19.1 Electrochemical Cells

Question Paper

Course	DP IB Chemistry
Section	19. Redox Processes (HL only)
Topic	19.1 Electrochemical Cells
Difficulty	Hard

Time allowed: 10

Score: /5

Percentage: /100

Question 1

Which of the following can be used for a standard hydrogen electrode (SHE)?

	Electrode	Electrolyte solution
A.	Graphite	1 mol dm^{-3} H_2SO_4
B.	Graphite	1 mol dm^{-3} HCl
C.	Platinum	0.5 mol dm^{-3} H_2SO_4
D.	Platinum	0.5 mol dm^{-3} HCl

[1 mark]

Question 2

What are the ratios of gases produced at the electrodes in the electrolysis of dilute vs concentrated sodium chloride solution?

	Ratio of gas produced at cathode : anode in the electrolysis of dilute NaCl	Ratio of gas produced at cathode : anode in the electrolysis of concentrated NaCl
A.	1:1	2:1
B.	1:1	1:2
C.	1:2	1:1
D.	2:1	1:1

[1 mark]

Question 3

Which of the following could be used to electroplate a zinc medal?

A. 1.0 mol dm^{-3} $AgNO_3$ solution with a silver anode

B. 1.0 mol dm^{-3} $AgNO_3$ with a silver cathode

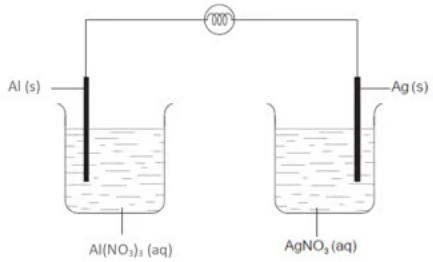
C. 1.0 mol dm^{-3} $CuSO_4$ solution with a copper cathode

D. 1.0 mol dm^{-3} solution of $SnCl_2$ and a tin anode

[1 mark]

Question 4

The diagram below shows the set-up of aluminium and silver cells in series:



What calculation shows the loss in mass of the aluminium electrode if the silver electrode gains 0.25 g?

A. Al mass lost = $\frac{107.87 \times 3 \times 0.25}{26.98}$

B. Al mass lost = $\frac{107.87 \times 0.33 \times 0.25}{26.98}$

C. Al mass lost = $\frac{26.98 \times 0.33 \times 0.25}{107.87}$

D. Al mass lost = $\frac{26.98 \times 3 \times 0.25}{107.87}$

[1 mark]

Question 5

The oxidation of iron is a spontaneous process described by the overall equation:

$$Fe(s) + \tfrac{1}{2}O_2(g) + H_2O(l) \rightarrow Fe(OH)_2(s)$$

$$(\Delta G^\theta = -164\ kJ\ mol^{-1}\ at\ 298\ K)$$

The two half equations for the process are:

$$Fe^{2+}(s) + 2e^- \rightarrow Fe(s)$$

$$\tfrac{1}{2}O_2(g) + H_2O(l) + 2e^- \rightarrow 2OH^-(s)$$

($\Delta G^\theta = -nFE^\theta$, $F = 9.65 \times 10^4\ C\ mol^{-1}$)

Which is the correct calculation to work out E^θ in V?

A. $E^\theta = \frac{-164}{-2 \times 9.65}$

B. $E^\theta = \frac{-164\ 000}{-2 \times 96\ 500}$

C. $E^\theta = \frac{-164\ 000}{-0.5 \times 96\ 500}$

D. $E^\theta = \frac{-164}{-0.5 \times 9.65}$

[1 mark]