**MARKING SCHEME: CHEMISTRY (S2)**

**End of Year Examination: (100 marks)**

**End of Year Examination: 2020**

**SECTION A: (70 marks)**

**SECTION A: Attempt all questions in this section (70 marks)**

1. a) A magnesium ion from magnesium atom. **(2 marks)**

Magnesium possesses 2 electrons in the outermost shell. Therefore Mg atom loses the 2 valency electrons to form Mg2+ ion.

 b) Chlorine atom possesses 7 electrons in the outermost shell. Therefore, Cl atom gains 1 electron to become a Cl- ion. **(2 marks)**

2.a) A covalent bond is formed by **sharing of valency electrons** between 2 atoms whereas an ionic bond is formed by **the electrostatic attraction** between 2 ions of opposite charges. **(2 marks)**

**(Give 1 mark for each underlined statement)**

 (b) -Ionic compounds have a **high melting point** but covalent compounds **have low melting points**.

-Ionic compounds **conduct electricity** when they are in molten form but covalent compounds **do not conduct electricity**. **(2 marks)**

3. -Type of bond: Covalent bond. **(1 mark)**

-The bond is of that nature because each of the two atoms contributes one electron to form a covalent bond. **(2 marks)**

4. a) The formula of the compound formed between element A and B:

A ionizes by losing 1 electron and B ionizes by gaining 2 eletrons to achieve the rare gas electron configuration. **(2 marks)**

So we obtain A+ and B2- ions. The formula of the compound formed is: A2B **(1 mark)** b) 2 physical properties of the compound formed between element A and B. **(2 marks)**

-The compound conducts electricity.

-The compound formed has a high melting point.

**(Give 1 mark for each answer)**

**(Accept other correct answers)**

5. a) The atomic number of magnesium Mg is 12 and that of calcium, Ca is 20.

i) Ca is more reactive. **(1 mark)**

ii) Ca is more reactive than Mg because its outermost shell electrons are further away from the nucleus than for Mg. So this makes it possible for Ca to lose the valency electrons more easily than for Mg. **(2 marks)**

 b) i) Cl is more reactive than S. **(1 mark)**

ii) Cl is more reactive than S because being in the same period Cl has a higher nuclear charge than S and therefore Cl is more electronegative which makes it to be more reactive than S. **(2 marks)**

6.a) Neutralization reaction is a chemical reaction that happens when an acid (H+) and a base (OH-) react to form water and a salt. (**2marks)**

 b) Completed substance formulae in the table: **(3marks)**

|  |  |  |
| --- | --- | --- |
| **ACID** | **BASE** | **SALT** |
| HNO3 | **Ca(OH)2** | Ca(NO3)2 |
| **H2SO4** | KOH | K2SO4 |
| **HCl** | **NaOH** | NaCl |
| **NH4OH** | **H3PO4** | (NH4)3PO4 |

 **(Give 0.5 mark for each answer in bold in the table)**

7. Required reagents: NaOH and HNO3 **(1 mark)**

Steps involved: Concentrated NaOH and HNO3 are added in a beaker, the resultant mixture is heated until all the water evaporates to leave NaNO3 crystals in the beaker. **(3 marks)**

8. a) Chemical equation of the reaction between sulphuric acid and copper (II) oxide.

 H2SO4 + CuO → CuSO4 + H2O (**2marks)**

**(Give 1 mark for unbalanced equation)**

b) Excess copper (II) oxide used to make sure that all the H2SO4 is used up to obtain a neutral solution.. **(1mark)**

c) The black solid of CuO turns into a blue solution. **(1mark)**

9. a) -Chemical reagent: Aluminon and NH3 solution.

-Observation: Adding aluminon to Al3+ ions in NH3 solution form a red lake and a colourless solution. **(2 marks)**

**(Give 1 mark for the reagent and 1 mark for the observation)**

b) Reagent: Barium nitrate

Observation: Adding barium nitrate solution to SO42- solution forms a white precipitate. **(2 marks)**

**(Give 1 mark for the reagent and 1 mark for the observation)**

10. The volume at standard conditions of temperature and pressure.

$\frac{P1V1}{T1}$ = $\frac{P2V2}{T2}$

$\frac{2.5 X 80}{300}$ = $\frac{1 X V2}{273}$

**V2= 182 ml** **(3 marks)**

**(Give 2 marks for the working method and 1 mark for the final answer)**

11.Pentane is an alkane with five carbon atoms.

a) The molecular formula for pentane.

C5H12 **(1 mark)**

b) The physical state of pentane at room temperature: It is liquid. **(1 mark)**

c) The equation for the complete combustion of pentane:

 C5H12(l) + 8O2(g) → 5CO2(g) + 6H2O(l) **(2 marks)**

**(Give 1mark for unbalanced equation)**

12. a) A substance that will conduct electricity when molten and/or in aqueous solution is called **an electrolyte**. **(1 mark)**

b)A compound that does not conduct electricity whether in the solid, molten or aqueous solution is called a **non-electrolyte**. **(1 mark)**

c)A solid substance that conducts electricity but does not contain ions is called **a metal**. **(1 mark)**

d)A particle that carries electric current in a solid conductor is called **an electron**. **(1 mark)**

e)A compound that does not conduct electricity when solid but does so when molten or in solution so called **an electrolyte**. **(1 mark)**

13.An alkane X has 6 carbon atoms.

a) The molecular formula of alkane X: C6H14. **(2 marks)**

b) The name of alkane X compound: Hexane  **(2 marks)**

c) The structural formulae of 2 isomers of alkane X compound and their names.

  **(2 marks)**

**(Give 0.5 mark for each structural formula and 0.5 mark for each name)**

14. a) Number of moles = $\frac{5}{24}$

Number of moles = **0.2083 mole** **( 3marks)**

**(Give 2 marks for the working method and 1 mark for the final answer)**

b) The formula of a lead compound:

Pb : S : O

$\frac{4.14}{207}$ : $\frac{0.64}{32}$ : $\frac{1.28}{16}$

 0.02 : 0.02 : 0.08

Dividing each figure by 0.02 we obtain the lead compound formula:

 PbSO4 **(4 marks)**

**(Give 3 marks for the working method and 1 mark for the final answer)**

15. a) The 4 types of oxides. **(4marks)**

|  |  |
| --- | --- |
| **Compound** | **Type of oxide** |
| i) K2O | Neutral oxide |
| ii) H2O | Neutral oxide |
| iii) SO2 | Acidic oxide |
| iv) Al2O3 | Amphoteric oxide |
| v) ZnO | Amphoteric oxide |
| vi) CO | Neutral oxide |
| vii) MgO | Basic oxide |
| viii) NO2 | Acidic oxide |

**(Give 0.5 mark for each answer)**

c)The ionic equation for the reactions below: **(2 marks)**

 CO32-(aq) + 2 H+(aq) → CO2(g)+ H2O(l)

**SECTION B: Attempt three questions in this section (30 marks)**

16**.**a) Waste management includes the activities and actions required to manage waste from its inception to its final disposal. **(2marks)**

 b) 3 steps which can be taken to achieve effective waste management.

-Source reduction

-Recycling

-Composting. **(3 marks)**

**(Accept other correct answers)**

 c) The major benefits of waste recycling include:

-Keeps the environment clean and fresh.

-Saves the earth and conserves energy.

-Reduces environmental pollution.

-Waste management will help you earn money.

- Waste management creates employment. **(2 marks)**

 d) The materials that do not decay:

-They block the drains.

-They harm animals. **(2 marks)**

 e) A negative consequence of burning materials:

-Burning causes emission of carbon dioxide gas into the atmosphere which in eventually causes global warming. **(1 mark)**

17.a) i) Why metals are good conductors of electricity: **(2 marks)**

-Metals have free mobile electrons that can move under the influence of potential difference.

ii) 2 differences between metals and of non-metals in terms of chemical properties.

-Metals can lose electrons to give cations whereas non-metals gain electrons to become anions.

-Metals combine with non-metals to produce ionic compounds whereas non-metals react with other non-metals to produce covalent compounds. **(2 marks)**

iii) Two uses of non-metals in daily life: **(2 marks)**

-They are used as fuel.

-They are used as clothes.

**(Give 1 mark for each correct answer)**

**(Accept other correct answers)**

b) i) One danger associated with water pollution:

-Water pollution can cause the death of marine animals such as fish due to toxic substances in water. **(2 marks)**

ii) The role of education and awareness campaign in preventing water pollution:

Education awareness campaign helps to explain the benefits of clean water and the dangers of polluted water to people and to animals so that they can put in place preventive measures of water pollution in their communities and the surrounding areas. **(2 marks)**

**(Accept other correct answers)**

18.a) Number of moles of Na = $\frac{4.6}{23}$

Number of moles of Na = **0.2 mole** **(2 marks)**

**(Give 1 mark for the working method and 1 mark for the final answer)**

b) The number of magnesium atoms present in a magnesium foil of mass 72 g.

Number of moles of Mg = $\frac{72}{24}$ = 3 moles

Number of atoms = 6.02 x1023 X 3

Number of moles of Mg = $\frac{72}{24}$ = 3 moles

**Number of atoms = 18.06 X 1023 atoms** **(3 marks)**

**(Give 2 marks for the working method and 1 mark for the final answer)**

c) The mass in grams of 3.5x 1025 atoms of silver, Ag:

Number of moles = $\frac{3.5X10^{25}}{6.02X10^{23}}$ = 0.5813X 102 moles = **58.13 moles**

The mass of Ag = 58.13 X 108

**The mass of Ag = 6278.04g (3 marks)**

**(Give 2 marks for the working method and 1 mark for the final answer)**

d) The number of molecules in 6.8 g of gaseous hydrogen H2:

Number of moles = 6.8/2

Number of moles = 3.4 moles

Number of molecules = 6.02 X1023 X 3.4

**Number of molecules = 20.468 X 1023 molecules. (2 marks)**

**(Give 1 mark for the working method and 1 mark for the final answer)**

19.a) The general formula of alkanes: **CnH2n+2** **(1mark)**

The name of one alkane molecule: **Pentane**  **(1mark)**

b) Differences between organic and inorganic compounds:

-Organic compounds contain carbon, hydrogen and oxygen while inorganic compounds generally do not contain carbon atoms.

-Organic compounds are insoluble in water while inorganic compounds are soluble in water. **(2 marks)**

c) The IUPAC name of the alkane with the molecular formula C5H12:

Name: Pentane

 **( 1 mark)**

d) The IUPAC name: Octane **(1 mark)**

**The molecular formula of B: C8H18** **(1 mark)**

e) The socio-economic importance of alkanes in our society:  **(3 marks)**

Alkanes are used for combustion in domestic kitchens and in vehicle engines.

Alkanes such as biogas produced after decay of domestic compost can generate money (income).

Alkanes can be used to produce alkenes that are used to make plastic materials.

**(Give 1 mark for each point)**

**(Accept other correct answers)**

……………………………………………………………………………………