

- 1. Environmental advantage of adding cryolite to aluminium oxide to lower the operating temperature**
Less carbon dioxide emission
- 2. Role of cryolite in the extraction of aluminium by electrolysis // why aluminium oxide melting point dissolved in molten cryolite**
 - Using cryolite provides lower operating temperature (which also reduces cost)
 - Improves conductivity of the electrolyte / makes the electrolyte a better conductor
- 3. Why anode used for aluminium extraction requires frequent replacement**
 - anodes or carbon / graphite react with oxygen / O₂
 - to form carbon dioxide
- 4. Differences in physical properties between transition elements and Group I elements.**
 - They have higher density
 - They have higher m.p and b.p
 - Transition elements are harder and stronger
- 5. Physical properties of transition elements that are similar to Group I elements.**
 - Good conductors of heat/electricity
 - malleability/ ductility
 - lustrous/ shiny
- 6. Chemical properties of transition elements.**
 - catalyst
 - more than one or different or variable oxidation state / oxidation number / valency
 - coloured compounds / coloured ions
- 7. How sacrificial protection prevents rusting**
 - A metal more reactive/ higher in the reactivity series than iron (eg. Magnesium/ zinc)
 - The zinc reacts/corrodes/oxidises in preference to iron
- 8. Methods of rust prevention**
 - Sacrificial protection
 - Barrier methods: grease, paint

NOTE:

- Brass: alloy of copper and zinc
- Bronze: alloy of copper and tin

9. Explain in terms of particles, why brass (an alloy of zinc) is harder than pure zinc.

- Exists in layers
- Consist of atoms of different sizes (atoms of zinc and copper)
- Makes it more difficult for layers of atoms to slide over each slip/shift other

10. Properties of aluminium that makes it suitable for overhead electricity cables

- Low density
- Good conductor of electricity
- Ductile / malleable
- Protective oxide layer

NOTE: Group 1 metals are soft metals stored in oil.

11. Suggest why group 1 metals are stored under oil

- To prevent contact with air/oxygen and/or water

12. Describe experiments to show that aluminium oxide is amphoteric; it is insoluble in water

- Add a named acid, e.g. hydrochloric acid / HCl AND
Add a named alkali, e.g. sodium hydroxide / NaOH
- The aluminium oxide / Al₂O₃ will react with / neutralise the acid and the alkali
- The aluminium oxide / Al₂O₃ will dissolve into the acid / alkali OR
The aluminium oxide / Al₂O₃ will form a solution with the acid / alkali

13.

Some properties of aluminium are listed.

- 1 It conducts heat.
- 2 It has a low density.
- 3 It is strong.
- 4 It is resistant to corrosion.

Which of these properties make aluminium suitable for making food containers for chilled food products?

- A** 1, 2 and 4 **B** 1, 3 and 4 **C** 1 only **D** 4 only

Answer: D

14.

The properties of the element titanium, Ti, can be predicted from its position in the Periodic Table.

Which row identifies the properties of titanium?

	can be used as a catalyst	conducts electricity when solid	has low density	forms coloured compounds
A	✓	✓	✓	x
B	✓	✓	x	✓
C	✓	x	✓	✓
D	x	✓	✓	✓

Answer: B

15. Element that is added to molten iron to remove impurities in the steelmaking process

Oxygen

16. Main impurity in iron ore

Silicon (IV) oxide

NOTE: do not confuse physical properties of metals with physical properties of ionic compounds!

17. Aluminium is more reactive than copper. When aluminium is added to aqueous copper (II) sulphate, no immediate reaction is seen. Explain why

Unreactive coating of aluminium oxide

18. Why coke is used in the blast furnace

- Acts as a fuel // source of energy // releases heat (when it reacts with oxygen or reacts in air) // increases temperature/ heats (the furnace)
- Reducing agent // reduces iron(III) oxide // converts iron oxide to iron
- Reacts with oxygen to form carbon monoxide // reacts with carbon dioxide to form carbon monoxide

19. Waste gases that leave the blast furnace

- Carbon dioxide
- nitrogen

20. State the meaning of the Roman numeral (II) in the name copper (II) oxide

The oxidation number of copper is +2

21. In an experiment, a sample of aluminium appeared less reactive than expected.

Explain why

Protective oxide layer

NOTE: copper is a red-pink solid // pink-brown solid

22. Describe what happens to the particles in iron when it is hammered into a shape.

Particles slide over each other

23. Suggest why copper, rather than other transition elements, is used for wires which conduct electricity.

Unreactive

24. Explain the apparent unreactivity of aluminium

- Aluminium oxide layer
- Oxide layer is unreactive

25. Type of reaction where calcium oxide reacts with silicon dioxide in blast furnace

State neutralisation AND acid-base reaction

NOTE:

- Lead: shiny grey solid
- Copper: pinkish brown solid