

Q1.

- (a) Endopeptidases and exopeptidases are involved in the hydrolysis of proteins.

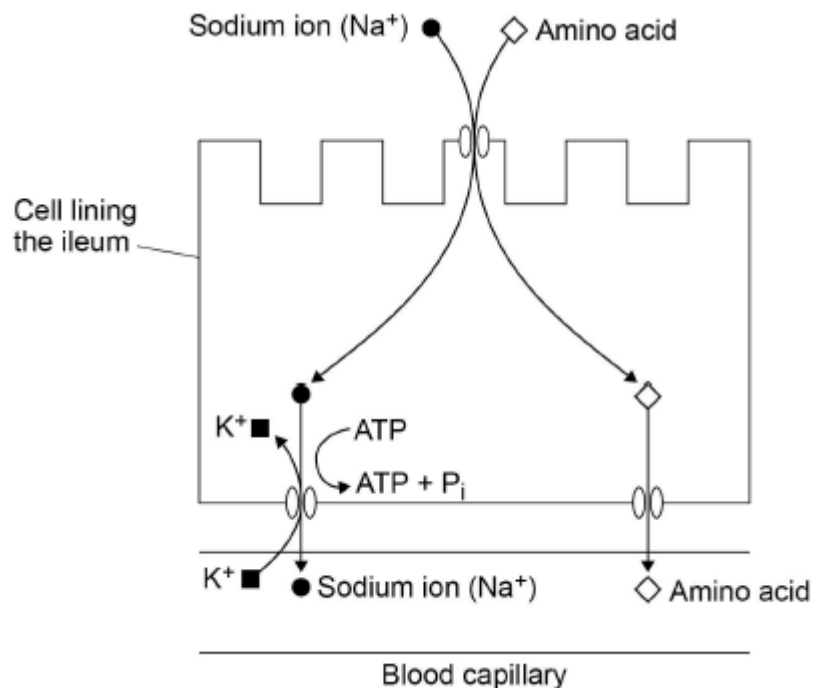
Name the other type of enzyme required for the complete hydrolysis of proteins to amino acids.

_____ (1)

- (b) Suggest and explain why the combined actions of endopeptidases and exopeptidases are more efficient than exopeptidases on their own.

(2)

- (c) The diagram shows the co-transport mechanism for the absorption of amino acids into the blood by a cell lining the ileum.



The addition of a respiratory inhibitor stops the absorption of amino acids.

Use the diagram to explain why.

(3)
(Total 6 marks)

Q2.

Large insects contract muscles associated with the abdomen to force air in and out of the spiracles. This is known as 'abdominal pumping'. The table shows the mean rate of abdominal pumping of an insect before and during flight.

Stage of flight	Mean rate of abdominal pumping/dm ³ of air kg ⁻¹ hour ⁻¹
Before	42
During	186

- (a) Calculate the percentage increase in the rate of abdominal pumping before and during flight. Show your working.

Answer _____ %

(2)

- (b) Abdominal pumping increases the efficiency of gas exchange between the tracheoles and muscle tissue of the insect. Explain why.

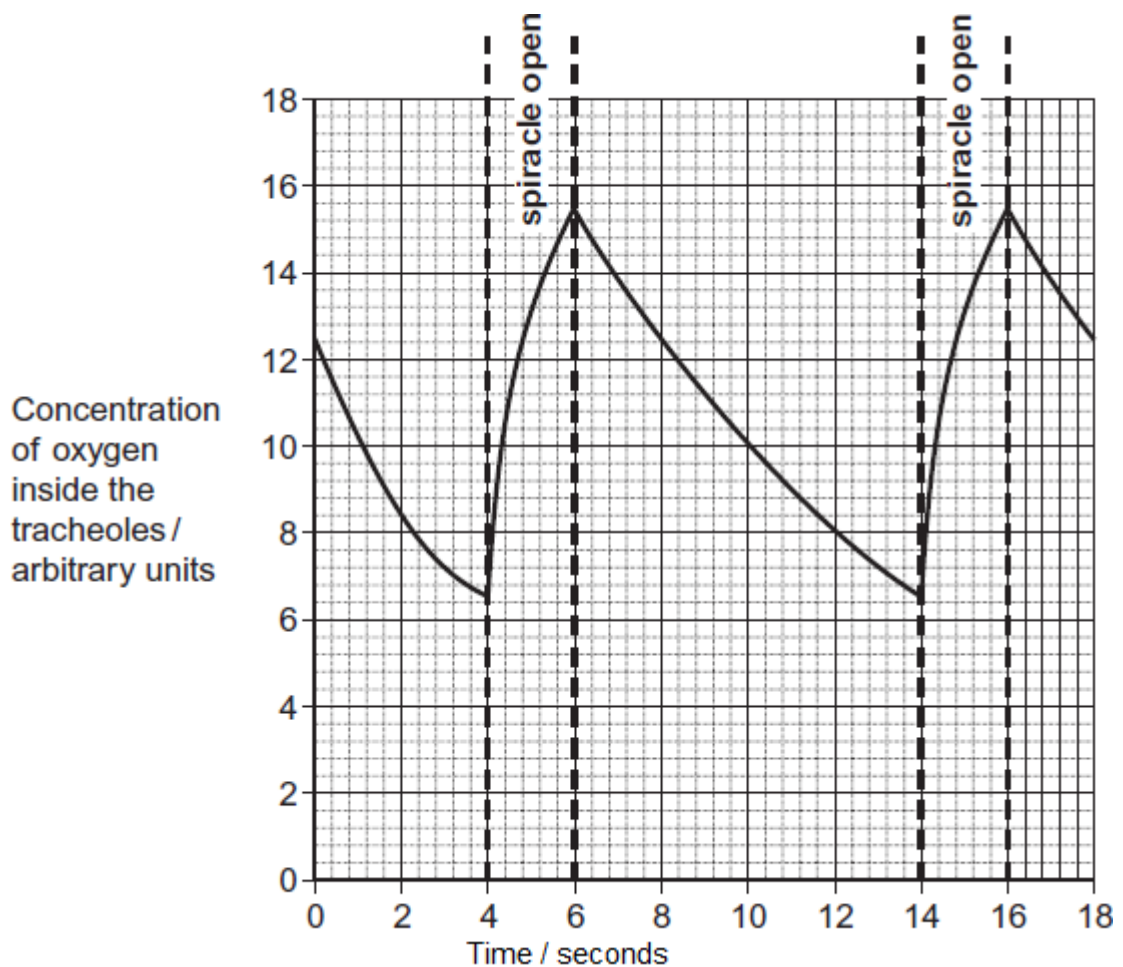
(2)

- (c) Abdominal pumping is an adaptation not found in many small insects. These small insects obtain sufficient oxygen by diffusion.

Explain how their small size enables gas exchange to be efficient without the need for abdominal pumping.

(1)

The graph shows the concentration of oxygen inside the tracheoles of an insect when at rest. It also shows when the spiracles are fully open.



- (d) Use the graph to calculate the frequency of spiracle opening. Show your working.

Frequency _____ times per minute

(2)

- (e) The insect opens its spiracles at a lower frequency in very dry conditions. Suggest **one** advantage of this.

(1)

- (f) The ends of tracheoles connect directly with the insect's muscle tissue and are filled with water. When flying, water is absorbed into the muscle tissue. Removal of water from the tracheoles increases the rate of diffusion of oxygen between the tracheoles and muscle tissue. Suggest **one** reason why.

(1)

(Total 9 marks)

Q3.

- (a) Describe the difference between the structure of a triglyceride molecule and the structure of a phospholipid molecule.

(1)

- (b) Describe how you would test for the presence of a lipid in a sample of food.

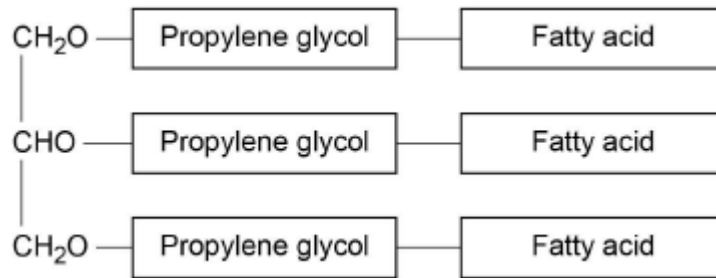
(2)

- (c) Animal fats contain triglycerides with a high proportion of saturated fatty acids. If people have too much fat in their diet, absorption of the products of fat digestion can increase the risk of obesity. To help people lose weight, fat substitutes can be used to replace triglycerides in food.

Describe how a saturated fatty acid is different from an unsaturated fatty acid.

(1)

The diagram shows the structure of a fat substitute.



(d) This fat substitute **cannot** be digested in the gut by lipase.

Suggest why.

(2)

(e) This fat substitute is a lipid. Despite being a lipid, it cannot cross the cell-surface membranes of cells lining the gut.

Suggest why it **cannot** cross cell-surface membranes.

(1)

(Total 7 marks)

Q4.

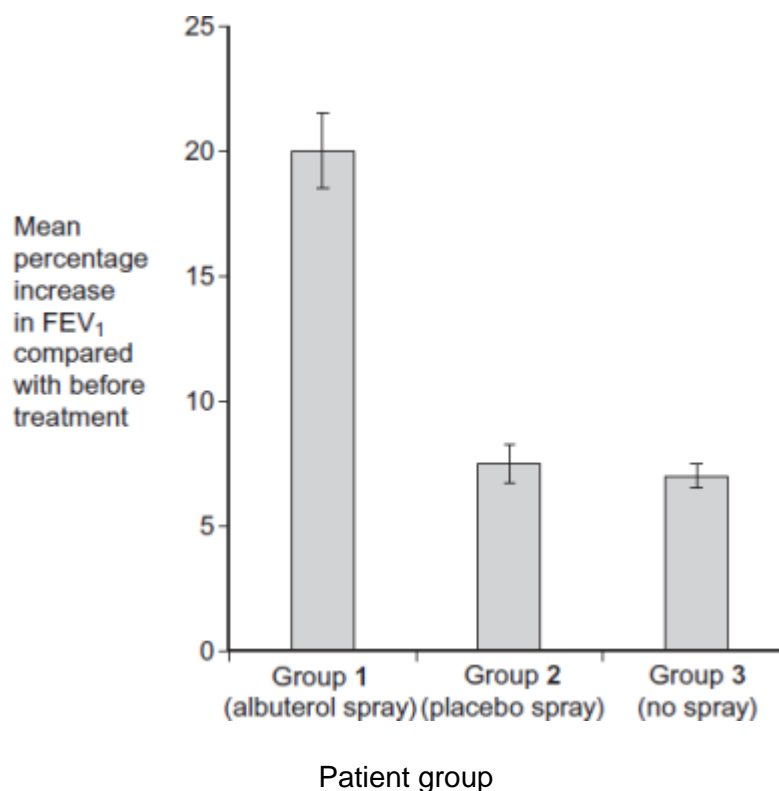
The 'placebo effect' describes the improvement in patients' symptoms due to psychological effects. Scientists investigated the placebo effect in patients with asthma. They divided a large number of asthma patients into three groups, **1**, **2** and **3**.

- Group 1 inhaled a spray containing albuterol every day. Albuterol is a drug used to treat asthma.

- Group 2 inhaled a placebo spray every day. This was identical to the spray given to group 1 but it did not contain albuterol.
 - Group 3 did not receive any spray treatment.
- (a) Describe one way the scientists could have allocated the patients to each group.

(2)

The scientists measured the forced expiratory volume (FEV_1) of each patient at regular intervals. The forced expiratory volume (FEV_1) is the volume of air forced out of the lungs in the first second when breathing out. The scientists recorded each patient's FEV_1 before treatment started and after 60 days of treatment. They then calculated the mean increase in FEV_1 for each group. Their results are shown in the graph. The bars show the standard deviation.



- (b) What do the standard deviation bars suggest about the difference in the mean increase in FEV_1 between Group 1 and the other groups? Explain your answer.

(2)

- (c) What do the data suggest about the 'placebo effect' in this investigation? Explain your answer.

(2)

- (d) On each occasion that a patient's FEV₁ was measured, a doctor repeated the measurement several times. Explain why.

(2)

- (e) All the patients continued with their normal treatment for asthma. The normal treatment was the same for all patients and its effects were short-lived. The patients were told to stop this treatment 24 hours before FEV₁ measurements were taken.

- (i) Suggest why all the patients were allowed to continue with their normal asthma treatment in this investigation.

(1)

- (ii) Suggest why the patients were told to stop their normal asthma treatment 24 hours before their FEV₁ measurements were taken.

(2)

(f) After 60 days, the patients in each group were asked to give themselves an *Improvement Score* from 0-10 to show how much they felt their symptoms had improved. This was done before their FEV₁ was measured. The scientists calculated the mean *Improvement Score* for each group.

(i) The scientists concluded that the data obtained for the *Improvement Scores* were less reliable than the data obtained measuring FEV₁. Suggest why they concluded this.

(2)

(ii) Group 3 reported the lowest mean *Improvement Score*. Suggest **one** explanation for this.

(2)

(Total 15 marks)

Q5.

Scientists studied three species of plant.

They selected fully grown leaves from five different plants of each species.

For each leaf they measured:

- leaf surface area
- leaf thickness
- the number of stomata per mm².

The scientists' results are shown in the table below.

Plant	Mean leaf surface area	Mean leaf thickness	Mean number of
-------	------------------------	---------------------	----------------

species	/ mm ²	/ μm	stomata per mm ²
A	218.0	191.5	380.0
B	17.0	296.3	136.0
C	2.2	354.8	419.0

- (a) How did the scientists ensure they could make a valid comparison between leaves from different species?

(1)

- (b) Describe a method you could use to find the surface area of a leaf.

[Extra space] _____

(3)

- (c) (i) Which species, **A** or **B**, would you predict grew in a drier environment?

Explain **one** feature that caused you to choose this species.

Species _____

Explanation _____

(1)

- (ii) Other than the features of leaves in the table above, give **two** features of leaves of xerophytes.

For each feature explain how it reduces water loss.

Feature 1 _____

Explanation _____

Feature 2 _____

Explanation _____

(2)

- (d) Species **C** has a high number of stomata per mm². Despite this it loses a small amount of water.

Use the data to explain why.

(1)

(Total 8 marks)

Q6.

Stomata are found mainly on the underside of leaves of dicotyledonous plants. A student painted a layer of nail varnish on the lower epidermis of a leaf. She peeled off the dry layer of nail varnish and placed it on a microscope slide. The student was able to see the impressions of the stomata on the varnish using an optical microscope. She then determined the mean diameter of the stomata.

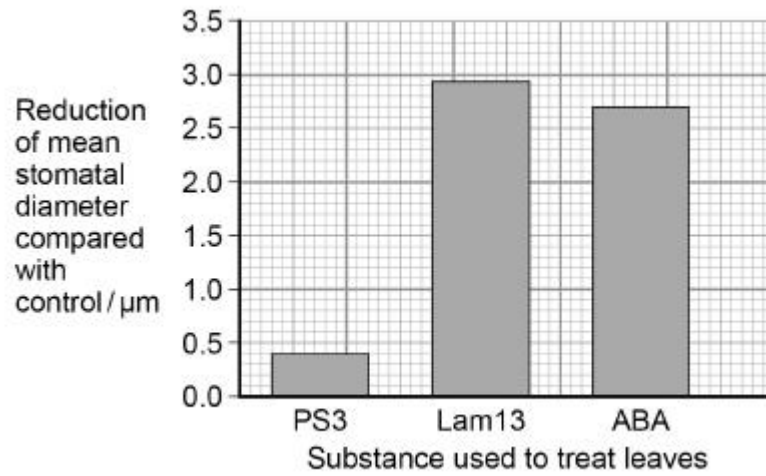
- (a) Describe how the student could use an eyepiece graticule to determine the mean diameter of stomata.

(3)

A scientist investigated the effect of treating the leaves of one species of plant with three different substances. These substances **reduce** the stomatal diameter. He compared the mean diameter of stomata after treating the leaves with these substances with the mean stomatal diameter on control leaves treated with distilled

water.

The scientist's results are shown in the graph below.
The mean stomatal diameter of the control leaves was $7.5\ \mu\text{m}$.



- (b) Calculate the ratio of mean stomatal diameter of leaves treated with PS3 to those treated with ABA.

Answer = _____ : 1

(2)

- (c) ABA is a substance that some plant species produce when little water is available.
Explain why producing ABA may help these species survive in dry conditions.

(2)

- (d) Many species of plants can be infected by powdery mildew which is spread by microscopic spores in the air.

Suggest how treatment with Lam13 might protect plants against powdery mildew infection.

(1)

(Total 8 marks)

Q7.

- (a) Explain **two** ways in which the structure of fish gills is adapted for efficient gas exchange.

1. _____

2. _____

(2)

- (b) Explain how the counter current mechanism in fish gills ensures the maximum amount of the oxygen passes into the blood flowing through the gills.

(3)

(Total 5 marks)

Q8.

- (a) Describe the pathway taken by an oxygen molecule from an alveolus to the blood.

(4)
(Total 8 marks)

Q9.

- (a) When first hatched, the young of some species of fish are less than 2 mm long. Explain how these young fish get enough oxygen to their cells without having gills.

(2)

- (b) Mackerel are fast swimming fish whereas toadfish only swim slowly. The table shows some features of the gills of these fish.

	Thickness of lamellae / μm	Number of lamellae per mm of gill length
Mackerel	5	32
Toadfish	35	8

Use evidence from the table to explain how mackerel are able to swim faster than toadfish.

(3)
(Total 5 marks)

Q10.

Breathing out as hard as you can is called forced expiration.

(a) Describe and explain the mechanism that causes forced expiration.

(4)

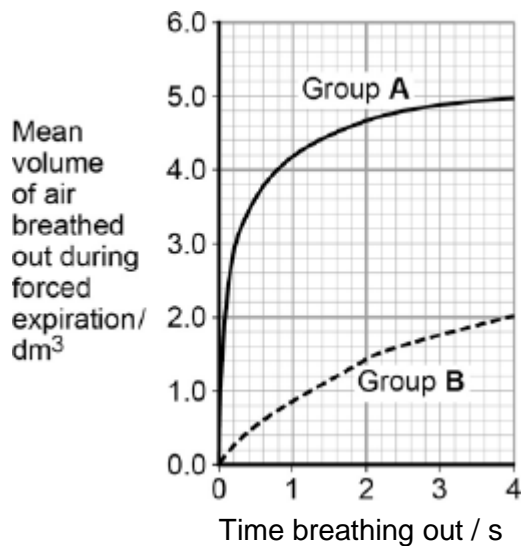
Two groups of people volunteered to take part in an experiment.

- People in group **A** were healthy.
- People in group **B** were recovering from an asthma attack.

Each person breathed in as deeply as they could. They then breathed out by forced expiration.

A scientist measured the volume of air breathed out during forced expiration by each person.

The graph below shows the results.



(b) Forced expiration volume (FEV) is the volume of air a person can breathe out in 1 second.

Using data from the first second of forced expiration, calculate the percentage decrease in the FEV for group **B** compared with group **A**.

Answer = _____ %

(1)

- (c) The people in group **B** were recovering from an asthma attack. Explain how an asthma attack caused the drop in the mean FEV shown in the figure above.

(4)

(Total 9 marks)

Q11.

- (a) Describe and explain how the countercurrent system leads to efficient gas exchange across the gills of a fish.

(Extra space)

(3)

- (b) Amoebic gill disease (AGD) is caused by a parasite that lives on the gills of some species of fish. The disease causes the lamellae to become thicker and to fuse

together.

AGD reduces the efficiency of gas exchange in fish. Give **two** reasons why.

1. _____

2. _____

(2)

(c) The table below shows some features of gas exchange of a fish at rest.

Volume of oxygen absorbed by the gills from each dm ³ of water / cm ³	7
Mass of fish / kg	0.4
Oxygen required by fish / cm ³ kg ⁻¹ hour ⁻¹	90

(i) Calculate the volume of water that would have to pass over the gills each hour to supply the oxygen required by the fish. Show your working.

_____ dm³

(2)

(ii) The volume of water passing over the gills increases if the temperature of the water increases. Suggest why.

(1)

(Total 8 marks)

Q12.

(a) (i) Name the process by which oxygen passes from an alveolus in the lungs into the blood.

(1)

(ii) Describe **two** adaptations of the structure of alveoli for efficient gas exchange.

1. _____

2. _____

(2)

(b)



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The photograph shows a fire-breather creating a ball of fire. Fire-breathers do this by blowing a fine mist of paraffin oil onto a flame. Some of this mist can be inhaled and may eventually lead to fibrosis.

People who have been fire-breathers for many years often find they cannot breathe out properly. Explain why.

(2)

(Total 5 marks)

Q13.

- (a) Many different substances enter and leave a cell by crossing its cell surface membrane. Describe how substances can cross a cell surface membrane.
- (b) Describe and explain how the lungs are adapted to allow rapid exchange of oxygen between air in the alveoli and blood in the capillaries around them.

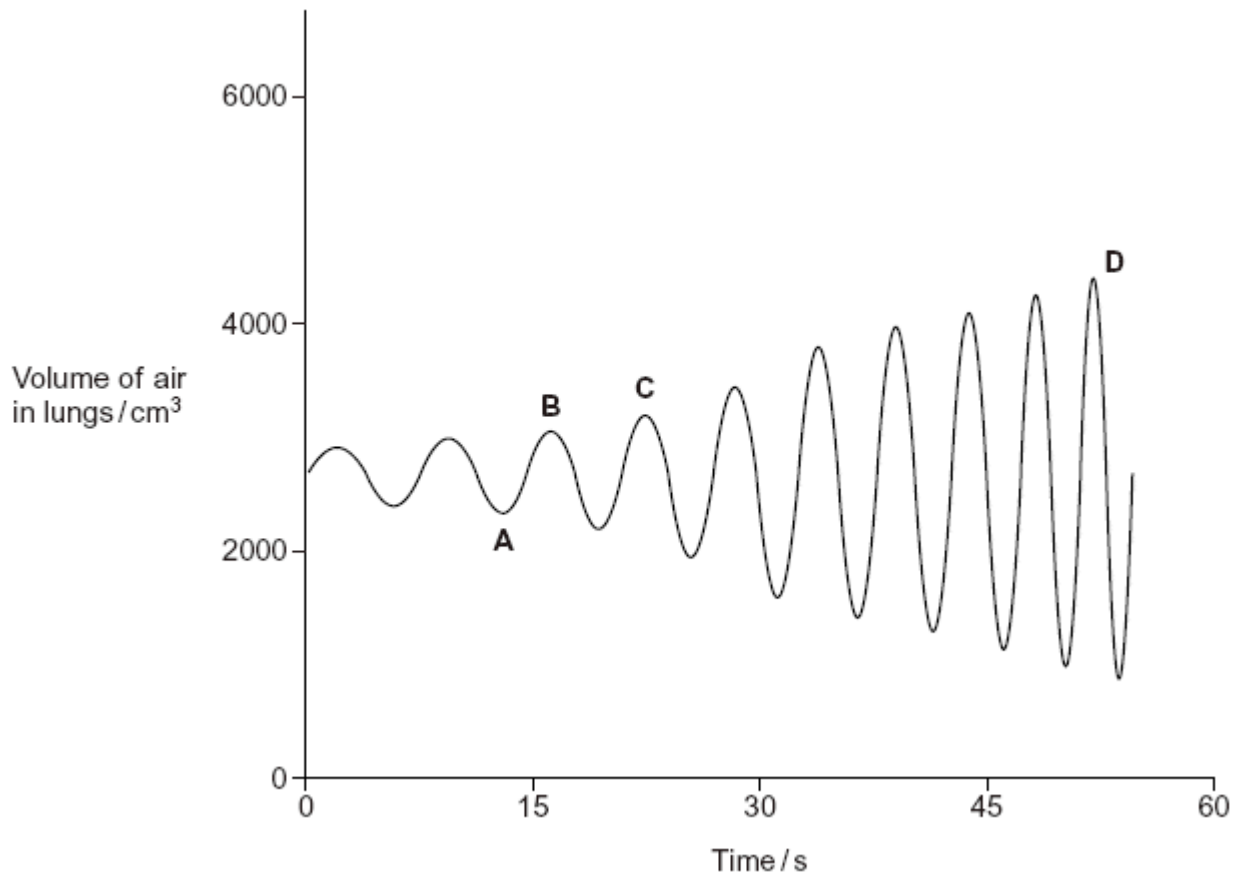
(5)

(5)

(Total 10 marks)

Q14.

The graph shows changes in the volume of air in a person's lungs during breathing.



The person was breathing in between times **A** and **B** on the graph.

- (i) Explain how the graph shows that the person was breathing in between times **A** and **B**.

(1)

- (ii) Describe and explain what happens to the shape of the diaphragm between times **A** and **B**.

(2)

(Total 3 marks)

Mark schemes

Q1.

- (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]

Q2.

- (a) Correct answer of $342.8 - 343 = 2$ marks;;

Credit incorrect answers that show the numerator as 144 (or $186-42$) or denominator as 42 for 1 mark; 2
- (b) 1. More air / oxygen enters / air / oxygen enters quickly / quicker;
1. Accept: converse for carbon dioxide
1. Can be in any correct context eg insect, tracheoles, muscle
1. Neutral: air / oxygen enters

(So) maintains / greater diffusion or concentration gradient; 2
- (c) Large(r) SA:VOL / short(er) diffusion distance (to tissues);
Accept: thin diffusion pathway 1
- (d) $6 / 6.6 / 6.7 / 7 / 7.5 / 8 = 2$ marks;;

Different answers given for different interpretations of the graph

Award 1 mark for incorrect answers that have divided 60 by any number;

2

- (e) Less / no water lost / (more) water retained;

Accept: less dehydration / less evaporation

Q Reject: less 'transpiration'

Q Reject: less water lost by osmosis

1

- (f) 1. Greater surface area exposed to air;

Neutral: shorter diffusion distance

2. Gases move / diffuse faster in air than through water;

2. **Q Neutral:** 'harder to diffuse'

2. *Accept gases diffuse directly, rather than through water*

3. Increases volume / amount of air;

1 max

[9]

Q3.

- (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]

Q4.

- (a) 1. Random;
Random number generator = 2 marks
2. Method e.g. number generator / number out of a hat;
Same age = 2 marks

OR

3. Matched / all the same;
4. For e.g. age / sex;

2 max

- (b) 1. (Differences) are real / significant / not due to chance;
It = the difference
2. (As) bars / SDs do not overlap;
2. Accept: 'standard errors do not overlap' as told 'standard deviation' in the question stem

2

- (c) 1. No / slight (placebo) effect;
2. Group 2 and 3 results are similar / the same / SDs / bars overlap;
2. Accept: other descriptions of Groups 2 and 3
2. Accept: that Groups 2 and 3 are not significantly different

2

- (d) 1. (Allows) anomalies to be identified / ignored / effect of anomalies to be reduced / effect of variation in data to be minimised / concordant results;
Accept: 'outliers' instead of anomalies
1. Reject: idea of not recording anomalies / preventing anomalies from occurring
1. Accept: 'cancels out anomalies' as bottom line response
2. (Makes) average / mean (more) reliable;
2. Q Neutral: makes the average / mean more accurate
2. Ignore: 'more reliable' alone

2

- (e) (i) 1. Unethical / unfair not to treat patients;
2. Dangerous / could cause an asthma attack; 1 max
- (ii) 1. Ensures normal treatment does not affect results / improvements are only due to the spray;
2. (As) normal treatment is short-lived / effective for less than 24 hours / (24h) is long enough for normal treatment to wear off; 2
- (f) (i) 1. (Improvement scores) are qualitative / subjective / rely on own judgement / different patients may assess symptoms differently;
Accept: converse arguments for measuring FEV₁ e.g. quantitative / objective patients cannot lie
2. Some patients may lie / exaggerate / want to please doctors;
1. Neutral: empirical evidence 2
- (ii) 1. Not blind / patients knew they were not receiving treatment / patients did not receive treatment;
2. (So) more likely to underestimate / give lower scores / did not expect to improve / less improvement; 2
- [15]**

Q5.

- (a) (Scientists) used fully grown leaves / used five plants of each (species).
Ignore other references to methodology. Reward only information provided in the Resource.
Do not accept reference to number of leaves – different plants were used. 1
- (b) Either
1. Draw around leaf on graph paper;
Mark as a trio – MP1, MP2 and MP3 OR MP4, MP5 and MP6. Do not mix and match.
Both aspects needed for mark – drawing and type of paper.
 2. Count squares (however described);
There is no reward for additional detail e.g. dealing with part squares.
 3. Multiply by 2 (for upper and lower leaf surface);
OR
 4. Draw around a leaf on paper of known mass (per unit area);
Both aspects needed for mark – drawing and mass of paper.
 5. Cut out *and* weigh;
 6. Multiply by 2 (for upper and lower leaf surface). 3

- (c) (i) Species **B** (no mark)
1. Smaller surface area
so
less evaporation / less heat absorbed;
Correctly selected feature and the explanation required for 1 mark.

In all marking points – ‘less water loss’ is insufficient as an explanation but accept transpiration for evaporation or diffusion.

2. Thicker leaves
so
greater diffusion distance (for water);
Accept ‘thicker leaves so more water storage’.
3. Fewer stomata / lower stomatal density
so
less diffusion / evaporation (of water);
4. Smaller surface area to volume ratio
so
less evaporation.

1 max

- (ii) 1. Thick(er) cuticle
so
increase in diffusion
distance / slower (rate of) diffusion;
Feature and explanation needed for each mark.
Reject other features not related to leaves.
Reject features related to water storage.
‘Cuticle’ alone is insufficient (all leaves have a cuticle).
Reject suggestion of ‘less’ diffusion, for idea of ‘slower diffusion’, an idea of rate is required.

2. Hairs on leaves
so
reduction in air movements / increase in humidity / decrease in water potential gradient;
3. Curled leaves
so
reduction in air movements / increase in humidity / decrease in water potential gradient;
4. Sunken stomata
so
reduction in air movements / increase in humidity / decrease in water potential gradient.

2 max

- (d) Small leaves / surface area so (total) number of stomata is low.
Both aspects needed for mark.

1

[8]

Q6.

- (a) 1. Measure (each stoma) using eyepiece graticule;
 2. Calibrate eyepiece graticule against stage micrometer / ruler / graph paper;
 3. Take a number of measurements (to calculate a mean);
 2. *Accept micrometer slide*
 3. *Idea of enough readings for a reliable mean (min. 5)*

3

- (b) 1.48;

Accept 1.5 and 1.479

1 mark for PS3 = 7.1 (μm) and ABA = 4.8 (μm)

2

- (c) 1. (Causes less stomatal opening so) less transpiration;
OR
 Less evaporation;
OR
 Less water lost by diffusion;
2. (So more) water available for photosynthesis / metabolism / support;
OR
 (So) less water needed from the (dry) soil;
 2. *Water conserved / retained is insufficient*
 2. *Ignore respiration*

2

- (d) (Closes the stomata so) fewer / no spores enter leaf;

1

[8]**Q7.**

- (a) 1. Many lamellae / filaments so large surface area;
 2. Thin (surface) so short diffusion pathway;
 1 & 2 must each have a feature and a consequence

2

- (b) 1. Water and blood flow in opposite directions;
 Allow diagram showing counter-flow
2. Blood always passing water with a higher oxygen concentration;
3. Diffusion gradient maintained throughout length (of gill)
OR
 Diffusion occurs throughout length of gill
OR
 If water and blood flowed in same direction equilibrium would be reached;

3

[5]**Q8.**

- (a) 1. (Across) alveolar epithelium;

2. Endothelium / epithelium of capillary;
Incorrect sequence = maximum of 1 mark

2

- (b) 1. (The alveolar epithelium) is one cell thick;
Reject thin membrane
2. Creating a short diffusion pathway / reduces the diffusion distance;

2 max

(c) **For**

1. Significantly higher concentrations of CO (compared with no smoking) with closed window (as no overlap in $2 \times SD$);
Accept higher concentrations of CO with closed window are not due to chance
Idea of higher is required, not just difference
2. Any increase in CO could be dangerous;
OR
CO causes less oxygen to be carried / provided (which could be deadly in children);
3. (significantly) higher levels after (just) 5 minutes (with closed windows supporting short journey statement);
Idea of higher is required, not just difference

Against

4. No idea if (roughly) 5ppm is 'deadly';
5. No significant difference with open window (as $2 \times SD$ overlaps);
Accept difference with open window could be due to chance
6. No data on child breathing rates;
OR
Idea that children breathe faster but have smaller lung volume, so overall volume of CO inhaled could be similar;

4 max

[8]

Q9.

- (a) exchange / diffusion across body surface / skin;
short diffusion pathway / distance / large SA:V ratio;
- (b) large numbers of lamellae so large SA;
lamellae thin so short (diffusion) pathway to blood / capillaries;
high rate of oxygen uptake for respiration / energy release;
(accept more oxygen)

2

3

[5]

Q10.

- (a) 1. Contraction of internal intercostal muscles;
 2. Relaxation of diaphragm muscles / of external intercostal muscles;
 3. Causes decrease in volume of chest / thoracic cavity;
 4. Air pushed down pressure gradient. 4
- (b) 19(%) 1
- (c) 1. Muscle walls of bronchi / bronchioles contract;
 2. Walls of bronchi / bronchioles secrete more mucus;
 3. Diameter of airways reduced;
 4. (Therefore) flow of air reduced. 4

[9]

Q11.

- (a) 1. Water and blood flow in opposite directions;
Accept: diagram if clearly annotated
2. Maintains concentration / diffusion gradient / equilibrium not reached / water always next to blood with a lower concentration of oxygen;
Must have the idea of 'maintaining' or 'always' in reference to concentration / diffusion gradient
Accept: constant concentration / diffusion gradient
3. Along whole / length of gill / lamellae;
Accept: gill plate / gill filament 3
- (b) 1. (Thicker lamellae so) greater / longer diffusion distance / pathway;
Q Neutral: 'thicker' diffusion pathway
2. (Lamellae fuse so) reduced surface area;
Accept: reduced SA:VOL 2
- (c) (i) Correct answer of **5.1** or **5.14(2857)** (dm³) = 2 marks;;
Allow 1 mark max for an answer of 5 if the correct answer of 5.1 or 5.14(2857) is not shown
- One mark for incorrect answers that show **36** or **0.4 × 90** or **90 ÷ 7**; 2
- (ii) 1. Increased metabolism / respiration / enzyme activity;
Accept: enzymes work more efficiently
2. Less oxygen (dissolved in water);
Neutral: references to increased kinetic energy (of water molecules)

1 max

[8]

Q12.

- (a) (i) (Simple) diffusion;
Reject facilitated diffusion
Accept lipid diffusion 1
- (ii) 1. Thin walls / cells;
 1. *'Short diffusion pathway' alone is an explanation not a description*
 1. *Accept squamous epithelia / one cell thick*
2. (Total) surface area is large;
 2. *Ignore references to 'volume ratio'* 2
- (b) 1. Loss of elasticity / elastic tissue / increase in scar tissue;
 1. *Accept elastin*
2. Less recoil; 2

[5]

Q13.

- (a) 1. (Simple / facilitated) diffusion from high to low concentration / down concentration gradient;
Q Do not allow across / along / with concentration gradient
2. Small / non-polar / lipid-soluble molecules pass via phospholipids / bilayer;
Reject: named molecule passing through membrane by an incorrect route
Accept: diagrams if annotated

OR

- Large / polar / water-soluble molecules go through proteins;
3. Water moves by osmosis / from high water potential to low water potential / from less to more negative water potential;
4. Active transport is movement from low to high concentration / against concentration gradient;
Only penalise once if active transport is not named
e.g. 'movement against the concentration gradient involves proteins and requires ATP' = 2 marks
5. Active transport / facilitated diffusion involves proteins / carriers;
Accept: facilitated diffusion involves channels
Reject: active transport involves channels
6. Active transport requires energy / ATP;
7. Ref. to Na⁺ / glucose co-transport;
Credit ref. to endo / exocytosis as an alternative

5 max

- (b) 1. Many alveoli / alveoli walls folded provide a large surface area;
Neutral: alveoli provide a large surface area
2. Many capillaries provide a large surface area;
3. (So) fast diffusion;
Neutral: greater / better diffusion
Neutral: fast gas exchange
Allow 'fast diffusion' only once
4. Alveoli or capillary walls / epithelium / lining are thin / short distance between alveoli and blood;
Reject: thin membranes / cell walls
Accept: one cell thick for 'thin'
5. Flattened / squamous epithelium;
Accept: endothelial
6. (So) short diffusion distance / pathway;
7. (So) fast diffusion;
8. Ventilation / circulation;
Accept: descriptions for ventilation / circulation
9. Maintains a diffusion / concentration gradient;
10. (So) fast diffusion;
Do not double penalise if description lacks detail
e.g. thin membranes so a short diffusion distance = 1 mark

5 max

[10]

Q14.

- (i) (Lung volume) increases / reaches a maximum (at **B**);
Do not negate mark for 'breathing out' if qualified e.g. when (lung volume) decreases
- (ii) Flattens / lowers / moves down;
(Diaphragm / muscle) contracts;
Reject: second mark only if intercostal muscles cause the diaphragm to flatten

1

2

[3]