

Acids and Bases

Question Paper 2

Level	Pre U
Subject	Chemistry
Exam Board	Cambridge International Examinations
Topic	Acids and Bases- Equilibria
Booklet	Question Paper 2

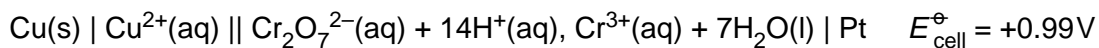
Time Allowed: 24 minutes

Score: /20

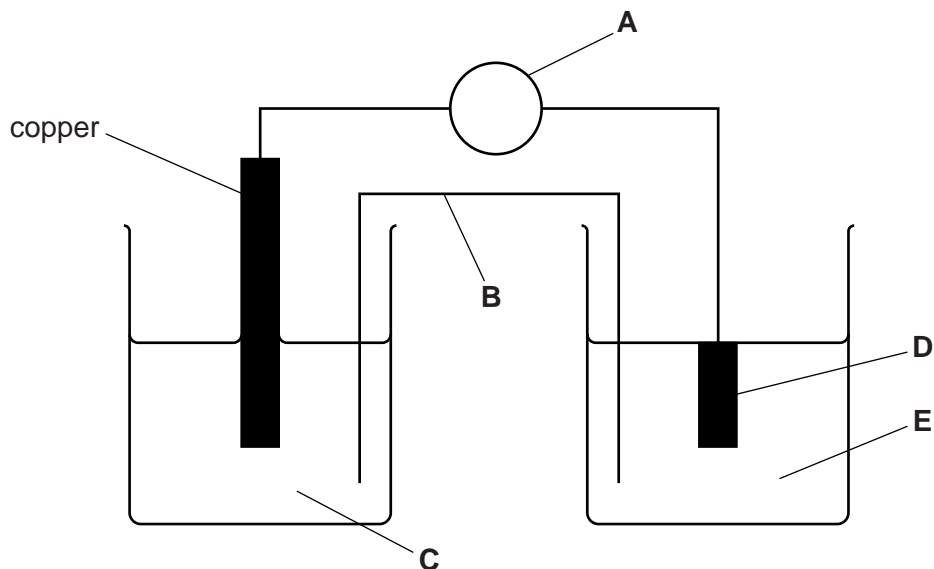
Percentage: /100

Grade Boundaries:

1. An electrochemical cell was set up as illustrated by the cell diagram.



(a) Some of the labels on a diagram of this electrochemical cell have been replaced with the letters **A – E**.



(i) Name the parts of the cell labelled **A** to **E**.
Include any detail necessary to allow the cell to be used to measure the standard cell potential, $E_{\text{cell}}^{\ominus}$.

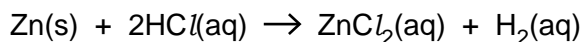
- A**
- B**
- C**
- D**
- E**
-[6]

(ii) Write the half-equations for the two half-cells that make up the cell.
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.....[2]

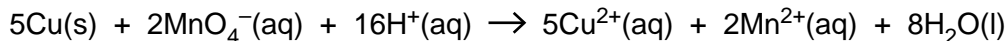
(iii) Write the overall equation for the reaction that occurs in the cell when a current is allowed to flow.
.....[1]

(b) A sample of finely ground copper was contaminated with zinc powder.

Treatment of the sample with excess hydrochloric acid produced 126 cm^3 of hydrogen gas, measured at 303 K and 10^5 Pa , by the reaction shown.



The remaining copper was then reacted with acidified potassium manganate(VII).



It was found that $4.88 \times 10^{-3}\text{ mol}$ of potassium manganate(VII) was required for complete oxidation of the copper.

(i) Calculate the mass of zinc present in the sample.
Give your answer to three significant figures.

mass of Zn = g [2]

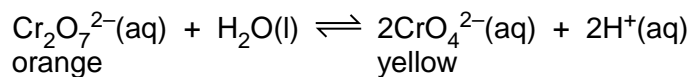
(ii) Calculate the mass of copper present in the sample.

mass of Cu = g [2]

(iii) Calculate the percentage by mass of copper in the original sample.

percentage by mass of Cu = % [1]

(c) In aqueous solution, dichromate(VI) ions exist in equilibrium with chromate(VI) ions.



(i) Explain why the solution turns from orange to yellow on the addition of aqueous sodium hydroxide.

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.....[2]

(ii) Following the addition of aqueous sodium hydroxide, the solution was cooled. This caused the colour of the solution to change from yellow back to orange.

Use Le Chatelier's principle to state and explain what you can conclude about the enthalpy change of the forward reaction.

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.....[1]

(iii) Barium chromate(VI), BaCrO_4 , is sparingly soluble, while barium dichromate(VI), BaCr_2O_7 , is soluble.

State and explain the effect of adding barium nitrate solution, $\text{Ba}(\text{NO}_3)_2(\text{aq})$, to the original equilibrium mixture of dichromate(VI) ions and chromate(VI) ions.

Your answer should refer to the effect on equilibrium position, K_c and pH.

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.....[3]

[Total: 20]