

Mark schemes

1

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

Ignore references to saturated and unsaturated

Accept $Pi/PO_4^{3-} / \textcircled{P}$

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

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2

(a) 1. From ADP and phosphate;

Accept $Pi/PO_4^{3-} / \textcircled{P}$

Reject P/Phosphorus

Reject use of water in the reaction

2. By ATP synthase;

3. During respiration/photosynthesis;

2 max

(b) 1. To provide energy for other reactions/named process;

Reject 'produce' energy

2. To add phosphate to other substances **and** make them more reactive/change their shape;

2

(c) (Can see) 3D image;

1

(d) Crista/cristae;

Ignore matrix

1

(e) Value between 20,750 (83mm) and 21,250 (85mm) two marks;;
Formula given/used but calculation wrong, award 1 mark

Magnification = $\frac{\text{image size}}{\text{Object size}}$

(Large number divided by 4)

2

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3

(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

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4

- (a) 1. Glucose;
2. Fructose;

Accept answers in either order

Ignore α and β glucose

2

- (b) 1. Line graph with rate on y axis and days/time in days on x axis and linear scales;

Correct answers $\times 10^{-3}$ 1.17, 1.50, 1.83, 2.50, 3.33, 4.00, 4.00 (accept to 1DP)

2. Correct units of $\mu\text{g min}^{-1}$ /per minute/minute⁻¹ $\times 10^{-3}$;

Reject m^{-1}

Reject if put 10^{-3} on axis for each point

'/' means separating units from what goes before i.e. accept sucrose hydrolysis per min / $\mu\text{g} \times 10^{-3}$

3. Rates correctly calculated and plotted, with line connecting points/line of best fit and no extrapolation;

*Do not accept a ruled **straight line** of best fit*

Accept y axis starting at 1

3

- (c) 1. Sucrose hydrolysis linked to some aspect of growth;

Accept 'breakdown

2. Greater the rate of/faster hydrolysis/more SPS activity as plant grows/cells divide (up to 8/10 days);

Accept 'breakdown

Accept converse of greater rate of growth, greater rate of hydrolysis

Reject 'sucrose broken down'

3. Growth/division remains the same/slows after 8/10 days (because SPS activity is levelling off);

Accept after 8 days/at 10 days growth rate maximum/growth stops

3

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- (a) 1. (before reaction) active site not complementary to/does not fit substrate;
2. Shape of active site changes as substrate binds/as enzyme-substrate complex forms;
Note. Points 1 and 2 may be made in one statement and 'complementary' introduced at any point.
Points 1&2 – active site mentioned once applies for both points
Point 2 – Ignore references to how shape change is caused
3. Stressing/distorting/bending bonds (in substrate leading to reaction);

2 max

- (b) 1. Tangent to curve drawn;
Tangent drawn at about 10 minutes
2. Value in range of 8 to 11;
1 mark only for correct answer

2

- (c) 1. (Rate of) increase in concentration of maltose slows as substrate/starch is used up
OR
High initial rate as plenty of starch/substrate/more E-S complexes;
Reject ref. to amylase being used up
2. No increase after 25 minutes/at end/levels off because no substrate/starch left;
Accept 'little'
Ignore references to substrate a limiting factor

2

- (d) 1. Make/use maltose solutions of known/different concentrations (and carry out quantitative Benedict's test on each);
2. (Use colorimeter to) measure colour/colorimeter value of each solution and plot calibration curve/graph described;
Axes must be correct if axes mentioned, concentration on x-axis and colorimeter reading on y-axis
3. Find concentration of sample from calibration curve;

3

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6

- (a) 1. Different parts/areas/amino acid sequences (of amyloid-precursor) protein;
Accept APP
2. Each enzyme is specific/fits/binds/complementary to a different part of the APP;
Point 2 subsumes point 1 and is worth 2 marks total.

2

- (b) 1. Peptide bond broken;
2. Using water;
Hydrolysis in stem

2

- (c) 1. Mutations prevent production of enzyme(s)/functional enzyme;
 2. (Increase in β -secretase) leads to faster/more β -amyloid production
OR
 (Decrease in α -secretase) leads to more substrate for β -secretase;
'This' must refer to α -secretase
 3. (Leads to) more/greater plaque formation; 3
- (d) 1. (Inhibitor) binds to/blocks active site of β -secretase/enzyme;
 2. Stops/reduces production of β -amyloid/plaque; 2
- (e) 1. Some β -amyloid required/needed (to prevent side effects)
OR
 (Some) β -secretase needed;
Accept 'Both enzymes needed'
 2. Leads to build-up of amyloid-precursor protein (that causes harm)
OR
 Too much product of α -secretase (causes harm);
Accept build-up of substrate (leads to harm) 1 max
- 7** (a) Hydrolysis (reaction); 1
- (b) 1. (Phosphate required) to make RNA;
 2. (Phosphate required) to make DNA;
1 and 2. If neither DNA or RNA are named allow one mark for nucleotide/nucleic acid/phosphodiester bonds/sugar-phosphate backbone.
 3. (Phosphate required) to make ATP/ADP;
 4. (Phosphate required) to make membranes;
Ignore: phospholipids without reference to membranes.
 5. (Phosphates required) for phosphorylation;
Accept: as additional mark points any named biological molecule containing phosphate e.g. NADP, AMP, RuBP. 2 max
- (c) Accept answer in range from 3.7 : 1 to 4.1 : 1;
Reject any ratio not : 1. 1

[10]

- (d) 1. Seeds/embryo remain dormant/inactive in winter/cold
OR
 Growth/development of seed/embryo during winter/cold;
Ignore: hibernate.
Accept: 'seed survives winter/cold'.
Reject: plant develops or seed germinates during winter/cold.
2. Seeds/plants develop in spring/summer
OR
 Seeds/plants develop when temperature/light increases;
Accept: seeds/plants develop when more light or when temperature is higher.
Accept: seed germinates/'sprouts' during spring/summer or when temp/light increases.
3. Plant photosynthesise (in spring/when warm);
4. Produce (more) seeds/offspring in spring/growing season;

3 max

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- (a) 1. Change in DNA base/nucleotide (sequence);
Accept: mutation in DNA base (sequence).
Accept: deletion/substitution/addition of a DNA base/nucleotide.
2. Change in amino acid (sequence)/primary structure;
Reject: different amino acid formed.
Ignore: change in code for amino acid.
3. Alters (position of) hydrogen/ionic/disulfide bonds;
4. Change in tertiary structure (of receptor);
Reject: any reference to active site.
Ignore: 3°.

4

- (b) 1. (Receptor) is not complementary
OR
 (HIV) cannot bind/attach and enter/infect (helper) T cell;
Accept: 'complimentary'.
Accept: invade as alternative to infect.
2. No replication (of virus)
OR
 No destruction of (helper) T cell;
Accept: reproduction (of virus).

2

- (c) 1. Low/lower exposure to HIV (in Europe)
OR
 Low/lower number of HIV/AIDS (infections/cases);
Accept: converse.
2. (HIV) has only been present for a short time period
OR
 (HIV relatively) recently evolved;
3. Mutation/CCR5 has been around for many years;
Accept: frequency of mutation has always been high.
4. Mutation/CCR5 is advantageous (for something else);

2 max

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9

- (a) Starch (max 3)
1. Helical/ spiral shape **so** compact;
 2. Large (molecule)/insoluble **so** osmotically inactive;
Accept: does not affect water potential/ ψ .
 3. Branched **so** glucose is (easily) released for respiration;
Ignore: unbranched.
 4. Large (molecule) **so** cannot leave cell/cross cell-surface membrane;

Cellulose (max 3)

5. Long, straight/unbranched chains of β glucose;
6. Joined by hydrogen bonding;
Note: references to 'strong hydrogen bonds' disqualifies this mark point.
7. To form (micro/macro)fibrils;
8. Provides rigidity/strength;

5 max

- (b) 1. (At source) sucrose is actively (transported) into the phloem/sieve element/tube;
Accept: 'sugar/s' for sucrose but reject other named sugars e.g. glucose.
Accept: co-transport (with H^+ ions).
2. By companion/transfer cells;
 3. Lowers water potential in phloem/sieve element/tube **and** water enters by osmosis;
 4. (Produces) high (hydrostatic) pressure;
Accept: pressure gradient.
 5. Mass flow/transport towards sink/roots/storage tissue;
Accept: sieve element/tube.
 6. At sink/roots sugars are removed/unloaded;
Accept: at sink/roots sugars are used in respiration/stored.

5 max

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10

(a) Any **one** from:

1. Numerical readings / not subjective / colour change subjective / gives quantitative data / not qualitative / gives continuous data;
2. Greater accuracy;

Accept greater precision

1 max

(b) Fatty acids produced;

1

- (c)
1. No more (fatty) acids produced;
 2. All triglycerides/fat//lipids/substrate used up / enzyme denatured;

2

- (d)
1. Line starting at same point and falling above original line;
 2. Levels off at same pH, but later;

Accept the line still falling at 4 minutes

Do not credit if levels off at higher pH

2

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(a) Ribosome/rough endoplasmic reticulum;

Ignore RER or endoplasmic reticulum unqualified

1

(b) 1. Does not digest protein inside cells;

Accept named examples

2. So (pancreatic) cell/tissue/function not destroyed/damaged;

2

(c) (i) Peptide (bond);

1

- (ii)
1. Inhibitor is a similar shape to the substrate;
 2. (Inhibitor) blocks active site/is complementary to the active site/binds to the active site (of trypsin);
 3. Substrate can't bind to active site / no/fewer ES complexes formed;

3

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