InkChemistry

QUESTION WORKBOOK

Electrode potentials and the standard hydrogen electrode

Electrochemistry · Unit C10

AQA 3.1.11.1 · OCR A 5.2.3

16 questions · 54 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 EPS-Q12

Identify the positive electrode of the cell Mg(s) | Mg^{2+}(aq) || Cu^{2+}(aq) | Cu(s), and the direction in which electrons flow in the external circuit. [2]

A2 EPS-Q14

Suggest two reasons why a student's zinc–copper cell reads 0.92 V when the expected EMF is 1.10 V. [2]

SECTION B · Standard, 3 to 5 marks

B1 EPS-Q1

Describe the standard hydrogen electrode, giving the conditions under which it is used, and explain why its electrode is made of platinum. [4]

B2 EPS-Q6

Explain why the EMF of a cell is measured with a high-resistance voltmeter, and why a metal wire cannot be used in place of the salt bridge. [4]

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B3 EPS-Q2 Give the meaning of the term standard electrode potential. [3]

B4 EPS-Q4 Explain the function of the salt bridge in an electrochemical cell, and explain why potassium nitrate is a suitable salt to use in it. [3]

B5 EPS-Q7 Explain how a potential difference arises between a strip of zinc and a solution of zinc ions in which it stands. [3]

B6 EPS-Q8 Calculate the standard EMF of a cell made from a standard zinc half-cell, $E^\circ = -0.76$ V, and a standard silver half-cell, $E^\circ = +0.80$ V, and state which electrode is positive. [3]

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B7 EPS-Q10 Calculate the standard EMF of the cell Mg(s) | Mg^{2+}(aq) || Fe^{3+}(aq), Fe^{2+}(aq) | Pt(s), and write the equation for the reaction when it delivers a current. $E^{\circ}(Mg^{2+}/Mg)$ = -2.37 V; $E^{\circ}(Fe^{3+}/Fe^{2+})$ = +0.77 V. [3]

B8 EPS-Q11 Complete the conventional representation of the cell made from a standard Fe^{3+}/Fe^{2+} half-cell, E° = +0.77 V, and a standard silver half-cell, E° = +0.80 V, and give its EMF. [3]

B9 EPS-Q15 Suggest how the standard electrode potential of the Cl_2/Cl^- half-cell could be measured, describing the chlorine half-cell. [3]

B10 EPS-Q16 Compare a standard zinc half-cell with a standard Fe^{3+}/Fe^{2+} half-cell, in terms of the species present and the electrode used. [3]

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B11 EPS-Q17 Evaluate the statement that the salt bridge carries electrons from one half-cell to the other. [3]

B12 EPS-Q19 Justify the choice of the zinc electrode as the negative pole of a cell made from a standard zinc half-cell, $E^\circ = -0.76$ V, and a standard copper half-cell, $E^\circ = +0.34$ V. [3]

SECTION C · Long, 6 marks or more

C1 EPS-Q5 Explain why aluminium foil placed in copper(II) sulfate solution shows almost no change for several minutes, yet becomes coated with copper, and the mixture warms, soon after sodium chloride is dissolved in the solution. $E^\circ(Al^{3+}/Al) = -1.66$ V; $E^\circ(Cu^{2+}/Cu) = +0.34$ V. Your answer should predict whether the reaction is feasible, give its equation, and explain why a feasible reaction may not be seen. [6]

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C2
EPS-Q13

Describe how you would measure the EMF of a cell made from a zinc half-cell and a copper half-cell in a school laboratory. [6]

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