EXAM PAPERS PRACTICE

Transport across cell membranes 3

Level: OCR A Level H420
Subject: Biology
Exam Board: Suitable for all boards
Topic: Transport across cell membranes 3
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

(a) Fluid = molecules move around;
Mosaic = proteins floating among phospholipids/not just phospholipids/ other molecules in it/made of different sorts of molecules;

Accept liquid

2

(b) Any two from
Enzymes;
Antigens/cell recognition/cell markers;
Receptors;
Carriers;
Channels;

Any 2

Accept active transport and facilitated diffusion for 1 mark each

2 max

(c) Active transport;
Calcium ions move against a concentration gradient/calcium ion concentration in solution is (much) higher than concentration inside cells;

2

2

(i) Lack of ATP;
Pump = <u>active</u> transport / requires <u>energy</u> / ATP provides <u>energy</u> / transport is up
concentration gradient;

2

[6]

(ii) Concentration of Na^+ inside cell no longer less than concentration in gut lumen / no longer a concentration gradient;
No (facilitated) diffusion of NA^+ ions possible / amino acid absorption requires diffusion of Na^+ ions into cell;

2

(iii) Diffusion / facilitated diffusion;

1

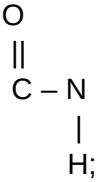
[5]

3

(a) Rate of movement / diffusion proportional to concentration gradient / difference in concentration;
High concentration of potassium ions inside cell compared to outside;
Must mention high concentration. Ignore reference to other factors if reasoning is appropriate.

2

(b) (i)



1

(ii) 10;

1

(c) Action of vanilomycin depends on fluidity of membrane;
Fluidity reduced / not fluid at low temperatures;
Pore formed by gramicidin A remains in place / permanent;

(d) Pore between sterol molecules lined with polyene antibiotic;
Hydrophobic region next to sterol;

3

2

[9]

4

(a) Large surface area to volume ratio;
For diffusion;
OR
Flat / thin;
So oxygen can reach all haemoglobin / centre rapidly / short pathway;

max 2

(b) (i) Partially permeable / allows water through but not sucrose;
Accept semi-permeable / selectively permeable.

1

(ii) Phospholipid (in membrane) / bilayer dissolved / broken down;
Allows haemoglobin / contents to leak out;

2

[5]

5

(a) (i) Pattern described as constant / decrease to 04.00 / 06.00 then rising;

1

(ii) Corresponds to ventricles contracting / systole;

1

(iii) Less / little difference between maximum and minimum / less variation / constant / not pulsed / smoother;
pressure in vein lower

2

(b) (i) The larger the molecule, the less permeable;
Over 68 000 walls not permeable;

2

(ii) Plasma proteins / albumin and globulin too large to leave capillary;
Water lost / Increase in concentration of proteins in blood / plasma;

2

(iii) Haemoglobin in red blood cells /
Haemoglobin too large to pass through membrane of RBC /
Red blood cells (containing haemoglobin) too large to pass through wall;

1

[9]

6

(i) In all cases reject 'energy' unless qualified

A – facilitated diffusion as transport protein needed but ATP not needed;
B – active transport 'energy' unless as (transport protein and) ATP needed; qualified
C – (simple) diffusion as neither ATP nor transport protein needed;
(Ignore all references to concentration gradients)

3

(ii) creates low concentration of amino acids / Na^+ in cell concentration gradient established between lumen and cell (of amino acids or Na^+)

2

[5]

7

(a) Digestion / hydrolysis / breakdown of a disaccharide into monosaccharides;
OR
(glucose and galactose form lactose) glucose is a monosaccharide;

max 1

(b) (i) Dipeptidase / disaccharidase / named disaccharidase;

1

(ii) Enzymes not lost (with gut contents) / more effective absorption of products formed by these enzymes;

1

(c) No ATP formed / no energy released by respiration;

[reject "making" energy]

Link ATP to active transport (of galactose) into cells;

2

[5]

8

(a) (i) 31 / 31.2;

1

(ii) Ratio would be less / smaller;
Cell is thin / has large surface area / (adapted) for diffusion;

Accept converse. Must relate to concept of ratio.

2

(b) (i) 6;

1

(ii) 11;

1

(c) Water potential inside vesicle more negative / lower;
Water moves into vesicle by osmosis / diffusion;

2

(d) Mitochondria supply energy / ATP;
For active transport / absorption against concentration gradient / synthesis / anabolism / exocytosis / pinocytosis;

Do not credit references to making, creating or producing energy.

2

(e) 1 Phospholipids forming bilayer / two layers;
2 Details of arrangement with “heads” on the outside;
3 Two types of protein specified;
e.g. passing right through or confined to one layer /
extrinsic or intrinsic /
channel proteins and carrier proteins /
two functional types
4 Reference to other molecule e.g. cholesterol or glycoprotein;
5 Substances move down concentration gradient / from high to low concentration;

Reject references to across or along a gradient

6 Water / ions through channel proteins / pores;
7 Small / lipid soluble molecules / examples pass between phospholipids / through phospholipid layer;
8 Carrier proteins involved with facilitated diffusion;

Ignore references to active transport.

Credit information in diagrams.

max 6

[15]

9

(a) Transports Na^+ and K^+ ;
By active transport / pump / against concentration gradient;
Restores ion balance after an action potential;
[*reject* K^+ out and Na^+ in]

2

(b) (i) each protein has a specific tertiary structure / shape;
because the ions have different sizes / shape / charge;
[*reject* receptors binding]

2

(ii) fewer protein B molecules, which transport sodium ions / more protein A molecules, which transport potassium ions;

1

[5]

10

(a) *two of the following:*
form(water) impermeable barrier to water-soluble substances / selectively permeable / allows non-polar molecules to pass through;
allows cell to maintain different concentrations either side;
makes membranes self-sealing / able to fuse with other membranes / able to form
vesicles / gives flexibility / fluidity;

2 max

(b) (surface / extrinsic protein) for cell recognition / binding to hormones / identification

1

(c) (i) involves carrier / transmembrane / transport proteins;
(reject channel proteins)

1

(ii) requires energy / requires use of ATP / moves substances / ions / molecules against a concentration gradient;

1

(iii) the curve levels off above a certain external concentration of substance; as channel proteins are saturated with molecules (and no more can be carried);

2

[7]

11 (a) contain nitrogen-fixing bacteria in roots / nodules (so don't need fertiliser);
nitrogen containing compounds added to the soil
when plant dies / after harvest of crop;

2

(b) low(er) / more negative water potential in soil (than in the plant);
prevents roots from taking up water (from the soil) / plants still lose water by transpiration; plants lose water to soil by osmosis;

2

12 (i) less / no calbindin protein;
{reject carrier protein)
calcium not transported / moved (across the cytoplasm);
so diffusion gradient reduced at small intestine interface;

2

(ii) **A** is channel / pore protein (for calcium ions);
passage by facilitated diffusion down diffusion / concentration gradient;

2

B is carrier protein(for calcium ions);
passage by active transport against concentration gradient
/ requires energy / ATP;

2

[6]

13 (a) feature and adaption; for example

1 phospholipid bilayer (as a barrier);
2 forms a barrier to water soluble / charged substances / allows non-polar substances to pass

OR

maintains a different environment on each side / compartmentalisation;

3 bilayer is fluid;
4 can bend to take up different shapes for phagocytosis / form vesicles / self repair;
5 channel proteins (through the bilayer) / intrinsic protein;
6 let water soluble / charged substances through / facilitated diffusion;
7 carrier proteins (through the bilayer);
8 allow facilitated diffusion / active transport;
9 surface proteins / extrinsic proteins, glycoproteins / glycolipids;
10 cell recognition / act as antigens / receptors;
11 cholesterol;
12 regulates fluidity / increases stability;

6 max

<u>principle mark (only for 5, 6, 7, 8)</u>
proteins transport material across the membrane

3 features max

(b) curve description:
1 Curve goes down when the poison is added <u>and</u> rises when ATP added;

1

explanation:

2 Ion movement is by active transport;
3 ATP / energy needed for active transport;
4 respiration provides ATP / energy;
5 poison inhibits / stops respiration / ATP production;

3 max

[10]

14 (a) (i) absorbed by diffusion;
no energy / ATP available / active transport requires energy / ATP;

2 max

(disqualify energy made)

(allow energy reference in either (i) or (ii))

(ii) absorbed by active transport;

1

(b) (absorption by) diffusion no longer occurs / diffusion / movement of ions equal in both directions;
because no concentration / diffusion gradient / reached equilibrium;

2

(c) malonate fits into / blocks active site of enzyme / complementary to active site;
(prevents fitting neutral)
competes with substrate / is a competitive inhibitor / prevents substrate forming enzyme-substrate complex;

2

[7]

15

(a)
1 shore crab rapidly colonises / rapid growth;
2 ability to live different environments / no natural predators / will have similar / overlapping niche with native species / valid example / shore crab may be carrier of disease;
3 shore crab better competitor / more aggressive;
4 decreased population of prey species;
5 ecosystem less stable;

5

(b) between A and B water potential of blood rises as water potential of blood rises as water potential of surrounding water rises, after B rise in water potential less rapid / at C no further change occurs;

1

(c) No – as blood is isotonic with surrounding water / blood and surrounding water have same water potential;

1

(d) (i) water potential of blood maintained;
so (blood) cells not destroyed (by osmosis);

OR

replaces ions / salts lost diffusion;
ions / salts required for named metabolic process;

2

(ii) rate of respiration decreases;
less ATP made;
insufficient to maintain water potential of blood when in estuary;
isotonic in sea so no need to transport salts;

OR

sea temperature higher than river;
higher metabolic rate / higher enzyme activity;
advantage of this crab e.g. still able to escape from predators;

3 max

[12]

16 (i) (graph shows) greater uptake (of ions) in aerobic (conditions);
aerobic respiration / conditions releases more energy / ATP
(for active transport);

(reject produces / makes energy)

2

(ii) ATP / energy limiting;
active transport stops;
diffusion gradient lost / equal concentrations of ions / no net movement of ions;

(do not allow store of ATP runs out)

1 max

[3]

17 (a) cell has lower water potential than external medium;
so, water enters by osmosis;

2

(b) (i) active transport;
by specific carrier proteins / pumps;

2

(ii) sodium ions transported more into vacuole (than to outside);
because more sodium carrier proteins / pumps in vacuole membrane;
or
vacuole membrane less permeable to sodium ions / allows slower sodium ion diffusion (back out);
membrane has fewer sodium channels;

2 max

[6]

18 (a) B;
D;

2

(b) idea of molecules / named molecules moving = Fluid;
idea of both proteins and phospholipids = Mosaic;

2

(c) slow rise, sharp rise, levelling off (*reject 'becomes constant'*);
diffusion rate increases / description of diffusion rate,
e.g. increase in kinetic energy increases loss of ions;

1

sharp rise / above 50^{o}C proteins are denatured;
levelling off due to concentration of chloride ions in water becoming equal / maximum loss of Cl^- ions;

2 max

[7]

19

(a) sterilisation of equipment (*once*);
use of pipette / syringe to transfer culture suspension to plate;
use of spreader / shake ;
detail regarding lid, e.g. keeping over plate during transfer / spreading;

3 max

(b) 2.25 = 2 marks
(*general principle ($1.5^2 \div 1^2$) gains 1 mark*)

2

(c) increased temperature increases rate;
increased concentration increases rate;
increased molecule size decreases rate;
(allow increased distance decreases rate)

3 max

[8]

20

(a) (i) **A** = phospholipid

B = protein;
(both correct)

1

(ii) allows movement of lipid soluble / non-polar molecules / named e.g. water / gases;
prevents movement of water <u>soluble</u> / polar molecules / named e.g. ions / amino acids;
idea of selection / membrane partially / differentially permeable / large molecules do not move through, small molecules do;
(accept semi-permeable)

2 max

(b) (i) diffusion
(reject facilitated)

1

(ii) higher rate of exchange / diffusion;
prevents cooling of the blood / prevents increase in viscosity;

2

(iii) concentration gradient maintained / equilibrium never achieved;
blood always meets fluid with lower concentration of urea;
diffusion / exchange along the whole length of surface;

2 max

(iv) $0.2 \times 60 = 12\ dm^3\ h^{-1}$;
(principle: volume per hour)

$12 \times 5 = 60\ dm^3$;
(correct answer 2 marks)

2

[10]

21 (a) (i) potato more negative water potential / hypertonic;
(accept more concentrated)

water enters by osmosis causing cells to extend / become turgid;

2

(ii) little / no water remaining in potato / fully plasmolysed /
all water has moved out;
cell wall prevents further shrinkage / sucrose solution moves in;

or, water potentials are equal / equilibrium / isotonic;
no net movement of water / no further osmosis;

2

(b) (i) faster rate (of decrease) in 0.8 mol dm^{-3};

1

(ii) bigger water potential gradient / greater difference in water potentials (between potato and surrounding solution);

1

(c) (i) water moved into the solution from the potato;
solution diluted / becomes less concentrated;

2

(ii) no net movement of water (in or out);
drops move up / less dense;

or, no net movement of water (in or out);

drop would not move / densities the same;

2

[10]

22 (a) beating / pumping of heart / contraction of ventricles / heart;

1

(b) (at arterial end) hydrostatic pressure / blood pressure;
greater than pressure of water potential gradient / greater than osmotic uptake;

2

(c) removed by lymphatic system / lymph; returned to blood;

2

(d) less protein in blood;
water potential gradient is lower (less –ve / higher Ψ).

2

[7]

23 (a) description of interspecific competition / competition between species / birds with beaks of different lengths;
link length of beaks to different positions of prey / reference to named bird with particular prey e.g. curlews with longer beaks able to feed on ragworms;

2

(b) variation in beak length in curlews / one species;
longer / more curved beaked curlews outcompete / at advantage /
suggested advantage e.g. larger / curled beaks access more food;
reproduction;
genes passed on (to offspring);

4

(c) body has lower water potential;
water diffuses along a water potential gradient / by osmosis;

2

[8]

24 (a) (i) 11g sucrose dissolved in water (and made up to) 50 cm^3 / 50g;

1

(ii) make a series of volumes of 22% sucrose solutions;
measure how far each travels up the chromatography paper;

2

(b) (i) both (volume) of nectar and (mass) of sucrose / sugar increased by regular removal;
(proportionately) greater effect on nectar than sucrose;

2

(ii) nectar from flower B has greater concentration of sugar;

(accept references to figures (A has 6.2 – 6.6 µg mm^{-3}, B has 12 – 12.4 µg mm^{-3}))

1

(iii) nectar always available for insects;

1

(c) (adding sucrose solution) decreases nectar secretion / less nectar produced than control;

(allow correct processed figures)

1

adding sucrose solution results in reabsorption of sugar

(gains 2 marks);;

(BUT adding sucrose solution reduces secretion of sugar in nectar / sugar moved out gains 1 mark);

2

(d) via (intrinsic) proteins;

(reject channel proteins)

using ATP / active transport / energy;

2

[12]

25 ***General Principles for marking the Essay:***

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

Category	Mark	Descriptor
Good	16 14 12	Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy.
Average	10 8 6	Some of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved.
Poor	4 2 0	Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors.

Breadth of Knowledge (maximum 3 marks)

Mark	Descriptor
3	A balanced account making reference to most areas that might realistically be covered on an A-level course of study.
2	A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered.
1	Unbalanced account with all or almost all material based on a single aspect.
0	Material entirely irrelevant or too limited in quantity to judge.

Relevance (maximum 3 marks)

Mark	Descriptor
3	All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material.
2	Material generally selected in support of title but some of the main content of the essay is of only marginal relevance.
1	Some attempt made to relate material to the title but considerable amounts largely irrelevant.
0	Material entirely irrelevant or too limited in quantity to judge.

Quality of language (maximum 3 marks)

Mark	Descriptor
3	Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout.
2	Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate.
1	The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas.
0	Material entirely irrelevant or too limited in quantity to judge.

[25]

Guidelines for marking the essay

Introduction

The essay is intended for the assessment of AO4 (Synthesis of knowledge, understanding and skills) and Quality of Written Communication (Sections 6.4 and 6.5 in the specification). Examiners are looking for

- evidence of knowledge and understanding at a depth appropriate to A level
- selection of relevant knowledge and understanding from different areas of the specification
- coverage of the main concepts and principles that might be reasonably be expected in relation to the essay title
- connection of concepts, principles and other information from different areas in response to the essay title
- construction of an account that forms a coherent response
- clear and logical expression, using accurate specialist vocabulary appropriate to A level

Assessing Scientific Content

Maximum 16 marks.

Descriptors are divided into 3 categories:
Good (16, 14, 12), Average (10, 8, 6) and Poor (4, 2, 0).
Only even scores can be awarded, i.e. not 15, 13, etc.
Examiners need first to decide into which category an essay comes.

A good essay

- includes a level of detail that could be expected from a comprehensive knowledge and understanding of relevant parts of the specification
- maintains appropriate depth and accuracy throughout
- avoids fundamental errors
- covers a majority of the main areas that might be expected from the essay title (These areas will be indicated in the mark scheme). (Occasionally a candidate may tackle an essay in an original or unconventional way. Such essays may be biased in a particular way, but where a high level of understanding is shown a high mark may be justified.)
- demonstrates clearly the links between principles and concepts from different areas.

Note that it is not expected that an essay must be 'perfect' or exceptionally long in order to gain maximum marks, bearing in mind the limitations on time and the pressure arising from exam conditions.

An average essay

- should include material that might be expected of C / D / E grade candidates
- is likely to have less detail and be more patchy in the depth to which areas are covered, and to omit several relevant areas
- is likely to include some errors and misunderstandings, but should have few fundamental errors
- is likely to include mainly more superficial and less explicit connections

A poor essay

- is largely below the standard expected of a grade E candidate
- shows limited knowledge and understanding of the topic
- is likely to cover only a limited number of relevant areas and may be relatively short
- is likely to provide superficial treatment of connections
- includes several errors, including some major ones

Having decided on the basic category, examiners may award the median mark, or the ones above or below the median according to whether the candidate exceeds the requirements or does not quite meet them.

Marking the essay

In marking scientific content, letters in the margin show each key area covered; these are used to assess the breadth of criteria. A single tick is used to indicate accurate coverage of each significant area, and a double tick to emphasise ‘good depth of content.’ Errors are indicated with a cross. A squiggly line in the margin is used to highlight irrelevance and ‘Q’ to highlight poor use of terminology, unclear grammar and inappropriate style.

Specific guidance for assessing Scientific Content and Breadth of Knowledge in Essays

The following provides guidance about topics which might be included in the essays. It is not an exclusive list; the assessment of scientific content does not place restrictions on topics that candidates might refer to, provided they are

- relevant;
- at an appropriate depth for A level and
- accurate.

It is not expected that candidates would refer to all, or even most, of the topics to gain a top mark; the list represents the variety of approaches commonly encountered in the assessment to the essays. In both essays, topics either from the option modules or beyond the scope of the specification should also given credit where appropriate.

The process of osmosis and its importance to living organisms

(1) definition (D)

(2) effects on cells (C)

turgity and support
plasmolysis (idea)
lysis

(3) importance in animals (A)

role in relationship between plasma and tissue fluid
role in medulla of kidney
reabsorption in gut
sweat production neutral

(4) importance in plants (P)

role in movement of water from soil to leaves in plants
role in mass flow hypothesis for movement in plants

Breadth of knowledge

3 marks	reference to all 4 areas
2 marks	definition + 2 other areas
1 mark	any 2 areas

(b) Energy transfers which take place in living organisms

(1) ATP (A)
synthesis from ADP and P
role as an energy source

(2) photosynthesis (P)
excitation of electrons
generation of ATP and reduced NADP
photolysis
reduction of glycerate phosphate to carbohydrate
structure of chloroplast in relation to energy transfers

(3) respiration (R)
net gain of ATP in glycolysis
production of ATP in Krebs cycle
synthesis of ATP associated with electron transfer chain
ATP production in anaerobic respiration
structure of mitochondrion in relation to energy transfers

(4) uses of energy in biological processes (B)

active transport
muscle contraction
nerve transmission
synthesis
translocation
kidney function
nitrogen fixation
receptors

Breadth of knowledge

3 marks	reference to all 4 areas
2 marks	ATP + 2 other areas
1 mark	any 2 areas

26

(a) passive / do not require energy / ATP;
movement down a concentration gradient / by diffusion;
go through phospholipid (bilayer) / not by protein / carriers;

(not by active transport gains mark if no other mark awarded)

2 max

(b) active transport;

1

occurs when oxygen present because energy / respiration required,
or against a concentration gradient because there is no uptake in
curve **Z**;

1

(c) concentration inside cells higher than surrounding solution;

1

(d) diffusion is proportional to the concentration gradient;

1

[6]

27

(a)
1. permeable capillary wall / membrane;
2. single cell thick / thin walls, reduces diffusion distance;
3. flattened (endothelial) cells, reduces diffusion distance;
4. fenestrations, allows large molecules through;
5. small diameter / narrow, gives a large surface area to volume / short diffusion distance;
6. narrow lumen, reduces flow rate giving more time for diffusion;
7. red blood cells in contact with wall / pass singly, gives short diffusion distance / more time for diffusion;

(allow 1 mark for 2 features with no explanation)

4 max

(b)
1. (hydrostatic) pressure of blood high at arterial end;
2. fluid / water / soluble molecules pass out (*reject plasma*);
3. proteins / large molecules remain;
4. this lowers the water potential / water potential becomes more negative;
5. water moves back into venous end of capillary (*reject tissue fluid*) by osmosis / diffusion;
6. lymph system collects any excess tissue fluid which returns to blood / circulatory system / link with vena cava / returns tissue fluid to vein;

6

[10]

QWC 1

28

(a) (i) presence of -COOH group;

1

(ii) similar structure so fit same protein / receptors;

1

(b) 2,4-D adds to effect of IAA (already present) / affects all cells;
stimulates growth in parts other than growing points / stimulates uncontrolled growth / makes walls of cells stretch too much / makes growth outstrip nutrient availability;

2

[4]

29

(a) rate of photosynthesis increased;
normal atmospheric concentration a limiting factor / more / faster production of biomass or sugars / more products of photosynthesis transported to fruits;

2

(b) (increased temperature) increases rate of respiration;
rate of photosynthesis too low to replace respiratory loss

2

(c) lower water potential of nutrient solution;
less water absorbed into roots (by osmosis);
(not: water lost from roots)

2

[6]

30

(a) phospholipids in a double layer / area covered is twice total surface area of red blood cells;
evidence of calculation of number × surface area ($4.74 \times 10^9 \times 99.4\ \mu m^2$) /

calculation of area of 1 cell $\frac{0.92}{4.74 \times 10^{-9}}$;

$0.471\ m^2 \approx 0.5 \times 0.92\ m^2$ / $194\ \mu m \approx 2 \times 99.4$;

3

(b) EITHER feature + explanation
red blood cells do not contain organelles / nucleus;
so only surface membrane / no internal membranes in macerate;
OR
red blood cells have simple / regular / spherical shape;
so easy to calculate surface area;
OR
any two features, e.g.
simple / regular shape;
all same size;

2

[5]

31 (a) Active transport against / facilitated down with concentration gradient;

Accept answers in terms of water potentials

Active transport uses ATP/energy, /facilitated doesn't;

Reject along/across gradient

Active uses carrier (proteins), / facilitated (often) uses channel (proteins);

2 max

(b) Lipid/fatty acid part of membrane is non-polar/hydrophobic;

Accept lipid/fatty acid bilayer

Oxygen and carbon dioxide small/ non-polar (molecules);

Oxygen/carbon dioxide can diffuse through/dissolve in/
get between molecules in this layer;

Down a concentration gradient;

2 max

(c) Brings more oxygen/removes carbon dioxide;

Maintains diffusion/concentration gradients;

Between alveoli and blood/capillaries;

Reject references to surface area

2 max

[6]

32 (a) To prevent contamination of apparatus with other microorganisms / bacteria;
To prevent personal contact with bacteria;
To prevent release of bacteria into air;

max 2

(b) (i) Diffuses slowly;

1

(ii) B;
Produces inhibition zone greater than the minimum diameter;

2

[5]