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VCE Chemistry $\frac{3}{4}$
Features of Electrolytic Cells [2.2]
Test

20 Marks. 1 Minute Reading. 16 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**.

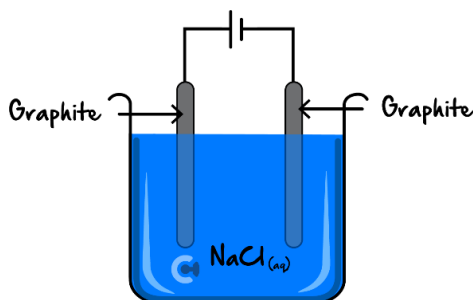
Statement	True	False
a. The conditions under which an electrolytic cell is set up will change the voltage needed but have no impact on the reactions taking place.		
b. The reason 5.0 M NaCl is used in certain electrolytic cells is to produce sodium metal.		
c. Molten conditions eliminate water as a potential reactant.		
d. Electrolytic cells are often constructed to produce chemicals.		
e. The reason CaCl_2 is added to NaCl in the electrolyte of the Down's Cell is so that there are more chloride ions available to react.		
f. Major concerns surrounding hydrogen are that it is difficult to store, transport and detect leaks.		
g. The primary purpose of the PEM cell is to save energy and uphold the Green Chemistry Principle of "Design for Energy Efficiency".		
h. Products of electrolysis are often immediately removed from the reaction vessel so as to prevent them from interfering with the cell.		

Space for Personal Notes

Question 2 (7 marks)

Ryan was cooking up some chicken for dinner when he realised that the brine solution (highly concentrated NaCl) he was marinating the chicken in could be electrolysed using inert electrodes.

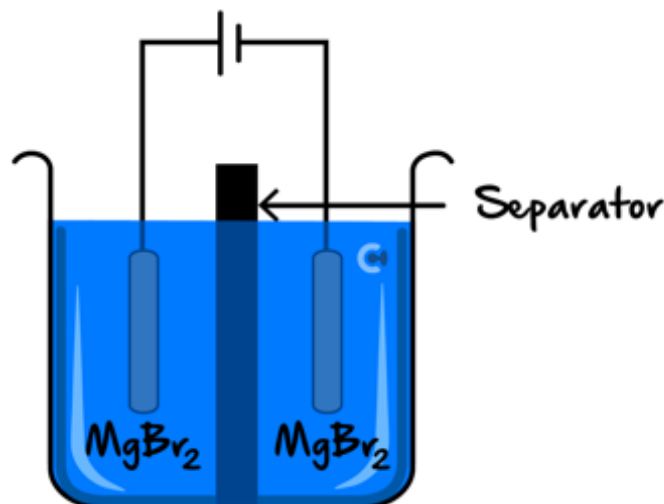
He intends to produce oxygen and hydrogen gas.



- a.
- i. Write the relevant half-equation occurring at the anode. (1 mark)
 - _____
 - ii. Write the other half-equation occurring. (1 mark)
 - _____
- b. Hence or otherwise, outline 3 observations for this cell as it operates. (3 marks)
1. _____
 2. _____
 3. _____
- c. State one Green Chemistry Principle which was unknowingly violated by Ryan in electrolysing brine. Justify your answer. (2 marks)
- _____
- _____
- _____
- _____

Question 3 (4 marks)

A molten solution of magnesium bromide is being electrolysed by Feba in order to produce molten magnesium and gaseous bromine, using the set-up below.



- a. Write the overall equation occurring in this cell. (1 mark)

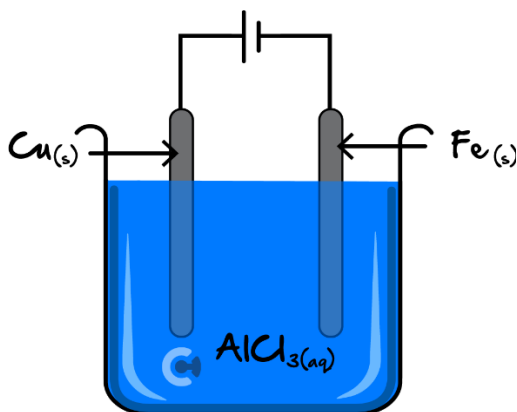
- b. Suggest one reason as to why Feba has placed a separator in the middle of the beaker. (1 mark)

- c. The magnesium produced is less dense than water, resulting in it floating to the top of the electrolyte. Explain why this might be an issue, **and** propose a relevant precaution that should be undertaken by Feba to combat it. (2 marks)

Section B: Extension (5 Marks)

Question 4 (5 marks)

The following electrolytic cell was set up at 25°C using a highly concentrated, 10.0 M, AlCl_3 electrolyte.



- a.
- Write the relevant half-equation occurring at the negative electrode. (1 mark)
-
- Write the other relevant half-equation taking place. (1 mark)
-
- b.
- Instead of inputting electrical energy - like in this cell - what renewable energy source does artificial photosynthesis make use of? (1 mark)
-
- In artificial photosynthesis, list one of the United Nations Sustainable Development Goals which are not upheld. Justify your reasoning. (2 marks)
-
-
-



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