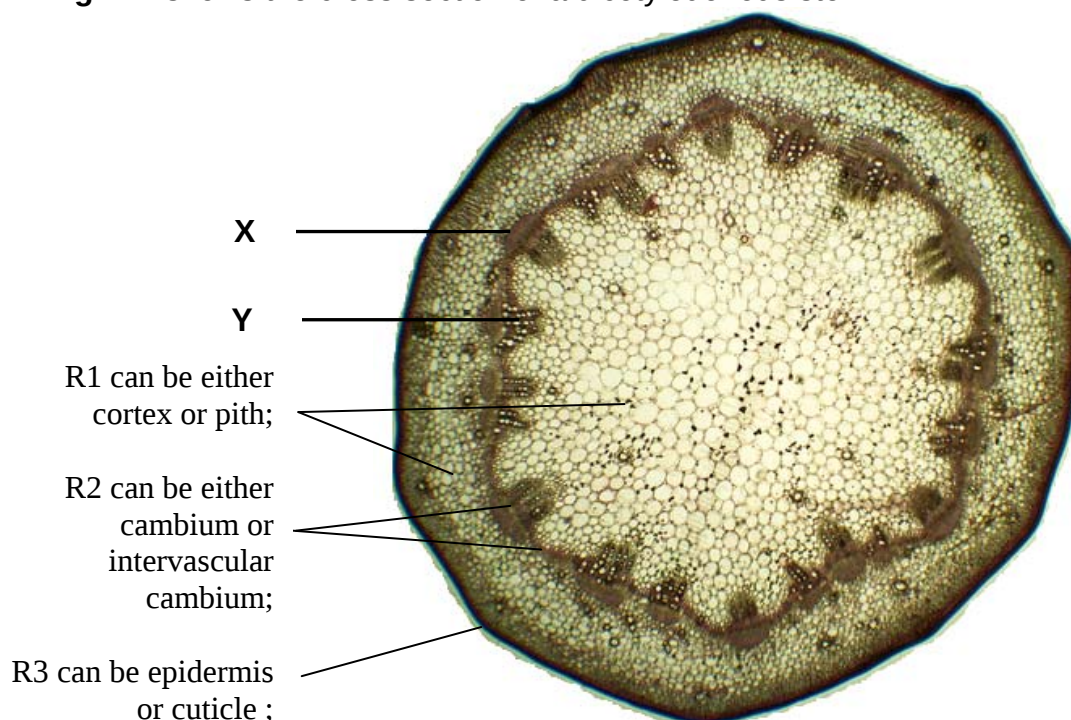


2011 Sec 3 BIO EOY Paper 1 Answers

1	C	7	D	13	D	19	C	25	C
2	D	8	C/D	14	B	20	B	26	B
3	C	9	B	15	B	21	A	27	C
4	A	10	D	16	C	22	B	28	B
5	C	11	D	17	C	23	A	29	C
6	A	12	A	18	B	24	D	30	B

Section A

A1 Fig. 1.1 shows the cross section of a dicotyledonous stem.



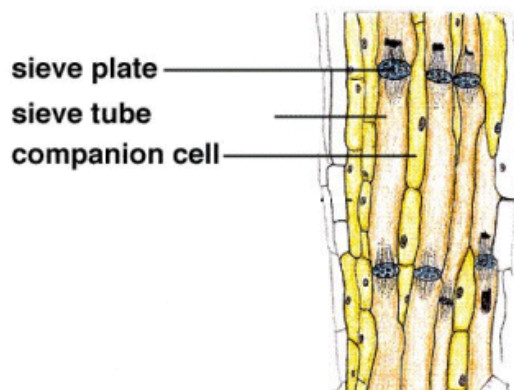
(Flickr photo by Shihchuan 2010. Available for download under a Creative Commons license
<http://www.flickr.com/photos/epingchris/5110418885/in/photostream/>)

Fig. 1.1

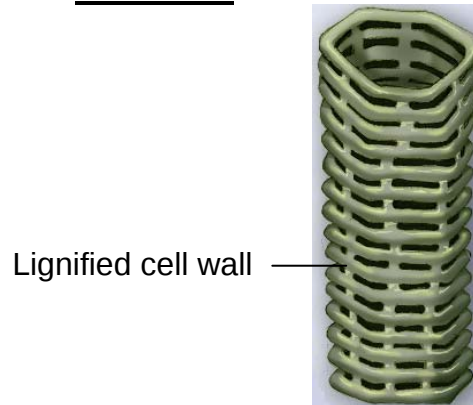
- (a) (i) X: phloem Y: xylem [1]
Both answers correct to be awarded 1 m
- (ii) Sucrose and amino acids [1]
Accept: ECF water and ions/dissolved mineral salts if X wrongly identified as xylem in (i)
- (b) Answer shown on Fig. 1.1 [3]

A1 (c) (i)

Structure X



Structure Y



<http://www.mhhe.com/biosci/pae/botany/histology/html/vasctis2.htm>

<http://12knights.pbworks.com/w/page/25273875/924-State-that-terrestrial-plants>

The above are sample diagrams. Drawings by students do not need to be as detailed.

[2]

Answer for structure X must include drawing and labeling of '**sieve tube**' and '**companion cell**';

Answer for structure Y must include the drawing of **lignin rings/spiral deposits of lignin** and labeling it as 'lignified cell wall or lignin deposits';

Allow for ECF from (a) (i)

- (ii) Valves must be inserted into structure Y + so that there will only be one directional flow of blood OR replace lignin with elastic tissue + so that they can be compressed by the skeletal muscles to assist in the flow of blood back to heart; [1]
- (d) (i) Obtain and observe the cross sections of a relatively large number of different species/types of dicotyledonous stems before making the drawing; [1]
- (ii) Allow proboscis/mouthpart of aphid pierce into structure X and then detach head of aphid to collect substances dripping through the proboscis/mouthpart [1]
Possible control:
Negative control is to just detach the proboscis from aphid and check if any substances drip from it
- Accept if candidate described how to collect the substance without stating any control

[Total: 10]

A2 (a)

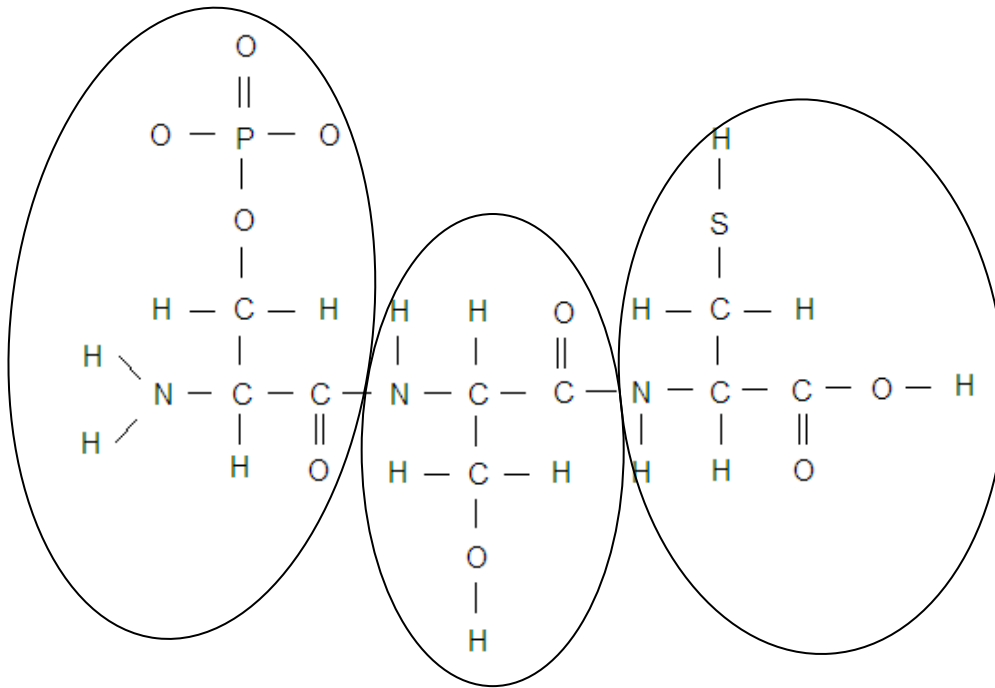


Fig. 2.1

- (i) All 3 amino acids accurately circled COMPLETELY; [1]
 (ii) Peptide bond / amide bond; [1]
Reject: "poly"peptide bond or "di"peptide bond (not a bond)

- (b) This polysaccharide has a compact coiled **SHAPE** so it occupy less space / it has a large surface area to volume ratio than all the individual (glucose) units that make up this polysaccharide; [max3]

This polysaccharide can be stored because it is a large molecule with many (glucose) **UNITS** so it cannot diffuse through the cell membranes and be lost from the cell;

This polysaccharide can be a source of energy because the (1-4 glycosidic) **BONDS** can be easily broken to release (glucose) units when needed for cellular respiration;

This polysaccharide has its $-OH$ groups all tucked in due to the spiral arrangement of (glucose) units so it is insoluble / osmotically inactive and can be stored;

Reject: Just stating insoluble without any reference to what can be seen in **Fig 2.2**

- (c) **Both answers are acceptable -** [1]
 Yes, because the (glycogen) has a **branched** structure unlike the coiled/unbranched/linear structure of starch (amylose form) in **Fig. 2.2**;
 No, because both starch (amylopectin form) (less branching) and glycogen have **branched** structures;
 No need to identify the polysaccharide. Do not repeat Q about bonds.

A2 (d)

- (i) Phospholipid; [1]
- (ii) Allow Error Carried Forward from d(i)
Change to the physical property = Now the phospholipid has both a [1]
hydrophilic region and a hydrophobic region / amphipathic molecule /
amphiphatic molecule instead of being totally hydrophobic;
Explanation = The **phosphate** group forms the hydrophilic head of the [max2]
phospholipid;
The two fatty acid/hydrocarbon tails forms the hydrophobic tails of the
phospholipid;
Allow for ECF from (d) (i), but answers must be reasonable and sound.

[Total: [10]

A3 (a)

- Compare: [any
two]
Both do not need the use of energy/energy from respiration/are passive transport
processes;
Accept = Molecules move down a concentration gradient
Contrast:
Osmosis only occur for water molecules unlike diffusion;
Osmosis occur in the presence of a partially/selectively permeable membrane
unlike diffusion which can happen with or without the partially permeable
membrane;
Reject: semi-permeable
Note: Answer for contrast between diffusion and osmosis should compare two
similar characteristics instead of giving the definition of each process.

(b)

- (i) Endocytosis occurs; [2]
Accept: Phagocytosis / Invagination
The amoeba is able to fold the cell membrane around the ciliate to form a
(food) vesicle / OWTTE;
Accept: The amoeba engulfs and ingests the ciliate and forms a (food)
vacuole / phagosome within its body
- (ii) Exocytosis occurs; [1]
Accept: Saprophytic nutrition / Extracellular digestion
Reject: Chemical digestion (answer is vague)

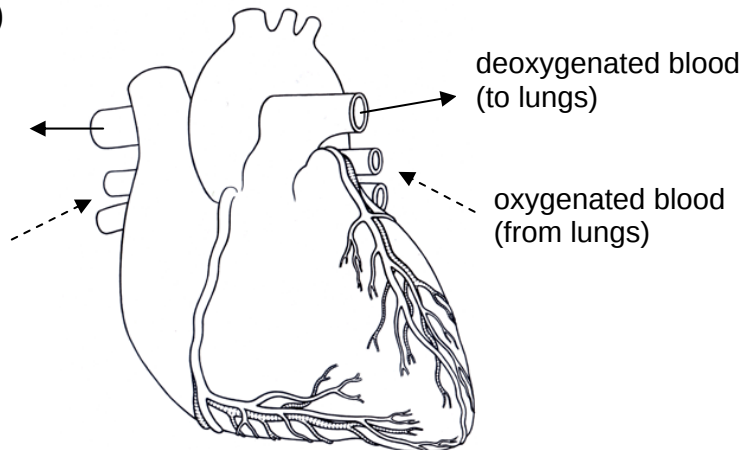
A3 (c)

- (i) Method = Facilitated diffusion; [3]
TWO reasons = Diffusion because glucose molecules move from high
concentration to low concentration / across concentration gradient;
Facilitated because there is the presence of a carrier protein / transport
protein to speed up movement of glucose molecules;
Reject = Channel protein (the protein in Fig 3.2 has changed its shape),
No need for energy (cannot tell from Fig 3.2)
- (ii) Increase the number of (carrier) proteins (in the cell membrane); [2]
Increase number of carriers increases the number of glucose that can bind
to the carriers per unit time / rate of glucose molecules being transported by
the proteins;
Accept: Active transport (only if answer has explained that it is an additional
process to facilitated diffusion)
Reject: increase rate of glucose taken in by the cell (repeating question)
Reject: increase temperature (structure is a cell)

[Total 10]

- 4 (a) Q – coronary artery; [1]
Accept: coronary vein Reject: capillary/ies

- (b) [1 mark for each correct set]



- (c) (i) R – endothelium / inner folded wall / tunica intima [1 mark for 2 correct]
S – elastic tissue / elastic fibres / muscular tissue / smooth muscles / tunica media
- (ii) vein will have thinner less muscular walls / wider lumen / presence of valves [any two]
Accept: the tunica media and tunica adventitia in the vein are indistinct
- (iii) larger surface area to volume ratio for diffusion/absorption/exchanges of materials / oxygen and nutrients;
Reject: create friction to slow down bloodflow (wrong concept)
- (d) Name of the heart disease – coronary heart disease / atherosclerosis / angina / heart attack / myocardial infarction / hypertension; [max 3]
Result of a diet rich in cholesterol and saturated fats;
Fatty substances may be deposited in the endothelium / inner lining / inner wall / inner surface of the (coronary) arteries;
Narrows lumen / increases blood pressure / development of plaque on the inner surface / development of rough inner surfaces / increase risk of blood clots (thrombosis);
Supply of oxygen and glucose to heart muscles may be cut off;

Section B

- 5 (a) During vigorous muscular contractions, an oxygen debt is incurred / oxygen supply is less than demand; [max 3]

When less oxygen is available, muscle cells/tissue will respire anaerobically;

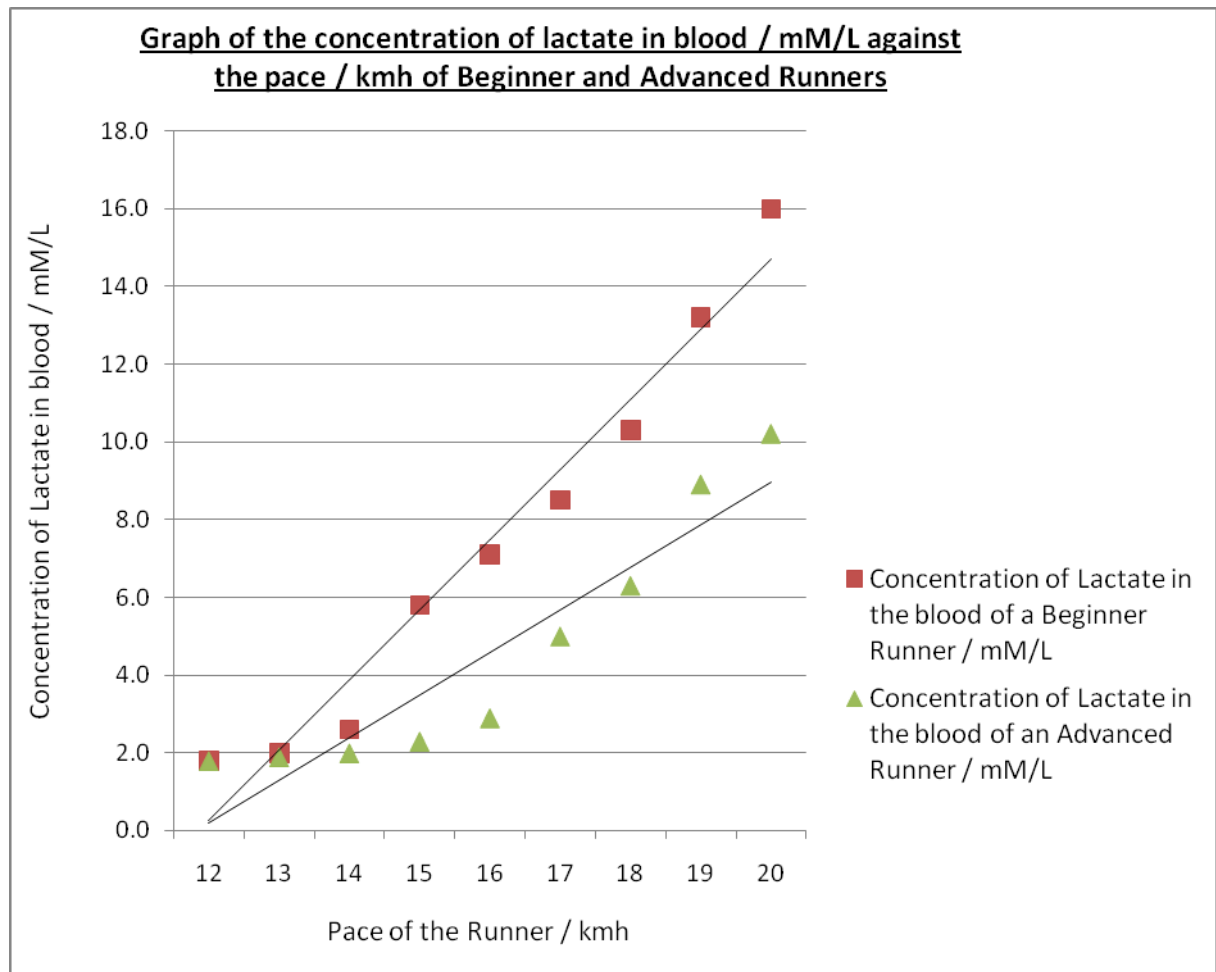
Aerobic respiration is unable to release enough energy to meet demand;

During anaerobic respiration, extra / small amount of energy is released;

Reject: When glucose/water is not available, anaerobic respiration occurs (nothing to do with insufficient glucose/water)

Reject: Muscle cells require energy to provide oxygen to the body/athlete (wrong concept)

(b)



- (i) Title of graph with units; [3]
Both axes labelled correctly with units;
All points plotted with appropriate scale + size of graph;
All points plotted accurately + distinguishes 'beginner runner' and 'trained runner'
Best-fit curve/line;
[max 3]
- (ii) After the athlete has trained, concentration of lactate in blood is reduced/decreased at any given intensity; [4]
Before training, a runner running at 16 km/h accumulates 7.1 mM/L of lactate in blood but while training, a runner running at 16 km/h accumulates (less than half the concentration of) 2.9 mM/L of lactate in blood (give values);
Training will improve oxygen carrying capacity in the body of an athlete / Training will improve oxygen supply to the muscle tissues which will then delay the onset of anaerobic respiration;
Accumulation of lactic acid causes muscular fatigue and pain;
High levels of lactic acid in muscles will force runner to slow down or stop;
Reduced levels of lactic acid in muscles will allow runner to continue for a longer period of time / run a longer distance;
[max 4]
- 6 (a) When blood vessel is damaged, the damaged tissues will cause platelets to deposit in the area / platelets plug to decrease blood loss; [6]
The enzyme thrombokinase is secreted by damaged tissues OR platelets;

Thrombokinase converts prothrombin in the blood to thrombin;
Calcium ions / Vit K / Plasma clotting factors must be present at prothrombin step;
Thrombokinase also neutralises the action of heparin so that clotting can take place;

Thrombin converts fibrinogen to fibrin / insoluble threads mesh together / OWTTE;
Fibrin threads form a mesh/network;
Fibrin network entangles (red) blood cells to form a clot;
Allow for Error Carried Forward in marking the answer
- (b) Transfusion of platelets / Infusion of clotting factors / blood transfusion / OWTTE; [1]
Reject: Diet
Reject: Inject proteins responsible for clotting (just repeating Q)
- (c) Name one component = White blood cells/Phagocytes/Lymphocytes/Leucocytes; [1]

Explanation = [2]
Describe function of (lymphocytes) – produce antibodies;
Describe function of antibodies – attaching to bacteria, causing the bacterial cell surface membrane to rupture/causing bacteria to clump together so that they can be easily ingested by phagocytes / neutralising toxins produced by bacteria / attach to virus making them unable to bind to host cells;

Describe function of (phagocytes) – engulf foreign cells/bacteria/OWTTE;
Describe how phagocytosis removes bacteria – engulfed bacteria digested by (phagocytes);

Describe function of (T lymphocyte) – directly attack infected cells;

7 E

- (a)
- (i) Describe activation of pepsinogen to pepsin [2]
e.g. inactive pepsinogen is activated to pepsin by action of HCl;
Describe action of pepsin as catalyzing the hydrolysis of proteins into peptones/polypeptides;
State source of pepsin as gastric glands;
Describe action of rennin as catalyzing the conversion of soluble milk protein caseinogen into insoluble milk protein, casein;
- (ii) Describe activation of trypsinogen to trypsin by the action of enterokinase; [2]
Action of trypsin on proteins not hydrolysed earlier in stomach;
State source of trypsinogen as pancreas;
- (iii) Describe action of erepsin on peptones/polypeptides as catalyzing the hydrolysis [2]
of peptones/polypeptides into amino acids;
Explain significance of digestion (relatively large protein molecules can be hydrolysed into smaller more diffusible substances for absorption to take place/OWTTE);
Amino acids are absorbed into the blood capillaries of villi via active transport;
- (b)
- (i) Suggest Orlistat as having a similar shape/structure/conformation as that of [2]
fats/lipids;
Suggest that Orlistat binds to active site of lipase thus preventing actual substrate/fats from binding;
Suggest that Orlistat binds to another site on lipase, altering the shape of active site;
Suggest that Orlistat denatures the enzyme (although this is not true, but we will accept);
Reject any suggestion that Orlistat increase or decrease KE of enzymes
- (ii) Rate of fat digestion decreases as there is less active site available/less enzymes [2]
available;
- Accept:** if all enzymes are inhibited, rate of digestion will not occur at all;
Reject: No enzyme available, hinder fat digestion, rate of digestion decrease because enzymes cannot speed up, it will reduce the rate of digestion as it will take longer for the fats to be digested.
- Undigested fats, being relatively large molecules, cannot be absorbed, less fatty acids and glycerol can be absorbed per unit time, rate of absorption decreases;
- Accept:** As the time taken to hydrolyse fats is longer hence lesser time is given for absorption before the it enters the colon
Reject: Rate of absorption decreases because rate of digestion decreases (did not explain how digestion is link to absorption)

7 Or

- (a)
- (i) Describe a net release of carbon dioxide during night; [5]
Explain net release of carbon dioxide due to respiration of plant, and lack of photosynthesis;
Explain closure of stomata due to lack of light;
Rate of water vapour diffusing out is low;
- (ii) Describe low light intensity, net release of carbon dioxide as rate of respiration is higher than rate of photosynthesis;
Describe and explain high light intensity, net release of oxygen as rate of photosynthesis exceeds rate of respiration;
Describe how oxygen is formed during photosynthesis (thru photolysis of water);
Explain opening of stomata due to presence of light;
Rate of water vapour diffusing out is relatively higher than at night;
- Accept:** show awareness that both respiration and photosynthesis are taking place in light
[max 5]
- (b) Increase in carbon dioxide increases rate of photosynthesis; [3]
Volume of oxygen releases increases;
Rate of diffusion of water vapour remains relatively constant;
- Accept:** carbon dioxide diffuses into the leaf at a faster rate due to a steep diffusion gradient
Reject: Any suggestion that increase carbon dioxide decreases the rate of respiration
- (c) Plants require nitrogen from soil to synthesize amino acids; [2]
Describe effects of hydrolysis of proteins in the bodies of insects/amphibians to release amino acids;
Amino acids absorbed by plants;
Plants less dependent on soil as source for nitrogen;