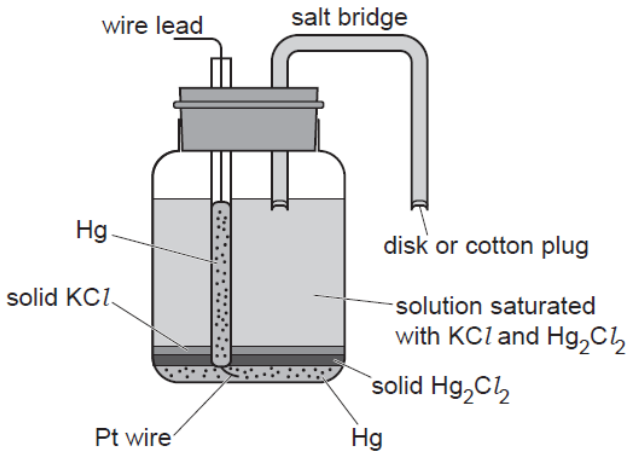
Oxford Cambridge and RSA

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 thestandard hydrogen electrode and has a standard $E^{\ominus}$ electrode potential, , of +0.27 V.



calomel electrode

The electrode is based on mercury metal, Hg, in contact with a saturated solution of Hg_2Cl_2.

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

Advantage.....
.....

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

1 (ii) Give the oxidation state of mercury in Hg_2Cl_2.

oxidation state =..... **[1]**

1 (b) A 25.0 g sample of Hg_2Cl_2 is vaporised at 400 °C and a pressure of 101 kPa.
A student assumes that the formula of the gaseous mercury chloride molecules is Hg_2Cl_2.

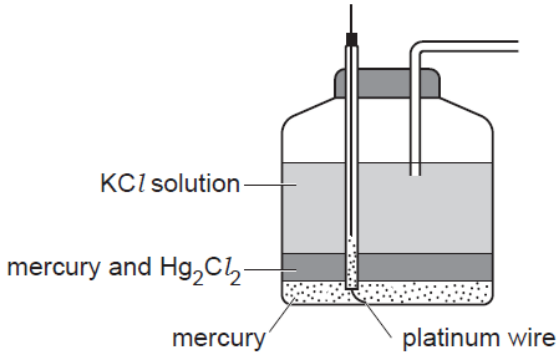
Calculate the volume of gas, in dm^3, that would be expected under these conditions.

volume of gas =..... 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 $aFe^{2+}(aq)|Fe(s)$ 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 Hg_2Cl_2 and its ions insolution.

$$Hg_2Cl_2(s) \rightleftharpoons Hg_2^{2+}(aq) + 2Cl^-(aq) \qquad \textbf{Equation 1.1}$$

The solubility of solid Hg_2Cl_2 in a saturated solution at 298 K is 3.5×10^{-4} g dm^{-3}.

Calculate the solubility product, K_{sp}, for Hg_2Cl_2 at 298 K. Include the units.

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

solubility product, K_{sp} = ... units……. **[5]**

Total Marks for Question Set 6 = 16