1st OPPORTUNITY EXAMINATION QUESTION PAPER

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EXAMINER(S): Mr. Onjefu Sylvanus, Dr. Marius Mutorwa
MODERATOR: Dr. Habauka Kwaambwa

INSTRUCTIONS:

1. Answer all the questions in the booklet provided
2. Show clearly all the steps used in the calculations
3. All written work MUST be done in blue or black ink and sketches must be done in pencils.
4. No books, notes and other additional aids are allowed.
5. Answers must be in SI units.

PERMISSIBLE MATERIALS
1. Non-Programmable Calculator

ATTACHMENTS:
1. Periodic table
2. Graph

This paper consists of 11 pages including this cover
SECTION A: BIOLOGY – TOTAL MARKS: 50

QUESTION 1

Multiple Choices [Total Marks: 6]

1.1 Which of the following is a correct sequence of levels of classification?
   (a) genus, species, family, order, class, phylum, kingdom
   (b) genus, species, order, phylum, family, class, kingdom
   (c) genus, species, order, family, class, phylum, kingdom
   (d) species, genus, family, order, class, phylum, kingdom
   (e) species, genus, order, family, class, phylum, kingdom

1.2 In the six-kingdom system, the kingdom that includes the protozoa is
   (a) plantae
   (b) protista
   (c) archea
   (d) eukarya
   (e) fungi

1.3 When ecologists study the abiotic components of the environment they are studying _____.
   (a) all organisms
   (b) all predators
   (c) soil, water, and weather
   (d) all organisms, soil, water, and weather

1.4 Unsaturated fats
   (a) are more common in animals than in plants.
   (b) have fewer fatty acid molecules per fat molecule.
   (c) are associated with greater health risks than are saturated fats
   (d) have double bonds in their fatty acid chains
   (e) are usually solid at room temperature
1.5 Where is keratin proteins found in your body?
   (a) Hair
   (b) In blood plasma
   (c) In connective tissue
   (d) Insulin
   (e) Enzyme

1.6 Beers are broken into two basic types, of which sub-types are created. What are the two basic types of beer?
   (a) Fermented and non-fermented
   (b) Ales and lagers
   (c) Saison and ales
   (d) Fruit and grain
   (e) Soured and un-soured

QUESTION 2  [Total Marks: 8]

2.1 How do protists and Archaebacteria differ? (1)

2.2 Which part of the flower contains ovules? (1)

2.3 Goiter is linked to a deficiency of which mineral? (1)

2.4 Which grain most often used to make beer? (1)

2.5 Name the enzyme that is added in the cheese to make the milk curdle. (1)

2.6 How much energy is lost at each trophic level? (1)

2.7 What is a Population? (1)

2.8 What organism is used to make yogurt? (1)
QUESTION 3  
[Total Marks: 7]

3.1 Explain the following terms or concepts:

a) Monoecious
b) Perianth
c) Complete flowers
d) Calyx
e) Gynoecium

3.2 Which are more showy, wind-pollinated flowers or animal-pollinated flowers? Why?

QUESTION 4  
[Total Marks: 14.5]

4.1 Name the two types of Vitamins that are synthesis naturally and how are they produced.

4.2 List the steps involved in wine production.

4.3 What is a disaccharide and mention the different type of it and give one examples of each where it is found in nature?

QUESTION 5  
[Total Marks: 14.5]

5.1 Describe the life cycle of the following animals (a) frog (b) termites (c) bees.

5.2 Explain symbiosis and distinguish the different type of symbiosis.
SECTION B: CHEMISTRY – TOTAL MARKS 40

QUESTION 6 [Total Marks: 10]

6.1 Distinguish between a concentrated solution and a saturated solution. Name a suitable physical separation technique that can be used to separate a solution of two miscible liquids with different boiling points. (3)

6.2 In terms of kinetic theory, discuss how a decrease in temperature affects the behaviour of atoms during the condensation phase change. (3)

6.3 Classify each of the following samples of matter as a homogeneous mixture, heterogeneous mixture, element or compound. (2)

   a. fresh milk
   b. a can of coke
   c. copper wire
   d. carbon dioxide

6.4 Define the term endothermic process. (1)

6.5 How does an increase in molecular weight affect the intermolecular force attracting atoms together in a sample of matter? (1)

QUESTION 7 [Total Marks: 12]

7.1 What is the difference between the mass and weight of an object? For each physical quantity, state the appropriate SI unit of measurement. (3)

7.2 In each of the following list, identify the two units which are related and provide an explanation as to why the remaining unit is not related. (3)

   a. centimetre, decimetre and kelvin
   b. mole, gram and candela
   c. liter, seconds and cubic metre
7.3 Perform the following mathematical operations and express each of the answers to the **correct number of significant figures** or where applicable, to the **correct number of decimal places**. (4)

a. 264.42 + 238.547 – 135.0

b. 75 million + 2.5 million

c. 5 thousandth – 20 hundredth

d. \((2.74 \times 10^3) – (4.22 \times 10^5) + (6.35 \times 10^4)\)

7.3 Using a Fahrenheit thermometer, the melting pint of a sample of nickel metal was experimentally determined to be **2650.8 °F**. Convert the melting point temperature, using the appropriate formula, into Degrees Celsius (°C) and Kelvin (K). (2)

*Given: °F = (1.8 \times °C) + 32 and K = 273.15 + °C*

**QUESTION 8** [Total Marks: 10]

8.1 Discuss the structure of the atoms according to Bohr’s Theory and specify which of the sub-atomic particles determine the overall mass and overall size of the atom, respectively. (3)

8.2 Fill in the gaps (a – h) in the table below. (4)

*Note: Symbol = \text{mass no.} \text{Element}^{\text{net charge}}*

<table>
<thead>
<tr>
<th>Symbol</th>
<th>(a)</th>
<th>(b)</th>
<th>32S\textsuperscript{2-}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protons</td>
<td>26</td>
<td>(c)</td>
<td>16</td>
</tr>
<tr>
<td>Neutrons</td>
<td>30</td>
<td>(d)</td>
<td>16</td>
</tr>
<tr>
<td>Electrons</td>
<td>(e)</td>
<td>46</td>
<td>(f)</td>
</tr>
<tr>
<td>Mass number</td>
<td>(g)</td>
<td>119</td>
<td>32</td>
</tr>
<tr>
<td>Net Charge</td>
<td>2+</td>
<td>4+</td>
<td>(h)</td>
</tr>
</tbody>
</table>
8.3 Determine whether each of the following statements is true or false. If false, correct or state why the statement is false. (3)

a. Elements in the same group have the same number of valence electrons and have similar chemical properties.

b. The group number determines the number of electronic shells around a nucleus while the period number determines the number of valence electrons.

c. Hydrogen is a monoatomic, reactive gas which is classified with the group 1 (alkali metals) elements.

QUESTION 9 [Total Marks: 8]

9.1 define the following terms. (2)

a. amphoteric

b. indicator

9.2 list two uses for nitric acid. (2)

9.2 fill in the products formed in the following reactions: (2)

a. Mg + 2HNO₃ → _________ + _________

b. H₂SO₄ + CaCO₃ → _________ + _________ + _________

9.3 Complete the following table by providing the name and formula of the inorganic compound. (2)

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium oxychloride</td>
<td>(a)</td>
</tr>
<tr>
<td>(b)</td>
<td>NH₄NO₃</td>
</tr>
</tbody>
</table>
SECTION B: PHYSICS – TOTAL MARKS: 40

QUESTION 8 [Total marks: 5]

An experiment carried out in the physics laboratory to determine the rate of change of velocity has the following results presented in graphical form below. Using the diagram answer the following question:

8.1 What are the two important pieces of information that are missing from the graph? (2)

8.2 From the question above, why do we say that velocity is the dependent variable? (1)

8.3 The equation of a straight line is given by

\[ y = mx + c \]

i) From the expression above, which is the independent variable? (1)

ii) From the expression above, which letter represents the gradient? (1)
9.1 Match the term in COLUMN A with either renewable or non-renewable energy source in COLUMN B (5)

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>i.</td>
</tr>
<tr>
<td>Crude oil</td>
<td>ii</td>
</tr>
<tr>
<td>Geothermal</td>
<td>iii.</td>
</tr>
<tr>
<td>Tidal</td>
<td>iv.</td>
</tr>
<tr>
<td>Natural gas</td>
<td>v.</td>
</tr>
</tbody>
</table>

9.2 Apart from recycling, the use of renewable energy source, riding of bicycle and public transport what other two things do you think can be done practically to save energy so that we use less of the earth’s energy resources (2)

9.3 State the principle of conservation of energy (2)

9.4 What are the advantages of using renewable energy over non-renewable energy? (3)

10.1 Define the term electromotive force (emf). (1)

10.2 Construct a circuit diagram containing 3 resistors a, b, c in parallel, resistors d and e in series, with an ammeter and 2 cells in series with a conventional current and an open circuit. (3)
10.3 Differentiate between Alternating and Direct Current (2)

QUESTION 11 [Total marks: 9]

11.1 With respect to magnetic deflection with magnet give the symbols of i. ii. and iii. (3)

11.2 The successful bombardment of nitrogen atom with alpha particle resulted in the formation of oxygen nucleus and proton according to the reaction,

\[ ^4_2\text{He} + ^{14}_x\text{N} \rightarrow ^y_2\text{O} + ^1_1\text{H} \]

What are the values x, y and z? (3)

11.3 The equation for the alpha decay of Ra-226 is given by;

\[ ^{226}_{88}\text{Ra} \rightarrow ^m_0\text{X} + ^4_2\text{He} \]

Determine the values of m and d and give the name of the new element X that is formed after the decay. (3)
QUESTION 12

12.1 State Newton’s first law. (2)

12.2 Determine the magnitude and direction of the particles (3)

12.3 In a pure note sound wave pattern, a series of crests and troughs are obtained. What is the difference between a crest and a trough? (2)

12.4 A police man sends out radar waves with a 3.4 cm wavelength from his police car with a speed of $3 \times 10^8$ m/s. What is their frequency? (2)

12.5 Water wave that are 10 cm long pass a point in a tank at the rate of 3.75 Hz. Determine the speed ($v$) (2)