This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls — Loueizeh - Baabda

Stage Exam 05
27APR2026

Do NOT write in this box. Your MARK will be placed here.

Subject :	Chemistry	
Class :	9B, 9C and 9E	
Teacher :	Mrs. Mirella Freige	
Duration :	1 hour	
Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

Exercise I: Multiple Choice Questions

Choose the letter corresponding to the correct answer. (8 points)

1. **What is oxidation?**

   A. Gain of electrons
   B. Loss of electrons
   C. Gain of protons
   D. Loss of neutrons

2. **What is reduction?**

   A. Loss of electrons
   B. Gain of electrons
   C. Loss of oxygen
   D. Gain of neutrons

3. **In the reaction below, which substance is oxidized?**

   $\mathbf{Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu}$

   A. Zn
   B. Cu^{2+}
   C. Cu
   D. Zn^{2+}

4. **In the same reaction, which substance is reduced?**

   $\mathbf{Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu}$

   A. Zn
   B. Cu^{2+}
   C. Zn^{2+}
   D. None

5. **Which of the following is an oxidizing agent?**

   A. A substance that loses electrons
   B. A substance that gains electrons
   C. A substance that remains unchanged
   D. A substance that loses protons

6. **Which process represents oxidation?**

A. $Cl_2 + 2e^- \rightarrow 2Cl^-$
B. $Fe^{2+} \rightarrow Fe^{3+} + e^-$
C. $Cu^{2+} + 2e^- \rightarrow Cu$
D. $O_2 + 4e^- \rightarrow 2O^{2-}$

7. **Which statement is true about redox reactions?**

A. Oxidation and reduction happen separately
B. Only oxidation occurs
C. Oxidation and reduction happen together
D. Only reduction occurs

8. **Which statement correctly describes a reducing agent?**

A. It gains electrons and is reduced
B. It loses electrons and is oxidized
C. It gains protons
D. It does not change

9. **What is the main function of a galvanic cell?**

A. To use electricity to drive a reaction
B. To store heat energy
C. To convert chemical energy into electrical energy
D. To produce light energy

10. **In a galvanic cell, where does oxidation occur?**

A. Cathode
B. Anode
C. Salt bridge
D. External circuit

11. **In a galvanic cell, electrons flow from:**

A. Cathode → Anode
B. Anode → Cathode
C. Salt bridge → Cathode
D. Cathode → Salt bridge

12. What is the role of the salt bridge?

A. To maintain electrical neutrality
B. To produce electricity
C. To increase voltage
D. To produce ions

13. Which statement is true about the cathode in a galvanic cell?

A. Oxidation occurs
B. Electrons are lost
C. Reduction occurs
D. It is negatively charged

14. In a working galvanic cell, what happens to the mass of the anode?

A. Remains constant
B. Increases
C. Decreases
D. Doubles

15. The Daniell cell consists of which two metals?

A. Zn and Fe
B. Cu and Ag
C. Zn and Cu
D. Fe and Cu

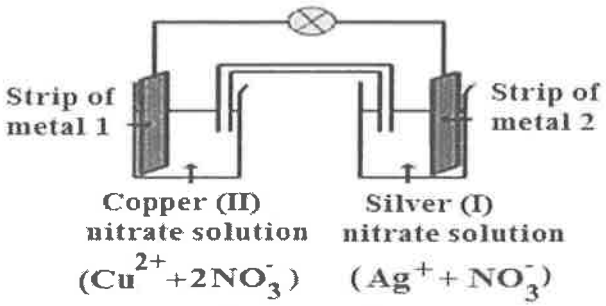
16. Which half-reaction occurs at the anode?

A. $Cu^{2+} + 2e^- \rightarrow Cu$
B. $Zn^{2+} + 2e^- \rightarrow Zn$
C. $Zn \rightarrow Zn^{2+} + 2e^-$

Exercise II: Electrochemical Cells (8 points)

An electrochemical cell converts chemical energy into electrical energy. Several metals can be used to construct such cells. Metals differ in their tendencies to lose electrons; for example, copper (Cu) has a greater tendency to lose electrons than silver (Ag), but a lower tendency than magnesium (Mg). The greater the difference between the tendencies of metals to lose electrons, the higher the voltage of the cell.

An electrochemical cell, G_1, is constructed. Document 1 shows a schematic diagram of the functioning cell.



Document-1

1.1. Identify the metal (1).

1.2. The overall equation of the cell reaction G_1 is given below:

$$2Ag^+_{(aq)} + Cu_{(s)} \rightarrow 2Ag_{(s)} + Cu^{2+}_{(aq)}$$

1.2.1. Write the half equations of the reactions that take place at the anode and the cathode of the cell G_1.

1.2.2. Identify the oxidant (oxidizing agent) and the reductant (reducing agent) in the cell reaction G_1.

1.3. Justify the following statements:

a) The mass of the copper strip decreases after a certain time of the functioning of the cell G_1.

b) When the salt bridge is removed, the lamp of the cell G_1 doesn't glow.

2. Referring to the text, answer the following questions:

2.1. Arrange the metals copper (Cu), silver (Ag) and magnesium (Mg) on an axis according to their increasing tendencies to lose electrons.

2.2. A cell, G_2, is constructed by connecting the following two half-cells:

- A magnesium strip (Mg) immersed in a solution containing magnesium ions (Mg^{2+}).
- A silver strip (Ag) immersed in a solution containing silver ions (Ag^{+}).

Give the symbolic representation of the cell G_2.

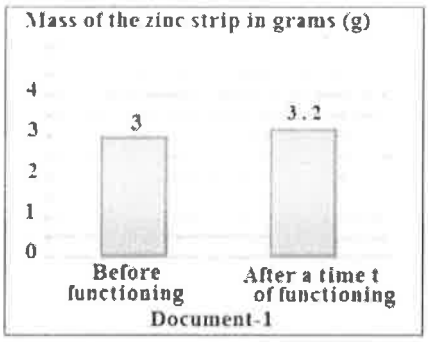
2.3. Under standard conditions, the voltage of the cell G_1 is $U_1 = 0.46V$.

Choose from the following values the one that corresponds to the voltage (U_2) of cell G_2 under the same conditions. Justify your answer.

a) $U_2 = 0.46$ V **b)** $U_2 = 0.16$ V **c)** $U_2 = 3.17$ V

Exercise III: Aluminum – Zinc Cell (5 points)

Redox reactions involve the transfer of electrons from one chemical species to another.
In the laboratory, a group of students constructs an aluminum–zinc electrochemical cell (G) in order to study the variation in the mass of the zinc strip during the operation of this cell.
Document 1 is a bar graph representing the obtained results.



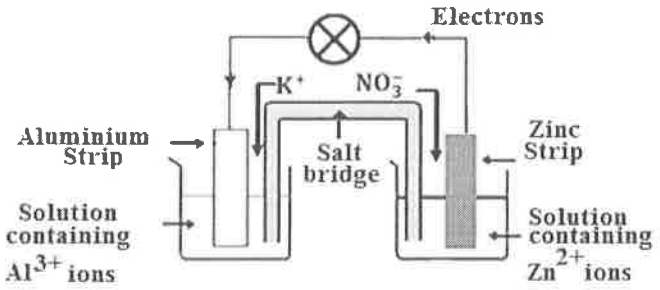
Document-1

Refer to Document 1 and answer the following questions:

1.1 Show that the zinc strip is the cathode of cell (G).

1.2 Identify, from the metals zinc and aluminum, the one that has the greater tendency to lose electrons.

2. A Grade 9 student represents the cell (G) constructed by his classmates using a schematic diagram.



Identify the errors made by the student in the schematic diagram. Justify your answer.

3. Write the oxidation and reduction half-reactions of cell (G).

4. Deduce the overall equation for the reaction occurring in this cell.

Exercise I (1/2 each)

1. B	9. C
2. B	10. B
3. A	11. B
4. B	12. A
5. B	13. C
6. B	14. C
7. C	15. C
8. B	16. C

Exercise II (8 points)

1.1. Metal(1) is immersed in Copper II nitrate solution ($Cu^{2+} + 2NO_3^-$) so Metal(1) is Copper. (1)

1.2.1. Anode : $Cu \rightarrow 2\bar{e} + Cu^{2+}$
Cathode : $Ag^+ + 1\bar{e} \rightarrow Ag$. (1)

1.2.2. . Oxidant undergoes reduction, so the oxidant is Ag^+. (1/2)
. Reductant undergoes oxidation, so the reductant is Cu. (1/2)

1.3. a) The mass of the copper strip decreases because it's the anode and it will be oxidized (or transformed) into Cu^{2+}. (1)

b) When the salt bridge is removed, the circuit is open. (1)

2.2.1. Ag Cu Mg → Increasing order of tendency to lose electrons (1)

2.2. Symbolic representation of G_2:

$\ominus$ Mg | Mg^{2+} salt bridge Ag^{+} | Ag $\oplus$ (1)

2.3. (G_1): $U_1 = 0.46V$

(G_2): $U_2 = 3.17V$ should be greater than $U_1 = 0.46V$ because the greater the difference between the tendencies to lose electrons, the higher the voltage of the cell. $\Rightarrow$ (c) $U_2 = 3.17V$. (1)

Exercise III (5 points)

1.1. Before functioning, the mass of the zinc strip = 3 g.
After functioning, the mass of the zinc strip = 3.2 g
$\Rightarrow$ the mass of the zinc strip increases; there is formation of Zn(s) by reduction of Zn^{2+} ions
$\Rightarrow$ Zn: Cathode. (1)

1.2. Zn: Cathode $\Rightarrow$ Al: Anode so Al has the greater tendency to lose electrons. (1/2)

2. The errors made by the student:
the direction of flow and the direction of migration of the ions of the salt bridge. (1/2)
* Al: anode should lose $\bar{e}$ and not zinc. (1/2)
(so electrons should flow from Al → Zn).
* K^{+} ions should migrate towards the cathodic half cell.
* NO_3^{-} ions should migrate towards the anodic half cell (1/2)

3. $Al \longrightarrow 3\bar{e} + Al^{3+}$: Oxidation (x2) (½)
$Zn^{2+} + 2\bar{e} \longrightarrow Zn$: Reduction (x3) (½)

4. Number of $\bar{e}$ lost is equal to the number of $\bar{e}$ gained. (½)

$$2Al + 3Zn^{2+} \longrightarrow 2Al^{3+} + 3Zn. \quad (½)$$