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Set 1: Metals and Everyday Applications (Page 40)

1. Provide an example for each:

- *(i) Liquid metal at room temperature:* Mercury exists as a liquid metal when kept at room temperature.
- *(ii) Metal easy to cut with a knife:* Metals like sodium and potassium are soft enough to be sliced using a knife.
- *(iii) Metal with highest thermal conductivity:* Silver is recognized as the best conductor of heat among metals.
- *(iv) Metal with low thermal conductivity:* Both mercury and lead do not conduct heat effectively.

2. Define the terms: malleable and ductile

- If a metal is malleable, it can be hammered into thin sheets without breaking.
- Metals are ductile when they can be drawn into thin wires, showing their flexibility.

Set 2: Reactivity and Chemical Equations (Page 46)

1. Reason for storing sodium in kerosene oil

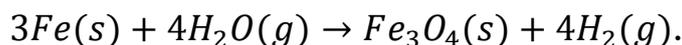
Sodium's high reactivity with oxygen and moisture in air may cause fire, so it's kept submerged in kerosene to prevent hazardous reactions.

2. Chemical equations for reactions involving metals

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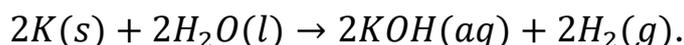
- (i) *Reaction of iron with steam:*



- (ii) *Reaction of calcium with water:*



- (iii) *Reaction of potassium with water:*



3. Analysis of metal reactivity based on a table

- The metal labeled B is the most reactive, as it can displace iron from its salt solution.
- When B is added to copper sulphate, the blue color fades and copper deposits on B.
- The descending order of reactivity: $B > A > C > D$.

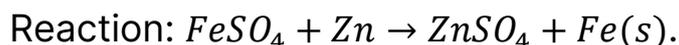
4. Gas produced when dilute hydrochloric acid is added to reactive metal

- Hydrogen gas is released in this reaction.



5. Zinc added to iron (II) sulphate solution

- Zinc, being more reactive, displaces iron. The pale green color of ferrous sulphate disappears.



Set 3: Chemical Bonding and Ionic Compounds (Page 49)

1. Electron-dot structures and compound formation

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- Sodium and oxygen are depicted using electron-dot diagrams.
- Formation of sodium oxide and magnesium oxide involves electron transfer, resulting in ionic compounds.
- Sodium oxide contains $2Na^+$ and O^{2-} ; magnesium oxide contains Mg^{2+} and O^{2-} ions.

2. Why ionic compounds have high melting points

- Due to strong electrostatic attraction between oppositely charged ions, a significant amount of heat is needed to separate them, resulting in high melting points.

Set 4: Minerals, Ores and Extraction Processes (Page 53)

1. Define mineral, ore, and gangue

- A mineral is a naturally occurring compound or element found in the earth's crust.
- Ores are minerals from which metals can be economically extracted.
- Gangue refers to impurities or unwanted materials mixed with ore.

2. Metals found in free state in nature

- Gold and platinum are commonly found in their free form.

3. Process to extract metal from its oxide

- Metals are obtained from their oxides via reduction, typically by heating with carbon.

Set 5: Reactivity Series and Alloys (Page 55)

1. Predicting reactions among metallic oxides and metals

- Magnesium, being most reactive, displaces others; copper is least reactive, and zinc is intermediate.

2. Metals resistant to corrosion

- Gold and platinum are notable for their resistance to corrosion.

3. Definition of alloys

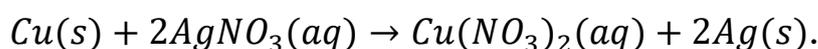
- An alloy is a uniform mixture of two or more metals, or a metal and a non-metal.

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Exercise Questions: Metal Reactivity and Uses (Page 56-57)

1. Identifying displacement reactions from given pairs

- Only copper metal with silver nitrate gives a displacement reaction:



2. Best method to prevent an iron pan from rusting

- Coating with zinc (galvanization) is most suitable for frying pans.

3. Element forming a high-melting, water-soluble oxide with oxygen

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- Calcium fits the description as it forms calcium oxide, soluble in water.

4. Reason for tin coating in food cans over zinc

- Tin is less reactive than zinc; hence, it is chosen for coating food cans to prevent contamination.

5. How to distinguish between metals and non-metals using simple apparatus

- Metals can be hammered into sheets and conduct electricity, lighting a bulb; non-metals break easily and do not conduct electricity.

6. Amphoteric oxides definition and examples

- Amphoteric oxides react with both acids and bases, e.g., lead oxide (PbO) and aluminum oxide (Al_2O_3).

7. Metals that displace/not displace hydrogen from dilute acids

- Zinc and magnesium can; gold and silver cannot.

8. Components for electrolytic refining of metal M

- Anode: impure metal M; cathode: pure metal M; electrolyte: suitable salt solution of metal M.

9. Action of gas produced by heating sulphur powder

- Sulphur dioxide produced turns moist blue litmus red; does not affect dry litmus.



10. Two ways to prevent rusting of iron

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- Coating with paint or oil/grease shields iron from moisture and oxygen.

11. Nature of oxides formed from non-metals

- Non-metals form acidic or neutral oxides, such as N_2O_5 (acidic) and CO (neutral).

12. Given reasons for properties/uses of metals

- (a) Jewelry metals are unreactive and lustrous.
- (b) Sodium, potassium, and lithium are stored under oil to prevent reaction with moisture or water.
- (c) Aluminum's nonreactive oxide coating makes it suitable for utensils.
- (d) Oxides are easier to reduce, so ores are converted to oxides during metal extraction.

13. Why lemon or tamarind cleans tarnished copper vessels

- The acids in these substances dissolve copper oxide, restoring the vessel's shine.

14. Chemical property-based differences: metals vs non-metals

Metals	Non-metals
Form basic oxides	Form acidic/neutral oxides
Lose electrons, become positive ions	Gain electrons, become negative ions

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Lustrous	Non-lustrous (except graphite)
Reducing agents	Good oxidizing agents
Good conductors	Poor conductors (except graphite)
Usually solids (except mercury)	Can be solid, liquid, or gas

15. Detective question: Solution used by the goldsmith

- The solution was likely aqua regia, a mixture of concentrated hydrochloric and nitric acid (3:1), capable of dissolving gold.

16. Why copper is preferred for hot water tanks, not steel

- Copper is resistant to reaction with water and steam, preventing corrosion, unlike steel.

All answers above include rephrased content, simplified language, and headings for clarity. Each section addresses the relevant class 10 science curriculum topics as per the in-text and exercise questions.