AHS 2021 Bio Paper 2
Prelim Exam Answers

<table>
<tr><td>1</td><td>(a)</td><td>(i)
(ii)</td><td>B
E</td><td>1
1</td></tr>
<tr><td></td><td>(b)</td><td colspan="2">Water/ urea/ glucose/ amino acids/ named ion e.g. Na^+</td><td>1</td></tr>
<tr><td></td><td>(c)</td><td colspan="2">H;

Cells are constantly carrying out <u>aerobic respiration</u> thus the concentration of oxygen is low and oxygen will diffuse into the cells.</td><td>1

1</td></tr>
<tr><td></td><td>(d)</td><td colspan="2">Blood flows through a <u>partially permeable</u> dialysis tubing bathed in dialysis fluid;

The dialysis fluid contains no <u>urea</u>, to ensure that urea will diffuse out of the blood into the fluid;

Fluid contains useful substances like glucose/ amino acids/ salts (any two excluding water, which cannot be described using “concentration”) at concentrations similar to those of a healthy person, to prevent these from diffusing out of the blood;

While excess salts and water move out by diffusion and osmosis respectively;

Molecules like proteins, platelets and blood cells (any two) are too large to diffuse through the dialysis tubing;

(any 4, but must address both parts of the qtn)</td><td>1

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1</td></tr>
<tr><td>2</td><td>(a)</td><td>(i)</td><td><table><tr><th>letter on Fig. 2.1</th><th>name of blood vessel</th><th>oxygenated or deoxygenated blood</th></tr><tr><td>D</td><td>pulmonary vein</td><td>oxygenated</td></tr><tr><td>E</td><td>aorta</td><td>oxygenated</td></tr></table></td><td>1,1

1,1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td colspan="2">Has valves;
To <u>prevent backflow</u> such that blood flows in one direction back to the heart;
OR

Has a large lumen relative to the diameter of the entire vessel;
To reduce resistance to blood flow; OR

Less elastic/muscular walls (than arteries);
Enables vein to be squeezed by (surrounding skeletal) muscles to push the blood along</td><td>1
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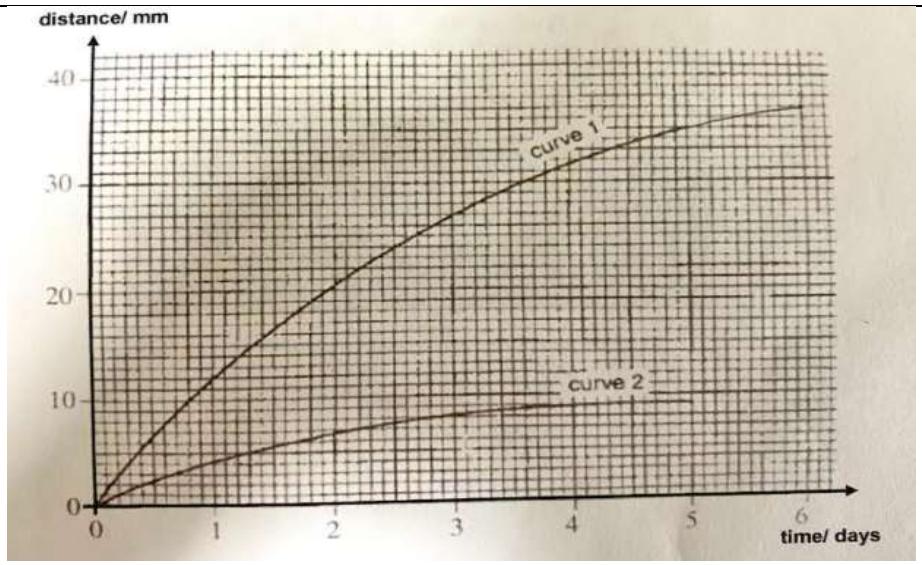
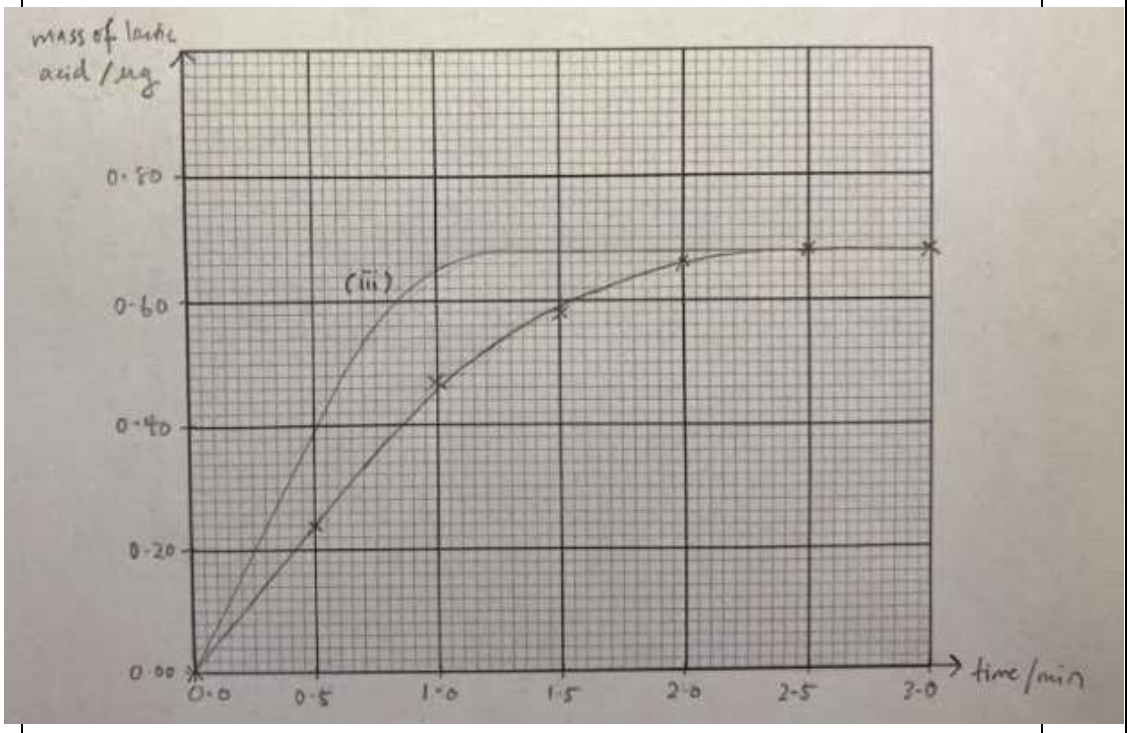
1</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td colspan="2">Percentage change = (135 – 181) / 181 x 100%
= - 25.4% (3 s.f.)</td><td>1
1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td colspan="2">Blood glucose conc. <u>above the norm</u> stimulated the <u>islets of Langerhans in the pancreas</u>;</td><td>1</td></tr>
</table>

			Which released <u>more</u> insulin into the bloodstream; Stimulating the conversion of <u>excess</u> glucose into glycogen in the liver	1 1
3	(a)	(i)	Guard cells	1
		(ii)	Carbon dioxide <u>diffuses</u> through the <u>stomata;</u> into the <u>intercellular air spaces</u>; <u>Dissolves</u> in the <u>thin film of moisture</u> on the (spongy/palisade) mesophyll cells; <u>Diffuses</u> into chloroplast of mesophyll cell;	1 1 1 1
	(b)	(i)	Carbon dioxide + Water $\xrightarrow[\text{Chlorophyll}]{\text{Light}}$ Glucose + Oxygen	1
		(ii)	Accept between 0600 to 0624	1
		(iii)	Carbon dioxide concentration/ temperature/ concentration of chlorophyll within the plant	1
		(iv)	Rate of aerobic respiration was equal to the rate of photosynthesis; OR Any carbon dioxide produced during aerobic respiration was taken up by the plant for photosynthesis	1
		(v)	So that rate of photosynthesis is greater than rate of respiration/ glucose produced by the plant is not all used up in respiration; This ensures that there is surplus glucose/ food to be used to build new protoplasm/ some specific fate of glucose contributing to increase in mass described	1 1
4	(a)	(i)	Movement of sucrose and amino acids through the phloem from leaves to all parts of the plant.	1
		(ii)	Phloem	1
	(b)	(i)	Curve 2	1
		(ii)	Smooth curve continuing from day 5 to day 6 i.e.:	1

			 Correct calculation made based on student's graph (e.g. 37 – 35 = 2 mm)	1
		(iii)	Explain transpiration: Water constantly evaporates from the mesophyll cells in the leaf into the intercellular air spaces; before diffusing out of the leaf as water vapour; Explain transpiration pull; The decrease in water potential in the mesophyll cells causes water to be drawn out of the xylem by osmosis; Creating a suction force that pulls water up as a continuous column	1 1 1 1
5	(a)		X: stigma Y: ovule	1 1
	(b)		Bee lands on the petal on flower S and moves in to collect <u>nectar</u>; in the process, pollen on anthers are brushed onto hairy back of insect; as bee moves into flower T, its back brushes against the <u>sticky stigma</u>, causing pollen to be transferred first point described at least once, for either flower; clear reference to pollen from S being transferred to stigma on T	1 1 1
	(c)		Parental phenotype: Dominant x Dominant Parental genotype: Rr x Rr Gametes: (R) (r) x (R) (r) Random fertilization	1 1

		F_1 genotype: RR Rr Rr rr F_1 phenotype: Dominant Dominant Dominant Recessive		1
		F_1 phenotypic ratio: 3 dominant : 1 recessive		1
	(d)	(i)	Z, W, Y, X	1
6	(a)	(i)		
		(ii)	All the substrate has been converted to products.	1
		(iii)	Graph with steeper gradient; levels off at same height as first graph; **labelled clearly**	1
		(iv)	At higher temperature, <u>enzyme and substrate have higher kinetic energy</u>; This i<u>ncreases the frequency of collisions</u> between enzyme and substrate to <u>form enzyme-substrate complexes more quickly</u>, hence the rate of reaction is higher.	1 1
	(b)	Genotype refers to the genetic makeup of the organism while phenotype refers to the observable trait; An individual with <u>two</u> copies of the recessive allele/ is <u>homozygous recessive</u> with respect to the LDHA gene (genotype) will exhibit fatigue, muscle pain and cramps during exercise (phenotype)		1 1

7	(a)	At the placenta, nutrients (e.g. glucose and amino acids) and oxygen diffuse from mother's blood to foetus' blood (at least two useful substances mentioned); Nutrients used for growth; Oxygen to enable aerobic respiration in fetus to release energy for growth; These are transported by the umbilical cord to the foetus; Antibodies are also transported across the placenta to protect foetus against diseases; Amniotic fluid is incompressible and therefore helps to protect foetus against physical injury/ acts as a shock absorber Also accept, if link to "nourished and protected" is explained clearly: metabolic wastes diffuse across placenta from foetus' blood to mother's blood to be excreted, preventing the build-up of toxic waste products in the foetus; Placenta produces progesterone to maintain the uterine lining to ensure foetus remains connected to mother to continue to receive nutrients for growth	1 1 1 1 1 1 1 Any 5
	(b)	Transmission of hormones in the blood is slower than the transmission of nerve impulses through neurones; hence nervous control allows a faster/immediate response to the source of danger/ provides effective protection	1 1
	(c)	Is a depressant which slows down brain functions, resulting in Slower reaction time/ increases reaction time; Poor muscle coordination/ slurred speech/ blurred vision; May lead to reduced self-control;	Any 2
8E	(a)	Gland cells in the trachea (A) produce mucus to trap dust and bacteria particles; Cilia on the epithelial cells then sweep the mucus with trapped particles upwards away from the lungs; C-shaped cartilage keep the trachea open by providing structural support, to allow air to pass through; (MAX 2 for trachea) Thin film of moisture (B) dissolves the oxygen gas so that it can diffuse into the blood plasma; Wall of alveolus (C) is one-cell thick, to shorten the diffusion distance for oxygen to travel to the blood capillary; Red blood cell (D) contains haemoglobin to bind to the oxygen to transport it to body cells.	1 1 1 1 1 1

	(b)		

Feature of comparison	Gaseous exchange	Aerobic respiration
Location	Occurs between the alveoli and blood capillaries	Occurs in (the mitochondria of) body cells
Type of process	It is a physical process whereby oxygen diffuses from the alveolus into the blood capillaries, while carbon dioxide diffuses in the opposite direction	It is a chemical process whereby glucose is oxidised in the presence of oxygen to release energy, and carbon dioxide and water are produced

1

1

	(c)	Breathing rate increases to increase rate of uptake of oxygen;	1
		To increase rate of aerobic respiration to release more energy;	1
		To support vigorously contracting muscles	1
8O	(a)	Males have a higher death rate from heart disease compared to females;	1
		African Americans have the highest death rate from heart disease, followed by whites and then other races;	1
		There may be a higher proportion of males who smoke compared to females;	Any 3 VP
		There may be a genetic factor that increases the risk of heart disease in males or African Americans compared to females/ other races;	
		Reference to African Americans having a diet <u>higher in saturated fats and cholesterol</u> / less regular exercise / more stressful lifestyle;	
		Must have least 1 reason to account for difference in gender and race respectively.	
	(b)	Used to synthesise plasma proteins;	Any 2
		<u>Excess</u> amino acids deaminated to form urea;	
		Used to synthesise new protoplasm for growth;	
		Used to make enzymes in the liver; AVP	
	(c)	<u>Gene</u> for insulin;	1
		Contains a specific <u>sequence of nucleotides</u>;	1
		To code for a specific sequence of amino acids to be joined together to form a polypeptide, which coils to form insulin	1