Name ……Teacher……..

Part 2 (70 marks = 35% of paper)

Answer all questions in part 2 in the spaces provided below

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1 Write reactions for any reactions that occur in the following procedures. If no reaction occurs write "no reaction" .

In each case describe **in full** what could be observed including any

- colours
- odours
- precipitates (state colours)
- gases evolved (state colour or describe as colourless)

If no change is observable, this should be stated

(a) Barium hydroxide solution is mixed with a solution of nitric acid.

Equation_____

Observation_____

_____

(3marks)

(b) Concentrated nitric acid is added to a piece of copper metal

Equation _____

Observation _____

_____

(3 marks)

(c) Solid chromium carbonate is added to a beaker of .10 M sulfuric acid

Equation___ _____

Observation _____

_____

(3 marks)

(d) A piece of solid nickel chloride is added to a beaker containing magnesium nitrate solution

Equation_____

Observation _____

_____

(3 marks)

2 Write a name or formula to give an example of each of the following .

A primary standard suitable for acid base titrations	
A polyatomic cation	
A catalyst used in the Haber Process	
The anode of a dry cell	
A reducing agent weaker than Cl^{1-} ion	
A substance that will oxidise Mn to Mn^{2+} but will not oxidise Pb to Pb^{2+}	
The conjugate acid of $C_5H_{10}Cl^{1-}$	

(7 marks)

3 Potassium selenite solution, K_2SeO_3 disproportionates into selenium,Se and the selenate ion, SeO_4^{2-}

Write oxidation and reduction half equations, a redox equation and name the oxidising and reducing agents

Oxidation half equation
Reduction half equation
Redox equation

Oxidising Agent …… **Reducing Agent** …….. (5marks)

4 For each of the following pairs of substances describe a chemical test that would distinguish between them. Describe the distinguishing observations , but no equations are

required

	Chemical test (Describe fully)	Observation in each case
Solid $Al_2(CO_3)_3$ and solid Na_2CO_3		With $Al_2(CO_3)_3$
		With Na_2CO_3
Lead nitrate solution and magnesium chloride solution		With lead nitrate solution
		With magnesium chloride solution
Water and hydrogen peroxide solution		With water
		With hydrogen peroxide solution

(6 marks)

5 Draw a large and clear diagram below to explain how an electrochemical cell using the Pb^{2+} / Pb and Ag^{+}/Ag half cells are used to create electric current

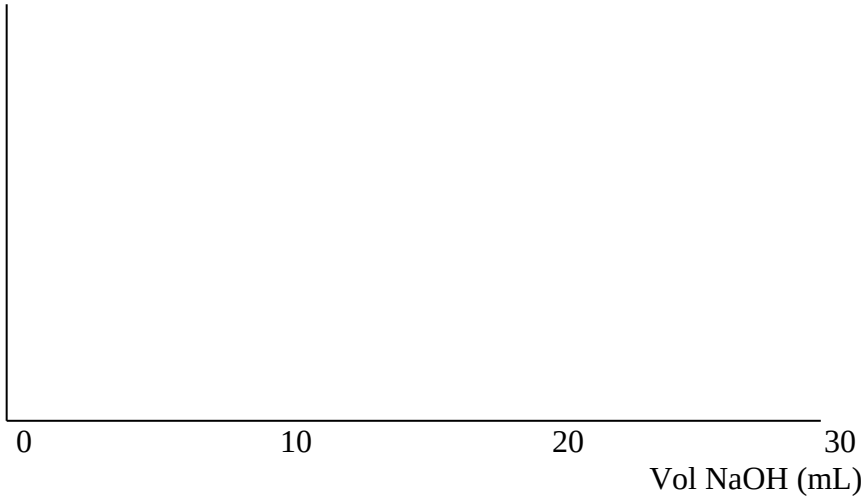
Your diagram should show:

Anode ; cathode ; oxidation half equation ; reduction half equation ; direction of electron flow ; direction of ion movement ; all substances present in the cell, predicted cell voltage (8)

6 The amount of CH_3COOH present in vinegar is analysed by titrating samples of it with a standardised 0.1000molL^{-1} solution of NaOH.
Methyl orange is used as indicator; vinegar is pipetted into conical flasks
The volume of NaOH required to titrate the 20.00mL samples is 17.00mL .

(a) Sketch a titration curve showing volume of NaOH added vs pH of flask contents (3)

(b)



(b) Describe the products of this titration (1)

(c)The results of this analysis are proven to be inaccurate; explain whether the calculated % of CH_3COOH would be too high or too low, and why

(3)

7 In the Hertzog Process process, $SiCl_4$ is produced as equilibrium is established

$$\mathbf{SiO_{2\,(S)} + 4HCl_{(g)} \rightleftharpoons SiCl_{4(g)} + 2H_2O_{(g)}}$$

The forward reaction is exothermic

For each situation described in the table below predict how each change to the equilibrium conditions would affect both the rate of reaction and equilibrium yield of $SiCl_4$

Change imposed	Effect on rate (Increase ,decrease ,no change)	Effect on yield of $SiCl_4$ (more, less, no change)
System is heated		
More SiO_2 is added		
The pressure is increased		
A catalyst is added		

(8 marks)

8 (a)Write the anode and cathode reactions occurring in the lead accumulator

Anode

Cathode

(2)

(b) Describe how the choice of sulfuric acid as electrolyte assists in the efficient operation of this cell, resulting in higher EMF than if other electrolytes were used

(2)

9 Explain each of the following

(a) The pH of a solution of 0.1M NaH_2PO_4 is 9 but the pH of a solution of $KHSO_4$ is 2

(3)

(b) Although an iron bar is stable when exposed to a flame, iron filings will spark vigorously when sprinkled into a bunsen flame.

(3)

(c) A solution of copper sulfate should not be stored in an iron container

(3)

10 (a) Describe what is meant by the term amphoteric

(1)

(b) With the aid of balanced equations illustrate the amphoteric nature of aluminium hydroxide

(3)

End of Part 2