

## Mark schemes

1

- (a) (i) variation in masses / more representative / more typical / more reliable / average / mean / reference to anomalies

**or**

one worm to light to measure change

*do not allow more accurate / more precise*

*ignore fair test / valid / repeatable / reproducible*

1

- (ii) remove solution / liquid (on outside of worm)

*allow 'water'*

1

- (iii) variable amounts removed from each worm

*ignore reference to length of timing*

1

- (iv) equal sizes of worm / more worms (in each group) / wash off all the sand / repeats / use more accurate balance / use smaller concentration intervals

*allow reference to improve blotting technique eg blot before / blot more thoroughly*

1

- (b) (i) different (starting) masses / sizes / weights (at different concentrations)

1

allows comparisons / shows pattern / shows trend

1

- (ii) (+)20

*correct answer = 2 marks, with or without working*

**or**

$$\frac{7.5 \times 100}{37.5} \quad / \quad \frac{7.5}{37.5} \quad / \quad \frac{(45.0 - 1) \times 100}{37.5}$$

*for 1 mark*

2

- (c) (i) graph:

points correct

*allow  $\pm 1$  mm*

*-1 mark per error*

*allow ecf from part b(ii)*

2

label on x-axis including units – ie Concentration of salt in arbitrary units

1

line of best fit = smooth curve / ruled straight line  
*anomaly (4.0, -52) either plotted and ignored re. line  
or not plotted  
do not allow point to point  
allow best fit for ecf from 2bii*

1

(ii) on graph:

ring drawn around point at (4.0, -52)  
*allow (5.0, -50) if cand. line indicates this*

1

(iii) sensible suggestion – eg used wrong solution / used 5.0% instead of 4.0% /  
different length of time in solutions / ref to error in blotting / balance not zeroed /  
error in weighing

*allow some lugworms died  
allow error in calculation*

1

(d) (i) 2.9 to 3.0 / correct for candidate's graph  $\pm 0.1$

1

value of no change in mass / worms in equilibrium with soln / described  
*allow small(est) mass change*

1

(ii) water loss

1

by osmosis / diffusion

1

from dilute region in the worm to more concentrated solution outside

*allow correct description in terms of high to low water concentration  
/ high to low water potential*

*salt solution is hypertonic*

*concentration unqualified = salt concentration*

1

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2

(a) motor

*allow efferent / postsynaptic  
allow **another** relay (neurone)*

1

(b) release of chemical (from relay neurone)

*allow ecf for 'motor' neurone from (a)  
allow release of neurotransmitter / named example*

1

chemical crosses gap / junction / synapse

*allow diffuses across*

*allow chemical moves to X*

1

chemical attaches to X / motor / next neurone (causing impulse)

1

(c) (curare) decrease / no contraction

*accept (muscle) relaxes*

1

(strychnine) increase / more contraction

*if no other mark awarded allow 1 mark for (curare) decrease / no response **and** (strychnine) increase / more response*

1

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3

(a) (i) A = (cell) membrane

1

B = cytoplasm

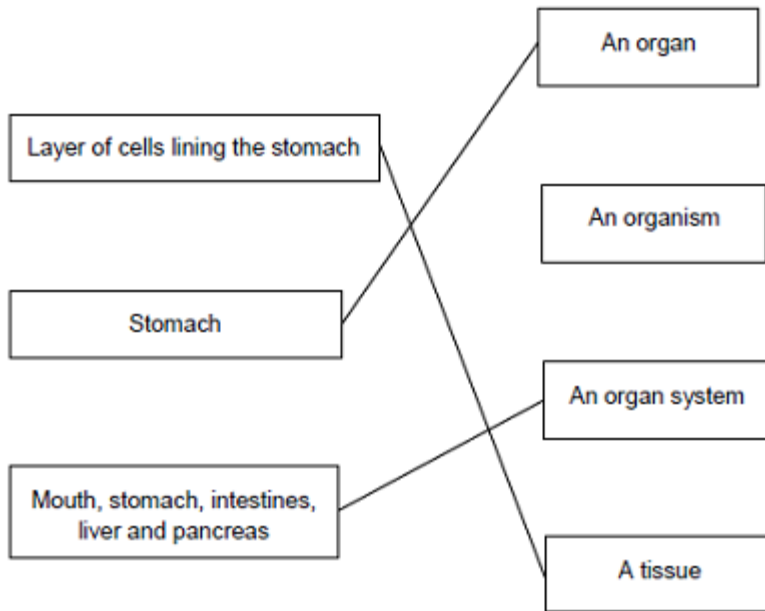
*do **not** accept cytoplasm*

1

(ii) To control the activities of the cell

1

(b)



extra lines cancel

3

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4

(a) (i) fertilisation

1

(ii) in sequence:

*accept 1 next to gene, 2 next to chromosome and 3 next to nucleus  
in box*

1 gene

2 chromosome

3 nucleus

*allow 1 mark for smallest **or** largest in correct position*

2

(iii) DNA

1

(b) (i) On diagram:

tick drawn next to **X** and / or **Y** from Parent 1

*tick(s) must be totally outside grid squares*

*allow ticks around "parent "*

*extra ticks elsewhere cancel*

1

(ii) 0.5 /  $\frac{1}{2}$  / 50% / 1:1 / 50:50 / 1 in 2

*allow 2/4 / 2 in 4 / 2 out of 4 / 'even(s)' / 'fifty – fifty'*

*do **not** allow 1:2 or '50 / 50' or '50 – 50'*

1

2 (out of 4) boxes are **XX**

**or**

half of the sperm contain an **X**-chromosome

*allow **XY** is male and 2 (out of 4) boxes are **XY***

1

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5

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

**0 marks**

No relevant content.

**Level 1 (1 – 2 marks)**

An example is given of a named substance

**or**

a process

**or**

there is an idea of why diffusion is important eg definition.

**Level 2 (3 – 4 marks)**

At least one example of a substance is given

**and**

correctly linked to a process in either animals or plants.

**Level 3 (5 – 6 marks)**

There is a description of a process occurring in either animals or plants that is correctly linked to a substance

**and**

a process occurring in the other type of organism that is correctly linked to a substance.

**examples of points made in the response**

**Importance of diffusion:**

- to take in substances for use in cell processes
- products from cell processes removed

**Examples of processes and substances:**

- for gas exchange / respiration: O<sub>2</sub> in / CO<sub>2</sub> out
- for gas exchange / photosynthesis: CO<sub>2</sub> in / O<sub>2</sub> out
- food molecules absorbed: glucose, amino acids, etc
- water absorption in the large intestine
- water lost from leaves / transpiration
- water absorption by roots
- mineral ions absorbed by roots

***extra information***

***Description of processes might include:***

- *movement of particles / molecules / ions*
- *through a partially permeable membrane*
- *(movement of substance) down a concentration gradient*
- *osmosis: turgor / support / stomatal movements*

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6

(a) osmosis

1

partially permeable

1

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

*allow correct answers in terms of A*

- vacuole is small(er)
- cytoplasm has shrunk
- gap between cytoplasm and cell wall
- cell wall curves inwards

*allow cell B is flaccid or cell A is turgid*

- the (cell) membrane has moved away from the wall

2

(ii) any **one** from:

- water will move / diffuse in
- (cells) will swell
- (cells) will burst

*ignore turgid*

1

(c) villi give the small intestines a large surface area

1

villi have many blood capillaries

1

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7

(a) any **three** from:

- (water through a) partially permeable  
*accept 'semi permeable' / selectively permeable*
- membrane
- from dilute to (more) concentrated solution  
*allow 'from a high concentration of water to a lower concentration (of water)'*  
*allow 'from high water potential to low water potential'*  
*allow 'down a concentration gradient of water'*  
*do not accept 'along a concentration gradient of water'*
- (it's a) passive (process)  
*allow requires no energy*

3

(b) (there are) many hairs **or** thin hairs **or** hairs are one cell thick

1

(which gives) large / increased surface area **or** short diffusion pathway

1

(so there is) more diffusion / osmosis (of water into the root)

*ignore absorption*

1

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8

(a) (i) A = nucleus

1

B = (cell) membrane

1

(ii) any **two** from:

*ignore shape*

- no (cell) wall
- no (large / permanent) vacuole
- no chloroplasts / chlorophyll

2

(b) because high to low oxygen / concentration **or** down gradient

*allow 'more / a lot of oxygen molecules outside'*

*ignore along / across gradient*

1

(c) a tissue

1

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9

(a) (i) allele expressed even when other allele present **or** expressed if just one copy of allele is present **or** expressed if heterozygous

*if present other allele not expressed*

1

(ii) 2 affected parents have unaffected child **or** 1 and 2 → 5 / 6

**or** if recessive all of 1 and 2s children would have CADASIL

1

(iii) heterozygous – has unaffected children **or** because if homozygous all children would have CADASIL

1

(b) genetic diagram including:

*accept alternative symbols, if defined*

1

correct gametes:

**D and d**  
**and d (and d)**

*ignore 7 / 8 or male / female*

1

derivation of offspring genotypes:

**Dd Dd dd dd**

*allow just **Dd dd** if ½-diagram*  
*allow ecf if correct for student's gametes*

1

identification of **Dd** as CADASIL

**or dd** as unaffected

*allow ecf if correct for student's gametes*

1

correct probability: 0.5 / ½ / 1 in 2 / 50% / 1 : 1

1

(c) (i) stem cells can differentiate **or** are undifferentiated / unspecialised

1

can form blood vessel cells / brain cells

**or**

stem cells can divide

1

(ii) ethical argument - eg no risk of damage to embryo or adult can give consent for removal of cells **or** adult can re-grow skin

*more ethical qualified*

*ignore religion unqualified*

**or**

if from a relative then less chance of rejection **or** if from self then no chance of rejection

**or**

skin cells more accessible

1

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10

(a) **A** sperm

1

**B** egg

1

**C** fertilised egg

1



D embryo

1

(b) insert into mother

*ignore fertilise / check fertilisation / check viability*

1

womb / uterus

1

(c) (i) one quarter

1

(ii) no / little chance of success over 42

1

reference to table of only two women in the age bracket 40-42 years became pregnant

*the statement 'only 2 out of 53 40-42 year old women became pregnant / had babies' gains 2 marks*

1

(iii) so fewer twins / multiple births

**or**

multiple births more dangerous

1

**[10]**

**11**

(a) (i) **C and D**

*no mark if more than one box is ticked*

1

(ii) any **one** from:

*do **not** allow if other cell parts are given in a list*

• (have) cell wall(s)

• (have) vacuole(s)

1

(b) (i) **A**

*apply list principle*

1

(ii) **D**

*apply list principle*

1

(c) respiration

*apply list principle*

1

**[5]**