2021-2022
F.6 Biology Mock Examination
Marking Scheme

Paper 1: section A (36 marks)

1.	A	11.	A	21.	D	31.	B
2.	B	12.	C	22.	D	32.	B
3.	C	13.	B	23.	C	33.	C
4.	D	14.	D	24.	B	34.	D
5.	A	15.	A	25.	D	35.	C
6.	A	16.	B	26.	C	36.	C
7.	A	17.	B	27.	C		
8.	B	18.	C	28.	D		
9.	A	19.	A	29.	D		
10.	A	20.	D	30.	B		

Paper 1: section B (84 marks)

1. (a) Cell type P has a thicker cell wall. (1)
There is no end wall in cell type P while there are end walls in cell type Q. (1)

(b) When there is an ample supply of water, (1)
cell type R provides turgidity to the plant. (1)

Total: 4 marks

2. (a) Whole milk contains more fat than skimmed milk. (1)
The presence of fat slows down the digestion of carbohydrates (1)
and hence glucose is absorbed more slowly. (1)

(b) No (1)
The energy value of whole grain bread is (slightly) higher than / similar to that of white bread. (1)
Whole grain bread increases (slightly) the energy input of the body (1)

Total: 6 marks

3. (a) To prevent the evaporation of water from the conical flask. (1)

(b) (i) Any ***one set*** of the following: (3)

- In still air, water vapour that has diffused out of the leaves accumulates around the stomata(1); the diffusion gradient of water vapour between the air spaces in the leaves and the surrounding air is smaller. (1)
  Therefore, water vapour diffuses out of the leaves more slowly through the stomata in condition 1. (1)

  OR
- When the fan is on, wind blows away water vapour around the stomata (1); the diffusion gradient of water vapour between the air spaces in the leaves and the surrounding air is greater. (1)
  Therefore, water vapour diffuses out of the leaves more rapidly through the stomata in condition 2. (1)

(ii) Comparing conditions 2 and 3, the rate of transpiration in light is higher than that in darkness. (1)
Any ***one set*** of the following: (1+1)

- The stomata open in the presence of light, (1)
  facilitating the diffusion of water vapour out of the leaves. (1)

  OR
- Leaf temperature is increased in the presence of light (1)
  and hence the rate of evaporation of water from the surfaces of mesophyll cells increases. (1)

Total: 6 marks

4. (a) The mRNA coding for the viral spike protein binds to a ribosome. (1)
Specific amino acids are carried to the ribosome by tRNA molecules. (1)
The anticodons on the tRNA molecules bind to the complementary codons on the mRNA. (1)
Adjacent amino acids are joined by a peptide bond, forming the polypeptide which then folds into the spike protein. (1)

(b) Y represents antibodies which bind to the spike protein on the surface of the virus.(1)
As a result, Y binds several virus particles together as a big mass / clump (1)
to facilitate the detection of antibodies by phagocytes. (1)

(c) A vaccine against a virus contains the antigen of the virus. (1)
The antigen stimulates the immune system to produce memory cells for that type of antigen. (1)
On the second exposure to the same antigen, (1)
these memory cells can produce a large amount of antibodies in a short time. (1)

(d) Some antibodies in the maternal blood pass through the placenta and enter the foetal blood. (1)
Some antibodies in the mother's milk are passed to the baby via breast feeding. (1)

Total: 13 marks

5. (a) (i) Ball-and-socket joint (1)
(ii) Joint X allows movement in many planes. (1)
Joint Y allows movement in one plane only. (1)

(b) Triceps (1)

(c) When there is an insufficient supply of oxygen for complete oxidation of glucose / energy requirement increases suddenly in short time in skeletal muscles, the muscles carry out lactic acid fermentation / anaerobic respiration to produce additional energy. (1)
The pyruvate from glycolysis is reduced to lactic acid by NADH. (1)
When oxygen becomes available again, lactic acid is oxidized by NAD to pyruvate. (1)
Pyruvate is converted back to glucose and glycogen / broken down into carbon dioxide and water through the aerobic pathway. (1)

Total: 8 marks

6. (a) A: ovule (1)
B: ovary wall (1)

(b) Mutualism (1)

(c) (i) Any ***two*** of the following: (2 x 1M)
- Ripeness of the fruits used
- Water availability
- Temperature of the soil
- Texture / particle size of the soil

(ii) The proportion of seeds that emerged is markedly greater for seeds passed by birds (treatment 1) and manually depulped seeds (treatment 2) than seeds within whole fruits (treatment 3), (1)
showing that separating the seeds from the fruits can enhance seed germination when the seeds settle in the soil. (1)
The proportion of seeds that emerged is greater for seeds passed by birds (treatment 1) than manually depulped seeds (treatment 2), (1)
which suggests that passage through the digestive tract of birds provides extra benefit on seed germination. (1)

Total: 9 marks

7. (a) Individual 4 is normal. She must have at least one normal allele that is inherited from either of her parents, individual 1 or 2. (1)
Both individuals 1 and 2 have Li-Fraumeni syndrome. They must have at least one allele for Li-Fraumeni syndrome. (1)
Hence, at least one of individual 1 or 2 is heterozygous. (1)
In a heterozygous condition, only the dominant allele can express its effect. (1)
As both individuals 1 and 2 have Li-Fraumeni syndrome, the allele for Li-Fraumeni syndrome must be dominant. (1)

(b) As the protein becomes non-functional, the ability to repair DNA damages in cells is reduced. (1)
The cells with damaged DNA continue to divide uncontrollably, forming tumours. (1)
As mutations accumulate, a tumour cell becomes cancerous and spreads to other parts of the body. (1)

Total: 8 marks

8. (a) His pancreas does not produce sufficient insulin (1)
to stimulate liver cells to convert glucose into glycogen for storage / to stimulate body cells to take up glucose from blood. (1)
The concentration of glucose in the blood may become so high / exceed the threshold value (1)
that glucose cannot be completely reabsorbed in the kidney (1)
Therefore, glucose appears in the urine.

(b) (i) It takes time for complex carbohydrates to be digested to form glucose for absorption. (1)
The fluctuation of blood glucose concentration is less. / Blood glucose concentration will not increase too quickly after a meal. (1)

(ii) Fast-acting insulin responds quickly to the increase in blood glucose after breakfast. (1)

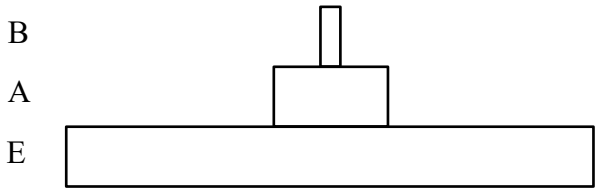
Slow-acting insulin reduces blood glucose from other meals before the evening meal / eliminates the need to inject at lunch. (1)

(iii) The pancreas secretes more glucagon to stimulate liver cells to convert stored glycogen into glucose. / He is not active and so little glucose is used in respiration. (1)

Total: 9 marks

9. (a) D: Animalia (1)
E: Protista (1)

(b) correct shape (1)
correct labels (1)



(c) when energy in the lower trophic level is transferred to the next higher level, there is energy lost (1)
and the individuals at lower trophic levels are smaller in size (1)
therefore, a larger number of individuals at a lower trophic level is required to support those at upper levels (1)

(d) C acts as a decomposer. (1)
It breaks down dead organic matters into inorganic matters, so that materials can be recycled into the ecosystem. (1)

Total: 9 marks

10. Content: (8)

	Eyes uncovered	Blindfolded	Marks
Action involved	**Voluntary actions**	**Reflex actions**	(1)
Pathway	Involving the cerebrum	Involving the spinal cord	(1)
Nature of response	Can be fast or slow	Very fast	(1)
	Not inborn / acquired	Inborn	(1)
	Not stereotyped	Stereotyped	(1)
	Under conscious control	Automatic	(1)
Importance	Decision made after thinking can reduce accident	Protect the body from getting burnt	(2)

Communication: max. 3

Total: 11 marks

Mark award for communication:

Mark	Clarity of expression and relevance to the question	Logical and systematic presentation
3	• Answers are easy to understand. They are fluent showing good command of language. • There is no or little irrelevant material.	• Answers are well structured showing coherence of thought and organisation of ideas.
2	• Language used is understandable but there is some inappropriate use of words. • A little relevant material is included, but does not mar the overall answer.	• Answers are organised, but there is some repetition of ideas.
1	• Markers have to spend some time and effort on understanding the answer(s). • Irrelevant material obscures some minor ideas.	• Answers are a bit disorganised, but paragraphing is evident. Repetition is noticeable.
0	• Language used is incomprehensible. • Irrelevant material buries the major ideas required by the question.	• Ideas are not coherent and systematic. Candidates show no attempt to organise thoughts.

Paper 2: section A (20 marks)

1. (a) (i) (1) Urine osmolality of CDI patients will rise to normal level (1)
while that of NDI patients will not show significant change. (1)

(2) In CDI patients, ADH added at 1600 causes the increase in permeability of walls of collecting duct (and distal convoluted tubule) to water. (1)
A greater proportion of water is reabsorbed into the plasma to restore the plasma osmolality to normal. (1)
Thus the urine concentration thus increases / less water is lost as urine. (1)
NDI patients are insensitive to ADH so that their water reabsorption / water permeability of walls of collecting duct / water permeability was not enhanced. (1)

(ii) Demospressin resists the digestion by enzyme / denaturation in extreme pH in digestive system. (1)
Demospressin is small enough to pass through cell membrane / specific carrier protein of epithelial cell to the blood. (1)

(iii) Any TWO x1:
- Intake drugs that promote reabsorption of water in kidney.
- Drink water ready to prevent dehydration
- Adopt low salt / sodium diet

1. (b) (i) The oxygen content of atmospheric air decreases with increasing altitude / increases with decreasing altitude. (1)

(ii) (1) Ventilation rate increases with increasing altitude (1)
so that more oxygen can be brought into the lungs (1)
to compensate for the decrease in oxygen content at higher altitude. (1)

(2) The chemoreceptors in carotid bodies detect the reduced oxygen content in blood (1)

and send more nerve impulses to the respiratory centre in the medulla oblongata. (1)

The respiratory centre sends more nerve impulses to the diaphragm and intercostal muscles (1)

for faster contraction. (1)

(3) Increase in the depth of breathing (1)

(iii) Oxygen acts as the final hydrogen / electron acceptor in oxidative phosphorylation of aerobic respiration. (1)

Paper 2: section B (20 marks)

2. (a) (i) DNA molecules are denatured / separated to form single strands (at the DNA denaturation stage). (1)

Primers with complementary bases as β-globin gene anneal to the single-stranded DNA (at the primer annealing stage). (1)

Complementary free nucleotides join to the primers accordingly to extend the DNA molecule (at the extension stage). (1)

(ii) (1) X is homozygous recessive. (1)

X has only one band containing the longest DNA fragment (1.3 kb) (1)

This indicates that she has mutated alleles only. (1)

(2) Y has three bands with different lengths (1.3 kb, 1.1 kb and 0.2kb). (1)

This indicates that she has one mutated allele and one normal allele / she is a carrier of sickle cell anaemia / heterozygote. (1)

The child of Y may inherit one mutated allele from Y. (1)

Y's husband should be tested for the mutated allele so as to find out the chance of having a child with sickle cell anaemia. (1)

2. (b) (i) The genetically modified sheep is developed from a fertilized ovum (1)
which is formed by the fusion of gametes / fertilization in sexual reproduction. (1)

(ii)
- Use specific primers to amplify the gene using PCR

OR Use specific restriction enzyme to obtain the target gene (1)

- Select the DNA fragment with the right size using gel electrophoresis

(iii) Pros: precise delivery to the target cell / no immune response from viral infection (1)

Cons: cause damage / only one cell is targeted per injection / time consuming / high failure rate (1)

(iv) The human blood clotting factors are less likely to be contaminated with pathogens in milk / less likely to have blood clumping. (1)
Large amounts of pure human blood clotting factors can be produced at a lower cost. (1)

(v) The genetically modified organisms may out-compete the wild types if they are released into the natural environment. This would reduce biodiversity / upset the ecological balance. (1)
The genetically modified organisms may transfer their genes to the wild types through sexual reproduction. These genes may have unexpected / unknown and dangerous effects. (1)
(or other reasonable answers)

~ End of Marking Scheme ~