

# MARK SCHEME

# GCSE

## BIOLOGY

## AQA - TRIPLE SCIENCE

---

B 1 - TEST 5

CELL BIOLOGY

Advanced

## Mark schemes

1.

(a) **B**

*no mark for "B" alone, the mark is for B **and** the explanation.*

large(r) surface / area **or** large(r) membrane

*accept reference to microvilli*

*ignore villi / hairs / cilia*

*accept reasonable descriptions of the surface eg folded membrane / surface*

*do **not** accept wall / cell wall*

1

(b) (i) any **one** from:

- (salivary) amylase
- carbohydrase

1

(ii) many ribosomes

*do **not** mix routes. If both routes given award marks for the greater.*

1

ribosomes produce protein

*accept amylase / enzyme / carbohydrase is made of protein*

**or**

(allow)

many mitochondria (1)

mitochondria provide energy to build / make protein (1)

*accept ATP instead of energy*

1

[4]

2.

(a) oxygen / O<sub>2</sub>

*allow O<sub>2</sub>*

*do not accept O<sup>2</sup>*

**or**

carbon dioxide / CO<sub>2</sub>

*allow CO<sub>2</sub>*

*do not accept CO<sup>2</sup>*

1

(b) any **four** from:

*ignore references to tail used for locomotion*

*ignore reference to nostrils*

- because structure X / gills has threads / filaments **or** is thin **or** tadpole has longer tail
- there is an increased surface area
- there is a shorter diffusion pathway
- therefore an increase in exchange  
*ignore food*
- eyes (now visible in older tadpole)
- so that food / danger etc can be seen  
*accept reference to a good blood supply*  
*accept increased water flow over gills / tail will increase diffusion of gases*

4

[5]

3.

**Level 3 (5–6 marks):**

A detailed and coherent explanation is provided with most of the relevant content, which demonstrates a comprehensive understanding of the human circulatory system. The response makes logical links between content points.

**Level 2 (3–4 marks):**

The response is mostly relevant and with some logical explanation. Gives a broad understanding of the human circulatory system. The response makes some logical links between the content points.

**Level 1 (1–2 marks):**

Simple descriptions are made of the roles of some of the following: heart function, gas exchange, named blood vessels, named blood cells. The response demonstrates limited logical linking of points.

**0 marks:**

No relevant content.

**Indicative content**

- dual / double circulatory system which means that it has higher blood pressure and a greater flow of blood to the tissues
- heart made of specialised (cardiac) muscle cells which have long protein filaments that can slide past each other to shorten the cell to bring about contraction for pumping blood
- heart pumps blood to lungs in pulmonary artery so that oxygen can diffuse into blood from air in alveoli
- blood returns to heart via pulmonary vein where muscles pump blood to the body via aorta
- oxygen carried by specialised cells / RBCs which contain haemoglobin to bind oxygen and have no nucleus so there is more space available to carry oxygen
- arteries carry oxygenated blood to tissues where capillaries deliver oxygen to cells for respiration and energy release
- thin walls allow for easy diffusion to cells
- large surface area of capillaries to maximise exchange
- waste products removed eg CO<sub>2</sub> diffuse from cells into the blood plasma
- blood goes back to the heart in veins which have valves to prevent backflow
- cardiac output can vary according to demand / is affected by adrenaline

accept annotated diagrams

[6]

4.

(a) water enters (funnel / sugar solution) **or** water diffuses in (to the funnel)

*do not accept if diffusion of sugar*

1

membrane partially / selectively / semi permeable **or** by osmosis

*allow description*

1

because concentration (of sugar) greater  
inside funnel than outside / water / in beaker

*assume 'concentration' refers to sugar unless candidate indicates otherwise*

*the position of the solutions may be implied*

1

(b) (level / it) rises more slowly **or** levels out earlier **or** does not rise as much  
*accept inference of less steep gradient (of graph)*  
*allow less / slower osmosis / diffusion / less water passes through*  
*or less water enters funnel*  
*allow water enters / passes through slower*

1

less difference in concentration (between solution / funnel and water / beaker)  
*accept due to lower diffusion / concentration gradient / described*

1

[5]

**5.** active transport needs energy **or** diffusion is not energy-dependent

1

any **three** from:

- (energy from) aerobic respiration
- more respiration with O<sub>2</sub> **or** more energy release with O<sub>2</sub>
- (aerobic) respiration / energy release occurs in mitochondria  
*do **not** allow anaerobic*
- xylose / other sugars absorbed by diffusion / not by active transport  
*allow active transport is selective / specific*  
***or** active transport can distinguish glucose and xylose*

3

[4]

**6.** (a) **C**

1

(b) cytoplasm **and** cell membrane dividing  
*accept cytokinesis for 1 mark*

1

to form two identical daughter cells

1

(c) stage 4

1

only one cell seen in this stage

1

(d)  $(4 / 36) \times 16 \times 60$

1

107 / 106.7

1

110 (minutes)

*allow 110 (minutes) with no working shown for 3 marks*

1

(e) binary fission

*do **not** accept mitosis*

1

(f) shortage of nutrients / oxygen

1

so cells die

**or**

death rate = rate of cell division

1

[11]

7.

(a) *correct names of cell components are required*  
*it = cell in sugar solution*

any **two** from:

*accept reverse only if clearly stated answer refers to cell in distilled water*

- smaller vacuole
- smaller / less cytoplasm  
*allow protoplasm for cytoplasm*
- cell membrane / cytoplasm not (fully) against cell wall  
*accept plasmolysed / flaccid / less turgid*

**or**

cell membrane / cytoplasm (partly) pulled away from cell wall

*ignore reference to nucleus / water*

*ignore explanations*

**or**

space / liquid / sugar solution between cell  
membrane / cytoplasm and cell wall

2

(b) water passed / moved out (of cell) by osmosis / diffusion

*accept reverse answer if clearly refers to cell in distilled water*

1

more concentrated (solution) outside

*assume reference to*

*concentration refers to solute*

*concentration unless answer refers to water concentration*

**or**

less concentrated (solution) inside

**or**

lower water concentration outside

*accept references to hypertonic / hypotonic solutions **or** water potential*

**or**

higher water concentration inside

1

[4]

8.

- (a) (yes, because) the mass change (of egg 4) is much lower than the others

*allow because it / egg 4 has gained (over) 50% less mass than the others*

*allow it / egg 4 has gained 1.5 g and the others have all gained more than 3 g (unit required)*

1

(b)  $\frac{75.7 - 72.4}{72.4} \times 100$

*or equivalent*

1

4.6 (%)

*allow 4.558 / 4.56 (%)*

*allow any correct rounding of 4.558011049723757*

1

*an answer of 4.6 / 4.56 / 4.558 scores 2 marks*

- (c) (mass increased because) water entered by osmosis

1

from a dilute solution in the beaker to a more concentrated solution in the egg (cell)

*allow from an area of high water concentration in the beaker to an area of low water concentration in the egg (cell)*

*allow ref to water potential*

*allow ref to 'strong' and 'weak' solutions*

*ignore along / across concentration gradient*

*do **not** accept 'amount' in place of concentration*

through a partially permeable membrane

*allow semi-permeable / selectively permeable membrane*

1

- (d) use five (or more) different concentrations of salt / sugar solution (in beakers)  
*allow any number of concentrations provided it is more than four* 1
- (by) plotting percentage change (in mass / volume) on / using a graph 1
- determine the concentration where the curve / line crosses the zero percentage change (in mass / volume) 1
- (e) (ions are moved) from an area of low concentration to high concentration  
*allow against the concentration gradient*  
*allow in terms of solution*  
*do **not** accept molecules* 1
- (by) active transport 1
- (which) requires using energy  
*do **not** accept idea of energy being created* 1

[12]

9.

- (a) 86  
*allow this answer only*  
*do **not** accept 85.7*  
*if no answer given, check for answer in the table* 1
- (b) as salt concentration increases, percentage of open stomata (in field of view) decreases (above  $0.1 \text{ mol / dm}^3$ )  
**or**  
 allow percentage of open stomata stays the same between 0.0 and 0.1 ( $\text{mol / dm}^3$ ) then decreases as salt concentration increases)  
*ignore references to number of open stomata*  
*allow converse*  
*allow idea that mean concentration (of salt) in guard cells is between 0.3 and 0.4 mol per  $\text{dm}^3$*  1
- (c) use concentrations between  $0.3 \text{ (mol / dm}^3 \text{)}$  and  $0.4 \text{ (mol / dm}^3 \text{)}$   
**or**  
 draw a graph of the data and read off the value at 50% (open stomata)  
*allow a list of appropriate concentrations i.e.  $0.32 \text{ mol / dm}^3$ ,  $0.34 \text{ (mol / dm}^3 \text{)}$ ,  $0.36 \text{ (mol / dm}^3 \text{)}$  etc.* 1



(d)  $(\pi \times 0.1875^2) = 0.11 \text{ (mm}^2\text{)}$   
an answer of 36 scores **3** marks

1

$$\frac{4}{0.11}$$

1

36 (per  $\text{mm}^2$ )

allow 36.22 / 36.23 **or** 36.2

if answer is incorrect allow for **2** marks for sight of number of open stomata = 9 per  $\text{mm}^2$  (diameter used instead of radius)

if no other marks awarded allow for **1** mark any **one** from:

- sight of area =  $0.44(\text{mm}^2)$  (diameter used instead of radius)
- sight of number of open stomata = 9.1 / 9.05 / 9.06 per  $\text{mm}^2$  (diameter used instead of radius and no rounding)

1

(e) (potassium) ions increase the concentration of the solution (inside guard cells)  
**or**  
(potassium) ions make cell more concentrated / less dilute

allow (potassium) ions decrease concentration of water / water potential (of guard cells)

1

water moves into the (guard) cell by osmosis

1

cell swells unevenly (so stoma opens)

1

as inner wall is less flexible than outer wall **or** thick part of the wall is less flexible than the thin part (of the wall)

1

[10]

10.

(a) testis / testes

allow testicle(s)

1

(b) (i) **B** = 13.2  
**C** = 6.6  
**E** = 3.3

all 3 correct = 2 marks

2 or 1 correct = 1 mark

If no marks awarded allow ecf for **C** **and** **E** based on answer to **B**

ie  $C = \frac{1}{2} B$  and  $E = \frac{1}{2} C$  for one mark

2

(ii) 6.6

allow twice answer for cell **E** in part bi

1

(iii) mitosis  
*correct spelling only*

1

(c) (i) any **two** from:  
• cells that are able to divide  
• undifferentiated cells / not specialised  
• can become other types of cells / tissues **or** become specialised /differentiated  
*allow pluripotent*

2

(ii) 4-day embryo is a (potential) human life

**or**

destroying/damaging (potential) human life  
*allow cord would have been discarded anyway*  
*ignore reference to miscarriage*  
*allow cannot give consent*

1

(iii) perfect tissue match **or** hard to find suitable donors  
*allow same/matching antigens*  
*allow no danger of rejection*  
*allow no need to take immunosuppressant drugs (for life)*  
*ignore genetically identical **or** same DNA*

1

(iv) stem cells have same faulty gene / allele / DNA / chromosomes  
*allow genetically identical*  
*ignore cells have the same genetic disorder*

1

**[10]**