

Year 11 Integrated Science

Unit 2 Semester 2 2023

**Chemistry Test**

Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Assessment Date:

**TOTAL MARKS**

**/44**

Working time: 50 minutes

Weighting: 5%

Teacher Comments:

**You should answer ALL of the questions and show full working.**

**Must be completed under test conditions.**

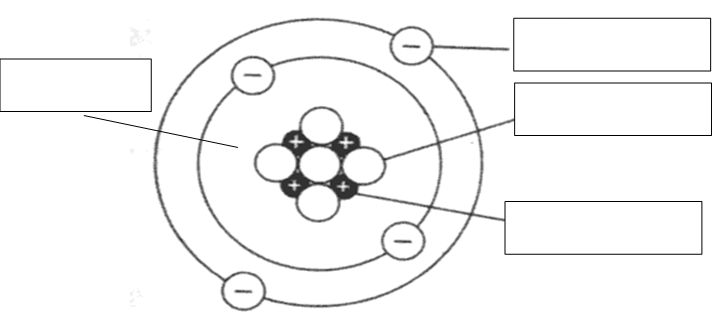
**SECTION A: MULTIPLE CHOICE**

1. What scientific term describes a combination of two or more substances?
   1. Mixture
   2. Solvent
   3. Distillate
   4. Sediment
2. Which of the following separation methods would be the most appropriate for recovering the salt from seawater?
   1. Decantation
   2. Magnetic separation
   3. Evaporation
   4. Filtration
3. What physical parameter does filtration use to separate substances?
   1. Density
   2. Magnetism
   3. Boiling point
   4. Particle size
4. Which of these is a pure substance?
   1. Wood
   2. Milk
   3. Stainless steel
   4. Aluminium
5. What are the three subatomic particles that make up an atom?
   1. Protons, neutrons and isotopes
   2. Positives, negative and neutral
   3. Protons, neutrons and electrons
   4. Protons and neutrons
6. Why do atoms of an element have no electric charge?
   1. There are an equal number of protons and neutrons, resulting in a neutral charge.
   2. There are an equal number of protons and electrons, resulting in a neutral charge.
   3. Subatomic particles are not charged.
   4. The positive charge of the electrons is cancelled by the negative charge of the protons.
7. What is a charged atom called?
   1. An ion
   2. An isotope
   3. A diode
   4. An electron
8. Copper has an atomic number of 29. Which of these statements is correct?
   1. Copper atoms have 29 protons.
   2. Copper atoms have 29 neutrons.
   3. Copper atoms have 29 protons and 29 neutrons.
   4. The sum of protons and neutrons in a copper atom is 29.

**SECTION B: SHORT RESPONSE**

**Question 9** (3 marks)

Label the parts of this atom: nucleus, proton, neutron, electron.



**Question 10** (4 marks)

An atom of potassium has an atomic number of 19 and a mass number of 39.

1. Calculate the number of protons, neutrons and electrons.

Protons:

Neutrons:

Electrons:

1. If the potassium atom loses one electron, what charge will the atom have?

**Question 11** (2 marks)

Consider the reaction: N2 + 3H2 🡪 2NH3

Explain how this reaction demonstrates the principle that chemical reactions involve the rearrangement of atoms and not the creation or destruction of matter.

**Question 12** (2 marks)

Write the following reaction as a word equation:

*When magnesium metal is exposed to oxygen, it forms a white powder of magnesium oxide.*

**Question 13** (6 marks)

1. Give two examples of combustion reactions in everyday life.
2. List two key features of combustion reactions.
3. A scientist measured the mass of the reactants and products in a combustion reaction. If the reaction started with 100g of reactants, would be the mass of the products be more than, less than or equal to 100g.

*More than 100g Exactly 100g Less than 100g*

Explain:

**Question 14** (2 marks)

Explain the difference between endothermic and exothermic reactions.

**Question 15** (8 marks)

The Apollo missions were monumental in human space exploration, landing astronauts on the Moon. One essential component of these missions was the Saturn V rocket, powered by a special type of kerosene fuel known as RP-1, combined with liquid oxygen as an oxidizer.

The choice of RP-1 was based on several factors. Firstly, its high energy density by mass allowed the rocket to carry more energy without adding too much weight. Secondly, RP-1's relatively stable nature made handling and storage less hazardous compared to other fuels. Lastly, the fuel's freezing point was considered, as a fuel that freezes at higher temperatures could become unusable in the cold vacuum of space.

However, the combustion of RP-1 and oxygen doesn't just happen on its own; just like lighting a match requires friction, initiating combustion requires something to overcome the activation energy. In the Saturn V's engines, an igniter provided the necessary heat to break the bonds in the reactants and initiate combustion. Once ignited, the reaction released a vast amount of energy, forming new substances (carbon dioxide and water) and propelling the rocket towards the Moon.

1. Write a word equation for the reaction described in the text between RP-1 and oxygen.

(2 marks)

1. Describe two factors used to choose RP-1 as the rocket fuel. Explain why these are important factors to consider. (4 marks)

1. Explain why an igniter required to combust the RP-1. (2 marks)

**Question 16** (9 marks)

Rocket scientists were investigating which fuel to use to launch their latest spacecraft. To help, they measured the energy density by combusting the fuels in a special combustion chamber sitting in a water bath. The heat from the combustion was measured by measuring the change in temperature of the water. The energy density was then calculated for each fuel.

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| --- | --- |
| **Rocket fuel type** | **Energy density**  **(MJ/kg)** |
| Kerosene | 46.2 |
| Hydrazine | 19.5 |
| Liquid Hydrogen | 142 |
| Solid Rocket Fuel | 6.00 |

1. What is the independent variable in this experiment? [1]
2. What is the dependent variable in this experiment? [1]
3. Identify a controlled variable required for this experiment to be a fair test. [1]
4. Plot the data on the grid provided. [4]
5. Which type of fuel would you recommend for the rocket? Justify your answer. [2]

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