

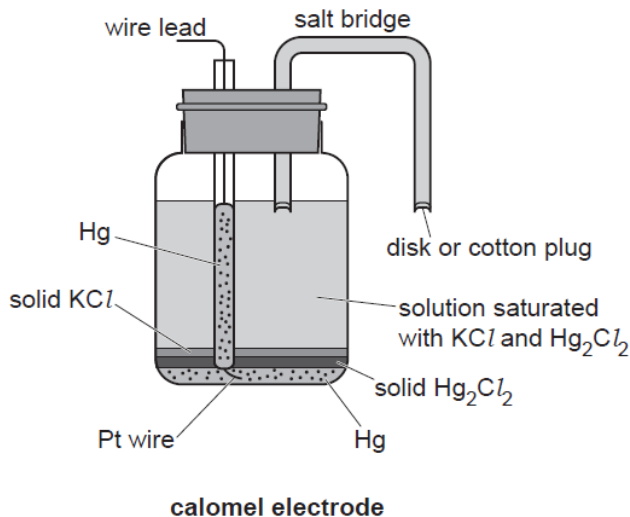
## **A level Chemistry B**

**H433/03** Practical skills in chemistry

**Question Set 6**

1 (a) (i)

The use of a standard hydrogen electrode for measuring standard electrode potentials is often not practicable. The diagram below shows a calomel electrode. This is often used in preference to the standard hydrogen electrode and has a standard  $E^\ominus$  electrode potential, of +0.27 V.



The electrode is based on mercury metal, Hg, in contact with a saturated solution of  $\text{Hg}_2\text{Cl}_2$ .

Suggest **one** advantage and **one** disadvantage of using a calomel electrode over a standard hydrogen electrode.

Advantage.....  
.....

Disadvantage..... [1]  
.....

1 (ii) Give the oxidation state of mercury in  $\text{Hg}_2\text{Cl}_2$ .

oxidation state = ..... [1]

1 (b) A 25.0 g sample of  $\text{Hg}_2\text{Cl}_2$  is vaporised at  $400^\circ\text{C}$  and a pressure of 101 kPa. A student assumes that the formula of the gaseous mercury chloride molecules is  $\text{Hg}_2\text{Cl}_2$ .

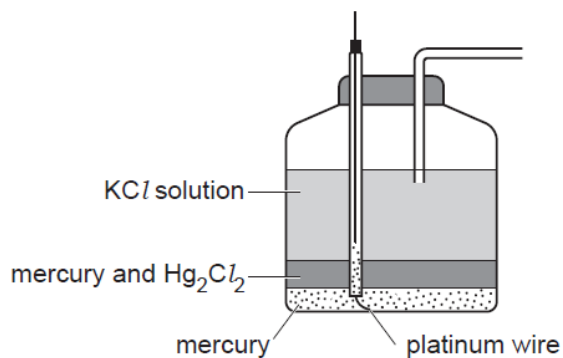
Calculate the volume of gas, in  $\text{dm}^3$ , that would be expected under these conditions.

volume of gas = .....  $\text{dm}^3$  [3]

1 (c)  
\*

A student investigating the rusting of iron is given a calomel electrode.

The diagram shows a simplified calomel electrode.



simplified calomel electrode

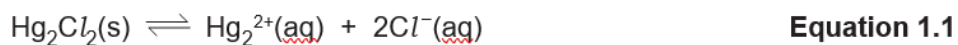
The student wants to use this electrode to measure the standard electrode potential of a  $\text{Fe}^{2+}(\text{aq})|\text{Fe}(\text{s})$  half-cell.

Give instructions on how to do this, justifying the uses of the pieces of apparatus you name. You may add to the diagram above to illustrate your answer.

[6]

1 (d)

An equilibrium, represented by **equation 1.1**, exists between the solid  $\text{Hg}_2\text{Cl}_2$  and its ions in solution.



The solubility of solid  $\text{Hg}_2\text{Cl}_2$  in a saturated solution at 298 K is  $3.5 \times 10^{-4} \text{ g dm}^{-3}$ .

Calculate the solubility product,  $K_{\text{sp}}$ , for  $\text{Hg}_2\text{Cl}_2$  at 298 K. Include the units.

Give your answer to an **appropriate** number of significant figures.

solubility product,  $K_{\text{sp}} = \dots\dots\dots$  units.....

[5]

**Total Marks for Question Set 6 = 16**

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