‘A’ LEVEL GUIDE

Biology

Paper 2

SECTION A (40 MARKS)

(a) (i) Ingestion of glucose caused the glucose levels to increase; in the blood up to a peak; and then glucose levels decreased; continuously; 4 x 1 marks@

(ii) Ingestion of glucose caused the blood glucose levels to increase; to a peak; the glucose levels then decreased; and levelled off; remained constat

(b) (i) Describe the differences in the glucose levels of diabetic and normal individuals. (04marks)

Differences in the glucose levels of diabatic 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 diabatic;*
- *After the peak; diabatic glucose level fall continuously while those of normal fall and then level off;*
- *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 Individuals. (06marks)

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

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

Any 6 x 1 mark @

*(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 is of type I diabetes; / onset juvenile diabetes / insulin - dependent diabetes. Therefore insulin would regulate the sugar levels. Owtte 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 @

*(d) (i) Describe the relationship between the concentration of glucoseand 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 exceded the norm, so insulin levels remained constant;

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 suppress the secretion of insulin by the beta cells / pancreas; whose level also falls later on;
Max 5 x 1 mark @

*(e) From the results in table **I** 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.*

1. (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; permit lateral flow of water;*
- *End walls of vessles are broken down; during development to give un interrupted flow of water; (from roots to leaves)*
- *Impregnation of cellulose walls with ligm; increases adhesion of water molecules promoting increased capillarity;*
- *No living contents; so little resistance to flow of water; / accept empty lumen*

8 x 1 mark @

(ii) Compact bone. (06marks)

- *Presence of osteoblasts; stellate that divide and lay down a new matrix;*
- *Presence of osteoclasts; that reabsorb bone matrix; and reduce on the bone size;*
- *Presence of canabiculi; that connect osteocytes / inactive bone cells to each other and to the haversian canal;*
- *The canaliculi transports materials to and from blood vessesl in the canal;*
- *The Volkmann cannals; provide a passage for nerves and vessles to be carried from bone surface down haversian systems.*
- *Blood vessels for nourishment of the bone cells;*
- *Nerves coordinate activities of bone cells*
- *Periosteum contains bundles of collagen fibres that pierce the bone providing an intmate connection between under lying bone adn periosteum and act as a firm base for tendon insertions*
- *Lamellae laid down in layers forming an irregular cylinder; to resist compression and tension.*
- *Presence of organic and inorganic salts in the matrix; for providing strength;*

6 x ½ mark@

(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 rigum; and cellulose respectively;

Also tendrils may be present for support;

Accept presence of little ligrin in the vascular bundles may provide additional support

6 x 1 mark @

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

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 a n 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 complentary mRNA is formed from one of the DNA strand and this acts as a template;
The sequence of bases on mRANA 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 syntehsised in accodiance 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 eh 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 @ . Accept only logical sequence of facts.

3. (a) Differentiate between the circulatory system of fish and mammals.
05marks)

Fish	*Mammals*

- *Single circulation* - *Blood flows under low pressure* - *Oxygenation of blood occurs in gill lamellae* - *Circulation is slow or sluggish* - *Heart has only one atriuman ventricle* - *Valves are absent* - *Pumps only deoxygenated blood* - *Blood passes through two capillary systems before returning to the heart* - *Blood meets more resistance during circulation* - *Blood does not return to the heart after picking*	- *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 ventricales;* - *Valves are present;* - *Heart pumps oxygenated and deoxygenated blood;* - *Blood passes through in one capillary system before returning to heart* - *Blood meets less resistance during circulation;* - *Blood returns to the heart after picking up water from lungs.*

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 purkrinje 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 @

(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 s 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 oganisms 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

demcomposing them down; while using up oxygen; thus oxygen becomes depleted; with time and this leads to death of other aerobic organisms;
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)

- *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*
- *Establish same parks or narional parks or game reserves or protected areas*
- *Enact or put strict laws against human activities that endanger wild life*
- *Reduce on teh use of bio – poisons or pesticides*
- *Sensitising of people or public about importance of wild life.*

7 x 1 mark @

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

After fertilization, the zygote developes into the blastocyst; whose outer cells begin to secrete human chorionicgona dotrophin 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 living 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 th 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 agglutimation in the fedal circulation; since the bloods of the two may not be compatible / be of differen 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 pas from maternal into fetal circulation; and provide the fetus with (passive) immunity; Allows nitrogenous wastes and carbondioxide 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)

reject part (c)

END