# MARK SCHEME

## AQA GCSE Biology · Paper 1: Cell Biology, Organisation, Infection & Response, Bioenergetics

Foundation Tier — Separate Science · Total: 100 marks



This mark scheme is designed for use by examiners. Alternative correct answers should be accepted. Marks in brackets [1] indicate one mark. Points separated by / indicate alternatives. Underlined words are essential. ★ indicates Higher Tier only marks.

### Question 1 [4 marks]

**(a) [1 mark]**

*Which structure is found in a plant cell but NOT in an animal cell?*

- B. Cell wall [1]

**(b) [1 mark]**

*What is the function of mitochondria?*

- C. Aerobic respiration [1]

**(c) [1 mark]**

*Which process moves substances from an area of LOW concentration to an area of HIGH concentration?*

- C. Active transport [1]

**(d) [1 mark]**

*Which of the following is a product of photosynthesis?*

- C. Glucose [1]

**Total for question 1: 4**

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### Question 2 [7 marks]

*Figure 1 shows a plant cell viewed under a microscope.*

**(a) [3 marks]**

*Name THREE structures that can be seen in a plant cell but NOT in an animal cell.*

- Cell wall [1]
- Chloroplast [1]
- Permanent (large central) vacuole [1]

**(b) [2 marks]**

*The image of the cell in Figure 1 is 60 mm long. The actual cell is 0.2 mm long. Calculate the magni…*

- Magnification = image size ÷ actual size = 60 ÷ 0.2 [1]
- = ×300 [1]

**(c) [2 marks]**

*State TWO differences between a plant cell and a bacterial cell.*

- Bacterial cell has no nucleus / no membrane-bound nucleus [1]
- Bacterial cell has no chloroplasts / mitochondria / no membrane-bound organelles [1] — any two valid differences

**Total for question 2: 7**

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### Question 3 [7 marks]

**(a) [2 marks]**

*What is meant by the term "diffusion"?*

• Net movement of particles [1]

• from an area of high concentration to an area of low concentration (down the concentration gradient) [1]

*Note: Must include "net movement" for first mark.*

**(b) [3 marks]**

*A student places a potato chip in a concentrated salt solution. After 30 minutes the potato chip has…*

• The salt solution has a lower water potential than inside the potato cells [1]

• Water moves out of the potato cells by osmosis [1]

• Down the water potential gradient / through the partially permeable membrane [1] — must mention partially permeable membrane

**(c) [2 marks]**

*State TWO differences between diffusion and active transport.*

• Diffusion is passive (no energy required); active transport requires energy (ATP) [1]

• Diffusion moves substances from high to low concentration; active transport moves from low to high concentration [1]

**Total for question 3: 7**

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## Question 4 [7 marks]

*Enzymes are biological catalysts that speed up chemical reactions in the body.*

**(a) [2 marks]**

*What is meant by the term "active site" of an enzyme?*

• The part of the enzyme where the substrate binds [1]

• Has a specific shape that is complementary to the substrate [1]

**(b) [3 marks]**

*A student measures the rate of an enzyme-controlled reaction at different temperatures. Describe how…*

• As temperature increases (up to optimum), rate increases — more kinetic energy, more frequent enzyme-substrate collisions [1]

• At optimum temperature, rate is highest [1]

• Above optimum temperature, enzyme is denatured — active site permanently changes shape, substrate can no longer bind — rate falls to zero [1]

**(c) [2 marks]**

*Name the enzyme that digests starch and state where in the digestive system it is produced.*

• Amylase [1]

• Produced in the mouth (salivary glands) / pancreas / small intestine [1]

**Total for question 4: 7**

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## Question 5 [7 marks]

*The heart pumps blood around the body in a double circulatory system.*

**(a) [2 marks]**

*Explain what is meant by a "double circulatory system."*

• There are two separate circuits: pulmonary (heart to lungs) and systemic (heart to body) [1]

• This keeps oxygenated and deoxygenated blood separate / allows efficient oxygen delivery [1]

**(b) [3 marks]**

*Describe how coronary heart disease can develop. State ONE treatment.*

• Fatty deposits (plaques) build up inside the coronary arteries [1]

• The arteries become narrower, reducing blood flow and oxygen supply to the heart muscle [1]

• Treatment: stents (inserted to open artery) OR statins (reduce cholesterol) OR bypass surgery [1]

**(c) [2 marks]**

*Compare the structure of an artery with a vein. State ONE similarity and ONE difference.*

- Similarity: both have a lumen / both carry blood / both made of similar tissues [1]
- Difference: arteries have thick muscular elastic walls / high pressure; veins have thinner walls / have valves / low pressure [1]

**Total for question 5: 7**

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## Question 6 [9 marks]

*Bacteria and viruses are two types of pathogen that can cause communicable diseases.*

**(a) [2 marks]**

*Describe TWO ways in which bacteria cause disease.*

- Bacteria reproduce rapidly inside the body [1]
- Bacteria release toxins that cause symptoms [1]

**(b) [1 mark]**

*State why antibiotics are effective against bacterial infections but NOT viral infections.*

- Antibiotics target bacterial cell walls or other bacterial structures that viruses do not have [1]

**(c) [4 marks]**

*Explain how vaccination protects people against disease.*

- Vaccine contains dead/weakened pathogens or antigens from the pathogen [1]
- Immune system produces antibodies in response to the antigens [1]
- Memory cells are produced [1]
- If the pathogen is encountered again, memory cells cause rapid antibody production — person rarely becomes ill [1]

**(d) [2 marks]**

*Explain what is meant by "herd immunity."*

- When a large enough proportion of the population is immune [1]
- The pathogen cannot spread easily, protecting even those who are not vaccinated [1]

**Total for question 6: 9**

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## Question 7 [11 marks]

*Photosynthesis is the process that allows plants to make their own food.*

**(a) [2 marks]**

*Write the word equation for photosynthesis.*

- Carbon dioxide + water → glucose + oxygen [1]
- Light energy required/needed [1]

**(b) [3 marks]**

*Name THREE limiting factors that can reduce the rate of photosynthesis.*

- Light intensity [1]
- Carbon dioxide concentration [1]
- Temperature [1]

**(c) [4 marks]**

*Explain why a greenhouse grower might increase the temperature and carbon dioxide concentration insi…*

- Increasing temperature increases the rate of enzyme reactions in photosynthesis [1]
- This increases the rate of photosynthesis (up to the optimum temperature) [1]
- Increasing CO■ concentration removes a limiting factor [1]
- More glucose is produced → faster plant growth → higher crop yield [1]

**(d) [2 marks]**

*Name TWO ways in which a plant uses the glucose produced during photosynthesis.*

• Any two of: respiration, starch storage, cellulose production, converted to amino acids, converted to sucrose for transport, converted to lipids/oils [1 each]

**Total for question 7: 11**

## Question 8 [5 marks]

*Figure 2 shows the results of a potato osmosis experiment.*

**(a) [2 marks]**

*From Figure 2, state the sucrose concentration at which there is no change in mass. Explain your ans…*

• Read from graph — approximately 0.4 mol/dm³ [1]

• At this concentration, the water potential of the solution equals the water potential inside the potato cells, so there is no net movement of water [1]

**(b) [3 marks]**

*A potato chip is placed in a concentrated sucrose solution. Use the term "osmosis" in your explanati…*

• The sucrose solution has a lower water potential than inside the potato cells [1]

• Water moves out of the cells by osmosis [1]

• The potato chip decreases in mass and becomes limp/soft [1]

**Total for question 8: 5**

## Question 9 [7 marks]

*This question is about respiration.*

**(a) [2 marks]**

*Write the word equation for aerobic respiration.*

• Glucose + oxygen → carbon dioxide + water [1]

• (+energy released) [1] — accept mentioning energy/ATP

**(b) [2 marks]**

*State TWO differences between aerobic and anaerobic respiration.*

• Aerobic requires oxygen; anaerobic does not [1]

• Aerobic releases much more energy per glucose; OR aerobic produces CO■ + water; anaerobic produces lactic acid (animals) or ethanol + CO■ (yeast) [1]

**(c) [3 marks]**

*A student does vigorous exercise for 5 minutes. Her heart rate and breathing rate stay elevated for …*

• During intense exercise, muscles used anaerobic respiration, producing lactic acid [1]

• After exercise, extra oxygen is needed to break down the lactic acid in the liver [1]

• Continued high breathing and heart rate supply the extra oxygen needed (oxygen debt) [1]

**Total for question 9: 7**

## Question 10 [6 marks]

**(a) [6 marks]**

*Describe the role of white blood cells in protecting the body against disease. Include in your answe…*

• Phagocytes carry out phagocytosis — engulfing and digesting pathogens [1]

• This is a non-specific response — works against any pathogen [1]

• Lymphocytes produce antibodies that are specific to one type of antigen [1]

• Antibodies bind to antigens on the pathogen, marking it for destruction [1]

• Memory cells are produced after the first infection — enable rapid response on re-exposure [1]

• This rapid response means symptoms rarely develop (person is immune) [1]

**Total for question 10: 6**