
	<b>INDIAN SCHOOL AL WADI AL KABIR</b>	
<b>Class: X</b>	<b>Department: SCIENCE 2023 – 24</b> <b>SUBJECT: SCIENCE(CHEMISTRY)</b>	<b>Date of submission:</b> <b>25-10-2023</b>
<b>Worksheet No: 03</b> <b>WITH ANSWERS</b>	<b>CHAPTER / UNIT: METALS AND NON-METALS</b>	<b>Note:</b> <b>A4 FILE FORMAT</b>
<b>NAME OF THE STUDENT</b>	<b>CLASS &amp; SEC:</b>	<b>ROLL NO.</b>

### OBJECTIVE TYPE QUESTIONS

#### MULTIPLE CHOICE QUESTIONS

- Which of the following oxide(s) is/are soluble in water to form alkalies?  
 (i)  $\text{Na}_2\text{O}$  (ii)  $\text{SO}_2$  (iii)  $\text{K}_2\text{O}$  (iv)  $\text{NO}_2$   
 (a) (i) and (iii)  
 (b) (i) only  
 (c) (ii) and (iv)  
 (d) (iii) only
- Sodium reacts with water to form sodium hydroxide and hydrogen gas. The balanced equation which represents the above reaction is:  
 (a)  $\text{Na}_{(s)} + 2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{NaOH}_{(aq)} + 2\text{H}_{2(g)}$   
 (b)  $2\text{Na}_{(s)} + 2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{NaOH}_{(aq)} + \text{H}_{2(g)}$   
 (c)  $2\text{Na}_{(s)} + 2\text{H}_2\text{O}_{(l)} \rightarrow \text{NaOH}_{(aq)} + 2\text{H}_{2(g)}$   
 (d)  $2\text{Na}_{(s)} + \text{H}_2\text{O}_{(l)} \rightarrow 2\text{NaOH}_{(aq)} + 2\text{H}_{2(g)}$
- Aluminium is used for making cooking utensils. Which of the following properties of aluminium are responsible for the same?  
 (i) Good thermal conductivity  
 (i) Good electrical conductivity  
 (ii) Ductility  
 (iii) High melting point  
 (a) i and ii  
 (b) i and iii  
 (c) ii and iii  
 (d) i and iv
- Among the following, the metal with lowest density is:  
 (a) Lithium (b) Lead  
 (c) Magnesium (d) Aluminium

5. Which of the following statements is correct about ionic compounds?
- (i) They conduct electricity in solid state.
  - (ii) They conduct electricity in aqueous solutions.
  - (iii) They conduct electricity in molten state.
- (a) (i) only  
(b) (ii) only  
(c) (iii) only  
(d) (ii) and (iii)

### **ASSERTION-REASONING QUESTIONS**

For the following questions, two statements are given-one labelled Assertion (A) and the other labelled Reason(R). Select the correct answer to these questions from the options

(i) , (ii), (iii) and (iv) as given below:

(i) Both A and R are true and R is the correct explanation of the Assertion.

(ii) Both A and R are true but R is not the correct explanation of the Assertion.

(iii) A is true but R is false.

(iv) A is false but R is true.

6. Assertion: - Aluminium oxide is an amphoteric oxide.  
Reason: - Aluminium oxide reacts with both acid and base to give salt and water.
7. Assertion: - Elements Pt, Ag, and Au occur in native state in nature.  
Reason: - Elements which are attacked by moisture, oxygen and CO<sub>2</sub> of air occur in native state.
8. Assertion: - Magnesium chloride is an ionic compound.  
Reason: - Metals and non-metals react by mutual transfer of electrons.
9. Assertion: Sodium and Potassium are stored under kerosene  
Reason: Sodium and Potassium belong to group I and are alkali metals

### **ONE MARK QUESTIONS**

10. What is meant by refining of metals? In the electrolytic refining of metal M, name the cathode, anode and the electrolyte.
11. At ordinary temperature, the surface of metals like Magnesium, Aluminium, Zinc etc. is covered with a thin layer. What is the composition of this layer and what is its importance?
12. Explain the following statement:  
Most metal oxides are insoluble in the water. But some of these dissolve in water  
What are these oxides and the solution in water known as?
13. Write one example of each of the following.
- (a) Most malleable and ductile metal
  - (b) The best conductor of heat and poorest conductor of heat.

14.  $X + YSO_4 \rightarrow XSO_4 + Y$  and  
 $Y + XSO_4 \rightarrow$  No reaction. Out of the two elements X and Y, which is more reactive and why?

### **THREE MARK QUESTIONS**

15. Explain the following
- (a) Sodium chloride is an ionic compound which does not conduct electricity in solid state whereas it does conduct electricity in molten state as well as in aqueous solution
  - (b) Reactivity of Aluminium decreases if it is dipped in nitric acid.
  - (c) Metals like magnesium and Calcium are never found in their free state in nature
16. (a) Name the method used to extract metals of high reactivity  
(b) Name the main ore of mercury. How is mercury obtained from its ore? Give balanced chemical equations.  
(c) Explain what is thermite reaction with the help of balanced equation. How is it used to join railway tracks or cracked machine parts?
17. With the help of suitable chemical equations, list the two main differences between roasting and calcination. How is metal reduced from the product obtained after roasting or calcination of the ore? Write the chemical equation of the reaction involved. (CBSE 2023)

### **FIVE MARK QUESTIONS**

18. (a) Describe an activity to show that metals are good conductors of electricity.  
(b) Explain the formation of  $Al_2O_3$  with electron-dot structure.  
(Given atomic number of Al and O are 13 and 8 respectively)  
(c) What happens when (report only observations)
- (i) a reactive metal reacts with a dilute mineral acid
  - (ii) an amphoteric oxide reacts with NaOH solution
  - (iii) a less reactive metal is dropped in a solution of high reactive metal salt solution
  - (iv) a metal carbonate is treated with acid.
19. (i) Write the steps involved in the extraction of pure metals in the middle of the activity series from their carbonate ores.  
(ii) How is copper extracted from its sulphide ore? Explain the various steps supported by chemical equations. Draw labelled diagram for the electrolytic refining of copper.
20. (a) Define reactivity series of metals.  
(b) Arrange the metals Gold, Copper, Iron and Magnesium in the order of their increasing reactivity  
(c) What will you observe when
- (i) Some Zinc pieces are placed in copper sulphate solution
  - (ii) Some silver pieces are placed in green coloured Ferrous sulphate solution
21. (a) Write electron dot diagrams of Chlorine (atomic number 17) and Calcium (Atomic number 20). Show the formation of Calcium chloride by the transfer of electrons.  
(b) Identify the nature of the above compound and explain three physical properties of

this compound.

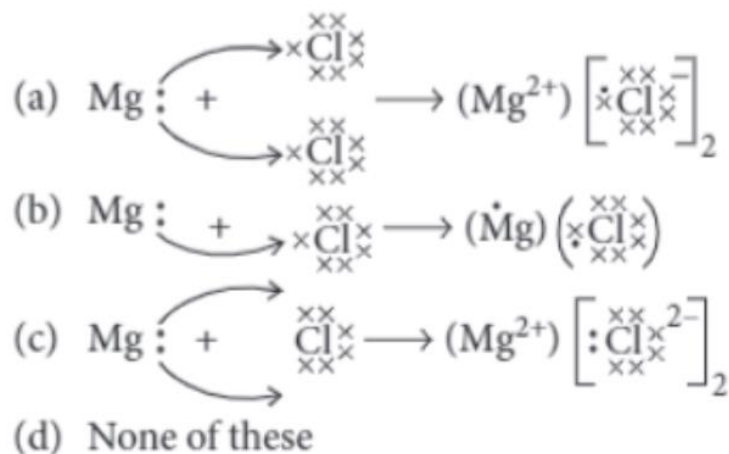
### **PREVIOUS YEAR BOARD QUESTIONS**

22. An ore on treatment with dilute hydrochloric acid produces brisk effervescence. Name the type of ore with one example. What steps will be required to obtain metal from the enriched ore? Also write the chemical equations for the reactions involved in the process. (CBSE 2019)
23. What would you observe on adding zinc granules to freshly prepared ferrous sulphate solution? Give reason for your answer. (CBSE 2019)
24. Two ores X and Y were taken. On heating these ores it was observed that  
(a) ore X gives CO<sub>2</sub> gas, and  
(b) ore Y gives SO<sub>2</sub> gas.  
Write steps to convert these ores into metals, giving chemical equations of the reactions that take place. (CBSE 2020)
25. State three reasons for the following facts:  
(i) Sulphur is a non-metal  
(ii) Magnesium is a metal  
One of the reasons must be supported with a chemical equation.
26. State the reason for the following:  
(i) Aluminium oxide is called an amphoteric oxide.  
(ii) An iron strip dipped in a blue copper sulphate solution turns the blue solution pale green.  
(iii) Hydrogen gas is not evolved when most metals react with nitric acid.  
(iv) Calcium does not occur in a free state in nature.  
(iv) Sodium or Potassium metals are kept immersed under kerosene.

### **CASE STUDY BASED QUESTIONS**

27. The chemical reactivity of an element depends upon its electronic configuration. All elements having less than eight electrons in the outermost shell show chemical reactivity. During chemical reactions, atoms of all elements tend to achieve a completely filled valence shell. Metals are electropositive in nature. They have tendency to lose one or more electrons from the valence shell of their atoms to form cations and achieve the nearest noble gas configuration. The compounds formed the transfer of electrons from one element to other are known as ionic compounds or electrovalent compounds.
- (i) The electronic configuration of three elements X, Y and Z are:-  
X-2      Y-2,8,7      Z- 2,8,2  
Which of the following is correct regarding these elements?  
(a) X is a metal  
(b) Y is a metal  
(c) Z is a non-metal  
(d) Y is a non-metal and Z is a metal.
- (ii) Element X reacts with element Y to form a compound Z. During the formation of compound Z, atoms of X lose one electron each whereas atoms of Y gain one electron each. Which of the following properties is not shown by compound Z?

- (a) High melting point
  - (b) Low melting point
  - (c) Occurrence as solid
  - (d) Conduction of electricity in molten state.
- (iii) Which of the following is correct representation of formation of magnesium chloride?



- (iv) The electronic configuration of sodium ion is:-
- (a) 2,8,8
  - (b) 2,8,2
  - (c) 2,6
  - (d) 2,8
- (v) Which of the following represents an electropositive element?
- (a) 2,8,6
  - (b) 2,8,8
  - (c) 2,8,8,1
  - (d) 2,7

28. The process of extracting metal ores buried deep underground is called Mining. The metal ores are found in the earth's crust in varying abundance. The extraction of metals from ores is what allows us to use the minerals in the ground. The ores are very different from the finished metals that we see in buildings and bridges. Ores consist of the desired metal compound and the impurities and earthly substances called Gangue. The extraction of metals and its isolation occurs over a few major steps: Concentration of ore, isolation of metal from concentrated ore, Purification of the metal.

- (i) Name the process used to extract highly reactive metals from their ores.
- (ii) What do you mean by enrichment of ore?
- (iii) How will you separate copper from its sulphide ore? Write the chemical equations.

OR

Explain thermite reaction with the help of balanced equation.

x-----x

## ANSWERS

### OBJECTIVE TYPE QUESTIONS

#### MULTIPLE CHOICE QUESTIONS

Q. No.	Answers
1	(a) (i) and (iii)
2	(b) $2\text{Na}_{(s)} + 2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{NaOH}_{(aq)} + \text{H}_{2(g)}$
3	(d) i and iv
4	(a) Lithium
5	(d) (ii) and (iii)

#### ASSERTION-REASONING QUESTIONS

6	(i) Both A and R are true and R is the correct explanation of the Assertion.
7	(iii) A is true but R is false.
8	(i) Both A and R are true and R is the correct explanation of the Assertion.
9	(ii) Both assertion and reason are correct but reason is not the correct explanation for Assertion

#### ONE MARK QUESTIONS

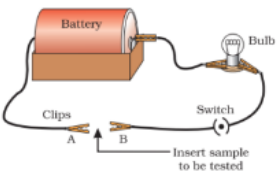
10	It is the process of purification of metals produced by various reduction processes. Anode -the impure metal Cathode -a thin strip of pure metal. Electrolyte -A solution of the metal salt.
11	Metal oxides and they protect the metal from corrosion
12	Metal Oxides are basic in nature. Alkali
13	(a) Gold (b) Copper is the best conductor and Lead is the poor conductor of heat
14	X is more reactive than Y because it replaces Y from its salt solution.

#### THREE MARK QUESTIONS

15	(a) In Solid-state the ions are not free to move to conduct electricity. In the molten state, the free-moving ions present in NaCl helps in conducting electricity (b) Al reacts with dilute Nitric acid to form an oxide. This layer prevents further reaction of Aluminium
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	(c) Metals like Magnesium and Calcium are very reactive that they are never found in a free state in nature.
16	<p>(a) Highly reactive metals are obtained by electrolytic reduction.</p> <p>(b) Cinnabar When we heat HgS (Cinnabar) it is first converted to HgO and then on heating again HgO reduces to Hg.</p> $2\text{HgS(s)} + 3\text{O}_2(\text{g}) \xrightarrow{\text{Heat}} 2\text{HgO(s)} + 2\text{SO}_2(\text{g})$ $2\text{HgO(s)} \xrightarrow{\text{Heat}} 2\text{Hg(l)} + \text{O}_2(\text{g})$ <p>(c) The reaction of iron oxide (Fe<sub>2</sub>O<sub>3</sub>) with Aluminium is used to join railway tracks and cracked machine parts. This reaction is known as Thermit reaction. The metal is obtained in the molten state.</p> $\text{Fe}_2\text{O}_3(\text{s}) + 2\text{Al(s)} \rightarrow 2\text{Fe(l)} + \text{Al}_2\text{O}_3(\text{s}) + \text{Heat}$
17	<p>Roasting:-</p> <ul style="list-style-type: none"> <li>• Conversion of sulphide ore to oxide</li> <li>• Done in presence of excess amount of air or oxygen.</li> </ul> $2\text{ZnS(s)} + 3\text{O}_2(\text{g}) \rightarrow 2\text{ZnO(s)} + 2\text{SO}_2(\text{g})$ <p>Calcination:-</p> <ul style="list-style-type: none"> <li>• Conversion of carbonate ore to oxide</li> <li>• Done in presence of limited supply or in the absence of air or oxygen.</li> </ul> $\text{ZnCO}_3(\text{s}) \xrightarrow{\text{Heat}} \text{ZnO}(\text{s}) + \text{CO}_2\uparrow$ <p style="text-align: center;">Zinc carbonate                      Zinc oxide      Carbon dioxide</p> <p>The metal oxide is then reduced to metal by using carbon as the reducing agent.</p> $\text{ZnO(s)} + \text{C(s)} \rightarrow \text{Zn(s)} + \text{CO(g)}$

### FIVE MARK QUESTIONS

18	<p>(a) Place the metal to be tested in between the terminals as shown in the figure given below. If the bulb glows it indicates that the metal sample is a good conductor of the heat</p> <div style="text-align: center;">  </div> <p>(b) Each Aluminium atom contains three electrons in its outermost shell . While each oxygen atom requires two more electrons to attain octet. Aluminium atom donates its electrons such that each atom attains octet as shown in the figure.</p>
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	<div style="text-align: center;"> <p>Aluminum Oxide <math>Al_2O_3</math></p> <p><math>Al \Rightarrow</math> donates <math>3 \times 2 = 6e^-</math>  <math>O \Rightarrow</math> needs <math>2 \times 3 = 6e^-</math></p> <p><math>2 [Al]^{3+} \quad 3 [O]^{2-}</math></p> </div> <p>(c) (i) a colourless and odourless gas is evolved  (ii) soluble salt is formed; heat is evolved  (iii) No characteristic observation  (iv) a colourless and odourless gas is evolved</p>
19	<p>(i) Moderately reactive metals are present in nature in the form of oxides, sulphides or carbonates.  It is easy to obtain a metal from its metal oxide. Before reduction, the metal sulphides and carbonates must be converted into metal oxides.</p> <p><u>CALCINATION</u>  It is the process of conversion of carbonate ore to oxide ore by heating strongly in limited air.</p> <p>Eg:- <math>ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2 \uparrow</math></p> <p>(ii) copper can be obtained from <math>Cu_2S</math> by heating.</p> $2Cu_2S + 3O_2(g) \xrightarrow{Heat} 2Cu_2O(s) + 2SO_2(g)$ $2Cu_2O + Cu_2S \xrightarrow{Heat} 6Cu(s) + SO_2(g)$ <p><u>Electrolytic refining of copper.</u></p>
20	<p>(a) The series of metals arranged in the decreasing order of reactivity is known as the reactivity series of metals.  (b) Magnesium, Iron, Copper, Gold  (c) (i) The blue colour of the Copper sulphate solution fades because zinc displaces copper from copper sulphate solution and makes zinc sulphate solution which is colourless. Reddish brown deposit of copper is formed on Zinc.  (ii) No characteristic observation as silver is less reactive than iron.</p>
21	(a)



<p>(b) It is an ionic compound Calcium chloride is Solid at room temperature High melting and boiling point Conducts electricity in molten and in solution form.</p>

### PREVIOUS YEAR BOARD QUESTIONS

22	<ul style="list-style-type: none"> <li>• Carbonate ore Zinc Carbonate</li> <li>• Calcination</li> </ul> $\text{ZnCO}_3 \xrightarrow[\text{In limited supply of air}]{\text{Heated}} \text{ZnO} + \text{CO}_2$ <ul style="list-style-type: none"> <li>• Reduction:</li> </ul> $\text{ZnO} + \text{C} \longrightarrow \text{Zn} + \text{CO}$				
23	<p>The solution turns</p> <ol style="list-style-type: none"> <li>i. green to colourless</li> <li>ii. black coating is formed on Zinc.</li> </ol> <p>Reason: Zinc is more reactive than iron so it displaces the iron from its salt solution.</p>				
24	<p>For ore X , Calcination/ Heating in limited supply of air/absence of air.</p> $\text{ZnCO}_3(\text{s}) \xrightarrow{\text{heat}} \text{ZnO}(\text{s}) + \text{CO}_2(\text{g})$ <p>For Ore Y, Roasting/Heating in excess of air.</p> $2\text{ZnS}(\text{s}) + 3\text{O}_2(\text{g}) \xrightarrow{\text{heat}} 2\text{ZnO}(\text{s}) + 2\text{SO}_2(\text{g})$ <p>The metal oxide is reduced by using suitable reducing agent such as carbon.</p> $\text{ZnO}(\text{s}) + \text{C}(\text{s}) \rightarrow \text{Zn}(\text{s}) + \text{CO}(\text{g})$				
25	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: left;">Sulphur is a non- metal</th> <th style="width: 50%; text-align: left;">Magnesium is a metal</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> <ol style="list-style-type: none"> <li>(i) Poor conductor of heat and electricity</li> <li>(ii) Neither malleable nor ductile.</li> <li>(iii) <math>\text{S} + \text{O}_2 \rightarrow \text{SO}_2</math> <math>\text{SO}_2 + \text{H}_2\text{O} \rightarrow</math> <math>\text{H}_2\text{SO}_3(\text{Sulphurous acid})</math> Sulphur dioxide is acidic oxide.</li> </ol> </td> <td style="vertical-align: top;"> <ol style="list-style-type: none"> <li>(i) Good conductor of heat and electricity</li> <li>(ii) Malleable and ductile.</li> <li>(iii) <math>2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}</math> <math>\text{MgO} + \text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2</math> Magnesium oxide is basic in nature.</li> </ol> </td> </tr> </tbody> </table>	Sulphur is a non- metal	Magnesium is a metal	<ol style="list-style-type: none"> <li>(i) Poor conductor of heat and electricity</li> <li>(ii) Neither malleable nor ductile.</li> <li>(iii) <math>\text{S} + \text{O}_2 \rightarrow \text{SO}_2</math> <math>\text{SO}_2 + \text{H}_2\text{O} \rightarrow</math> <math>\text{H}_2\text{SO}_3(\text{Sulphurous acid})</math> Sulphur dioxide is acidic oxide.</li> </ol>	<ol style="list-style-type: none"> <li>(i) Good conductor of heat and electricity</li> <li>(ii) Malleable and ductile.</li> <li>(iii) <math>2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}</math> <math>\text{MgO} + \text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2</math> Magnesium oxide is basic in nature.</li> </ol>
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26	<ol style="list-style-type: none"> <li>(i) Aluminium oxide has the nature of acidic as well as basic oxide as it reacts with acids and bases to produce salt and water.</li> </ol>				

	<p>(ii) Iron being more reactive than copper displaces copper from its solution forming iron sulphate solution. iron sulphate solution is green in colour.</p> <p>(iii) Nitric acid being a strong oxidising agent oxidises the hydrogen produced to water</p> <p>(iv) Calcium is a fairly reactive metal hence it forms compounds easily and is not seen in free state in nature.</p> <p>(v) Sodium and potassium are highly reactive. These metals react with oxygen in the air and may catch fire. Hence kept immersed in kerosene oil</p>
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### CASE STUDY BASED QUESTIONS

27	<p>(i) (d) Y is a non-metal and Z is a metal.</p> <p>(ii) (b) Low melting point</p> <p>(iii) (a)</p> <p>(iv) (d) 2, 8</p> <p>(v) (c) 2, 8, 8, 1</p>
28	<p>(i) Electrolytic reduction</p> <p>(ii) The removal of impurities from the ore that is obtained from the earth is known as enrichment of ore.</p> <p>(iii) copper can be obtained from <math>\text{Cu}_2\text{S}</math> by heating.</p> $2\text{Cu}_2\text{S} + 3\text{O}_2(\text{g}) \xrightarrow{\text{Heat}} 2\text{Cu}_2\text{O}(\text{s}) + 2\text{SO}_2(\text{g})$ $2\text{Cu}_2\text{O} + \text{Cu}_2\text{S} \xrightarrow{\text{Heat}} 6\text{Cu}(\text{s}) + \text{SO}_2(\text{g})$ <p style="text-align: center;">OR</p> <p>The reaction of iron oxide (<math>\text{Fe}_2\text{O}_3</math>) with Aluminium is used to join railway tracks and cracked machine parts. This reaction is known as Thermit reaction.</p> <p>The metal is obtained in the molten state.</p> $\text{Fe}_2\text{O}_3(\text{s}) + 2\text{Al}(\text{s}) \rightarrow 2\text{Fe}(\text{l}) + \text{Al}_2\text{O}_3(\text{s}) + \text{Heat}$

PREPARED BY ASHA JOHN	CHECKED BY HOD SCIENCE
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