruguiera sp. → Rhizophora sp
   D Brugueva → Rhizophora sp. → Avicennia sp.

12. Diagram shows the distribution of plants in mangrove area.
   Which zones are colonized by pioneer species?
   A A and B
   B A and C
   C B and C
   D C and D
13. An abandoned housing project can form a primary forest. Which of the following sequences is correct in the formation of the primary forest?
   A Successor →pioneer climax →community
   B Pioneer →successor climax →community
   C Successor →climax community →pioneer
   D Pioneer →climax community →successor

14. The following statement is an adaptive characteristics of a mangrove tree

   Germination occurs when the seeds are still attached to the parent plant

   The adaptive characteristics above refers to
   A Oviparity
   B Pneumatophores
   C Viviparity
   D Prop root

15. The following information is about habitat.

   - Habitat: School field
   - Size: 50 m X 100 m
   - Type of plants: Mimosa pudica

   Which of the following is the most suitable method used to estimate the population of woody plants in the habitat?
   A Line transect
   B Belt transect
   C Quadrate size 1m X 1m
   D Quadrate size 5m x 5m

16. Table shows the data obtained from an experiment to study the population of snails in an area.

<table>
<thead>
<tr>
<th>Number of snails in the first capture</th>
<th>Number of snails in the second capture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of unmarked snails in the second capture</td>
<td>Number of marked snails in the second capture</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>60</td>
<td>53</td>
</tr>
</tbody>
</table>

   Estimate the size of population of snails in an area.
   A 13.2
   B 17
   C 272
   D 362

17. Table shows the sampling results obtained on plant X in a school field using a one meter square quadrat.

<table>
<thead>
<tr>
<th>Quadrat</th>
<th>Number of plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>7</td>
</tr>
</tbody>
</table>

   What is the species frequency of plant X?
   A 8%
   B 6 per m²
   C 80%
   D 6 per m²

18. Aliaa carried out a study on the population of grass X in a garden. She uses the quadrat sampling technique in the study. Table shows the result of the study.
Quadrat | Area covered by grass X/m²
---|---
1 | 1.32
2 | 0.87
3 | 0.18
4 | 0.46
5 | 1.20
6 | 0.51

The percentage coverage of grass X in the garden is
A 45.4%
B 4.54%
C 75.7%
D 7.57%

19. Table shows the result of a field study to determine the frequency of a plant species, *Mimosa pudica*, in a field by using the quadrat sampling technique.

<table>
<thead>
<tr>
<th>Quadrat</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of plant</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

The frequency of *Mimosa pudica* in the field is
A 20%
B 40%
C 60%
D 80%

20. Table shows the number of plant P present in 10 different quadrats, each measuring 1m x 1m.

<table>
<thead>
<tr>
<th>Quadrat number</th>
<th>Number of plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>14</td>
</tr>
<tr>
<td>II</td>
<td>10</td>
</tr>
<tr>
<td>III</td>
<td>0</td>
</tr>
<tr>
<td>IV</td>
<td>22</td>
</tr>
<tr>
<td>V</td>
<td>18</td>
</tr>
<tr>
<td>VI</td>
<td>16</td>
</tr>
<tr>
<td>VII</td>
<td>12</td>
</tr>
</tbody>
</table>

| VIII | 0 |
| IX | 15 |
| X | 13 |

Calculate the density of P
A 8 m²
B 12 m²
C 15 m²
D 120 m²

21. The following information refers to a kingdom in the classification of organisms
- Unicellular organisms
- Have a cell wall
- No membrane-bound organelles
- The genetic material is scattered in the cytoplasm

This organism belongs to which kingdom?
A Monera
B Fungi
C Protista
D Plantae

22. Diagram shows two types of sharks, *Carcharhinus longimanus* and *Carcharhinus obscurus*.

Which of the following is the difference between these two types of sharks?
A Species
B Family
C Genus
D Class
1. **Diagram 1.1** shows an example of energy flow in an ecosystem.

   ![Diagram 1.1](image)

   (a)(i) Energy loss at each trophic level is 90%. Complete the diagram by calculate the amount of energy transferred to organism Q and organism R. [2 marks]

   …………………………………………………………………………………………………

   (b) **Diagram 1.2** shows an interaction between biotic component and abiotic component in an ecosystem.

   ![Diagram 1.2](image)

   (i) State two biotic components and two abiotic components in the ecosystem. [2 marks]

   Biotic component: ………………………………………………………………………...

   Abiotic component: ………………………………………………………………………...
(ii) Based on **Diagram 1.3**, constructs food web which contain at least three food chains. [3 marks]

---

(c) A farm has been setup near to the pond. Alga bloom occurs and the pond water turns green. Explain the effect of this condition to the organism in the pond. [3 marks]

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……………………………………………………………………………………………

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2. **Diagram 2** shows distribution population of aquatic plant in the pond. Population study using quadrat sampling technique. Five quadrat sampling were taken at random.

(a) State two abiotic factors influence distribution population of aquatic plant in pond. /2 marks

i: .........................................................................................................................

ii: .........................................................................................................................

(ii) Calculate the density of *Colocasia sp.* in the pond. /2 marks
(c) Explain one abiotic factor stated in a(i) that influence the distribution of *Colocasia* sp. [3 marks]

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(d) The area around the pond has been developed for vegetable cultivation where farmers use pesticides without following the recommended amount which is 25ml insecticide in 1 litre of water, but farmers using pesticides 50 ml in 1 litre of water.

(i) Explain the effect of activities on aquatic plant in pond. [3 marks]

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(ii) Suggest suitable method to overcome the effect in (d)(i) [2 marks]

........................................................................................................................................
........................................................................................................................................

3(a) **Diagram 3** shows a terrestrial ecosystem.

![Diagram 3](image)

(i) State the definition of ecosystem. [1 mark]

........................................................................................................................................
(ii) A niche of an organism is its roles in the ecosystem. 
Based on organisms in Diagram 3, state an example of niche. [1 mark]

(b)(i) Based on Diagram 3, construct a food web showing interaction of four organisms. [2 marks]

(ii) Based on the constructed food web in (b)(i) construct a pyramid of numbers. [2 marks]

(c)(i) The organisms in the first trophic level absorbs 15,000kJ solar energy. Energy loss at each trophic level is 90%. 
Calculate the total energy transferred to the organisms in the third trophic level. [2 marks]

(ii) State two ways in which energy may be lost in the food web. [2 marks]
1 : ......................................................................................................................................
2 : ......................................................................................................................................

(d) Many problems related to the environment are the results of human activities. Explain one bad effect of the activities on the ecosystem. [2 marks]

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......................................................................................................................................
......................................................................................................................................
4. **Diagram 4.1** shows the distribution of mangroves at a river mouth.

![Diagram 4.1](image)

(a) Name a dominant plant species present in each of the following zone: [2 marks]

Zone L: ………………………………………………………………………………………
Zone M: ………………………………………………………………………………………

(b) (i) Which zone in **Diagram 4.1** is occupied by pioneer species? [1 mark]

………………………………………………………………………………………………..

(ii) Name a pioneer species that can be found in the zone named in (b)(i). [1 mark]

………………………………………………………………………………………………..

(iii) Explain the role of pioneer species in the process of succession in the river mouth area. [2 marks]

……………………………………………………………………………………………

……………………………………………………………………………………………
(c) **Diagram 4.2** shows the profile of the mangrove swamps from P to Q, as shown in **Diagram 4.1**.

![Diagram 4.2](image)

(i) Match the roots of mangrove trees in each zone as shown in **Diagram 4.2**.

![Diagram 4.3](image)

(ii) If the mangrove area is left undisturbed by human activities for about 100 years, name type of common plant that can be found in Zone 4. Give reason for your answer. [3 marks]

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

5. A study on rat population in an oil palm plantation was carried out. On the first day, a total of 100 rats were caught with rat’s traps. The rats were marked and then released. After 1 week, the traps were used again. There were 40 marked rats out of a total of 140 caught.

(a) Name the technique used in this study. [1 mark]

………………………………………………………………………………………………
(b)(i) Suggest a suitable material which can be used to mark the specimens. [1 mark]

..................................................................................................................................................

(ii) Give two reasons for your answer in (b)(i). [2 marks]

..................................................................................................................................................
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(c) Calculate the rat population in the oil palm plantation. [2 marks]

..................................................................................................................................................

(d) Why the second capture was only carried out after one week? [1 mark]

..................................................................................................................................................

(e) If another survey is carried out after three months, name the factors which would affect the size of the rat population in the oil palm plantation. Explain briefly. [2 marks]

..................................................................................................................................................
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(f) Suggest what would happen if excess fertilisers from the oil palm plantation flows into the nearby river. [2 marks]

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..................................................................................................................................................
..................................................................................................................................................

.....................................................................................................................................................
ESSAY QUESTIONS

1(a) *Pleurococcus sp.* is a unicellular green algae found on the bark of tree. A group of students carried out an experiment to estimate the population size of *Pleurococcus sp.* within the school compound.

![Diagram 1.1](image_url)

(i) Based on **Diagram 1.1**, describe the technique used to estimate the percentage coverage of *Pleurococcus sp.* on the bark of tree. [6 marks]

(ii) **Table 1** shows the results of activity to estimate population size of *Pleurococcus sp.* in the **Diagram 1.1**.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage coverage of <em>Pleurococcus sp.</em> (cm²)</td>
<td>53</td>
<td>86</td>
<td>70</td>
<td>63</td>
<td>54</td>
</tr>
</tbody>
</table>

**Table 1**

Based on the result in **Table 1**, explain how the light intensity influence the population size of the *Pleurococcus sp.* [6 marks]

(b)(i) **Diagram 1.2** shows the vector of dengue fever. Based on the statement below describe how the vectors cause dengue fever to human. [5 marks]

Dengue fever is a viral infection caused by the female mosquito. Dengue fever occurs in tropical and sub-tropical regions and usually increases in the hot and humid months. In recent years, dengue fever has become a major international public health concern.
Diagram 1.2

(ii) Explain the role of individual, community and government that can control the disease. [5 marks]

2(a) **Diagram 2.1** shows a type of interaction between organisms.

(i) Name and describe the interaction shown in **Diagram 2.1** [4 marks]

![Diagram 2.1](image)

(ii) Explain how the dynamic equilibrium in a prey-predator relationship is maintained. [6 marks]
(b) **Diagram 2.2** shows the nitrogen cycle which plays an important role in the formation of protein.

![Diagram 2.2](image)

Explain the role of microorganisms R, S, T, U and V in this cycle. [10 marks]

3(a) Ecological succession is a continual series of changes in the structure and species composition of a community from initial colonization of an area by pioneer species until a stable complex community is reached.
Describe the changes that occur in the mangrove swamp ecosystem throughout the years that end up forming a stable ecosystem as shown in **Diagram 3.1** [10 marks]

(b) Though mangrove forests are in many ways very adaptable ecosystems, and are inherently able to respond to physical changes in their environment, they are highly vulnerable to oil toxicity and can be further damaged by many types of clean-up activities. Thus we must approach any type of response or restoration activities in mangroves with knowledge and caution.

**Diagram 3.2**

As a biologist, suggest actions that should be taken to overcome the problems shown in **Diagram 3.2**. Support your suggestion with suitable explanations [10 marks]
Diagram 4 shows the colonisation and succession process take place in the pond.

Based on Diagram,
(a)(i) State the meaning of colonization and succession in the pond. [2 marks]
(ii) Describe how the pond habitat changes until the primary forest is formed. [8 marks]

(b) Based on the following statement and situation, explain the effects may be occur in the pond within the next three years. [10 marks]

FARMING IS A BUSINESS

Vegetables planting activity is carried actively to increase the food supply and the economy of a country

This activity can reduce dependence supply of vegetables from abroad.

To reduce the cost of draining, these activities are conducted near the pool
9

ENDANGERED ECOSYSTEM

9.1 Human Activities that Endanger an Ecosystem
9.2 The Greenhouse Effect and the Thinning of the Ozone Layer

QUICK NOTES & REVISIONS

The Importance of Proper Management of Development Activities and the Ecosystem
Formation of Acid Precipitation

Wind

Power plant and industrial plumes

Mobile emissions

SO₂ + NOₓ

Conversion to acids:
Sulfuric acid (H₂SO₄)
Nitric acid (HNO₃)

Acid precipitation (droplets of H₂SO₄ and HNO₃ dissolved in rain and snow)

Lakes become acidic

Surface runoff
THINNING OF OZONE LAYER
1. UV causes a chlorine atom to break away from the CFC molecule.

2. The free chlorine atom hits an ozone molecule.

3. The chlorine atom pulls one oxygen atom away.

4. A free oxygen atom hits the chlorine monoxide molecule.

5. The result is another free chlorine atom.

6. Free chlorine will continue to deplete ozone in the stratosphere.

**Human Health**
- Skin cancer / melanoma
- Eye damage such as cataract
- Lowering of body's immune system

**Plants**
- Damage of leaf cells & chlorophyll, reducing photosynthesis
- Decrease in nutrient content & crop yields
- Killing of phytoplankton

**Environment**
- Increase in surrounding temperature
- Change in wind directions
- Climatic changes
OBJECTIVES QUESTIONS

1. The information below shows the impacts of phenomenon S

- Increase in the earth’s temperature
- Change in climate zone
- Decline in the yields of crops
- Melting of polar ice and glaciers causing rise in sea level

What is phenomenon S?
A Greenhouse effect
B Ozone depletion
C Thermal pollution
D Global warming

2. Diagram shows logging activity.

Which of the following is the effect of the activity?
A Eutrophication
B Increase of biodiversity
C Air pollution
D Soil erosion

3. Diagram shows an environmental phenomenon.
Which of the following is correctly matched?

4. Diagram shows the emission of various gases by a chemical factory in an industrial area.

Which of the following is the effect of this activity?
A Reduce BOD value of water
B Increase the humidity of atmosphere
C Increase the acidity of the water
D Reduce the vision distance problems

5. Diagram shows two type of aquatic organism which live in a pond.

Which of the following is true regarding the relationship between the level of BOD in the water, the populations of R and the population of S?

<table>
<thead>
<tr>
<th>Level of BOD</th>
<th>Population of R</th>
<th>Population of S</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Lower</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
<tr>
<td>B Higher</td>
<td>Increases</td>
<td>Decreases</td>
</tr>
<tr>
<td>C Lower</td>
<td>Decreases</td>
<td>Decreases</td>
</tr>
<tr>
<td>D Higher</td>
<td>Increases</td>
<td>Increases</td>
</tr>
</tbody>
</table>
6. What is the main cause of the greenhouse effect?
   A The thinning of the ozone layer
   B More ultra-violet rays reaching the earth
   C The presence of glass-walled high-rise buildings
   D An increase of carbon dioxide in the atmosphere

7. Which of the following can reduce environmental pollution?
   I Use of unleaded petrol
   II Use of biological control to control pests
   III Control the usage of aerosol
   IV Implementation of laws to protect the environment
   A I and II only
   B I, II and III only
   C I, II and III only
   D I, II, III and IV

8. Newspaper clipping below shows the impact of human activity on the environment.

   Which human activity contributes to this air pollution?
   A Releasing of chlorofluorocarbon (CFC)
   B Dumping of radioactive waste
   C Dumping of domestic waste
   D Open burning

9. Diagram shows an environmental phenomenon.

   Which of the following shows the effects of the phenomenon?

10. Diagram shows the apparatus and materials set up in an experiment to determine the level of water pollution in a river.

    Why is the tip of the needle should be at the base of the reagent bottle while adding methylene blue solution?
A To avoid oxygen from dissolve into the water sample  
B To make sure that methylene blue solution is equally distributed in the water sample  
C To avoid photosynthesis by algae  
D To avoid carbon dioxide from dissolve into the water sample

11. Which of the following are the effects of the thinning of ozone layer?  
I. Increase amount of carbon dioxide  
II. Increase of sea level  
III. Increase the rate of photosynthesis of aquatic plant  
IV. Extreme changes of climate  
A I and II only  
B I and III only  
C II and IV only  
D III and IV only

12. The following are the effects of human activity on the environment.  
- Destruction of food chain  
- Extinction of flora and fauna  
- Increase BOD level

Which of the following human activity caused the above effects?  
A Cutting down the trees  
B Using polystyrenes container  
C Using excess fertiliser in farm  
D Releases of sulphur dioxide from factory

13. Read the following statement.  
- Increase of skin cancer  
- Increase the sea level

The statement above shows the effect of:

14. Which of the following gases can cause the depletion of ozone layer?  
A Chlorofluorocarbon (CFC)  
B Nitrogen dioxide  
C Methane  
D Ozone

15. Diagram shows the impacts of phenomenon Y.  

What is phenomenon Y?  
A Greenhouse effect  
B Deforestation  
C Thermal pollution  
D Global warming

16. Diagram shows the thinning of ozone layer in the Earth’s stratosphere.  

Which of the following substances causes this phenomena?  
A Carbon dioxide  
B Chlorofluorocarbon  
C Methane gas  
D Nitrogen dioxide
17. Which of the following are the effects of noise pollution?
   I. High blood pressure
   II. Headaches
   III. Heart attack
   IV. Deafness
   A I, II and III only
   B I, II and IV only
   C I, III and IV only
   D II, III and IV only

18. Diagram shows the pollutant released by a factory that can cause acid rain.

Which of the following is true about the effect of acid rain?
   A the pH of soil increases
   B Corrode the paint of building
   C Production of crops increases
   D Rate of photosynthesis of aquatic plant increase

19. The following steps are carried out to reduce damage to the environment.
   I. Replanting trees
   II. Sharing transport
   III. Reducing the usage of fossil fuel
   IV. Reducing the leftovers of industrial solid waste

Which of the following steps can help to reduce the problem of global warming?
   A I, II and III
   B I, II and IV
   C I, III and IV
   D II, III and IV

20. Which of the following activities causes the thinning of the ozone layer?
   A Burning of fossil fuels
   B Throwing of rubbish into the river
   C Use of substances that contains chlorine
   D Construction of glass buildings

27. The following statements are about eutrophication.

Which of the following sequences is correct about eutrophication?
   A R, P, S, Q and T
   B R, P, Q, T and S
   C Q, S, R, T and P
   D S, R, T, Q and P

28. Which pollutant results in a decreased amount of oxygen transported by red blood cells?
   A Carbon monoxide
   B Sulphur dioxide
   C Lead compound
   D Particulate matter
1 Diagram 1.1 shows an agricultural activity which give effect P along the river at Zone R, Zone S and Zone T

Diagram 1.2 shows the changes of dissolved oxygen and the changes certain bacteria population in the river.

(a)(i) State the distance from X where the concentration of dissolved oxygen and the bacterial population begin to change? [1 mark]
(ii) What is the ecological term for the effect P? Give one example of substance which cause the effect P [2 marks]

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(b) The fish population in the river was also affected by P. Draw in the Diagram 1.2 to show the change of fish population at zone R, S and T. Give a reason. [2 marks]

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(c) Describe the phenomenon based on the following statement. [4 marks]

After 3 years, there is abundant of algal population at Zone S which result the death of aquatic organisms

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(d) Based on Diagram 1.2, explain the relationship between the agriculture sewage, bacterial population and the oxygen content in the river [3 marks]

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2. Human activities often bring about negative effects that increasingly threaten the economic resources, health and survival of ecosystem. Diagram 2.1 shows a phenomenon caused by human activities.
(a) State what the phenomenon is [1 mark]
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(b) Explain how deforestation can cause the phenomenon in (a) [2 marks]
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(c) As an environmentalist, suggest three ways to overcome the phenomenon in (a) [3 marks]

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2: ...........................................................................................................................................
3: ...........................................................................................................................................

(d) **Diagram 2.2** shows a situation related to the phenomenon.

![Diagram 2.2](https://via.placeholder.com/150)

(i) Name the situation shown in the Diagram 2.2 [1 mark]
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(ii) If the situation in Diagram 5.2 continues for a long time, explain its effect on crop yield [3 marks]
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Diagram 1.1 (a) shows a human activity on the environment in area X. The area is developed such as Diagram 1.1 (b).

(a) Based on your opinion, justify the effect of the development to the ecosystem in area X [10 marks]
2(a) Diagram 2.1 shows a graph of the change in temperature and concentration of carbon dioxide in atmosphere from year 1880 until year 2000.

(i) Explain the phenomenon that occur in the atmosphere in relation to the graph shown in Diagram 2.1 [8 marks]

(ii) Describe the effect of the phenomenon on the environment if the concentration level of carbon dioxide are increasing. [6 marks]

(b) Diagram 2.2 shows the activity of forest burning.
Discuss how this activity causes disasters to the environment and human besides increasing the global temperature. [6 marks]

3(a) **Photograph 3.1** shows a human activity which causes the permanent removal of trees from the forest for wood products such as furniture. Although deforestation is not encouraged, it plays an important role to increase the economy of the country.

Deforestation also gives some adverse effects on the ecosystem such as landslide, flash flood and climatic change.

Photograph 3.1

(i) Suggest how to minimise the effects of deforestation? [4 marks]
(ii) Explain the importance of deforestation to human. [6 marks]

(b) **Photograph 3.2** shows three examples of technology development used to help maintain a balance between human activities and a balanced ecosystem.

Photograph 3.2

Explain how these technologies maintain the balanced ecosystem. [10 marks]
4. **Diagram 4.1** shows a common activity among our teenagers.

![Diagram 4.1](image)

(a) Suggest the effects of the activity on the health. [5 marks]

(b) **Diagram 4.2** shows a power plant that generates electricity in an area. The plant releases hot water into the nearby river.

![Diagram 4.2](image)

Based on the picture, suggest the impact of the power plant on the environment and precautionary measures that can be taken by all of us to ensure a green Earth for the future generations. [5 marks]
(c) Introducing the first electric hybrid with electrifying performance. Our engineers have invented the industry’s most advanced hybrid vehicle. Unlike other hybrids on the market, ours uses a patented Lithium Polymer battery. It has 40% less volume; it's 25% lighter and 10% more efficient. The battery also has a longer life-span; it comes with a lifetime warranty guarantee. So you can feel good about preserving the environment for the life of your vehicle.

Diagram 4.2

Based on the promotion, discuss the benefits of using an eco-friendly car. [5 marks]