



# **A-Level Biology**

## **Cell Transport**

### **Mark Scheme**

**Time available: 66 minutes**

**Marks available: 52 marks**

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## Mark schemes

1.

- (a) 1. (ATP to ADP + Pi ) Releases energy;  
*Reject 'produces/makes/creates energy'.*
2. (energy) allows ions to be moved against a concentration gradient

OR

(energy) allows active transport of ions;

*For 'ions' accept Na<sup>+</sup> or K<sup>+</sup>.*

*Do not accept if this movement is of glucose not ions.*

2

- (b) 1. (Maintains/generates) a concentration/diffusion gradient for Na<sup>+</sup> (from ileum into cell);  
*Accept '(Maintains/generates) a lower concentration of Na<sup>+</sup> inside the cell compared with outside the cell'.*

2. Na<sup>+</sup> moving (in) by facilitated diffusion, brings glucose with it

OR

Na<sup>+</sup> moving (in) by co-transport, brings glucose with it;

*Accept 'co-transporter' for 'co-transport'.*

2

- (c) 1. Folded membrane/microvilli **so** large surface area (for absorption);  
*Reject references to 'villi'.*  
*Accept 'brush border' for 'microvilli'.*
2. Large number of co-transport/carrier/channel proteins **so** fast rate (of absorption)
- OR
- Large number of co-transport/carrier proteins **for** active transport
- OR
- Large number of co-transport/carrier/channel proteins **for** facilitated diffusion;
3. Large number of mitochondria **so** make (more) ATP (by respiration)
- OR
- Large number of mitochondria **for** aerobic respiration
- OR
- Large number of mitochondria **to** release energy for active transport;
4. Membrane-bound (digestive) enzymes **so** maintains concentration gradient (for fast absorption);  
*Accept named examples of digestive enzymes.*

2 max

- (d) 1. Phospholipids drawn with head and two tails;
2. Correctly positioned as a bilayer on either side of SGLT1;  
*Some of every 'head' must extend into the hydrophilic region **and** some of every 'tail' must extend into the hydrophobic region.*  
*Reject phospholipids drawn within the protein.*

2

- (e) 1. One amine/ $\text{NH}_2$  group joins to a carboxyl/ $\text{COOH}$  group to form a peptide bond;  
*Accept on diagram, for example (at least) two amino acids joining by a correctly drawn peptide bond (MP1) with  $\text{NH}_2$  at one end and  $\text{COOH}$  at the other (MP2).*  
*Ignore incorrect names of  $\text{NH}_2$  and  $\text{COOH}$  groups.*
2. (So in chain) there is a free amine/ $\text{NH}_2$  group at one end **and** a free carboxyl/ $\text{COOH}$  group at the other
- OR
- Each amino acid is orientated in the same direction in the chain;  
*Allow ECF for incorrect naming of groups.*

2

[10]

2.

(a) 69.3 cm<sup>3</sup> solvent, 29.7 cm<sup>3</sup> water, 1.0 cm<sup>3</sup> acid (box 2);

1

- (b)
1. Temperature;
  2. Agitation/mixing/stirring;
  3. Source/age/type of blueberries;
  4. Crushing of the blueberries;
  5. Rinsing of the blueberries prior to mixing;
  6. Concentration of ethanol/acid;

*Do not accept pH.*

*Accept 'Filtering method'.*

2 max

(c) 1. Higher absorbance indicates more anthocyanin

OR

Higher absorbance indicates more membrane damage/permeability

OR

(G not zero because) some anthocyanin released when blueberries are crushed

OR

(G not zero because) some membrane damage when blueberries are crushed;

*For 'anthocyanin' accept 'pigment'.*

*A direct comparative statement is not needed, can be taken from the answer as a whole.*

*Accept 'most' for 'more'.*

2. More membrane damage/permeability results in more anthocyanin release

*Accept 'most' for 'more'.*

3. (E and F greater than water because) phospholipids dissolve in ethanol;

4. (E greater than F because) acid denatures membrane proteins;

*Accept description of denaturation in terms of change in tertiary structure or breaking of hydrogen/ionic bonds.*

4

- (d) 1. Use known concentration of blueberry juice/extract  
OR  
Use known concentration of anthocyanin/pigment (solution)  
OR  
Use known concentration of (extraction) solvent to be added to blueberries;
2. Prepare dilution series;  
*Accept descriptions and 'serial dilutions'*  
*Accept dilution series in terms of pigment or solvent.*
3. Compare (results) with colour standards to give score/value/concentration;  
*For 'colour standards' accept 'dilutions'.*

3

[10]

3.

- (a) 1. (Movement) down a gradient / from high concentration to low concentration;  
*Ignore along / across gradient*  
*Reject movement from gradient to gradient*
2. Passive / not active processes;  
**OR**  
Do not use energy **from** respiration / **from** ATP / **from** metabolism;  
**OR**  
Use energy **from** the solution;  
*Reject do not use energy unqualified*
- (b) 1. Movement through carrier proteins;  
**OR**  
Facilitated diffusion;  
**Between A and B**  
*Accept MP1 in either section*  
*Ignore co-transport / active transport*  
*Accept channel proteins*
2. Rate of uptake proportional to (external) concentration;  
**Between C and D**  
*Accept description of proportional*
3. All channel / carrier proteins in use / saturated / limiting;  
*Accept used up*  
*Accept transport proteins*

2

3

- (c) 1. Rate of uptake is proportional / does not level off (so diffusion occurring);  
*Accept as one increases the other increases*
2. (Lipid-soluble molecules) diffuse through / are soluble in phospholipid (bilayer);

2

[7]

4.

- (a) Diffusion

*Automarker*

1

- (b) 1. **Droplets** increase surface areas (for lipase / enzyme action);  
 2. (So) faster hydrolysis / digestion (of triglycerides / lipids);  
 3. **Micelles** carry fatty acids and glycerol / monoglycerides to / through membrane / to (intestinal epithelial) cell;
1. *Context is important*  
 1. *Reject micelles increase surface area*  
 2. *Ignore 'breakdown'*  
 3. *Ignore 'small enough'*  
 3. *Accept description of membrane*  
 3. *Reject any movement through membrane proteins*

3

- (c) 1. Golgi (apparatus);  
 2. Modifies / processes triglycerides;  
 3. Combines triglycerides with proteins;  
 4. Packaged for release / exocytosis

**OR**

Forms vesicles;

*Ignore 'processes and packages' unqualified*

2. *Reject synthesises triglycerides*  
 3. *Accept 'forms / are lipoproteins'*

4

[8]

5.

- (a) 1. Co-transport;  
 2. Uses (hydrolysis of) ATP;  
 3. Sodium ion and proton bind to the protein;  
 4. Protein changes shape (to move sodium ion and / or proton across the membrane);
3. *Accept 'Na<sup>+</sup> and H<sup>+</sup> bind to protein' but do not allow incorrect chemical symbols*

3 max

- (b) 1. Tenapanor / (Group)B / drug causes a significant increase;  
**OR**  
 There is a significant difference with Tenapanor / drug / between **A** and **B**;  
 2. There is a less than 0.05 probability that the difference is due to chance;  
 3. (More salt in gut) reduces water potential in gut (contents);  
 4. (so) less water absorbed out of gut (contents) by osmosis  
**OR**  
 Less water absorbed into cells by osmosis  
**OR**  
 Water moves into the gut (contents) by osmosis.  
**OR**  
 (so) water moves out of cells by osmosis.
1. and 2. *Reject references to 'results' being significant / due to chance once only.*
  2. *Do not credit suggestion that probability is 0.05% or 5.*
  2. *Accept 'There is a greater than 0.95 / 95% probability that any difference between observed and expected is **not** due to chance'*

4

- (c) 1. (Higher salt) results in lower water potential of tissue fluid;  
 2. (So) less water returns to capillary by osmosis (at venule end);  
**OR**  
 3. (Higher salt) results in higher blood pressure / volume;  
 4. (So) more fluid pushed / forced out (at arteriole end) of capillary;  
*For 'salt' accept 'sodium ions'.*  
*Do not allow mix and match of points from different alternative pairs*  
 3. *Accept higher hydrostatic pressure.*

2

[9]

6.

- (a) 1. and 2. Accept for 2 marks correct names of three components adenine, ribose/pentose, three phosphates;;  
*Accept for 1 mark, correct name of two components*  
*Accept for 1 mark, ADP **and** phosphate/Pi*  
*Ignore adenosine*  
*Accept suitably labelled diagram*
3. Condensation (reaction);  
*Ignore phosphodiester*
4. ATP synthase;  
*Reject ATPase*

4

- (b) Correct answer for 1 mark = 57/57.1;

1

- (c) 1. (Amino acid uptake by) active transport;  
*Accept for 'transport', process*
2. Cyanide reduces/stops amino acid uptake;
3. ATP production stops on membranes

**OR**

Enzymes not working on membranes;

4. ATP production continues in cytoplasm

**OR**

Enzymes active in cytoplasm;

3 max

**[8]**