KUO CHUAN PRESBYTERIAN SECONDARY SCHOOL
Sec 4 Express / Sec 4 Normal Academic (SBB)
Biology (5088)
Prelim Examination / 2024

Marking Scheme

Important Note:

1. Mark only answers clearly written in black or blue ink.

Section A – Multiple Choice Questions [20 marks] – Using OTAS

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	D	B	D	A	C	A	B	C	B

Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
D	C	D	B	A	C	A	B	D	C

SECTION A [55 marks]

1	(a)	A: starch B: (salivary) amylase 2 correct for 1 mark.	1
	(b)	1. 1 mark for correct drawing of enzyme-substrate complex and maltose 2. 1 mark for correct labelling of enzyme-substrate complex, amylase and maltose.	2
	(c)	solution with substrate A: remains blue solution with final products: brick-red / orange / yellow / green ppt 2 correct for 1 mark.	1
			Total: 4

2	(a)(i)	A: oesophagus B: small intestine C: large intestine D: rectum Any 2 – 1m	2
	(a)(ii)	B / C.	1
	(b) (i)	Any 1 point: 1. stimulates the conversion of excess glucose to glycogen in the liver / muscles 2. increased uptake of glucose by cells 3. increase permeability of cell membranes to glucose	1
	(b) (ii)	Blood glucose concentration will remain high for a longer period of time.	1
		Comments:	
		Total: 5	

3	(a)	coronary artery *[R: coronary heart artery]*	1
	(b)	Any one: high level of <u>stress</u> / <u>smoking</u> / <u>lack of exercise</u> / old age / <u>obesity</u> / genetics Reject: diet high in cholesterol/saturated fats	1
	(c)(i)	**<u>1 point for 1m</u>** 1. less oxygenated blood and **<u>glucose</u>** (nutrients) is pumped to heart muscles/tissues *[R: heart]* 2. less/no aerobic respiration/more anaerobic respiration	1 1 1

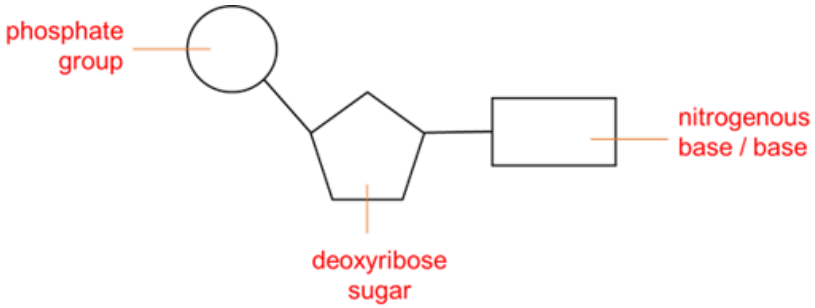
		3. less/no energy released *[R: produced]* 4. less/no contraction/pump of heart muscle to pump blood (out of aorta)/reduced pressure generated by heart muscle.	1
			Total: 6

4	(a)(i)	To absorb carbon dioxide gas.	1
	(a)(ii)	Maggots respire, taking in oxygen, thus volume of gas within capillary tube decreases, causing the droplet to move towards the left.	1
		Comments:	
	(b)(i)	1. During vigorous exercise, glycogen is converted to glucose as 2. glucose is needed to be oxidised via respiration to release energy for the muscle cells.	1 1
		Comments:	
	(b)(ii)	1. As muscles did not get enough oxygen to release energy the body needs, anaerobic respiration has occurred. 2. As anaerobic respiration happen, lactic acid, a by-product is produced and accumulated. Hence, the increase in concentration is observed.	1 1
			Total: 6

5	(a)(i)	Percentage change = (final – initial)/initial x 100% = (240-1400)/1400 x 100% = – 82.9% (3s.f.) Working – 1 mark, Final answer – 1 m (if didn't put (–), no 1m for final answer)	1 1

	(a)(ii)	**<u>Any 1 point 1m</u>** 1. Vaccine contains an agent that resembles the pathogen. 2. Vaccines stimulates WBC to produce antibodies. 3. The white blood cells remain in the blood and can produce antibodies to bind to actual virus faster, hence the decrease in the spread rate.	1 1 1
		1.	
	(b)	Virus.	1
		1.	
		Total: 6	

6	(a)	Eqn: carbon dioxide + water → oxygen + glucose Conditions: light and chlorophyll (on arrow)	1 1
	(b)	Light intensity.	1
	(c)(i)	When limiting factor stated in (b) increases after 15 arbituary units of light, rate of photosynthesis did not increase/ remains constant.	1
	(c)(ii)	carbon dioxide concentration Reject: Temperature/ water/ amount of photosynthetic pigment (chloropyll)	1
		Total: 5	

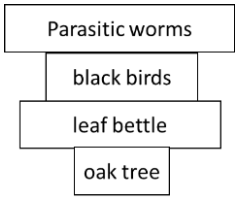
7	(a)	 1 mark for correct drawing 1 mark for correct labelling	2
	(b)	1. <u>No</u>, it is not DNA. 2. ratios of <u>adenine to thymine</u> and <u>C:G</u> are <u>not in a 1:1 ratio</u>. 3. This indicates that there is <u>no complementary base-pairing</u>. Hence, it is not DNA.	1 1 1
		Total: 5	

8	(a)	1. ***[S]*** *Appropriate **s**cale/reject odd scale – the scale used must allow the graph is occupy at least half of the graph paper* 2. ***[L]*** *Best-fit **l**ine – use a sharp pencil to draw a smooth line.* • *This mark is deducted if a messy line is drawn.* • *Some students also plotted the points but did not draw the graph.* • *No extrapolation of the line beyond the points.* 3. ***[A]*** *Correct **a**xes + units - [x-axis: day of menstrual cycle; y-axis: probability of pregnancy/%] – Please consult your teachers if you are not able to identify the X and the Y axis based on the question.* ***[P]*** *Correct plotting **p**oints – double-check your points to ensure that you get this easy mark.*	1 1 1 1
	(b)	1. The probability of pregnancy decreases from Day 16 to Day 28 as it is the **[Quote Date]** 2. Infertile period where the egg disintegrate after day 16.	1 1
		1.	
	(c)	1. progesterone level will remain high; 2. to maintain the thickness of the uterine lining	1 1
		Total: 8	

9	(a) (i)	Gene is a sequence of DNA nucleotides that controls the formation of a single polypeptide. Mutation is a change in the sequence of a gene or in the chromosome number.	1 1
		1.	
	(a) (ii)	Any one: 1. Albinism 2. Sickle cell anaemia	1
	(b)	1. Discontinuous variation. 2. There are no intermediates for the trait/ The phenotypes (traits) are distinct (clear-cut) / not affected by environmental changes (conditions) / controlled by one gene.	1 1
	(c) (i)	aa	1
	(c) (ii)	Genotype of parents: Aa x Aa Gametes: A, a, A, a **(circle gametes)** Genotypes of children: AA, Aa, Aa, aa Phenotypes of children: 3 achondroplasia, 1 normal bone growth *[R: female / male… as unable to determine from this cross]*	1 1 1 1
		Total: 10	

10	(a)	1. **A** (cuticle): transparent to allow light to pass through / waxy cuticle to prevent excessive water loss 2. **B** (palisade mesophyll): closely packed for maximum absorption of light / highest number of / numerous chloroplasts for maximum (more) absorption of light 3. **C** (intracellular air spaces): *interconnected* for rapid gaseous exchange eg carbon dioxide for photosynthesis or oxygen for respiration 4. **D** (stoma): *found in epidermal layer* to allow gaseous exchange eg entry of carbon dioxide used in photosynthesis or oxygen for respiration 5. **E** (chloroplasts): contain chlorophyll to trap (absorbs) light energy for photosynthesis Reject: store or trap carbon dioxide For **B** and **E**: needs to state eg of uses of the gases at least once to get full 2 marks	1 1 1 1 1
	(b)	1. Water molecules move from soil to the cell sap of the root hair cell via osmosis. 2. down a water potential gradient. 3. Water molecules move out of the cell sap of root hair cell (down a water potential gradient) to the surrounding cell sap of root cells (via osmosis). 4. The water moves towards the xylem vessels and is pulled up the xylem vessel via transpiration pull.	1 1 1 1

	(c)	Any one: 1. Stronger wind / Higher air movement 2. Higher temperature 3. Higher light intensity / more light 4. Lower humidity	1
		Total: 10	

11	(a)	Pyramid of numbers: 1. Shape of pyramid - more leaf beetle than oak tree 2. Shape of pyramid - more parasitic worms than blackbirds 3. Correct sequence of labelling (lower trophic level at bottom)  Pyramid of biomass: 4. Correct shape (upright pyramid) 5. Correct sequence of labelling (lower trophic level at bottom)	1 1 1 1 1
	(b)	Define carbon sink: 1. an area that stores carbon for a long period of time / stores more carbon than it releases Suggest how deforestation affects carbon cycle: 1. With less trees, less carbon dioxide is taken in from the environment for photosynthesis	1 1

		2. causing an increase in carbon dioxide concentration in the atmosphere. 3. The cutting of trees can also lead to decomposition of dead trees releases more carbon dioxide into the atmosphere. 4. Carbon dioxide is greenhouse gas and this will lead to global warming.	1 1 1
		Total: 10	