

Practice exam questions for Chapter 3: Electrochemistry (Write-on version)

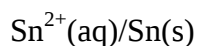
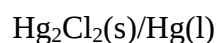
Question 1 (Bursary 2000 Question 7)

The saturated calomel electrode is a common reference electrode. In this electrode, mercury metal is in equilibrium with a solution saturated with mercury(I) chloride which actually exists as Hg_2Cl_2 . The standard potential for the electrode is + 0.24 V at 25 °C.

a Give the formula for the cation in Hg_2Cl_2 . **A** **M** _____

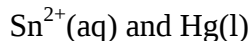
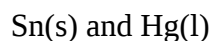
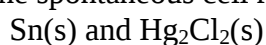
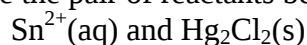
The standard potential for $\text{Sn}^{2+}(\text{aq})/\text{Sn}(\text{s})$ is –0.15 V. Questions in this part refer to a cell having this electrode connected to a calomel electrode

b Circle the positive half cell (electrode) below. **A**



c Calculate the standard cell potential. **A** **M**

d Circle the pair of reactants below that is involved in the spontaneous cell reaction. **A**



e If standard potentials were referred to the calomel electrode instead of to the standard hydrogen electrode, what would be the magnitude **and** sign of the ‘standard’ potential of the $\text{Sn}^{2+}(\text{aq})/\text{Sn}(\text{s})$ couple? **A** **M**

Question 2 (Bursary 2001 Question 1)

Group 17

The standard reduction electrode potentials for the halogens are shown below.

Reduction half equations	E°/V
$F_2 + 2e^- \rightarrow 2F^-$	+2.87
$Cl_2 + 2e^- \rightarrow 2Cl^-$	+1.36
$Br_2 + 2e^- \rightarrow 2Br^-$	+1.09
$I_2 + 2e^- \rightarrow 2I^-$	+0.54

- a** Explain why fluorine gas, F_2 , is extremely reactive and does not occur naturally. **A M**

- b** Explain why chlorine gas can be used to extract bromine from bromide ions in sea water. **A M**

Question 3 (Bursary 2002 Question 9)

Dental discomfort

An amalgam filling is an alloy consisting mostly of silver, tin and mercury. When a gold filling presses against an amalgam filling, some discomfort and an unpleasant metallic taste may occur. This is because an **electrochemical cell** is created in the mouth and will eventually result in corrosion of the amalgam filling.

Standard reduction potentials for some of the species in the mouth under these conditions are:



- a** Name the metal most likely to be oxidised. **A** _____
- b** What is acting as the anode in this cell? **A** _____
- c** Write redox half equations for the reaction occurring between tin and oxygen.
Hence write an overall equation for this reaction. **A M**

- d** Calculate the E° for this reaction. **A M**

- e** What role does the saliva play in this electrochemical cell? **A**
