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VCE Chemistry ¾
Electroplating [2.4]
Test

20 Marks. 1 Minute Reading. 17 Minutes Writing.

Results:

Test Questions	_____ / 15
Extension Questions	_____ / 5

Section A: Test Questions (15 Marks)

Question 1 (4 marks)

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

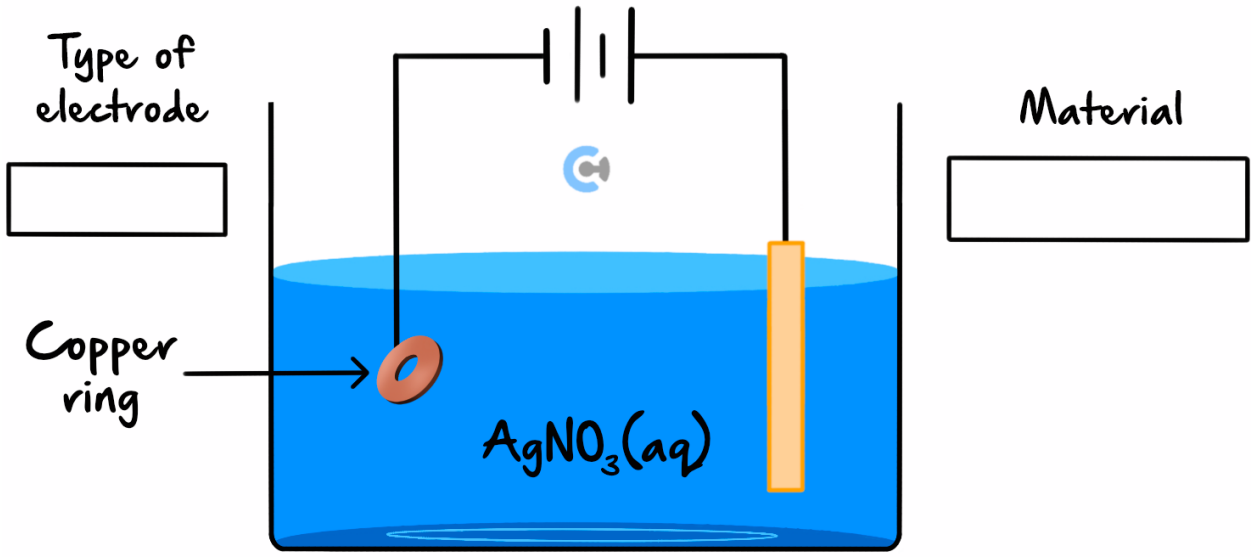
Statement	True	False
a. Electroplating can be used to protect metals by coating them in other metals, as well as for aesthetic purposes.		
b. When multiple oxidants are present in an electrolytic cell, once the strongest oxidant is depleted, the cell stops operating as no more reactions can occur.		
c. High voltages are typically used to electroplate materials as this leads to a greater efficiency.		
d. Faraday's first law suggests that the more charge passed through a cell, the greater the chemical change observed, and this principle holds for both galvanic and electrolytic cells.		
e. To deposit 65.4 g of zinc at the anode, 2 mol of electrons would be needed.		
f. When the same electric charge is passed through two separate electroplating cells, the cell which will have a greater mass change at the cathode will be the one whose electrolyte has ions with a greater molar mass.		
g. The power source used during electroplating is merely there to aid and speed up the reactions occurring, as they would occur even without an external supply of energy.		
h. Metal ions which are weaker in oxidant strength than water will typically not be able to reduce in an aqueous environment.		

Space for Personal Notes

Question 2 (8 marks)

James is planning on proposing to his girlfriend but can't afford to buy a fancy ring. He does, however, have leftover strips of copper and silver from his time doing chemistry at school.

He realises he can set up the following cell, with the intention of coating a copper ring in silver.



a.

i. State whether the ring is acting as the anode or the cathode by writing 'anode' or 'cathode' in the box on the **left** in the diagram above. (1 mark)

ii. Label what **material** the electrode on the **right** should be made out of in the box above, and write half-equation occurring at this electrode. (2 marks)

_____

b. Given that the solution of $AgNO_3$ has a concentration of 1.0 M initially, explain what will happen to its concentration during the operation of this cell. (1 mark)

_____

_____

_____

c. Given that the volume of Silver needed to completely coat the ring is 5.12 cm^3 and the density of Silver is 10.49 g/cm^3. Calculate the time James needs to spend running this cell, in days, if he supplies a current of 50.0 mA. (4 marks)

Space for Personal Notes

Question 3 (3 marks)

Iron nails are often protected by being coated in zinc so as to prevent them from rusting.

a. Zinc is often referred to as the 'sacrificial coating'. Explain why this is the case. (1 mark)

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b. Your friend tells you that when a zinc-coated iron nail's surface is scratched, it begins to turn brown. Using your knowledge of chemistry, explain whether they are correct or not. (2 marks)

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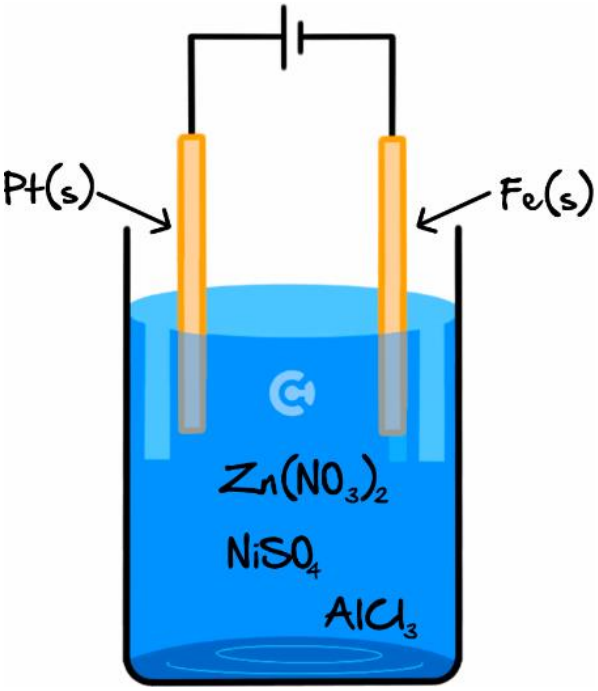
Space for Personal Notes

Section B: Extension Questions (5 Marks)

Question 4 (5 marks)

The following cell is being analysed by a group of Year 12 chemistry students.

They turn the power source on and observe a series of changes until the cell is eventually rendered inactive.



All the solutions in the electrolyte have a concentration of 0.20 *M*.

After some time since the cell is turned on, one of the ions is fully depleted.

a. State which ion this must be and predict the reactions that will take place at the iron electrode after this point in time up until the cell is unable to operate. (2 marks)

_____

_____

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_____

b. Once the cell is rendered in active, state the coatings on the iron electrode, from the outermost layer to the innermost layer. (1 mark)

_____

c.

i. Had more concentrated solutions been used, justify why this would have caused a greater mass change at the cathode. (1 mark)

_____

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ii. The students' teacher had urged them to not make use of highly concentrated solutions. Propose a reason for this recommendation. (1 mark)

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