

S.3 CHEMISTRY ASSESSMENT TEST

TIME: 90 MINUTES

TOPIC: ELECTROCHEMISTRY

INSTRUCTIONS: Attempt all questions

SECTION A

PART I

1. Which one of the following particles conducts electric current in molten lead (II) bromide?
A. Electrons B. Molecules C. Atoms D. Ions. ☐
2. Which one of the following substances can conduct electricity either in solution or molten state?
A. Hydrogen chloride B. Sugar C. Ethanol D. Sulphur ☐
3. Which one of the following is a strong electrolyte?
A. Nitric acid C. Ethanoic acid
B. Ammonia solution D. Sodium hydroxide solution ☐
4. The substances produced during electrolysis of brine using a mercury cathode cell are
A. Sodium hydroxide, oxygen and chlorine
B. Hydrogen, chlorine and sodium hydroxide
C. Hydrogen, sodium and chlorine
D. Sodium, oxygen and hydrogen ☐
5. Which one of the following substances is used as the anode during the extraction of sodium chloride?
A. Iron B. Graphite C. Mercury D. Platinum ☐
6. Which one of the following equations represents the reaction that takes place at the cathode during the electrolysis of dilute copper(II) chloride solution?
A. $4\text{OH}^-(\text{aq}) \longrightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g}) + 4\text{e}^-$
B. $2\text{Cl}^-(\text{aq}) \longrightarrow \text{Cl}_2(\text{g}) + 2\text{e}^-$
C. $2\text{H}^+(\text{aq}) \longrightarrow \text{H}_2(\text{g})$
D. $\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \longrightarrow \text{Cu}(\text{s})$ ☐
7. Which one of the following pairs of substances consist of strong electrolytes only?
A. Potassium hydroxide solution and dilute ethanoic acid
B. Sodium hydroxide solution and dilute sulphuric acid
C. Sodium hydroxide solution carbon acid
D. Aqueous ammonia and dilute ethanoic acid ☐
8. Which one of the following is observed when a solution of copper(II) sulphate, is electrolyzed using copper electrodes
A. A brown solid is deposited at the anode
B. A colourless gas is evolved at the cathode
C. The colour of the solution remains the same
D. The cathode decreases in size ☐
9. Which one of the following ions is discharged at the cathode when brine is electrolyzed using mercury cathode?
A. Hydrogen B. Sodium C. Hydroxide D. Chloride ☐

10. Which one of the following substance(s) is/are formed at the anode when zinc sulphate solution is electrolyzed using carbon electrodes?

A. water and oxygen

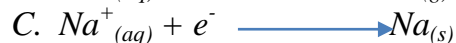
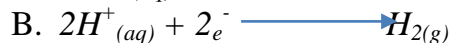
C. water only

B. Zinc only

D. Zinc and hydrogen

☐

11. Which one of the following equations show that the reaction that takes place at the cathode during the electrolysis of concentrated sodium chloride solution using graphite electrode?


☐

PART II

12. Aqueous solution of hydrogen chloride gas conducts electricity.

Because

Hydrogen chloride gas is a covalent compound.

☐

13. During the electrolysis of concentrated sodium chloride solution, chlorine is liberated at

Because

The chloride ion is higher than the hydroxide ion in the electrochemical series.

☐

14. During the manufacture of chlorine by electrolysis of brine, the cathode is made of mercury.

Because

Chlorine gas is soluble in water

☐

15. A solution of hydrogen chloride in methylbenzene does not conduct electricity

Because

Methylbenzene does not conduct electricity.

☐

16. Electrolysis of dilute sulphuric acid between platinum electrodes produces oxygen at the anode

Because

The hydroxide ions are preferentially discharged at the anode.

☐

PART III

17. Which factor(s) determine the ion to be discharged at an electrode during electrolysis?

1. The nature of electrode used

3. The position of ion in the activity series

2. The amount of current passed

4. The charge on the ion

☐

18. Which of the following observations take(s) place when copper(II) sulphate is electrolysed using graphite electrodes?

1. Bubbles of a colourless gas are formed at the anode

2. A brown coating is formed at the anode

3. The blue colour of copper(II) sulphate fades

4. The anode dissolves in solution

☐

19. During electroplating of iron with copper, the

- | | | |
|----------------------------|--|--------------------------|
| 1. cathode is made of iron | 3. electrolyte is copper(II) sulphate solution | <input type="checkbox"/> |
| 2. anode is made of copper | 4. electrolyte is iron(II) sulphate solution | |

20. During electrolysis of dilute hydrochloric acid using carbon electrodes

- | | | |
|---------------------------------------|---|--------------------------|
| 1. oxygen is given off at the anode | 3. hydrogen is given off at the cathode | <input type="checkbox"/> |
| 2. chlorine is given off at the anode | 4. the pH of the acid decreases | |

21. Which of the following is/are true about electrolysis of dilute sulphuric acid?

- | | |
|--|--------------------------|
| 1. hydrogen is produced at the cathode | <input type="checkbox"/> |
| 2. The acidity at the cathode increases | |
| 3. The volume of gas produced at the cathode is bigger than the one produced at the anode. | |
| 4. the anode decreases in size. | |

SECTION B

22. During the manufacture of sodium hydroxide, concentrated sodium chloride solution is electrolyzed using mercury as the cathode.

a) i) Name the substance that is used as the anode. (1/2mark)

.....

ii) Give a reason for the choice of the substance. (01mark)

.....

iii) Identify the product collected at the anode. (1/2mark)

.....

b) During the electrolysis, sodium amalgam is formed at the cathode

i) State how sodium amalgam is converted to sodium hydroxide. (1/2 mark)

.....

ii) Write an equation for the reaction leading to the formation of sodium hydroxide. (1 1/2 mark)

.....

c) State one industrial use of sodium hydroxide. (1/2 mark)

.....

23. Dilute copper (II) sulphate was electrolyzed using carbon electrodes.

(a) State what was observed at

(i) the anode (01 mark)

.....

(ii) the cathode (01 mark)

.....

(b) Write an equation for the reaction at the anode.

(02 marks)

.....

(c) Dilute copper (II) sulphate was electrolyzed using copper electrodes. State what was observed at the anode.

(01 mark)

.....

.....

24. Molten lead(II) bromide was electrolysed between two carbon electrodes.

a) Explain why lead(II) bromide was electrolysed in the molten state and not in the solid state.

(02marks)

.....

.....

.....

.....

b) State what observed at the:

i) anode.

(01mark)

.....

ii) cathode.

(01mark)

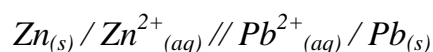
.....

c) Write equation for the reaction that took place at the anode.

(01mark)

.....

25. The cell convention for an electrochemical cell is shown below.



a) Name two substances that could be used as electrolytes.

(02 marks)

.....

.....

b) State which one of the electrodes is the anode.

(01mark)

.....

c) Write equation for the reaction at

(i) the anode

(01mark)

.....

(ii) the cathode

(01mark)

.....

d) Write equation for the overall cell reaction.

(1½ marks)

.....

SECTION C

26. (a) (i) Describe how sodium hydroxide can be manufactured using the mercury-cathode cell. (your answer should include equations of the reactions, but not diagram). (07 marks)

(ii) State one use of the product formed at the anode and one use of the by product. (02 marks)

(b) State how sodium hydroxide can react with the following substances, and in each case write equation for the reaction

(i) Sulphuric acid. (2 ½ marks)

(ii) Aluminium ion. (3 ½ marks)

27. (a) Distinguish between the terms anode and cathode. (02 marks)

(b) Explain why copper(II) chloride in solid form doesn't conduct electricity whereas in molten form it does. (2½ marks)

(c) A dilute solution of copper(II) chloride was electrolyzed using graphite as electrodes.

(i) State what was observed at the cathode. (01 mark)

(ii) Write equation for the reactions at the anode and cathode respectively. (2½ marks)

(d) Describe how the product at the anode can be identified. (02 marks)

(e) The electrolysis of dilute copper(II) chloride was repeated for some time using copper instead of graphite as electrodes.

(i) State what was observed at the anode and cathode respectively. (02 marks)

(ii) Write equation to support your observation at the anode. (01 mark)

(f) State one factor other than change of electrodes from graphite to copper that would affect the products of electrolysis of copper(II) chloride solution and indicate how it would affect the process.

(02 marks)

END!!!

“What men have done, Man can do!!!!!!”