**FORM 4 CHEMISTRY PAPER 233/2**

**PAPER 2**

**END TERM 2 2021**

**MARKING SCHEME**

1. a) i) Alkynes

ii) Alkanoic acid

b) i) **Vulcanization**

ii) **To harden rubber√**

**To make it stronger and tougher√**

**To make it durable√**

c) i) **2CH3CH2CH2OH (l) + 2K(s) -> 2CH3CH2CH2OK (s) + H2(g) √**

ii) I **Dehydration√**

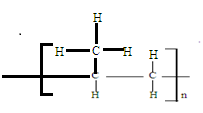
II **Hydrogenation√**

iii) A **1, 2-dibromopropane√ / CH2BrCH2Br**

B **Ethene√/ CH2CH2**

iv) **Nickel√/palladium**

v)



1. **As a fuel√**

**Production of carbon black for making printers ink√**

**/Preparation of methanol√**

**/Product of hydrogen√**

2. (a) i) Allotropy is the existence of an element in more than one form in the same physical state.

ii) M **Graphite√**

N **Diamond√**

(iii) **Making drills√**

**Cutting glass and metals√**

**In jewellery√**

**Making padlocks√**

(iv) **M/graphite√**

**Has the free 4th valence electron in each carbon delocalized√**

(b) i) **CO2(g) + C(s) -> 2CO(g) √**

(ii) **Potassium hydroxide√**

(iii) **Pass the gases separately through lime water√.**

**White ppt formed with CO2√**

**No white ppt formed with CO√**

**Ignite the gases separately√**

**CO burn with a blue flame√**

**CO2 does not burn√**

(iv) **As a fuel√**

**As a reducing agent in extraction of metals form their ores√.**

**In the manufacture of methanol√.**

1. a) i) **Sodium/potassium hydroxide√ //NaOH/KOH**

ii) **Heat √the liquid air**

**Nitrogen distils first because it has a lower boiling point√**

(b) i) **Hydrogen√**

ii) **To complete the oxidation of ammonia so as to increase the yield of gas Q/NO√ because all the ammonia gas is converted to gas Q/NO**

iii) **Nitrogen (II) oxide√**

iv) **NH3 (g) + HNO3 (aq) -> NH4NO3 (aq) √**

v) **As fertilizer√**

**//Making explosives√**

c) **Brown fumes√**

**//Yellow solid dissolves√**

**Concentrated nitric acid is a strong oxidizing agent. It oxidizes yellow sulphur to colorless sulphur (IV) oxide gas, itself reduced to brown**

**nitrogen (IV) oxide√.**

4. (a) **Mass number√/sum of number of protons and neutrons in an atom of element**

(b) (i) **NP2 √**

(ii) **P, R, √ S√**

(iii) **P. √**

**P is nonmetal√½ while R and S are metals.**

**Metal come first before non-metals across a period√½**

(iv) **P and U√**

(c) i) I **Ionic/electrovalent. √**

II **Metallic√**

(ii) **IV. √**

**Is made of simple molecular structure√ with low boiling/melting point and a poor electrical conductor.**

5. (a) (i) **Graphite√/Titanium**

**They do not react with chlorine gas√ produced**

**(ii) A steel diaphragm/gauze is suspended between the electrodes. √**

(iii) **2Cl- (l) -> Cl2 (g) + 2e √**

(b) (i) **Calcium chloride/CaCl2√**

(ii) **To reduce the cost of production√**

(c) **At cathode: H+ ions are preferentially discharged at expense of Na+ ion√. Hydrogen gas is produced.**

**At anode: OH- ion is preferentially discharged at expense of Cl- ions√. Oxygen gas is produced.**

(d) **In limited air: Na2O√**

**In excess air: Na2O2√**

(e) **Produce yellow vapour in street lamps√**

**Sodium/potassium alloy as coolant in nuclear reactors√**

**Making sodium cyanide, for extraction of gold.**

6. (a) i) **When blue anhydrous cobalt (II) chloride paper is dipped in a sample of the liquid, it turns to pink√.**

**White anhydrous copper (II) sulphate turns to blue√ when sample of the liquid is added.**

(ii) **When the liquid is heated to boil, its boiling point is 100oC at sea level/one atmosphere pressure√.**

**When the liquid is cooled to solidify, its freezing point is 0oC at sea level/one atmosphere pressure√.**

**When the density of liquid is determined it is 1gcm-3 at 4oC √**

(b) (i) **Large solid particles like rock/sang√**

(ii) I **Causes small suspended particles to settle√.**

II **To kill germs/microorganisms√**

(c) (i) **Permanent hardness√**

(ii) **Addition of sodium carbonate√ that precipitates Ca2+ and Mg2+ ions√**

**Distillation√ to remain with MgSO4 / CaSO4 as residue√.**

**Use ion-exchange permutit√ which will remove Ca2+ and Mg2+ ions√.**

d. (i) **Hydrogen/H2√**

(ii) **Calcium hydroxide is slightly soluble√ in water. It is partially dissociated into few Ca2+ and OH-(aq) ions. √**

(iii) **Test for the presence of CO2 gas√**

**Preparation of ammonia gas. √**

(e) (i) Step 2 **Carbon(IV)oxide/ CO2√**

Step 4 **Dilute hydrochloric acid√/ HCl**

1. **Ca(HCO3) 2(aq) -> CaCO3(s) + CO 2 (g) + H 2O(l) √**

|  |  |
| --- | --- |
| Chemical reaction | Nuclear reaction |
| Involves valence electrons | Involves the nucleons(protons and neutrons) |
| Rate of reaction depend on temperature and pressure | Rate of reaction independent of temperature and pressure/external factors |
| Small amount of energy involved | Huge amount of energy involved |
| No change in mass | change in mass |

7. a)

(b) (i)

Smooth curve – 1mk

Correct plots – 7 points -1mk

5 or 6 points – ½mk

Below 5 points – 0mk

Scale – Consistent scale on both axis – ½mk

-Labeling of axis – ½mk

(Penalize 1mk if the axis are inverted)

ii) I. **From correctly plotted graph t ½ = 20 minutes√**

II.  **From correctly plotted graph at 70minutes = 9%√**

**=> Original mass = 0.16 x 100 √ = 1.7778 g**

**9**

c) **Treatment of cancer√**

**Detection of uptake of iodine in kidneys√**

**Regulation of heart pace maker√**

**Sterilization of surgical instruments√**