

Principal's Message

SmartSkills has been prepared with the belief that knowledge must continually be renewed with focus and effort. Our aim, as before is to help students understand, analyse and thus learn to think critically. This exercise will help them to internalize the academic goals they have set for themselves.

This Question Bank will, I am sure, not only reinforce their learning but also serve as an instrument of self assessment. I hope students will make the best use of this material and maximize their scores.

Abha Sahgal

Principal

SMART SKILLS

SYLLABUS 2017-2018

CHEMISTRY

INDEX

S. No.	CONTENT	Page No.
1.	Syllabus	3
2.	Chapter 1 Chemical Reactions and Equations	8
3.	Chapter 2 Acids, Bases and Salts	12
4.	Chapter 3 Metals and Non-metals	19
5.	Chapter 4 Carbon and its Compounds	25
6.	Chapter 5 Periodic Classification of Elements	31
7.	Chapter 14 Sources of energy	49
8.	Question bank	50
9.	MCQ on Experimental Skills	60

SYLLABUS - 2017-2018**CHEMISTRY****CLASS - X****March -April**

Chapter1: Chemical reactions and equations

Types of chemical reactions: Combination, decomposition, displacement, double displacement, oxidation and reduction in terms of gain and loss of oxygen, corrosion, rancidity.

Activities:

To demonstrate different types of reactions in the class.

Practical

Experiment - 1

To perform and observe the following reactions and classify them into:

- Combination reaction
- Decomposition reaction
- Displacement reaction
- Double displacement reaction

(1) Action of water on quick lime.

(2) Action of heat on ferrous sulphate crystals.

(3) Iron nails kept in copper sulphate solution.

(4) Reaction between sodium sulphate and barium chloride solutions.

MCQ questions on practical skills

MAY

Chapter2: Acids, bases and Salts

Understanding the chemical properties of acids and bases: how do acids and bases react with metals, how do metal carbonates and metal hydrogen carbonates react with acids, how do acids and bases react with each other, reaction of metallic oxides with acids, reaction of a non-metallic oxide with base, what happens to an acid or a base in a water solution .

pH, importance of pH in everyday life, chemicals from common salt, sodium hydroxide, bleaching powder, baking soda, washing soda, plaster of Paris.

Activities:

- Reaction of acids and bases with metal.
- Reaction of HCl with NaHCO_3 and Na_2CO_3 .
- Neutralization reaction.
- Effect of acid and base on litmus paper.

PracticalExperiment – 3

To find the pH of the following samples:

- Dilute HCl solution
- Dilute NaOH Solution
- Dilute ethanoic acid solution
- Lemon juice
- Water
- Dilute sodium carbonate solution by using pH paper/ universal indicator.

Experiment – 4

To study the properties of acids (dil HCl) by their reactions with:

- Litmus solution (Red/Blue)
- Zinc metal
- Sodium carbonate.

Experiment – 5

To study the properties of bases (dil NaOH sol) by their reactions with:

- Litmus solution
- Zinc metal
- Solid sodium carbonate
- Phenolphthalein.

MCQ questions on practical skills

July**Chapter 3: Metals and non-metals**

Physical properties of metals and non-metals, chemical properties of metal, reactivity series, properties of ionic compounds, various metallurgical processes, corrosion, prevention of corrosion.

Various metallurgical processes, corrosion, prevention of corrosion.

Activities:

- Reaction of metals with water.
- Rusting of iron.
- Reaction of Zn with CuSO_4 .

Practical**Experiment - 6:**

(a) To observe the action of Zinc, iron, copper and aluminium on the following salt solutions:

- (i) ZnSO_4 (aq)
- (ii) FeSO_4 (aq)
- (iii) CuSO_4 (aq)
- (iv) $\text{Al}_2(\text{SO}_4)_3$ (aq)

(b) Arrange Zn, Fe, Cu and Al in the decreasing order of reactivity based on the above result.

MCQ questions on practical skills

August**Chapter 4: Carbon and its compounds**

Nomenclature of carbon compounds, bonding in carbon- the covalent bond, versatile nature of carbon, saturated and unsaturated carbon compounds.

Chains, branches and rings, homologous series, properties of alcohols and carboxylic acids,

September

soap-cleansing action of soap.

Practical**Experiment - 7**

To study the following properties of acetic acid:

- (i) Colour
- (ii) Solubility in water
- (iii) Effect on litmus
- (iv) Reaction with sodium carbonate

MCQ questions on practical skills

Experiment - 8

Preparation of soap using Castor oil and NaOH.

Testing its behavior with hard and soft water and other properties.

October**Chapter 5: Periodic classification of elements**

Early attempts at the classification of elements: Dobereiner's triads, Newland's law of octaves, Mandeleev's periodic table, achievements of Mandeleev's periodic table, limitation of Mandeleev's classification, Modern periodic table, position of elements in the modern periodic table, trends in the modern periodic table: valency, atomic size, metallic and non-metallic properties.

November**Chapter 14: Sources of energy**

Conventional sources of energy : fossil fuels, thermal power plant , hydro power plant , biomass and wind energy .

Revision

PRACTICALS

- 1) Observation of following and classifying into kind of reaction
 - (i) Action of water on Quick lime
 - (ii) Action of heat on FeSO_4 crystals
 - (iii) Iron nails kept in CuSO_4 solution.
 - (iv) Reaction between Na_2SO_4 and BaCl_2 solutions
- 2) Finding pH of Dil .HCl solution, Dil. NaOH solution , Dil. Ethanoic acid solution , lemon juice , water, dil. Sodium carbonate solution
- 3) Study the reaction of dil. HCl with litmus solution (Red/ Blue), Zinc metal, Sodium carbonate
- 4) Study the properties of bases with litmus solution, zinc metal, sodium carbonate, phenolphthalein.
- 5) Observing the action of Zn, Fe, Cu and Al on ZnSO_4 , FeSO_4 , CuSO_4 and $\text{Al}_2(\text{SO}_4)_3$ solutions. Based on these, arrange the metals in the reactivity series.
- 6) To study the following properties of acetic acid:
 - (i) Colour
 - (ii) Solubility in water
 - (iii) Effect on litmus
 - (iv) Reaction with sodium carbonate
- 7) Preparation of soap
 - Study of prepared soap on following parameters
 - Lather formation with hard and soft water and its comparison.

Rubric:

- | | |
|--|---|
| (i) Aim | 1 |
| (ii) Apparatus | 1 |
| (iii) Theory and diagram | 2 |
| (iv) Observation and performing skills | 4 |
| (v) Inference drawn | 1 |
| (vi) Precautions | 1 |

Chapter No. 1

Chemical Reactions and equations (I)

(Multiple choice questions)

- Q1. A solution of a substance in water is denoted by-
- 1) (l) 2) (s) 3) (aq) 4) (w)
- Q2. $x \text{ Cl}_2 (\text{g}) + y \text{ KI} (\text{aq}) \rightarrow z \text{ KCl} (\text{aq}) + \text{I}_2 (\text{s})$ What are x, y and z respectively?
- 1) 1, 2, 3 2) 1,2,1 3) 1,2,2 4) 1,1,2
- Q3. $2 \text{ HCl} + \text{Zn} \rightarrow \text{ZnCl}_2 + \text{H}_2$ is an example of ----- reaction.
- 1) Oxidation 2) Reduction 3) Combination 4) Displacement
- Q4. Which of the following metals do not corrode in moist air?
- 1) Copper 2) Iron 3) Gold 4) Silver
- Q5. The removal of oxygen from a substance is called
- 1) oxidation
2) Corrosion
3) reduction
4) rancidity
- Q6. What happens when dilute hydrochloric acid is added to iron filings?
- 1) Hydrogen gas and iron chloride is produced.
2) Chlorine gas and iron hydroxide are produced.
3) No reaction takes place.
4) Iron salt and water are produced.
- Q7. Oxidation of fatty substances in food is prevented by
- 1) Galvanisation
2) Electroplating
3) Antioxidants
4) Oxidation

Q8 An iron nail is kept immersed in a solution of copper sulphate for three hours. When it was taken out of the copper sulphate solution, it was found to acquire a brown colour. This brown colour is

1. due to the rusting of the iron nail.
2. oxidation of iron due to iron oxide.
3. due to deposition of copper metal on iron nail.
4. due to conversion of iron to iron sulphate.

Q9 $\text{Fe}_2\text{O}_3 (\text{s}) + \text{Al} (\text{s}) \rightarrow 2\text{Fe} (\text{s}) + \text{Al}_2\text{O}_3 (\text{s})$. This reaction is an example of

- 1) combination reaction
- 2) double decomposition reaction
- 3) decomposition reaction
- 4) displacement reaction

Q10 $\text{Mg} (\text{s}) + \text{CuO} (\text{s}) \rightarrow \text{MgO} (\text{s}) + \text{Cu} (\text{s})$

The equation represents

- 1) decomposition reaction as well as displacement reaction.
- 2) redox reaction as well as displacement reaction.
- 3) double displacement reaction as well as redox reaction
- 4) combination reaction as well as double displacement reaction.

Assignment

Q1. Explain Thermal Decomposition and Photolytic decomposition reactions with example. .

Q2. Balance the following equations :-



Q3. What happens

i) when quicklime is added to water?

ii) Zinc metal is dipped in copper sulphate solution .

Q4. Translate the following into balanced chemical equations :

1) Steam is passed over heated iron to form magnetic oxide of iron (Fe_3O_4) and hydrogen.

2) Carbon disulphide burns in air to give carbon dioxide and sulphurdioxide .

3) Magnesium burns in presence of Nitrogen to form Magnesium nitride.

Q5. With the help of an activity show the displacement reaction of zinc granules and dilute hydrochloric acid.

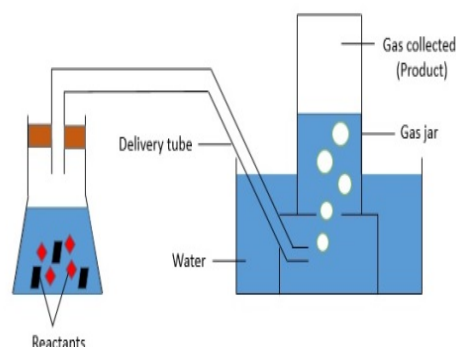
Q6. A metal is treated with dilute sulphuric acid .The gas evolved is collected by the method shown in the figure. Answer the following

(i) Name the gas.

(ii) Name the method of collection of the gas.

(iii) Is the gas soluble or insoluble in the water?

(iv) Is the gas lighter or heavier than air?



Q7. When hydrogen burns in oxygen, water is formed and when water is electrolysed, then hydrogen and oxygen are produced. What type of reaction takes place

- a) in the first case.
- b) in the second case.

Give equations.

Q8. Give one example of a redox reaction which is also

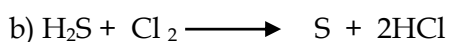
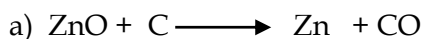
- 1) a combination reaction
- 2) a displacement reaction.

Q9. a) Define a combination reaction.

b) Give one example of a combination reaction which is also an endothermic reaction.

c) Give one example of a combination reaction which is also an exothermic reaction.

Q10 Identify the component oxidised in the following reactions



Chapter No- 2**Acids, bases and salts (I)****(Multiple choice questions)**

- Q1. Which amongst the following can be used as an antacid ?
- 1) Vinegar
 - 2) Milk of magnesia
 - 3) Calcium hydroxide
 - 4) Sodium hydroxide
- Q2. Tooth decay starts when the pH of the mouth is lower than
- 1) 10
 - 2) 8
 - 3) 7
 - 4) 5.5
- Q3. When a base is dissolved in water
- 1) concentration of OH^- ions per unit volume increases.
 - 2) concentration of OH^- ions per unit volume decreases.
 - 3) concentration of OH^- ions per unit volume may increase or decrease depending upon the nature of the base .
 - 4) no change in concentration of OH^- ions per unit volume occurs.
- Q4. Wasp stings can be treated with
- 1) vinegar
 - 2) clove oil
 - 3) baking soda solution
 - 4) Washing soda
- Q5. The sting of ants and bees contains
- 1) formic acid
 - 2) acetic acid
 - 3) slaked lime
 - 4) sodium hydroxide

- Q6. The oxides of metals are
1) neutral 2) basic 3) acidic 4) none of these.
- Q7. Large deposits of sodium chloride in the form of brown crystals is called
1) salt petre 2) alum 3) soda 4) rock salt
- Q8. The salt whose aqueous solution will turn blue litmus red
a) Ammonium sulphate b) sodium acetate
c) sodium chloride d) Potassium carbonate
- Q9. Solutions A, B, C and D have pH 3, 4, 6 and 8. The solution with highest acidic strength is
1) A 2) B 3) C 4) D
- Q10. Methyl orange is
1) Yellow in acidic medium and red in basic medium
2) Red in acidic medium and yellow in basic medium
3) Colourless in acidic medium and red in basic medium
4) Red in acidic medium and Colourless in basic medium

Assignment

- Q1. What is an indicator? Name three common indicators and their effect on acids and bases.
- Q2. Crystals of a substance changed their colour on heating in a closed vessel but regained it after some time when they were allowed to cool down .Name one such substance .
- Q3. Identify the compound of calcium which is yellowish white powder and is used for disinfecting drinking water. How it is manufactured? Write chemical equations for the reactions involved. What happens when it is left exposed to air?
- Q4. With the help of an activity show that hydrochloric acid solution conducts electric current.
- Q5. Name the products obtained after the electrolysis of aqueous sodium chloride?
(Give the reaction involved)
- Q6. Give reasons;
- Acid must be added to water and not vice versa during dilution.
 - Solution of sulphuric acid conducts electricity whereas alcohol does not.
 - Cake rises on adding baking powder.
 - Dry ammonia gas has no action on litmus paper, but a solution of ammonia in water turns red litmus blue.
 - Tartaric acid is an important ingredient of baking powder.
- Q7. Identify the compound of calcium which is used for plastering of fractured bones. With the help of chemical equation show how it is prepared. What special precautions should be taken during the preparation of this compound?
- Q8. Write balanced equations for the following reactions ;
- Dilute sulphuric acid reacts with aluminium powder.
 - Dilute hydrochloric acid reacts with iron fillings.
 - Dilute sulphuric acid is added to solid sodium carbonate.

Q9. Baking soda is used in small amount in making bread and cake. It helps to make these soft and spongy. An aqueous solution of baking soda turns red litmus blue. It is also used in soda - acid fire extinguisher.

- 1) How does baking soda helps to make cakes and bread soft and spongy?
- 2) How does it help in extinguishing fire?
- 3) Is the pH of baking soda solution less than or greater than 7.

Q10. Write balanced equations for the preparation of the following salts -

- 1) NaNO_3
- 2) K_2SO_4
- 3) $\text{Al}(\text{NO}_3)_3$

FUN WITH CHEMISTRY

Make Sloppy Slime

Slime that can't make up its mind – one minute it's oozing like a liquid, the next it's acting like a tough solid.

Steps:

1. Pour some corn flour in the bowl.
2. Add a little of the food colouring to the water. (Food colouring can stain so be very careful).
3. Slowly stir in some of the coloured water in with the corn flour (adding a few drops at a time).
4. Continue to stir with the wooden until it starts to thicken to a paste. You may find that you need to add more water or corn flour to get the right mix.
5. Take a handful and watch it ooze out of your hand. It flows like a slippery liquid.
6. Squeeze the slime and it becomes a solid.

THIS EXPERIMENT CAN BE VERY MESSY, SO PLEASE TAKE CARE AND BE PREPARED!!!

Rocket Cola

Materials you will need:

- Outside access
- Packet of Mint Mentos
- 2 Litre Bottle of Diet Coke

This is a very messy experiment so it really does need to be conducted outside on a nice day. Do not do this experiment inside.

Steps:

- 1.) Place the 2L bottle of Diet Coke on a flat surface and in a secure place outside.
- 2.) Remove the lid from the bottle of Diet Coke.
- 3.) Remove 4 mentos from the packet and get ready to drop all four of them into the bottle of Diet Coke as quickly as possible and jump back out of the way of the shooting rocket.

It is amazing how quickly the mentos react with the Diet Coke and the amount of pressure build up that is released by spewing the cola into the sky.

Try doing this experiment with a smaller cola bottle and dropping in two mintos.

Another way is to do this experiment is to get an adult to put a small hole in the lid so that the cola can shoot out the top of the hole. If you try this experiment use peppermint lifesavers, extra strong mints or polo mints. Drop the mint in, screw the lid back on the bottle, shake it and hold it at an angle pointing away from you. Shake the cola bottle a few more times to see how many time you can get it to rocket out of the bottle.

Surface Tension Experiment

Materials you will need:

- Water
- A Bowl
- Liquid Dish Soap
- Wooden Matchsticks

Steps:

1. Fill a bowl with water and place a few matchsticks on the water.
2. Drop in a small amount of dish soap into the centre of the bowl and watch the matches shoot across the surface of the water like power boats.

It works because the soap gives off an oily film that rushes outwards, breaking down the surface tension of the water and pushing the matches away.

Bobbing Raisins

Materials you will need:

- A Clear Glass/Jar
- Carbonated Drink (Clear)
- A Handful (4-6) of Raisins

Steps:

1. Pour the carbonated drink into the glass/jar.
2. Drop the raisins into the glass/jar.

What to see what happens to the raisins!!!

The bobbing up and down works because the bubbles of carbon dioxide gas in the drink are much less dense than the drink or the raisins.

Once the raisins start bobbing up and down, they will continue to rise and fall for about an hour.

-Raisins are denser than the carbonated drink, so they will sink.

-Gas bubbles attach to the wrinkles on the raisins.

-When the raisins are covered with the bubbles they become less dense than the drink, so they start to rise.

-The gas bubbles start bursting and then the raisins become denser than the drink, so they sink again.

Chapter No. 3
Metals and Non Metals (I)
(Multiple choice questions)

Q1. Which of the following metal forms amphoteric oxides?

- 1) Copper
- 2) Silver
- 3) Aluminium
- 4) Iron

Q2. Aqua regia is a mixture of

- 1) HNO_3 and HCl in the ratio of 1:3 by volume
- 2) HNO_3 and HCl in the ratio of 3:1 by volume
- 3) HNO_3 and HCl in the ratio of 1:1 by volume
- 4) H_2SO_4 and HCl in the ratio of 1:3 by volume

Q3. A basic oxide will be formed by the element

- 1) Aluminium
- 2) Sulphur
- 3) Krypton
- 4) nitrogen

Q4. Which of the following metals is protected from oxygen and moisture by immersing in kerosene oil?

- 1) Potassium
- 2) Aluminium
- 3) Magnesium
- 4) silver

Q5. Which of the following metal will not displace H_2 gas from dilute H_2SO_4

- 1) zinc
- 2) iron
- 3) copper
- 4) aluminium

Q6. Among the metals poorest conductor of heat is

- 1) Lead
- 2) Tin
- 3) Bismuth
- 4) Mercury

Q7. The common method for the extraction of metals from the oxide ore is

- 1) Reduction with carbon
- 2) Electrolytic method
- 3) Reduction with aluminium
- 4) All of these

Q8. The best conductor of electricity is

- 1) Copper
- 2) Aluminium
- 3) Silver
- 4) All are equal

Q9. Stainless steel in addition to iron contains

- 1) nickel and chromium
- 2) copper and tin
- 3) aluminium and magnesium
- 4) carbon and manganese

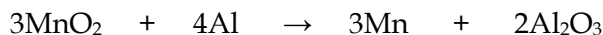
Q10. Which of the following oxide cannot be reduced with carbon to obtain metal?

- 1) MnO_2
- 2) Cr_2O_3
- 3) Al_2O_3
- 4) All of these

Assignment

Q1. An element on burning in air forms an oxide XO_2 which when dissolved in water turns blue litmus red. Identify if 'x' is a metal or a non metal. Justify your answer.

Q2. Name the reducing agent in the reaction



For the reduction of metal oxide to metal, suggest a reducing agent cheaper than aluminium

Q3. Give reason:

- (i) Metals are regarded as electropositive metals.
- (ii) Aluminium which is more reactive than iron does not corrode like iron.
- (iii) When a piece of copper metal is added to a solution of zinc sulphate, no change takes place, but the blue colour of copper sulphate fades away when a piece of zinc is placed in its solution.
- (iv) Aluminium cannot be extracted by using carbon as a reducing agent.
- (v) Ionic compounds in solid state do not conduct electricity and they do so in molten state.
- (vi) When calcium is added to water, the gas evolved does not catch fire but the same gas evolved on adding sodium metal to water catches fire.

Q4. Name a metal which does not react with cold water as well as hot water but reacts with steam. Give the reaction involved.

Q5. Describe with the help of a labeled diagram the method of refining of copper by electrolytic method

Q6. How are the less reactive metals extracted? Explain with the help of an example.

Q7. An ore on heating in the absence of air gives carbon dioxide. Which method will you use to convert the ore into oxide form? Explain.

Q8. What are amphoteric oxides? Show by giving equations that Aluminium oxide is an amphoteric oxide.

Q9. What are alloys? What properties of alloys make it useful over pure metals. Explain with examples.

Q10. Show the formation of Na_2O by the transfer of electrons between the combining atoms.

Amazing Facts about gold

The Istana Nurul Iman palace domes are made of gold-leaf. It is the official residence of the Sultan of Brunei, Hassanal Bolkiah.

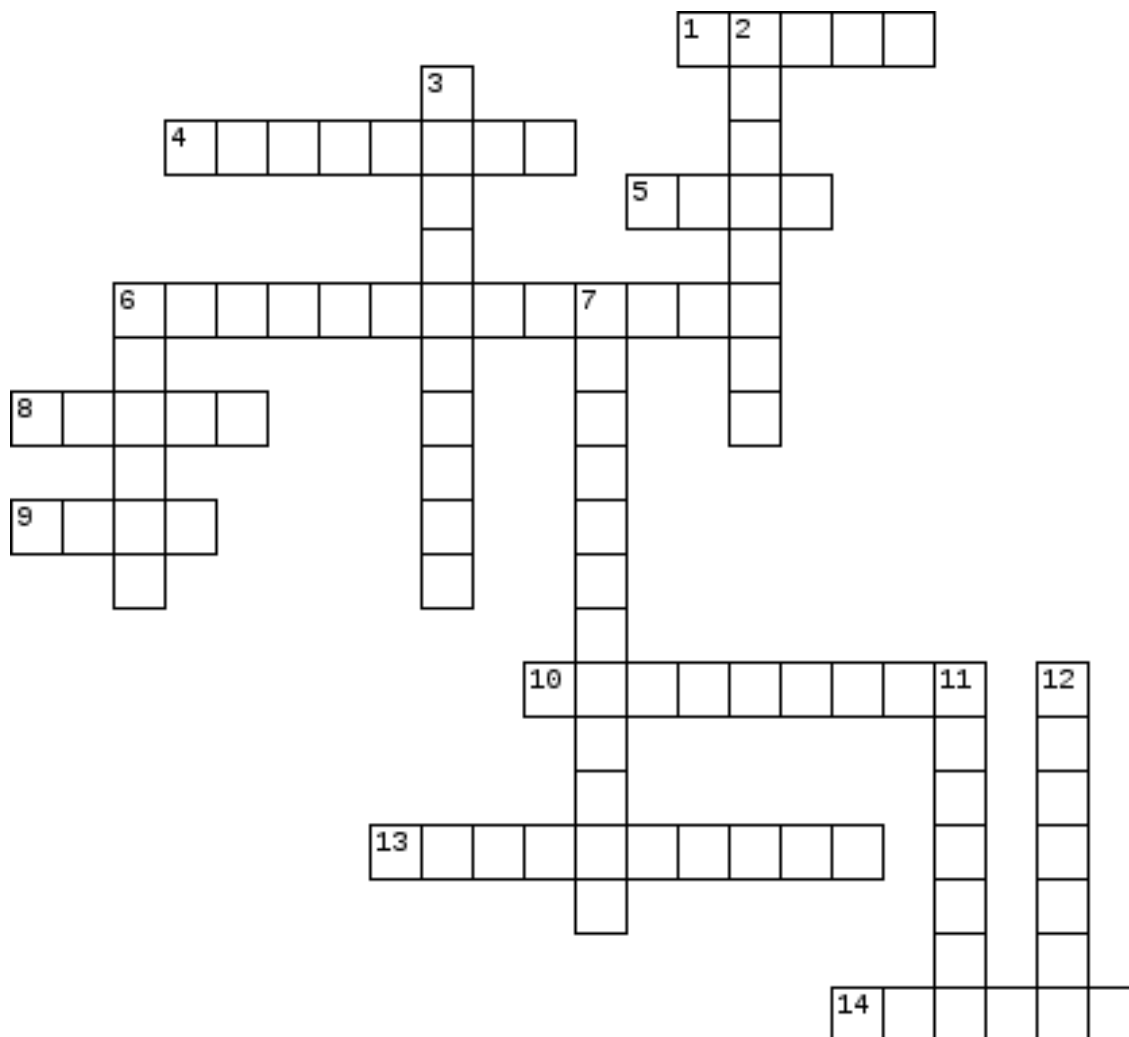
Gold is the most malleable and ductile metal; a single gram can be beaten into a sheet of one square meter, or an ounce into 300 square feet.

Uses of Gold

1. Gold is the most popular metal used in [jewelry making](#). Here are some other uses of this precious metal.
2. McLaren F1 uses gold foil in the engine compartment
3. Gold is used in astronauts' helmets
4. Gold can be used in food. Goldwater, traditional herbal liquor produced in Poland and Germany, contains flakes of gold leaf. There are also some expensive (\$1000) cocktails which contain flakes of gold leaf.
5. Gold is used in the connectors of expensive electronics cables, like audio, [video](#) and USB cables
6. Gold is used in computers, communications equipment, spacecraft, and jet aircraft engines
7. Colloidal gold (also known as "nanogold", is a suspension (or colloid) of sub-micromete-sized particles of gold in a fluid - usually water) is used in [research](#) applications in medicine, biology and materials science. Colloidal gold is also the form of gold used as gold paint on ceramics prior to firing.
8. It is used for the protective coatings on many [artificial satellites](#)
9. It is used in infrared protective faceplates in thermal protection suits
10. It is used in electronic warfare planes like the EA-6B Prowler
11. Gold is used as the reflective layer on some high-end CDs
12. The isotope gold-198 is used in some cancer treatments and for treating other diseases
13. Gold leaf, flake or dust is used on and in some gourmet foodstuffs, notably sweets and drinks as decorative ingredient
14. Gold alloys are used in restorative dentistry, especially in tooth restorations, such as crowns and permanent bridges
15. Gold can be made into thread and used in embroidery

ENJOY THE CROSSWORD

<i>Across Clues</i>	<i>Down Clues</i>
1. One characteristic of metals is that they have?	2. Salt forming elements are also known as?
4. The type of element that is a poor conductor of heat and electricity	3. The periodic table is not based on:
5. I have 26 protons	6. I am a horizontal row
6. I am a list of all known elements	7. What are group one elements known as?
8. The number of valence electrons that boron has?	11. I am a metal and a liquid at room temperature.
9. I am the element in period 2, group 18	12. The vocabulary term used that states: Can be stretched into wire
10. I am a metalloid	
13. The type of elements that have characteristics of both metals and nonmetals	
14. I am a gas with 8 protons	



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Chapter No. 4
Carbon and Its Compounds (I)
(Multiple choice questions)

Q1. Detergents are sodium or potassium salts of long chain

- 1) Aldehydes
- 2) Ketones
- 3) Carboxylic acids
- 4) Sulphonic acids

Q2. Which of the following compounds have a triple bond?

- 1) C_2H_6
- 2) C_3H_8
- 3) C_3H_4
- 4) C_3H_6

Q3. The difference in the formula and molecular masses of CH_3OH and C_2H_5OH is

- 1) CH_3 and 16u
- 2) CH_2 and 14u
- 3) CH_4 and 18u
- 4) CH_3 and 16u

Q4. The number of covalent bonds in C_4H_{10} is

- 1) 10
- 2) 8
- 3) 13
- 4) 12

Q5. Which of the following is added to denature ethanol?

- 1) Methanol
- 2) Pyridine
- 3) Copper sulphate
- 4) All of these

Q6. Ethene is produced when

- 1) Ethanol reacts with ethanoic acid in the presence of a few drops of conc. H_2SO_4
- 2) Ethanol is oxidized with acidified potassium dichromate
- 3) Ethanol is heated with excess of conc. H_2SO_4 at 443K
- 4) Ethanol reacts with Na metal

Q7. The difference between molecular mass of any two adjacent homologues is-----

1) 14 u 3) 16 u

2) 12 u 4) 3 u

Q8. The general formula of alcohols is

- 1) $\text{C}_n\text{H}_{2n+2}$
- 2) $\text{C}_n\text{H}_{2n+1}\text{OH}$
- 3) C_nH_{2n}
- 4) $\text{C}_n\text{H}_{2n+2}\text{COOH}$

Q9. The allotrope of carbon containing 60 carbon atoms is

- 1) fullerene
- 2) graphite
- 3) diamond
- 4) coal

Carbon and Its Compounds (II)C.W. ASSIGNMENT

Answer the following

Give the molecular formula and IUPAC names of the following organic compounds:

- a) An alkyne containing 3 carbon atoms

- b) An alcohol containing 5 carbon atoms

- c) An aldehyde containing 3 carbon atoms

- d) Simplest ketone

- e) An alcohol used in cough syrups.

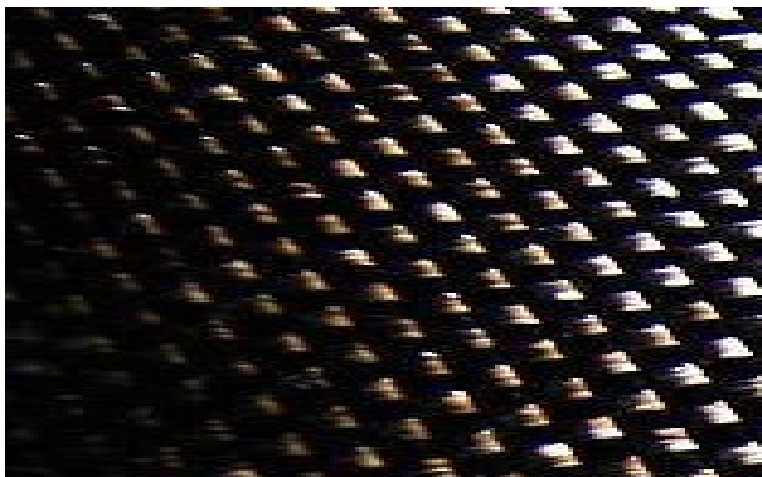
- f) A carboxylic acid used as a preservative.

g) A saturated hydrocarbon containing 4 carbon atoms.

h) A cyclo alkane containing 3 carbon atoms.

i) An aromatic compound.

A few facts about carbon fibre



Carbon fibre is a lightweight yet strong substance. Many things from sports equipment like golf clubs and tennis racquets to sports cars use carbon fibre. Carbon fibre is easily identifiable by its unique chequered appearance.

What is carbon fibre?

Carbon fibre is a material that is made from very thin fibres having carbon atoms. These are bonded together in microscopic crystals, aligned parallel to the long axis of the fibre. It is this crystal alignment that makes carbon fibre so strong. Carbon fibre is used to make composite materials with plastics resins. Carbon fibre has the strength of steel, yet is lightweight. It also does not expand when heated due to its high heat resistance. When stretched or bent, carbon fibre is very strong, but if you subject it to high shock or compression, such as hitting it with a hammer it will break. Carbon fibre has the best weight to strength ratio.

The first carbon fibres

You might be surprised to know that carbon fibre is by no means a recent discovery.

1. Thomas Edison used carbon fibre filaments in his early light bulb experiments back in 1879. He created these fibres by heating bamboo in a controlled environment. The carbon fibre Edison carbon made was from cellulose-based materials, today it is made from petroleum bases. The carbon fibres that Edison

made out of the bamboo fibres were fire resistant, making it ideal for his filament for incandescence.

The carbon fibres that Edison made out of the bamboo fibres were fire resistant, making it ideal for his filament for incandescence.

2. Later in 1958 Roger Bacon would try to make carbon fibres from strands of rayon but these fibres were not very strong. It was only later in 1963 that the Royal Aircraft Establishment at Farnborough, Hampshire UK developed strong carbon fibre. Rolls Royce used this in their aeroplane engines.

3. Today carbon fibre is made from the polymer PAN. Once this polymer is produced it is stretched in a manner that it becomes parallel to the axis of the fibre. This polymer is then oxidised at a temperature of 200°C to 300°C to remove hydrogen and add oxygen to the molecule. The polymer is further purified by carbonisation, done by heating it to a temperature of 2500°C in a nitrogen rich environment. The result depends on the quality of the fibre and is a polymer having more than 90% carbon in it. The final step in the manufacture of carbon fibre is called sizing. Here the fibres are weaved into sheets and embedded in an epoxy resin. What you get in the end is the characteristic black carbon fibre sheet which you can use to make a variety of things.

Types of carbon fibre compounds and their uses

Carbon fibre compounds are very expensive compounds. Different types of carbon fibre compounds can be used for a variety of purposes.

For high temperature applications, carbon fibre reinforced graphite is ideal.

Carbon fibre can be used to filter high temperature gases as a corrosion resisting electrode with an anti-static component.

Carbon fibre compounds with metals are avoided as the combination forms metal carbides. The metals in these compounds eventually corrode. Today carbon fibre is even having applications in the field of medicine. Carbon fibres are used to complement regular skin for skin grafts.

Periodic classification of elements

At present 114 elements are known to us all these have seemingly different properties. To make the study of elements easy and systematic they have been classified based on their properties.

Early attempts at the classification of elements

1. Dobereiner's triads

In 1817 Johann Dobereiner tried to arrange the elements with similar properties into groups these were called **triads** he showed when three elements of any particular triad were arranged in order of their increasing atomic masses the atomic mass of the middle element was roughly the average of the atomic masses of the other two elements.

Element	Symbol	Atomic mass	Average atomic masses of Li and K= $(6.9+39)/2=22.95u$
Lithium	Li	6.9u	
Sodium	Na	23.0u	
Potassium	K	39.0u	

Group A element	Atomic mass	Group B element	Atomic mass	Group C elements	Atomic mass
N	14.0	Ca	40.1	Cl	35.5
P	31.0	Sr	87.6	Br	79.9
As	74.9	Ba	137.3	I	126.9

Limitations

Could not be applied to all the elements known at that time

New land's law of octaves.

In 1866 John Newland arranged then known elements in order of increasing atomic masses he started with hydrogen and ended with Thorium which was the 56th element

He observed that when elements were arranged in order of increasing relative atomic masses the properties of every 8th element were similar to the first one like the 8th note of a musical octave.

Table 5.3 Newlands' Octaves

Notes of music:	1st (do)	2nd (re)	3rd (mi)	4th (fa)	5th (so)	6th (la)	7th (ti)
	H	Li	Be	B	C	N	O
	F	Na	Mg	Al	Si	P	S
	Cl	K	Ca	Cr	Ti	Mn	Fe
	Co and Ni	Cu	Zn	Y	In	As	Se
	Br	Rb	Sr	Ce and La	Zr	—	—

limitations

1. The law was applicable to only lighter elements up to Ca.
2. When more elements were discovered their properties did not fit into the law of octaves.
3. He placed some unlike elements in the same column like Co and Ni are placed with F and Cl and Fe is placed separately.
4. After the discovery of noble gases the properties of the 8th and the first were no longer similar.

Mendeleev's periodic law

Mendeleev a Russian chemist is the most important contributor to the early development of periodic table of elements. when he started his work 63 elements were known he studied the relation ship between the atomic masses of the elements and their physical and chemical properties.

Among chemical properties he concentrated on the compounds formed by oxygen and hydrogen as they are very reactive and form compound with most elements. The formula of the hydrides and oxides formed by an element were treated as one of the basic properties of an element for its classification.

Mendeleev stated the law

"The physical and chemical properties of elements are a periodic function of their atomic masses"

features of mendeleev's periodic table

1. The table contains vertical columns called **groups (8)**
2. horizontal rows called **periods. (7)**

Table 5.4 Mendeleev's Periodic Table

Group	I		II		III		IV		V		VI		VII		VIII			
oxide	R ₂ O		RO		R ₂ O ₃		RO ₂		R ₂ O ₅		RO ₃		R ₂ O ₇		RO ₄			
hydride	RH		RH ₂		RH ₃		RH ₄		RH ₅		RH ₆		RH					
Periods	A	B	A	B	A	B	A	B	A	B	A	B	A	B	Transition series			
H	1.008																	
Li	Be		B		C		N		O		F		Ni					
	6.939		9.012		10.81		12.011		14.007		15.999		18.998					
Na	Mg		Al		Si		P		S		Cl		Ni					
	22.99		24.31		29.98		28.09		30.974		32.06		35.453					
K	Ca		Sc		Ti		V		Cr		Mn		Fe		Co			
	39.102		40.08		44.96		47.90		50.94		50.20		54.94		58.93			
Cu	Zn		Ga		Ge		As		Se		Br		Ni					
	63.54		65.37		69.72		72.59		74.92		78.96		79.909					
Rb	Sr		Y		Zr		Nb		Mo		Tc		Ru		Rh			
	85.47		87.62		88.91		91.22		92.91		95.94		99		102.91			
Ag	Cd		In		Sn		Sb		Te		I		Ni					
	107.87		112.40		114.82		118.69		121.75		127.60		126.90					
Cs	Ba		La		Hf		Ta		W		Os		Ir		Pt			
	132.90		137.34		138.91		178.49		180.95		183.85		190.2		192.22			
Au	Hg		Tl		Pb		Bi											
	196.97		200.59		204.37		207.19		208.98									

Achievements

1. He took atomic mass as a fundamental base for classification of elements.
2. Blank gaps were left in the table for those elements which were not known at that time and later on they would be easily fit in the blanks without disturbing it for instance scandium, gallium and germanium discovered later have properties similar to eka-boron, eka-aluminium and eka-silicon respectively.
3. Noble gasses were discovered later on which were placed in a new group without disturbing the existing order.

Limitations

1. Position of isotopes could not be explained.
2. Anomalous position of hydrogen .
3. Wrong order of atomic masses of some of the elements could not be explained.
(Position of Argon (40) and Potassium (39))
4. Uncertainty in prediction of new elements.

Modern periodic table

In 1913 Henry mosley stated

“The chemical and physical properties of elements are a periodic function of their atomic numbers”

When the elements are arranged in order of increasing atomic numbers they show periodicity in properties.

Characteristics of long form periodic table.

1. There are 18 vertical columns called groups.
2. 7 horizontal rows called periods.
 - 1st period – shortest period
 - 2nd and 3rd -short
 - 4th and 5th –long
 - 6th -longest period
 - 7th – incomplete

- 1) In a group all elements contain the same number of valence electrons.
- 2) The number of shells increases as we go down the group .
- 3) In a period the elements do not have the same number of valence electrons , but they contain the same number of shells
- 4) The number of valence electrons increases by one unit, as the atomic number increases on moving from left to rt in a period .
- 5) The valence electrons determine the kind of bonds formed by an element.

LONG FORM OF THE PERIODIC TABLE

GROUPS
PERIODS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IA	IIA	IIIA	IVB	VB	VIB	VIIIB	VII	IB	IIB	IIIA	IVA	VVA	VIA	VIIA	VIIIA	0	

OLD NOS. → IA, IIA, IIIA, IVB, VB, VIB, VIIIB, VII, IB, IIB, IIIA, IVA, VA, VIA, VIIA, 0
MODERN GROUP NOS. → 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

ATOMIC NUMBER → 26
SYMBOL → Fe
NAME → Iron

NON-METALS

REPRESENTATIVE ELEMENTS

METALS

NON-METALS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H Hydrogen	2 He Helium	3 Li Lithium	4 Be Beryllium	5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon	11 Na Sodium	12 Mg Magnesium	13 Al Aluminium	14 Si Silicon	15 P Phosphorus	16 S Sulphur	17 Cl Chlorine	18 Ar Argon
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon
55 Cs Caesium	56 Ba Barium	57 La Lanthanum	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
87 Fr Francium	88 Ra Radium	89 Ac Actinium	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Uu Ununium	111 Uuq Ununium	112 Uub Unbinium	113 Uut Ununtrium	114 Uuq Ununquadium	115 Uup Ununpentium	116 Uuq Ununhexium	117 Uuh Ununheptium	118 Uuo Ununoctium

58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium
90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium

Achievements.

1. Could explain the position of isotopes
2. Could explain wrong order of atomic masses of certain elements.

Trends in the modern periodic table

1) **Valency** - It is determined by the number of valence electrons present in an atom.

In case of metals

Valency = no. of valence electrons

Mg (12) 2,8,2 valency is 2

In case of non metals

Valency = 8- no. of valence electrons

S = 16 2,8,6, valency is $8 - 6 = 2$

In a period valency increases from 1 to 4 and then decreases to 0 .

In a group valency remains the same .

2) **Atomic size** - It refers to the radius of an atom , which is the distance between the centre of the nucleus and the outermost shell .

In a period on moving from left to right atomic size decreases .

In a group on going down the size increases gradually .

3) **Metallic and nonmetallic character** -

In a period the metallic character decreases while the nonmetallic character increases.

In a group amongst the metals the metallic character increases down the group .

In non metals the non metallic character decreases

Chapter No- 5

Periodic classification of elements (I)

(Multiple choice questions)

- Q1. Which of the following decreases across the period?
- (1) Electronegativity (2) Atomic radius
(3) Non - metallic character (4) None of these
- Q2. The atomic radius decreases as we move across a period because
- 1) atomic mass increases
2) atomic number increases
3) effective nuclear charge increases
4) additive electrons are accommodated in the new electron level
- Q3. Which of the following remain unchanged on moving down the group in a periodic table
- 1) Valance electrons
2) Atomic size
3) Density
4) Metallic nature
- Q4. The two elements for which Mendeleev left blank places in his original periodic table were:
- (1) Si, Ti (2) Ga, Ge
(3) Al, Ga (4) As, Sb
- Q5. Which of the following is a metalloid?
- (1) Sulphur (2) Silicon
(3) Sodium (4) Aluminium
- Q6. _____ element has electronic configuration of 2, 8, 2.
- (1) Calcium (2) Beryllium
(3) Strontium (4) Magnesium
- Q7. Elements A, B and C form a Dobereiner's triad. If the atomic mass of A is 7 and that of C is 39. What is the atomic mass of the element B?
- 1) 23 2) 46 3) 32 4) 22

- Q8. The noble gas having duplet electrons is
- | | |
|------------|-----------|
| (1) Helium | (2) Neon |
| (3) Argon | (4) Xenon |
- Q9. Atomic number is a more fundamental property than atomic mass. This was emphasized by
- 1) Doberenier
 - 2) Bohr
 - 3) Moseley
 - 4) Mendeleev
- Q10. Which of the following elements belong to the same group?
- 1) Na, Mg, Al
 - 2) Li, Be, Al
 - 3) O, S, Cl
 - 4) F, Cl, Br

Periodic classification of elements (II)**(C.W . ASSIGNMENT)**

- Q1 The reactivity of non-metals _____ down the group.
- Q2. Non- metallic character _____ from left to right in a period.
- Q3. Size of Na^+ is _____ than Na atom .
- Q4. Atomic size _____ from left to right in a period.
- Q5. Group 2 elements are known as _____ .
- Q6. Which one of the halogens have highest non-metallic character?
- Q7. Group 17 elements are called _____ .
- Q8. Group 18 elements are _____ valent .
- Q9. Name two elements whose valences are equal to their group number.
- Q10. An element belongs to 2nd period and group 14. Is it a metal or a non-metal? Why?

(C.W Assignment)

- Q1. What are periods and groups?
- Q2. State modern periodic law.
- Q3. Name the first and last member of the third period
- Q4. Name the following
- The sum of the number protons and neutrons in the atoms.
 - Most electro negative element.
 - Most electro positive element.
- Q5. Given below is a list of elements that form the periodic table:
S, Al, C, Ar, Mg, F, O and B
- Choose from the above list,
- the most metallic element
 - the most electronegative element
 - elements of period 3 of the periodic table

4) elements of group 16 of the periodic table

Q6. An element has atomic no 17. Predict its

- a) Valency
- b) Group number
- c) Whether it is a metal or non-metal
- d) Nature of the oxide found
- e) Name of the element

Q.7 Two elements with symbol X (atomic no. 11) and Y (atomic no. 13) are placed in the III period of the modern periodic table -

(i) Which amongst the two has more metallic character?

(ii) Calculate the valency of each element.

(iii) Element 'Y' is smaller than 'X' in terms of atomic size. Is the statement true, justify?

Q8.

a) What happens to the size of the atom down the group.

b) Classify the following elements as metal, non-metal and metalloid :

(i) Calcium

(ii) Sulphur

c) Explain how the tendency to form electropositive ions change on moving down a group ?

Q9. In the table given below some of the elements are placed in their correct positions and others are represented by hypothetical letters.

1	2	13	14	15	16	17	18
Li	A	B	Carbon	C	D	E	F
I			G		Sulphur	L	argon
J			H			M	
K						N	

- Which of these has smallest radius?
- Which of these has electronic configuration (2,8,4)?
- What is the electronic arrangement of J?
- Name the family of the elements represented by E, L, M, and N.
- Which of these is an alkaline earth metal?

Q10. Two elements 'P' and 'Q' belong to the same period of the modern periodic table and are in Group-1 and Group - 2, respectively. Compare their following characteristics in tabular form

- The number of electrons in their atoms.
- The sizes of their atoms.
- Their metallic characters.
- The formula of their oxides.
- The formula of their chlorides.

ASSIGNMENT

Q1. While classifying the elements Mendeleev was guided by two factors. What were these two factors?

Q2. Name three elements for which Mendeleev left gap in his periodic table.

Q3. State modern periodic law.

Q4. Name an element which has 2 electrons in N shell.

Q5. Amongst elements with atomic number 11 and atomic number 14 , which has a bigger size atom and why?

Q6. Element M is in the first group of the periodic table. Write the formula of its Oxide.

Q7. An element X has configuration 2,8,8,1, while element Y has electronic configuration 2,8,7.

Which of these is a metal? Write the formula of the compound formed between X and Y .

Q8. Why do Lithium, Sodium and Potassium show resemblance on the basis of Dobereiner's law of triads?

Q9. What are the names of group 2 elements?

Q10. The formula of a compound is M_2O_3 . Predict the valency of element M.

Q11. What does the word period signify in the periodic table?

Q12. An element X readily accepts an electron from another element Y. Predict the nature of the element X.

Q13. What do you understand by periodicity in properties?

Q14. What is the reason of placing Ar before K in the Mendeleev's periodic table?

Q15. Why are metals called electropositive elements



Many chemical reactions produce both light and heat. A burning candle is such a reaction. When a candle is lit, its flame both glows and becomes hot. It is much less common for a chemical reaction to produce light without heat. The light from such reactions is called cool light, because it is created without heat. Reactions that produce light without heat are called chemiluminescent reactions. Perhaps the most familiar chemiluminescent reactions are those that occur in living organisms. Fireflies produce light without heat by a chemiluminescent reaction. Chemiluminescent reactions that occur in living organisms are called bioluminescent reactions.

In this activity you will examine a commercial chemiluminescent chemical reaction. The reaction occurs inside a Lightstick. Lightsticks are available at many sporting goods stores, camping supply stores, and hardware stores. (Lightsticks are available from [Educational Innovations](#)) Amusement parks and carnivals often have them in the shape of bracelets and necklaces.

Open the wrapper and remove the Lightstick.

Describe the Lightstick. What does it look like? What color is it? How big is it? Is anything inside the Lightstick?

Immediately before activating the Lightstick, record today's date and the time:

Date: _____

Time: _____

Follow the directions on the wrapper to activate the Lightstick:

1. Bend the Lightstick just enough to break the thin glass tube inside the Lightstick.
2. Shake the Lightstick to mix its contents.

Observe the Lightstick in a darkened room.

Describe the appearance of the Lightstick. What is the color of the glow? Does the glow come from the entire Lightstick or only from the liquid inside the Lightstick?

Immerse the Lightstick in a glass of ice water for five minutes.

Does chilling the Lightstick affect its glow? What happens to the glow?

Immerse the Lightstick in a glass of warm water for five minutes. DO NOT USE BOILING WATER OR PLACE THE LIGHTSTICK IN THE OVEN. THE PLASTIC SHELL OF THE LIGHTSTICK CAN MELT.

What happens to the glow when the Lightstick is warmed?

Summarize how temperature affects the glow of the Lightstick.

Put the glowing Lightstick in the freezer for at least 24 hours.

Does the Lightstick continue to glow while it is in the freezer?

Remove the Lightstick from the freezer and allow it to warm to room temperature.

Does the glow come back when the Lightstick returns to room temperature?

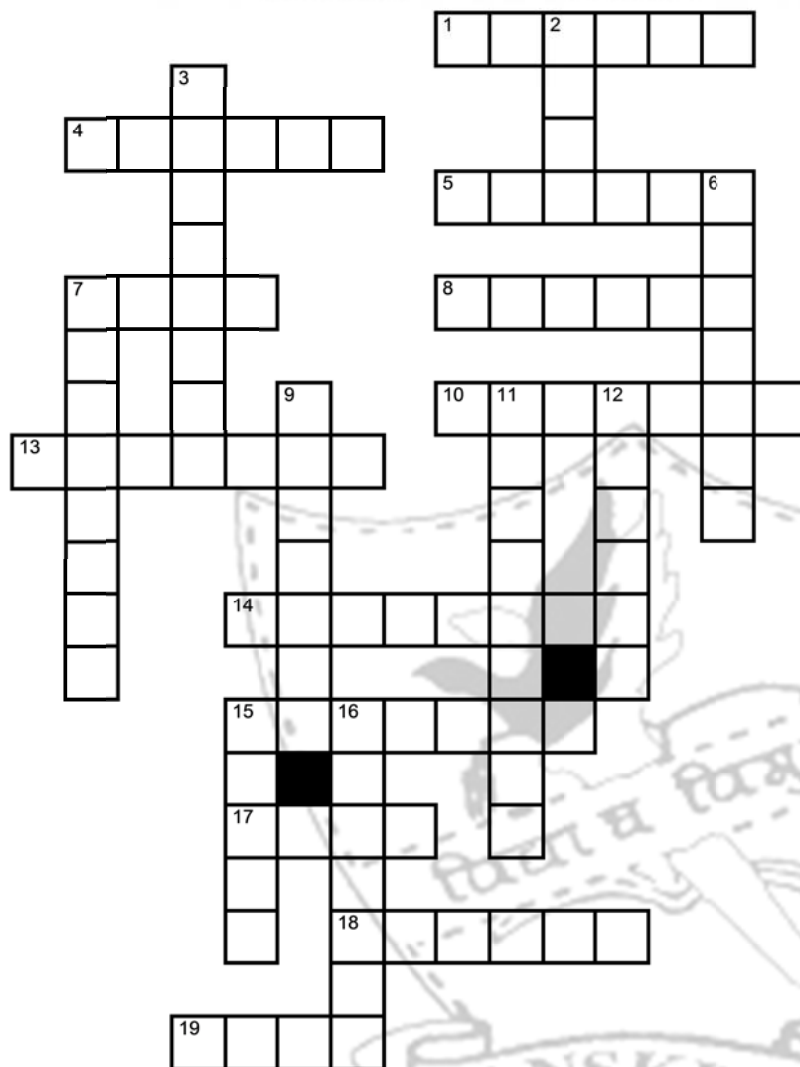
Observe your Lightstick periodically during the day.

How does the glow change with time? How long does it take for the glow to disappear?

Where did you keep the Lightstick? What was the approximate temperature of the Lightstick? What could be done to preserve the glow of the Lightstick?

In this activity you observed the effect of temperature on the glow of a Lightstick. This effect is a result of the effect of temperature on the rate of the chemical reaction that produces the glow. Like all chemical reactions, the reaction that produces the glow is slower at lower temperatures and faster at higher temperatures. In a Lightstick, the faster the reaction the brighter the glow. When the reaction in a Lightstick occurs at a faster rate, it will use up the reactants inside more quickly than when the reaction occurs more slowly. Can you devise an experiment that would test this statement?

Elements of the Periodic Table



Across

- 1 The lightest inert gas. (6)
- 4 The element we need to breathe. (6)
- 5 Alkaline metal in table salt. (6)
- 7 Inert gas used to make bright city lights. (4)
- 8 2nd place in the Olympics. (6)
- 10 An important element in bones. (7)
- 13 A radioactive element often used in nuclear power stations. (7)
- 14 Poison gas in WWI. (8)
- 15 A famous poison that turns your tongue black. (7)
- 17 A metal sought after during the Klondike. (4)
- 18 The element diamonds are made from. (6)
- 19 This metal is used along with carbon to make steel. (4)

Down

- 2 Heavy metal used in paints, batteries, and radiation shields. (4)
- 3 The most common element in the universe. (8)
- 6 A liquid metal that was used in thermometers. (7)
- 7 Most common element in the earth's atmosphere. (8)
- 9 A component of gunpowder that smells like rotten eggs. (7)
- 11 A metal used in foil. (World Spelling) (9)
- 12 A metal used in wires. (6)
- 15 The most common inert gas in the atmosphere. (5)
- 16 Element used to make semi-conductors (computer chips). (7)

Fizzing and Foaming

With just a few household chemicals you can turn a glass of colored liquid into a froth that overflows its container.

For this experiment you will need:

- 15 cm³ (1 tablespoon) of baking soda (sodium bicarbonate)
- 15 cm³ (1 tablespoon) of laundry detergent
- about 180 milliliters (3/4 cup) of water
- about 60 milliliters (1/4 cup) of vinegar
- several drops of food coloring (optional)
- a 400-milliliter (12-ounce) drinking glass
- a waterproof (plastic or metal) tray
- a teaspoon

Place the drinking glass on the tray. Put 15 cm³ baking soda and 15 cm³ laundry detergent to the glass. Add 180 mL of water and a few drops of optional food coloring. Gently stir the mixture to mix the contents of the glass. To display and observe the fizzing and foaming, quickly pour the vinegar into the glass. The mixture will foam up and over the top of the glass, covering the tray with a froth of tiny bubbles.

To produce a color change when the vinegar is added to the mixture in the glass, you can substitute some red cabbage juice for the optional food coloring. The experiment titled "[Exploring Acids and Bases with Red Cabbage](#)" gives instructions on how to prepare some red cabbage juice. With red cabbage juice, the mixture will change color from blue-green before adding vinegar to red-orange after the vinegar is added. For a different color change, try grape juice.

In this experiment, the fizz is produced by a chemical reaction between baking soda and vinegar. Baking soda and vinegar react, and one of the products of the reaction is

carbon dioxide gas. This gas forms bubbles that are surrounded by the liquid. The laundry detergent makes the bubbles last longer, and a foam is produced. The volume of the gas produced and trapped in the foam is much greater than the glass can hold, so some of it spills over the top of the glass.

Baking soda is sodium bicarbonate. Vinegar contains acetic acid dissolved in water. Sodium bicarbonate reacts with most acids. The products of the reaction with vinegar are carbon dioxide gas, sodium acetate, and water.

The reaction of sodium bicarbonate to form carbon dioxide gas is the basis of its use as a leavening agent in baking. Cakes are solid foams. The foam is produced when bubbles of carbon dioxide from the reaction of sodium bicarbonate are trapped in the batter. As the cake bakes, the batter dries, and the trapped bubbles of carbon dioxide form the holes in the cake.

Chapter 14

Sources of energy (conventional sources)

Q1. Firewood is our conventional fuel. List any four reasons for replacing it by the alternate sources of energy.

Q2. Name the process for obtaining charcoal from wood. What are the advantages and disadvantages of burning charcoal over wood?

Q3. Why are fossil fuels called non renewable sources of energy

Q4. How can you minimize pollution caused by burning fossil fuels?

Q5. Distinguish between renewable and non renewable sources of energy.

Q6. Explain how a thermal power plant produces electricity.

Q7. Mention advantages and disadvantages of producing hydroelectricity by building dams on river.

Q8. Describe the steps involved in obtaining biogas and explain what is meant by anaerobic decomposition.

Q9. Give the limitations of wind energy.

Q10. Name the different constituents of bio gas. Why is biogas a better fuel than animal dung cakes?

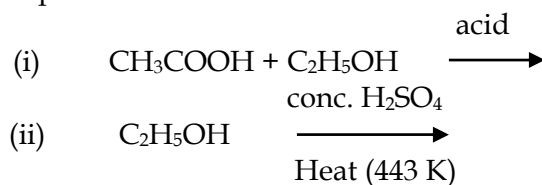
QUESTION BANK

- Q1. Write the balanced chemical equations for the following chemical reactions.
- Aqueous solution of sulphuric acid reacts with sodium hydroxide to form aqueous sodium sulphate and water.
 - Phosphorous burns in chlorine gas to form phosphorous penta chloride.
- Q2. Identify the substance oxidized and substance reduced in the following reactions-
- $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$
 - $\text{MnO}_2(\text{s}) + 4\text{HCl}(\text{aq}) \rightarrow \text{MnCl}_2(\text{s}) + 2\text{H}_2\text{O}(\text{l}) + \text{Cl}_2(\text{g})$
 - $\text{Cu}(\text{s}) + 2\text{AgNO}_3(\text{aq}) \rightarrow \text{Cu}(\text{NO}_3)_2(\text{aq}) + 2\text{Ag}(\text{s})$
- Q3. Balance the following equations -:
- $\text{Al} + \text{HCl} \rightarrow \text{AlCl}_3 + \text{H}_2$
 - $\text{KMnO}_4 \rightarrow \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$
- Q4. Suggest methods which can be used to prevent food from getting rancid .
- Q5. What types of reactions are represented by the following equations -:
- $\text{A} + \text{B}^{2+} \rightarrow \text{A}^{2+} + \text{B}$
 - $\text{A} + \text{BC} \rightarrow \text{AC} + \text{B}$
 - $\text{A} \rightarrow \text{B} + \text{C}$
 - $\text{A} + \text{B} \rightarrow \text{AB}$
 - $\text{AB} + \text{CD} \rightarrow \text{AD} + \text{CB}$
- Q6. When the solutions of lead (II) nitrate and potassium iodide are mixed, what type of reaction occurs ? Write balanced equation for this reaction.
- Q7. Give an example of decomposition reaction carried out with the help of electricity.
- Q8. Name the products obtained on strong heating of lead nitrate. Write chemical equation for the reaction. What type of chemical reaction occurs in the change?
- Q9. Which of the following reactions are possible and why?
- $\text{Cu}(\text{s}) + 2\text{AgNO}_3(\text{aq}) \rightarrow \text{Cu}(\text{NO}_3)_2(\text{aq}) + 2\text{Ag}(\text{s})$
 - $\text{Cu}(\text{s}) + \text{ZnSO}_4(\text{aq}) \rightarrow \text{Zn}(\text{s}) + \text{CuSO}_4(\text{aq})$
- Q10. What is corrosion? List two methods which can prevent the corrosion of metals.

- Q11. What is an acid base indicator? Give two examples of synthetic acid base indicators.
- Q12. A gas produced in the lab is highly soluble in water. Its colourless solution turns pink on adding few drops of indicator. Name the indicator and the nature of this gas?
- Q13. How is plaster of Paris obtained from gypsum? Give chemical reaction.
Plaster of paris should be stored in moisture proof container. Explain why.
- Q14. What happens when electricity is passed through brine? Give reaction.
- Q15. 'Sweet tooth' may lead to tooth decay. Explain why? What is the role of tooth paste in preventing cavities?
- Q16. A compound "X" of sodium is used to in kitchen for making crispy pakoras. It is also used for curing acidity in the stomach. Identify 'X' .What is its chemical formula? State the reactions that take place when it is heated on cooking.
- Q17. There are some substances which give different odour in different medium.
a) What is the name given to such substances?
b) Give an example of such substance.
- Q18. Why is plaster of Paris written as $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$? How is it possible to have half a molecule of water attached to CaSO_4 .
- Q19. Black colour of copper oxide changes to bluish green if reacted with dilute hydrochloric acid .why?
- Q20. A white powder is used for decolorizing wood pulp in paper industry.
a) Give its chemical name and formula.
b) Give the chemical equation to show its preparation

- Q21. Write the chemical equation for the reaction of hot aluminium with steam.
- Q22. Holes are observed in zinc plate immersed in copper sulphate solution. Explain why?
- Q23. State two properties of carbon which are not expected from its classification as Non-metal.
- Q24. What happens when basic oxides like Na_2O or K_2O is dissolved in water? Write the balanced chemical reactions.
- Q25. What do you understand by thermite reaction?
- Q26. Which is more metallic Sodium or Aluminium? Why?
- Q27. Give reasons for the following:
- 1) Hydrogen is not metal but it has been assigned a place in the activity series of Metals.
 - 2) Aluminium is found in combined state whereas gold is found free in nature.
 - 3) An alloy solder is used for soldering wires.
 - 4) Electric wires are coated with polyvinyl chloride.
- Q28. A metal is found in nature as its carbonate ore. It is used in galvanization of iron articles. Identify the metal M and name its ore, MCO_3 . How will you convert this carbonate ore into free metal? Explain with equations.
- Q29. Out of copper and iron, which one is more reactive? How can you test it?
- Q30. Silver metal does not combine with oxygen easily but silver jewellery tarnishes after some time. Why?
- Q31. What happens when limestone reacts with dil. HCl.
- Q32. Name two synthetic indicators which are used to test acids and bases.
- Q33. What are strong acids? Give two examples.
- Q34. What happens when HCl reacts with ammonium hydroxide? Give chemical equation for the reaction.

- Q35. Do alkalis also react with metals? Give any two examples.
- Q36. Which acid and base can be used to prepare sodium bicarbonate and sodium hydrogen sulphate?
- Q37. On eating spicy food we feel burning sensation in our stomach, why? Which medicine will you take as a remedy?
- Q38. When concentrated acid is diluted does the pH get higher or lower? Give reason.
- Q39. How are acids and bases similar?
- Q40. Name one chemical used to remove permanent hardness of water.
- Q41. What is the role of tartaric acid in baking powder?
- Q42. How is plaster of Paris obtained? Give a chemical equation.
- Q43. What happens when electricity is passed through an aqueous solution of sodium chloride?
- Q44. Why does blue vitriol lose its colour on heating? Write the reaction also.
- Q45. a) Complete the following reactions / chemical equations and name the main product formed in each case-



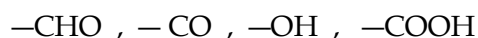
Also state the importance of conc. H_2SO_4 in this reaction.

- b) List two reasons why carbon forms large number of compounds and are poor conductors of electricity?

Q46. Explain with the help of chemical equation, what happens when sodium hydrogen carbonate reacts with ethanoic acid.

Q47. What is meant by denatured alcohol? What is the need to denature alcohol?

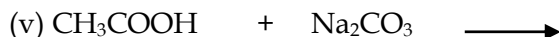
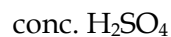
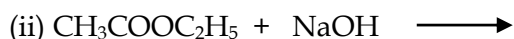
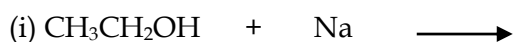
Q48. Name the groups of compounds with the following functional groups



Q49. Give one example each for the following reactions:

- Dehydration
- Oxidation of alcohols
- Combustion
- Saponification
- Esterification

Q50.. Complete and balance the following reactions:



Q51. Show the bond formation in ;

- Nitrogen gas
- Methane
- Ethanol

Q52. Under what conditions can a saturated hydrocarbon produces a sooty flame?

Explain.

Q53. Write down the possible structural isomers for hexane. Also write their IUPAC names .

Q54. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n} .

Q55. With the help of an example , explain the process of hydrogenation . Mention the essential conditions for the reaction and state the change in physical property with the formation of product .

Q56. What is the difference between the molecules of soaps and detergents , chemically ? Explain the cleansing action of soaps .

Q57. Explain why carbon forms compounds mainly by covalent bond . Why does carbon form strong bonds with other elements?

Q58. List two tests for experimentally distinguishing between an alcohol and a carboxylic acid .

Q59. An organic compound 'X' is an essential constituent of wine and beer. 'X' is responsible for intoxication caused by these drinks. Oxidation of 'X' yields an organic acid 'Y' which is present in vinegar. Name the compounds 'X' and 'Y' and write their formulae.

Q60. The molecular formula C_3H_6O can represent an aldehyde as well as ketone. Write their structures and name them.

Q61. What is an ester? Describe an activity to form an ester .

Q62. What is a functional group in a carbon compound ? Write the formulation for the functional groups of alcohols and carboxylic acids .

Q63. Saturated hydrocarbons take part in substitution reactions while unsaturated hydrocarbons in addition reactions . Explain.

Q64. Give reasons for the following observations:

- Air holes of a gas burner have to be adjusted when the heated vessels get blackened by the flame.
- Use of synthetic detergents causes pollution of water.
- Soaps are ineffective in hard water.

Q65. An organic compound 'A' which is sometimes used as an antifreeze and has the molecular formula C_2H_6O . Upon reaction with alkaline $KMnO_4$, the compound 'A' is oxidized to another compound 'B' with formula $C_2H_4O_2$. Identify the compounds 'A' and 'B'. Write the chemical equation for the reaction which leads to the formation of 'B'.

Q66. Two carbon compounds A and B have the molecular formula C_3H_8 and C_3H_6 respectively. Which one of the two is more likely to show addition reaction? Justify your answer. Explain with the help of chemical reaction. How is an addition reaction useful in the vegetable ghee industry?

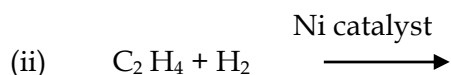
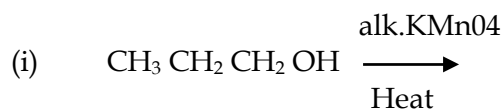
Q67. An organic compound 'A' is widely used as a preservative in pickles and has the molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form a sweet smelling compound 'B'.

- Identify the compound 'A'.
- Write the chemical equation for its reaction with ethanol to form compound 'B'.
- How can we get compound 'A' back from 'B'?
- Name the process and write the corresponding chemical equation.
- Which gas is produced when compound 'A' reacts with washing soda? Write the chemical equation.

Q68. Define soap. With the help of a well-labeled diagram of micelle, explain the cleansing action of soap.

Q69. State how you would distinguish between acetic acid and ethanol in your laboratory. Give chemical equations of the reactions shown by them. Write the chemical equations involved.

Q67. Complete the reaction(s) given below and classify them as Combustion / Oxidation / Addition / Substitution reaction.



Q68. Draw the electron dot structure of the gas molecule which is liberated when zinc metal is treated with aqueous NaOH solution.

Q69. What do you understand by periodicity? Are the properties of elements placed in a group the same? Illustrate.

Q70. Why atomic number is more important than atomic weight in determining chemical properties?

Q71. How does electronic configuration of an atom relate to its position in the modern periodic table?

Q72. Explain the variation in atomic size in a group and a period in the periodic table, Giving examples.

Q73. What will happen to electron releasing tendency of the elements in a group?

Q74. Why could no fixed position be given to hydrogen in Mendeleev's periodic table.

Q75. Explain why sodium is an active metal while neon is inert?

Q76. What physical and chemical properties were used by Mendeleev in creating his periodic table? List two observations which posed a challenge to Mendeleev's periodic law.

Q77. What is meant by group in a periodic table? Within a group where would you find an element with (a) most metallic character (b) the largest atomic size?

Q78. How does the tendency to gain electron change on moving left to right in a period of the periodic table.

Q79. How does the tendency to lose electron change on moving left to right in a period of the periodic table.

Q80. How does the nature of oxide change on moving left to right in a period of the periodic table.

Value – based questions :

- Q1. There are different types of chemical reactions occurring around us or being carried out for the benefit of mankind e.g., combination reactions , decomposition reactions , displacement reactions , precipitation reactions , neutralization reaction etc. Now , answer the following questions :
- 1) Combustion of coke is a combination reaction. CO_2 is not a pollutant . Then why is combustion of coke harmful?
 - 2) Which decomposition reaction followed by two combination reactions are involved in whitewash of walls?
 - 3) What value has been added to our lives by electroplating ? Give two examples
- Q2. The three important acids called mineral acids are sulphuric acid , nitric acid and hydrochloric acid. They find wide application in different industries like fertilizer , textile , leather industry etc. At home , their use for cleaning toilets is very common . However in recent times , bad elements in society are misusing these acids for example incidents of acid throwing on faces, thereby causing burns on the face are being reported. Balloons filled with acids are thrown on passers- by on Holi. A mixture of hydrochloric acid and nitric acid (called aqua regia) is being used to cheat women in the name of cleaning their gold jewellery. Now answer the following questions :
- i) What steps should be taken to stop the incidents of acid throwing.
 - ii) What should be done to check the miscreants from cheating the women of their jewellery cleaning?
 - iii) How do you think that the use of acid balloons on Holi festivals can be stopped?
- Q3. Metals possess such properties which make them useful for number of purposes, e.g., in making jewellery, cans, electrical wires, heating pans etc. The nature of metals used depends upon the type of requirement. Now answer the following questions :
- i) Give two reasons for why gold is used in making jewellery?
 - ii) If you have to choose between copper and aluminium wires for transmission of electricity, which one will you prefer and why?
 - iii) If you have to choose between silver and copper vessels for heating, which one will you prefer and why?
- Silver foils are often used in decorating sweets, how do they harm us?
- Q4. Vegetable oils, such as soyabean oil, groundnut oil, sunflower oil, cotton seed oil etc. develop unpleasant smell and taste when kept for along time in hot and humid weather, therefore these oils are hydrogenated in presence of Nickel as catalyst to form vegetable ghee. However vegetable ghee contains saturated carbon chains which are not good for health as advised by the doctors.

Now answer the following questions :

- i) What is hydrogenation? what changes occur during hydrogenation of vegetable oils?
- ii) What type of health problem is caused by consumption of saturated fats and how can this problem be checked?
- Q5. The inert gases or the noble gases form group 18 of the long form of periodic table, helium is the first member of this group, it has very low boiling point and is lighter than air. It is chemically inert and does not form any compounds. It has many applications in our daily life.

Now answer the following questions :

- i) Give the names and symbols of the elements of group 18.
- ii) Give three uses of helium in our daily life.
- iii) Why are they called noble gases.
- Q6. Shanky and Bunty were returning home after attending a wedding .They had enjoyed the dishes served in the party. Their father was driving the car, suddenly midway a police party stopped them, a breathalyser was put into the mouth of their father and he tested positive for alcohol. He was served with a fine challan. The mood was suddenly spoiled after having a great time at the party.
- i) What is breathalyser and what is its function?
- ii) What are the harmful effects of excessive intake of alcohol?
- iii) What values were displayed by the police.
- Q7. Public transport in Delhi runs on CNG. This is a pollution free fuel. There were lots of hurdles in bringing CNG in public transport system, but ultimately government of Delhi succeeded in achieving this goal. According to world study, Delhi's environment now much cleaner than what it used to be with Diesel as fuel.
- i) What is the full form of CNG? What is the main constituent of this fuel?
- ii) How is the fuel energy efficient?
- iii) Give the formula and names of the next two higher homologues of the main constituent of CNG.
- iv) What values were shown by the government of Delhi in introducing CNG in public transport system?

MULTIPLE CHOICE QUESTIONS BASED ON EXPERIMENTAL SKILLS

- Q1) The product formed when quick lime is treated with water.
- calcium hydride
 - calcium bicarbonate
 - calcium carbonate
 - calcium hydroxide
- Q2) When ferrous sulphate crystals are heated it gives off gases, these gases
- have a suffocating smell like burning sulphur
 - fume strongly in the moist air
 - do not fume strongly in the moist air
 - both a) and b)
- Q3) When iron nails are placed in copper sulphate solution the colour of copper sulphate changes from
- Green to blue
 - Blue to green
 - Red to blue
 - Blue to red
- Q4) Barium chloride solution is mixed with sodium sulphate solution. a white insoluble ppt. which is formed is
- barium sulphide
 - barium sulphite
 - barium sulphate
 - barium carbonate
- Q5) Which is the incorrect statement, A student drops some quick lime in water he observes
- the lump disintegrates with hissing sound
 - the mixture becomes hot
 - it dissolves to form a clear solution
 - the reaction is an example of combination reaction

Q6) Zinc metal displaces hydrogen from hydrochloric acid because zinc metal is

- a) less electropositive than hydrogen
- b) more electropositive than hydrogen
- c) as much electropositive as hydrogen
- d) none of these

Q7) Which chemical on treating with HCl gives CO₂ gas

- a) Sodium chloride
- b) Sodium nitrate
- c) Sodium carbonate
- d) Sodium hydroxide

Q8) The ions which are responsible for change of colour of red litmus to blue are

- a) hydroxyl ions
- b) sodium ions
- c) potassium ions
- d) zinc ions

Q9) The zinc metal used in the lab for doing experiments are available in the form of

- a) pellets
- b) granules
- c) filings
- d) strips

Q10) The formula of sodium zincate is

- a) Na₂ZnO₂
- b) NaZnO
- c) Na₂ZnO
- d) NaZn₂O

11) To test the presence of an acid with a strip of red litmus paper you would

- a) dip the strip as it is in the sample and see the colour change
- b) moisten the paper and dip in the sample
- c) first dip it in common salt solution and then use it to test the sample
- d) first dip it in alkaline solution and then use it to test the sample

Q12) A liquid sample turned red litmus paper blue. This indicates that the sample is

- a) An alcohol
- b) Distilled water
- c) Sodium hydroxide solution
- d) Hydrochloric acid

Q13) The substance used to determine the pH of a solution is

- a) litmus solution
- b) methyl orange solution
- c) universal indicator
- d) turmeric solution

Q14) The two colors seen at the extreme ends of the pH chart are

- a) red and green
- b) green and blue
- c) red and orange
- d) red and blue

Q15) A student tested the pH of distilled water and found that the color of paper changed to green and he checked the pH again after dissolving a pinch of common salt in it, the color of the pH paper this time was

- a) yellow
- b) red
- c) green
- d) blue

Q16) A few drops are added to the sample of water. The pH of the solution

- a) increases
- b) decreases
- c) remains same
- d) none of these

Q17) Which one of the following is not required to find the pH of the solution ?

- a) pH paper
- b) Litmus paper
- c) Universal indicator
- d) Standard pH value chart
- e)

Q18) The chemical reaction between ferrous sulphate solution and zinc can be represented by the balanced equation

- a) $\text{FeSO}_4(\text{aq}) + \text{Zn}(\text{s}) \longrightarrow \text{ZnSO}_4(\text{aq}) + \text{Fe}(\text{s})$
- b) $\text{Fe}_2\text{SO}_4(\text{aq}) + 2\text{Zn}(\text{s}) \longrightarrow \text{Zn}_2\text{SO}_4(\text{aq}) + 2\text{Fe}(\text{s})$
- c) $\text{FeSO}_4(\text{aq}) + \text{Zn}(\text{s}) \longrightarrow \text{ZnSO}_4(\text{aq}) + \text{Fe}(\text{s})$
- d) $\text{Fe}(\text{SO}_4)_2(\text{aq}) + 2\text{Zn}(\text{s}) \longrightarrow 2\text{ZnSO}_4(\text{aq}) + \text{Fe}(\text{s})$

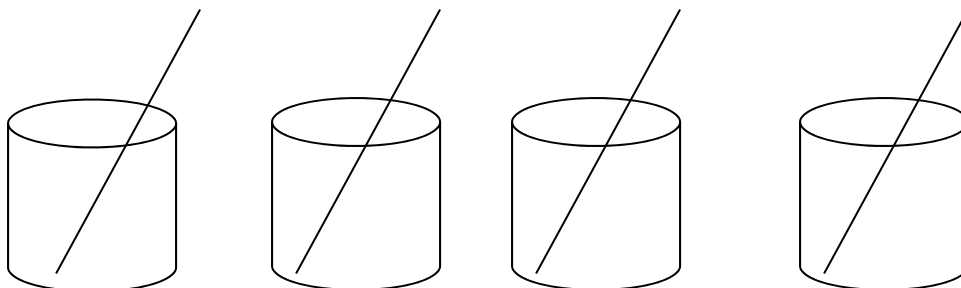
Q19) 10 ml of freshly prepared iron sulphate was taken in each of the four test tubes. Strips of copper, iron, zinc and aluminium were introduced in different test tube. A black residue was obtained in two of them. The right pair of forming the precipitate is

- a) copper and zinc
- b) aluminium and copper
- c) iron and aluminium
- d) zinc and aluminium

Q20) A piece aluminium of was dropped in copper sulphate solution. After some time the color of the solution changed from

- a) light green to blue
- b) blue to milky
- c) blue to colorless
- d) blue to yellow

Q21) Zinc granules were added to Solutions of ferrous sulphate, zinc sulphate, copper sulphate and aluminium sulphate as shown below. You would observe the deposition of metal on zinc in beakers



zinc sulphate

(I)

copper sulphate

(II)

aluminium sulphate

(III)

ferrous sulphate

(IV)

- a) I and III
- b) II and IV
- c) I and II
- d) III and IV

Q22) On adding sodium bicarbonate to acetic acid you immediately

- a) observe strong effervescence
- b) hear hissing sound
- c) get pungent smell
- d) notice formation of bubbles

Q23) On adding sodium bicarbonate to acetic acid .a gas evolves. Which of the following statements is not true for this gas?

- a) it turns lime water milky
- b) extinguishes a burning splinter
- c) dissolves in a solution of sodium hydroxide
- d) turns acidified $K_2Cr_2O_7$ solution green

Q24) A small piece of zinc is added to acetic acid in a test tube

- a) no reaction takes place
- b) colorless and odorless gas is evolved which turns lime water milky
- c) pungent smelling gas is produced
- d) none of these

Q25) On adding sodium carbonate to acetic acid .a gas evolves. The gas evolved was tested with a burning splinter. Which of the following observation was reported?

- a) the flame extinguishes and the gas does not burn
- b) the gas burns with a blue flame and the splinter burns brightly
- c) the gas does not burn but the splinter burns with a pop sound
- d) the gas burns with a pop sound and the flame gets extinguished

Q. 26 Acetic acid was added to four test tubes containing the following chemicals:

- a. Sodium carbonate
- b. Blue litmus solution
- c. Lime water
- d. Distilled water

Which amongst these is/ are correct option(s) for carrying out a characteristic test for identification of a carboxylic acid (acetic acid) in the laboratory?

- a. (a) only
- b. (c) only
- c. (a) and (b)
- d. (c) and (d)

Q27. On adding concentrated NaOH solution to a test tube containing phenolphthalein, the colour change observed by a student would be:

- a. Pink to colourless
- b. Pink to blue
- c. Colourless to pink
- d. Red to blue

Q28. A student while observing the properties of acetic acid would report that this acid smells like

- (a) vinegar and turns red litmus blue
- (b) rotten egg and turns red litmus blue
- (c) vinegar and turns blue litmus red
- (d) rotten egg and turns blue litmus red

Q29. When acetic acid and sodium bicarbonate are mixed , it is observed that :

- a) a colourless and odourless gas is liberated with effervescence
- b) a colourless gas liberated turns moist blue litmus paper red
- c) a colourless gas is liberated turns lime water milky
- d) Each one

Q30. The side product formed in the saponification reaction is

- a) Glycol
- b) Glycine
- c) Glycerol
- d) None of the above

Q31. Sunil took two water samples in test tubes A and B . He added soap solution to both . He observed soap lather in A and no lather in B . He concluded that :

- a) A is hard water
- b) B is soft water
- c) A is soft water
- d) Both A and B are hard water

Q32. Sodium hydroxide solution was added to a liquid X. The mixture was stirred for sometime . A lot of heat was produced. Among the products formed were glycerol and a solid Y . The substances X and Y respectively are

- a) Soap, oil
- b) Oil, soap
- c) Sugar, soap
- d) Vinegar , soap

Q33. What type of reaction takes place when soap reacts with hard water ?

- a) Addition reaction
- b) Decomposition reaction
- c) Displacement reaction
- d) Double displacement reaction

Q34. A solution of soap or detergent in water turns :

- a) Blue litmus red
- b) Red litmus blue
- c) Blue litmus colourless
- d) Red litmus colourless

Q35. The odour of acetic acid resembles that of

- a) Rose
- b) Burning plastic
- c) Vinegar
- d) Kerosene