

Popular Exam Questions & Answers

IGCSE Chemistry 0620

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Chapter 1: The Particular Nature of Matter

1) Define a Compound [1]

- When two or more elements are combined together

2) Define a Molecule [1]

- Two or more atoms are bonded together

3) Define Element [2]

- Substance that cannot be broken down into anything simpler
- Substance that contains only one type of atom

4) Explain why nitrogen gas diffuses faster than chlorine gas [2]

- Nitrogen has a smaller relative molecular mass/Mr
- Therefore Nitrogen Molecules move faster than chlorine molecules

5) Explain why a gas diffuses faster at a higher temperature [2]

- At higher temperature, molecules move faster due to having more kinetic energy

6) What term describes the random movement of dust particles [1]

- Brownian motion

7) Identify the particles in the air which cause the random movement of dust particles [2]

- Nitrogen molecules or Oxygen molecules [1 Mark for the element and 1 Mark for mentioning molecule]

8) Explain why the dust particles move in this way [2]

- Dust particles collide with nitrogen or oxygen molecules
- Therefore the dust particles move randomly resulting in brownian motion

Chapter 2: Experimental Techniques

1) Define a Mixture

- Two or more substances are not chemically combined

2) What is the method of separation that can be used to obtain water from salt solution? [1]

- Simple Distillation

3) Which method would be most suitable to obtain crystals from an aqueous solution of Copper(II) Sulfate [1]

- Crystallization

4) How could the purity of the ethanol collected be checked? [2]

- Determining the melting point and boiling point

5) How to separate and purify amino acids/glucose/color dye [1]

- Chromatography

6) What are the solvent that can be used during chromatography [2]

- Water
- Organic solvent (ethanol)

7) Why does the sample stay on the baseline/not move during chromatography? And how to deal with this? [2]

- It is insoluble in the solvent
- Therefore use another solvent

8) How to separate nitrogen from a mixture of nitrogen and oxygen? [3]

- Turn the mixture into a liquid
- Use Fractional Distillation
- Based on different boiling points

Chapter 3: Atoms, Element & Compounds

1) Define an Ion [1]

- Group of atoms which has gained or lost electrons

2) Define the Atomic Number [1]

- Number of protons in one atom of an element

3) Define the Nucleon Number [1]

- Number of neutrons and protons in one atom of an element

4) Define the proton number [1]

- The number of protons in an atom

5) Define the relative atomic mass/Mr [1]

- Average mass of an atom compared to an atom of carbon

6) What is a covalent bond?

- A shared pair of electron
- Between two atoms
- Happens between Non-metals

7) What is Ionic bonding? [2]

- The electrostatic forces of attraction
- Between oppositely charged ions
- Happens between Metals & Non-metals

8) Describe what happens in terms of electron loss and gain when potassium reacts with iodine [2] (This answers applies to all types of ionic structure just state the correct electron movement from metal and non metal and how many electrons are transferred)

- Movement of electron from potassium to iodine
- One electron is transferred

9) Define an isotope [2]

- Atoms of the same element
- With different number of neutrons and same number of protons

10) Why isotopes have the same chemical properties [2]

- Same number of electrons
- At outermost shell

11) Describe the structure of solid potassium iodine [2] (The first part of the answer applies to all ionic structures just fit the ions into the 2nd part of the answer)

- Regular arrangement of alternating
- Positive potassium K^+ ions and Negative I^- ions

12) Explain why ionic structures have a high/low melting point [2] (This answer applies to all ionic structure, weather it's high or low m.p)

- Strong/weak electrostatic forces of attraction between oppositely charged ions
- Which requires lots/less amount of energy to overcome the forces

13) Explain why Silicon(IV) Oxide has a very high melting point [2]

- All bonds are strong
- A lot of heat energy is required to overcome the bonds

14) Describe the structure of Silicon (IV) Oxide/ Why the formula for silicon (IV) is SiO_2 [3]

- It's a tetrahedral structure
- Each oxygen is joined to two silicon atoms
- Each silicon is joined to four oxygen atoms

15) State three properties which Silicon (IV) Oxide and Diamond have in common [3]

- High melting and boiling point
- Hard & Strong
- Poor conductors of electricity
- Insoluble in water

16) Explain why the physical properties of carbon dioxide are different from those of Diamond and Silicon (IV) Oxide [1]

- Because carbon dioxide has a simple molecular structure

Chapter 5: Electrolysis & Chemistry

Give three examples of inert electrodes [3]

- Platinum
- Carbon
- Graphite

All inert electrodes are good conductors of electricity

Define electrolyte

- Substances which conduct electricity in either molten state or an aqueous state

Define the term electrolysis [2]

- The breaking down of ionic compounds when molten or in aqueous state
- Using electricity

State the function of electrodes [1]

- To conduct electricity

State the use of heat in electrolysis of molten electrolyte [1]

- To melt the electrolyte

Platinum is a good conductor of electricity, State one other property of platinum which makes it suitable for use as electrodes [1]

- It's inert (Does Not react with the electrolyte)

Suggest why electrolyte is a paste/molten [1]

- To allow for ions to flow/move, Ions can't move in solid

Name the type of particles responsible for the conduction of electricity during electrolysis in the metal wire and the electrolyte respectively [2]

- Metal wires - Electrons are conducting the electricity
- Electrolyte - Ions are conducting the electricity

Copper (II) Sulfate solution conducts electricity but solid Copper (II) Sulfate does not. Explain this statement [2]

- Ions are free to move around in solution
- Ions are unable to move in the solid due to them being in fixed position

Describe the electrolysis of concentrated aqueous potassium bromide. Include an ionic half equation for the reaction at the cathode & anode, the name of the products at the anode, and the name of potassium compound formed [5]

- Ions present are = K^+ , H^+ , Br^- and OH^- because it's in a concentrated aqueous
- Equation at the cathode = $2H^+ + 2e^- \rightarrow H_2$
- Equation at the anode = $2Br^- \rightarrow Br_2 + 2e^-$

- Bromine gas is produced at anode
- Potassium hydroxide is formed

When molten potassium bromide is electrolysed, the product at the cathode is different, name the product at the cathode [1]

- Potassium
- Because they are no H^+ and OH^- ions present in molten potassium bromide

What difference would the student observe at the positive electrode if aqueous copper (II) sulfate were replaced with concentrated aqueous copper (II) chloride [1]

- Yellow chlorine gas is formed
- Halide ions are always discharged in concentrated aqueous electrolyte

Name the products of electrolysis of concentrated aqueous sodium chloride [3]

- Ions present are Na^+ , Cl^- , H^+ , OH^-
- Hydrogen gas is produced
- Chlorine gas is produced
- Sodium hydroxide is the remaining electrolyte

The masses of copper electrodes changed during electrolysis, state how and explain why the masses of the two copper electrodes changed state the half-equations [4]

- Anode decreases in size as copper is removed and becomes aqueous
- $Cu \rightarrow Cu^{2+} + 2e^-$
- Cathode increases in size as copper ions become copper, and deposit copper solids
- $Cu^{2+} + 2e^- \rightarrow Cu$

Explain why, during electrolysis, the colour of copper (II) sulfate solution does not change [2]

- Because the formation of copper (II) ions is the same as the removal of copper (II) ions

Give reasons why steel is electroplated with a metal such as chromium [2]

- To prevent corrosion/rusting
- To improve appearance/Decorative purposes

Name the main ore of aluminum [1]

- Bauxite

What is the use of cryolite [2]

- To lower melting point of the electrolyte
- Increase conductivity

Describe how aluminum is extracted from bauxite, include an ionic half-equation for the reaction at each electrode [5]

- Bauxite is dissolved in molten cryolite
- Cryolite lowers the melting point and increases conductivity
- Molten aluminum is formed
- Ions present are Al^{3+} and O^{2-}
- Anode reaction = $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$
- Cathode reaction = $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$

Explain why the anode have to be replaced regularly [2]

- Carbon anode reacts with oxygen gas to form carbon dioxide

Why is aluminium not extracted from its ore by reduction with carbon [1]

- Because aluminum is more reactive than carbon

Is electrolysis reaction endothermic or exothermic? Explain your answer [1]

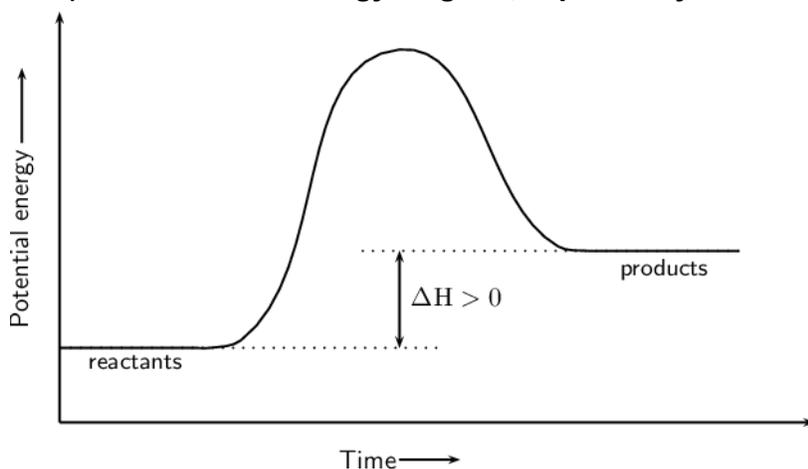
- Endothermic because electrical energy is supplied

Is the reaction in a simple cell endothermic or exothermic? Explain your answer [1]

- Exothermic because electrical energy is released

Chapter 6: Chemical Energetics

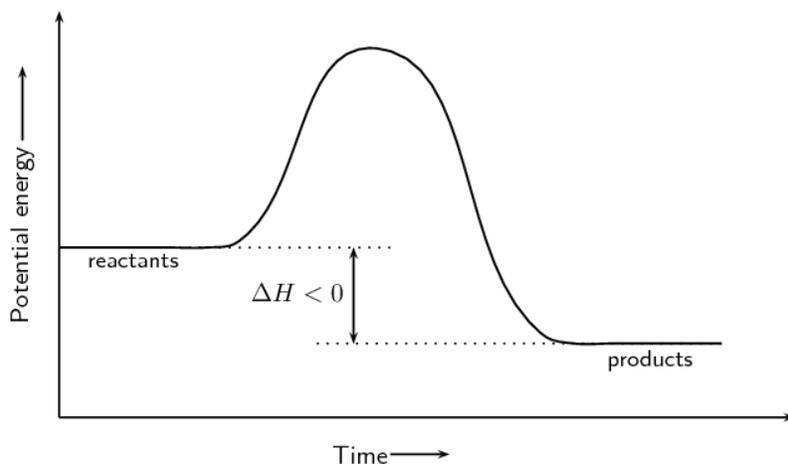
1) **Based on the energy diagram, explain why the reaction is endothermic [2]**



- The chemical energy of the reactants is lower than the chemical energy of the products
- Energy is absorbed from the surroundings

DON'T FORGET TO WRITE THE REACTANTS AND THE PRODUCTS IN THE GRAPH

2) Based on the energy diagram, explain why the reaction is exothermic [2]



- The chemical energy of the reactants is higher than the chemical energy of the products
- Energy is lost to the surroundings

DON'T FORGET TO WRITE THE REACTANTS AND THE PRODUCTS IN THE GRAPH

3) Define the term activation energy [2]

- The minimum energy needed by the reactants to start reaction

4) What is the advantage and disadvantage of using hydrogen fuel cell [2]

- Advantage: No pollutant is produced
- Disadvantage: Hard to store
- Hydrogen reacts with Oxygen to produce Water

Chapter 7: Chemical Reactions

1) Suggest a way of increasing the reaction using the same amounts of reactants

- Reactants should be powder form (Powder form = Higher surface area)
- Higher concentration of solution
- Increasing the temperature
- Using a catalyst

2) Define the term catalyst [2]

- A substance which speeds up the rate of reaction
- Remains unchanged at the end of the reaction
- Lowers the activation energy

3) What would be the effect of volume of products if the mass of catalyst was increased [1]

- No change

- Because catalyst only affects the rate of reaction not the amounts produced
- 4) Explain why an increase in concentration increases the rate of reaction [2]**
- There are more particles per unit volume, particles are closer to each other
 - Increases the rate of collision
- 5) Explain why an increase in temperature increases the rate of reaction [4]**
- When temperature is increase, particles gain more kinetic energy
 - Therefore particles move faster
 - Which increases the rate of reaction
 - As a higher proportion of particles have sufficient energy to react
- 6) Explain why an increase in surface area increases the rate of reaction [2]**
- This is because more surface area particles will be exposed to the other reactant
 - So there will be more frequent and successful collisions
 - That's why using powder form increases the rate of reaction
- 7) Define equilibrium [2]**
- Rate of forward reaction is the same as rate of backward reaction
 - Concentration of reactants and products remains constant
- 8) Explain the phrase photochemical reaction [1]**
- Rate of reaction influenced by light
- 9) Give an example of photochemical reaction and explain why it is important either to the environment or in industry [3]**
- Photosynthesis
 - Carbon dioxide is converted into carbohydrate and oxygen
 - Which decreases the greenhouse gas effect
- 10) Define the terms of electron transfer/term of oxidation [3]**
- OIL
 - Oxidation is loss of electron
 - Gain of oxygen
 - Loss of Hydrogen
 - Increase in oxidation state
- 11) Define the terms of electron transfer/term of reduction [3]**
- RIG
 - Gain of electron
 - Loss of oxygen
 - Gain of hydrogen
- 12) Explain why positive ions are oxidising agents [2]**

- They can accept electrons/gains electron
- Therefore undergo reduction

13) What is an oxidizing agents [2]

- Substance which give oxygen or removes hydrogen and g

14) What is a reducing agents [2]

- Substance which gives hydrogen or removes oxygen and

Chapter 8: Acid, Bases and Salts

1) Define the term acid [1]

- Proton donor

2) Define the term base or alkali [1]

- Proton acceptor

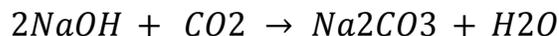
3) Explain what is meant by a weak base [1]

- Proton acceptor
- Does not accept protons readily

4) How could you show which base is stronger with a 'fair' comparison [3]

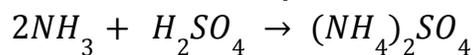
- For fair test: same CONCENTRATION of both bases
- Measure their pH
- The higher pH is the stronger base using pH meter/Universal indicator

5) Write a chemical equation between sodium hydroxide and carbon dioxide [3]



- Sodium hydroxide + Carbon dioxide = Sodium carbonate + Water

6) Write a chemical equation between ammonia and sulfuric acid [3]



- Ammonia + Sulfuric acid = Ammonia sulfate

7) Define what is meant by amphoteric oxide [2]

- An amphoteric oxide will react with both acid and alkali

8) Define what is meant by neutral oxide [2]

- Neutral oxide will not react with both acid and alkali

9) Define what is meant by basic oxide [2]

- They react with acids to form a salt and water
- They only dissolve in acid and not alkaline

10) Give an example of amphoteric oxide [2]

- Aluminium oxide, Al_2O_3
- Zinc oxide, ZnO

11) Give an example of neutral oxide [1]

- Carbon monoxide, CO

12) How to differentiate between strong and weak acid [3]

- Measure the acids pH with a pH meter
- Strong acid has a lower pH
- Weak acid has a higher pH

13) Describe a test, other than measuring pH, which can be carried out on both acid solutions to confirm the different pH values of the two acids [3]

- Test with suitable metal ex. Magnesium or zinc
- The strong acid reacts faster and produces more bubbles
- The weak acid reacts slower compared to the strong acid and produces less bubbles

14) Define the term strong acid [1]

- Strong acid exists completely as ions in solution
- Higher concentration of hydrogen ions

15) Define the term weak acid [1]

- Weak acid is only partially ionised in solution
- Smaller concentration of hydrogen ions

16) Given aqueous solutions of ammonia and sodium hydroxide, both having a concentration of 0.1mol/dm³, how could you show that ammonia is the weaker base [4]

- Measure both ammonia pH and the sodium hydroxide pH with pH meter
- Sodium hydroxide has a higher pH, Therefore is a strong base
- Ammonia has lower pH, Therefore its a weak base

17) You cannot prepare a neutral solution of magnesium chloride by titration.

Describe how you could prepare a neutral solution of magnesium chloride [3]

- Add the magnesium into the hydrochloric acid
- Until in excess
- Filter out the excess metal or unreacted solid

18) Why hydrochloric acid and ethanoic acid of the same concentration have different pH [4]

- Hydrochloric acid is strong acid
- Ethanoic acid is a weak acid
- Hydrochloric acid dissociate completely to produce higher concentration of hydrogen ions compared to ethanoic acid

19) What are the three observations when solid copper (II) carbonate reacts with sulfuric acid (3)



- Solid copper (II) carbonate dissolves
- Effervescence/Bubbles formed
- Blue solution is formed

20) Describe how you could show that magnesium oxide is a basic oxide and not a amphoteric oxide [4]

- Add an acid HCl acid
- It'll dissolve in HCl
- Add an alkaline NaOH
- Does not dissolve in alkali
- Therefore its basic since it only dissolves in acid and not alkaline

21) Describe an experiment to show that aluminium oxide is amphoteric [4]

- Add an acid (HCl acid) and an alkaline (NaOH)
- Aluminum oxide will react with both reagents
- And it will also dissolve into the reagent

22) The sulfuric acid is added slowly from the burette until the indicator just changes colour. The volume of sulfuric acid needed to just neutralise the lithium hydroxide is noted, Describe how you would continue the experiment to obtain pure dry crystals of hydrated lithium sulfate [6]

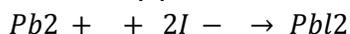
- Repeat the experiment without indicator using the same volume of acid & alkaline
- Heat the solution until crystallization point
- Leave the solution to cool and dry

- Filter out the crystals formed
- Rinse the crystal with distilled water
- Dry with filter paper

23) Describe how a pure dry sample of lead iodide could be made from solid potassium iodide and solid lead nitrate (Precipitation)

- Dissolve the solids in water and mix
- Filter out the precipitate
- Wash the residue with distilled water
- Dry between filter papers

24) Write an ionic equation for the formation of lead(II) iodide when potassium iodide and lead(II)



- Lead + iodide = lead iodide
- Remove spectator ions to get ionic equation

25) Describe test for copper (II) ions

- Add sodium hydroxide
- If copper ions present = blue precipitate is formed

26) Describe test for nitrate ions

- Add aluminum and aqueous sodium hydroxide and ward the water
- Ammonia gas given off, turns red litmus paper blue

27) How to carry out a flame test?

- Prepare hot flame using bunsen burner
- Dip wire into concentrated hydrochloric acid to clean it
- Use the wire to introduce the sample to hot flame
- Lithium/Li⁺ = red flame
- Sodium/Na⁺ = Yellow flame
- Potassium/K⁺ = lilac flame
- Calcium/Ca²⁺ = Orange red flame
- Copper/Cu²⁺ = Blue-green flame

Chapter 9: The Periodic Table

- 1) What is the relationship between the group number and the number of valence electron [1]**
 - Number of valence electron is the same as the group number

- 2) Describe how the type of oxide changes across period [3]**
 - Basic to amphoteric to acidic

- 3) Predict three physical properties of group 1 metals that are different from transition metals [3]**
 - Group 1 metals have a lower melting point and boiling point
 - Group 1 metals can be cut easily
 - Group 1 metals have a lower density

- 4) Predict three chemical properties of transition elements that are different from Group 1 metals [3]**
 - More than one oxidation state
 - Form colored compound
 - Can acts as catalyst

- 5) Observation when Group 1 metals is added to cold water [3]**
 - Bubbles formed/Effervescence (of Hydrogen)
 - Explosion
 - Dissolves to form a solution

- 6) Explain why noble gases are chemically inert [1]**
 - They have a full outer shell of 8 electrons

Chapter 10: Metals

- 1) What is the term alloy [1]**
 - Mixture of one or more different metals

- 2) Give a use of mild steel [5]**
 - Screws
 - Chains
 - Car bodies
 - Nails
 - Screws

- 3) Give a use of high carbon steel [3]**
 - Knives
 - Drills
 - Cutting tools

- 4) Brass is an alloy which contains zinc. Name the other metal in brass [1]**
 - Copper

- 5) Bronze is an alloy which metals does it contain [2]**
 - Copper and Tin

- 6) Stainless steel is an alloy which metals does it contain [3]**
 - Iron, Chromium and Nickel

- 7) Suggest two reason why an alloy is preferred to either of its constituent metals [3]**
 - Harder & Stronger
 - Resistant to corrosion
 - Better appearance

- 8) Explain why metals are malleable [3]**
 - Metals are made of metals ions
 - Arranged in a lattice
 - The layers can slide over one another

- 9) Explain why alloys are less malleable than metals [2]**
 - The new atom that are introduced into the structure are of different size
 - So they reduce moving and interrupt movement

10) What are the conditions needed for rusting [2]

- Oxygen
- Water

11) What is the term Sacrificial protection [2]

- Iron is protected with a more reactive metal

12) What is the term galvanizing [2]

- Protecting Iron with zinc metal

13) Explain in terms of electron transfer, why steel does not rust even if the layer of zinc is scratched so the steel is exposed to air and water [4]

- Because zinc is more reactive than iron
- Zinc loses electron
- Iron gains electron
- Therefore the iron does not get oxidised

Thermal decomposition of metals equations

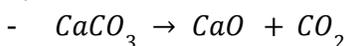
- METAL HYDROXIDE All metals except potassium and sodium

1) Metal Hydroxide → Metal oxide + Water



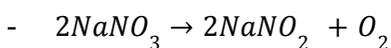
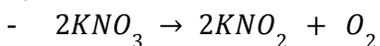
- METAL CARBONATE All metals except potassium and sodium

2) Metal Carbonate → Metal Oxide + Carbon dioxide



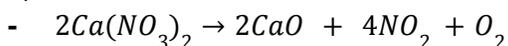
- METAL NITRATE Only potassium and sodium

3) Metal Nitrate → Metal Nitrite + Oxygen



- METAL NITRATE All metals except potassium and nitrate

4) Metal Nitrate → Metal Oxide + Nitrogen dioxide + Oxygen



- Nitrogen dioxide is brown in color

5) Describe the process of extraction of aluminum [5]

- Bauxite is dissolved in molten cryolite
- Cryolite lowers the melting point and increases conductivity
- Molten aluminum is formed
- Ions present are Al^{3+} and O^{2-}
- Anode reaction = $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$
- Cathode reaction = $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$

6) Why the carbon anode needs to be replaced periodically [3]

- Anode is made up of carbon
- Oxygen produced at the anode
- Carbon anode reacts with oxygen to form carbon dioxide

7) What is the name of the iron ore [1]

- Hematite (Fe_2O_3)

8) Describe the extraction of Iron with equations [5]

- Hot air enters the furnace as it provides oxygen
- Coke burns in the air to produce heat
- $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$ [Exothermic reaction]
- Carbon dioxide is reduced to carbon monoxide
- $\text{C} + \text{CO}_2 \rightarrow 2\text{CO}$ [Redox reaction]
- Limestone undergoes thermal decomposition to produce calcium oxide and carbon dioxide
- $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ [Thermal decomposition reaction]
- Reduction of hematite by carbon monoxide producing molten iron
- $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ [Redox reaction]
- Removal of silica impurities forming slag removed by calcium oxide
- $\text{SiO}_2 + \text{CaO} \rightarrow \text{CaSiO}_3$ [Acid base reaction]

9) State the two function of coke used in the blast furnace [2]

- As a reducing agent
- Source of heat

10) Why there is no immediate reaction or observation when aluminium metal is added into hydrochloric acid [2]

- Protective oxide layer

11) Explain how the silica impurity is removed and separated from the molten iron [3]

- Silica reacts with limestone or calcium
- To form a slag
- Molten slag floats on molten iron

12) Explain how the amount of carbon in the iron can be decreased

- Blowing oxygen in
- Which forms carbon dioxide

13) What is the name of the iron ore

- Zinc Blende (ZnS)

14) Describe the extraction of Zinc with equations

- Hot air enters the furnace
- Coke burns in the air producing heat
- $C + O_2 \rightarrow CO_2$ [Exothermic reaction]
- Carbon dioxide is reduced to form carbon monoxide
- $C + CO_2 \rightarrow 2CO$ [Redox reaction]
- Zinc blende is roasted in the air to form zinc oxide
- $2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$
- Reduction of zinc oxide by carbon
- $ZnO + C \rightarrow Zn + CO$
- Zinc is distilled out from the furnace through vaporation and condensation

15) Describe how zinc oxide is made from zinc blende [3]

- Zinc blende is roasted in the air
- Zinc sulfide + Carbon = Zinc oxide + Sulfur dioxide

16) Describe the word question for the reduction of zinc oxide by coke [2]

- Zinc oxide + Carbon = Zinc + Carbon monoxide

Chapter 10: Air & Water

1) How to test for the presence of water [4]

- Cobalt (II) chloride test
- Blue to pink in the presence of water
- Anhydrous copper (II) sulfate
- White to blue

2) State three industrial uses of water [3]

- Manufacture of ethanol
- Used in the manufacture of sulfuric acid
- Manufacture of hydrogen

3) State two uses of water in the home [3]

- Cooking
- Drinking
- Washing

4) Rain water is collected in reservoirs. How is it treated before entering the water supply [2]

- Filtration to remove large insoluble solids
- Chlorination to kill bacteria/pathogens

5) In many regions, drinking water is obtained by the distillation of sea-water. Explain how distillation separates the water from sea-water [3]

- By boiling the sea-water, water turns the steam
- Condense the steam

6) Describe how high temperatures in vehicles engines cause acid rain [3]

- Oxygen and nitrogen in the air react
- Oxides of nitrogen are formed
- Then oxides of nitrogen react with water to form acids

7) One cause of acidity in soil is acid rain. Explain how acid rain is formed [3]

- From the burning of fossil fuels containing sulfur
- With leads to the formation of sulfur dioxide gas

- Which reacts with the rain water to form sulfuric acid, H_2SO_4