Mark schemes

Q1.

(a) 1. (In) DNA;

2. (In) RNA;

If neither DNA or RNA named allow 1 mark for nucleotide/nucleic acid/phosphodiester bond/sugar-phosphate backbone

3. (In) ATP/ADP;

Accept any other correct biological compound containing phosphate; eg (in)RuBP or GP or triose phosphate or NAD

4. Phosphorylation;

Accept binds with substance to make it more reactive

5. (In) phospholipids;

2 max

(b) 1. Increased (plasma) acidity

OR

Decreased (plasma) pH;

2. Denatures (protein)

OR

Changes (protein) tertiary structure

OR

Changes active site (shape)

OR

Changes antigen-binding site (shape);

Accept description of bond changes, eg 'disrupts hydrogen/ ionic bonds' for 'changes in tertiary structure'

2

(c) 1. Equal positive and negative (in both);

Accept answers in either order

Ignore reference to sodium ions

Accept no overall charge or no net charge

2. Higher (ion concentration) in cytoplasm;

Ignore more ions in cytoplasm

2

(d) 1. (Sodium) ions move in (to cells) by <u>facilitated</u> diffusion down a concentration gradient;

Accept a description of the concentration gradient, eg from high (concentration) to low (concentration)

2. (Sodium) ions move out (of cells) by active transport against a concentration gradient;

Accept a description of transport against a gradient, eg from low (concentration) to high (concentration)

2

[8]

Q2.

(a) 1. (Movement of) polar/charged molecules;

*Accept ions **OR** non-lipid soluble for polar*

*Accept named polar molecule, eg glucose **OR** amino acids **OR** nucleotides*

2. (Facilitated diffusion) movement down a concentration gradient via carrier/channel protein;

Reject if ATP used

*Ignore along **OR** with for down*

Ignore diffusion gradient

3. (Active transport) movement against a concentration gradient via carrier protein using ATP;

Reject channel protein

3

(b) (Highly) folded cell(-surface) membrane;

Accept invaginated

***OR** projections **OR** extensions for folded*

Reject hairs

Ignore brush border

1

(c) 1. Combine/mix/join with bile salts;

2. Make (more) soluble (in water);

3. (Micelles) breakdown close to cells

OR

Maintain high(er) concentration at cell(-surface membrane)

OR

Transport to cells/lining;

Accept 'fuse with' for 'breakdown close to'

4. Diffuses (into cells/ileum);

Ignore facilitated

Ignore micelles are absorbed

*Max 2 if context is related to digestion of vitamin A to phospholipids **OR** monoglycerides **OR** fatty acids*

Ignore emulsification of vitamin A

3 max

[7]

Q3.

(a) 1. Everything other than the COOH inside drawn box;

1

(b) (Triglyceride)

1. 3 fatty acids rather than 2;

2. 3 ester bonds rather than 2;
Accept 'only 2 fatty acids'

3. No phosphate group;
1, 2 and 3 Accept converse

2 max

(c) 1. Phospholipid both hydrophobic and hydrophilic

OR

Phospholipid polar

OR

Phosphate group is charged;

2. Triglycerides only hydrophobic

OR

Fatty acid/triglyceride is non-polar;
Accept 'Triglycerides not hydrophilic'

3. Hydrophilic/phosphate group attracts water (to either side of bilayer);
Accept 'faces water' for 'attracts water'
Ignore 'fatty acids repel water'

3

(c) 1. Fatty acid A is saturated

OR

Fatty acid B is unsaturated;

2. (At 4 months) less fatty acid A **and** more fatty acid B

OR

Fish oil has more fatty acid B than fatty acid A;
1 and 2 Accept identification of A (as saturated) or B (as unsaturated) using numbers from the table

3. Increase in fluidity caused by increased unsaturated fatty acids

OR

Increase in fluidity caused by increased fatty acid B (from the fish oil);

4. Double bonds/unsaturated fatty acids cause bends/kinks in fatty acid tail

OR

(Membrane more fluid because) phospholipids further apart;

3 max

[9]

Q4.

(a) For 1 mark, accept any **two** from:

Prokaryotes have

No membrane-bound organelles/correct example

OR

(Single,) circular/loop DNA (in cytoplasm)

OR

DNA free in cytoplasm

OR

DNA not associated with proteins/histones

OR

Murein/peptidoglycan (in) cell wall;

Apply list rule

Accept (prokaryotes) only have smaller ribosomes/60S/70S

Accept mesosome

Accept no introns

Accept nucleoid for single, circular DNA

Reject nucleosome

Reject plasmid

Reject (bacterial) chromosome

Reject capsule/slime layer

Reject flagellum

1

(b) Hydrogen ☑

1

(c) 1. Hydrophobic side next to/in/face fatty acids/tails

OR

Hydrophobic side next to/in/face hydrophobic (part of) phospholipid/bilayer;

Accept 'part/region/bit/half' for side

2. Hydrophilic sides allow ion movement through membrane

OR

Hydrophilic sides form a channel;

Accept 'part/region/bit/half' for side

Accept water OR charged/polar molecules/substances OR water-soluble substances for ions

2

(d) Correct answer for 2 marks, 2.5;;

Accept 1 mark for

2.5434 (Correct answer but 2 or more decimal places)

OR

10.2 (correct area calculation using diameter, to 1 decimal place)

OR

6.6 (correct calculation using radius (4 − 1.1) ÷ 2, to 1 decimal place)

OR

26.4 (correct calculation using diameter, 4 − 1.1, to 1 decimal place)

2

(e) 1. Cholesterol stabilises (the membrane)

OR

Cholesterol restricts the movement of molecules/phospholipids/fatty acid (tails) (making up the membrane);

Accept makes (membrane) less flexible OR less fluid OR stiffer OR rigid OR gives structural support for stabilises

Ignore strength

Accept holds together for restricts movement

2. (So) APs do not make channels in (eukaryotic) membranes

OR

(So) APs cannot enter the (eukaryotic) membrane;

Accept fewer for do not

Accept cannot fit OR be positioned OR sit in OR form in OR embed OR disrupt for enter

2

(f) 1. Antibody binds to AP

OR

Gold (present) where AP located;

Accept attaches OR forms antibody-AP OR antibody-antigen complex, for binds

2. (As antibody/tertiary structure is) <u>complementary</u> (to AP);

Reject reference to active site

3. Gold interacts with electrons (in TEM);

For 'interact' accept scattered/deflected/reflected OR blocked/absorbed/bounced/interrupted OR a description of these

4. (T)EM (used as it) has a high resolution;

3 max

[11]

Q5.

(a) 1. (Rate of) transpiration/evaporation increases due to increased temperature
OR
(Rate of) transpiration/evaporation increases due to increased light intensity
OR
(Rate of) transpiration/evaporation increases due to decreased humidity
OR
(Rate of) transpiration/evaporation increases due to increased wind/air movement;

Reject tide affecting transpiration/water potential/humidity

Correct link needed between factor affecting transpiration and the explanation

2. (So) increased kinetic energy (causing more water loss)
OR
(So) increased water potential gradient (so more water lost)
OR
(So) increased (water) diffusion gradient (so more water lost);

Reject tide affecting transpiration/water potential/humidity

Correct link needed between factor affecting transpiration and the explanation

3. Stomata open (at sunrise/after 5 am) allowing gas exchange
OR
Stomata open (at sunrise/after 5 am) allowing carbon dioxide to enter;

4. (Some) stomata close at midday/after 11 am (reducing transpiration);

Accept at 11 am as the time when stomata close

Ignore reference to tide

4

(b) Correct answer for 2 marks, 6.6̇, 6.67 − 7 (%);;

Accept for 1 mark,

0.05 (correct difference in transpiration rate)

OR

6.6 (correct calculation, but incorrect rounding)

OR

6.25/6.3 (correct calculation using incorrect denominator)

OR

666/667 correct number sequence but decimal place in wrong place eg 66.7/0.0667
OR

0.75 as denominator

2

(c) 1. **Mark in groups, either 1 to 4 OR 5 to 8**

1. Record mass/length before **and** after;

2. Place in sea water for (specified/equal) time;
Ignore period of time
Accept seawater in a dilution series
Ignore blot dry before initial mass measurement
Reject 'size' once then allow ECF.

3. Method to remove surface water;
Accept eg use tissue paper to dry OR blot dry

4. Increase in mass/length shows water has been absorbed by osmosis
OR
Increase in mass/length shows cells have lower water potential;
Accept root/mangrove for cells

OR

5. Put tissue/cells on (microscope/glass) slide;

6. Add seawater (and leave)

7. Observe under (optical) microscope;

8. If cells become flaccid they do not have a lower water potential than seawater
OR
(If cells become) turgid cells show water is absorbed by osmosis
OR
(If cells become) turgid cells show cells have a lower water potential
OR
(If cells are) not flaccid/plasmolysis cells show water is not lost by osmosis
OR
(Determine) percentage plasmolysis;
Accept description of turgid (cells)

4

Accept 'weight' for 'mass'.
Accept 'diameter' for 'length'.

[10]