2021 ASSESSMENT MATERIALS

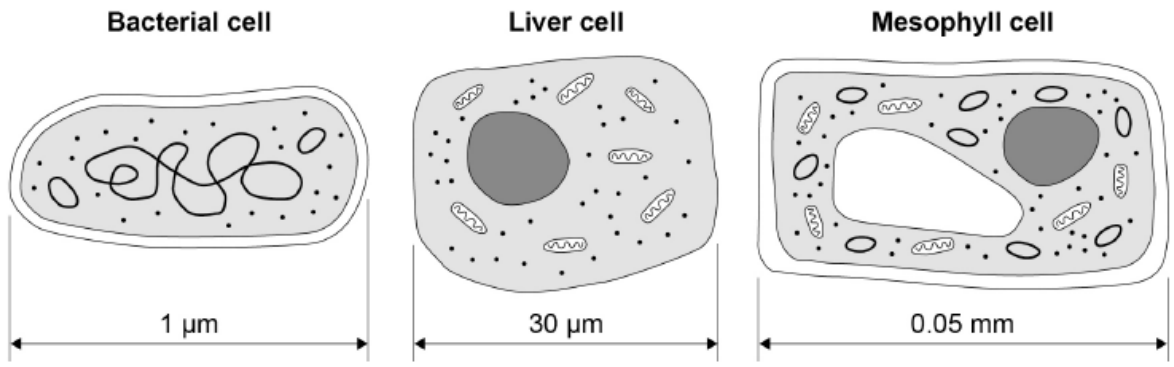
GCSE
BIOLOGY

Biology Test 1: Cell biology and Organisation (Higher)

Total number of marks: 35

0 3 **Figure 5** shows three types of cell.

Figure 5



0 3 . 1 Give **two** similarities between the prokaryotic cell and the eukaryotic cells in **Figure 5**.

[2 marks]

1 all have ribosomes

2 all have a cell membrane

0 3 . 2 Give **three** differences between the prokaryotic cell and the eukaryotic cells in **Figure 5**.

[3 marks]

1 the prokaryotic cell does not have a nucleus whereas the eukaryotic cells do

2 the prokaryotic cell has plasmids whereas the eukaryotic cells do not

3 the prokaryotic cell has no mitochondria whereas the eukaryotic cells do

0 3 . 3 Calculate the ratio of the size of the bacterial cell to the size of the mesophyll cell.

[2 marks]

bacterial cell : mesophyll cell 0.05mm = 50µm

⇒ 1µm : 50µm

⇒ 1 : 50

Ratio = 1 : 50

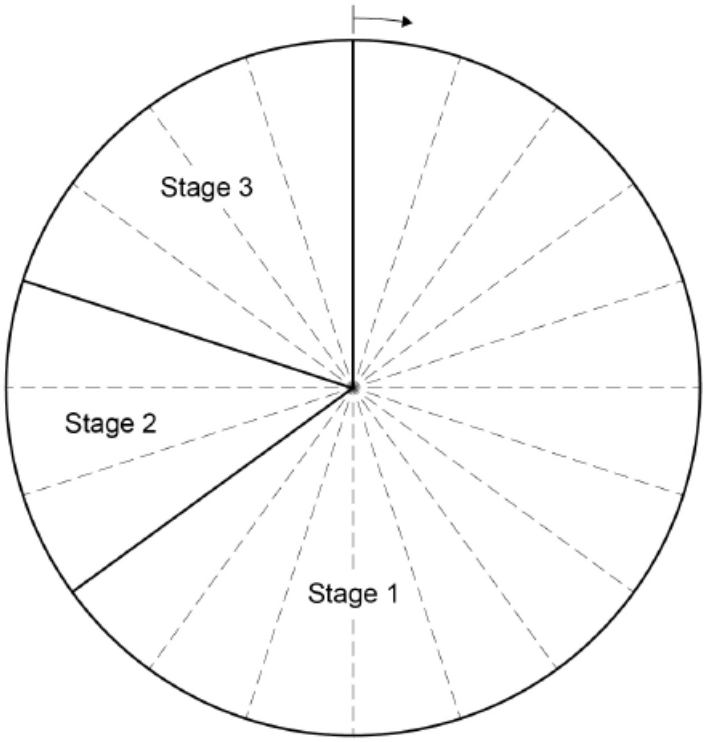
0 3 . 4 Name the type of cell division that produces genetically identical body cells for growth and repair.

[1 mark]

mitosis

Figure 6 shows a cell cycle.

Figure 6



0 3 . 5 What percentage of the time for one cell cycle is represented by stage 2 and stage 3 together?

[1 mark]

Tick (✓) **one** box.

7% ☐ 35% ☑ 40% ☐ 65% ☐

20 = 100%
1 = 5%
7 = 35%

0 3 . 6 Describe what happens during each stage of the cell cycle.

[4 marks]

Stage 1 Cell growth. The cell increases in size and any new organelles / molecules required for cell division are synthesised. DNA is replicated and two copies of each chromosome are formed.

Stage 2 Mitosis. One copy of each chromosome is pulled to opposite poles of the cell. Nuclear membrane breaks down and the nucleus divides.

Stage 3 Cytokinesis. The cytoplasm and cell membranes divide to form 2 identical cells, each with an exact copy of DNA.

0 4 . 1 Lipases break down lipids.

Which **two** products are formed when lipids are broken down?

[2 marks]

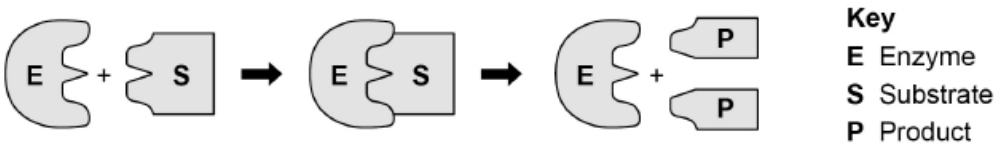
Tick (✓) **two** boxes.

Amino acids	
Fatty acids	✓
Glucose	
Glycerol	✓
Glycogen	

One model used to explain enzyme action is the 'lock and key theory'.

Figure 7 shows a model of the theory.

Figure 7



The enzyme has an active site into which the substrate fits into. The enzyme's active site is complementary to the substrate. The enzyme then breaks down the substrate into the products which break away from the active site.

0 4 . 2 Explain the 'lock and key theory' of enzyme action.

Use information from **Figure 7** in your answer.

[3 marks]

0 4 . 3 There are many different types of lipase in the human body.

Why does each different type of lipase act on only **one** specific type of lipid molecule?

Each enzyme is specific to only one type of substrate as the shape of the enzyme's active site is complementary to only one substrate. **[1 mark]**

Students investigated the presence of starch and glucose in the leaves of geranium plants.

This is the method used.

1. Place two identical geranium plants on a bench near a sunny window for two days.

2. After two days:
   - leave one plant near the window for two more days.
   - place one plant in a cupboard with no light for two more days.

3. Remove one leaf from each plant.

4. Crush each leaf to extract the liquid from the cells.

5. Test the liquid from each leaf for glucose and for starch.

0 4 . 4 Describe how the students would find out if the liquid from the leaf contained glucose.

Transfer the liquid into a boiling tube and add a few drops of Benedict's reagent and heat in a water bath. The solution will change from a blue colour to an orange/red colour if glucose is present. **[3 marks]**

0 4 . 5 Describe how the students would find out if the liquid from the leaf contained starch.

Transfer the liquid to a boiling tube and add a few drops of iodine solution. The solution will change colour from brown to blue-black if starch is present. **[2 marks]**

0 4 A student carried out an investigation using chicken eggs.

This is the method used.

1. Place 5 eggs in acid for 24 hours to dissolve the egg shell.
2. Measure and record the mass of each egg.
3. Place each egg into a separate beaker containing 200 cm^3 of distilled water.
4. After 20 minutes, remove the eggs from the beakers and dry them gently with a paper towel.
5. Measure and record the mass of each egg.

Table 4 shows the results.

Table 4

Egg	Mass of egg without shell in grams	Mass of egg after 20 minutes in grams
1	73.5	77.0
2	70.3	73.9
3	72.4	75.7
4	71.6	73.1
5	70.5	73.8

0 4 . 2 Calculate the percentage change in mass of egg **3**.

[2 marks]

$\left(\frac{75.7 - 72.4}{72.4}\right) \times 100 = 4.6\%$

Percentage change in mass = 4.6 %

0 4 . 3 Explain why the masses of the eggs increased.

[3 marks]

The inside of each egg has a higher solute concentration than the outside of the egg so water moves from an area of high water potential (outside of the egg) to an area of low water potential (inside the egg) by osmosis, through a partially permeable membrane.

0 4 . 4 Explain how the student could modify the investigation to determine the concentration of the solution inside each egg.

[3 marks]

Use more concentrations of sugar solution (e.g. 5 different concentrations) and place each egg into a different beaker. Plot the percentage change in mass on a graph and draw a line of best fit. Determine the concentration by looking at where the line crosses the zero percentage change.

Chicken egg shells contain calcium. Calcium ions are moved from the shell into the cytoplasm of the egg.

Table 5 shows information about the concentration of calcium ions.

Table 5

Location	Concentration of calcium ions in arbitrary units
Egg shell	0.6
Egg cytoplasm	2.1

0 4 . 5 Explain how calcium ions are moved from the shell into the cytoplasm of the egg.

[3 marks]

Calcium ions move from the shell into the cytoplasm by active transport, from an area of low concentration of ions in the shell to an area of higher concentration of ions in the cytoplasm. The ions move against their concentration gradient, which requires energy in the form of ATP, and requires transport proteins.