**Write the answers to the following questions in your exercise/activity books.**
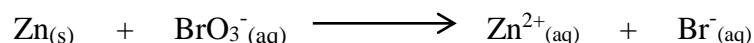
| Strand 3: Reactions | Sub-strand: Electrochemistry |
|---|---|

1.  Use the unbalanced redox equation below to answer the questions that follow.

$$Zn_{(s)} \ + \ BrO_3^-{}_{(aq)} \longrightarrow Zn^{2+}{}_{(aq)} \ + \ Br^-{}_{(aq)}$$

   (i)   Write the balanced **oxidation** half-equation.                    **(1 mark)**
   (ii)  Write the balanced **reduction** half-equation.                    **(1 mark)**
   (iii) Deduce the **overall** balanced equation in a **basic medium**.    **(2 marks)**

2.  Deduce the **overall** balanced equation in a **basic medium** for the
    unbalanced redox reaction equation given below.

$$Cr(OH)_{3(aq)} \ + \ IO_3^-{}_{(aq)} \longrightarrow CrO_4^{2-}{}_{(aq)} \ + \ I^-{}_{(aq)}$$
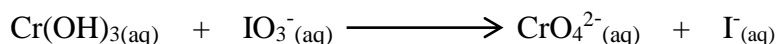
                                                                            **(4 marks)**

3.  A fertiliser contains ammonium iron (II) sulphate, $FeSO_4.(NH_4)_2SO_4.6H_2O$
    as a source of iron.

    A 6.50 g sample of this fertiliser is made up to 250 mL with dilute
    sulphuric acid. 25 mL of this solution is reacted with 23.5 mL of
    0.01 mol $L^{-1}$ potassium dichromate ($K_2Cr_2O_7$) solution as shown by the
    balanced equation below.

$$Cr_2O_7^{2-} \ + \ 6Fe^{2+} \ + \ 14H^+ \longrightarrow 2Cr^{3+} \ + \ 6Fe^{3+} \ + \ 7H_2O$$
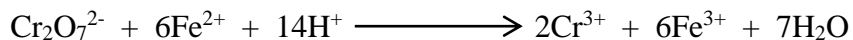
   (i)   Calculate the moles of $Cr_2O_7^{2+}$ ions that has reacted.          **(1 mark)**
   (ii)  Determine the moles of $Fe^{2+}$ ions that has reacted.              **(1 mark)**
   (iii) Calculate the mass of Fe in the 25 mL aliquot ($M_{(Fe)} = 56$ g mol$^{-1)}$). **(1 mark)**
   (iv)  Determine the total mass of Fe present in the 6.50 g sample of
         fertiliser.                                                          **(1 mark)**
   (v)   Calculate the percentage of Fe in the fertiliser.                    **(1 mark)**

**The End**