Biology II

Date: 23/June/2022
Period: 8H30' - 11H30'

NESA NATIONAL EXAMINATION AND SCHOOL INSPECTION AUTHORITY

END OF TERM III EXAMINATIONS

LEVEL: **Advanced Level S4**

COMBINATIONS
MATHS-CHEMISTRY BIOLOGY: MCB
PHYSICS CHEMISTRY BIOLOGY: PCB
BIOLOGY CHEMISTRY GEOGRAPH: BCG

DURATION: **3 Hours**

MARKS: **..... /100**

INSTRUCTIONS

This paper consists of **three** sections: **A and B.**

Section A: Attempt **all** questions. **(70 marks)**

Section B: Attempt **three** questions. **(30 marks)**

SECTION A: Attempt all questions **(70 Marks)**

1) a) What are the four main things that all members of a species share? (**4 marks)**

b) What are the three features of a natural system of classification? **(3 marks)**

2) Evaluate the contribution of biodiversity to human wellbeing. (**5 marks)**

3) Define the following terms:

A. magnification (**2 marks)**
B. Resolution. (**2 marks)**

4) What is the role of cholesterol in cell surface membrane? (**3 Marks)**

5) Give Three characteristics of meristematic cells. (**3 Marks)**

6) Organise steps involved in testing Vitamin C (**3 Marks)**

1. To juice extracted from orange
2. Add 3cm3 add drops of DCPIP
3. The blue colour of DCPIP is decolorised.

7) The general formula for sugars is $Cn(H_20)n$ or CnH2nOn (**2 Marks)**

What would be the formula of:

a) a triose?

b) a pentose

8) What would you advise someone starting to have symptoms of:
A. Scurvy (2 **marks)**
B. Pernicious anemia (2 **marks)**

9) List the characteristic features of gaseous exchange surface (**3 marks)**

10) Explain how alveoli are adapted for gas exchange (**4marks)**

11) What would happen to guard cells if the concentration of malate doubled? **(2 marks)**

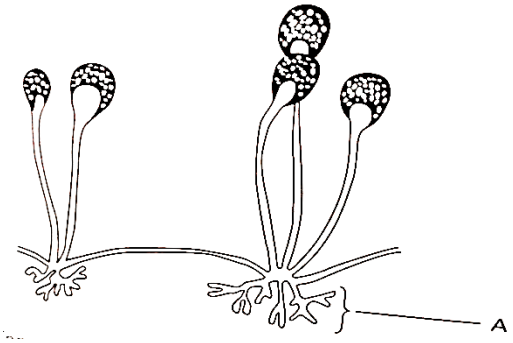
12) Describe the three stages of seed germination. **(3 marks)**

13) How birds are adapted to flying? **(5 marks)**

14) Explain why there is a high death rate from TB in countries with a high proportion of the population who are HIV-positive. **(4 marks)**

15) Show how vegetative propagation takes place in potatoes? **(3 marks)**

16) The diagram below shows on organism of genus Rhizopus.



a. Name the major taxonomic group to which this organism belongs and give one external feature characteristic of this group. **(2 marks)**

b. Describe the role of part A in the nutrition of the organism. **(3 marks)**

c. Explain how parasitic nutrition differs from the nutrition of Rhizopus. **(3 marks)**

17) a) State the advantages of using immobilized enzymes. **(4 marks)**

b) Why are enzymes added to washing powder? **(3marks)**

Section B: Attempt any 3 questions only **(30 Marks)**

18) Compare the xylem and Phloem **(10 Marks)**

19)Defend that human cannot live without blood. **(10 marks)**

20)Examine physical and chemical properties of water that make it effective in supporting life. **(10 marks)**

21)Discuss why it is difficult to eradicate malaria. **(10 marks)**

22)identify the various types of asexual reproduction in plants and animals (**10 marks)**

End !!!!

S4 BIOLOGY MARKING SCHEME

SECTION A: Attempt all questions (70 Marks)

1) a) What are the four main things that all members of a species share?
4 marks

b) What are the three features of a natural system of classification?
3 marks

Answer

a) They have similar genes and therefore resemble one another, immunologically' biochemically and anatomically. They are capable of breeding to produce offspring which themselves are fertile. They have common ancestry' They occupy the same ecological niche. **4 marks**

b) It is based on evolutionary relationships between organisms and their ancestors. It classifies species into groups using shared characteristics derived from their ancestors. It is arranged in a hierarchy in which groups are contained within larger composite groups with no overlap. **3 marks**

2) Evaluate the contribution of biodiversity to human wellbeing. **5 marks**

Answer

Contribution of biodiversity to human well-being.

•Good health and productive livelihoods depend on ecosystem products and

services, such as availability of fresh air, food, fuel sources, esthetic services,

financial/economical gains, etc…

- Ecosystem services and goods contribute positively in human health promotion,

  diseases prevention and public health. But, biodiversity loss and ecosystem

  change may limit discovery of new components of biodiversity used in traditional

  medicine and put at risk community health development.

3) Define the following terms:

A. magnification **2 marks**
B. Resolution. **2 marks**

Answer

A. magnification is the number of times larger an image is than the real size of the object.

$$\text{magnification} = \frac{\text{observed size of the image}}{\text{actual size}}$$

$$M = \frac{I}{A}$$

B. Resolution: is the minimum distance apart that two object can be in order for them to appear as separate items / ability to distinguish two separate points.

4) What is the role of cholesterol in cell surface membrane? **3 Marks**

Answer

Cholesterol in cell surface membrane:

- Reduces lateral movement of phospholipids.
- Regulates membrane fluidity depending on temperature.
- Prevents leakage of water and dissolved ions from the cell.

5) Give Three characteristics of meristematic cells. **3 Marks**

Answer

Characteristics of meristematic cell:

- Thin cell walls, small or no vacuole
- no specialized features.
- Large prominent nucleus
- Undifferentiated cells
- Undergo rapid cell division
- Cells are mostly isodiametric in shape and sometimes circular
- Absent intercellular space
- Do not undergo secondary thickening
- Cells contain a large number of ribosomes. etc

- The cells are small

6) Organise steps involved in testing Vitamin C **3 Marks**

1. To juice extracted from orange
2. Add 3cm3 add drops of DCPIP
3. The blue colour of DCPIP is decolorised.

Answer

The organised steps are: **3 Marks**

1. To 3cm3 of DCPIP
2. Add drops of juice extracted from orange
3. The blue colour of DCPIP is decolorized

7) The general formula for sugars is $Cn(H_20)n$ or CnH2nOn **2 Marks**

What would be the formula of:

a) a triose?

b) a pentose

Answer

The formula for

a) Is $C_3(H_20)_3$ or C3H6O3
b) $C5(H20)_5$ or $C_5H_{10}O_5$

8) What would you advise someone starting to have symptoms of:
A. Scurvy 2 **marks**
B. Pernicious anemia 2 **marks**

Answer

A. Taking food-rich in the vitamin C (Ascorbic acid) such as Tomatoes, citrus fruits, green vegetables, etc
B. Taking food-rich in The vitamin B12 like meat, liver, milk, shellfish, eggs, cheese, etc

9) List the characteristic features of gaseous exchange surface **3 marks**

Answer

Characteristic features of gaseous exchange surfaces are:

- Large surface area
- Rich supply of blood
- Thin surface or thin wall
- Moist surfaces area
- Protection against injury and dry out

10) Explain how alveoli are adapted for gas exchange **4marks**

Answer

Alveoli are adapted for gas exchange:

- ✓ They are numerous hence they increase the surface area for gas exchange .
- ✓ They have large surface area to volume ratio hence there is increase of the rate of gas exchange.
- ✓ They have thin epithelium, therefore short diffusion distance between air and blood;
- ✓ They are well supplied with many blood capillaries.

11) What would happen to guard cells if the concentration of malate doubled? **2 marks**

Answer

If the concentration of malate doubled the osmotic pressure will increase and guard cells will open wider.

12) Describe the three stages of seed germination. **3 marks**

Answer

Germination involves three main

stages: imbibition, radicle sprouting and plumule sprouting

Imbibition: a dry seed (dormant seed contains very little water) when placed in

moist conditions, it absorbs water by osmosis.

Radicle sprouting

As the seed absorbs water and oxygen, it swells, the embryo grows and the seed-coat cracks, and the radicle also called primary root emerges downward. This is seed coat rupture and radicle sprouting.

Plumule sprouting

The primary root is the first organ to appear during

embryo development. The plumule cells develop and the first leaf forms upwards in the process known as plumule sprouting.

13) How birds are adapted to flying? **5 marks**

Answer

Birds are adapted to flying by:

• Modification of limbs particularly forelimbs,

• Increased number of flight feathers provide a large surface area of wings without increasing the weight;

• Large and powerful pectoral muscles

• Bones of vertebrae are fused

• Enlarged sternum to provide a large surface area for attachment of the flight muscles: pectoral muscles

• Hollowed bones make birds light

• Streamlined body covered with light feathers.

• Backward arrangement of features for reducing air resistance

14) Explain why there is a high death rate from TB in countries with a high proportion of the population who are HIV-positive. **4 marks**

Answer

HIV/AIDS decreases the number of T-lymphocytes, weakening the ability of the body to mount an effective immune response

against HIV and other pathogens. About one third of the human population is infected with *M. tuberculosis*, and this infection may

progress to cause the symptoms of TB if the immune system is weakened by HIV infection.

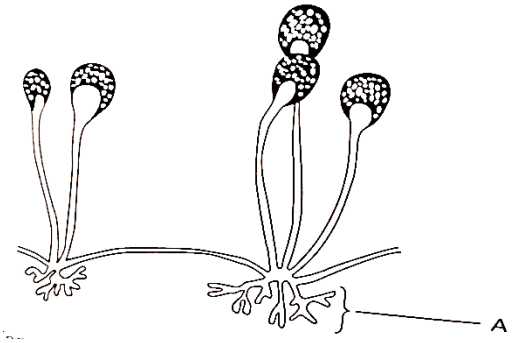
15) Show how vegetative propagation takes place in potatoes? **3 marks**

Answer

The potato tubers have nodes or eyes from which the new growth begins

The new stems growing from each eye are called sprouts which gives rise to the new plant.

16) The diagram below shows on organism of genus Rhizopus.



Name the major taxonomic group to which this organism belongs and give one external feature characteristic of this group. **2 marks**

b. Describe the role of part A in the nutrition of the organism. **3 marks**

c. Explain how parasitic nutrition differs from the nutrition of Rhizopus. **3 marks**

Answer

a. Fungi/zygomycota;hyphae/mycelium/sporangia
b. Hyphae penetrate blood source: secrete enzymes; absorbe digested products **3marks**

c. Parasite: nutrient already digested/soluble only has to absorbe them; source of nutrients is living/host/rhizpus feed on dead matter; parasite has detrimental effect on host. **3marks**

17) a) State the advantages of using immobilized enzymes. **4 marks**

b) Why are enzymes added to washing powder? **3marks**

Answer

a) The advantages of using immobilized enzymes are: (i) reuse (ii) continuous use (iii) less labour intensive (iv) saving in capital cost (v) minimum reaction time (vi) less chance of contamination in products, (vii) more stability (viii) improved process control. **4marks**

b) The biological washing powders contain enzymes like protease and lipase to remove protein stains and fat/grease from clothes. The enzymes break down proteins or fats on the fabric, forming water-soluble substances that can be washed away **3marks**

Section B: Attempt any 3 questions only **(30 Marks)**

18) Compare the xylem and Phloem **(10 Marks)**

Answer

Xylem vs Phloem

Similarities

The cell walls of the xylem and phloem consist of cellulose.

They both contain chloroplast.

Phloem and xylem function in the transportation process that occurs in vascular plants.

They both exhibit primary and secondary growth.

These tissues both contain more than one type of cell.

They both develop from the cambium.

They both possess fibers.

These tissues are both differentiated into proto- and meta-elements.

They both possess parenchymatous cells.

Differences

Xylem	**Phloem**
Transports water and dissolved minerals absorbed from the roots to the rest of the plant.	Transports soluble organic compounds prepared during photosynthesis from the green parts of the plant to the rest of the plant.

Xylem	**Phloem**
Xylem is mainly located in the center of the vascular bundles	Phloem is mainly localized towards the periphery of the vascular bundles.
Xylem forms most of the bulk of the wood.	Phloem forms most of the bulk of the bark.
Xylem tissue is composed of xylem vessels, fibers, and tracheids and xylem parenchyma cells	Phloem tissue is composed of like sieve tubes, companion cells, phloem fibers, and phloem parenchyma.
Xylem fibers are robust and longer.	Phloem fibers are flexible in shorter.
The cells of the xylem tissue are dead cells except for the parenchyma cells.	The cells of the phloem tissue are living cells except for the blast fibers.
The cell wall of the cells in the xylem is thick-walled.	The cell wall of the cells of the phloem is thin-walled.
Lignified cell walls are present in the xylem.	The cell wall is not lignified.
Two types of conducive cells are present in xylem; tracheids and vessels.	Only one type of conducive cell is present in phloem; sieve tubes.
The conducive tissues consist of dead cells.	The conducive tissues consist of living cells.
The primary function of xylem is to transport water and dissolved minerals from the root to different parts of the plant.	The primary function of the phloem is to transport the prepared sugars from the leaves to different parts of the plant.
The transport by xylem is unidirectional; the water and mineral are only moved up from the roots.	The transport by phloem is bidirectional; the food can travel both up and down the plant.
Xylem also aids in providing physical support to the plant.	Phloem is not involved in mechanical support.

19)Defend that human cannot live without blood. **10 marks**

Answer

Blood has three main functions in human body **transport, protection** and **regulation.**

In transport: Soluble excretory materials are transported to organs of excretion (eg urea), hormones from the glands where they are produced to target organs(eg insulin), nutrients and respiratory gases are circulated in all parts of the body trough blood. Without blood there would be an accumulation

of waste products in the body, Hormones will not reach to target cells and therefore result in poor body coordination

In **regulation,** blood is used in distribution of excess heat from the deeply seated organs. Without blood maintain a constant body temperature would be impossible.

In protection; blood plays important role in defense against disease.

For examples Phagocytosis and production of antibodies. Without blood body would be attacked by diseases defencelessly.

So, human cannot live without blood. **10 marks**

20) Examine physical and chemical properties of water that make it effective in supporting life. **10 marks**

Answer

Property of water	**Significance for living organism**
Water is a liquid at room temperature	Provides a fluid environment inside of cells and aquatic environment for organism to live in.
Water is universal solvent	The chemical reactions inside of the cell happens in aqueous solution. Water is the main transport medium in organisms.
Water has high surface tension	Water forms a surface film at an air water interface. This allows some aquatic organism such as pond stakers to land on the surface of ponds and move over it.
Ice is less denser than liquid water	Ice forms on the surface of water body and insulates the water below allowing aquatic life to survive.
Water has adhesion forces	Along with low viscosity adhesion forces help capillarity so that for example, water can move upward through narrow channel in the soil against gravity.
Water has high specific heat capacity	Water being a major component of internal fluid. Organisms resist temperature changes and so remain relatively stable.
High latent heat of vaporization	Heat is lost from the surface when water evaporates from it. This is used as cooling mechanism mechanism, sweating in animals and transpiration in plants.
High latent heat of fusion	Cell content and aquatic habitats are slow to freeze in cold weather.

Water is denser than air	Acts as habitat for large organisms. helps support and disperses reproductive structures such as larvae and large floating fruits like coconuts.
Water is difficult to compress	Water is an important structure agent acting as a hydrostatic skeleton in invertebrates (worms) and turgid cells in plants.
Water has high tensile strength	Continuous column of water are pulled up the xylem to the top of the plant during transpiration..
Water combines with many organic molecules to form hydrate molecule	Most organic molecules occur in a hydrated form in a cell. If water is removed, their physical and chemical properties are affected, the use and storage of food.
Water is colorless and transparent	Transmission of sunlight helps aquatic plants to phosynthesize.

21)Discuss why it is difficult to eradicate malaria. **10 marks**

Answer

Malaria eradication is the disappearance of every malaria parasite from the face of this planet. Is the permanent interruption of malaria transmission at a global level and that is a major aspiration that the public health community has had for the last decades .

It is difficult to eradicate malaria because:

• There is no effective vaccine against malaria

• The pathogens are transmitted by mosquitoes which are not eradicated.

• The plasmodium has become resistant to different anti-malarial drugs

• Ignorance of some people toward the disease and how it is spread.

However some improvement are being made to control malaria:

- use of modern techniques in gene sequencing and drug design
- Development of vaccines targeted against different stages of the parasite's life cycle
- a renewed international will to remove the burden of disease from the poorest parts of the world, allied to generous donations from wealthy individuals and foundations. **10 marks**

22)identify the various types of asexual reproduction in plants and animals

10 marks

Answer

Binary fusion

Spore formation

Vegetative propagation

Natural layering

Rhizomes

Tubers

Cuttings

Fragmentation

Buddings

Grafting

Suckers

Clonings

End !!!!

BIOLOGY
Alternative to practical

Date: 30/June/2022
Period: 8H30'-10H00'

NESA NATIONAL EXAMINATION AND SCHOOL INSPECTION AUTHORITY

END OF TERM III EXAMINATIONS

LEVEL: **Senior four**

COMBINATIONS: **MATHS-CHEMISTRY BIOLOGY: MCB**
PHYSICS CHEMISTRY BIOLOGY: PCB
BIOLOGY CHEMISTRY GEOGRAPH: BCG
ASSOCIATE NURSING PROGRAM: ANP

DURATION: **1H:30 Min**

MARKS: **..... /15**

INSTRUCTIONS

1. This questions is compulsory
2. Don't open this question paper until you are told to do so`.
3. Read each question carefully before answering it.
4. Use only a **blue** or black **pen**

Six identical potato cylinders measuring 2.0 cm in length were each place in different concentration of sugar solution. After two hours the potato cylinder were removed from the solution and remeasured.

The table bellow shows the results

Concentration of sugar solution	Length of potato cylinder after 2 hrs (cm)	Difference in length of potato cylinder after 2 hrs (cm)
0.1 0.2 0.3 0.4 0.5 0.6	2.40 2.25 2.15 2.05 1.98 1.02	

a) Complete the table by filling in difference in the length of each potato cylinder after 2 hours (ie length after 2 hours subtract initial length) **(3 Marks)**

b) Plot a graph of the difference in length after 2 hours against concentration of sugar solution **(3 Marks)**

c) i) What was the effect of the concentration of sugar solution on the length of the potato cylinders **(2Marks)**
ii) Explain why concentration of sugar solution affected the length of potato cylinders **(2 Marks)**

d) i) From your graph, determine the concentration of sugar solution that would give no difference in length of potato cylinder **(2 Marks)**
ii) Explain what happen in potato cylinder when no changes in length occurs **(2 Marks)**

e) Suggest one other observation other than change in size, that would be made on the potato cylinders **(1 Marks)**

End !!!!

Biology senior four marking schemes

Alternative to practical exams

This paper consists of one compulsory number of 20 Marks

Time allocated: 1.30 hrs

Six identical potato cylinders measuring 2.0 cm in length were each place in different concentration of sugar solution. After two hours the potato cylinder were removed from the solution and remeasured.

The table bellow shows the results

Concentration of sugar solution	Length of potato cylinder after 2 hrs (cm)	Difference in length of potato cylinder after 2 hrs (cm)
0.1 0.2 0.3 0.4 0.5 0.6	2.40 2.25 2.15 2.05 1.98 1.02	

a) Complete the table by filling in difference in the length of each potato cylinder after 2 hours (ie length after 2 hours subtract initial length) **(3 Marks)**
b) Plot a graph of the difference in length after 2 hours against concentration of sugar solution

(5 Marks)
c) i) What was the effect of the concentration of sugar solution on the length of the potato cylinders
(4Marks)
ii) Explain why concentration of sugar solution affected the length of potato cylinders **(3 Marks)**
d) i) From your graph, determine the concentration of sugar solution that would give no difference in length of potato cylinder
(2 Marks)
ii) Explain what happen in potato cylinder when no changes in length occurs **(2 Marks)**

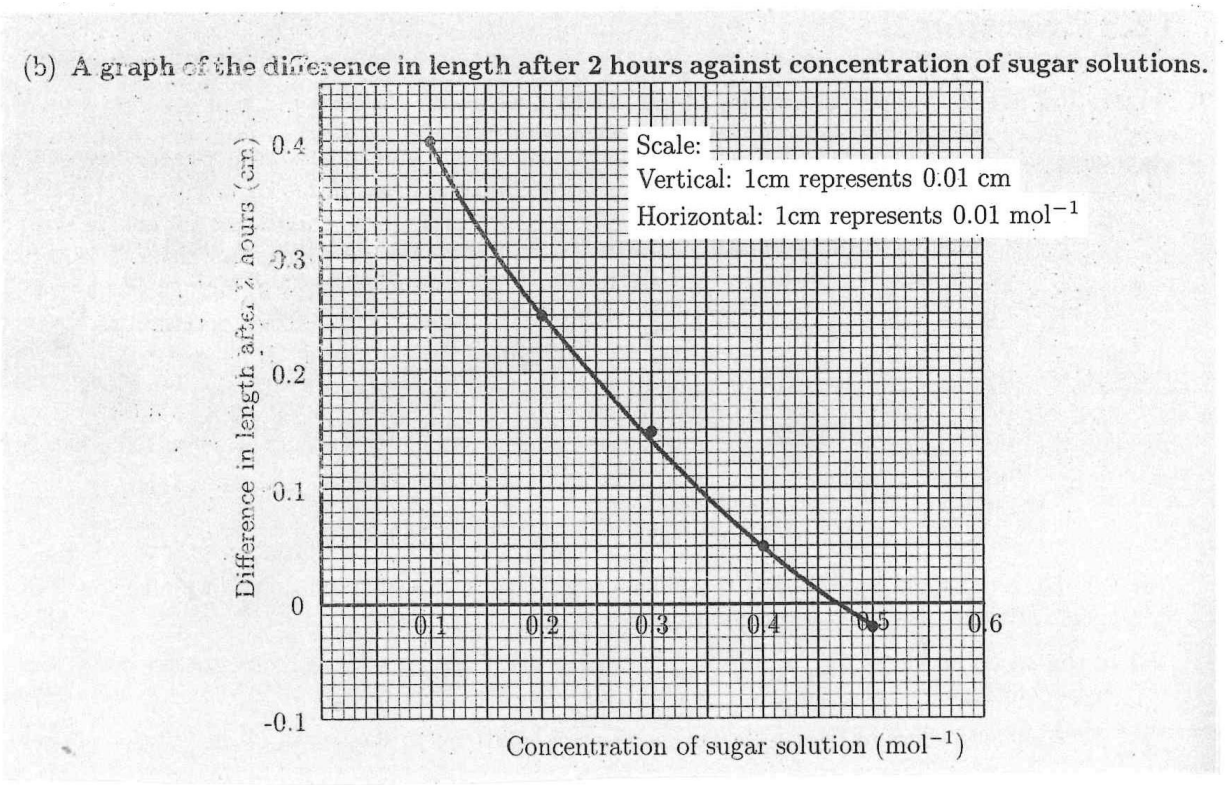
e) Suggest one other observation other than change in size, that would be made on the potato cylinders
(1 Marks)

Answer

a)

Concentration of sugar solution	Length of potato cylinder after 2 hrs (cm)	Difference in length of potato cylinder after 2 hrs (cm)
0.1	2.40	0.4
0.2	2.25	0.25
0.3	2.15	0.15
0.4	2.05	0.05
0.5	1.98	0.02
0.6	1.02	0.98

b)



C) i) Sugar concentration from 0.1 to 0.4 mol L^{-1} had an effect of increasing the length of potato cylinders. However sugar concentration of 0.5 mol L^{-1} and 0.6 mol L^{-1} had an effect of decreasing the length potato cylinder

II)Sugar concentration from 0.1 to 0.4 mol l^{-1} were Lower than the concentration of the cell sap in the cell vacuoles of the potato cylinders cells. Hence water passed by solution from these solution into the cell sap in the vacuole there by increasing the length of the potato cylinders. Sugar solution of 0.5 mol $l^{-1}$and 0.5 mol l^{-1} were higher than of the cell sap in the vacuole of the potato cells.

Therefore, water passed by osmosis from cell sap.

In the vacuole to these solution there by decreasing the length of potato cylinder.

d) i) From the graph a concentration of 0.46 mol l^{-1} would give no difference in length of a potato cylinder

ii) when no change in the length occurs, it means that there is no net passage of water by osmosis into or out of the potato cells. This is because the concentration of the cells sap with cell vacuole of the potato cells is equal to the concentration of the sugar solution in which the potato cylinder is placed.

e) Change in turgidity; some potato cylinders would be stiff while others would be flaccid.

End !!!!

BIOLOGY
Practical

Date: 30/June/2022
Period: 8H30'-10H00'

END OF TERM III EXAMINATIONS

LEVEL: **Senior four**

COMBINATIONS: **MATHS-CHEMISTRY BIOLOGY: MCB**
PHYSICS CHEMISTRY BIOLOGY: PCB
BIOLOGY CHEMISTRY GEOGRAPH: BCG
ASSOCIATE NURSING PROGRAM: ANP

DURATION: **1H:30 Min**

MARKS: **..... /15**

INSTRUCTIONS

1. This questions is compulsory
2. Don't open this question paper until you are told to do so`.
3. Read each question carefully before answering it.
4. Use only a **blue** or black **pen**

Requirements

Iodine solution

Benedicts solution

Dilute sodium hydroxide

Copper II sulphate

Ethanol

Distilled water

Heat source

Substance K - a mixture of

- Starch
- Protein
- Fats

1) You are provided with substance K a food mixture. Using the reagents provided carry out the following tests on substance K and record your observation and deductions in the table bellow. **(4 Marks)**

Experiment	Observation	Deduction
To 1 cm^3 of K in a test tube add 2-3 drops of iodine solution		
To 1 cm^3 of K in another test tube add 1 cm^3 of benedicts solution and boil		
To 2cm^3 of K in third test tube add 1cm^3 of dilute sodium hydroxide followed by few drops of copper II sulphate solution and shake		
To 2cm3 of K in fourth test tube, add 5cm3 of ethanol followed by 5 drops of water.		

b) From your observation and deductions in test (i) to (iV) above, list the components of substance K **(4 Marks)**

c) Give the nutritive uses of the components K you have identified above. **(4 Marks)**

d) How would you find out if there was Vitamin C in substance K. **(3 Marks)**

S4 PRACTICAL MARKING SCHEME

Requirements

Iodine solution

Benedicts solution

Dilute sodium hydroxide

Copper II sulphate

Ethanol

Distilled water

Heat source

Substance K - a mixture of

- Starch
- Protein
- Fats

1) You are provided with substance K a food mixture. Using the reagents provided carry out the following tests on substance K and record your observation and deductions in the table bellow. **(4 marks)**

Answer

Experiment	Observation	Deduction
To 1 cm^3 of K in a test tube add 2-3 drops of iodine solution	The colour of K turns blue black	Starch present
To 1 cm^3 of K in another test tube add 1 cm^3 of benedicts solution and boil	The solution of K turns pale blue. On heating the solution turns blue-green, yellow and finally to orange precipitate.	Reducing sugar present
To 2cm^3 of K in third test tube add 1cm^3 of dilute sodium hydroxide followed by few drops of copper II sulphate solution and shake	Solution of K turns pale blue solution	Proteins present
To 2cm3 of K in fourth test tube, add 5cm3 of ethanol followed by 5 drops of water.	A white emulsion is formed	Lipids present

b) From your observation and deductions in test (i) to (iV) above, list the components of substance K **(4 marks)**

Answer

i) Starch
ii) Reducing sugar
iii) Proteins
iv) Lipids

c) Give the nutritive uses of the components K you have identified above.

Answer

Starch- provide energy

Reducing sugar- give energy

Proteins- building structures in the body and growth some proteins are enzymes

Lipids- give energy, insulate the body against heat loss **(4 marks)**

d) How would you find out if there was Vitamin C in substance K.

Answer

To 1cm3 of DCPIP solution in attest tube, solution K would be added drop by drop, if the deep blue colour of DCPIP turns colorless, the Vit C is present. **(3 marks)**