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VCE Chemistry $\frac{3}{4}$
AOS 1 Revision II [1.12]
Test

20 Marks. 1 Minute Reading. 17 Minutes Writing

Results:

Test Questions	_____ / 15
Extension	_____ / 5



Section A: Test Questions (15 Marks)

Question 1 (4 marks)

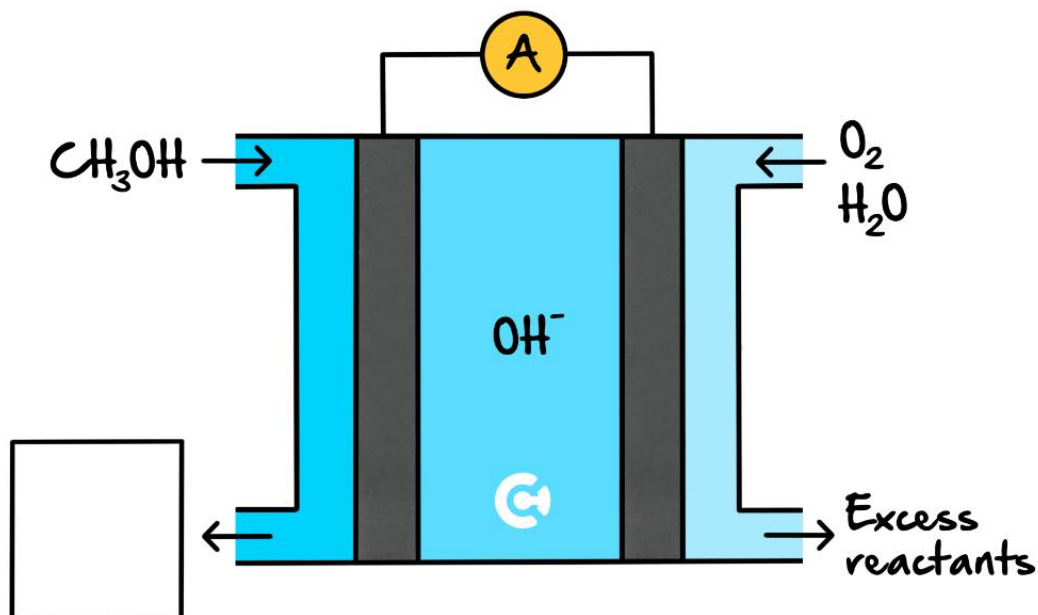
Tick whether the following statements are **true** or **false**.

Statement	True	False
a. A redox reaction can be identified by the presence of electrons in the overall equation.		
b. The oxidation number of F in SF ₆ is -6.		
c. If a beaker contains PbSO ₄ (aq), MgCl ₂ (aq), FePO ₄ (aq) and a tin rod is placed into it, the reduction half equation will be: Pb ²⁺ (aq) + 2e ⁻ → Pb(s).		
d. The purpose of galvanic cells is to ensure that there is an indirect redox reaction occurring.		
e. In a galvanic cell, the cations in the salt bridge migrate towards the positive electrode.		
f. Galvanic cells are characterised by having two separate half-cells, each with its own electrolyte, whereas primary cells are those which share the electrolyte.		
g. The cathode reaction in a fuel cell typically involves oxygen gas reducing, regardless of the choice of fuel or electrolyte.		
h. If there are 0.28 mol of electrons running through a wire in a galvanic cell, Faraday's second law explains that 0.14 mol of metal X will be produced, if the charge on X is +2.		

Space for Personal Notes

Question 2 (7 marks)

An alkaline methanol fuel cell at standard conditions is shown below:



- a. Write the equation for the overall reaction occurring. Assume full oxidation of any carbon-containing reagents. (1 mark)

- b. Write the oxidation half-equation. (1 mark)

- c. Hence or otherwise, fill in the box above by listing the product/s formed at the anode. (1 mark)

- d. Compare the **greenhouse gas** emissions of this fuel cell compared to those produced at a methanol power station. Explain your answer. (4 marks)

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Question 3 (4 marks)

Mani decides to be sneaky and test a bunch of unknown metals, X, Y and Z, that she finds in her shed to see what will happen when they are mixed with sulphuric acid, $\text{H}_2\text{SO}_4(\text{aq})$. Her results are summarised below:

Reacted with	X	Y	Z
H_2SO_4	Bubbles produced	No reaction	$[\text{Z}^{2+}]$ increases
X^+	-	No reaction	Fizzing sound
Y^{2+}	Y(s) produced	-	Y(s) produced

- a. After she is finished with her series of experiments, she notices that the reaction vessels are very hot. Suggest why this might be the case. (1 mark)

- b. List the metals, X, Y and Z, in order of decreasing reductant strength. Show your working. (2 marks)

Decreasing reductant strength: _____

- c. Using your answer to **part b.** as well as the electrochemical series from the Data Book, state the identity of metal Y. (1 mark)

Space for Personal Notes

Section B: Extension (5 Marks)

Question 4 (5 marks)

Arush constructs a galvanic cell with lead and cobalt as the two electrodes, and their respective metal ion solutions as the electrolytes.

- a. Given both electrodes weigh exactly 50.0 g, identify which one will be depleted first and thus act as the limiting reagent. (1 mark)

- b. If this particular cell generates a current of 10.0 A, calculate the time taken, in hours, for the cell to be rendered inactive. Assume an excess of ions within the electrolyte solutions. (3 marks)

Now instead of lead, a H^+/H_2 and Co^{2+}/Co galvanic cell was made with both electrodes still weighing 50.0 g.

- c. Given that the potential difference generated when Arush constructed the cell matched that predicted by the electrochemical series, determine the volume of acidic electrolyte, in L, needed for the cobalt electrode to limit the reaction. (1 mark)

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