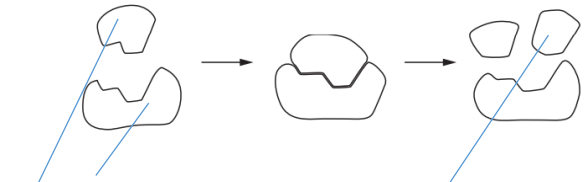
Ans: 2024 Secondary 4 Science Bio 5088 Prelim Paper 4

Qn	Ans	Marks	Remarks	LO
1a	for absorption + (become soluble) + small enough, for diffusion / active transport ;	1		4 (a) describe the functions of the various parts of the digestive system: mouth, salivary glands, oesophagus, stomach, duodenum, pancreas, gall bladder, liver, ileum, colon, rectum, anus, in relation to ingestion, digestion, absorption, assimilation and egestion of food, as appropriate
1bi	 Enzyme – protease / pepsin Substrate – protein Product – polypeptides	1	R product as amino acids R substrate as polypeptide	4 (b) describe the functions of enzymes (e.g. amylase, maltase, protease, lipase) in digestion, listing the substrates and end-products
1bii	**1 Biological catalyst +speed up rate of reaction**; 2 without being chemically unchanged; 3 can be reused; 4 Provide alternative pathway with lower activation energy;	2	1 must be in answer	3 (d) explain the mode of action of enzymes in terms of an active site, enzyme-substrate complex and enzyme specificity using the 'lock and key' hypothesis

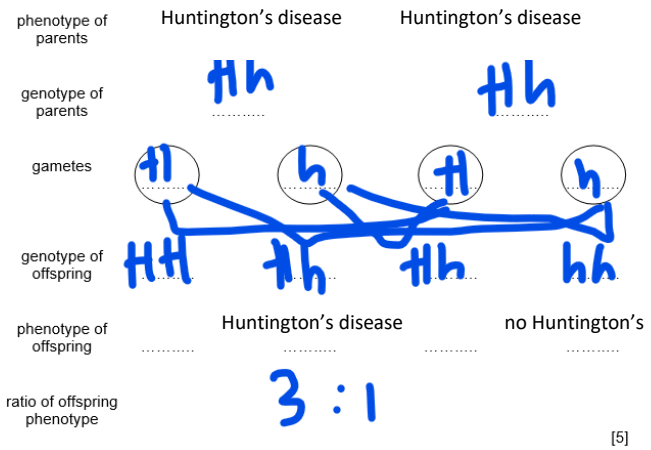
1ci	Lipase	1		4 (b) describe the functions of enzymes (e.g. amylase, maltase, protease, lipase) in digestion, listing the substrates and end-products
1cii	any two from: enzymes are specific OR idea of, one type removes protein and one removes fats / AW ; protein (stains/substrate) will not fit into the active site of lipase / AW ora ; enzyme and substrate have complementary shapes ;	2		3 (d) explain the mode of action of enzymes in terms of an active site, enzyme-substrate complex and enzyme specificity using the 'lock and key' hypothesis
1ciii	compare with tubes A, B and C to assess effect of lipase and / or bile + quote time taken to turn colourless bile, does not (chemically) digest fats / does not make solution acidic ; lipase / enzyme, is required (for breakdown of fats in milk) ; bile help speed up digestion of fats + emulsify fats;	3		4(b) describe the functions of enzymes (e.g. amylase, maltase, protease, lipase) in digestion, listing the substrates and end-products 4 (d) state the role of the liver in: • fat digestion
	Total	**10m**		

2a	1.25 – 1.32 / 1.32 *100% = -5.3	1	R if not in one DP Ig if no working shown but warn students	3. manipulate numerical and other data; Calculate is used when a numerical answer is required. In general, working should be shown, especially where two or more steps are involved.
2bi	1m scale 1m plot 1m best fit	3	See last page	(in words or by using symbolic, graphical and numerical forms of presentation) to translate information from one form to another.
2bii	0.44 / mol dm^{-3}; where graph intersects X-axis	1		
2c	potato (cube) in 0.8 (mol dm^{-3} solution) loses (percentage) mass / ora + potato in 0.4 mol dm^{-3} solution gain mass/ora + quote data; water molecules moves from an area of **high water potential** to an area of low water potential / AW + **osmosis**; water potential of 0.8 (mol dm^{-3} solution) is lower than potato cell + the water potential of the 0.4 (mol dm^{-3} solution) is higher than potato cell; movement of **water molecules** out / loss of water / into cell/gain water + cause of mass loss/gain;	3		2 (b) define osmosis, investigate and describe the effects of osmosis on plant and animal tissues
2d	The cell from a potato cube will be turgid + red blood cell burst;	2		2(b) define osmosis, investigate and describe the effects of osmosis on plant and animal tissues

	Red blood cell no cell wall to maintain shape of cell + rigid structure + prevent cell from bursting			
	Total	**10m**		
3ai	A Pulmonary arteries D (Inferior) Vena cava	2		5 (a) identify the main blood vessels to and from the heart, lungs, liver and kidney
3aii	Left ventricle	1		5 (d) describe the structure and function of the heart in terms of muscular contraction and the working of valves (histology of the heart muscle, names of nerves and transmitter substances are not required)
3aiii	Pump blood to all parts of body through the (aorta); Generate force for blood + greatest distance	2		
3aiv	Semi-lunar valve; Prevent backflow of blood + ensure blood flows from right ventricle to pulmonary arteries	2	Allow ecf for wrong vessel	
3bi	1 0 to 2 minutes pH decreases from 7.07 to 6.55 during vigorous exercise 2 anaerobic respiration + lactic acid production +extra energy required for vigorous exercise 3 After vigorous exercise + pH increases from 6.55 to 7.07 from 2 to 40 min 4 oxygen debt + time taken for lactic acid to be transported to liver	**2**	Students to quote figures 1 and 2 to get 1m 3 and 4 to get 1m	6 (f) explain why cells respire anaerobically during vigorous exercise resulting in an oxygen debt that is removed by rapid, deep breathing after exercise
3bii	Longer time taken for pH to increase back to 7.07/ ora; Lower pH reached during the 2 minutes; AVP	**3**		6 (f) explain why cells respire anaerobically during vigorous exercise resulting in an oxygen debt that is

	Less blood is sent to the lungs to be oxygenated; Less oxygenated blood sent to all parts of body for vigorous exercise; More anaerobic respiration + more lactic acid produced; Longer time required to repay oxygen debt			removed by rapid, deep breathing after exercise
	Total	**12m**		
4a	A Palisade mesophyll B Spongy mesophyll C Intercellular air space	3		8 (a) identify the cellular and tissue structure of a dicotyledonous leaf, as seen in transverse section using the light microscope and describe the significance of these features in terms of their functions, such as the • distribution of chloroplasts for photosynthesis • stomata and mesophyll cells for gaseous exchange • vascular bundles for transport
4b	any 2 from: many (air spaces) / large (air spaces) ; reduces density (of the leaf) ; allowing it to float / be on water / be near surface of water ; (so) accessible, to light / carbon dioxide / gas exchange / AW, for photosynthesis ;)	2		
4ci	Guard cells	1		
4cii	comparison - max 1 from: 1 water lily has more stomata on upper epidermis than tomato ; ORA 2 water lily has more stomata (per mm2) than tomato ; ORA	2		

	any use of comparative manipulated figures from table including unit (at least once in the answer) ; explanation: 3 idea that tomato needs to reduce, water loss / transpiration / evaporation ; 4 water lily (floats on water so) only upper surface is exposed to air ; 5 (water lily has large number of stomata) as water does not need to be conserved ;			
	Total	**8m**		
5a	Carnivore – 3 Consumer – 6 Herbivore – 3 Producer -1	**2m**	2 correct 1 m	9 (b) describe the roles of producers, consumers and decomposers in food chains and food webs
5b	Dogwhelks will decrease as there would be more competition for limpets as food; Algae – increase as less limpet will consume the algae	**2m**		9 (b) describe the roles of producers, consumers and decomposers in food chains and food webs
5c	Decomposers	**1**		9 (b) describe the roles of producers, consumers and decomposers in food chains and food webs
	Total	**5m**		

6ai	2	**1**		
6aii	Individual 1 and 2 give birth to offspring 5 who do not have the disease; This means that Individual 1 and 2 are heterozygous; They display the trait though they are heterozygous;	**2**		12 (c) explain the terms dominant, recessive, homozygous, heterozygous, phenotype and genotype
6aiii	 [5]	**5**	1m phenotype + genotype of parents 1m gametes 1m correct cross 1m genotype of offspring + phenotype of offspring of offspring 1m ratio	12 (f) use genetic diagrams to solve problems involving monohybrid inheritance
6bi	Gene is a unit of unit of inheritance made up a sequence of nucleotide that codes for polypeptides	**1**		10 (d) state that each gene: • is a sequence of nucleotides, as part of a DNA molecule

				• codes for one polypeptide • is a unit of inheritance
6bii	XX and XY	**1**		12 (g) describe the determination of sex in humans – XX and XY chromosomes
	Total	**10m**		
7a	any three from: daily doses / use (of erythromycin), peak, 1989 / at 2.8 doses per 1000 people ; (bacterial) infections (resistant to erythromycin) peak, in 1993 / at 180 bacterial infections per 1000 people ; no record of resistant infections, until 1991 / from 1983 to 1989 / first 6 years ; daily doses of erythromycin increases from 1983 to 1989 from 2.3 to 2.8 doses per 1000 people and decreases from 2.0 to 0.5 doses per 1000 people from 1991 to 1995; delay (of 4 years) between peak of doses and peak of (resistant) infections;	**3**		use information to identify patterns, report trends and draw inferences;
7b	any two from: 1 fewer doses of erythromycin used ;	**2**	MP3 examples: only giving	use information to identify patterns, report trends and draw inferences;

	2 development of new, antibiotics / treatments / vaccines ; 3 any example that would cause a reduced usage of antibiotics ;; 4 more, awareness / education about, overuse of antibiotics / antibiotic resistance ; 5 improved, detection / screening (of pathogens to avoid spread) ; 6 ref to improved, cleanliness / hygiene or more people vaccinated / population has reached herd immunity ; 7 Isolating infected individuals ;		antibiotics when essential do not use antibiotics for viral infections	present reasoned explanations for phenomena, patterns and relationships; make predictions and propose hypotheses;
7c	ref to (random) mutations occur (in some of the bacteria) + (genetic) variation (in ability of bacteria to survive antibiotic treatment) ; bacteria with (antibiotic) resistance, survive / reproduce ; ora + pass on resistant, gene / allele (to offspring / other bacteria) ; increase in frequency of resistant, allele / gene (in the population) ;	**3**		7 (g) explain that the misuse and overuse of antibiotics may accelerate the emergence of antibiotic-resistant bacteria

	ref to natural selection / become (better) adapted (for the new environment) ; AVP ;			
7d	1 store food, in the fridge / freezer / at less than 5.2 °C 2 cook food at, high temperature / (least) 75 °C ; 3 cook food for, the recommended length of time / 10 minutes ; 4 do not keep food warm for a long time before eating it ; 5 wash hands (before preparing food) ; 6 use, filtered / boiled, water (for cooking) ; 7 washing cooking, utensils / surfaces ; 8 cover food / named method to prevent cross contamination ; 9 ref. to waste (food) disposal ;/ AVP Explain 11 ensure that bacteria cannot reproduce 12 ensure that bacteria are not transmitted via fecal material	**2**	Suggested ways must match explanation At least 2 ways and 2 explanation	7(b) explain that infectious diseases are caused by pathogens such as bacteria and viruses and can be spread from person to person through body fluids, food and water (knowledge of the structure of bacteria and viruses is not required)
	Total	**10m**		

8ai	hormone as a chemical substance + produced by a gland + carried by the blood + which alters the activity of one or more specific target organs	**1**		4(e) define a hormone as a chemical substance, produced by a gland, carried by the blood, which alters the activity of one or more specific target organs
8aii	QF – Day 0 to Day 5+ uterine lining decrease in thickness + menstruation+ oestrogen and progesterone level is low; From day 10 to Day 16+ oestrogen level increase + repair uterine lining; Day 16 to Day 30 + uterine lining thickens + progesterone level increases to repair and maintain the uterine lining	**3**	Student need to identify that it is a 30 day cycle and not 28 days both hormones must be identified correctly	11 (d) outline the menstrual cycle with reference to the alternation of menstruation and ovulation, the natural variation in its length, and the fertile and infertile phases of the cycle with reference to the effects of progesterone and oestrogen only
8b	Insulin + blood glucose level increase above normal + to decrease blood glucose level back to normal; Increase cell permeability to glucose + causes liver and muscle cells to convert more glucose to glycogen; Glucagon + blood glucose level decrease below normal + to increase blood glucose level back to normal;	**4**		4(f) outline how blood glucose concentration is regulated by insulin and glucagon

	Liver and muscle cells convert glycogen to glucose			
8c	Hormones are a type of protein; DNA carry genetic code + code for specific polypeptide + Polypeptide forms protein; Specific DNA sequence will code for specific polypeptide for different protein	**2**		10 (e) state that DNA is used to carry the genetic code, which is used to synthesise specific polypeptides (details of transcription and translation are not required)
	Total	**10m**		

(b) (i) Using the information in Table 2.1, plot a graph to show the percentage change in mass of potato at different sucrose solutions in Fig. 2.1 below. [1]

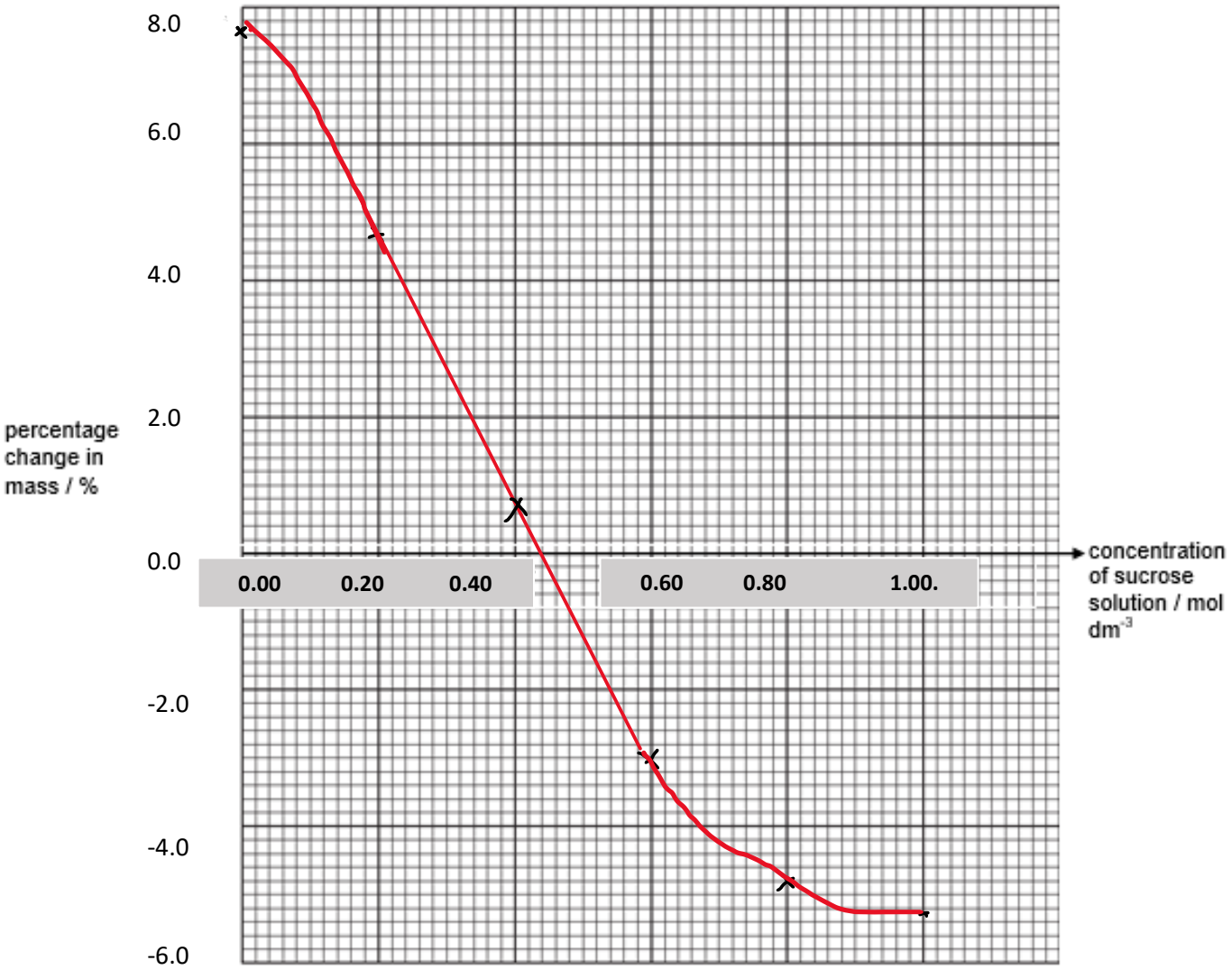


Fig. 2.1

[3]