

'A' LEVEL GUIDE

Biology

Paper 2



SECTION A (40 MARKS)

- context! the question includes the range for horizontal axis. ie if the horizontal axis is quoted in the question.*
- (a) (i) *An effect is at a hand, questions on effects don't quote horizontal axis. Extension.*
Ingestion of glucose caused the glucose levels to increase, in the blood up to a peak, and then glucose levels decreased; continuously; *led to / related into* 4 x 1 marks @
- (ii) Ingestion of glucose caused the blood glucose levels to increase; to a peak; *thereafter* the glucose levels then decreased; and levelled off; *(remained constant)*
- (b) (i) Describe the differences in the glucose levels of diabetic and normal individuals. (04marks)

- (ii) Differences in the glucose levels of diabetic and normal individual.
- Normal glucose levels reach their peak earlier than for a diabetic;
 - The peak of glucose level for normal individual is lower than for diabetic;
 - After the peak, diabetic glucose level fall continuously while those of normal fall and then level off;
- 1st* - Diabetic glucose concentrations show at first a rapid followed by slow increase while those for normal show gradual increase only; ✓
- 4 x 1 mark @

- (ii) Explain the observed differences in the levels of glucose of the two *(not changed in the trend)* Individuals. (06marks)

The diabetic individual has a faulty *pancreas* *pancreas*, so the islets of *langerhans* / beta cells cannot secrete insulin hormone; so that the absorbed glucose *which is being removed* is not being *removed*; or regulated.

The normal individual has a functional pancreas / islets of Langerhans / beta cells; so they secrete enough insulin hormone; *removes* that *removes* the excess glucose absorbed; and the glucose level becomes restored to its norm / set point; ✓

Any 6 x 1 mark @

effect (c) Suggest and explain how the results of the experiment in figure 1 would be affected if the:

(i) Normal individual had ingested a starch solution instead of glucose solution.

(05marks)

Ingestion of starch would show a similar response as that for glucose; but raise in glucose levels of blood would not occur immediately; the results would be similar because the starch would be digested; to produce glucose;

The raise in glucose levels would not occur immediately because starch being a large molecular carbohydrate; would take longer to be digested into glucose;

Any 5 x 1 mark @

(ii) Diabetic individual was injected with insulin hormone before ingestion of the glucose solution.

(03marks)

- Glucose levels would show minimum deviation; if the individual of diabetes, 1 is of type 1 diabetes / onset juvenile diabetes / insulin - dependent diabetes. Therefore insulin would regulate the sugar levels; write 3 x 1 mark @

Alternatively

Glucose levels would show a similar response as before; if the individual is a type II diabetes / late onset diabetes or insulin - independent diabetes; where the target cells for insulin hormone have lost their response to insulin; 3 x 1 mark @

Xylem
- tracheid
- parenchyma

(d) (i) Describe the relationship between the concentration of glucose and insulin in table 1.

(03marks)

Initially, As the glucose level raises, the concentration of insulin remains constant;

As the glucose level continues to rise, the levels of insulin also rise;

As the glucose levels fall, the levels of insulin fall later;

3 x 1 mark @

(ii) Explain the relationship described in (d) (i) above.

(04marks)

Initially the absorbed glucose had not exceeded the norm, so insulin levels remained constant;

ref: words like leads to, causes, results as these are explanatory words

The raise in glucose levels above the set point; induced the pancreas to secrete insulin hormone whose level rose; in order to lower the glucose levels back to the norm;

The fall in glucose levels suppresses the ^{secretion} secreting of insulin by the beta cells / pancreas; whose level also falls later on;

Max 5 x 1 mark @

(e) From the results in table 1 above, explain the likely healthy condition of the individual. (04marks)

The individual is normal; because raise in glucose levels is followed by raise in insulin levels; which lowers the glucose levels back to the normal; 3 x 1 mark @

Total 40 marks

SECTION B (60MARKS)

Attempt any THREE questions.

2. (a) Explain how the following tissues are adapted for their function.

(i) Xylem vessels. (08marks)

- Long cells joined end to end; to allow flow of water in the continuous column;
- Narrowness of the lumina or lumen; to increase on capillarity forces;
- Lignified walls; to prevent them collapsing under tension;
- Presence of pits in the walls; to permit lateral flow of water;
- End walls of vessels are broken down; during development to give an interrupted flow of water; (from roots to leaves)
- Impregnation of cellulose walls with ^{lignin} lignin; increases adhesion of water molecules promoting increased capillarity;
- No living contents; so little resistance to flow of water; to accept empty lumen

8 x 1 mark @

The lamellae are arranged in layers forming an irregular cylinder, to resist compressional and tensional force

- The periosteum contains numerous bundles of collagen fibres that prove the bone and connect it with the periosteum

- The perforations created by collagen fibres in the bones also provide a firm base for tendon insertion

(ii) Compact bone. (06marks)
- Presence of a periosteum to resist compressional forces.

- Presence of osteoblasts that divide and lay down a new matrix;

- Presence of osteoclasts; that reabsorb bone matrix; and reduce on the bone size;

- Presence of ^{canaliculi} canaliculi; that connect osteocytes / inactive bone cells to each other and to the haversian canal;

- The canaliculi transports materials to and from blood vessels in the canal;

- The Volkmann canals; provide a passage for nerves and vessels to be carried from bone surface down haversian systems.

- Blood vessels for nourishment of the bone cells;

- Nerves coordinate activities of bone cells

6 x 1/2 mark @ - matrix contains organic and inorganic materials
salts; for providing strength;

(b) How is support achieved in herbaceous plants? (06marks)

- Herbaceous plants absorb water by osmosis; and become turgid; and maintain erect position.

Have schrenchyma; and collenchyma tissues; whose walls are thickened with ^{lignin} lignin; and cellulose respectively; ✓

Also tendrils may be present for support; ✓

Accept presence of little ^{lignin} lignin in the vascular bundles

6 x 1 mark @

2. (a) Describe the structure and formation of nucleic acids. (10marks)

^{Structure / polymer}
Nucleic acids are long chained molecules consisting of repeated complex molecules called nucleotides; each nucleotide then consists of a sugar ring; attached onto phosphoric acid; and an organic nitrogenous base; ✓ 5 x 1 mark @

Formation of nucleic acids;

A pentose sugar unites with a phosphoric acid molecule; and ^{an} organic base; in a condensation reaction; to form a nucleotide; The nucleotide then joins through their phosphate groups; being linked by phosphodiester bonds; to form a polynucleotide chain or nucleic acid; ✓ 5 x 1 mark @

(b) How is DNA involved in the synthesis of proteins in cells? (06marks)

DNA unwinds; and a complementary mRNA is formed from one of the DNA strand and this acts as a template; ✓

The sequence of bases on ^{mRNA} mRNA is used to determine the sequence of amino acids that form a polypeptide; during translation; ✓

Thus the sequence of amino acids in a protein synthesized depends on the sequence of bases on mRNA; which is also synthesised in accordance to the sequence of bases of DNA molecule; ✓

6 x 1 mark @

(c) Explain the effect of temperature on the denaturation of enzymes.

(04marks)

Temperatures above the optimum; cause the hydrogen bonds and other bonds that maintain the globular or tertiary structure of ^{3-D structure / protein shape} enzyme to break; this leads to loss of the tertiary structure of the enzyme and thus the structure of the active sites; ✓

4 x 1 mark @

3. (a) Differentiate between the circulatory system of fish and mammals.

(05marks)

Fish	Mammals
<ul style="list-style-type: none"> - Single circulation - Blood flows under low pressure - Oxygenation of blood occurs in gill lamellae - Circulation is slow or sluggish - Heart has only one atrium and one ventricle - Valves are absent - Pumps only deoxygenated blood 	<ul style="list-style-type: none"> - Double circulation; - Blood flows under high pressure; - Oxygenation of blood occurs in lung capillaries; - Circulation is more rapid or fast - Heart has two atria and two ventricles; - Valves are present; - Heart pumps oxygenated and deoxygenated blood

<ul style="list-style-type: none"> - Blood passes through two capillary systems before returning to the heart - Blood meets more resistance during circulation 	<p>deoxygenated blood;</p> <ul style="list-style-type: none"> - Blood passes through in one capillary system before returning to heart - Blood meets less resistance during circulation;
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Any 5 x 1 mark @

(b) Outline the events that lead to ventricular systole in mammals. (06marks)

Electrical excitations or waves of excitation are initiated by the sino atrial node; that functions as the pace maker; ✓

The waves of excitation spread across both the atria; causing them to contract at the same time; simultaneously; and these eventually reached the atria ventricular node; from here the waves are passed on to the purkinje tissue via the bundle of his; the purkinje tissue spreads them to the ventricle; causing them to contract or inducing systole; ✓

Max 6 x 1 mark @

Elect

(c) Explain each of the following observations:

(i) Endothermy requires a double circulatory system. (04marks)

Endotherms have high metabolic rate; to maintain a constant body temperature; and a double circulation ensures a more rapid circulation; to supply metabolites quickly or faster; in order to sustain a high level of metabolism; ✓

Any 4 x 1 mark @

(ii) Single circulation is not suitable for fresh water fish. (05marks)

Fresh water fishes are faced with a problem of osmotic entry of water into their tissues; and this can lead to dilution of their body fluids; so they need a high glomerular filtration rate to off set the excess water absorbed; and this requires a high blood pressure; which

cannot be availed with single circulation; therefore they have adaptively developed many large glomeruli to overcome this challenge; ✓
Any 5 x 1 mark @

4. (a) Explain the ecological impact of each of the following human activities.
(i) Use of pesticides. (07marks)

Are used to remove unwanted organisms like pests and vectors of human diseases; pesticides are often not specific and may kill beneficial organisms; thus disrupting food webs;

They can be concentrated along food chain; and kill organisms at the top of the chain; ✓ may affect animal products e.g. shells of eggs in birds; ✓

Pesticides may be slow to break down; and consequently may have long term effects in the environment; ✓

Over use of pesticides may lead to development of resistance in the pests or pest resurgence; ✓

7 x 1 mark@.

- (ii) Drainage of nitrate into water bodies. (06marks)

Water bodies become enriched with nutrients; accelerating growth of algae or aquatic plants leading to algae blooms; ✓ when the algae die; ✓ aerobic bacteria begin decomposing them down; while using up oxygen; ^{OWTTE} thus oxygen becomes depleted; with time and this leads to death of other aerobic organisms; ✓

- increase in number of anaerobes, breeding in migrating species of birds

6 x 1 mark each

Accept oxygen depletion leads to;

- Increase in number of anaerobes
- Reduced metabolism or productivity
- Disruption of breeding in migratory species
- Increased anaerobiosis hence accumulation of water

(b) How can endangered species be conserved?

(07marks)

- Enacting strict laws against human activities that endanger wildlife
- Restrict trade in endangered species;
- Protect, and restore habitats;
- Transfer endangered species from threatened to safer areas;
- Reduce on hunting or poaching;
- Establish sperm banks; and seed stores
- Reduce on the use of bioprospecting (poisoning)

7 x 1 mark @

- Establish game parks / national parks / protected areas
- Sensitization of the masses / public about the importance of wildlife

5. (a) How is the loss of uterine lining prevented after conception in humans?

After fertilization, the zygote develops into the blastocyst; whose outer cells begin to secrete human chorionic gonadotrophin hormone; (HCG) that prolongs the life of corpus luteum;

The corpus luteum continues to secrete progesterone; and oestrogen; hormones. These bring about increased growth of the endometrium; and this prevents the loss of lining of the endometrium or uterine wall;

(b) Explain the role of the placenta as a barrier and link between the foetus and the mother.

(08marks)

The placenta prevents mixing of the fetal and maternal blood; so that the fetus is not exposed to the relatively high blood pressure of maternal blood or circulation; and there is no possibility of agglutination in the fetal circulation; since the bloods of the two may not be compatible / be of different ABO blood groups;

Placenta also prevents passage of pathogens; and maternal hormones into the fetal circulation, as these could adversely affect fetal development;

Role of placenta as link;

Allows antibodies to pass from maternal into fetal circulation; and provide the fetus with (passive) immunity; Allows nitrogenous wastes and carbon dioxide from the fetus to pass into maternal circulation;

Allows the passage of nutrients or oxygen or water or soluble foods or vitamins or salts; from maternal to fetal circulation for metabolism; of the fetus

- (c) *Describe the significance of developmental changes undergone by the mammalian foetus during pregnancy.* (08marks)

END