UNITY SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2023
Secondary 4 (Express)

Biology 6093

General notes

Symbols used in mark scheme and notes.

1. **;** separates points for the award of a mark
2. **/** separates alternatives for a marking point
3. **R** reject
4. **A** accept (for answers correctly cued by the question)
5. **Ig** ignore/irrelevant (for incorrect but irrelevant responses)
6. **AW** alternative wording (where responses vary more than usual)
7. **AVP** alternative valid point (where greater than usual variety of responses is expected)
8. **ORA** or reverse argument/reasoning
9. **OWTTE** or words to that effect
10. **( )** contents in brackets are not required to gain marks but should be implied
11. **underlined** words – actual word underlined must be used by students
12. **+** statements on both sides of the '+' are needed for that mark
13. **MP** mark point (numbered marking points to facilitate teaching and feedback for students)

Biology 6093/01 Multiple Choice

Qn	C^3R	Ans	Qn	C^3R	Ans	Qn	C^3R	Ans	Qn	C^3R	Ans
1.	KU B	D	**11.**	KU B	B	**21.**	HISP B	D	**31.**	KU B	A
2.	KU C	B	**12.**	KU B	C	**22.**	HISP B	B	**32.**	KU B	C
3.	KU C	A	**13.**	HISP B	A	**23.**	HISP B	C	**33.**	HISP A	D
4.	KU B	C	**14.**	KU B	A	**24.**	KU B	B	**34.**	KU B	A
5.	KU B	D	**15.**	KU B	B	**25.**	HISP A	C	**35.**	KU B	B
6.	KU B	C	**16.**	HISP B	D	**26.**	HISP A	D	**36.**	KU B	A
7.	KU B	D	**17.**	HISP B	C	**27.**	HISP B	D	**37.**	KU B	C
8.	KU C	D	**18.**	KU B	A	**28.**	KU B	C	**38.**	KU B	B
9.	KU B	B	**19.**	HISP B	C	**29.**	HISP B	C	**39.**	KU B	C
10.	KU B	B	**20.**	KU B	A	**30.**	KU B	B	**40.**	KU B	C

Biology 6093/02 – Structured and Free Response Questions

Question	C³R	Answer	Part Marks	Marker's Annotations
1a	HISP A	MP1. species **B** lost more water than species **A** in, either/ both, conditions/ ORA; MP2. both species lost more water in hot conditions than in cool/ ORA; MP3. the difference in water loss (in cool and hot temperature) was greater in species **A** compared to B/ ORA; MP4. ref data, comparison/ quote + units, for, cool/ hot;	max 3	Comparison qn – expected to use 'comparison words' and ref species + temp Different ways of saying the same point will not get additional marks MP4 - Repeated reference to data without comparison max 1m
1b	HISP A	MP1. one bar drawn on Fig. 1.1, with a height less than 4.8 cm^3 per hour (i.e. lower than Species B, cool temp bar); MP2. correct spacing of 2 units + same width with existing bars (cool temp)	1 1	
1c	KU C	xylem;	1 Total: 6	
2a	HISP B	**B**: cilia + (beat dust-trapped) mucus upwards/ out of the airway; **C**: mucus + traps particles/ pathogens; **E**: cartilage/ c-shaped ring + keeps the airway/ trachea open;	max 3	**AVP** - B/C prevent infections;
2bi	KU B	U → P; → T → S → Q → R; V	2	
2bii	KU B	MP1. For gas exchange/ diffusion / movement of CO_2 and O_2 ; MP2. short distance (for diffusion/ gas exchange); MP3. fast/ efficient (gas exchange / diffusion);	max 2 Total: 7	
3a	HISP B	kidney;	1	No ecf
3b	HISP B	C – renal artery; E – pulmonary artery;	2	A: aorta (C)

<table>
<tr><th>Question</th><th>C³R</th><th>Answer</th><th>Part Marks</th><th>Marker's Annotations</th></tr>
<tr><td>3c</td><td>HISP B</td><td>
<table>
<tr><th>C (renal artery)</th><th></th><th>F (ureter)</th></tr>
<tr><td>blood</td><td>+</td><td>Urine;</td></tr>
<tr><td>(a named) cell/ platelets/ plasma</td><td>+</td><td>no cells/ platelets/ plasma;</td></tr>
<tr><td>proteins/ antibodies/ amino acids/ fats</td><td>+</td><td>none;</td></tr>
<tr><td>glucose</td><td>+</td><td>no glucose;</td></tr>
<tr><td>lower urea concentration</td><td>/</td><td>higher urea concentration;</td></tr>
<tr><td>less salts/ ions/ less water</td><td>/</td><td>more salts/ ions/ water;</td></tr>
<tr><td>more hormones/ vitamins</td><td>/</td><td>fewer hormones/ vitamins;</td></tr>
</table>
</td><td>max 4

Total: 7</td><td>Ig: ref to oxygen/ carbon dioxide waste products

Ig: minerals / nutrients</td></tr>
<tr><td>4a</td><td>HISP B</td><td>30;
5;
15;
0 / 30;</td><td>1m each

Total: 4</td><td></td></tr>
<tr><td>5a</td><td>HISP A</td><td>parental phenotypes: resistant x not resistant
MP1. resistant parental genotypes: Rr x rr;
MP2. gametes: R, r x r, r;
MP3. show working: arrows rep fertilisation;
MP4. offspring genotype: Rr, Rr and rr, rr;
MP5. offspring phenotype: disease resistant, disease resistant, not disease resistant, not disease resistant (1:1)</td><td>5</td><td>No ecf</td></tr>
<tr><td>5b</td><td>HISP A</td><td>MP1. Heterozygous plant/parent, carry the not-resistant/ r, allele;
MP2. some offspring would be not-resistant/ rr/ homozygous recessive;
MP3. using heterozygotes results in profit loss / AW ;</td><td>max 2</td><td></td></tr>
<tr><td>5ci</td><td>HISP A</td><td>MP1. paint pollen onto selected trees / AW ;
MP2. isolate plants / cover flowers, of unselected trees ;
MP3. identify not disease resistant trees ;
MP4. remove not-resistant trees</td><td>max 1</td><td>A: artificial pollination</td></tr>
<tr><td>5cii</td><td>KU B</td><td>Artificial selection vs Natural Selection
MP1. human choice vs environmental pressures) / AW;
MP2. less diversity/ variation vs more variation;
MP3. faster change vs slower (random);</td><td>max 2

Total: 10</td><td>AVP: e.g. mating is not random
Matched point by point. Merely describing each does not bring out key difference.</td></tr>
</table>

Question	C³R	Answer	Part Marks	Marker's Annotations
6a	KU C	MP1. unit of inheritance / give characteristics / traits; MP2. section of DNA; can be copied; MP3. (each) specifies production of one protein / polypeptide;	max 2	**A**: contains hereditary information R: ref to chromosomes
6b	KU B	MP1. radiation/ x-ray/ ultraviolet; MP2. chemicals/ mutagens; MP3. faulty cell division;	max 2	A: ref to smoking/ alcohol consumption can expose cells to mutagenic substances/ induce changes in DNA Ig: inherited mutations
6c	HISP B	MP1. reduction in surface area / volume ; MP2. so less haemoglobin; MP3. less oxygen + carriage / absorption / in blood (cell); MP4. loss of elasticity + more difficult to move through blood vessels; MP5. sticky + may clump together / clot; MP6. (causing) blockage of blood vessel + reduction of blood flow (to tissue);	max 4 Total: 8	
7a	HISP A	MP1. transport/ AW; MP2. processing/ packaging; MP3. refrigeration; MP4. cooking/ AW; MP5. waste food / disposal of low-quality food / decomposition / respiration AW; MP6. burning / combustion; MP7. fuel;	max 3	
7bi	HISP A	27.0 – 1.1 / 27.0 = 96% or 95.9%;	1	**R**: if % is omitted
7bii	HISP A	MP1. less + carbon dioxide / CO_2; MP2. less CO_2 + less greenhouse gas / slow greenhouse effect / global warming; MP3. reduced/ slow down climate change effect; MP4. increase + biodiversity AW; MP5. decrease in methane from animals; MP6. make ref to / compare data in table 6.1;	max 4 Total: 8	**Ig:** response which does not explain *benefits*

Question	C³R	Answer	Part Marks	Marker's Annotations
8ai	HISP A	MP1. both axes labelled + units + linear scales; time/min on x-axis + temperature/°C on y-axis MP2. good use of grid (3/4 space used, lines occupy at least 5 grid sq) y-axis 35–70 °C; MP3. correct plots for all line graphs; MP4. lines of best fit drawn; MP5. lines identified by label or key;	1m each 5	**R**: use of *t* to represent time or temperature **R:** [MP4] extrapolation beyond last plot **A**: plots joined by clear, straight lines for MP4.
8aii	HISP A	MP1. temperature decreases/ falls/ in all three; MP2. most/ fastest in **A**; MP3. least in **B**/ stays about the same; MP4. intermediate in **C** / AW; MP5. temperature changes calculated for each tube e.g. A: 34°C and B: 3°C and C: 10°C;	max 3	
8aiii	HISP A	MP1. Improvement: repeat / replicate; Explanation: increase reliability / identify error / calculate mean / average; MP2. Improvement: use hotter water at start; Explanation: greater difference in temperature of water and room / heat loss more pronounced; MP3. Improvement: same volume of water in all tubes at start; Explanation: same amount of heat available to be lost / AW;	max 2	**Ig.** wrapping / insulating thermometers are not mentioned as the method of measuring temperature so **Ig**. refs. to more use of sensitive probes etc.
8b	HISP A	MP1. lowers surface area for heat loss to volume ratio; MP2. less heat radiated/ lost to environment; MP3. Ref insulation; MP4. heat transferred from hotter to colder regions ;	max 2 Total: 12	
9a	KU B	MP1. (ciliary) muscles relax; MP2. suspensory ligaments are, taut/ tight/ tense/ are pulled/ AW; MP3. so ligaments pull on lens; MP4. lens is, thinner/ flatter/ less convex/ elliptical shape/ stretched; MP5. light is refracted less;	max 4	

Question	C³R	Answer	Part Marks	Marker's Annotations
9b	HISP B	MP1. thicker lens drawn with correct shape and position; MP2. suspensory ligaments touching the lens; MP3. light rays are shown refracted in, cornea/ lens; MP4. light rays focused on fovea;	1m each 4 Total: 8	
Either 10a	KU C	anther;	1	**A:** stamen
Either 10b	KU B	Any 6 from: MP1. large/ obvious petals/ sepals; MP2. anthers/ stigmas, inside flower; MP3. filaments are stronger/ thicker / AW; MP4. pollinators must touch anthers, to reach nectar; MP5. sticky stigma ; pollen large ; pollen, sticky/ spiky; MP6. nectar guides; MP7. landing platforms; MP8. mimic insects;	max 6	R: flowers large (specific reference to petals/ sepals
Either 10c	KU B	MP1. meiosis; MP2. so that diploid number restored + after fertilisation; MP3. to enable sexual reproduction ; MP4. (so that the offspring) are genetically different / to allow variation ;	max 3 Total: 10	
Or 10a	KU B	**aorta 4 max:** MP1. transport oxygenated blood; MP2. from left ventricle + to rest of body; MP3. thick walls/elastic + muscle + high pressure; MP4. elastic recoil OR lumen can stretch + high + pressure; MP5. valve + prevent blood returning to heart; **vena cava 4 max:** MP6. transport deoxygenated blood; MP7. from the body/ head + to the right atrium; MP8. thin walls + lower pressure; MP9. wide lumen;	max 7	N.B max of 4 marks for either section

Question	C³R	Answer	Part Marks	Marker's Annotations
		MP10. valves + to prevent backflow/ one way flow;		
Or 10b	KU B	MP1. mixing/ non-separation + oxy- and deoxygenated blood; MP2. more oxygen in blood sent to the lungs; MP3. less oxygen in blood sent to body / organs / tissues / cells; MP4. reduced (aerobic) respiration / reduced energy / more anaerobic respiration / more lactic acid; MP5. heart beats faster / harder + to meet oxygen demand; MP6. (blood) pressure reduced;	max 3 Total: 10	