3 Fuel cells are an increasingly important energy source for vehicles. Standard electrode potentials are used in understanding some familiar chemical reactions including those in fuel cells.

Table 1 contains some standard electrode potential data.

Table 1

Electrode half-equation	$E^{\ominus}$/ V
$F_2 + 2e^- \longrightarrow 2F^-$	+2.87
$Cl_2 + 2e^- \longrightarrow 2Cl^-$	+1.36
$O_2 + 4H^+ + 4e^- \longrightarrow 2H_2O$	+1.23
$Br_2 + 2e^- \longrightarrow 2Br^-$	+1.07
$I_2 + 2e^- \longrightarrow 2I^-$	+0.54
$O_2 + 2H_2O + 4e^- \longrightarrow 4OH^-$	+0.40
$SO_4^{2-} + 4H^+ + 2e^- \longrightarrow SO_2 + 2H_2O$	+0.17
$2H^+ + 2e^- \longrightarrow H_2$	0.00
$4H_2O + 4e^- \longrightarrow 4OH^- + 2H_2$	−0.83

0 3 . 1 A salt bridge was used in a cell to measure electrode potential.

Explain the function of the salt bridge.

[2 marks]

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0 3 . 2 Use data from **Table 1** to deduce the halide ion that is the weakest reducing agent.

[1 mark]

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0 3 . 3 Use data from **Table 1** to justify why sulfate ions should **not** be capable of oxidising bromide ions.

[1 mark]

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0 3 . 4 Use data from **Table 1** to calculate a value for the EMF of a hydrogen–oxygen fuel cell operating under alkaline conditions.

[1 mark]

EMF = _____ V

0 3 . 5 There are two ways to use hydrogen as a fuel for cars. One way is in a fuel cell to power an electric motor, the other is as a fuel in an internal combustion engine.

Suggest the major advantage of using the fuel cell.

[1 mark]

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Turn over for the next question