**GATITU MIXED SECONDARY SCHOOL**

**FORM 3 CHEMISTRY**

**MID-TERM EXAM**

1. Hydrogen gas is one of the lightest gas known but has not lived to its expectation to be used in observation balloons. Explain (2mks)

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2. Using dots (•) and crosses(**x**), show bonding in magnesium chloride. (2mks)

1. Below is a table of 1st ionization energies for elements A, B, C, and D which are metals.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Elements | A | B | C | D |
| Ionization energies Kjmol-1 | 494 | 418 | 519 | 376 |

a) What is meant by 1st ionization energy? (1mk)

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b) With an explanation, arrange the elements in order of increasing relativities. (2mks)

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4. The catalytic oxidation of ammonia gas is done as per the set up below.



**Oxygen**

**gas**

**Glass rod**

**Platinum wire**

**Concentrated**

**Ammonia solution**

a) Name the catalyst used in the above reaction. (1mk)

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b) After sometime, brown fumes are formed in the flask. Explain briefly how this observation

 occurs. (1mk)

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 c) Why does the metal catalyst stay red hot for some time? (1mk)

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5. Using a suitable equation explain why it is not advisable to use hard water in hot water systems. (3mks)

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6. (i) Carbon(IV) oxide is one of the main contributor to global warming.

 Name **two** other gases. (2mks)

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 (ii) What is cloud seeding? (1mk)

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7. Classify the following processes as either chemical or physical.

 **Process Type of change**

|  |  |
| --- | --- |
| a) Heating of copper(II) suplphate crystals |  (1mk) |
| b) Obtaining Kerosene from crude oil |  (1mk) |
| c) Souring of milk |  (1mk) |

 8. (a) State Gay-Lussac’s law (1mk)

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 (b) Under certain conditions, methane reacts with steam to form carbon (II) oxide and hydrogen only.

Calculate the total volume of the gas that can be formed when 100cm3 of steam reacts completely with methane. (2mks)

9. The diagram below represents set-up that can be used to prepare and collect oxygen gas

**Solids P**

**Water**

**Oxygen gas**

**Water**

1. Name solid **P** (1mk)…………………………………………………………………………………………………..……

 b) What property of oxygen makes it possible for its collection as indicated by the diagram. (1mk)

…………………………………………………………………………………………………..………

1. Explain why it is important not to collect any gas for the first few seconds of the experiment. (1mk)

10. 36cm3 of a solution of potassium hydroxide requires 25cm3 of 0.5M sulphuric acid to neutralize it. Calculate the concentration of alkali in g/dm3 (3mks)

11. The following table gives the melting points of oxides of elements in period 3. Study it and answer the

 questions that follow:-

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Formula of oxide | Na2O | MgO | Al2O3 | SiO2 | P4O10 | SO3 |
| Melting point (oC) | 1190 | 3080 | 2050 | 1730 | 560 | -73 |

 (i) Explain the difference in melting points of MgO and P4O10  (2mks)

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 (ii) Name the compound in the above table that will dissolve both in dilute hydrochloride acid and

 dilute sodium hydroxide. (1mk)

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12. Describe how you would prepare crystals of sodium nitrate starting with 200cm3 of 2M sodium hydroxide. (3mks)

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13. The diagram below shows an iron bar, which supports a bridge. The iron bar is connected to a

 piece of magnesium metal.

**Magnesium metal**

**Iron bar**

**Soil**

 Explain why it is necessary to connect the piece of magnesium metal to the Iron bar. (2mks)

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14. Study the set-up below and answer the questions that follow



**Dilute hydrochloric acid**

**A gas jar**

**Red litmus paper**

 **Sodium sulphite**

 **Gas x**

 a) Identify gas **X** (1mk)

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 b) Write an equation for the reaction that produces gas **x**. (1mk)

 c) What is the effect of the gas **x** above on the red-litums paper (1mk)

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15. Study the scheme below and use it to answer the questions that follow.

**Salt solution**

 **P**

**White precipitate**

**Colourless gas which is acidic**

**BaCl2 (aq)**

**HCl(aq)**

 Write down the formulae of two possible anions present in salt solution **P**. (2mks)

16 The diagram below shows a Bunsen burner when in use



 Which of the labeled parts is used for heating? Give a reason (2mks)

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1. It is highly flammable / it burns or explodes in air.

2. Correct charge√ correct electronic structure √

-

Correct charge √

Correct electronic structure √

2+

-

3. (a) This is the energy required to remove the 1st outermost electron from an atom in gaseous state to form an ion √ 1

(b) C A B D √ 1

 Increasing reactivity

 Higher ionization energy implies high nuclear charge which hinders removal of electron.

4. (a) Pt or copper

 (b) No formed is oxidized by O2 to NO2 which is brown

 (c) The reaction is exothermic

5. Ca(HCO3)2 (aq)  CaCO3(s) + CO2(g) + H2O(l)

Mg(HCO3)2(aq) MgCO3(s) + CO2(g) + H2O(l)

When water containing these salts are boiled, they decompose into carbonate, carbon (IV) oxide and water. These carbonates precipitate out and form scales.

6. (i) N2O, ozone – methane

 water vapour

(ii) Spraying of CO2 into the sky using jets so that cloud may form and rain may fall.

7. (a) physical (b) Physical (c) Chemical

8. (a) When gases react together, the volumes of the gases which react and those of the products; if gases, bear a simple whole number ratio to one another, all volumes being measured at the same temperature and pressure.

(b) CH4(g) + H2O(g) CO(g) + 3H2(g)

 1vol. 1vol. 1vol. 3vol

1cm3 of H2O react to produce 1cm3 CO(g) and 3cm3 H2(g)

100cm3 of steam react to produce 100cm3 CO(g) and 300cm3 H2(g)

Total volume of the gases formed = 100 + 300 = 400cm3

9. (a) Solid **P** – Sodium Peroxide, reject formula

 (b) Slightly soluble in water

 (c) To ensure that the air that occupied the apparatus initially is expelled.

10. 2KOH(aq) + H2SO4(aq) → K2SO4(aq) + 2H2O(l)

 36cm3 0.5M 25cm3

Moles of H2SO4 = 0.5 x 25 = 0.0125moles

 1000

Moles of KOH = 2 x 0.0125 = 0.025

Molarity of KOH = 0.025 x 1000 = 0.6944

 36

 ≈ 0.7

Concentration in g/dm3 = 38.9g

11. (i) MgO has giant ionic structure with ionic bonds.

 P4O10 has molecular structure with weak intermolecular forces

(ii) Aluminium oxide

12. (a) Drying agent H2SO4 in a wash bottle// anhydrous CaCl2 in U-tube

 Collection by downward delivery.

(b) NaCl(s) + H2SO4(l) → NaHSO4(s) + HCl(g)

Balanced √1mk with state symbols

No state symbols award ½mk

13. Magnesium is above iron in the activity series. It supplies electrons to the iron bar hence prevent

it from rusting.

14. (a) Sulphur (IV) oxide / SO2(g)

 (b) Na2SO3(s) + 2HCl(aq) 2NaCl(aq) + SO2(g) + H2O(l)

(c) It bleaches the litmus paper/ it decolourises

 SO2 in water form H2SO3 which ionizes to give SO32- ions.

H2SO3(aq)  2H+(aq) + SO32-(aq)

SO32- pick [O]from litmus paper to form SO42- (aq)

 ***Or*** -121.8KJmol-1

15. SO32- and CO32-

Reject SO42- it does not react with dil. HCl acid

16. A – hottest