

UGANDA NATIONAL EXAMINATIONS BOARD  
UGANDA CERTIFICATE OF EDUCATION  
OCTOBER - NOVEMBER, 2022

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Page 2 of 8

Candidate's Name ..... PROPOSED GUIDE FOR UNNASE - UACE BIOLOGY P2

Signature ..... YEAR-2023 BY WASSWA

Random No.			
Personal Number			

Subject ..... Paper code ..... ENOCK

0701300439 / 0762867639 - WASSWA ENOCK

SECTION A

NO1 (a)

Compare the levels of glucose and insulin after swallowing glucose

Similarities for levels of glucose and insulin

Both increased from 46 minutes to 76 minutes ✓

Both attained a peak / Both reached maximum ✓

Both decreases after attaining a peak. ✓

Both decreased from 120 minutes to 160 minutes, ✓

Differences for levels of glucose and insulin

MUL 03

Glucose levels

Insulin levels

Attained a higher peak

Attained a lower peak ✓

Generally higher

Generally lower. ✓

From 120 minutes to 160 minutes, decreases gradually

From 120 minutes to 160 minutes, ✓ decreases rapidly

Reached maximum earlier / Attained a peak earlier

Reached maximum later / earlier attained a peak later. ✓  
 $t_{\text{max}} = \text{max}$  66



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OCTOBER - NOVEMBER, 2022**

Page 3 of 8

Candidate's Name .....

Signature .....

Random No. 

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Subject ..... Paper code ..... / .....

Personal Number 

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NB 1(b)

(i) Glucose,

From 46 minutes to 90 minutes, Concentration of glucose in blood increases rapidly ~~to the maximum~~ because there was absorption of glucose from the ileum into the blood stream.

From 90 minute to 160 minutes, Concentration of glucose in blood decreases gradually, because some glucose was metabolized during respiration to produce energy, some glucose was converted into glycogen, some glucose was converted into fats; and within the liver by insulin hormone produced / secreted.

Mark 04

(ii) Insulin

From 46 minutes to 106 minutes, Concentration of insulin in blood increases rapidly to the maximum; this is because increased absorption of glucose in blood raises the glucose levels from the norm / set point; and this stimulated the Beta-cells of islets of Langerhans of the pancreas to secrete insulin hormone into the blood stream, which flows to the liver and reduces / lowers / decrease glucose levels back to norm.

From 106 minutes to 160 minutes, Concentration of insulin in blood decreases rapidly, because it was metabolized / broken down by the body and excreted through the kidney nephron.



Mark 04

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OCTOBER - NOVEMBER, 2022

Page 4 of 8

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No 1 (c)

The Concentration of insulin would reduce / decrease, because during exercise, the demand for energy by the body increases; therefore g stored glycogen in muscle is converted into glucose; also glycogen in liver cells is converted into glucose; by therefore there would not be stimulation of beta cells of islets of Langerhans in the pancreas.

Max 03

Glycogen;

No 1 (d)

From 0 to 25 minutes, prolonged exercise leads to a decrease in the amount of glycogen.

From 25 minutes to 35 minutes, prolonged exercise leads to a constant amount of glycogen.

Accept mass of liver glycogen / Mass of glycogen.

Glucagon,

From 0 to 20 minutes, prolonged exercise leads to an increase in the amount of Glucagon.

From 20 minutes to 35 minutes, prolonged exercise leads to a decrease in amount of Glucagon.

Accept Concentration of glucagon / Concentration of glucagon in blood.

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OCTOBER - NOVEMBER, 2022

Page 5 of 8

UCE

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No 1 & (ii)

Glycogen; From 0 to ~~10~~ minutes, mass of liver glycogen, decreases gradually, because little glucagon has been produced as exercise has just started.

From 6 minutes ~~to~~ 10 minutes, Mass ~~of~~ glycogen decreases rapidly, because glycogen is converted into glucose by produced / secreted glucagon, which is metabolized to form energy to meet the high energy demand during exercise.

From 10 minutes ~~to~~ 25 minutes, mass of glycogen decreases gradually ~~X~~ because liver glycogen is getting exhausted / depleted.

From 25 minutes ~~to~~ 35 minutes, Mass of glycogen remains constant <sup>at 0 g</sup> because glucagon levels has lowered / reduced, and also there is another energy source for the body for example fat metabolism. Glycogen has got depleted in the liver. Also all the glycogen ~~X~~ has been converted to glucose.

Glucagon.

From 0 to ~~10~~ minutes, most concentration of glucagon increases gradually, this is because exercise has just started, and glucose levels are just having just started decreasing below the norm, there less stimulation of alpha cells of islets of Langerhans of the pancreas to secrete little glucagon hormone.



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OCTOBER - NOVEMBER, 2022

Page 6 of 8

UCE

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Candidate's Name .....

Signature .....

Subject ..... Paper code ..... /.....

Random No.				
Personal Number				

From 10 minutes to 20 minutes, Concentration of glucagon in blood increases rapidly to the maximum, this is because further exercise, caused a further <sup>more</sup> decrease of blood glucose below the norm; and this caused more stimulation of beta cells of islets of Langerhans of the pancreas to secrete more glucagon hormone to raise blood glucose levels back to norm; so as to ensure energy source from respiration; and this is done by converting glycogen into glucose in the liver cells.

From 20 minutes to 35 minutes, Concentration of glucagon in blood decreases gradually; this is because levels have gone back to norm; and therefore glucagon hormone in blood was metabolised and excreted through the kidney.

Met 12

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OCTOBER - NOVEMBER, 2022

Page 8 of 8

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Candidate's Name .....

Signature .....

Subject ..... Paper code ..... / .....

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No 1 (e)

under influence of Adrenocortical

corticosteroids  
from  
Anterior  
pituitary  
gland.

Adrenal gland is stimulated to secrete Cortisol hormone  
Cortisol hormone causes formation of glucose from  
amino acids and glycogen hence increasing glucose concentration  
in blood.

Cortisol hormone also increases the formation of enzymes from  
enzymes amino acids, used to catalyse the breakdown of  
fats and proteins to glucose.

Enzymes

Adrenaline hormones cause breakdown

Metabolism

metabolism

3 867630

2

1

Candidate's Name ..... UUNNACE - A'LEVEL BIOLOGY - P2 Grade - 2022

Signature ..... By WASSWA ENOCK

Subject ..... 07.01.800489 Paper code ..... 0762867639

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### SECTION B

#### No 2 (a)

What is meant by the term eutrophication (Co mts)

Refer to excessive enrichment of the water body by the nutrients for example phosphates and nitrates leading to increased growth of the algae / aquatic plants / resulting into algal blooming

#### No 2 (b) <sup>Explain</sup> What causes of eutrophication (Co mts)

- Discharge of sewage in the water body, which accumulates nutrients leading to algal blooming
- Application of fertilizers in agriculture which later erodes by rain into the water body, increasing nutrient amount.
- Feeding of cattle and waste products produced by animals both contribute to the nutrients found in rivers, lakes.
- Soil erosion carry excess nutrients.
- Excessive nutrients results can accumulate in the water body when sediments and rocks are eroded
- Release of industrial waste products in the water body increases the growth of the algae.
- Deforestation, increases soil erosion carrying nutrients in a water body.



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OCTOBER - NOVEMBER, 2022

Candidate's Name .....

Page 3 of 8

Signature .....

Random No.				
Personal Number				

Subject ..... Paper code ..... /.....


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No 2 c (ii) Explain the  
Adaptations of water hyacinth for its survival  
as a successful weed (otb)

water hyacinth can reproduce sexually and asexually;

- Sexually by producing seeds through flowers; and
- asexually reproduce by budding; this increases their survival
- — Has a high reproduction rate, this enables them to multiply fast and therefore survive.
- Have leaves, with large air spaces in the spongy mesophyll layers which enables gaseous exchange and also increases buoyancy.
- Has long, pendant and adventitious roots for water absorption.
- Broad leaves, to increase surface area for absorbing sunlight for photosynthesis.

Max 56

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OCTOBER - NOVEMBER, 2022

Page 4 of 8

Candidate's Name .....

Signature .....

Subject ..... Paper code ..... / .....

Random No.				
Personal Number				

NQ2 (C) (ii)

(ii) ~~Ques~~ Ecological effects of water hyacinth on water.

(ob meta)

Water hyacinth grows on surface of water causing shading preventing light penetration, which restricts the development of photosynthetic algae, which form the basis of the aquatic food chain.

Restricted growth of photosynthetic algae, deprives the water of oxygen, resulting into death of fish.

- Decay of the dead weed uses up oxygen, increasing biochemical oxygen demand (B.O.D), creating anoxic condition hence death.
- Water hyacinth may be habitat for dangerous species like snakes; which are harmful to people's life
- Shallow water breeding fish compete with water hyacinth, reducing their population.
- Water hyacinth are food to aquatic organisms, hence survival of those fish.

Mark 6

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OCTOBER - NOVEMBER, 2022**

Page 5 of 8

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No 3 (a)

Compare polyploidy and aneuploidy

(06 marks)

Similarities

- In both, a cell may possess extra set of chromosomes.
- Both conditions create lethal genetic diseases
- Both disrupt the existing equilibrium in cells

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OCTOBER - NOVEMBER, 2022

Page 6 of 8

Candidate's Name .....

Signature .....

Random No. | | | |

Subject ..... Paper code ..... / .....

Personal Number | | | |

## Poly ploidy

Involves presence of more than two sets of chromosomes

- Types include monosomy, disomy, trisomy

## Aneuploidy

Involves presence of an abnormal number of chromosomes

- Types include triploidy, tetraploidy

~~More common in humans~~

Rare in humans

More Common in humans

not often

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OCTOBER - NOVEMBER, 2022

Page 7 of 8

UCE

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No 3 (b)

Give Conditions for emergence of polyploids in plants

out early

- Mitotic ~~/~~ chromosomal non-disjunction, in which chromosomes fail to separate equally.
- Non disjunction of the sex chromosomes leads to gametic non-reduction during meiosis
- Parthenogenesis, in which the female gamete is fertilized by more than one male gamete.
- Endo-duplication, the replication of DNA during the S-phase of the Cell Cycle without the subsequent completion of mitosis

max 04

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OCTOBER - NOVEMBER, 2022

Page 8 of 8

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By WASIWA ENOCK - 0701300431 / 0762867639

N03 C Explain the failure to plasmodium  
(i) develop an effective vaccine <sup>against</sup> recombination

Plasmodia parasite undergo continuous mutation forming large number of new antigenic variants, which are resistant to the vaccine made.

This mutation leads to a change in the surface membrane of the plasmodium parasite, hence failure to develop an effective vaccine against plasmodia

NO3

Explain how man influences the process of speciation (05 marks)

Man / Humans impose artificial selection, in the process of breeding, males and females with desired characteristics are allowed to mate, individuals lacking the desired qualities are prevented from mating, by extermination, segregation and by sterilization by tropars. Vigorous selection over many generations forming species which are different from parents.

With 05



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# WAKISSHA JOINT MOCK EXAMINATIONS

JULY/AUGUST: \_\_\_\_\_

O&A

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SUBJECT: ..... PAPER: ..... SIGNATURE: .....

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Describe how a Carbon dioxide molecule in the cells of mesophyll cells of a C<sub>3</sub> plant can be converted into a triglyceride.

*(CoG marks)*

Triglyceride — 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 a 6-Carbon intermediate which splits to form stable glycerate-3-phosphate.
- Some of the glycerate-3-phosphate enters a glycolytic pathway and 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 Acetyl Coenzyme A ester of Fatty acid —
- Some of the Glycerate-3-phosphate is reduced using NADPH<sub>2</sub> and phosphorylated using ATP to form triose phosphate.

Some triose phosphate is converted into glycerol

- Then a fatty acid combines with a glycerol to form a triglyceride —

W.M. 09

# WAKISSHA JOINT MOCK EXAMINATIONS

JULY/AUGUST: \_\_\_\_\_

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(b)

~~E~~ Explain the physiological and ecological advantages C<sub>4</sub> plants has over C<sub>3</sub> plants. (6marks)

Physiological advantages.

C<sub>4</sub> plants able photosynthesize at very low Carbon dioxide concentration because PEP Carboxylase enzyme has a very high affinity for Carbon dioxide therefore no photorespiration however C<sub>3</sub> plants have RbcS RUBP Carboxylase oxygenase which has equal affinity for both oxygen and CO<sub>2</sub>, therefore in condition of low Carbon dioxide concentration, photorespiration occurs.

Ecological advantages.

The CO<sub>2</sub> fixing enzymes in C<sub>4</sub> plants are more active at hot temperature and high illumination, therefore photosynthesis occurs rapidly at low altitude, hot and tropical conditions, however C<sub>3</sub> plants, enzymes are more active at low temperature, hence distributed in temperate regions, high altitude.

Mark 85

# WAKISSHA JOINT MOCK EXAMINATIONS

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Explain the physiological significance of chlorophyll.

In the ~~the~~ thylakoid membrane, there contained (O<sub>2</sub> not)  
chlorophyll molecules, which absorbs sunlight, which excites  
electrons in Photosystem 1 and photosystem 2, the  
electrons move uphill and get accepted by electron  
acceptor, electrons then move downhill for releasing  
energy used to combine ADP and Pi to form ATP.

Also Absorbed light, split water into hydrogen (H<sup>+</sup>)  
ions, electrons and oxygen gas,  
H<sup>+</sup> and electrons combine with NADP<sup>+</sup> to form  
reduced NADP or NADPH<sub>2</sub>.

mark 65

# WAKISSHA JOINT MOCK EXAMINATIONS

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CANDIDATE'S NAME: ..... INDEX No. ....

SUBJECT: ..... PAPER: ..... SIGNATURE: .....

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(No 5 Qa)

Describe the role of the aortic and Carotid bodies in the control of the respiratory rate in man (10 marks)

Aortic and Carotid bodies are chemoreceptors found in wall of aorta aorta and Carotid artery.

They detect changes in blood pH and initiate the firing of an impulse through the afferent nerve to the respiratory Centre and in the medulla oblongata of the brain; which increase or decrease the rate of ventilation.

Also they detect changes in blood pH, and initiate the firing of an impulse through the afferent nerve to the Cardiovascular centre in the medulla oblongata which regulates heart rate.

Max 6

(b)

Describe how the respiratory rate in a cell is controlled (10 marks)

The respiratory rate is controlled by respiratory Centre in medulla oblongata of the brain; which has two regions i.e inspiratory centre and expiratory centre.

When the Carbon dioxide level rises, the Carotid and aortic bodies become stimulated and fire initiate the firing of an impulse through the afferent nerve to the inspiratory Centre in the medulla oblongata, which become stimulated on receiving the impulses and fire impulses along the phrenic, phrenic and thoracic nerves to the diaphragm and intercostal muscles respectively, this causes increase in contraction, leading into faster inspiration.



# WAKISSHA JOINT MOCK EXAMINATIONS

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CANDIDATE'S NAME: ..... INDEX No. ....

SUBJECT: ..... PAPER: ..... SIGNATURE: .....

O&A

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As the lungs expand, stretch receptors in their walls are stimulated and fire impulses along the vagus nerve to the expiratory centre in the medulla oblongata. This automatically switches off the inspiratory centre, the muscles relax and expiration takes place.

Method

No 5 c  
Distinguish between Krebs cycle and glycolysis  
(4 marks)

Krebs cycle

Glycolysis

The first compound formed is Citric acid

The first compound formed is Glucose-6-phosphate

occurs in the mitochondria

occurs in the cytoplasm

No phosphorylation of substances occurs (ATP is not utilised)

Phosphorylation of glucose occurs. (ATP is utilised)

More ATP molecules are formed

less ATP molecules are formed

No lysis occurs / splitting of a compound occurs

Splitting of Fructose-1,6-diphosphate

occurs in <sup>only</sup> presence of oxygen

occurs in presence and absence of oxygen

The final product formed is oxaloacetate

The final product formed is pyruvate



# WAKISSHA JOINT MOCK EXAMINATIONS

JULY/AUGUST: \_\_\_\_\_

CANDIDATE'S NAME: ..... INDEX No. ....

SUBJECT: ..... PAPER: ..... SIGNATURE: .....

Explain why ATP is a suitable energy store in cells  
(to 3 marks)

ATP consists of 3 phosphate groups, that link through phosphodiester bonds which are strong. Therefore on breaking the bonds, high energy is released which is used in many cell activities for example protein synthesis during growth, active transport of molecules or substances.

mark 03

No 6(a) Describe the physiological significance  
Physiological significance of monosaccharides of monosaccharides  
(Continued)

- Synthesis of nucleic acid for example Ribose is a constituent of RNA, deoxyribose of DNA ✓

- Synthesis of some Coenzymes e.g. ribose is used in the synthesis of NADP and FAD, NAD ✓

- Synthesis of ATP, ADP, AMP also require ribose. ✓

- Ribulose bisphosphate is the Carbon dioxide acceptor and is made from 5 C-sugar ribulose ✓

Source of energy when oxidized in respiration,  
for example glucose ✓

- Synthesis of disaccharides, two monosaccharide can link to form a disaccharide

- Synthesis of polysaccharides, Glucose

is used in formation, e.g. cellulose, starch  
~~glycogen~~ max 06



# WAKISSHA JOINT MOCK EXAMINATIONS

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No 6 (b)

Describe the structure of the following polysaccharides

i) Starch

(ab mer)

It is a main storage form of plants and it is a polymer of  $\alpha$ -Glucose ✓  
- It comprises of amylose 20 to 30% ✓  
- It comprises of Amylopectin 70 to 80%, all together with other substance eg phosphate ✓

- The polymer is made up of straight chain components called amylose ✓; joined by 1,4-glycosidic bonds and branches 1,6-glycosidic bond in Amylopectin the branched chain

- These components are folded to form helix, where the OH group points into the interior and they are not free to take part in its bonding -

mark ob

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(Cellulose)

(Cof work)

- Consists of approximately 10,000  $\beta$ -glucose units - ~~This is very~~

- The chain of  $\beta$ -glucose are unbranched with many cross linkages between chains which are parallel.

- It contains 1,4-glycosidic bond ✓

- It consists of straight chain of molecules which project both sides of the chain at alternative position ie alternating heads up and tails down.

weak oil

(c)

Explain why Carbohydrates are able to form all variety of Carbohydrates

Both pentoses and hexoses can be used to make polysaccharides though normally one type of monosaccharides is used in each polysaccharide type like hemicelluloses, nucleic acids sugars may be aldoses and ketoses.

Capacity to form 1,4. and 1,6 glycosidic bonds are common between sugar units eg in cellulose. This accounts for the case of branching and hence formation of different type of polysaccharide

Existence of alpha and beta forms of monosaccharide accounts for the variation of polysaccharides eg starch, alpha glucose monosaccharides while cellulose made of beta glucose units.



- Sugars may be ketoses or aldoses, these increase the polysaccharide variation like <sup>inulin</sup> ~~inulin~~ is made of ketose monosaccharide units while starch and glycogen are made of glucose monosaccharide units.

The high chemical reactivity of sugars and OH groups and their variation in exposure increases polysaccharide variability.

- Capacity to form chains of various length and branching.

By WASSWA ENOCK

0701300439 / 0762867639

"ALWAYS"

Mark 84



P530/2

Biology  
Paper 2  
July/Aug, 2023  
2<sup>1</sup>/<sub>2</sub> Hours



## JOINT MOCK EXAMINATIONS

UGANDA ADVANCED CERTIFICATE OF EDUCATION RESOURCEFUL  
EXAMINATIONS  
BIOLOGY PAPER 2  
(THEORY)  
TIME: 2 HOURS 30 MINUTES

### Instruction to candidates

- This paper consists of section A and B;
- Answer question one in section A plus any three from section B.
- Candidates are advised to read the questions carefully, organised their answers and present them precisely and logically, illustrating with well labelled diagrams wherever necessary.

Question	Marks
Total	

## SECTION A: (40 MARKS)

### Compulsory question

1. Figure 1 shows the changes that occur in the concentration of insulin and glucose in the blood stream of a person who had fasted overnight and then swallowed 75g of glucose.

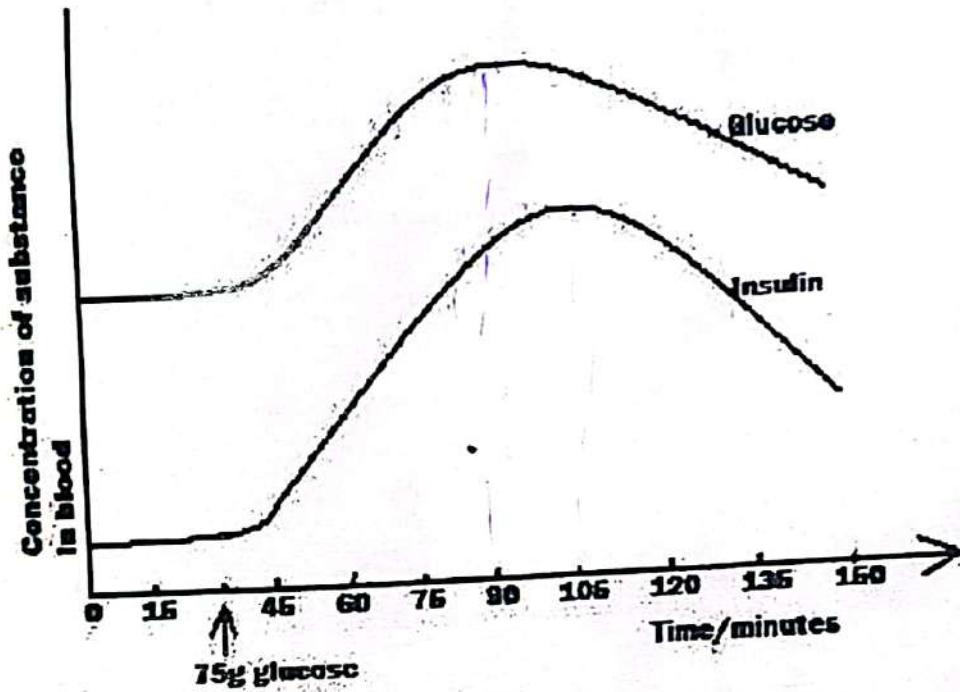
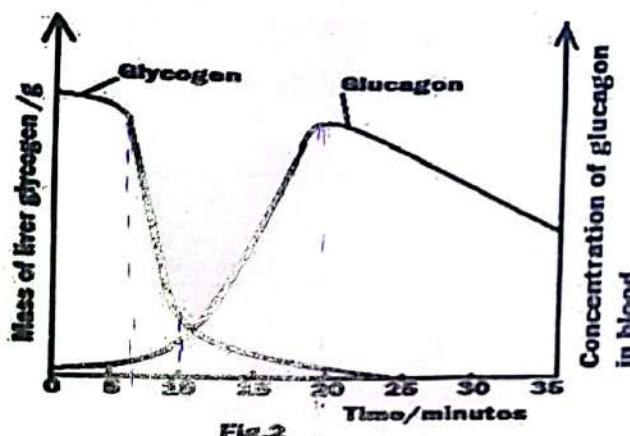


Fig.1

- (a) Compare the levels of glucose and insulin after swallowing glucose. (06 marks)
- (b) Explain the changes in the concentration of;  
(i) Glucose. (06 marks)  
(ii) Insulin. (06 marks)
- (c) Explain how the concentration of insulin would change if the person engaged in an exercise. (03 marks)
- (d) Figure 2 shows the changes in the amount of liver glycogen and glucagon concentration in blood of a person during prolonged exercise.



- Describe the effects of prolonged exercise on the amount of glycogen and the concentration of glucagon in blood. (04 marks)
- Explain the trend in the mass of glycogen and glucagon in blood. (12 marks)
- Suggest how continuous supply of glucose is ensured after the 25<sup>th</sup> minute. (05 marks)

- Failure to develop an which causes malaria
- How man influences

- Describe how a carbon dioxide plant can be converted into a triglyceride.
  - Explain the physiological C<sub>3</sub> plants.
  - Explain the physiological
- Describe the role of the respiratory rate in man.
  - Describe how the respiratory rate is controlled.
  - Distinguish between Krebs cycle and glycolysis.
  - Explain why ATP is a suitable energy carrier.
- Describe the physiological changes in blood glucose levels during prolonged exercise.
  - Describe the structure of cellulose.
  - Starch.
  - Cellulose
  - Explain why carbohydrates are important for energy storage.

#### SECTION B: (60 MARKS)

Attempt any three questions

- What is meant by the term eutrophication? (02 marks)
  - Explain the causes of eutrophication. (06 marks)
  - Explain the;
    - Adaptations of water hyacinth for its survival as a successful weed. (06 marks)
    - Ecological effects of water hyacinth on water. (06 marks)
- Compare polyploidy and aneuploidy. (06 marks)
  - Give the conditions for emergence of polyploids in plants. (04 marks)
  - Explain the following;

- (i) Failure to develop an effective vaccine against plasmodia species which causes malaria. (05 marks)
- (ii) How man influences the process of speciation. (05 marks)
4. (a) Describe how a carbon dioxide molecule in the mesophyll cells of a C<sub>3</sub> plant can be converted into a triglyceride. (09 marks)
- (b) Explain the physiological and ecological advantages C<sub>4</sub> plants have over C<sub>3</sub> plants. (06 marks)
- (c) Explain the physiological significance of chloroplast. (05 marks)
5. (a) Describe the role of the aortic and carotid bodies in the control of the respiratory rate in man. (06 marks)
- (b) Describe how the respiratory rate in a cell is controlled. (07 marks)
- (c) Distinguish between Kreb's cycle and glycolysis. (04 marks)
- (d) Explain why ATP is a suitable energy store in cells. (03 marks)
6. (a) Describe the physiological significance of monosaccharides. (06 marks)
- (b) Describe the structure of the following polysaccharides; (06 marks)
- (i) Starch. (04 marks)
- (ii) Cellulose
- (c) Explain why carbohydrates are able to form a variety of carbohydrates. (04 marks)

END/AB 2023