

# Transport across cell membranes 1

Level: OCR A Level H420

Subject: Biology

Exam Board: Suitable for all boards

Topic: Transport across cell membranes 1

Type: Mark Scheme

To be used by all students preparing for OCR A Level Biology H420 foundation or higher tier but also suitable for students of other boards.

## Mark schemes

1

### By osmosis (no mark)

*No mark awarded for naming terms e.g. osmosis, facilitated diffusion, active transport, co-transport etc.*

1. From a high water potential to a low water potential / down a water potential gradient;
2. Through aquaporins / water channels;  
*QWC ignore large / small WP*

### By facilitated diffusion (no mark)

*QWC ignore reference to high / low concentrations of water or high / low concentration of solution*

3. Channel / carrier protein;
4. Down concentration gradient;

### By active transport (no mark)

*QWC ignore 'along' concentration gradients*

5. Carrier protein / protein pumps;
6. Against concentration gradient;
7. Using ATP / energy (from respiration);  
*Co-transport subsumed into mark scheme for active transport and facilitated diffusion*

### By phagocytosis / endocytosis (no mark)

*Can award MP2, 3, 5 for 3 marks with no context given*

8. Engulfing by cell surface membrane to form vesicle / vacuole;  
*Ignore lipid diffusion as in stem of question*

### By exocytosis / role of Golgi vesicles (no mark)

9. Fusion of vesicle with cell surface membrane;

5 max

[5]



2

- (a) 1. Polar molecule;  
2. Acts as a (universal) solvent;

OR

3. (Universal) solvent;  
4. (Metabolic) reactions occur faster in solution;

OR

5. Reactive;  
6. Takes place in hydrolysis / condensation / named reaction;  
*Polar molecule so acts as (universal) solvent so (metabolic reactions are faster = 3 marks*

4

- (b) Name of ion;

Correct function within cell;

*Ions other than sodium in specification are  $H^+$ ,  $Fe^{2+}$  and  $PO_4^{3-}$  but accept any correct ion (other than sodium) plus relevant function = 2.*

*Allow ion to be named in words but not as element, e.g, iron ion but not iron.*

2

- (c) 1. Comparison: both move down concentration gradient;  
2. Comparison: both move through (protein) channels in membrane;  
*Accept aquaporins (for water) and ion channels*  
3. Contrast: ions can move against a concentration gradient by active transport

3

[9]



- 3** (a) 1. Between 0 and 0.1 calcium (ions) cannot enter by facilitated diffusion  
**OR**  
No diffusion gradient for entry into the cell.
2. Between 0.1 and 0.3 calcium (ions) enter by facilitated diffusion;
3. As calcium (ions) enter without oxygen  
**OR**  
Oxygen is not required for facilitated diffusion;
4. Between 0 and 0.1 calcium (ions) enter by active transport;
5. Movement is against the concentration gradient;
6. As calcium (ions) only enter in presence of oxygen / oxygen is required for active transport.

*Accept 'they' refers to calcium ions*

**5 max**

- (b) (She could have used) boiled (and cooled) water  
**OR**  
Layer of oil in top of solution;

**1**

**[6]**



- 4** (a) Binary fission;  
*Reject mitosis*
- (b) 1. Keep lid on Petri dish  
**OR**  
Open lid of Petri dish as little as possible.
2. To prevent unwanted bacteria contaminating the dish.  
**OR**  
*L. monocytogenes* may be dangerous / may get out.
- OR**
3. Wear gloves  
**OR**  
Wear mask  
**OR**  
Wash hands;
4. To prevent contamination from bacteria on hands / mouth  
**OR**  
Prevent spread of bacteria outside the lab;
- OR**
5. Use sterile pipette  
**OR**  
Flame the loop  
**OR**  
Flame the neck of the container of the culture;
6. To maintain a pure culture of bacteria
- (c) Cinnamon;
- (d) 1. Thyme is the most effective / best (at 4 °C);  
2. Clove and cinnamon same effectiveness at 4 °C as 35 °C (so suitable);  
3. Bay and nutmeg are less effective at 4 °C than 35 °C (so unsuitable).
- (e) Less kinetic energy  
**OR**  
Less movement of oil molecules / of phospholipid molecules

1

4 max

1

3

1 max

[10]

- 5** (a) 1. (Overall) outward pressure of 3.2 kPa;  
2. Forces small molecules out of capillary.
- (b) Loss of water / loss of fluid / friction (against capillary lining).

2

1



- (c) 1. High blood pressure = high hydrostatic pressure;  
2. Increases outward pressure from (arterial) end of capillary / reduces inward pressure at (venule) end of capillary;  
3. (So) more tissue fluid formed / less tissue fluid is reabsorbed.

*Allow lymph system not able to drain tissues fast enough*

3

- (d) 1. Water has left the capillary;  
2. Proteins (in blood) too large to leave capillary;  
3. Increasing / giving higher concentration of blood proteins (and thus wp).

3

[9]

6

- (a) 1. Dissolve in alcohol, then add water;  
2. White emulsion shows presence of lipid.

2

(b) Glycerol.

1

(c) Ester.

1

(d) Y (no mark)  
Contains double bond between (adjacent) carbon atoms in hydrocarbon chain.

1

- (e) 1. Divide mass of each lipid by total mass of all lipids (in that type of cell);  
2. Multiply answer by 100.

2

(f) Red blood cells free in blood / not supported by other cells so cholesterol helps to maintain shape;

*Allow converse for cell from ileum – cell supported by others in endothelium so cholesterol has less effect on maintaining shape.*

1

- (g) 1. Cell unable to change shape;  
2. (Because) cell has a cell wall;  
3. (Wall is) rigid / made of peptidoglycan / murein.

2 max

[10]

7

(a) Calculations made (from raw data) / raw data would have recorded initial and final masses.

1

(b) Add  $4.5 \text{ cm}^3$  of  $(1.0 \text{ mol dm}^{-3})$  solution to  $25.5 \text{ cm}^3$  (distilled) water.

*If incorrect, allow 1 mark for solution to water in a proportion of 0.15:0.85*

2



- (c) 1. Water potential of solution is less than / more negative than that of potato tissue;  
*Allow  $\Psi$  as equivalent to water potential*
2. Tissue loses water by osmosis. 2

- (d) 1. Plot a graph with concentration on the x-axis and percentage change in mass on the y-axis;
2. Find concentration where curve crosses the x-axis / where percentage change is zero;
3. Use (another) resource to find water potential of sucrose concentration (where curve crosses x-axis). 3

[8]

- 8** (a) 0.22; 1

- (b) 1. Uptake in flask **G** much greater than in flask **F**;
2. Showing use of ATP in flask **G**;
3. Sodium ion concentration in flask **G** falls to zero;
4. Showing uptake against a concentration gradient. 4

- (c) 1. (Uptake of sodium ions occurring by) facilitated diffusion;
2. Equilibrium reached / sodium ion concentrations in solution and in cells the same. 2

[7]

- 9** (a) 1. Water potential becomes lower / becomes more negative (as sugar enters phloem);
2. Water enters phloem by osmosis;
3. Increased volume (of water) causes increased pressure. 3

- (b) 1. Rate of photosynthesis related to rate of sucrose production;
2. Rate of translocation higher when sucrose concentration is higher. 2

- (c) 1. Rate of translocation does not fall to zero / translocation still occurs after 120 minutes;
2. But sucrose no longer able to enter cytoplasm of phloem cells. 2

[7]

- 10** (a) 1. Trachea and bronchi and bronchioles;
2. Down pressure gradient;
3. Down diffusion gradient;
4. Across alveolar epithelium.

*Capillary wall neutral*

5. Across capillary endothelium / epithelium.

4 max



(b) (About) 80.0%.

1

- (c) 1. (Group **B** because) breathe out as quickly as healthy / have similar FEV to group **A**;  
2. So bronchioles not affected;  
3. FVC reduced / total volume breathed out reduced.

*Allow this marking point for group **C***

3

[8]

11

- (a) 1. Facilitated diffusion involves channel or carrier proteins whereas active transport only involves carrier proteins;  
2. Facilitated diffusion does not use ATP / is passive whereas active transport uses ATP;  
3. Facilitated diffusion takes place down a concentration gradient whereas active transport can occur against a concentration gradient.

*Since 'contrast', both sides of the differences needed*

3

(b) 3.3:1.

*Correct answer = 2 marks*

*If incorrect, allow 1 mark for 470–360 / 60 for rate in second hour*

2

- (c) 1. Group **A** – initial uptake slower because by diffusion (only);  
2. Group **A** – levels off because same concentrations inside cells and outside cells / reached equilibrium;  
3. Group **B** – uptake faster because by diffusion plus active transport;  
4. Group **B** fails to level off because uptake against gradient / no equilibrium to be reached;  
5. Group **B** – rate slows because few / fewer chloride ions in external solution / respiratory substrate used up.

4 max

[9]





12

- (a) 1. (Because) same water potential (as valve);  
2. (So) prevents loss or gain of water by osmosis / down water potential gradient;  
*Loss or gain and method of loss or gain must both be in the answer*  
3. (So) cells / tissues in the valves aren't damaged;

2 max

- (b) 1. Kills / stops growth of bacteria that could cause infection / disease (in patient);  
2. Kills / stops growth of bacteria that could damage the valve;  
*'Kill / stop growth of bacteria' is insufficient without further explanation.*

1 max

- (c) (After surgery) valve closes fully / correctly / works so preventing blood flowing back into the heart;

**OR**

(After surgery) valve closes fully / correctly / works so preventing blood flowing out of the artery;

*Do not credit the converse here*

1

- (d) 1. (For maximum) mean decreases, to within the normal range;  
2. (For minimum) mean increases to within normal range;  
3. No overlap in the (means  $\pm$ ) standard deviation for minimum pressure so there is a real difference;  
*Ignore references to the differences in maximum pressure*  
*Accept idea of significant difference for 'real difference'*  
4. Includes wide range of ages of patients;

3 max

- (e) 1. Standard deviation shows that some of the patients will be outside normal pressure range (after surgery);  
*Accept this as a general statement or in relation to maximum or minimum pressures*  
2. Small group;  
3. Short follow up times;  
4. No comparison with other treatments;

2 max

- (f) Don't know the range;

1

[10]



13

- (a) 1. In phospholipid, one fatty acid replaced by a phosphate;

*Ignore references to saturated and unsaturated*

*Accept  $\text{Pi}/\text{PO}_4^{3-}$  / (P)*

*Reject P/Phosphorus*

*Accept annotated diagrams*

1

- (b) 1. Add ethanol, then add water;

*Reject ethanal/ethonal*

*Accept 'Alcohol/named alcohol'*

2. White (emulsion shows lipid);

*Accept milky – Ignore 'cloudy'*

*Sequence must be correct*

*If heated then DQ point 1*

*Reject precipitate*

2

- (c) Saturated single/no double bonds (between carbons)

**OR**

Unsaturated has (at least one) double bond (between carbons);

*Accept hydrocarbon chain/R group for 'between carbons' for either*

*Accept Sat = max number of H atoms bound*

*'It' refers to saturated*

1

- (d) 1. (Fat substitute) is a different/wrong shape/not complementary;

**OR**

Bond between glycerol/fatty acid and propylene glycol different  
(to that between glycerol and fatty acid)/no ester bond;

2. Unable to fit/bind to (active site of) lipase/no ES complex formed;

*If wrong bond name given (e.g. peptide/glycosidic), then penalise once*

2

- (e) It is hydrophilic/is polar/is too large/is too big;

*Ignore 'Is not lipid soluble'*

1

[7]



14

(a)

Transport through a channel protein

Q

1

Transport of small, non-polar molecules

P

1

Transport of glucose with sodium ions

S

1

(b) 1. (Y is) an enzyme/has active site/forms ES complex;

*Accept catalyst*

2. That makes cellulose/attaches substrate to cellulose/joins  $\beta$  glucose;

**OR**

3. Makes cellulose/forms glycosidic bonds;

4. From  $\beta$  glucose;

*Mark in pairs (1&2 or 3&4)*

2

(c) Cell wall forms outside cell-surface membrane/has cellulose on it (on the outside);

1

(d) (Tick in box next to) Hydrogen;

1

[7]

15

(a) Dipeptidase/s;

*Accept: membrane bound dipeptidase/s.*

1

(b) 1. Endopeptidases hydrolyse internal (peptide bonds)

**OR**

Exopeptidases remove amino acids/hydrolyse (bonds) at end(s);

*Accept: break for hydrolyse.*

*Accept: endopeptidases break (proteins) into shorter chains.*

2. More ends or increase in surface area (for exopeptidases);

2



- (c) 1. No/less ATP produced  
**OR**  
No active transport;
2. Sodium (ions) not moved (into/out of cell);  
*Accept: sodium (ions) increase in cell.*  
*Accept: sodium (ions) cannot diffuse into cell.*
3. No diffusion gradient for sodium (to move into cell with amino acid)  
**OR**  
No concentration gradient for sodium (to move into cell with amino acid);  
*Accept: converse for all three points.*  
*Note: no active transport of sodium (ions) equals 2 marks.*

3

[6]

16

- (a) (Simple) diffusion;  
*Reject: facilitated diffusion.*
- (b) 1. Thin/small **so** short diffusion pathway;  
*Reject: thin membrane/wall/cells.*
2. Flat/long/small/thin **so** large surface area to volume ratio/surface area : volume;  
*Accept: small volume to surface area ratio.*
- (c) 1. High/50% saturation (with oxygen) below ( $pO_2$  of) 0.2 kPa;  
*Accept: fully saturated **or** above 50% saturation below 0.2kPa.*  
*Accept: any number between 0.08 and 0.2 kPa*
2. (Oxygen) for respiration;
- (d) 1. Water potential higher in worm  
**OR**  
Lower water potential in seawater;  
*Accept: correct reference to water potential gradient if direction of water movement is given.*  
*Accept:  $\psi$  for water potential.*
2. Water leaves by osmosis (and worm dies);  
*Reject: worm/cells burst.*

1

2

2

2

[7]



17

- (a)
1.  $\text{Na}^+$  ions leave epithelial cell and enter blood;  
*Penalise for Na without ions once.*
  2. (Transport out is by) active transport / pump / via carrier protein using ATP;  
*Reject channel protein*
  3. So,  $\text{Na}^+$  conc. in cell is lower than in lumen (of gut);  
*Maintains diffusion gradient for  $\text{Na}^+$  from lumen/into cells;*
  4. Sodium/ $\text{Na}^+$  ions enter by facilitated diffusion;  
*Accept diffusion/from high to low concentration through a symport/cotransport protein*
  5. Glucose absorbed with  $\text{Na}^+$  ions against their concentration/diffusion gradient / glucose absorbed down an electrochemical gradient;  
*Accept glucose absorbed with sodium ions by indirect active transport*

5

- (b)
1. Chloride ions water soluble/charged/polar;  
*Penalise chloride molecules only once*  
*Ignore ref to size*  
*Accept not lipid soluble*
  2. Cannot cross (lipid) bilayer (of membrane);
  3. Chloride ions transported by facilitated diffusion OR diffusion involving channel/carrier protein;
  4. Oxygen not charged/non-polar;  
*Accept oxygen lipid soluble*
  5. (Oxygen) soluble in/can diffuse across (lipid) bilayer;

5

[10]

18

- (a)
1. (Releases) toxins;
  2. Kills cells / tissues.  
*2. Accept any reference to cell / tissue damage*  
*Ignore infecting / invading cells*

2

- (b)
1. Water potential in (bacterial) cells higher (than in honey) / water potential in honey lower (than in bacterial cells);  
*Q candidates must express themselves clearly*  
*1. Must be comparative e.g. high WP in cell and low WP in honey*
  2. Water leaves bacteria / cells by osmosis;
  3. (Loss of water) stops (metabolic) reactions.  
*3. Needs a reason why lack of water kills the cell*

3

[5]



19

(a) Regulator protein.

*Accept regulator protein antigen*

*Reject regulator protein receptor*

*Ignore regular protein*

1

- (b) 1. Lipid soluble / hydrophobic  
2. Enters through (phospholipid) bilayer

**OR**

3. (Protein part of) LDL attaches to receptor

4. Goes through carrier / channel protein.

*4. Accept by facilitated diffusion or active transport*

*4. Reject active transport through channel protein*

2

(c) Any **two** from:

1. (Monoclonal antibody) has a specific tertiary structure / variable region / is complementary to regulator protein

*Do not award MP1 if reference to active site.*

2. Binds to / forms complex with (regulator protein)

*"It" refers to monoclonal antibody in MP1 and MP2*

3. (So regulator protein) would not fit / bind to the receptor / is not complementary to receptor

*3. Reject receptor on LDL*

2 max

(d) 1. Injection with salt solution

*1. Accept inject placebo in salt solution*

2. Otherwise treated the same.

2

[7]



20

- (a) 1. (No grease)  
means stomata are open  
OR  
allows normal CO<sub>2</sub> uptake;  
*Allow 'gas exchange' for CO<sub>2</sub> uptake.*  
*'As a control' is insufficient on its own.*
2. (Grease on lower surface)  
seals stomata  
OR  
stops CO<sub>2</sub> uptake through stomata  
OR  
to find CO<sub>2</sub> uptake through stomata  
OR  
shows CO<sub>2</sub> uptake through cuticle / upper surface;
3. (Grease on both surfaces) shows sealing is effective  
OR  
stops all CO<sub>2</sub> uptake.

3

- (b) (i) 1. (Mean rate of) carbon dioxide uptake was constant *and* fell after the light turned off;  
*Ignore absence of arbitrary units in both marking points.*  
*Both ideas needed for mark.*  
*Accept 'stayed at 4.5' as equivalent to 'was constant'.*
2. Uptake fell from 4.5 to 0 / uptake started to fall at 60 minutes and reached lowest at 80 minutes / uptake fell over period of 20 minutes;  
*One correct use of figures required.*  
*Accept fell to nothing / no uptake for 0.*

2

- (ii) 1. (Because) water is lost through stomata;  
2. (Closure) prevents / reduces water loss;  
3. Maintain water content of cells.  
*This marking point rewards an understanding of reducing water loss e.g. reduce wilting, maintain turgor, and is not related to photosynthesis.*

2 max

- (c) (i) (Carbon dioxide uptake) through the upper surface of the leaf / through cuticle.
- (ii) 1. No use of carbon dioxide in photosynthesis (in the dark);  
2. No diffusion gradient (maintained) for carbon dioxide into leaf / there is now a diffusion gradient for carbon dioxide out of leaf (due to respiration).

1

2

[10]



21

- (a) 1. Bilayer;  
*Accept double layer*  
*Accept drawing which shows bilayer*
2. Hydrophobic / fatty acid / lipid (tails) to inside;
3. Polar / phosphate group / hydrophilic (head) to outside;  
*2. & 3. need labels*  
*2. & 3. accept water loving or hating*

2 max

- (b) (i) 1. (Rough endoplasmic reticulum has) ribosomes;  
*accept "contains / stores"*
2. To make protein (which an enzyme is);  
*Accept amino acids joined together / (poly)peptide*  
*Reject makes amino acids*  
*Ignore glycoprotein*

2

- (ii) (Golgi apparatus) modifies (protein)

**OR**

packages / put into (Golgi) vesicles

**OR**

transport to cell surface / vacuole;

*Accept protein has sugar added*

*Reject protein synthesis*

*Accept lysosome formation*

1

[5]

22

- (a) Variable that is changed;  
*Reject 'the variable that changes'.*

1

- (b) 1. Idea of a confounding variable;
2. (So) genetically similar;  
*2. Do not accept 'genetically identical / same DNA'.*
3. (So) have similar salt tolerance / response to salt water / response to watering treatment;
4. (So) have similar yield / mass of seeds;  
*Do not accept 'amount / number of seeds' or 'growth rate'.*

2 max





(c) Mitosis;

*Ignore cell division*

1

(d) 1. Irrigation with sea water / **C** / **D** increased yield compared with no irrigation / **A**;

*For 'yield' accept 'mass of seed' throughout.*

2. Yield was lower when irrigated with sea water / **C** / **D** compared with fresh water / **B**;

*Only penalise once for use of 'amount / number of seeds'.*

3. Yield was lower when watered with sea water throughout growth and seed formation / **C** than when watered with sea water just at seed formation / **D**;

*Accept use of figures from table.*

*'It' refers to watering with seawater / mixture.*

2 max

(e) 1. Irrigation with sea water / **C** / **D** increases concentration of salt in soil;

*Ignore reference to standard deviation / quality of the data.*

2. Lower water potential in the soil linked to reduced uptake of water;

3. Salt concentration in the soil might / might not increase in the future;

*Mark point 3 includes the principle for mark point 1 so mp3 gains 2 marks (for mp1 and mp3)*

4. Might decrease plant growth / yield in the future;

5. Less food / fewer seeds for future planting;

*Mp 3 and 4. Allow 'further' for the idea of 'in the future'.*

3 max

[9]

23

(a) 1. (Curve for) dog falls rapidly at the start but (curve for) sheep falls slowly at first;

*Do **not** allow curve for dog falls more steeply (since from 0.5% NaCl fall in sheep is just as steep as fall in dog)*

2. Sheep doesn't fall rapidly until 0.5 (but dog falls rapidly from 0);

3. (Trend shows that) for any concentration of sodium chloride haemolysis is lower in the dog;

*The idea of a trend is required. Statement of individual values alone is insufficient, eg 'at 0.2, 34% in dog and 98% in sheep' is insufficient*

*Accept dog reaches 0 at lower concentration of sodium chloride than for sheep / dog reaches 0 at 0.38% compared to 0.84 % in sheep;*

2 max



(b) 74 to 76;

*Accept a value within this range*

1

(c) 1. (Red) colour is due to haemoglobin;

*Note: a correct response to marking point 2 also scores marking point 1*

2. The more haemoglobin released the more red the solution;

*Need idea of haemoglobin release before giving credit*

2

(d) 1. (Use of 0.9%) will not cause haemolysis in any (of the mammals);

*Full credit requires statement of marking point 1 and any approach from marking point 2*

2. (So) will not kill any of the animals;

or

Only need to use / store / buy one concentration of sodium chloride solution / cheaper to have one concentration of sodium chloride solution / can buy in bulk;

or

Anyone can give it / no need to find out what concentration any animal requires;

*Different approaches available for this marking point*

2 max

[7]

24

(a) Answer of 9.09 / 9.1;; = 2 marks

Calculation of the difference in mean time (2) divided by original time (22); = 1 mark

*Ignore number of decimal places as long as they are correct*

2



(b) (Yes)

*Can mix and match yes or no approach, all 5 responses are available*

(No)

1. Faster running time after sports drink;  
*'Faster running time in group Q' is insufficient but accept 'faster running time in group Q in Race 2'*
2. Mean times given **so** there will be variation in the group;
3. No standard deviations to know the spread of the data (about the mean) / whether they overlap;  
*Accept 'no stats analysis'*
4. Improvement in running time only small in both groups / both groups improved in Race 2;
5. Did not drink the same volumes;

**3 max**

(c) 1. Age;

2. Gender / sex;

3. Ethnicity;

4. Food / fluid intake before the race;  
*Any fluid / food is included here eg coffee, alcohol*

5. Amount of sleep / rest / exercise before the race;

6. Reference to one named health factor eg diabetic or non-diabetic, smoker or non-smoker;

*Reference to medication is included here*

**3 max**



- (d) 1. Sodium ions and glucose absorbed by co-transport;  
*Only penalise omission of 'ions' once in marking points 1, 3, 4 and 5*
2. (Co-transport) via carrier / channel protein;  
*Accept via symport*  
*Only reward reference to carrier / channel proteins in the context of co-transport*
3. Sodium ions removed (from epithelial cell) by active transport into blood;
4. Maintains low concentration of sodium ions (in epithelial cell) / maintains sodium ion concentration gradient (between small intestine and epithelial cell);  
*Principle: marking points 3, 5, and 6 require consideration of 'what moves', 'where it moves to' and 'how it moves' to achieve credit*
5. Sodium ions enter epithelial cells by facilitated diffusion taking glucose with them (from small intestine);  
*Reference to diffuse / diffusion for movement is required.*  
*Accept facilitated diffusion*
6. Glucose moved by facilitated diffusion into blood (from epithelial cells);

4 max

[12]

- 25** 1. (Drink) contains carbohydrates / sugars **so** High GI / (drink) contains carbohydrates / sugars **so** raises blood glucose concentration quickly;  
*Each alternative requires both aspects for credit*  
*The second alternative requires a reference to speed eg 'quickly' or 'immediately'*
2. Contains salt so glucose more rapidly absorbed;
3. Increases glucose to muscles for respiration;
4. More / faster respiration so more / faster energy release;  
*Reject reference to energy production*  
*Accept more ATP produced*

[3]

- 26** (a) 1. **A:** phospholipid (layer);  
*1. Reject hydrophobic / hydrophilic phospholipid*
2. **B:** pore / channel / pump / carrier / transmembrane / intrinsic / transport protein;  
*2. Ignore unqualified reference to protein*

2

- (b) (i) Condensation (reaction);

1



(ii) Organelle named; Function in protein production / secretion;

*Function must be for organelle named*

*Incorrect organelle = 0*

eg

1. Golgi (apparatus);  
*1. Accept smooth endoplasmic reticulum*
2. Package / process proteins;

**OR**

3. Rough endoplasmic reticulum / ribosomes;  
*3. Accept alternative correct functions of rough endoplasmic reticulum. ER / RER is insufficient*  
*3. Accept folding polypeptide / protein*
4. Make polypeptide / protein / forming peptide bonds;

**OR**

5. Mitochondria;
6. Release of energy / make ATP;  
*6. Reject produce / make energy*  
*6. Accept produce energy in the form of ATP*

**OR**

7. Vesicles;
8. Secretion / transport of protein;

2

[5]

27

- (a) 1. To allow comparison;
2. Because different number of cells in samples / different times for incubation / numbers become easier to manipulate;

2

(b) 203.7(%);;

*Allow 1 mark for 21.8 / 10.7*

*Allow 1 mark for correct answer (203.74) but not correctly to 1 dp*

*204 = 1 mark*

2

- (c) (i) 1. (At every concentration) uptake is faster at 37°C / at higher temperature;
2. Due to faster respiration / ATP production;

2



- (ii) 1. Uptake at 37°C only small increase / levelling off / almost constant as carrier proteins full;  
*Accept 'no (significant) change'*  
*Ignore use of numbers*

2. Concentration of imatinib is not the limiting factor;

2

[8]

28

- (a) (i) Substance that causes an immune response / production of antibodies;  
*Ignore foreign / non-self*

1

- (ii) 1. Not lipid soluble;  
2. Too large (to diffuse through the membrane);  
3. Antigens do not have the complementary shape / cannot bind to receptor / channel / carrier proteins (in membranes of other epithelial cells);

2 max

- (b) 1. (Vaccine contains) antigen / attenuated / dead pathogen;  
*1. Reject if in context of injection of vaccine*

2. T-cells activate B-cells;

3. B-cells divide / form clone / undergo mitosis;

4. Plasma cells produce antibodies;

5. Memory cells produced meaning more antibodies / antibodies produced faster in secondary response / on reinfection;

5

[8]



29

- 1.M Membrane function as selectively permeable barrier
- 1.T Transport mechanisms across membranes
- 1.CT Absorption and co-transport of sodium ions and glucose
- 2.P Photosynthesis, chloroplast, thylakoids
- 2.R Respiration, mitochondrion and cristae.
- 2.Ps Protein secretion, RER, SER and Golgi
- 3.A Surface receptors / antigen and immune response
- 3.CD Cell division
- 3.B Vertical and horizontal transmission – membranes and bacteria
- 3.Pc Pacinian corpuscle
- 4.Tr Tropisms – movement of IAA
- 4.N Nerve impulses / action potentials
- 4.S Synaptic transmission
- 4.Mc Muscle contraction, calcium ion movement / storage
- 4.H Hormones - eg Blood glucose regulation – insulin and glucagon
- 4.O Osmosis, including water movement in plants

*Examiners are free to select other letters if they wish*

*The emphasis in answers should be on the involvement of membranes in processes, not just the processes themselves*

*Breadth, one mark for use of an example from each of the following approaches:*

1. Membranes – basic functions
2. Organelle membranes
3. Cell surface membranes
4. Processes – eg protein secretion, synaptic transmission, cell division

[25]

30

FOR

1. (If the husband smokes) there's a greater risk of dying from lung cancer / emphysema / cervical cancer;
2. The more the husband smokes, the greater the risk of dying from lung cancer / emphysema;
3. Suitable use of figures from the table to illustrate answer;



AGAINST

- 4. Little difference in risk of dying of stomach / heart disease;
- 5. Other factor (than husband smoking) / named factor might cause death;
- 6. Only one sample / further studies needed;

4 max

[4]

31

- (a)
- 1. Sodium ions actively transported from ileum cell to blood;
  - 2. Maintains / forms diffusion gradient for sodium to enter cells from gut (and with it, glucose);
  - 3. Glucose enters by facilitated diffusion with sodium ions;

3

(b)

Biochemical test	Liquid from beaker	Liquid inside Visking tubing
Biuret reagent		✓
I <sub>2</sub> /KI		✓ or blank
Benedict's	✓	✓

1 mark for each correct row

3

- (c)
- 1. Biuret: protein molecules too large to pass through tubing;  
*Neutral: enzyme molecules*
  - 2. Iodine in potassium iodide solution: starch molecules too large to pass through tubing;  
*If no tick in 04.2, allow no starch hydrolysed*
  - 3. Benedict's: starch hydrolysed to maltose, which is able to pass through tubing.  
*Reject: glucose*

3

[9]