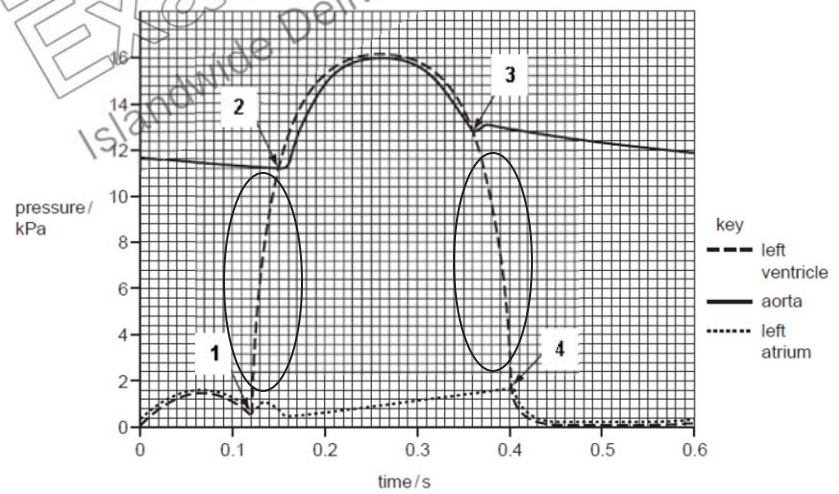
Answer Key (Prelim 2019 – 6093/02)

Paper 2 Section A: Answer all questions [50 marks]

1	**(a)(i)**	Transpiration is the loss of <u>water vapour</u> from the aerial parts of the plants through the <u>stomata of the leaves</u>.	[1m]
	(a)(ii)	• Temperature As the temperature during the drought is very high, there will be an increase in the rate of evaporation of water from the surfaces of the leaf. This increases the rate of transpiration. • Humidity As the humidity is very low, the water vapour concentration gradient between the surrounding air and the intercellular air space (in the leaf) is very high. Water vapour diffuses out of the leaf increasing the rate of transpiration. (light intensity and wind speed not accepted)	[2m] [2m]
	(a)(iii)	• Wilting will cause the leaves to droop/fold up, reducing the surface area exposed to sunlight. • Stomata size reduced • This helps the plant to reduce transpiration as the guard cells turn flaccid.	[2m]
	(b)	Photosynthesis	[1m]
	(c)	• From 1800 to 2000 hours, the uptake of oxygen is increasing as the rate of respiration in the plant is now higher • than the rate of photosynthesis as the light intensity of the surrounding decreases to zero at night.	[2m] **Total: 10**
2	**(a)(i)**	5 minutes	[1m]
	(a)(ii)	Anaerobic respiration	[1m]
	(a)(iii)	• Aerobic respiration is not able to meet the energy demands of the athlete. Muscles will respire aerobically and anaerobically to get more energy creating an <u>oxygen debt</u>. • Anaerobic respiration releases a <u>lactic acid</u> as a by-product. • The lactic acid produced caused the pH to decrease from <u>7.6 to 6.2 from 5 min to 20 min</u>.	[3m]
	(b)	glucose + oxygen → carbon dioxide + water + <u>large amounts of energy</u>	[1m]
	(c)(i)	• The oxygen enters the alveoli where it dissolves into the <u>thin film of moisture</u> lining the inner walls of the alveoli increasing the speed of diffusion. • The walls of the alveoli are <u>one-cell thick</u> which allows for rapid diffusion of dissolved oxygen into the red blood cells.	[2m]

	(c)(ii)	• Tar will paralyse the cilia causing a build-up of mucus which may result in bronchitis / frequent coughing. • The frequent coughing may cause emphysema where the walls of the alveoli are damaged reducing the surface area for gaseous exchange.	[2m] **Total: 10**
3	**(a)(i)**	A – Aorta B – Pulmonary vein	[2m]
	(a)(ii)	Deoxygenated and oxygenated returns to the right and left atrium from the body and lungs respectively. • During atrial systole, the higher pressure in the atriums compared to the ventricles causes the atrio-ventricular valves to open forcing blood into the ventricles. • During ventricular systole, the higher pressure in the ventricles compared to the atrium and arteries causes the semi-lunar valves to open and the atrio-ventricular valves to close creating the "lub" sound. • As the blood is pumped to the lungs and rest of the body, the higher pressure of the aorta and pulmonary artery will cause the semi-lunar valves to close to prevent backflow of blood. This will create the softer "dub" sound. (1m awarded for stating when the "lub" and "dub" sound is produced)	[1m] [1m] [1m] [1m]
	(a)(iii)	• The hole in the median septum will cause the oxygenated blood in the left side of the heart to mix with the deoxygenated blood in the right side of the heart. • This will result in less oxygen transported in the blood around the body. Hence, he will be unable to participate in any strenuous activities.	[2m]
	(b)(i)	 2 correct circles required for full marks	[1m]
	(b)(ii)	60 / 0.8 = 75	[1m]
	(c)(i)	Vein	[1m]

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>(c)(ii)</td><td>Y has thinner <u>less muscular and elastic walls</u> compared to X.</td><td>[1m]

Total: 12</td></tr>
<tr><td>4</td><td>(a)</td><td>H – Efferent arteriole
I – Glomerulus
J – Afferent arteriole

1m for 1 correct
2m for all correct</td><td>[2m]</td></tr>
<tr><td></td><td>(b)</td><td>Red blood cell / Plasma proteins</td><td>[1m]</td></tr>
<tr><td></td><td>(c)(i)</td><td>Excretion is the process by which <u>metabolic waste products</u> and <u>toxic waste materials</u> are removed from the body.</td><td>[1m]</td></tr>
<tr><td></td><td>(c)(ii)</td><td>Ultrafiltration</td><td>[1m]</td></tr>
<tr><td></td><td>(d)</td><td>• Anti-diuretic hormone.
• It controls the <u>permeability</u> of the proximal convoluted tubule and the collecting duct to water for reabsorption.</td><td>[2m]</td></tr>
<tr><td></td><td>(e)</td><td><table><tr><td>Involve nerve impulses (electrical signals)</td><td>Involve hormones (chemical substances)</td></tr><tr><td>Impulse are transmitted by neurones</td><td>Hormones are transported by the blood</td></tr><tr><td>Quick response</td><td>Slow Response</td></tr><tr><td>Reponses are short-lived</td><td>Reponses may be short-lived or long-lived</td></tr><tr><td>May be voluntary or involuntary</td><td>Always involuntary</td></tr><tr><td>Tend o affect one target organ</td><td>Tend to affect more than one target organ</td></tr></table>Any 2 suitable comparison</td><td>[2m]

Total: 9</td></tr>
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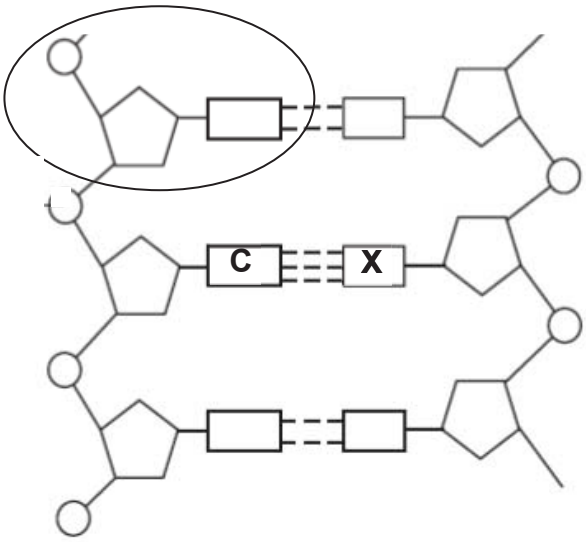
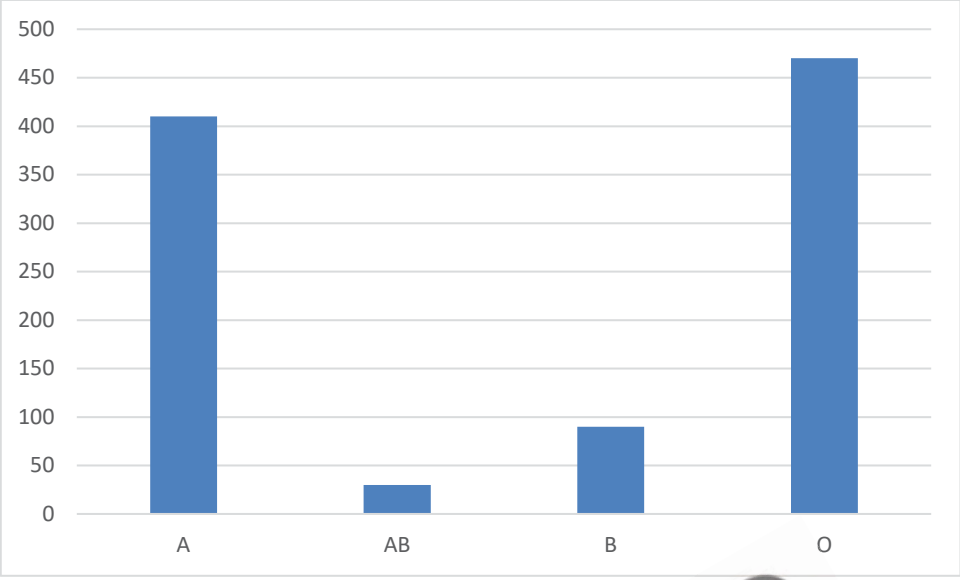
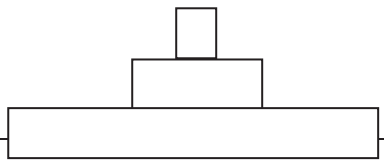
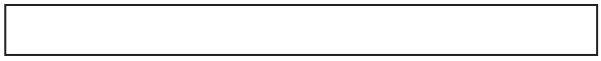
5	**(a)(i)**		[1m]
	(a)(ii)	Guanine	[1m]
	(a)(iii)	• A gene is made up of a specific sequence of nucleotides that code for a particular polypeptide. • A chromosome contains many genes / DNA organises into many chromosomes within the nucleus / Each molecule of DNA is a chromosome.	[2m]
	(b)	• Use a restriction enzyme to cut out the insulin gene from a human chromosome. Sticky ends will be produced. • Using the same restriction enzyme, cut the plasmid from a bacterium • to produce complementary sticky ends. • Combine the insulin gene with the plasmid using DNA ligase to produce a recombinant plasmid. • Use heat or electric shock to insert the recombinant plasmid into *E.coli* bacteria and culture the bacteria for commercial production of insulin.	[5m] **Total: 9**

Paper 2 Section B: Answer all questions [30 marks]

6	**(a)(i)**	Number of people	[3m]

		 Blood Group - Clean, clear bars drawn/point plotted correctly - Correct axis labels - Appropriate scale	
	(b)	- Discontinuous variation - There are a few clear-cut phenotypes / genes do not show additive effect.	[2m]
	(a)	B or O	[1m]
	(b)	Allele of blood group A = I^A Allele of blood group B = I^B Allele of blood group O = I^O Parental phenotype – blood group A : blood group B Parental genotype - I^AI^O : I^BI^O Gametes - I^A I^O ; I^B I^O (with circles) Crossing over F1 genotype - I^AI^B / I^AI^O / I^BI^O / I^OI^O F1 phenotype - AB / A / B/ O Ratio - 1 : 1 : 1 : 1 Probability = 0.25 or 1/4	[1m] [1m] [1m] [1m]
	(a)	B or O	[1m] **Total: 10**
7	**(a)(i)**		[2m]

		 1m for correct pyramid shape 1m for correct trophic levels with labels • water plant > tadpole > small fish > kingfisher • water plant > water beetle > frog > kingfisher • water plant > water beetle > snail > kingfisher (any 1)	
	(a)(ii)	<table><tr><th>statement</th><th>number</th></tr><tr><td>the number of producers</td><td>1</td></tr><tr><td>the number of consumers</td><td>6</td></tr><tr><td>the number of food chains</td><td>3</td></tr></table> All correct for 1m	[1m]
	(b)	• A carbon sink is an area that stores carbon compounds for an indefinite period of time. It stores more carbon than it releases. • Carbon dioxide that dissolves in the oceans are absorbed by phytoplankton during photosynthesis. • Some of the carbon compounds found in oceans is buried under the seabed as fossil fuels.	[3m]
	(c)	• Excess DDT used by farmers might have washed into nearby river. DDT is <u>non-biodegradable</u> and not easily <u>excreted</u> by the cells in the body. • The microscopic algae absorb the DDT which accumulates in their bodies. • As we move up the trophic levels, bio-accumulation occurs as DDT concentration increases in the bodies of the animals • Bio-amplification occurs as the concentration of DDT in top-level predators may reach lethal levels.	[4m] **Total: 10**
8	**Either** **(a)**	• Asexual reproduction does not involve the fusion of gametes while the fusion of gametes occurs in sexual reproduction. • Only one parent is need in asexual reproduction compared to one or two parents in sexual reproduction. • Offspring are genetically identical in asexual reproduction while they are genetically different in sexual reproduction. • Asexual reproduction is a quicker method of reproduction compared to sexual reproduction. • Asexual reproduction produces a larger number of offspring than sexual reproduction. (any 4)	[4m]
	(b)	• Large petals to attract insects to land • Small, compact stigma that do not protrude out of the flower.	[2m]

		➢ Insects will help transfer pollen grains onto the stigma as they enter the flower to collect nectar.	
	(c)	• The mature stigma secretes a <u>sugary fluid</u> that stimulates germination of the pollen grain. • A pollen tube grows out of the pollen grain transporting the male gametes <u>down the style</u>. • The pollen tube secretes <u>enzymes</u> to digest the tissues of the stigma and style as it grows towards the ovule. • The pollen tube enters the <u>ovule through the micropyle</u>, releasing the male gametes to fuse with the female gametes for fertilisation.	[4m] **Total: 10**
8	**Or** **(a)**	• During the menstrual flow stage (day 1 to day 5), the levels of oestrogen and progesterone are very low. <u>Menstruation</u> occurs. • During the <u>follicle stage</u> (day 6 to day 13), the follicle cells begins to produce oestrogen which causes the repair and growth of the uterine lining. • During the <u>corpus luteum stage</u> (day 16 to day 28), the corpus luteum will secrete progesterone and some oestrogen. The progesterone maintains and further thickens the uterine lining, building up more blood capillaries. • If no fertilisation occurs, the corpus luteum breaks down and the levels of oestrogen and progesterone decreases causing menstruation to occur again. • If fertilisation occurs, the corpus luteum will not degenerate and continue to produce both hormones until the placenta is fully developed and takes over.	[1m] [1m] [1m] [1m] [1m]
	(b)	Placenta (A) • Separates the maternal blood from the foetal blood to protect it from the <u>high blood pressure</u>. • Prevents the <u>mixing of the mother's blood and the foetus's blood</u> as they may <u>agglutinate</u> if the blood groups are not compatible. • The maternal blood allows protective <u>antibodies</u> to <u>diffuse</u> from the mother's blood to the foetus's blood <u>protecting</u> it from certain <u>diseases</u>. • The placenta produces progesterone which maintains the uterine	[5m] **Total: 10**

		lining in a healthy state during pregnancy. (any 2) Amniotic Fluid (B) • Helps to protect the foetus from physical injury / shock absorber. Umbilical cord (C) • Umbilical arteries transport deoxygenated blood and metabolic wastes from the foetus to the placenta. • Umbilical veins transport oxygenated blood and nutrients from the placenta to the foetus.	