

**INTERSECONDARY SCHOOLS EXAMINATION SERIES**

**ISESE**

**FORM TWO PRE NATIONAL NO.1**

**CHEMISTRY**

**TIME 2;30 HOURS**

**Monday 15<sup>th</sup> July 2024**

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**INSTRUCTIONS**

- This paper consists of sections A, B and C
- Answer all questions in both sections
- All writings should be in blue or black ink except diagrams which you must use a pencil
- A clean work is highly recommended

## SECTION A (15 marks)

Answer all questions in this section

1. (i) Mrs Dickson , a mother at home, engage in various activities, she decide to apply knowledge of Chemistry to optimize these tasks . In which of the following activities can Mrs. Dickson of festively utilize Chemistry

- A. Weed blowers in the garden
- B. Cooking food in the kitchen
- C. Dusting the floor of her house
- D. Weighing maize flour

(ii) Hydrogen gas is commonly used in production of ammonia. This reaction is classified as

- A. Decomposition
- B. Combustion
- C. Synthesis
- D. Neutralization

(iii) A scuba diver is exploring an ocean reef. What gas from the air mixture do they rely on to breathe underwater through their diving equipment?

- A. Nitrogen
- B. Oxygen
- C. Carbon dioxide
- D. Water vapour

(iv) Biogas generated from organic waste can be used for cooking and heating provide sustainable energy source. This indicates the need for

- A. Renewable energy sources like solar and wind power
- B. Fossil fuel like coal and natural gas
- C. Hydropower generation from dam and river
- D. Nuclear power plants for generating electricity

(v ) During a drought, farmers struggle to grow crops due to lack of water. This situation highlights the importance of water for

- A. Conducting electricity
- B. Regulating body temperature
- C. Supporting plant growth
- D. Dissolving solid substances

(vi) An environmental scientist is studying the impact of air pollution on plant growth; different plants are exposed to varying levels of pollutants over a period, and measurement is to assess their growth rate. What is the scientific procedure involved in this study?

- A. Data collection and Observation
- B. Filtration
- C. Hypothesis testing
- D. Distillation

(vii) Gypsum a common building material is primarily composed of Calcium Sulphate ( $CaSO_4$ ), which alkali earth metal is present in this compound?

- A. Beryllium (Be)
- B. Magnesium (Ma)
- C. Calcium
- D. Strontium (Sr)

(viii) While working with chemicals, a small break, out on the laboratory bench. What should you use from the first aid kit to help extinguish the flames?

- A. Adhesive bandages
- B. Fire blanket
- C. Sterile eye pads
- D. Elastic bandage

(viii) Oxygen is used in steel industry to remove impurities from molten metal, this application is based on the property oxygen being an

- A. Odourless gas
- B. Strong oxidizing agent
- C. Colourless gas
- D. Essential element for life

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(x) An action of element X has 17 protons in its nucleus. What is the atomic number of element X

- A. 16
- B. 17
- C. 18
- D. 19

2. Match each item in List A with a correct response on List B by writing its letter below the number of the corresponding item in List A in the table provided.

LIST A	LIST B
i) Nucleus ii) Proton iii) Energy level iv) Valence electron v) Isotope	A. Region where electrons reside B. Emission or absorption of energy by an atom C. Electrons in the outermost shell D. Number of electrons lost or gained to form an ion E. Subatomic particle with positive charge F. Atoms with the same number of protons but different number of neutrons G. Location of nucleus which are protons and neutrons H. Sum of protons and neutrons in an atom

### SECTION B (70 marks)

#### **Answer all questions in this section**

3. a) In the food industry, Oxygen is used in modified atmosphere packaging to extend the shelf life of perishable goods. Elaborate on how the property of reactivity is harnessed to preserve the freshness of food products.

**(04 marks)**

b) Imagine you are a chef in a busy restaurant. How does your understanding of chemistry influence your choices selecting ingredients and cooking method to create the perfect dish?

**(06 marks)**

4. a) In a pharmaceutical research laboratory researchers are designing a new drug molecule. Explain how the knowledge of the periodic trends in elements would guide them in choosing suitable atoms for the drug's structure

**(04marks)**

b) During an experiment involving electrical equipment you notice, frayed wires on a power cord, explain the potential dangers of using damaged electrical equipment and the actions you should take to address this issue

**(06marks)**

5. a) Imagine being a chef concocting delicious dishes, but instead of ingredients, You're mixing and matching atoms to create molecules with unique properties. Construct a diagram to show the arrangement of the outer electrons, in each of the following molecules,

(i) Chlorine ( $\text{Cl}_2$ )

(ii) Ammonia ( $\text{NH}_3$ )

(iii) Carbon dioxide ( $\text{CO}_2$ )

**(10 marks)**

6. a) You are a food safety inspector concerned about the sodium content of processed food, You have two samples of potato chips, one labelled as low-sodium and the other as "regular" You want to use a quick and reliable method to determine if the Sodium content on the label, is accurate. How can you use this knowledge to design a test to detect the presence of sodium in the potato chip sample?

**(04 marks)**

b) You are working (cooking) a delicious stir-fry for your family. You need to heat up your work with a gas stove. However you notice the flame is Yellow and flickering indicating incomplete combustion. Based on your understanding of the flame, suggest ways to achieve a blue, non-luminous flame that is ideal for cooking. Give (3 points).

**(06 marks)**

7. a) You're a passionate gardener who takes pride in your tools, However you notice that some of your Metal tools are starting to rusting them less of a sight and aesthetically pleasing. Choose the most appropriate methods for protecting three different tools a gardener shovel, a pruning shears, and a cast iron skillet.

**(06 marks)**

b) A farmer irrigates his crops using water from a nearby river. Discuss the specific properties of water that make it an effective medium for agricultural irrigation, considering factors such as cohesion, adhesion and thermal stability.

**(04 marks)**

8. A company is conducting a quality control test on a batch of silicon wafers used in the production of semiconductors. Naturally occurring Silicon has three isotopes  $^{28}\text{Si}$ ,  $^{29}\text{Si}$ , and  $^{30}\text{Si}$ , with atomic masses of 27.976 amu, 28.9865 amu and 29.9838 amu, respectively. The most abundant isotope is  $^{28}\text{Si}$ , constituting 92.23% of naturally occurring Silicon. Given that the observed atomic mass of silicon is 28.0855 amu. Calculate the percentage of  $^{29}\text{Si}$  and  $^{30}\text{Si}$  in the batch of silicon wafers.

**(10 marks)**

9. a) A horticulturist is studying the effects of soil amendments on plant growth. Explain how the chemical properties of Group I elements can influence nutrient availability and uptake by plants. Give three (03) points

**(06marks)**

b) The Manufacturing plant decides to use a different type of biodiesel and repeats the experiments. The new biodiesel has a mass of 75g and final temperatures of the matter are 23.5°C and 67.2°C respectively. If 15 Litres of water are used in the experiment, calculate the heat value of the new biodiesel in KJ / Kg.

**(04 Marks)**

### **SECTION C (15 Marks)**

Answer question number **ten** (10)

10. A quality control analyst in a food processing plant discovers a deviation in the acidity of a popular beverage. Apply the scientific procedure to systematically identify the cause of the deviation and propose corrective actions.

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