

NB
Question paper
is attached!
Check down!!

2024

Proposed Marking guide to ASSITV-BIOLOGY Paper 2

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NO1

(a) Compare the levels of glucose and insulin after swallowing glucose? (OBM10)

Similarities for levels of glucose and insulin after swallowing.

- In both, Concentration of substance increases after swallowing
- In both, concentration of substance in blood attained a peak
- In both, concentration of substance in blood decreases after peak
- Both reached / attained maximum.

Differences;

Level of glucose	Level of insulin
Generally higher	Generally lower ✓
Attained higher peak	Attained lower peak ✓
Attained a peak earlier	Attained a peak ✓ later
Initially higher	Initially lower ✓

mark of

b) Explain the changes in the concentration of

(i) Glucose

(65 marks)

From 0 to 30 minutes, concentration remained constant because glucose had not yet been ingested.

From 30 minutes to 90 minutes, concentration increased gradually to the maximum, because there was glucose absorption into blood stream following its swallowing.

From 90 minutes to 150 minutes, concentration decreased gradually because glucose was converted to glycogen, some glucose was oxidised in cellular respiration to produce energy under the influence of insulin hormone.

Mark 65/

(ii) Insulin

From 0 to 30 minutes, concentration of ~~substance~~ insulin remained constant because glucose level in blood was at norm.

From 30 minutes to 105 minutes, concentration increased gradually to maximum, because glucose levels in blood had increased above the norm, following its absorption into blood stream, and this stimulated beta cells of islets of Langerhans in the pancreas to secrete/produce insulin hormone.

From 105 to 150 minutes, concentration decreased gradually because glucose levels had reduced back to norm, and it was destroyed and excreted via kidney.

d/c) Explain how the concentration of insulin would change if the person engaged in an exercise? (04 mark)

The concentration would reduce, because during exercise the demand for energy increases, and therefore glucose is oxidized to produce energy in cellular respiration; reducing glucose levels.

mark off

d) ii) Describe the effects of prolonged exercise in the amount of glycogen and the concentration of glycogen (04 marks)

From 0 to 25 minutes, prolonged exercise leads to a decrease in mass of liver glycogen.

From 25 minutes to 35 minutes, prolonged exercise has no effect on mass of liver glycogen.

Glucagon

From 0 to 25 minutes, prolonged exercise leads to an increase in concentration of glucagon.

From 25 to 35 minutes, prolonged exercise leads to a decrease in concentration of glucagon.

mark off

(ii) Explain your desription in d(ii) above.

A decrease in mass of liver glycogen, because during exercise the demand for energy is high, to prepare the body for contraction and relaxation of skeletal muscles; therefore stored glycogen in liver was converted into glucose; which is oxidized to liberate Energy required by the body

A constant mass of liver glycogen, because all the stored glycogen in the liver was depleted to enable continuous supply of energy required by the body

(iii) Concentration of glucagon:

Increase in glucagon level concentration; because during exercise, glucose levels reduce below the norm; and this stimulated ^{Alpha} _{Beta} cells of islets of Langerhans in the pancreas to produce glucagon hormone into blood

A decrease in concentration of glucagon; because glucose levels had increased back to norm; and this inhibited secretion of glucagon

Max T2

Suggest how continuous supply of glucose is ensured after the 25th minute (O/F male)

Adrenal gland is stimulated to secrete Cortisol hormone;

- Cortisol hormone increases formation of glucose from amino acids and glycerol therefore increasing glucose levels
- Cortisol hormone also increases the formation of enzymes from amino acids; that catalyse the breakdown of fats and proteins to glucose.

Max (O/F)

1 day ago 41°8 -

Section B (5 questions)

2(a) Describe how a Carbon dioxide molecule in the mesophyll cells of a plant can be converted to a triglyceride.

Solution

- Triglyceride is an ester of fatty acid and glycerol ✓
- Carbon dioxide diffuses into the cytoplasm of mesophyll cells and combines with ribulose bisphosphate under catalysis of Ribulose bisphosphate Carboxylase enzyme to form unstable carbon intermediate which split down immediately to form 2 molecules of glyceraldehyde-3-phosphate (GA).
- Some molecules of GA enters a glycolytic pathway and get converted into pyruvate; which is converted into acetyl group which later combines with a Coenzyme A to form acetyl coenzyme A and this is used to form fatty acid.
- The remaining molecules of GP is reduced using NADPH₂ and phosphorylated by using ATP to form Triose phosphate (TP)
- Some molecules of TP is converted into glycerol

Then a fatty acid combines with a glycerol via a condensation reaction to form triglyceride

Mark 10

b) Explain the physiological and ecological advantages of C₄ plants have
C₃ plants (o 6 marks)

Soln.

(i) Physiological

- C₄ plants able photosynthesize at very low Carbon dioxide concentration; since

PEP Carboxylase enzyme has a very high affinity for Carbon dioxide therefore no photorespiration.
However C₃ plants have RUBP Carboxylase which accepts both oxygen and Carbon dioxide
and therefore in low Carbon dioxide levels, it fixes oxygen hence photorespiration.

(ii) Ecological advantage.

The Carbon dioxide fixing enzymes in C₄ plants (PEP Carboxylase)
are more active at hot temperatures and high illumination, therefore
photosynthesis occurs rapidly at low altitudes, hot and tropical conditions;

However C₃ plants, Carbon dioxide fixing enzymes are more active at low temperature
hence distributed in temperate regions, high altitudes

Mark 6/6

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c) Explain the physiological significance of chloroplasts

- formation of ATP and NADPH₂ during light dependent reaction, (O₂ mol)
within the thylakoid membrane. ATP and NADPH₂ are fed into the
dark reactions used for photo phosphorylation and reduction of Glycerate-3-
phosphate respectively forming TP (Triose phosphate) which is
utilised to make carbohydrate; which are stored in plants

Max Dif

NO 3 (a)

(i) Define the term Immunity? (01 mark)

Is the ability of the animal to resist infection produced by infecting organism.

(b) Describe how

(i) The body reacts to damaged blood vessels? (09 marks)

Solution

Damage to a blood vessel causes platelets to stick together at the site of damage, ruptured platelets produce a chemical thromboplastin, which stimulates conversion of plasma protein inactive prothrombin to active thrombin enzyme in presence of Calcium ions and Vitamin K.

Thrombin enzyme catalyses the conversion of soluble plasma protein Fibrinogen; to insoluble fibrin; which forms a mesh network of threads across a wound.

METHOD

(ii) Body reacts to presence of foreign body in blood (07 marks)

Solution

Presence of antigens in the body stimulates the lymphocytes; to produce corresponding antibodies, the antibodies can attack antigens in the following ways

- Agglutination; where the antibodies clump the antigens and destroys them

- lysis; causes the antigen to disintegrate

- opsonisation; where the antibodies adsorb onto surface of

antigens for easier phagocytosis

Neutralisation, by producing anti-toxins

precipitation, by crystallising the antigen molecule.

Mek o F.

(c) Explain the consequences of over bleeding (Q3)

- It leads to reduced blood pressure, which slows down blood flow
- It also leads to reduction in number of red blood cells, which lowers body's blood ability to carry oxygen.
- It leads to loss of mineral ions ~~for example iron~~
- When the brain does not receive enough blood; it leads to unconsciousness, and eventually death.

Mek o 3

4(Q) How do hormones in the brain and kidney interact to regulate the amount of water and salt in tissue fluid (12 marks)

Solution,

Increased Concentration of solutes in blood (little water relative to salts) is detected by osmoreceptors in the hypothalamus which stimulate posterior pituitary gland to secrete antidiuretic hormone (ADH) and at the same time triggering the sensation of thirst resulting in drinking of water.

ADH increases the permeability of distal convoluted tubule and collecting duct to water, allowing the osmotic flow of water from the tubular fluid into the kidney interstitium (interstitial fluid/tissue fluid) hence reducing the osmotic pressure of blood but increasing that of urine.

Low Solute Concentration in blood (too much water relative to salts) Inhibits ADH release, tubule walls and collecting duct become impermeable to water, less water is reabsorbed from renal fluid into blood and large volume of dilute urine is passed out hence raising the osmotic pressure of blood.

Mark 12

b) Explain the operation of a hairpin current multiplier in the loop of Henle (12~~0~~ 0.5 mark)

A system of parallel and opposite flows of renal fluid in the descending and ascending limbs of the loop of Henle in the kidney. The ascending limb of the loop of Henle is impermeable to water, but sodium ions are actively transported out of it and deposited into the interstitial of the medulla of the kidney. This results into reabsorption of water by osmosis from the renal fluid flowing downwards in the descending loop of Henle, and collecting duct.

Mark 0.5

(c) State the significance of Counter flow systems in homeostasis (0.3 Marks)

Countercurrent flow maximizes the concentration gradient, enabling efficient extraction (absorption) of important materials back to blood; enabling survival of the animal.

Mark 0.3

Q5(a) What is meant by the term organelle?
(03 marks)

Solution
Refers to separate structure within a cell which performs specific function e.g. Mitochondria, chloroplast

The organelle may be enclosed by a membrane, therefore called membrane bound organelle; or ^{e.g. Nucleus} not bound by membrane for example microtubules; microfilaments.

Mark 3

b) Describe the structure of each of the following as seen in an electron microscope and indicate in each case how the structure is related to function.

(i) Golgi Complex (02 marks)

Solution:

- It is made up of piles of flattened sacs called Cisternae with vesicles budding off at edges of sacs.
- One GTS Cisterna is a flattened sac, with a lumen enclosed by a single membrane

Guru The Golgi Complex contains a number of separate compartments, as well as some that are interconnected.

The Cisternae stack has 4 functional regions; the cis-Golgi network, medial-Golgi, and trans-Golgi network.

Mark 04

(ii) Nucleus

- It is enclosed by a double-layered nuclear membrane.
- Perinuclear space exists between the two layers of nuclear membrane.
- Nuclear membrane is perforated by nuclear pores.
- Enclosed within the inner membrane are the nucleoplasm; nucleoles and chromosomes.
- Nucleolus is a dense, spherical-shaped structure.
- Chromosomes are thread-like i.e. heterochromatin and ~~euchromatin~~.
Allelt a dark structure (labelled) ~~met 04~~

Mitochondrion

- It is double membrane bound, outer membrane is entire, inner membrane folds into the mitochondrial matrix to form cristae.
- Matrix is fluid filled with several enzymes, small sized ribosomes and circular DNA.
- Each membrane is phospholipid bilayer.

(c) What are the functions of ribosomes in a cell?

- It assembles amino acids to form proteins that form cellular functions.
- that are essential to carry out the ~~DNA produces mRNA by~~ protein synthesis. Ribosomes are the site for protein synthesis.

- Free ribosomes also store rRNA and synthesize enzymes for muscles, skin cells etc.

(Q6) Compare the Spores of a moss plants with the pollen grains of angiosperms? (13 marks)

Similarities

- Both are haploid ✓
- Both are nucleated ✓
- Both are produced by meiosis ✓
- Both are produced in large quantities ✓
- Both are reproductive units ✓
- Both can remain dormant for longer periods
- Both are light ✓

Any correct ob

Differences

Spore of a moss	Pollen grain of angiosperm
Has one nucleus	has two nuclei ✓
produced inside sporangia	produced inside anther ✓
Grows anywhere damp and moist	germinates only on stigmas of compatible species ✓
- Non ruptured outer most covering	- Ruptured outer most covering ✓
Thin outer covering	Thick outer covering ✓
only dispersed by wind	both wind and insects are agents ✓
Relatively smaller	Relatively larger ✓
Single covering	Double covering ✓

b) Explain how the formation of a seed in angiosperms has contributed to their evolutionary success

Solution

The seed has a rich store of food, on which the embryo is nourished, until it becomes self supportive, after germination. This increases survival and hence evolutionary potential.

Seeds have embryo protective structures like cotyledons and seed coat, which enhances embryo survival, promoting evolutionary success over generations.

Seeds are modified in a number of ways to aid dispersal, for plants to colonise new areas, hence increasing chances of survival and evolution.

Fertilization, which forms seeds does not require water, a rare source on land hence easily formed on land, which increase evolutionary success.

Seeds are hardy hard in nature; hence not easily destroyed by the harsh terrestrial condition, which enhances evolutionary success.

Maturation of seeds requires minimal water, this supports angiosperms to live a successful life in a terrestrial environment.

Seeds can remain dormant to allow angiosperms survive harsh weather conditions, which increases evolutionary survival.

Seed formation involves fertilization which is associated with gene mixing, which increases variations and vigour, promoting evolution success. *Any correct or not* *Any correct or not*

1530/2
BIOLOGY (Theory)
Paper 2
August, 2024
Time: 2½ Hours

ASSHU BUSHENYI DISTRICT MOCK EXAMINATIONS 2024
UGANDA ADVANCED CERTIFICATE OF EDUCATION.

**BIOLOGY
(THEORY)**
2 HOURS 30 MINUTES

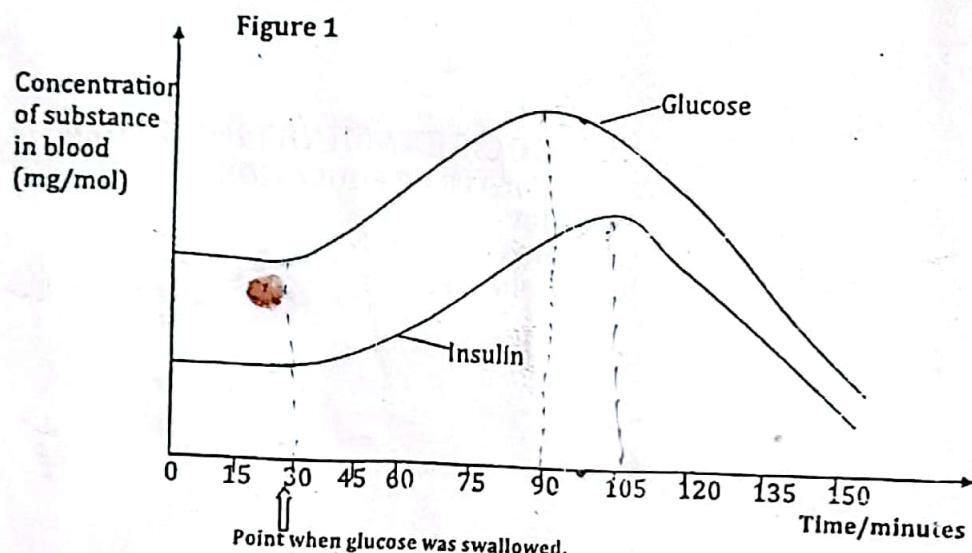
INSTRUCTIONS TO CANDIDATES:

- ❖ Answer question ONE in section A, plus THREE others from section B.
- ❖ Candidates are advised to read questions carefully, organize their answers and present them precisely and logically.
- ❖ Illustrate whenever necessary, with well labeled diagrams.

Question	Marks
SECTION A	
SECTION B	
No.	
No.	
No.	
Total	

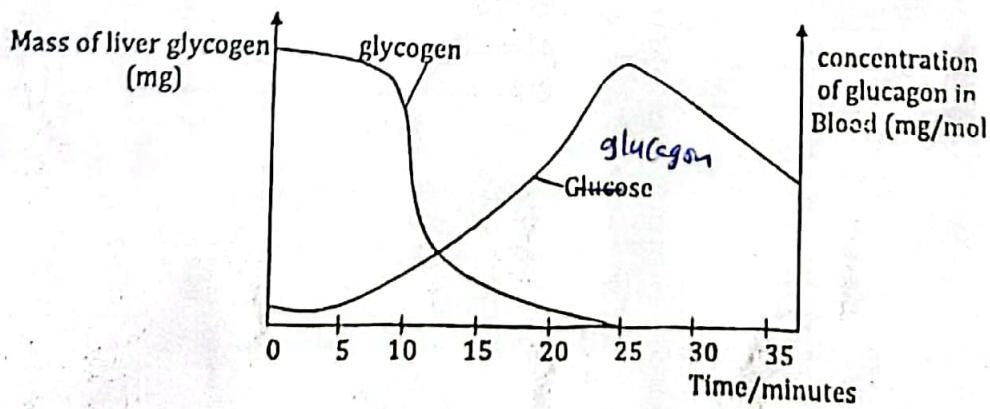
SECTION A (40marks)
Compulsory question

1. Figure 1 below shows changes that occur in the concentrations of insulin and glucose in blood of an individual who had fasted overnight, and then swallowed 75g of glucose. Use it to answer questions that follow;



- (a) Compare the levels of glucose and insulin after swallowing glucose? (06marks)
- (b) Explain the changes in the concentration of;
 (i) Glucose
 (ii) Insulin (05marks) (05marks)
- (c) Explain how the concentration of insulin would change if the person engaged in an exercise? (04marks)
- (d) Figure 2 shows changes in the amount of liver glycogen and glucagon concentration in blood of an individual during prolonged exercise. (04marks)

Figure 2



- (i) Describe the effects of prolonged exercise on the amount of glycogen and the concentration of glucose in blood? (04marks)
- (ii) Explain your description in (d)(i) above? (12marks)
- (e) Suggest how continuous supply of glucose is ensured after the 25th minute. (04marks)

SECTION B (60marks)
Attempt only 3 questions.

2. (a) Describe how a Carbon dioxide molecule in the mesophyll cells of a C₃ plant can be converted to a triglyceride. (10marks)
- (b) Explain the physiological and ecological advantages C₄ plants have over C₃ plants. (08marks)
- (c) Explain the physiological significance of a chloroplast. (04marks)
3. (a) Define the term immunity? (01mark)
- (b) Describe how:
 (i) the body reacts to a damaged blood vessel? (09marks)
 (ii) the body reacts to presence of a foreign body in blood? (07marks)
- (c) Explain the consequences of over bleeding? (03marks)
4. (a) How do hormones in the brain and kidney interact to regulate the amount of water and salt in tissue fluid? (12marks)
- (b) Explain the operation of a hair pin current multiplier in the loop of Henle. (03marks)
- (c) State the significance of counter flow system in homeostasis. (03marks)
5. (a) What is meant by the term organelle? (01mark)
- (b) Describe the structure of each of the following as seen in an electron microscope and indicate in each case how the structure is related to function.
 (i) Golgi complex. (04marks)
 (ii) Nucleus. (04marks)
 (iii) Mitochondrion. (04marks)
- (c) What are the functions of ribosomes in a cell? (13marks)
6. (a) Compare the spores of a moss plant with the pollen grains of angiosperms? (07marks)
- (b) Explain how seed formation has led to evolutionary success in plants. (07marks)

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