



**Annual Examinations for Secondary Schools 2019**

**YEAR 10**

**BIOLOGY**

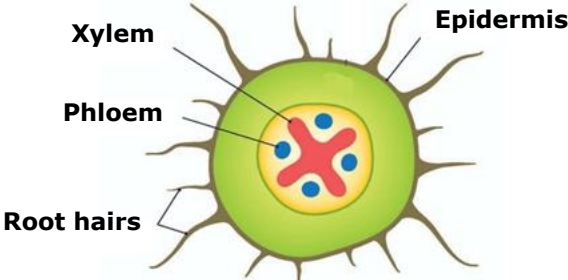
**MARKING SCHEME**

**Section A**

1.	a.	Autotrophic	[1]
	b.	i. Chloroplast	[1]
		ii. <p style="text-align: center;">sunlight</p> $\text{Carbon dioxide} + \text{Water} \Rightarrow \text{Glucose} + \text{Oxygen}$ <b>Comments:</b> Award marks <b>only</b> if equation is completely correct.	[2]
	c.	i. <p style="text-align: center;"><b>The Effect of Carbon Dioxide Concentration upon Rate of Photosynthesis</b></p> <p style="text-align: center;">Phot o s y n t h e s i s</p> <p style="text-align: center;">R a t e o f</p> <p style="text-align: center;">0</p> <p style="text-align: center;">C o n c e n t r a t i o n o f C O<sub>2</sub></p>	[2]
		ii. Initially the rate of <b>photosynthesis increases with increasing carbon dioxide concentration</b> . At a certain point however, <b>the rate of photosynthesis levels off and does not increase anymore even if carbon dioxide concentration increases</b> ... the enzymes all being utilised.	[1] [1]
		iii. Light intensity  <b>Comments: Do not accept</b> temperature.	[1]
			<b>TOTAL: 9 marks</b>

2.	a.	Glycogen	[1]
	b.	Nitrogen, Sulphur	[1] [1]

	c.	Starch	[1]
	d.	Excretion	[1]
	e.	Monosaccharides, Hydrolysis <b>OR</b> Catabolic	[1] [1]
	f.	Anaerobic	[1]
			<b>TOTAL: 8 marks</b>

3.	a.	i. <b>Transport of water and dissolved substances</b> taken up by the roots to the upper parts of the plant.	[1]
		ii. <ul style="list-style-type: none"> <li>Xylem vessels are <b>lignified</b> <ul style="list-style-type: none"> <li><b>provides support and prevents caving in.</b></li> </ul> </li> <li>Xylem vessels <b>lose their end walls</b> <ul style="list-style-type: none"> <li><b>continuous flow.</b></li> </ul> </li> </ul>	[1/2] [1/2] [1/2] [1/2]
		iii. Water, which is needed for photosynthesis and to keep the cells turgid, cannot travel to all parts of the plant.	[1]
	b.	Phloem	[1]
	c.	i. <div style="text-align: center;">  <p>The diagram shows a cross-section of a root cell. It is a green circle with several brown root hairs extending from its outer surface. Inside the cell, there is a central vascular cylinder. The outer part of this cylinder is labeled 'Phloem' and contains small blue dots. The inner part is labeled 'Xylem' and contains a large red star-shaped structure. The outermost layer of the cell is labeled 'Epidermis'. The entire structure is labeled 'Root hairs'.</p> </div>	[1/2] for each label
		ii. Transport in xylem is <b>unidirectional</b> – from the roots upwards. Transport in the phloem is <b>bidirectional</b> – from leaves to all other parts of the plant.	[1] [1]
			<b>TOTAL: 9 marks</b>

4.	a.		<b>Meaning</b>	<b>Term</b>	[1/2] each x 4
			An interacting group of various species in a common location.	community	
			Where an organism lives.	<b>habitat</b>	
			A group of organisms of the same species living in the same area.	<b>population</b>	
			Position in a pyramid of numbers.	<b>trophic level</b>	
			Organisms and their environment.	<b>ecosystem</b>	

	b.	i.	<div style="text-align: center;"> </div> <p><b>Comments: Do not award</b> any marks if the producer is not at the bottom.</p>	[1] Correct sequence [1] Relative size of levels
		ii.	Since the <b>fleas are very small parasites, every rabbit can host more than one flea.</b> Hence the greater number of fleas than rabbits.	[1/2] [1/2]
	c.	i.	Grass	[1/2]
		ii.	Fleas	[1/2]
	d.		<ul style="list-style-type: none"> <li>Not all the food is digested when eaten.</li> <li>Some of the energy is wasted as heat.</li> </ul> <p><b>Comments:</b> Or equivalent.</p>	[1] [1]
	e.		<ul style="list-style-type: none"> <li>The rabbits did not find enough food to eat.</li> <li>Some of the rabbits were killed by the fires.</li> <li>Loss of habitat.</li> </ul> <p><b>Comments:</b> Any two or equivalent.</p>	[1] [1]
<b>TOTAL: 10 marks</b>				

5.	a.	<p>Mean mass = [Sum of 4 individual seedlings] / 4</p> <p>= [0.3+0.2+0.2+0.4] / 4</p> <p>= 1.1 / 4</p> <p>= 0.275</p> <p>= 0.28 g</p> <p><b>Comments:</b> Deduct 1/2 mark if no working is shown. Deduct 1/2 mark if value is not given to 2 dp.</p>	[1] [1]
	b.	i. <b>Nitrogen</b>	[1]
		<p><b>Comments: Do not accept</b> nitrates.</p> <p>Seedlings growing in solution without nitrates <b>gained least mass.</b></p>	[2]
		ii. Nitrogen is <b>an important component of chlorophyll and amino acids.</b> Without chlorophyll the plant cannot photosynthesise. Amino acids are the building blocks of structural proteins and enzymes.	[1]

	c.	i. Seeds would have been exposed to the same conditions. <b>OR</b> Seeds would have approximately the same mass. <b>OR</b> The seeds would be genetically similar.  <b>Comments:</b> Any one or equivalent.	[1]
		ii. Temperature <b>OR</b> Sunlight <b>OR</b> Amount of water <b>OR</b> Oxygen  <b>Comments:</b> Any one or equivalent.	[1]
	d.	i. Calcium Dairy products  <b>Comments:</b> Accept any mineral and its respective source. <b>Do not accept</b> vitamins and their sources.	[1/2] [1/2]
		ii. Weak bones and teeth.  <b>Comments:</b> Or an equivalent provided it's a symptom caused by a deficiency of the mineral named in d i.	[1]
			<b>TOTAL: 10 marks</b>

6.	a.	<table border="1" style="width: 100%;"> <tr> <td style="text-align: center;"><b>Stomach</b></td> <td>An organ for the mixing of food.</td> </tr> <tr> <td style="text-align: center;"><b>Peristalsis</b></td> <td>Wavelike contractions in the gut that move food along.</td> </tr> <tr> <td style="text-align: center;"><b>Molars</b></td> <td>Grind food into smaller pieces.</td> </tr> <tr> <td style="text-align: center;"><b>Lipase</b></td> <td>An enzyme that digests fats into fatty acids and glycerol.</td> </tr> <tr> <td style="text-align: center;"><b>Bile</b></td> <td>A secretion that emulsifies fats.</td> </tr> <tr> <td style="text-align: center;"><b>Diastema</b></td> <td>A gap between the incisors and premolars of a herbivore.</td> </tr> </table>	<b>Stomach</b>	An organ for the mixing of food.	<b>Peristalsis</b>	Wavelike contractions in the gut that move food along.	<b>Molars</b>	Grind food into smaller pieces.	<b>Lipase</b>	An enzyme that digests fats into fatty acids and glycerol.	<b>Bile</b>	A secretion that emulsifies fats.	<b>Diastema</b>	A gap between the incisors and premolars of a herbivore.	[1/2] each x 6
<b>Stomach</b>	An organ for the mixing of food.														
<b>Peristalsis</b>	Wavelike contractions in the gut that move food along.														
<b>Molars</b>	Grind food into smaller pieces.														
<b>Lipase</b>	An enzyme that digests fats into fatty acids and glycerol.														
<b>Bile</b>	A secretion that emulsifies fats.														
<b>Diastema</b>	A gap between the incisors and premolars of a herbivore.														
	b.	i. Villus	[1]												
		ii. <b>Comments:</b> Any two or equivalent. <ul style="list-style-type: none"> <li>• Rich blood supply</li> <li>• Large surface area</li> <li>• Thin epithelium</li> </ul>	[1/2] each x 2												
	c.	Fats <b>Comments:</b> Accept lipids.	[1]												

	d.	i. Liver	[1]
		ii. The <b>concentration of absorbed nutrients from the gut may be higher or lower than that which is actually allowed inside the body.</b>	[1]
		The <b>liver regulates the concentration of these nutrients</b> before they enter the general circulation.	[1]
			<b>TOTAL: 9 marks</b>

## Section B

1.	a.	i. <b>Both the breathing rate and heart rate increase</b> gradually during a race until <b>they reach a plateau that cannot be exceeded.</b>	[1] [1]
		ii. As time passes during a race, <b>the demand for energy by the muscles increases</b> and <b>the body attempts to continue generating the energy required aerobically.</b>	[1/2] [1/2]
		1. So the heart rate increases in order to transport: <b>the deoxygenated blood to the lungs</b> <b>and the oxygenated blood to the muscles</b> <b>more quickly.</b>	[1/2] [1/2]
		2. And the breathing rate increases in order to: <b>take up oxygen from the air</b> <b>and remove carbon dioxide from the blood</b> <b>at a faster rate.</b>	[1/2] [1/2]
		iii. At the end of the race <b>extra oxygen needs to be taken up</b> by the lungs to <b>pay off the oxygen debt.</b>	[1/2] [1/2]
		This 'extra oxygen' is used for <b>the breakdown of lactic acid</b> which accumulates in the muscle cells as a result of <b>anaerobic respiration.</b> This takes place in order to supply the extra energy that is required during the race.	[1/2] [1/2]
	b.	The red blood cells: 1. Are <b>biconcave</b> in shape – <b>larger surface area for transport of oxygen.</b> 2. Have <b>no nucleus</b> – so, they <b>contain more haemoglobin.</b> 3. Are <b>small and flexible</b> – so, they can <b>fit through narrow blood vessels.</b> 4. <b>Contain haemoglobin</b> – a red protein that <b>combines with oxygen.</b>  <b>Comments:</b> Any two.	[1/2] [1/2] [1/2] [1/2]
	c.	White blood cells play an important role in protecting the body against harmful pathogens – <b>they increase in number in order to fight off and destroy the invading pathogen.</b>	[1]

	d.	i. The oxygenated blood leaves the lungs at a low pressure. Thus, it returns to the <b>left side of the heart</b> so that <b>it will be pumped with enough strength to reach all parts of the body.</b>	[1/2] [1/2]
		ii. Wall of left ventricle is thicker than that of the right ventricle so as to exert more pressure. Septum separates the left side from the right side so that the oxygenated blood does not mix with the deoxygenated blood. Presence of valves prevents backflow of blood. Walls of the atria are thin so that they can stretch to receive the blood but can contract with enough force to push blood into ventricles. Wall of the heart is made up of cardiac muscle so that it will contract and relax continuously without becoming fatigued.  <b>Comments:</b> Any four or equivalent.	[1] [1] [1] [1]
<b>TOTAL: 15 marks</b>			

2.	a.	i. It is a protein digesting enzyme.	[1]
		ii. The rate of reaction increases (a shorter time is taken for mixture to go colourless) as temperature increases from 20°C to 40°C. At higher temperatures than 40°C, the rate of reaction decreases.	[1] [1]
	b.	i. 40°C	[1]
		ii. Deactivated	[1]
		iii. <b>As temperature increases further above 45°C the rate of reaction is expected to decrease even more (time taken for mixture to turn colourless will be longer).</b> This is because the <b>high temperatures denature the enzyme</b> and therefore, <b>it would not be possible for the substrate to fit into the enzyme's active site.</b>	[1] [1] [1]
		iv. Enzymes are: <ul style="list-style-type: none"> <li>• catalysts</li> <li>• pH sensitive</li> <li>• proteins</li> <li>• substrate specific</li> <li>• sensitive to inhibitors</li> </ul> <b>Comments:</b> Any one or equivalent.	[1]
	c.	i. Mass of boiled egg / Volume of enzyme solution /Concentration of enzyme solution / Surface area to volume ratio of lump / Lump of egg must be fully submerged in enzyme solution  <b>Comments:</b> Any two or equivalent.	[1] [1]

		ii. <b>Longer times</b> but <b>same pattern</b>	[1] [1]
		iii. The <b>lump has a smaller surface area exposed for enzyme activity</b> . Thus, the reaction takes longer to go colourless. However, <b>the different temperatures affect the enzyme in the same way as in the first set of results</b> ... hence the same pattern.	[1] [1]
<b>TOTAL: 15 marks</b>			

3.	a.	i. All three are <b>blood vessels</b> .	[1/2]
		Capillaries are <b>very narrow</b> and just <b>one cell thick</b> .	[1/2] [1/2]
		They <b>allow the diffusion to take place</b> between the <b>blood and the tissue fluid</b> that bathes the cells.	[1/2] [1/2]
		Veins have <b>thicker walls</b> and a <b>wider lumen</b> .	[1/2] [1/2]
		The blood flowing through them <b>returns to the heart</b> at a <b>low pressure</b> ,	[1/2] [1/2]
		so the presence of <b>valves prevents its backflow</b> .	[1/2]
		Arteries have <b>very thick walls</b> and a <b>very narrow lumen</b> .	[1/2] [1/2]
		The blood flows through them <b>from the heart</b> at a <b>very high pressure</b> .	[1/2] [1/2]
		<b>Comments:</b> Accept well annotated diagrams with the above highlighted characteristics.	
		Lymph is <b>found in the lymphatic vessels</b> . It <b>contains fats</b> absorbed into the lacteals of the villi in the intestine.	[1/2] [1/2]
		Tissue fluid is found in the <b>spaces between cells</b> . It <b>does not contain fats</b> .	[1/2] [1/2]

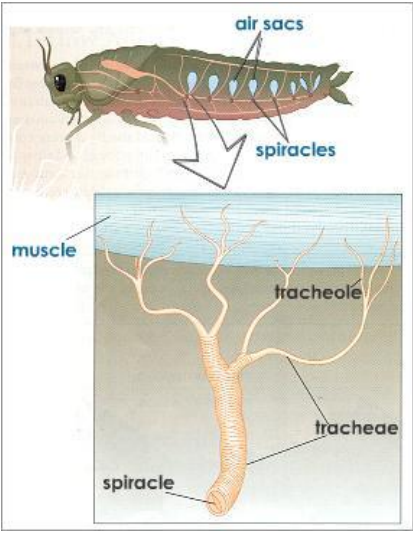
	b.	Cigarette smoke causes the <b>airways to produce more mucus</b> . This causes the smoker to suffer from a <b>persistent cough</b> , leading to emphysema, which refers to the <b>reduction of surface area available for gas exchange</b> due to the <b>weakening and bursting of alveoli</b> . The smoker also suffers from <b>shortness of breath</b> .	[1] [1] [1] [1]
			<b>TOTAL: 15 marks</b>

4.	a.	i. Mass excreted is equivalent to the mass found in urine. So, mass excreted = amount filtered – amount reabsorbed = 53 – 28 = 25 g	[1]
		ii. 537 g of sodium are reabsorbed from 540 g which are filtered.  % Sodium reabsorbed = $537/540 \times 100$ = 99.44 = 99.4%	[1] Working [1] Correct answer
	b.	i. Liver	[1]
		ii. <b>Extra proteins taken up in the diet</b> are deaminated because <b>they cannot be stored in the body</b> .	[1] [1]
	c.	i. reabsorbed – 180 g excreted – 0 g	[1] [1]
		ii. Glucose is <b>soluble and small enough to pass from the glomerulus and into the Bowman’s capsule during the process of ultrafiltration</b> . Since this is a <b>useful substance for the body</b> , it is reabsorbed back into the bloodstream when passing through the <b>first convolution</b> of the nephron.	[1/2] [1/2] [1/2] [1/2]
		iii. In a diabetic person, the <b>glucose is not reabsorbed back from the glomerular filtrate</b> . So, <b>it is lost from the body in the urine</b> .	[1/2] [1/2]
	d.	i. Homeostasis is the maintenance of a constant internal environment. Osmoregulation is the control of water levels and mineral ions in the blood.	[1] [1]



	ii. Because of osmoregulation, animal like organisms manage to survive in situations where their cells are surrounded by solutions of higher water potential.	[1/2]
	An uncontrolled inflow of water would cause animal cells to burst since they do not possess a cell wall.	[1/2]
	An <i>Amoeba</i> has a contractile vacuole which fills up with the inflowing water and expels it on the outside when full up.	[1/2]
	A human being has a kidney which removes the excess water from the blood and expels it in the urine.	[1/2]
<b>TOTAL: 15 marks</b>		

5.	a.	<p>The leaf:</p> <ul style="list-style-type: none"> <li>• has a <b>flattened shape – larger surface area to trap sunlight.</b> [1]</li> <li>• is <b>thin – shorter diffusion distances</b> for carbon dioxide to enter and oxygen to leave the leaf. [1]</li> <li>• has <b>stomata – pores which can open to allow the exchange of gases.</b> [1]</li> <li>• has <b>internal air spaces in the mesophyll layer – facilitates the uptake of carbon dioxide.</b> [1]</li> <li>• has <b>more chloroplasts in the palisade cells than in the cells of the spongy mesophyll – the palisade are situated closer to the upper epidermis and so are more likely to trap sunlight.</b></li> </ul> <p><b>Comments:</b> Any two or equivalent adaptations with corresponding explanation.</p>	
	b.	<p>Destarched means that a plant is made to <b>use up all its starch reserves.</b> [1]</p> <p>This is done by <b>leaving the plant in the dark</b> for a long time so that <b>photosynthesis cannot take place.</b> [1/2]</p>	[1/2]
	c.	i. Respiration	[1]
		<p>ii. <b>Respiration rate, unlike that of photosynthesis, is not affected by light intensity.</b> [1]</p> <p>As a result, when the <b>rate of photosynthesis is higher than that of respiration</b> (noon) – <b>carbon dioxide enters leaf and oxygen exits.</b> [1/2]</p> <p>When <b>rate of respiration is higher than that of photosynthesis</b> (night time) – <b>oxygen enters leaf and carbon dioxide exits.</b> [1/2]</p>	[1/2]

d.	<p>i. Tracheal system</p>  <p>Insects breathe through spiracles (small holes in their abdomen). <b>Air enters through the spiracles and travels along a network of tubes called tracheae</b> to all parts of the body, <b>supplying the organs directly with air.</b></p> <p>The <b>tracheae branch repeatedly and end as very fine thin walled tubules called tracheoles</b> which <b>allow diffusion of oxygen and carbon dioxide into and out of the tissues.</b></p>	[1]
	<p>ii. Insects have a <b>relatively small surface area to volume ratio</b> when compared to an <i>Amoeba</i>.</p> <p>This implies that <b>diffusion all over the body surface of an insect, to absorb the required oxygen and remove the unwanted carbon dioxide, will not be as efficient as in an <i>Amoeba</i>.</b></p> <p>Hence the need for a specialised exchange surface as the tracheal system.</p>	[1] [1]
<b>TOTAL: 15 marks</b>		