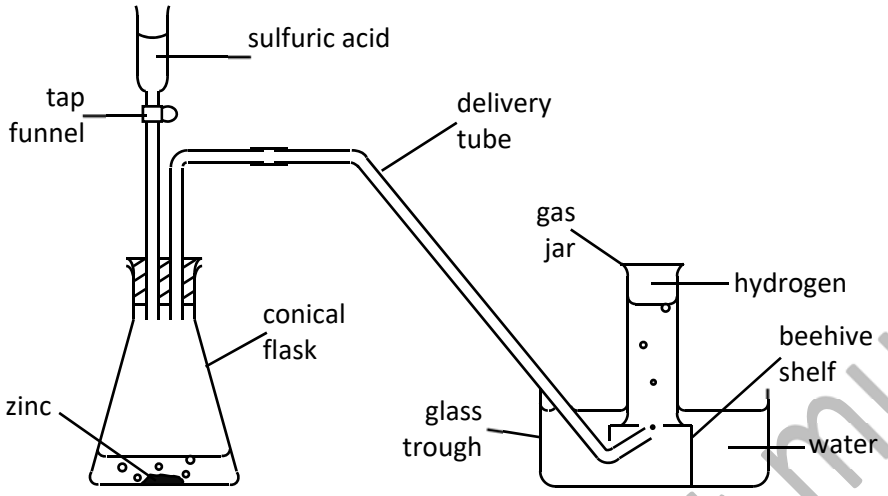
CHEMISTRY SUMMARY FOR THE FORM 3 NATIONAL ASSESSMENT

1. Define the term element.
   An element is a pure substance that cannot be broken down into simpler substances by any ordinary chemical process.
2. Define the term compound.
   A compound is a pure substance which contains two or more elements chemically combined together in a fixed proportion.
3. Define the term mixture.
   A mixture is an impure substance which contains two or more elements or compounds in proportions which may vary because they are not chemically combined together.
4. Define the term atom.
   An atom is the smallest, indivisible particle of an element that can take part in a chemical reaction.
5. Define the term molecule.
   A molecule is the smallest part of a chemical compound that can take part in a chemical reaction.
6. List the metals in the reactivity series.
   Potassium, sodium, calcium, magnesium, aluminium, zinc, iron, lead, copper, mercury, silver and gold.
7. Define the term acid.
   An acid is a hydrogen containing compound which, when dissolved in water, can produce a solution of pH less than 7.
8. Define the term base.
   A base is a compound, which reacts with an acid to form a salt and water only.
9. State the importance of hydrochloric acid, ethanoic acid and sulphuric acid.
   Hydrochloric acid is naturally present in the stomach and it helps to digest food. Ethanoic acid, which is the acid present in vinegar, can be used to neutralise wasp stings. Sulphuric acid is present in car batteries.
10. State the importance of the base magnesium hydroxide and the bases found in toothpaste.
    Magnesium hydroxide is used as an antacid to neutralise excess acidity in the stomach. Toothpastes contain bases which neutralise the acids released by bacteria in the mouth.
11. State the colours of the following indicators in acid and in alkali: methyl orange, phenolphthalein, litmus.
    Methyl orange is red in acids and yellow in alkalis. Phenolphthalein is colourless in acids and pink in alkalis. Litmus is red in acids and blue in alkalis.
12. Giving appropriate examples, explain two ways in which a physical change is different from a chemical change.
    A physical change produces no new substance, for example, melting an ice cube will not change the mass of the water. A chemical change always produces a new substance, for example, magnesium burns in oxygen to produce the new substance magnesium oxide. Physical changes are reversible, for example, steam can be cooled back to water. Chemical changes are generally irreversible, for example, rust cannot be converted back to iron.

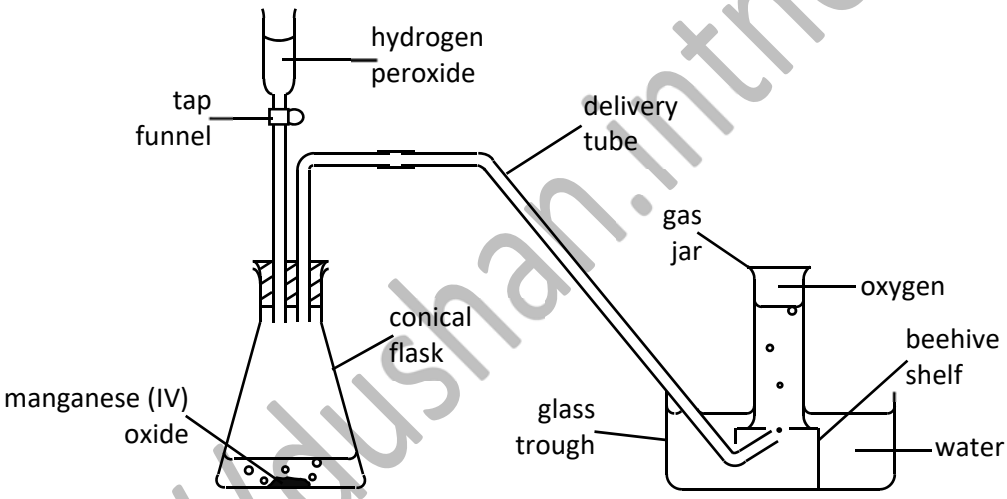
13. State the symbol and valency of the following metals: aluminium, barium, calcium, copper, gold, iron, lead, magnesium, mercury, potassium, silver, sodium, tin and zinc:
    Aluminium A*l* 3, barium Ba 2, calcium Ca 2, copper Cu 1 or 2, gold Au 1 or 3, iron Fe 2 or 3, lead Pb 2 or 4, magnesium Mg 2, mercury Hg 1 or 2, potassium K 1, silver Ag 1, sodium Na 1, tin Sn 2 or 4 and zinc Zn 2.
14. State the symbol and valency of the following non-metals: argon, bromine, carbon, chlorine, fluorine, helium, hydrogen, iodine, neon, nitrogen, oxygen, phosphorus, silicon and sulphur:
    Argon Ar 0, bromine capital Br 1, carbon C 2 or 4, chlorine C*l* 1, fluorine F 1, helium He 0, hydrogen H 1, iodine I 1, neon Ne 0, nitrogen N 3, oxygen O 2, phosphorus P 3 or 5, silicon Si 4, sulphur S 2, 4 or 6.
15. Define the term radical.
    A radical is a group of atoms that has a valency left over, although the atoms in it are chemically combined together.
16. State the formulae and valencies of the following radicals: hydroxide, carbonate, sulphate, ammonium and nitrate.
    Ammonium capital NH_4 1, carbonate CO_3 2, hydroxide OH 1, nitrate NO_3 1 and sulphate SO_4 2.
17. Compare the reactions of the metals in the reactivity series with oxygen.
    Potassium or sodium become easily covered with a dull oxide layer in air. Magnesium and iron burn on heating in air to produce their oxides. Copper does not burn but produces an oxide layer on strong heating in air. Silver and gold do not react even on strong heating in air.
18. Compare the reactions of the metals in the reactivity series with water.
    Potassium and sodium react vigorously with cold water to form their hydroxides, with the evolution of hydrogen gas. Calcium also reacts with cold water, although less vigorously. Magnesium, zinc and iron do not react with cold water but with steam to form their corresponding metal oxides and hydrogen gas. Lead shows very slight reaction with the steam in a Bunsen flame. Copper, mercury, silver and gold do not react with water nor steam, even under extreme conditions.
19. Compare the reactions of the metals in the reactivity series with dilute acids.
    The reaction of potassium and sodium with a dilute acid is explosive. Calcium, magnesium, zinc and iron will produce their corresponding salts, liberating hydrogen. The reaction between lead and dilute acids is too slow to be observed. Copper, mercury, silver and gold do not react with dilute acids.
20. Using a suitable example explain the meaning of the term displacement reaction.
    A displacement reaction is one in which a more reactive metal displaces a less reactive one to form new and more stable compound. Thus, if zinc in put in aquoeus copper (II) sulphate, zinc sulphate and copper are formed, because zinc is more reactive than copper.
21. Compare the action of heat on metallic carbonates for metals in the reactivity series.
    Sodium carbonate and potassium carbonate will not decompose on strong heating. All other metallic carbonates decompose on heating to produce their corresponding oxides and carbon dioxide gas.

22. Describe how you will prepare and collect hydrogen gas.



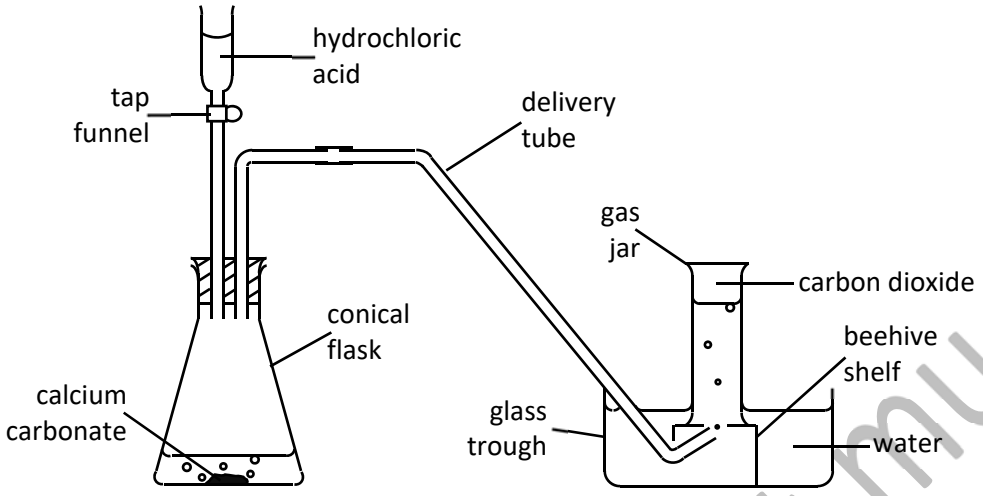
Hydrogen gas is prepared by adding a dilute acid like hydrochloric acid or sulphuric acid to a metal like magnesium or zinc. The hydrogen is collected over water.

23. Describe how you will prepare and collect oxygen gas.



Oxygen gas is prepared by decomposing hydrogen peroxide faster using manganese (IV) oxide. Oxygen is collected over water.

24. Describe how you will prepare and collect carbon dioxide gas.



Carbon dioxide gas is prepared by adding a dilute acid like hydrochloric acid or nitric acid to a metal carbonate like calcium carbonate or sodium carbonate. Carbon dioxide is collected over water.

25. Outline four important reactions of acids.

Acids turn litmus paper red. They will also turn phenolphthalein indicator colourless and turn methyl orange indicator red. Acids react with bases and alkalis to produce a salt and water only. With reactive metals, acids produce a salt and hydrogen gas. Acids react with carbonates to produce a salt, water and carbon dioxide gas.

26. Outline three important reactions of bases and alkalis.

Alkalis turn litmus paper blue. They will also turn phenolphthalein indicator pink and methyl orange indicator yellow. Bases react with acids to form a salt and water only. Bases react with ammonium salts on warming to form a salt, water and ammonia gas.

27. What is meant by a neutralisation reaction?

Neutralisation is the reaction between an acid and an alkali to produce a salt and water only.

28. Describe the importance of four neutralisation reactions in everyday life.

Excess acidity in the digestive system is neutralised with antacids like calcium carbonate, magnesium hydroxide or sodium hydrogencarbonate. Bee stings are neutralised with weak alkalis like sodium bicarbonate. Wasp stings are neutralised with weak acids like ethanoic acid. Acids released by bacteria in the mouth are neutralised with toothpastes.

29. What is a salt?

A salt is a compound formed when an acid neutralises a base or an alkali.

30. Give examples of salts which are soluble in water and examples of salts which are insoluble.

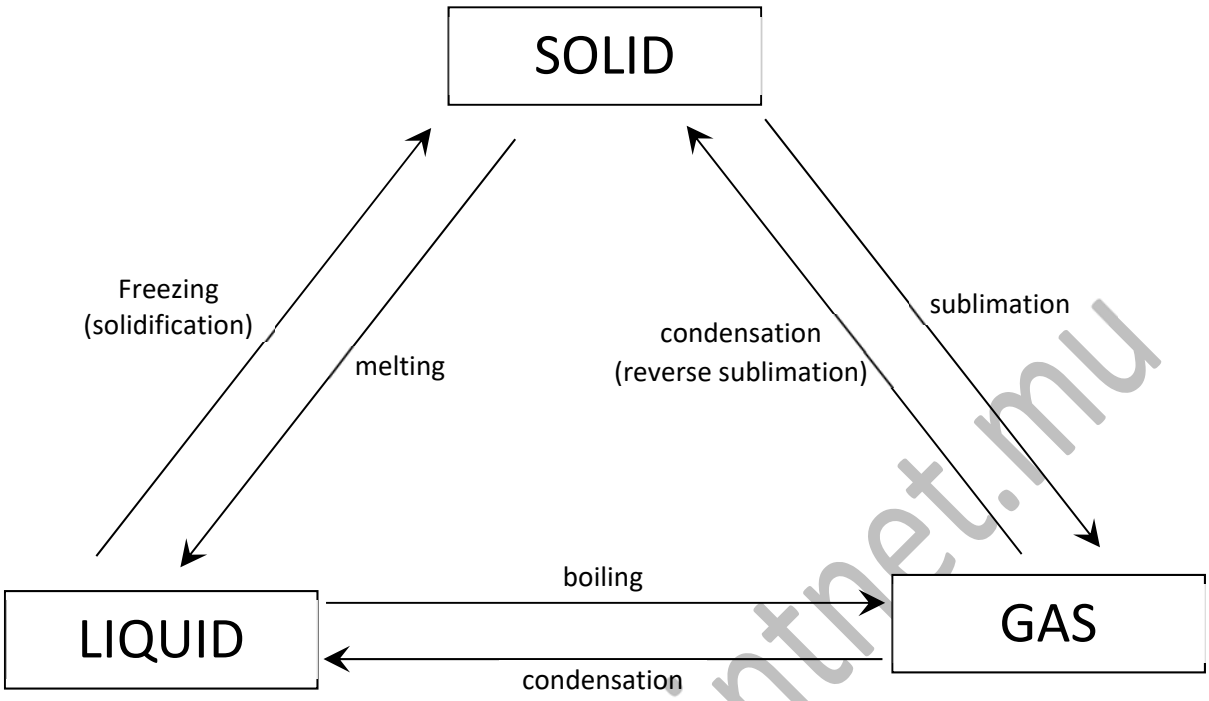
All nitrates, all potassium, sodium and ammonium salts, all chlorides except silver and lead chlorides, all bromides except silver and lead bromides, all iodides except silver and lead iodides and all sulphates except barium, lead and calcium sulphates, are soluble in water. All carbonates are insoluble in water with the exception of potassium, sodium and ammonium carbonates.

31. Describe three ways of preparing soluble salts.

Soluble salts are prepared by titration, by the action of a selected acid on a metal or by the action of a selected acid on a base or carbonate.

32. State the importance of selected salts in everyday life.
    Ammonium phosphate, ammonium sulphate and potassium chloride are used as fertilisers. Calcium sulphate is used in plaster of Paris for setting broken bones. Sodium bicarbonate is used in baking and in the treatment of mild indigestion. Sodium chloride is used for food preservation and to enhance the taste of foods. Sodium fluoride is used in toothpaste to prevent cavities.
33. Define combustion and state its importance.
    Combustion is a chemical reaction in which a substance reacts rapidly with oxygen, producing heat and light. Combustion of fuels is used to produce heat and to generate electricity.
34. Define respiration and state its importance.
    Respiration is a slower chemical process which takes place in living organisms, by which food substances combine with the oxygen of the air to release energy, carbon dioxide and water vapour. This process provides energy for the normal functioning of all tissues and cells in living matter.
35. Define photosynthesis and state its importance.
    Photosynthesis is the chemical process by which green plants synthesize organic compounds from carbon dioxide and water in the presence of sunlight. Photosynthesis allows green plants to manufacture food.
36. State the percentage composition of the gases present in air.
    Nitrogen 78%, oxygen 21%, noble gases less than 1% and carbon dioxide 0.034%.
37. Name three most common air pollutants and state their sources, effects and measures that can be taken to reduce their impact on the environment.
    Carbon monoxide is a poisonous gas which cuts off oxygen supply to the body and it is produced by the incomplete combustion of carbon-containing substances. Carbon monoxide can be converted into less harmful carbon dioxide by the use of catalytic converters. Nitrogen oxides which are produced in internal combustion engines are responsible for acid rain and photochemical smog. They can also be reduced to harmless nitrogen with catalytic converters. Sulphur dioxide which comes from the combustion of fossil fuels leads to the formation of acid rain but it can be reacted with calcium carbonate.
38. What is global warming and how is it harmful?
    Global warming refers to the measurable increases in the average temperature of the Earth's atmosphere, oceans and landmasses. Greenhouse gases like carbon dioxide, methane or nitrogen dioxide can trap too much of the Sun's heat and cause a rise in the sea level, also causing destructive climatic conditions.
39. Define the terms solute, solvent and solution.
    A solute is a substance dissolved in a solvent to form a solution. A solvent is a liquid that dissolves another substance to form a solution. A solution is a homogeneous mixture of a liquid with a gas or solid.

40. Draw a concept diagram to illustrate melting, freezing, boiling, condensation and sublimation.



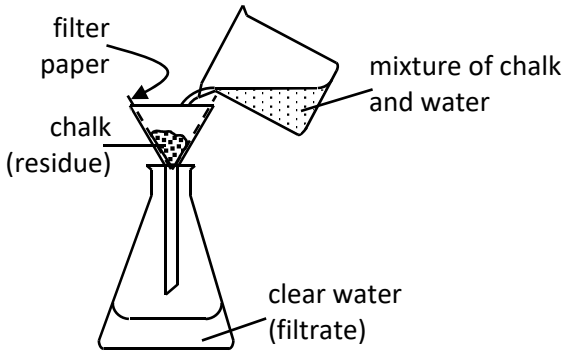
41. Define the terms melting point, boiling point and freezing point.

The melting point of a solid is the temperature at which the solid turns into a liquid at constant temperature. The boiling point of a liquid is the temperature at which the liquid turns into a gas at constant temperature. The freezing point of a liquid is the temperature at which the liquid turns into a solid at constant temperature.

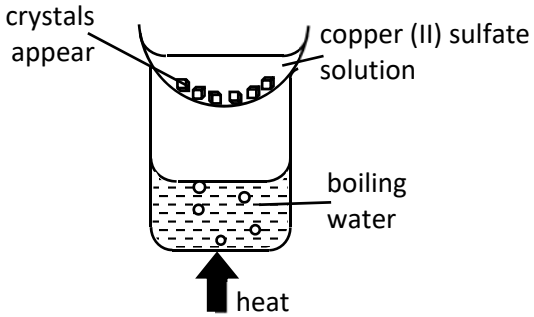
42. What is magnetic separation, decantation, filtration, crystallisation, distillation, sublimation, chromatography and how is it used in everyday life?

(a) Magnetic separation is a way of separating a magnetic material from a mixture. Decantation is the process of separating a liquid from a settled solid suspension or from a denser immiscible liquid, by carefully pouring it into a different container and it can be used to separate water from sand.

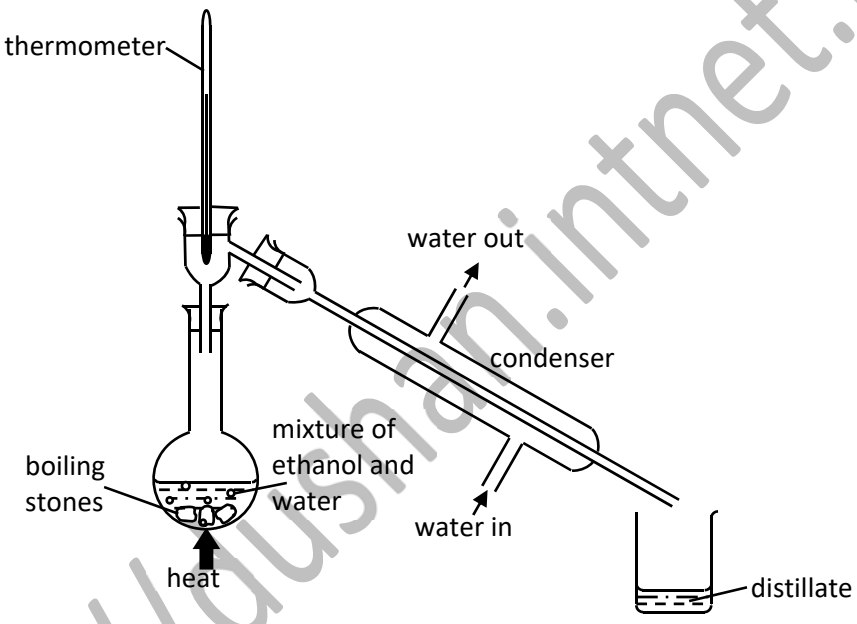
(b) Filtration is used to separate insoluble solids from a liquid and it can be used to separate water from mud.



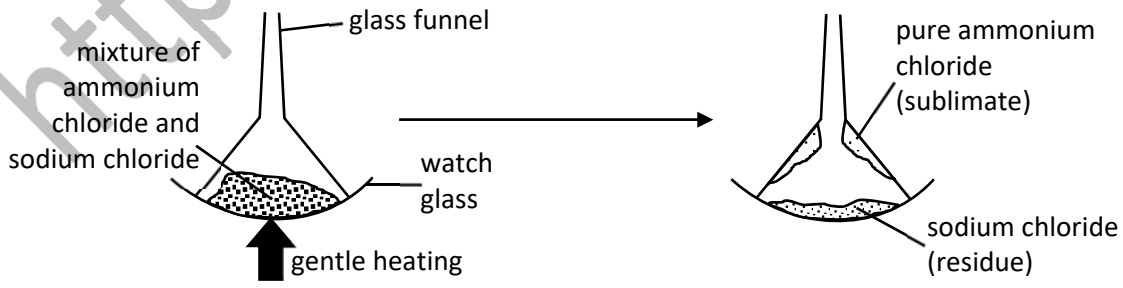
(c) Crystallisation is used to obtain a pure solid from an aqueous solution and it can be used to separate sugar from its solution.



(d) Distillation is used to separate a mixture of two miscible liquids that have different boiling points and it can be used to separate ethanol from water.



(e) Sublimation is used to separate a solid that sublimes on heating, from a mixture of solids and it can be used to separate ammonium chloride from sand.



(f) Chromatography is used to separate small amounts of substances that are soluble in a given solvent and it can be used to separate black ink into its constituent colours.