Class: 9th

Subject: Chemistry

Chapter 9: Group Properties and Elements

Exercise MCQs:

(i) Which halogen will have the least reactivity with alkaline earth metals?

(a) Chlorine

(**b**) Iodine ✅

(c) Bromine

(d) Fluorine

(ii) Which compound do you expect to be coloured?

(a) KCl

(b) $BaCl_2$

(c) $AlCl_3$

(d) $NiCl_2$ ✅

(iii) In which element there exists the strongest forces of attraction between atoms?

(a) Mg ✅

(b) Ca

(c) Sr

(d) Ba

(iv) Elements of which group are all coloured?

(a) Second group

(b) Sixth group

(c) Fourth group

(d) Fifth group ✅

(v) Which halogen acid is unstable at room temperature?

(a) HBr

(b) HI ✅

(c) HCl

(d) HF

(vi) Which oxide is the most basic oxide?

(a) Na_2O ✅

(b) Li_2O

(c) MgO

(d) CO

(vii) Which group elements are the most reactive elements?

(a) Transition metal group

(b) First group ✅

(c) Second group

(d) Third group

(viii) The following solutions of a halogen and a sodium halide are mixed together. Which solution will turn dark because of a reaction?

(a) Br_2 and NaCl

(b) Br_2 and NaF

(c) Cl_2 and NaF

(d) Cl_2 and NaI ✅

(ix) X is a monoatomic gas, which statement about this is correct?

(a) X burns in air

(b) X is coloured

(c) X is unreactive ✅

(d) X will displace iodine from it

(x) Which property is correct for group 1 elements?

(a) Low catalytic activity

(b) High density

(c) Low electrical conductivity

(d) High melting point ❌ (Correct: None, all incorrect — Group 1 elements have low melting point, low density, high conductivity, high reactivity, and low catalytic activity — Option None would be correct if listed)

درست آپشن کیا ہونا چاہیے؟

Group 1 elements (Alkali metals) have:

Low density (except Li)

High electrical conductivity

Low melting points (compared to other metals)

Not used as catalysts typically

اس لیے بہتر آپشن یہ ہوتا:

(e) Low melting point ✅ (اگر موجود ہوتا)

Important MCQs:

1. Group 1 elements are called:

(a) Halogens

(b) Noble gases

(c) Alkali metals ✅

(d) Transition elements

2. Which of the following Group 1 metals reacts most violently with water?

(a) Lithium

(b) Sodium

(c) Potassium ✅

(d) Rubidium

3. The electronic configuration of Group 1 elements ends with:

(a) ns^2

(b) ns^1 ✅

(c) np^6

(d) np^1

4. Which of the following is not an alkali metal?

(a) Hydrogen ✅

(b) Sodium

(c) Potassium

(d) Lithium

5. The reactivity of alkali metals:

(a) Increases down the group ✅

(b) Decreases down the group

(c) Remains constant

(d) First increases then decreases

6. Group 1 metals form:

(a) Acids

(b) Covalent compounds

(c) Soluble hydroxides ✅

(d) Neutral oxides

7. Potassium reacts with chlorine to form:

(a) KOH

(b) KCl ✅

(c) K_2O

(d) $KClO_3$

8. As we go down Group 1, the melting point of metals:

(a) Increases

(b) Decreases ✅

(c) Remains same

(d) Becomes zero

9. Halogens have how many electrons in their outermost shell?

(a) 6

(b) 7 ✅

(c) 8

(d) 5

10. Reactivity of halogens:

(a) Increases down the group

(b) Decreases down the group ✅

(c) Remains constant

(d) Becomes zero

11. Which halogen is a solid at room temperature?

(a) Fluorine

(b) Chlorine

(c) Bromine

(d) Iodine ✅

12. Which halogen is most reactive?

(a) Fluorine ✅

(b) Bromine

(c) Chlorine

(d) Iodine

13. Halogens are also known as:

(a) Alkali metals

(b) Inert gases

(c) Salt-forming elements ✅

(d) Reducing agents

14. Fluorine is:

(a) Green gas

(b) Red-brown liquid

(c) Pale yellow gas ✅

(d) Grey solid

15. Halogens displace:

(a) More reactive halogens

(b) Less reactive halogens ✅

(c) Group 1 metals

(d) Noble gases

16. Transition elements belong to which block of the periodic table?

(a) s-block

(b) p-block

(c) d-block ✅

(d) f-block

17. What is the general nature of transition elements?

(a) Non-metals

(b) Soft metals

(c) Hard metals ✅

(d) Metalloids

18. Transition elements typically show:

(a) Constant oxidation states

(b) Variable oxidation states ✅

(c) No oxidation state

(d) Negative oxidation states only

19. The compounds of transition elements are often:

(a) Colorless

(b) White

(c) Colored ✅

(d) Transparent

20. Which transition metal is used as a catalyst in the Haber process?

(a) Nickel

(b) Iron ✅

(c) Platinum

(d) Copper

21. Which gas is produced in the Haber process?

(a) Oxygen

(b) Sulphur dioxide

(c) Ammonia ✅

(d) Methane

22. Which compound is preferred as a catalyst in the contact process?

(a) Platinum

(b) Iron

(c) Vanadium pentoxide (V_2O_5) ✅

(d) Rhodium

23. Catalytic converters in vehicles commonly use:

(a) Zinc

(b) Lead

(c) Platinum, palladium, and rhodium ✅

(d) Iron

24. Which metal is used to convert oils into margarine?

(a) Copper

(b) Nickel ✅

(c) Zinc

(d) Aluminium

25. What does "high tensile strength" in transition metals mean?

(a) Ability to absorb heat

(b) Resistance to corrosion

(c) Ability to hold heavy weights without breaking ✅

(d) Ability to conduct electricity

26. Noble gases are:

(a) Diatomic

(b) Monoatomic ✅

(c) Triatomic

(d) Reactive gases

27. The outermost shell of noble gases is:

(a) Incomplete

(b) Empty

(c) Complete ✅

(d) Half-filled

28. Which noble gas has only two electrons in its outermost shell?

(a) Neon

(b) Argon

(c) Helium ✅

(d) Xenon

29. Which of the following is a physical property of metals?

(a) Brittle

(b) Dull

(c) Malleable ✅

(d) Non-conductive

30. Why can graphite conduct electricity?

(a) It is metallic

(b) It has free protons

(c) It has loosely held electrons between layers ✅

(d) It has mobile neutrons

Exercise Short Questions:

i. Why does it become easier to cut an alkali metal when we move from top to bottom in Group I?

As we move down Group I, alkali metals become softer because their atomic size increases, and the metallic bonding becomes weaker. Therefore, it

becomes easier to cut them with a knife.

ii. Predict the reactivity of potassium towards halogens.

Potassium is highly reactive towards halogens due to its large atomic size and low ionization energy. It readily loses one electron to form K^+ and forms stable ionic compounds like KCl, KBr, etc.

iii. In the following reaction, chlorine acts as an oxidising agent. Which is the reducing agent?

Reaction:

$Cl_2(aq) + 2NaBr(aq) \Rightarrow 2NaCl(aq) + Br_2(g)$

Answer:

The reducing agent is NaBr, because bromide ions (Br^-) lose electrons (get oxidized) to form bromine (Br_2).

iv. Why does iodine exist in the solid state at room temperature?

Iodine exists in the solid state at room temperature because it has strong van der Waals forces between its molecules, which require more energy

to break, resulting in a higher melting and boiling point.

v. How does Ni catalyse the reaction involving hydrogenation of oil?

Nickel (**Ni**) acts as a catalyst by adsorbing hydrogen gas and oil molecules onto its surface. This weakens their bonds, making it easier for hydrogen atoms to add across the double bonds in the unsaturated oil, converting it into saturated fat (margarine).

Important Short Questions:

1. Why do alkali metals become more reactive as we move down the group?

Answer:

As we move down Group 1, the atomic size increases, making it easier to remove the outermost electron. This leads to increased reactivity in the lower members of the group.

2. Write the chemical equation for the reaction of potassium with water.

Answer:

Potassium reacts violently with water to form potassium hydroxide and hydrogen gas.

3. How do atomic size and density of Group 1 elements change down the group?

Answer:

Both atomic size and volume increase down the group due to more protons and electrons. However, mass increases more than volume, so the density also gradually increases down the group.

4. Why does the reactivity of halogens decrease down Group 17?

Answer:

As we move down Group 17, the atomic size increases, and the tendency to accept an electron decreases. This makes halogens less reactive down the group.

5. What are halogens and why are they called so?

Answer:

Halogens are Group 17 elements that react with metals to form salts. The term "halogen" means "salt-former".

6. Why does iodine exist as a solid while fluorine and chlorine are gases at room temperature?

Answer:

Iodine atoms are larger and form stronger intermolecular forces, which make iodine solid at room temperature, while smaller halogens like fluorine and chlorine are gases.

7. Why are transition elements called d-block elements?

Answer:

Transition elements are called d-block elements because their d-orbitals are being filled with electrons in their atomic structure.

8. Mention two important properties of transition metals.

Answer:

Transition metals show variable oxidation states and form coloured compounds. They also act as catalysts in many chemical reactions.

9. How does a catalytic converter work and which metals are used in it?

Answer:

A catalytic converter changes harmful gases from vehicle exhaust into less harmful gases. It uses platinum, palladium, and rhodium as catalysts.

10. Why are noble gases chemically unreactive?

Answer:

Noble gases are chemically unreactive because they have complete outermost electron shells, making them stable.

11.Which noble gas does not have 8 electrons in its outermost shell and what is its configuration?

Answer:

Helium does not have 8 electrons; its outermost

shell has 2 electrons with the configuration $1s^2$.

12. What are the physical states and nature of noble gases at room temperature?

Answer:

Noble gases are monoatomic and exist as colorless gases with very low boiling points at room temperature.

13. Define malleability and name a metal which shows this property.

Answer:

Malleability is the ability of a metal to be hammered into thin sheets. Example: Aluminium.

14.Why are metals good conductors of electricity?

Answer:

Metals are good conductors because they have free electrons that move easily through the metal.

15. Why can't non-metals be drawn into wires?

Answer:

Non-metals are brittle and break easily when

stretched, so they cannot be drawn into wires.

16. Which non-metal is an exception and can conduct electricity? Why?

Answer:

Graphite is an exception among non-metals as it conducts electricity due to the mobility of free electrons between its layers.

Important Long Questions:

Q1: Describe the physical and chemical properties of Group 1 elements.

Answer:

Group 1 elements, also known as alkali metals, include lithium, sodium, potassium, rubidium, and cesium. These elements have a single electron in their outermost shell (ns^1 configuration), making them highly reactive. Hydrogen is also placed in this group but is a non-metal and behaves differently.

Physical properties:

- They are soft metals and softness increases down the group.
- Melting points decrease from lithium to cesium (Li: 180°C, Cs: 28°C).
- Their densities generally increase down the group, although potassium is less dense than sodium.
- Li, Na, and K are lighter than water and float on it, while Rb and Cs sink.

Chemical properties:

- Reactivity increases down the group due to increased atomic size and weaker hold on the outer electron.
- All metals react with water to produce hydroxides and hydrogen gas:
- e.g.

$$2Na + 2H_2O \rightarrow 2NaOH + H_2\uparrow$$

Reaction becomes more vigorous from lithium to cesium.

They also react with chlorine to form metal chlorides (salts):

e.g.,

$$2K + Cl_2 \rightarrow 2KCl$$

The reaction is more vigorous as we go down the group.

Q2: How does the reactivity of alkali metals change down the group and why? Support your answer with examples.

Answer:

The reactivity of alkali metals increases as we move down the group from lithium to cesium. This is because the atomic size increases, and the outermost electron is farther from the nucleus. The attraction between the nucleus and the outer electron becomes weaker, making it easier to lose the electron and form a positive ion.

Examples:

- Lithium reacts slowly with cold water.
- Sodium reacts vigorously with water producing flame.
- Potassium reacts violently and may ignite.
- Cesium reacts explosively with water.

Reactions with water:

$2Li + 2H_2O \Rightarrow 2LiOH + H_2$

$2Na + 2H_2O \Rightarrow 2NaOH + H_2$

$2K + 2H_2O \Rightarrow 2KOH + H_2$

This trend is also observed in reactions with chlorine and oxygen. Thus, reactivity increases down the group due to the decreasing ionization energy.

Q3: Discuss how the physical properties like melting point and density of Group 1 elements vary down the group.

Answer:

As we go down Group 1 in the periodic table:

Melting point:

- The **melting point** decreases down the group.
- **Lithium** melts at 180°C
- **Sodium** at 98°C
- **Potassium** at 64°C
- **Rubidium** at 39°C
- **Cesium** at 28°C
- This decrease is due to the weakening of metallic bonds caused by the increase in atomic size.

Density:

The density generally increases down the group because the increase in atomic mass is more than the increase in atomic volume.

- Lithium: 0.53 g/cm³
- Sodium: 0.97 g/cm³
- Potassium: 0.86 g/cm³ (exception)
- Rubidium: 1.53 g/cm³

- Cesium: 1.87 g/cm³

Exception: Potassium is less dense than sodium due to irregular atomic arrangement.

Q4: Describe the physical and chemical properties of Group 17 elements.

Answer:

Group 17 elements, called halogens, have seven electrons in their outermost shell (ns^2 np^5 configuration). They are highly electronegative non-metals and tend to accept one electron to form halide ions (X^-). Halogens exist as diatomic molecules (F_2, Cl_2, Br_2, I_2).

Physical properties:

- Atomic size increases down the group.
- Melting and boiling points increase down the group due to stronger intermolecular forces as atoms get larger. For example, fluorine and chlorine are gases at room temperature, bromine is a fuming liquid, and iodine is a solid.

- Fluorine gas is pale yellow, chlorine is yellowish-green, bromine is reddish-brown, and iodine forms shiny grey crystals.

Chemical properties:

- **Reactivity** decreases down the group because the atomic size increases and the ability to attract electrons reduces.
- **Halogens** react with alkali and alkaline earth metals to form salts (metal halides), which are mostly ionic.
- They are strong **oxidizing** agents, with chlorine being more powerful than bromine and iodine.
- **Halogens displace** less reactive halogens from their salts in aqueous solutions (e.g., chlorine displaces bromine).
- They **react** with **hydrogen** to form hydrogen halides (HX), which are strong acids in water.

Q5: What are noble gases? Describe their main physical and chemical properties. Why are noble gases considered chemically inert?

What are noble gases?

Noble gases are the elements found in Group 18 of the modern periodic table. These include Helium (He), Neon (Ne), Argon (Ar), Krypton (Kr), Xenon (Xe), and Radon (Ra).

Main Physical Properties of Noble Gases:

1. **Monoatomic gases**: Noble gases exist as single atoms, not molecules.

2. **Low boiling and melting points**: They have very low boiling and melting points because of weak forces between their atoms.

3. **Colorless, odorless, and tasteless:** These gases are colorless and have no smell or taste.

4. **Non-flammable:** They do not catch fire.

5. **Low density:** Compared to other gases, they generally have low density.

Main Chemical Properties of Noble Gases:

1. Complete outer electron shells: Except helium (which has 2 electrons), all noble gases have eight electrons in their outermost shell (octet

configuration), making them very stable.

2. **Very low reactivity:** Due to their full outer shells, noble gases rarely form compounds.

3. **Inertness:** They do not easily gain, lose, or share electrons with other elements.

4. **Occasional compound formation**: Some heavier noble gases like xenon can form compounds under special conditions, but these are rare.

Why are noble gases considered chemically inert?

- Noble gases have completely filled outer electron shells, making them very stable.
- Because their valence shells are full, they have no tendency to gain, lose, or share electrons.
- This full shell configuration means they do not easily react with other elements, which is why they are called chemically inert or noble.

Q6: Explain the physical properties of metals. Discuss how these properties make metals useful in daily life.

Physical properties of metals:

Malleability: Metals can be hammered or rolled into thin sheets without breaking. This property allows metals to be shaped into various forms, like sheets of aluminum used in packaging.

Ductility: Metals can be drawn into thin wires. Copper wires are commonly used in electrical wiring because of this property.

Luster: Metals have a shiny appearance when polished. This shiny surface makes metals like gold and silver useful in jewelry.

Conductivity: Metals are excellent conductors of heat and electricity because of the free movement of electrons in metallic bonds. This makes copper and aluminum ideal for electrical cables and cooking utensils.

Hardness and strength: Metals are generally hard

and have high tensile strength, meaning they can hold heavy loads without breaking. This property makes metals like steel useful in construction and machinery.

High melting and boiling points: Due to strong metallic bonds, metals generally have high melting and boiling points, allowing them to be used in high-temperature applications like engines and turbines.

Density: Metals usually have high density (mass per unit volume), which means they are heavy and sturdy.

Sound: Metals produce a ringing sound when struck, which is why they are used in musical instruments like bells.

Usefulness in daily life:

- Metals' malleability and ductility allow them to be manufactured into wires, sheets, and foils.
- Their conductivity makes them essential for electrical appliances, cables, and cookware.

- Hardness and strength help metals in building bridges, vehicles, and machinery.
- Their luster and corrosion resistance make them valuable in jewelry and decorative items.

Q7: Describe the physical properties of non-metals. How do these properties differ from those of metals?

Physical properties of non-metals:

Brittle: Non-metals are brittle and break or shatter when hammered or stretched. For example, sulfur and phosphorus are powders and cannot be made into sheets.

Non-ductile and non-malleable: Non-metals cannot be drawn into wires or hammered into sheets because they break easily.

Poor conductors: Non-metals do not conduct heat and electricity due to the absence of free electrons. An exception is graphite, which conducts electricity because of its special structure.

No luster: Non-metals are usually dull and do not

have a shiny appearance. Most non-metals are found as powders or gases.

Low density: Non-metals generally have low density because their atoms are not tightly packed.

Low melting and boiling points: Non-metals usually melt and boil at low temperatures compared to metals. **For example**, sulfur melts at 115°C. Exceptions like diamond and graphite have high melting points.

Differences from metals:

- **Metals** are **malleable** and ductile, but non-metals are brittle.
- **Metals** conduct heat and electricity well, **non-metals** generally do not.
- Metals are lustrous and shiny, non-metals are dull.
- **Metals** have high **density**; non-metals have low density.
- Metals have high melting/boiling points;

non-metals mostly have low melting/boiling points.

Q8: Compare and contrast the physical properties of metals and non-metals with examples.

Physical Properties of Metals:

- Metals are malleable, meaning they can be hammered into thin sheets (e.g., aluminum foil).
- Metals are ductile, meaning they can be drawn into wires (e.g., copper wire).
- Metals are lustrous (shiny), like gold and silver used in jewelry.
- Metals are good conductors of heat and electricity (e.g., copper wiring).
- Metals generally have high melting and boiling points (e.g., iron has a high melting point).
- Metals have high density (e.g., lead and gold).
- Metals produce a ringing sound when struck.

Physical Properties of Non-Metals:

- Non-metals can exist as solids, liquids, or

gases at room temperature (e.g., oxygen gas, bromine liquid).

- Non-metals are brittle, meaning they break when struck or pressed (e.g., sulfur powder).
- Non-metals are not ductile and cannot be drawn into wires.
- Non-metals are usually dull and not shiny.
- Non-metals are poor conductors of heat and electricity or act as insulators (except graphite).
- Non-metals usually have low melting and boiling points (e.g., sulfur melts at 115°C).
- Non-metals have low density compared to metals.
- Non-metals cannot be polished as they are often powders or gases.

Comparison:

- Metals are malleable and ductile, while non-metals are brittle.
- Metals are lustrous and good conductors,

whereas non-metals are dull and poor conductors.

- Metals have high density and melting points, while non-metals have lower ones.
- Metals produce sound when hit, but non-metals break instead.

Examples:

- Metals: Copper, iron, gold, silver, aluminum
- Non-Metals: Oxygen, sulfur, phosphorus, chlorine, carbon

3. Constructed Response Questions:

i. Which noble gas should have the lowest boiling point and why?

- Helium (He) has the lowest boiling point among noble gases.
- Reason: Helium atoms are the smallest with the least number of electrons.
- Because of very weak intermolecular forces (Van der Waals forces), less energy is required

to convert helium from liquid to gas.

- Hence, helium boils at the lowest temperature.

ii. Compare the reactions of alkali metals with chlorine.

- Alkali metals react with chlorine to form metal chlorides (salts).
- Reaction becomes more vigorous down the group (from lithium to potassium).
- Lithium reacts slowly with chlorine forming lithium chloride.
- Sodium reacts more vigorously with chlorine forming sodium chloride.
- Potassium reacts violently with chlorine producing potassium chloride.
- The increasing reactivity is due to increasing atomic size, making it easier to lose the outer electron.

iii. Why are almost all the metals solids while non-metals generally exist as gases and solids?

- Metals have strong metallic bonds due to free-moving delocalized electrons, making their structure solid and dense.
- This strong bonding requires high energy to break, so metals are solid at room temperature (except mercury).
- Non-metals have weaker intermolecular forces and no free electrons.
- This weak bonding leads to many non-metals existing as gases (oxygen, nitrogen) or solids with lower densities (sulfur, phosphorus).
- Non-metals lack metallic bonding and thus have lower melting and boiling points.

iv. Name any three elements in the periodic table which exist as liquids.

- Mercury (Hg) – a metal that is liquid at room temperature.
- Bromine (Br_2) – a non-metal liquid halogen.
- Gallium (Ga) – a metal that melts just above room temperature, often considered liquid-like.

v. Why are transition elements different from normal elements?

- Transition elements have partially filled d-orbitals.
- They show variable oxidation states.
- Their compounds are often colored.
- They have high melting and boiling points.
- They are generally harder and denser than normal metals.
- They exhibit catalytic properties.
- Normal elements usually have fixed oxidation states and less varied properties.

vi. Compare the reactivity of chlorine and bromine as oxidising agents.

- Chlorine is more reactive than bromine as an oxidizing agent.
- This is because chlorine atoms are smaller, so they attract electrons more strongly.
- Chlorine has higher electronegativity and

oxidizing power.

- Chlorine can displace bromine from its compounds, but bromine cannot displace chlorine.
- **Example**: $Cl_2 + 2NaBr \Rightarrow 2NaCl + Br_2$ (reaction occurs), but $Br_2 + 2NaCl$ (no reaction).

vii. Which element is the most reactive and which is the least reactive among halogens? Give two reasons to explain your answer.

- Most reactive: Fluorine (F_2).
- Least reactive: Iodine (I_2).

Reasons:

1. Atomic size increases down the group, making it harder for larger atoms to attract electrons.

2. Fluorine has the smallest atomic radius and strongest attraction for electrons, making it most reactive.

3. Iodine has the largest atomic size with weaker attraction for electrons, making it less reactive.

4. Reactivity decreases down the group due to decreased oxidizing power.

4. Descriptive Questions:

i. Explain the role of catalytic converter in an automobile.

- Catalytic converter helps reduce harmful emissions from automobile exhaust.
- It converts toxic gases like carbon monoxide (CO), nitrogen oxides (NOx), and unburnt hydrocarbons into less harmful gases.
- It uses catalysts such as platinum, palladium, and rhodium.
- These catalysts speed up chemical reactions without being consumed.
- The harmful gases are converted into carbon dioxide (CO_2), nitrogen (N_2), and water vapor (H_2O).
- This helps reduce air pollution and protects the

environment.

ii. Why do the chemical reactivities of alkali metals increase down the group whereas they decrease down the group in case of halogens?

Alkali metals:

- Reactivity increases down the group because atomic size increases.
- Outer electron is farther from the nucleus and shielded by inner electrons.
- It is easier to lose this electron, increasing reactivity.

Halogens:

- Reactivity decreases down the group because atomic size increases.
- Larger atoms attract electrons less strongly.
- Their ability to gain an electron decreases, reducing reactivity.

iii. Why are metals generally tough and strong whereas non-metals are neither tough nor strong?

- Metals have strong metallic bonds due to delocalized electrons.
- This bonding allows metals to be malleable, ductile, tough, and strong.
- Non-metals have weak intermolecular forces and covalent bonds.
- They are brittle, break easily, and lack the strength and toughness of metals.

iv. Both alkali metals and halogens are very reactive elements with roles opposite to each other. Explain.

- Alkali metals have one electron in their outer shell and tend to lose it easily.
- They act as reducing agents by donating electrons.
- Halogens have seven electrons and tend to gain one electron.
- They act as oxidizing agents by accepting electrons.
- Thus, alkali metals and halogens show

opposite behavior in chemical reactions.

- Their reactions often produce ionic compounds (salts).

v. Why hydrogen bromide is thermally unstable as compared to hydrogen chloride?

- Hydrogen bromide (HBr) has a longer bond length than hydrogen chloride (HCl).
- Longer bond length means weaker bond between hydrogen and bromine.
- Weaker bond breaks more easily under heat, making HBr less thermally stable.
- HCl has a shorter, stronger bond, so it is more stable at higher temperatures.

vi. Compare the properties of metals and non-metals.

Metals:

- Lustrous and shiny.
- Good conductors of heat and electricity.
- Malleable and ductile.

- Generally have high melting and boiling points.
- High density and hardness.

Non-metals:

- Dull appearance.
- Poor conductors (except graphite).
- Brittle and not malleable or ductile.
- Low melting and boiling points (except diamond and graphite).
- Low density.

vii. V2O5 catalyst is preferred over platinum in the oxidation of sulphur dioxide. Give reasons.

- V_2O_5 (vanadium pentoxide) is cheaper than platinum.
- It is highly effective and selective in catalyzing the conversion of SO_2 to SO_3.
- V_2O_5 is more stable at high temperatures used in the process.
- It has a longer life and is easier to handle.
- Platinum is expensive and less stable in this

specific reaction environment.

Note:

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further exploration of the subject. The content has been carefully selected to support effective learning and inspire students to engage with the topic more deeply.

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and understanding.

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