

## **QUESTION 1: BIOLOGICAL MOLECULES**

1.1. The table below shows the results of an investigation into the removal of stains from clothing. Study the information given and answer the questions that follow.

| Type of stain | Washing temperature (°C) | Biological washing powder | Non-biological washing powder |
|---------------|--------------------------|---------------------------|-------------------------------|
| Grass         | 40                       | ✓                         | ×                             |
| Mud           | 40                       | ✓                         | ×                             |
| Wine          | 40                       | ✓                         | ✓                             |
| Grass         | 100                      | ×                         | ×                             |
| Mud           | 100                      | ✓                         | ✓                             |
| Wine          | 100                      | ×                         | ×                             |

✓ = stain removed

× = stain not removed

1.1.1. What is a biological washing powder and how does it work? (2)

1.1.2. Which washing powder removes grass stains? (1)

1.1.3. Which washing treatment did not remove the wine stains? (1)

1.2. The table below shows the percentage nutrient composition of a **vegetarian burger**.


| Component | Composition (%) |
|-----------|-----------------|
| Proteins  | 50              |
| Fats      | 15              |
| Fibre     | 25              |
| Water     | 10              |

1.2.1. Present the information in the table as a pie chart / sector diagram. (6)

1.2.2. The vegetarian burger weighs 50 grams. Calculate the amount (in gram) of protein present in the vegetarian burger. (2)

1.2.3. A beef burger contains 35% fat. Determine the most simplified **ratio (in whole numbers)** of fat in a beef burger to the fat in a vegetarian burger. (2)

1.2.4. Name **ONE** other organic nutrient NOT presented in the nutrient table of elements? (1)

1.3. If  represents a glucose molecule, draw:

1.3.1. a disaccharide molecule (2)

1.3.2. part of a starch molecule using this symbol. (2)

1.4. Read the article below and answer the questions that follow.



### **What's in a washing powder?**

Modern washing powders contain a number of chemical substances that reflect the complex requirements of our modern world. These washing powders have to remove stains without damaging the material or washing machine. They must also be environmentally friendly.

Most washing powders contain up-activating substances that allow the water to spread over the material, as well as builders that soften the water. Foam-controlling substances are also added to prevent the formation of too much foam and bubbles. The pleasant scents of washing powders are created by aromatic substances. Corrosion inhibitors also protect the washing machine against rust.

Biological washing powders also contain various enzymes such as proteases, amylases and lipases. These enzymes are so powerful that washing powders only contain 1% enzymes.

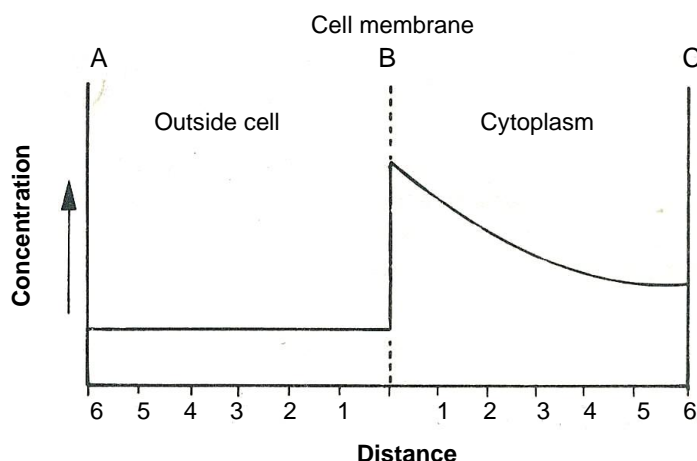
Source: *Scottish Qualifications Authority 2007 BIOLOGY INTERMEDIATE 1*

- 1.4.1. Name the chemical substance in washing powders that prevents too much foam from being formed. (1)
- 1.4.2. Why are aromatic substances added to washing powders? (1)
- 1.4.3. Why do biological washing powders contain such low percentages of enzymes? (1)
- 1.4.4. Name the three enzymes found in biological washing powders. (3)

**QUESTION 1: [25]**

## QUESTION 2: THE CELL

2.1. The graph shows the concentration of a substance inside and outside a cell.



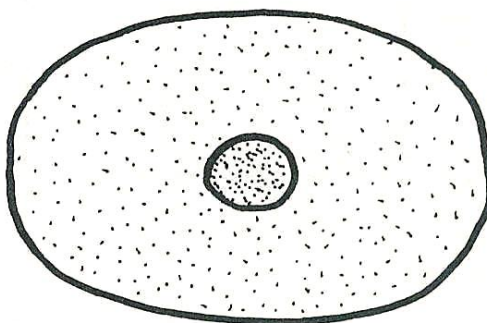
2.1.1. If the substance is free to move by diffusion, use the letters **A**, **B** and **C** to describe the direction in which it will move:

a) inside the cell? (2)

b) between the cell and the medium outside the cell? (2)

2.1.2. If the concentration has not changed after a few hours, what assumption can you make about the movement of this substance across the cell membrane? (2)

2.2. The drawing shows an outline of a human cell.



Use the diagram to show how the cell **will change** if it was placed (for a few minutes) in a solution with:

2.2.1. a higher salt concentration than its own cytoplasm. (2)

2.2.2. a higher water concentration than its own cytoplasm. (2)

2.3. Read the information given below and answer the questions that follow.

A group of learners wishes to study osmosis in a living cell. They know that an egg is a good example of a cell. They bring two eggs, relatively equal in size, to school. Their teacher explains that in order to observe osmosis in an egg, they will have to remove the shell. They place the two eggs in a container with vinegar. After 24 hours they notice that the egg shells have completely vanished. Only a thin, white membrane remains around each egg. They carefully remove the eggs from the vinegar, rinse them under a tap and dry them. Thereafter they weigh each egg with a scale. They then place each egg in a beaker filled with distilled water. They mark the beakers A and B. Every hour they measure and record the weight of each egg and put it back into its respective beaker. Their results were recorded in the table below:

| Time (hours) | Mass of egg A (g) | Mass of egg B (g) | Average mass of the eggs (g) |
|--------------|-------------------|-------------------|------------------------------|
| 0            | 84,4              | 81,2              | 82,8                         |
| 1            | 87,8              | 86,1              | (a)                          |
| 2            | 89,3              | 88,0              | (b)                          |
| 3            | 91,0              | 89,8              | (c)                          |
| 4            | 92,1              | 91,0              | (d)                          |
| 5            | 93,4              | 92,7              | (e)                          |
| 6            | 94,6              | 94,4              | (f)                          |
| 7            | 95,3              | 95,0              | (g)                          |
| 8            | 95,4              | 95,2              | (h)                          |

2.3.1. Complete the table by calculating the average mass of the eggs.

Write your answers next to the letters (a) to (h) on your answer sheet.

Round off to **ONE** decimal.

(3)

2.3.2. Draw an appropriate graph with the data of **JUST THE AVERAGE MASS** to represent the data.

(10)

2.3.3. According to your graph:

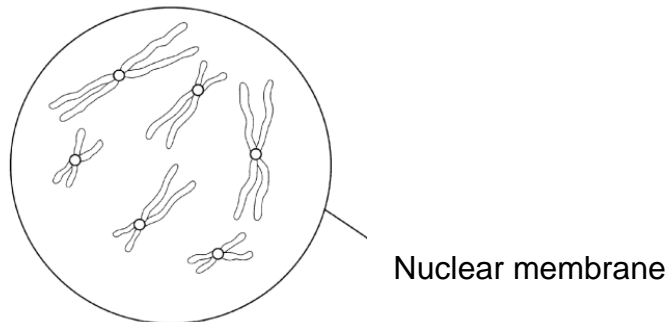
(a) during which period did the mass of the eggs increase the most? (1)

(b) during which period did the mass of the eggs increase the least? (1)

**QUESTION 2: [25]**

### QUESTION 3: MITOSIS AND PLANT ORGANS

- 3.1. The drawing below depicts the nucleus of an animal cell during the early prophase of mitosis.



Draw an annotated diagram to show what the **anaphase** of mitosis would look like in this cell.

(5)

- 3.2. Leaves perform important functions and their tissues are specially developed for these functions. Each tissue has a specific role and task that it must perform. Discuss how leaves are adapted for photosynthesis and also briefly explain how the stomata function (stomatal mechanism) during the day.

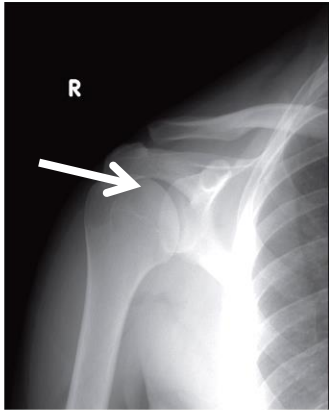
**Facts = 17**  
**Synthesis = 3**  
**Total = (20)**

**QUESTION 3: [25]**

#### **QUESTION 4: ANIMAL SUPPORT SYSTEMS**

4.1. Identify each type of joint (a to f) on the X-rays below. Also indicate where the joint is found and how it moves. (*Where synovial joints are involved: specify the type*)

a



b



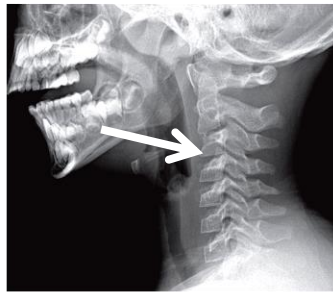
c



d



e



f



(18)

4.2. Match each of the following scientific names for bones with their everyday names.

**Scientific name:** *humerus, femur, sternum, pelvis, tibia, clavicle, scapula,*

**Everyday name:**

- a) shoulder blade
- b) shin bone
- c) upper arm bone
- d) collar bone
- e) breast bone
- f) thigh bone
- g) hips

(7)

**QUESTION 4: [25]  
SUM TOTAL: [100]**

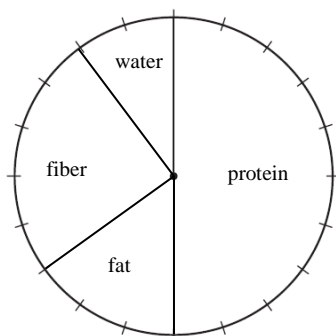
## GRADE 10 ASSIGNMENT **MEMORANDUM**

**MARKS: 100**

**TIME: 1.5 H**

### **QUESTION 1: BIOLOGICAL MOLECULES**

- 1.1.1. Washing powder/soap that contains enzymes✓  
Enzymes break down the stains/cleans the washing ✓ (2)
- 1.1.2. biological washing powder✓ (1)
- 1.1.3. 100 °C ✓ temperature for both types of washing powders (1)
- 2.1.2. Die nutrient composition of a vegetarian burger ✓



(6)

Total composition = 50 + 15 + 25 + 10 = 100

Proteins =  $50/100 \times 360 = 180^\circ$



Fats =  $15/100 \times 360 = 54^\circ$

Fibre =  $25/100 \times 360 = 90^\circ$

Water =  $10/100 \times 360 = 36^\circ$

|                                                         |                                                       |
|---------------------------------------------------------|-------------------------------------------------------|
| Type of graph correct (T)                               | 1                                                     |
| Heading correct (H)                                     | 1                                                     |
| Proportion of sectors (print on transparency paper) (P) | 1 – 1 to 2 sectors correct<br>2 – All sectors correct |
| Name of sectors indicated / Key provided (K)            | 1                                                     |
| Calculations correct (C)                                | 1                                                     |

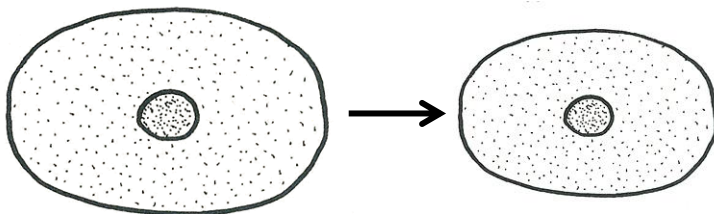
- 1.2.2. The vegetarian burger weighs 50 grams. 50% protein is present in the vegetarian burger  
Therefore:  $50 \times 0.50 = 25$  grams (2)
- 1.2.3. Fat in vegetarian burger is 15%  
Fat in beef burger is 35%  
Fat of beefburger : Fat of vegetarian burger  
15 : 35  
1✓ : 2✓ (2)
- 1.2.4. Carbohydrates OR Vitamins ✓ (1)

- 1.3.1.  ✓✓ (learner may use a stripe (—) to indicate the bonds) (2)
- 1.3.2.  ✓✓ (2)
- 1.4.1. foam controlling substances ✓ (1)
- 1.4.2. To produce a pleasant scent / Clothes smell fresh and clean ✓ (1)
- 1.4.3. Because their functioning is very strong/powerful/effective ✓ (1)
- 1.4.4. Protease ✓, lipase ✓, amylase ✓ (3)
- QUESTION 1: [25]**

## **QUESTION 2: THE CELL**

- 2.1.1.
- a) From B ✓ → C ✓ / Further into the cell, away from the cell membrane (**Important: a learner cannot just say "away from the cell membrane" without specifying towards the inside or outside of the cell**) / Closer to C / Closer to 6 at C ✓✓ (2)
- b) From B ✓ → A ✓ / Out of the cell / Away from the cell membrane towards the outside / Closer to A / Closer to 6 at A (2)
- 2.1.2. The molecule moves through active transport ✓ against a concentration gradient ✓ (2)

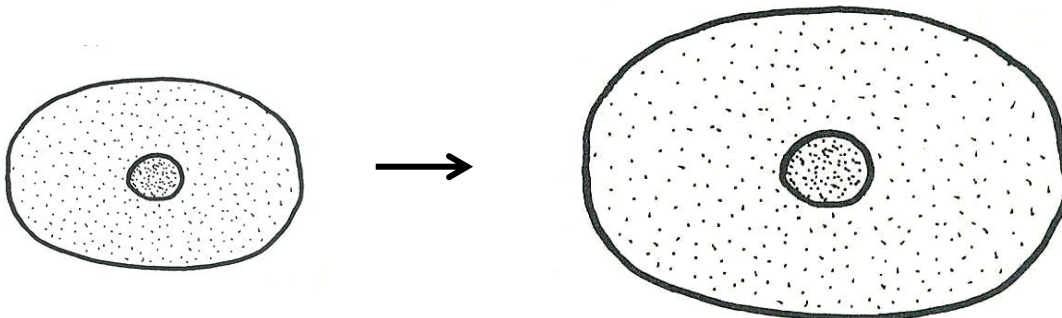
2.2.1. A higher salt concentration ( $\downarrow\psi$ ) compared to its own cytoplasm ( $\uparrow\psi$ )



(a lot smaller than the original) ✓✓

(2)

2.2.2. A lower salt concentration ( $\uparrow\psi$ ) compared to its own cytoplasm ( $\downarrow\psi$ )



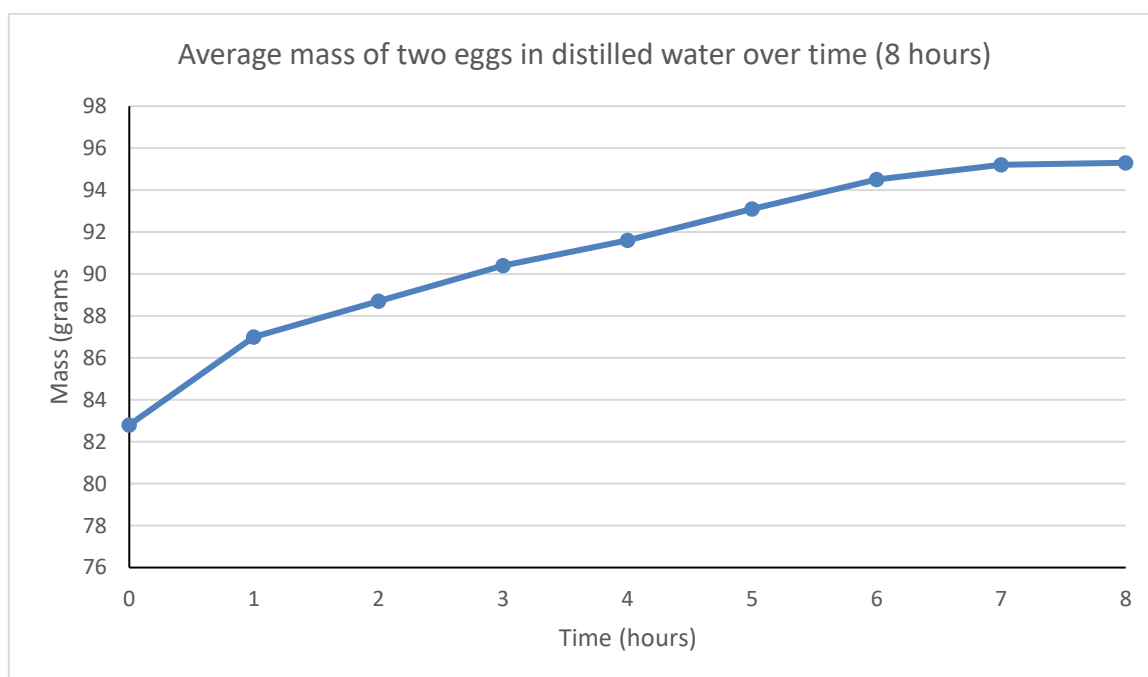
(much larger than original) ✓✓

(2)

- 2.3.1. (a) 87.0  
 (b) 88.7  
 (c) 90.4  
 (d) 91.6  
 (e) 93.1  
 (f) 94.5 ✓  
 (g) 95.2 ✓  
 (h) 95.3 ✓

**(check that all averages are correct. Max 3 marks.)**

2.3.2.



|                                         |                                                    |
|-----------------------------------------|----------------------------------------------------|
| Type of graph correct (T)               | 1                                                  |
| Heading correct with both variables (H) | 2                                                  |
| Plotted points (P)                      | 1 – 3 – 4 points correct<br>2 – All points correct |
| X-axis name and unit (X)                | 1                                                  |
| X-axis intervals even (Xi)              | 1                                                  |
| Y-axis name and unit (Y)                | 1                                                  |
| Y-axis intervals even (Yi)              | 1                                                  |
| Average values plotted (A)              | 1                                                  |

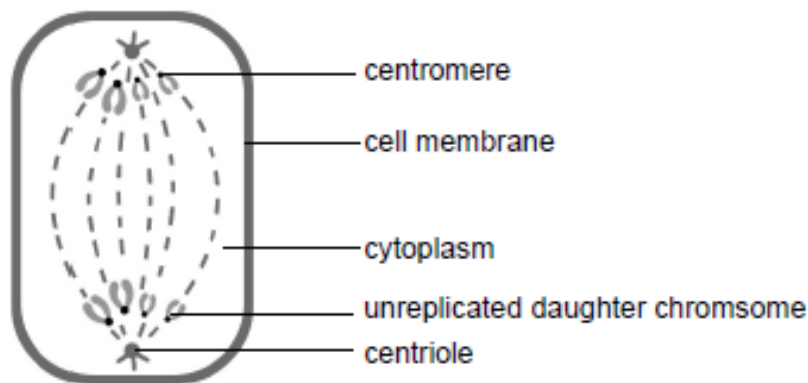
(10)

- 2.3.3. (a) 0 – 1 hour / during first hour (1)  
 (b) 7 – 8 hour / during last hour (1)

**QUESTION 2: [25]**

### **QUESTION 3: MITOSIS AND PLANT ORGANS**

#### **3.1. ANAPHASE**



#### **Compulsory marks:**

- chromatids/unreplicated daughter chromosomes ✓
- pulled to opposite poles ✓
- 6 chromatids/unreplicated daughter chromosomes at each pole ✓

#### **Any TWO other marks for correct labels ✓✓**

(5)

#### **3.2.**

#### **All adaptations must have a characteristic (✓) + explanation of its importance (✓)**

- Large surface area – fast diffusion of gases
- Transparent cuticle and epidermis – allows sunlight onto the mesophyll
- Many chloroplasts in mesophyll – allows for maximal photosynthesis
- Parenchyma / Palisade mesophyll – cells are tightly packed to fit in as many chloroplasts for maximal sunlight
- Spongy mesophyll – loosely packed with large intercellular air spaces for gaseous exchange
- Moist exchange surface – allows for fast gaseous exchange in the spongy mesophyll
- Stomata help to regulate carbon dioxide, water vapour and oxygen concentrations
- Guard cells of stomata contain chloroplasts – can photosynthesise
- Xylem transports water to the cells in the leaf
- Phloem transports nutrients / dissolved sugars

(Min 8 / Max 12)

**(Mark the first 6 + 6 = 12 max marks)**

#### **Stomatal mechanism during the day**

- Photosynthesis occurs during the day ✓
- Glucose is produced and accumulates in the guard cells ✓
- Water potential in the guard cells is lower than the surrounding epidermal cells ✓
- Water moves into the guard cells through osmosis ✓
- Guard cells expand unevenly (bean shaped) ✓
- Stomatal pore is pulled open ✓
- Water diffuses in and out of the leaf ✓

(Min 3 / Max 5)

**(Mark first 5 facts)**

**Synthesis:****R – relevant information given only – no irrelevant information****L – Logical sequence of events****C / B – All aspects discussed in a way that shows the learner understood the work / Min 8 out of 12 and 3 out of 5****Total = (20)****QUESTION 3: [25]****QUESTION 4: ANIMAL SUPPORT SYSTEMS**

4.1.

| <i>Type of joint</i>   | <i>Location</i>  | <i>Movement</i>                |
|------------------------|------------------|--------------------------------|
| (a) Ball-and-socket    | Shoulder         | All directions                 |
| (b) Hinge              | Ankle            | In one plane, e.g. up and down |
| (c) Hinge              | Knee             | In one plane, e.g. up and down |
| (d) Ball-and-socket    | Hip              | All directions                 |
| (e) Partially moveable | Vertebral column | Minimal movement               |
| (f) Gliding joint      | Wrist            | Bones glide over each other    |

**(18)**

4.2.

- a) Scapula ✓
- b) tibia ✓
- c) humerus ✓
- d) clavicle ✓
- e) sternum ✓
- f) femur ✓
- g) pelvis ✓

**(7)****QUESTION 4: [25]  
SUM TOTAL: [100]**