Mark schemes

Q1.

(a) **Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.

5–6

Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.

3–4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1–2

No relevant content

0

Indicative content:

- (measure and) record mass of potato pieces
- place potato pieces into different concentrations of salt solution
  - use at least 3 different concentrations of salt solution
- leave potato pieces in salt solutions
- remove potato pieces from salt solutions
- blot potato pieces dry
- (measure and record mass of potato pieces and) calculate change in mass
- repeat each concentration
  - repeat each concentration 2 **more** times
- calculate mean change in mass

Control variables

- use same size / mass potato pieces
- use same potato **or** use same type of potato
- use same blotting technique
- ensure no skin on potato pieces
- keep potato pieces in solution for the same amount of time (≥10 minutes)
- keep potato pieces in solutions at the same temperature

For **Level 1**, the method must allow the determination of the change in mass for a piece of potato.

For **Level 3**, the method must allow the production of the graph in the figure.

(b) (pieces) lost mass because <u>water</u> left cells / potato

1

(because) the solution in the cells / potato is less concentrated than outside
or
(because) the solution in the cells / potato is more dilute than outside

allow (because) the solution outside the cells / potato is more concentrated than inside

allow (because) the solution outside the cells / potato is less dilute than inside

allow correct references to <u>water concentration</u> / <u>potential</u>

ignore reference to amount of water or salt

*do **not** accept water moves from an area of high (solute) concentration to an area of low (solute) concentration*

1

water left cells / potato by osmosis

allow water left cells by diffusion through a partially / selectively / semi permeable membrane

1

(c) (pieces at 1.0 mol/dm^3) lost more mass because more water left potato / cells

(pieces at 1.0 mol/dm^3) lost more mass because more osmosis occurred out of the potato / cells

1

(because) there is a steeper concentration gradient (at 1.0 mol/dm^3)

allow there is a greater difference in the concentration between inside and outside the cells / potato at 1.0 mol/dm^3

1

[11]

Q2.

(a) $\frac{9.96 \times 10^{-3}}{1.35 \times 10^{-4}}$

allow $\frac{0.00996}{0.000135}$

1

73.77…

1

74 (:1)

allow a correctly derived whole number from an incorrect calculation

*do **not** accept if unit is given*

1

*if no answer in answer space allow answer in **Table 1***

(b) as size increases, (surface area to volume) ratio decreases

*allow they are inversely proportional **or** they are negatively correlated*

allow as one increases, the other decreases

allow as size decreases, (surface area to volume) ratio increases

1

(c) **D** has a smaller surface area to volume ratio (than **B**)

1

(so) diffusion distance is too large (to meet demands of cells / organism)

allow (so) diffusion is too slow (to meet demands of cells / organism)

1

*allow converse for **B** throughout*

(d) **D** has a larger surface area to volume ratio **and** so will lose heat more quickly (per unit volume than **E**)

*allow **D** has a larger surface area to volume ratio **and** so temperature of **D** will drop more quickly*

*ignore **E** loses more heat (overall)*

1

(**D**) requires greater rate of respiration

1

(as) respiration is a (large) part of metabolism

1

(so) need to generate more heat (to keep itself warm)

allow (so) needs to release more heat (to keep itself warm)

*do **not** accept energy produced / made / created*

1

*allow converse for **E** throughout*

(e) **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.

3–4

Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.

1–2

No relevant content

0

Indicative content

- **both** have a large surface area
  - to maximise diffusion
- **both** have thin walls **or** have walls that are one cell thick
  - to reduce diffusion distance / time
- **both** are in close proximity to blood supply
  - to reduce diffusion distance / time
- **both** have a good blood supply **or** both have a capillary network
  - to maintain concentration gradient
- villi have microvilli
  - to (further) increase surface area
- cells of villi contain many mitochondria
  - for active transport

For **Level 2** reference to functions of structural details of **both** alveoli and villi is required.

[14]