

Transport across cell membranes 1

Level: Edexcel A Level 9BN0

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 Edexcel Biology A Level 9BN0 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



EXAM PAPERS PRACTICE

- (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 cm^3 of $(1.0 \text{ mol dm}^{-3})$ solution to 25.5 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 Ψ 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 Pi/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 β glucose;

OR

3. Makes cellulose/forms glycosidic bonds;

4. From β 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: ψ for water potential.
2. Water leaves by osmosis (and worm dies);
Reject: worm/cells burst.

1

2

2

2

[7]



17

- (a)
1. 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, Na^+ conc. in cell is lower than in lumen (of gut);
Maintains diffusion gradient for Na^+ from lumen/into cells;
 4. Sodium/ Na^+ ions enter by facilitated diffusion;
Accept diffusion/from high to low concentration through a symport/cotransport protein
 5. Glucose absorbed with 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 CO₂ uptake;
Allow 'gas exchange' for CO₂ uptake.
'As a control' is insufficient on its own.
2. (Grease on lower surface)
seals stomata
OR
stops CO₂ uptake through stomata
OR
to find CO₂ uptake through stomata
OR
shows CO₂ uptake through cuticle / upper surface;
3. (Grease on both surfaces) shows sealing is effective
OR
stops all CO₂ 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
- (b) (i) Condensation (reaction);

2

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 ₂ /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

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[9]