2.METALS, NON-METALS, METALLOIDS AND NOBLE GASES
SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

1. Which of the following is liquid metal at room temperature?

A) Zinc B)Mercury C)Silver D)Copper

Answer:B

Solution:Mercury (Hg) is the only metal that remains liquid at room temperature (25°C). Gallium (A) melts at 29.8°C, so it's solid at room temperature but close to melting.

2. Which of the gases are colourless?

A)Hydrogen B) Nitrogen C)Oxygen D)All the above

Answer:D

Solution:All three gases (H_2, N_2, O_2) are colorless, odorless, and diatomic at room temperature.

3. Tellurium is a

A)Metal B)Non-metal C)Metalloid D)Noble gas

Answer:C

Solution:Tellurium (Te) exhibits properties of both metals and nonmetals, classifying it as a metalloid.

4. A liquid metal at room temperature is

A)Gallium B)Magnesium C)Mercury D)Both A and C

Answer:D

Solution:Mercury is liquid at 25°C.
Gallium melts at 29.8°C, so it’s solid at standard room temperature but may liquefy slightly above.

5. ..... is the nonmetal which is good conductor of electricity

A) Iodine B)Nitrogen C) Graphite D)Diamond

Answer:C

Solution:Graphite (a form of carbon) conducts electricity due to its delocalized electrons, unlike other nonmetals.

6. Which metal is neither malleable nor ductile ?

A)Zinc B)Copper C)Silver D)Gold

Answer:A

Solution:Zinc is brittle at room temperature, breaking easily when hammered (non-malleable) or stretched (non-ductile).

7. If a substance breaks easily, it is said to be _____.

A) Magnetic B)Conductive C) Brittle D) Ductile

Answer:C

Brittle materials (e.g., sulfur, zinc) shatter under stress without deformation
8. Which of the following is an element?
A) Calcium oxide B)Common salt C)Ozone D)Water
Answer:C
Solution:Ozone is an allotrope of oxygen (O) and thus an element. Others are compounds:
Calcium oxide (CaO), Common salt (NaCl), Water (H2O).
9. Which of the following has low melting point?
A)Magnesium B)Sodium C)Manganese D) Calcium
Answer:B
Solution:Sodium (Na) melts at 97.8°C, much lower than:
Magnesium (650°C), Manganese (1246°C), Calcium (842°C).
10. Which among the following are bad conductors of electricity?
A)Zinc B)Copper C)Aluminium D)Phosphorus
Answer:D
Solution:Phosphorus (a nonmetal) is an insulator, unlike metals (Zinc, Copper, Aluminium).
11. When sulfur reacts with water, what is the primary product formed?
A)Sulfuric acid B)Sulfurous acidC) Hydrogen sulfide D)Sulfur dioxide
Answer:B
Solution:Sulfur reacts with water to form sulfurous acid, not sulfuric acid (which requires oxidation).
12. When phosphorus reacts with water, what is the main product formed?
A)Phosphoric acid B)Phosphorous acid C)Hydrogen phosphide D)Phosphine
Answer:D
Solution:White phosphorus reacts with water to produce phosphine gas (PH_3), not phosphoric acid.
13. Which nonmetal reacts with hydrochloric acid (HCl) to produce hydrogen gas and a chloride salt?
A)Nitrogen B) Sulfur C)Chlorine D)Oxygen
Answer:B
Solution:Sulfur reacts with HCl to form hydrogen sulfide (H_2S) and sulfur chlorides.
14. When hydrogen reacts with nitrogen gas (N_2) under certain conditions, what is the primary product formed?
A)Ammonium nitrate B)Nitrogen dioxide C) Ammonia D)Nitric acid
Answer:C
Solution:The Haber process combines H_2 and N_2 to produce ammonia (NH_3).
15. When hydrogen reacts with sulfur, what is the product formed when the ratio of hydrogen to sulfur is 2:1?

A)Hydrogen sulfide B)Sulfuric acid
C) Sulfurous acid D) Sulfur hexafluoride
Answer:A
Solution:At a 2:1 ratio, hydrogen and sulfur form H_2S, a toxic gas with a rotten egg smell.

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

16. Which of the following are polyatomic elements?
A)Ozone B)Phosphorus C) Sulphur D)Boron
Answer:A,B,C
Solution:Polyatomic elements exist as molecules with multiple atoms in their natural state:
Ozone (O_3) - Triatomic
Phosphorus (P_4) - Tetratomic
Sulphur (S_8) - Octatomic
Boron exists as individual atoms or small clusters, not as large molecules.
17. For which of the following elements atomicity is same?
A)Hydrogen B)Oxygen C)Nitrogen D)Chlorine.
Answer:A,B,C,D
Solution:These elements all exist as diatomic molecules (atomicity = 2) in their natural state:Oxygen (O_2),Nitrogen (N_2),Chlorine (Cl_2),Hydrogen (H_2)
18. Which of the following are true?
A) Graphite is non-metal B)Mercury is liquid metal at room temperature.
C) Iodine is solid D)Bromine is liquid non-metal at room temperature.
Answer:A,B,C,D
Solution:A) Graphite is a non-metallic form of carbon
B) Mercury (Hg) is the only metal liquid at room temperature
C) Iodine is a solid non-metal at room temperature (sublimes when heated)
D) Bromine is the only non-metal that's liquid at room temperature

Statement Type:

19. Statement-I : Mercury and Gallium are liquids at room temperature.
Statement-II : Sodium, Potassium do not have high melting points.
Answer:B
Solution:Statement-I Evaluation:
Mercury (Hg) is indeed liquid at room temperature (25°C)
Gallium (Ga) melts at 29.8°C, so it's solid at standard room temperature (though it melts in hand)
Therefore, Statement-I is partially false (only mercury is truly liquid at room temp)

Statement-II Evaluation:
Sodium (Na) melts at 97.8°C
Potassium (K) melts at 63.5°C
These are indeed low melting points for metals (Statement-II is true)
20. Statement-I : The molecule of a monoatomic element contains only one atom.
Statement-II : The number of atoms present in one molecule of an element is called its Atomicity.
Answer:A
Solution:Statement-I:
Monoatomic elements (e.g., noble gases: He, Ne, Ar) exist as single atoms
This is completely true
Statement-II:
Atomicity precisely means the number of atoms in a molecule
For monoatomic elements, atomicity = 1
This is both true and directly explains Statement-I
Comprehension Type:
21. Which of the following are metalloids?
A)Boron B)Beryllium C)Manganese D)Neon.
Answer:A
Solution:Metalloids are elements that show properties intermediate between metals and non-metals

Integer Type:

22. Atomicity of sulphur is .....
Answer:8
Solution:Sulphur exists as S_8 molecules (octatomic) in its most stable form at room temperature.
23. Elements are classified into ..... types.
Answer:4
Solution:Metals, Non-metals, Metalloids,Noble gases
Matrix Matching Type:
24.**Answer:A-iv,B-iii,v,C-i,D-ii**
Solution:

COLUMN-I	COLUMN-II
A)Metal	iv) Potassium
B)Non-metal	iii) Graphite , v) Hydrogen
C)Liquid nonmetal	i) Bromine
D)Lustrous nonmetal	ii) Iodine

25. **Answer:A-iv,v,B-iii,C-ii,D-i**

COLUMN-I	COLUMN-II
A)Monoatomic elements	iv) Silver , v) Copper
B)Diatomic elements	iii) Oxygen
C)Triatomic elements	ii) Ozone
D)Tetra atomic elements	i) Phosphorus

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

1. Atomicity of Ozone is:

A) 2 B) 1 C) 3 D)4

Answer:C

Solution:Ozone (O_3) is a triatomic molecule (3 oxygen atoms).

2. Which of the following is noble gas?

A)H B)He C)O D)Li

Answer:B

Solution:Helium (He) is a noble gas (Group 18). Others:

H (hydrogen) - Non-metal

O (oxygen) - Non-metal

Li (lithium) - Alkali metal

3. Which of the following is non-metal?

A) Iron B) Calcium C) Nitrogen D)Aluminium.

Answer:C

Solution:Nitrogen (N) is a gaseous non-metal. Others are metals.

4. He,Ne,Ar,.... are known as

A) Rare gases B)Inert gases C)Noble gases D)All the above.

Answer:D

Solution:Noble gases are also called:

Rare gases (occur in small amounts in atmosphere)

Inert gases (historically thought to be chemically inert)

Noble gases (modern IUPAC name)

5. Which of the following is characteristic of nonmetal?

A)Non-lustrous B)Bad conductor C)Non-ductile D)All the above.

Answer:D

Solution:Nonmetals are typically:

Non-lustrous (dull appearance)
Bad conductors (of heat and electricity)
Non-ductile (brittle)
6. Which of the following is diatomic molecule?
A)Phosphorus B)Ozone C)Oxygen D)Copper.
Answer:C
Solution:Oxygen exists as O_2. Others:Phosphorus (P_4 - tetraatomic),Ozone (O_3 - triatomic),Copper (monoatomic)
7. Atomicity of Phosphorus
A)3 B)2 C)4 D)8
Answer:C
Solution:White phosphorus exists as P_4 molecules (4 atoms in tetrahedral structure).
8. Elements which exhibits some properties of metals and nonmetals are called
A)Metals B)Non-metals C) Metalloids D)Noble gases.
Answer:C
Solution:Elements which exhibits some properties of metals and nonmetals are called Metalloids
9. Bromine is a
A)Liquid metal B)Liquid non-metal C)Liquid metalloid D)None of these.
Answer:B
Solution:Bromine (Br) is the only liquid non-metal at room temperature.
10. Which of the following is a metalloid?
A)Po B)He C)H D)N
Answer:A
Solution:Polonium (Po) is sometimes classified as a metalloid, though it's more metallic.
Others:
He (noble gas), H (non-metal), N (non-metal)
JEE MAINS LEVEL QUESTIONS
1. Which of the following are chemically inert?
A) All metals B)All non-metals C)All metalloids D)Noble gases
Answer:D
Solution:Noble gases (He, Ne, Ar, etc.) have complete valence shells, making them chemically unreactive.
2. Which of the following are metalloids?
A)Boron B)Nitrogen C)Sulphur D)Neon
Answer:A
Solution:Boron (B) is a metalloid. Others:Nitrogen (N), Sulphur (S), Neon (Ne) are non-metals
3. Germanium is a .....

A)Metal B) Gas C)Liquid D)Metalloid

Answer:D

Solution:Germanium (Ge) shows properties of both metals and non-metals (semiconductor).

4. Which of the following is pair of soft metals?

A)Sodium, Potassium. B)Potassium, Magnesium

C)Magnesium, Calcium. D)Calcium,Manganese.

Answer:A

Solution:Alkali metals (Na, K) are soft enough to be cut with a knife

5. Non-metals are generally

A) Liquids B)Gases C)Solids and Gases. D)Gases and Liquids

Answer:C

Solution:Examples:

Solids: Carbon, Sulphur

Gases: Oxygen, Nitrogen

Only Bromine is liquid.

6. All metals are solids except

A) Sodium B)Calcium C)Mercury D)Hydrogen.

Answer:C

Solution:Mercury (Hg) is the only liquid metal at room temperature.

7. If a metal is _____ it can be drawn into a wire

A) Conductive B) Malleable C)Magnetic D) Ductile

Answer:D

Solution:Ductility = Ability to be stretched into wires.

8. Ringing bells in the temples are made up of

A) Non-Metals B)Metalloids C) Metals D)None

Answer:C

Solution:Metals like bronze (Cu + Sn) are used due to their sonorous property.

9. The atomicity of which among the following is maximum?

A) Helium B)Flourine C)Ozone D)Sulphur

Answer:D

Solution:Sulphur (S_8) > Ozone (O_3) > Fluorine (F_2) > Helium (He)

10. The property of elements producing sound is called as

A)Sonorous B)Ductile C)Metalloids D)Malleable.

Answer:A

Solution:Metals produce ringing sounds when struck.

11. Which metal is commonly associated with rusting?

A)Gold B)Aluminum C)Copper D)Iron

Answer:D

Solution:Rust = Hydrated iron oxide

12. What is the product of the reaction between zinc and hydrochloric acid?

A) $ZnCl_2 + H_2$ B) Zn(OH)2 C)ZnO + H_2 D)$Zn(NO_3)_2$

Answer:A

Solution:Zn+2HCl---->$ZnCl_2 + H_2$

13. Which of the following metals is known for forming a protective oxide layer, preventing further corrosion?

A)Iron B)Aluminum C)Zinc D)Copper

Answer:B

Solution:Al forms Al2O3, which prevents further corrosion.

14. What is the general nature of oxides formed by metals?

A)Acidic B) Basic C)Neutral D)Amphoteric

Answer:B

Solution:Most metal oxides (e.g., Na_2O, CaO) are basic.

15. What is the primary product of the reaction between magnesium and hydrochloric acid?

A)$MgCl_2$ B) $Mg(OH)_2$ C)MgO + H_2 D)No reaction occurs

Answer:A

Solution:Mg+2HCl---->$MgCl_2$+H_2

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

16. Which of the following are characteristics of metal?

A)They are malleable B)They are ductile

C)They have non- lustre. D)They have high melting point and boiling point

Answer:A,B,D

Solution:A) Malleable: Metals can be hammered into thin sheets (e.g., aluminum foil).

B) Ductile: Metals can be drawn into wires (e.g., copper wires).

D) High melting/boiling points: Most metals (except Hg, Ga) have strong metallic bonds, requiring high energy to melt.

C) Non-lustre: Incorrect. Metals are lustrous (shiny).

17. What happens when chlorine reacts with water?

A)Formation of hydrochloric acid B) Formation of hypochlorous acid

C)Release of chlorine gas D) Formation of chloric acid

Answer:A,B

Solution:Cl_2+H_2O---->HCl+HOCl

Comprehension Type:
18. Identify which of the following is monoatomic element?
A)Ozone B)Phosphorus C)Nitrogen D)Silver
Answer:D
Solution:Monoatomic elements exist as single, uncombined atoms in their natural state.
Silver (Ag): Exists as individual atoms in its metallic lattice.
Others are polyatomic:
Ozone (O_3) $\rightarrow$Triatomic
Phosphorus (P_4) $\rightarrow$ Tetraatomic
Nitrogen (N_2) $\rightarrow$ Diatomic
19. The molecule which contains two atoms is called..... molecule.
A)Monoatomic B)Diatomic C)Triatomic D)Polyatomic
Answer:B
Solution:Diatomic molecules consist of two atoms bonded together.
20. Metals are
A)Non-ductile B)Non-malleable C)Ductile D)Bad conductor of electricity.
Answer:C
Solution: Properties of Metals:
Ductile: Can be drawn into wires (e.g., copper wires).
Malleable: Can be hammered into sheets (e.g., aluminum foil).
Lustrous: Shiny appearance (e.g., gold, silver).
Good conductors: Of heat and electricity.
Integer Type:
21. Atomicity of sulphur is .....
Answer:8
Solution:The atomicity of sulphur in its most stable form (S_8) is 8, as it exists as an 8-atom molecule.
22. Elements are classified into ..... types.
Answer:4
Solution:Elements are classified into 4 types:Metals,Non-metals,Metalloids,Noble gases
23. Among Helium, Hydrogen,Neon,Nitrogen and Argon. How many are inert gases?.....
Answer:3
Solution: The inert (noble) gases in the list are:Helium (He),Neon (Ne),Argon (Ar)
Hydrogen (H) and Nitrogen (N_2) are not inert gases.

KEY

			TEACHING TASK						
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
B	D	C	D	C	A	C	C	B	D
11	12	13	14	15					
B	D	B	C	A					
			JEE ADVANCED LEVEL QUESTIONS						
16	17	18	19	20	21	22	23	24	
A,BC	A,B,C,D	A,B,C,D	B	A	A	8	4	A-iv,B-iii,v,C-i,D-ii	
25			LEARNERS TASK						
A-iv,v,B-iii,C-ii,D-i		CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)							
1	2	3	4	5	6	7	8	9	10
C	B	C	D	D	C	C	C	B	A
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
D	A	D	A	C	C	D	C	D	A
11	12	13	14	15	16	17	18	19	20
D	A	B	B	A	A,B,D	A,B	D	B	C
21	22	23							
8	4	3							