

PHYSICAL SCIENCES

STUDY MATERIAL

Class X

Continuous Comprehensive evaluation Method

Self Improving Studymaterial

Easy to Understand

Focus on Slow Learners

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ముందు మాట

పదవతరగతి లోకి ప్రవేశించిన విద్యార్థులకు మా అభినందనలు మరియు ఉపాధ్యాయులకు మా నమస్కరణలు తెలుపుచున్నాము.

మానవ నాగరికత నానాటికి పెరుగుతూవుంది అనడంలో సందేహం లేదు. పేరుగుతున్న అవసరాలకు అనుగుణం గా పాఠ్యపుస్తకాలలో మార్పులు చోటు చేసుకున్నాయి. బట్టి పట్టి విధానాలను రూపుమాపి, సమగ్రమైనటువంటి, ఉపయోగకరముగా విద్యార్థులను తీర్చిదిద్దే విధముగా పాఠాలను సమకూర్చిన ఆంధ్రప్రదేశ్ విద్యాశాఖ మండలికి మనం కృతజ్ఞత తెలపాలి అవసరం ఎంతోవుంది. నూతన విధానాలకు అనుగుణం గా భోధిస్తున్న ఉపాధ్యాయుల కృషి అభినందనీయం.

అసలు విషయానికి వస్తే ప్రతీ విద్యార్థి సులభంగా అర్థం చేసుకునే విధముగా ఈ Material రూపొందించడం జరిగింది. ఈ Material చదివిన ప్రతీ విద్యార్థి గరిష్ట మార్కులు వస్తాయని చెప్పడం లేదు. కాని ప్రతీ విద్యార్థి పూర్తి స్థాయిలో ప్రశ్నలకు సమాధానాలు అర్థం చేసుకొని, గుర్తుంచుకునేవిధంగా తయారుచేయబడింది. విద్యార్థులు పాఠ్యపుస్తకాన్ని చదవాలని ప్రేమపూర్వక సలహా ఇస్తున్నాము.

సంపూర్ణ శ్రద్ధాసక్తులతో ప్రచురించినప్పటికీ ఏవైనా పదజాలం తప్పుగా వుండినయెడల మాదృష్టికి తెచ్చినచో సరిచేయగలమని భావిస్తున్నాము. మీ సలహాలు మాకు విలువైనవి. ఎలాంటి లాభాపేక్ష లేకుండా అందరు విషయపరిజ్ఞానం పొందుటకు ఈ ప్రచురణ చేస్తున్నందుకు మేము గర్విస్తున్నాము. మమ్ములను ఎంతగానో ప్రోత్సహించిన అంతర్జాల మిత్రులకు, శ్రేయోభిలాషులకు మా కృతజ్ఞతలు.

సర్వహక్కులు రిజర్వ్ చేయబడినవి.

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Gali Sree Kar M.Sc, B.Ed (9700842884, 9440234404)

పరులను జూచి యసూయతో,
చెరపగ యత్నింపబోకు చెరుపగు నీకే
పరుల సుఖంబును గోరిన,
విధాత నిన్ను గాచు పదిలము జీవా!!

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Chapter -1

Heat

1. What would be the final temperature of a mixture of 50g of water at 20°C temperature and 50g of water at 40°C temperature? (AS1)

Solution :- Given $m_1 = 50\text{g}$ $T_1 = 20^\circ\text{C}$ Final temperature, $T = ?$
 $m_2 = 50\text{g}$ $T_2 = 40^\circ\text{C}$

Formula :- $T = \frac{m_1T_1 + m_2T_2}{m_1 + m_2}$

$$T = \frac{50 \times 20 + 50 \times 40}{50 + 50} = \frac{1000 + 2000}{100} = \frac{3000}{100} = 30^\circ\text{C}$$

2. Explain why dogs pant during hot summer days using the concept of evaporation? (AS1)

1. Dogs pants on hot days because they are trying to cool down just like we sweat on a hot days.
2. So, dogs pant to regulate their body temperature.

3. Why do we get dew on the surface of a cold soft drink bottle kept in open air? (AS1)

1. When a cold soft drink bottle kept in open air, bottle surface absorb the heat from the surrounding air.
2. So, outer surface of the molecules get cooled, thus the water droplets are formed.

4. Write the differences between evaporation and boiling? (AS1)

Evaporation takes place at any temperature, while boiling occurs at a definite temperature (100°C).

5. Does the surrounding air become warm or cool when vapours phase of H₂O condenses? Explain?

The surrounds air becomes warm when vapour phase of H₂O condenses.

Explanation: - 1. Heat is transferred from vapour phase of H₂O to surrounding air.

2. So, The surrounds air becomes warm when vapour phase of H₂O condenses.

6. Answer these. (AS1)

a) How much energy is transferred when 1gm of boiling water at 100°C condenses to water at 100°C?

540 calories of heat energy is transferred when 1 gm of boiling water at 100°C condenses to water at 100°C.

b) How much energy is transferred when 1gm of boiling water at 100°C cools to water at 0°C?

1. The heat energy transferred when 1 gm of water at 100°C to become water at 0°C on cooling is 100 calories.
2. Hence, (540+100) calories =640 calories of heat is transferred when 1 gm of boiling water at 100°C cool water at 0°C.

c) How much energy is transferred when 1gm of water at 0°C freezes to ice at 0°C?

1 gm of water at 0°C releases 80 calories of heat energy when it freezes to ice at 0°C.

d) How much energy is transferred when 1gm of steam at 100°C turns to ice 0°C?

1. The heat energy transferred when 1 gm of water at 100° C to become water at 0°c on cooling is 100 calories.
2. Hence, (540+80+100) Calories =720 calories of heat energy is released when 1 gm of steam at 100°C turns to ice at 0°C.

7. Explain the procedure of finding specific heat of solid experimentally. (AS1)

Aim:- To find the specific heat of given solid.

Apparatus:- Calorimeter, thermometer, stirrer, water, steam heater, wooden box and lead shots.

Procedure:- 1. Let the mass of the calorimeter along with stirrer is ‘ m₁’ gm.

2. One third of the volume of the calorimeter is filled with water and its mass is ‘ m₂’ gm.
3. The temperature of the calorimeter is noted (T₁°C).
4. The heated Lead pieces (m₃ gm and T₂°C) are quickly transferred in to calorimeter, with minimum loss of heat.
5. Contents in the calorimeter are stirred and then resultant temperature (T₃°C) is noted .
6. Let the specific heats of the calorimeter, led shots and water are S_c , S₁ and S_w respectively.
7. By using the formula we calculate the specific heat of the given solid,

$$S_1 = [m_1 S_c + (m_2 - m_1) S_w (T_3 - T_1)] / (m_3 - m_2) (T_2 - T_3)$$

8. Covert 20°C into Kelvin scale. (AS1)

Temperature in Kelvin =273 + Temperature in Celsius degrees. =273+20 =293 K

9. Your friend is notable to differentiate between evaporation and boiling. What questions do you ask to make him know the differences between evaporation and boiling? (AS2)

1. Is boiling temperature of the water is always 100°C?
2. How wet clothes dry without heating?
3. Does boiling depend on the surface on the area of a liquid?
4. Does evaporation depend on the surface area of a liquid?

10. What happens to the water when wet clothes dry? (AS3)

When wet clothes are dried, the water in them is escaped as water vapour due to evaporation and mixes with the air.

11. Equal amounts of water are kept in a cap and in a dish. Which will evaporate faster? Why? (AS3)

1. Evaporation depends on the surface area.
2. Hence, the water kept in dish will evaporate faster than the cap.

12. Suggest an experiment to prove that rate of evaporation of liquid depends on its surface area and vapour already present in surrounding air. (AS3)

Aim:- To prove that rate of evaporation of liquid depends on its surface area.

Apparatus:- Two dishes of different surface area and water.

Procedure:- 1. Take a small quantity of water in two dishes separately.

2. Keep the dishes under the fan and switch on the fan.

3. After some time observe the quantity of water in both dishes.

4. It is proved that the dishes contain larger surface area of water is fastly evaporated.

13. Place a Pyrex funnel with its mouth-down in a sauce pan with full of water, in such a way that the stem tube of the funnel is above the water or pointing upward into air. Rest the edge of the bottom portion of the funnel on a nail or on a coin so that water can get under it. Place the pan on a stove and heat it till it begins to boil. Where do the bubbles form first? Why? Can you explain how a Geyser works using above experience? (AS4)

1. When a Pyrex funnel with its mouth-down in a in a sauce pan with full of water.

2. Rest the edge of the bottom portion of the funnel on a nail or on a coin so that water can get

3. Place the pan on a stove and heat it till it begins to boil. under it.

4. The bubbles of water come from the top of the funnel.

Working of Geyser: – 1. The Geyser works on the principle of electrical energy converted into heat

2. When heat energy increases, the inside pressure of Geyser is increases. energy.

3. So, the bubbles of water will come out from the top portion of the Geyser.

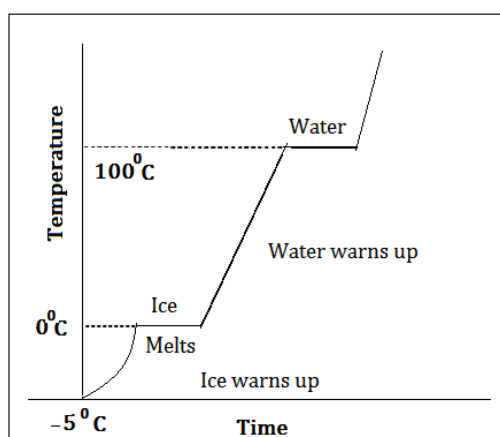
14. Collect the information about working of geyser and prepare a report. (AS4)

1. A geyser has inner heating element made up of Nichrome.

2. It acts as a thermostat unit to control the temperature by switching off the element, once the desired temperature has been reached.

3. The resistance of the wire restricts the current flow causing a pressure of electrons and potons and in turn creates a heat.

15. Assume that heat is being supplied continuously to the ice at -5°C . You know that ice melts at 0°C and boils at 100°C . Continue the heating till it starts boiling. Note the temperature for every minute. Draw a graph between temperature and heat using the values you get. What do you understand from the graph? Write the conclusions. (AS5)



- Conclusions:** - 1. The temperature remains constant at 0°C, till all the ice is converted in to water.
2. The temperature remains constant at 100°C, until all the water is converted in to water.

16. How do you appreciate the role higher specific capacity value of water in stabilizing atmospheric temperature during winter and summer seasons? (AS6)

1. The sun delivers a large amount of energy to the Earth daily.
2. The water masses on Earth, particularly the oceans, absorb this energy for maintaining a relatively constant temperature.
3. The oceans behave like heat “store houses” for the earth.
4. Therefore, oceans moderate the surrounding temperature near the equator during winter and summer season
5. So, I appreciate the role higher specific capacity value of water in stabilizing atmospheric temperature during winter and summer seasons.

17. Suppose that to 1 litre of water is heated for a certain time to rise and its temperature by 2°C. If 2 liter of water for the same time, by how much will its temperature rises? (AS7)

Solution :- Given $m_1 = 1\text{Kg}$ $\Delta T_1 = 20\text{C}$
 $m_2 = 2\text{Kg}$ $\Delta T_2 = ?$

Formula :- $\frac{m_1}{m_2} = \frac{\Delta T_1}{\Delta T_2} \rightarrow \frac{1}{2} = \frac{\Delta T_2}{2} \rightarrow \Delta T_2 = 1^\circ\text{C}$

18. What role does specific heat capacity play in a watermelon to keep it cool for long time after removing it from a fridge on a hot day? (AS7)

1. Water melon brought out from the refrigerator retains its coolness for a longer time than any other fruit.
2. Because it contains large percentage of water. (Water has greater specific heat).

19. If you are chilly outside the shower stall, why do you feel warm after the bath if you stay in bathroom? (AS7)

1. In the bathroom, the number of vapour molecules per unit volume is greater than number of vapour molecules per unit volume outside the room.
2. When you try to dry yourself with a towel, the vapour molecules surrounding you condense on your skin and this condensation makes you feel warm.

చెట్టును కసిగా నరికినా మౌనంగా సహిస్తుంది. కొత్త చిగురు మహా సమాధానం

While you cut it out bluntly trees bears it, with due patience- New sprouts shoot and shout, as a fitting reply.

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Chapter 2

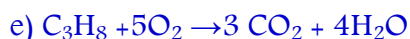
Chemical Reactions and Equations

1. What is a balanced chemical equation? Why should chemical equations be balanced? (AS1)

1. A chemical equation in which the numbers of atoms of different elements on the reactants side (left side) are same as those on product side (right side) is called a balanced reaction.
2. All the chemical equations must be balanced as atoms are neither created nor destroyed in chemical reactions.



2. Balance the following chemical equations. a) $\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$



3. Write the balanced chemical equations for the following reactions. (AS1).

a) Zinc + Silver nitrate \rightarrow Zinc nitrate + Silver.

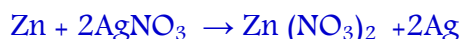
b) Aluminum + copper chloride \rightarrow Aluminum chloride + Copper.

c) Hydrogen + Chlorine. \rightarrow Hydrogen chloride.

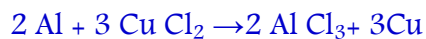
d) Ammonium nitrate \rightarrow Nitrogen + Carbon dioxide + water.

Balanced chemical equations:-

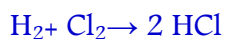
a) Zinc + Silver nitrate \rightarrow Zinc nitrate + Silver.



b) Aluminum + copper chloride \rightarrow Aluminum chloride + Copper.



c) Hydrogen + Chlorine \rightarrow Hydrogen chloride.



d) Ammonium nitrate \rightarrow Nitrogen + Oxygen + water.



4. Write the balanced chemical equation for the following and identify the type of reaction in each case? (AS1).

a) Calcium hydroxide (aq) + Nitric acid (aq) → Water (l) + Calcium nitrate (aq)



This is a chemical double displacement reaction.

b) Magnesium (s) + Iodine (g) → Magnesium Iodide. (s)



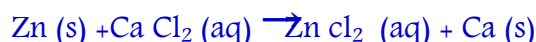
This is a chemical combination reaction.

c) Magnesium(s) + Hydrochloric acid (aq) → Magnesium chloride (aq) + Hydrogen (g)



This is a chemical displacement reaction.

d) Zinc(s) + Calcium chloride (aq) → Zinc Chloride (aq) + Ca(s)



This is a chemical displacement reaction.

5. Write an equation for decomposition reaction where energy is supplied in the form of heat/ light/ electricity (AS1).

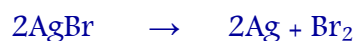
1. The decomposition reaction where energy is supplied in the form of Heat is called thermal decomposition reaction.

Heat



2. The decomposition reaction where energy is supplied in the form of light is,

Sun light



3. The decomposition reaction where energy is supplied in the form of electricity is,

electricity



6. What do you mean by precipitation reaction? (AS1)

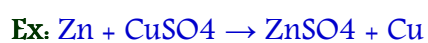
1. Sometimes the products in the chemical reactions are insoluble in water is called precipitation reactions.

2. This insoluble solution is known as precipitation.

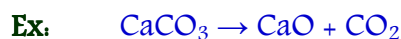


7. How chemical displacement reactions differ chemical decomposition reaction? Explain with an example for each. (AS1).

1. Chemical displacement reaction. In a displacement reaction one element replaces another element from its compound.

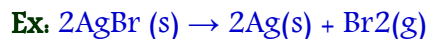


2. Chemical decomposition reaction. In a decomposition reaction one substance (reactant) decomposes into two or more new compounds.



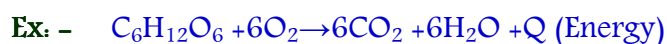
8. Name the reactions taking place in the presence of sunlight? (AS1)

The reactions occur in the presence of sunlight is called photo chemical reactions.



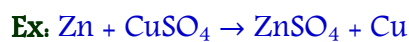
9. Why is respiration considered as an exothermic reaction? Explain? (AS1)

In respiration oxidation of glucose takes place which produce a large amount of heat energy. This is known as exothermic reaction. So respiration is considered as an exothermic reaction.



10. What is the difference between displacement and double displacement reactions? Write equations for these reactions? (AS1)

Chemical displacement reaction. In a displacement reaction one element replaces another element from its compound.



Chemical double displacement reaction. In a double displacement reaction the reactants exchange their constituents chemically and form two new compounds.



11. $\text{MnO}_2 + 4 \text{HCl} \rightarrow \text{MnCl}_2 + 2 \text{H}_2\text{O} + \text{Cl}_2$ In the above equation, name the compound which is oxidized and which is reduced? (AS1)



In this reaction Cl is oxidized and Mn is reduced.

12. Give two examples for oxidation – reduction reaction.



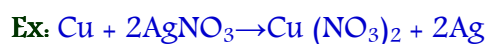
In this reaction Fe_2O_3 is reduced and C is oxidized.



In this reaction PbO is reduced and C is oxidized.

13. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write the reaction involved? (AS1)

The displacement reaction involved in the recovery of Silver from Silver Nitrate solution by copper metal is as follows.



14. What do you mean by corrosion? How can you prevent it? (AS1)

1. When some metals are exposed to moisture, acids, etc., they tarnish due to the formation of respective metal oxide on their surface. This process is called corrosion.
2. Corrosion can be prevented by shielding the metal surface, painting, oiling, greasing, galvanizing, chrome plating or making alloys.

15. Explain rancidity? (AS1)

- Rancidity.** - 1. Rancidity is an oxidation reaction. When fats and oils are oxidized they become rancid. Their smell and taste changes.
2. Oxidation reactions in food material that were left for a long period are responsible for spoiling of food.
 3. Rancidity can be prevented by adding preservatives like vitamin C and vitamin E and also anti oxidants.

16. Balance the following chemical equations including the physical states. (AS1)

- a) $C_6H_{12}O_6 \rightarrow C_2H_5OH + CO_2$
- b) $Fe + O_2 \rightarrow Fe_2O_3$
- c) $NH_3 + Cl_2 \rightarrow N_2H_4 + NH_4Cl$
- d) $Na + H_2O \rightarrow NaOH + H_2$

The balanced chemical equations are.

- a) $C_6H_{12}O_6 (s) \rightarrow 2C_2H_5OH_{(l)} + 2CO_{2(g)}$
- b) $4Fe(s) + 3O_2 (g) \rightarrow 2Fe_2O_3(s)$
- c) $4NH_{3(l)} + Cl_{2(g)} \rightarrow N_2H_{4(l)} + 2NH_4Cl(g)$
- d) $2Na(s) + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + H_{2(g)}$

17. Balance the chemical equation by including the physical state of the substances for the following reactions. (AS1)

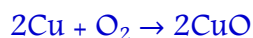
- a) Barium chloride and Sodium sulphate aqueous solutions react to give insoluble Barium sulphate and aqueous solution of sodium chloride.
- b) Sodium hydroxide reacts with Hydrochloric acid to produce Sodium chloride and water.
- c) Zinc pieces react with dilute hydrochloric acid to liberate hydrogen gas and forms Zinc chloride.

The balanced chemical equations are.

- a) $BaCl_{2(aq)} + Na_2SO_{4(aq)} \rightarrow BaSO_4(\downarrow) + 2NaCl_{(aq)}$
- b) $NaOH_{(aq)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$
- c) $Zn_{(s)} + 2HCl_{(aq)} \rightarrow ZnCl_2(\downarrow) + H_{2(g)}$

18. A shiny brown coloured element 'X' on heating in air becomes black in colour. Can you predict the Element 'X' and the black coloured substance formed? How do you support your predictions?(AS2)

1. Brown coloured element 'X' is copper. The black coloured substance is copper oxide.
2. When brown colour copper (Cu) is heated it reacts with oxygen and forms black colour copper oxide (CuO).



19. Why do we apply paint on iron articles? (AS7)

We apply paint on iron articles to shield their surfaces from oxygen and moisture to prevent them corrosion.

20. What is the use of keeping food in air tight containers? (AS7)

1. Keeping food in air tight containers helps to slow down the oxidation process.
2. If food items are kept in air tight bags, then the item does not react with oxygen.
3. So they do not spoil.

Niels Bohr (1885–1962)



Niels Bohr, a Danish physicist received his Ph.D. from the University of Copenhagen in 1911. He then spent a year with J.J. Thomson and Ernest Rutherford in England. In 1913, he returned to Copenhagen where he remained for the rest of his life. In 1920 he was named Director of the Institute of theoretical Physics. After first World War, Bohr worked energetically for peaceful uses of atomic energy. He received the first Atoms for Peace award in 1957. Bohr was awarded the Nobel Prize in Physics in 1922.

Erwin Schrödinger (1887-1961)

Erwin Schrödinger, an Austrian physicist received his Ph.D. in theoretical physics from the University of Vienna in 1910. In 1927 Schrödinger succeeded Max Planck at the University of Berlin at Planck's request. In 1933, Schrödinger left Berlin because of his opposition to Hitler and Nazi policies and returned to Austria in 1936. After the invasion of Austria by Germany, Schrödinger was forcibly removed from his professorship. He then moved to Dublin, Ireland where he remained for seventeen years. Schrödinger shared the Nobel Prize for Physics with P.A.M. Dirac in 1933.



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Chapter -3

Reflection of light on different surfaces

1. State the laws of reflection of light. (AS1)

Laws of Reflection of Light: – 1. Light travels in a straight line motion.

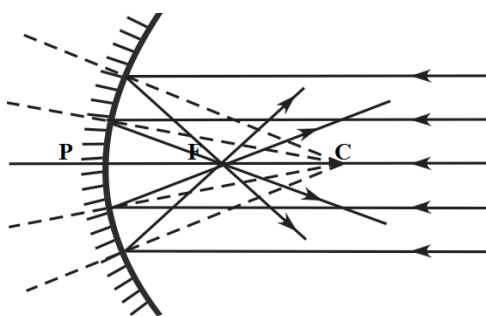
2. When light gets reflected from a surface, the angle of incidence is equal to the angle of reflection.

3. The incident ray, reflected ray and normal are lies in a same surface.

2. Why concave and convex mirrors are called spherical mirrors? (AS1)

Convex and concave mirrors contain curved surfaces. So, they are called spherical mirrors.

3. How do you find the focal length of a concave mirror? (AS1)



1. The reflected rays on the concave mirror are converging at a point.

2. This point is called Focus or focal point (F) of the concave mirror.

3. The distance between the pole and focal point is called its focal length.

4. Where will the image form when we place an object, on the principal axis of a concave mirror at a point between focus and centre of curvature? (AS1)

When we place an object, on the principal axis of a concave mirror at a point between focus and centre of curvature the image is formed on beyond the center of curvature.

6. State the differences between convex and concave mirrors. (AS1)

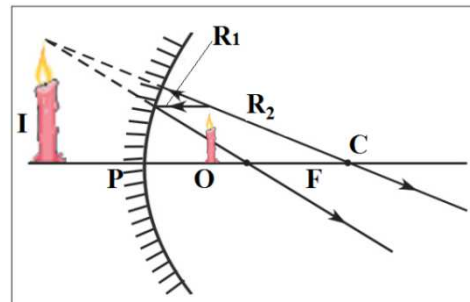
Concave mirror	Convex mirror
1.The surface of the concave mirror is curved In wards.	1.The surface of the convex mirror is bulged Out wards.
2. It reflected real and inverted images.	2. It reflected virtual images.
3. Focal point is formed in front of the mirror.	3.Focal point is formed behind the mirror.

7. Distinguish between real and virtual image? (AS1)

Real image	Virtual image
1. Real image can be caught on a screen.	1. Virtual image cannot be caught on a screen.
2. These are formed due to converge of rays.	2. These are formed due to diverging of rays.
3. These are always inverted.	3. These are always erect.

8. How do you get a virtual image using a concave mirror? (AS1)

If the object is placed in between the pole and focal point on a concave mirror then virtual images are formed.



9. What do you know about the terms given below related to the spherical mirrors? (AS1)

a) Pole b) Centre of curvature c) Focus d) Radius of curvature e) Focal length f) Principal axis
g) Object distance h) Image distance i) Magnification.

a) Pole. - The midpoint (Geometrical centre) of the mirror is called pole (P) of the mirror.

b) Centre of curvature. - All normals of concave mirror will converge towards a point. This point is called centre of curvature(C) of the mirror.

c) Focus. - All the reflected ray of concave mirror is intersecting at one point on the principle axis is called focus or focal point (F).

d) Radius of curvature. - The distance between Pole and Center of curvature is radius of curvature (R) of the mirror.

e) Focal length. - The distance between pole and focal point of a mirror is called focal length (f).

f) Principal axis. - The horizontal line which passes through the centre of curvature and pole is called central axis or principal axis of the mirror.

g) Object distance. - The distance between the pole of a mirror and object is called object distance.

h) Image distance. - The distance between the pole of a mirror and image is called image distance.

i) Magnification. - $m = \frac{\text{size of image (height)}}{\text{size of object (height)}}$ (or) $m = - \frac{\text{image distance from mirror (v)}}{\text{object distance from mirror (u)}}$

10. Write the rules mentioned for sign convention. (AS1)

Rules mentioned for sign convention. - 1. All distances should be measured from the pole.

2. The distances measured in the direction of incident light, to be taken as positive.

3. The distances measured in the opposite direction of incident light, to be taken as negative.

11. The magnification of a plane mirror is +1. What you are observing from this value?

The magnification of a plane mirror is +1 means both object and images are lie on same plane.

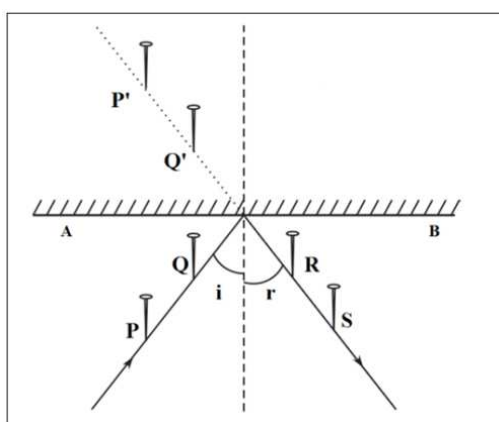
12. Imagine that spherical mirrors are not known to human being, guess the consequences. (AS2)

1. It would be unsafe to drive vehicles, especially in the night.
2. Dentist cannot analyze the problems in our teeth.
3. Many large telescopes to observe the universe will not possible.

13. By observing steel vessels and different images in them; Surya, a third class student asked some questions his elder sister Vidya. What may be those questions? (AS2)

1. Why our image is reduced in some steel vessels?
2. Why our image is enlarged in some steel vessels?
3. Why we are not observing the clear image in a steel vessel like a mirror?

14. How do you verify the 1st law of reflection of light with an experiment? (AS3)



Aim.- Verification of first law of reflection of light.

Required material.- Mirror strip, drawing board, white paper, pins, clamps scale and pencil.

- Procedure.-**
1. Take a drawing board and fix a white paper on it with the help of clamps.
 2. Draw a straight line PQ making certain angle and find its reflection P^I and Q^I.
 3. Join R, S and O as shown in the figure. Measure the angle between RS and ON.
 4. You will find that angle of incidence = angle of reflection.
 5. Hence first law is verified.

15. How do you verify the 2nd law of reflection of light with an experiment? (AS3)

Aim.- Verification of second law of reflection of light.

Required material.- mirror strip, drawing board, white paper, pins, clamps scale and pencil.

- Procedure.-**
1. Take a drawing board and fix a white paper on it with the help of clamps.
 2. Draw a straight line PQ making certain angle and find its reflection P^I and Q^I.
 3. Join R, S and O as shown in the figure.
 4. We will find the incident ray PO, The reflected ray RS and normal ON are lying in the same surface.
 5. Hence second law is verified.

Note: - Draw the same diagram of question number 14 .

16. What do you infer from the experiment which you did with concave mirror and measured the distance of object and distance of image? (AS3)

Position of the candle (object)	Position of the image	Bigger/smaller than object	Inverted or erected	Real or virtual
Between mirror & F	Behind the mirror	Bigger	Erected	Virtual
On focal point	At infinity	Bigger	Inverted	Real
Between F and C	Beyond C	Bigger	Inverted	Real
On centre of curvature	On C	Same size	Inverted	Real
Beyond C	Between F and C	Smaller	Inverted	Real

17. Find the plane of the reflection experimentally for the incident ray which passes through the heads of the pins pierced in front of mirror. (AS3)

1. Take a drawing board and fix a white paper on it with the help of clamps.
2. Draw a straight line PQ making certain angle and find its reflection P^I and Q^I.
3. Join R, S and O as shown in the figure.
4. We will find the incident ray, the reflected ray and normal are lying in the same surface.

Note. - Draw the same diagram of question number 14.

18. Collect the information about the history of spherical mirrors in human civilization. Display in your class room. (AS4)

1. One of the famous examples is from the Greek Archimedes, who burnt ships with parabolic mirrors.
2. Metal coated glass mirror, is invented in Sidon in 1st century A.D.
3. Bronze mirror was manufactured from around 200 B.C.
4. Mirrors made from mixtures are also been produced in China and India.

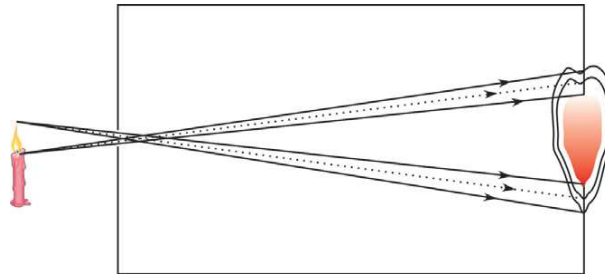
19. Think about the object which acts as a concave or convex mirror in your surroundings. Make a table and display in your class room (AS4)

Concave	Convex
1. Spoon bulged inwards.	1. Spoon bulged outwards.
2. Inner surface of a steel basin.	2. Outer surface of a steel basin.
3. Inner surface of a cooking vessel.	3. Outer surface of a cooking vessel.

20. How will our image in concave and convex mirrors? Collect photographs and display in your class room. (AS4)

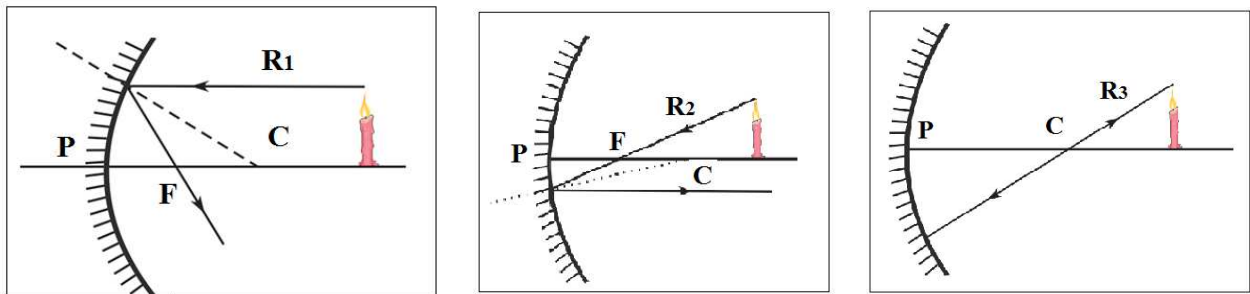
1. In concave mirror our image is thin.
2. In convex mirror our image is bulged out.

21. Draw and explain the process of formation of image with a pinhole camera? (AS5)

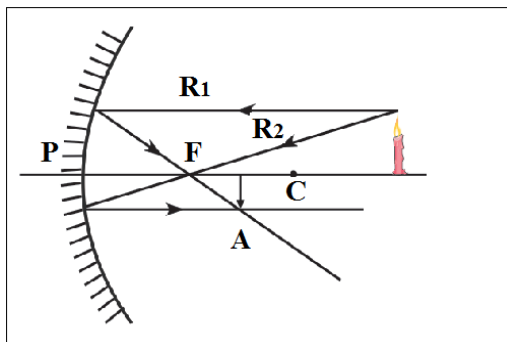


- Formation of image in pinhole camera.** - 1. The light rays coming from the top of the candle flame fall at different points on the screen.
 2. Similarly the rays coming from bottom of the candle flame also fall at different points on the screen.
 3. Thus we get blurred image on the screen.

22. Draw suitable rays by which we can guess the position of the image formed by a concave mirror. (AS5)

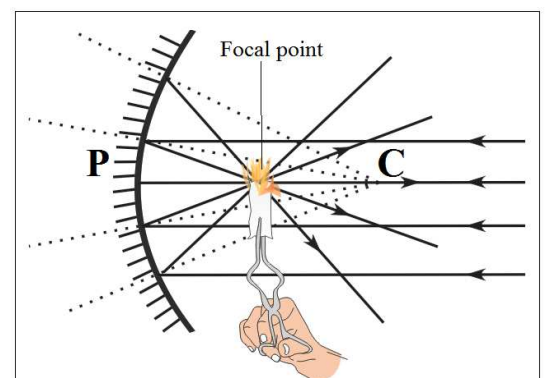


23. Show the formation of image with a ray diagram, when an object is placed on the principal axis of a concave mirror away from the centre of curvature. (AS5)



24. Make a solar heater/cooker and explain the process of making. (AS5)

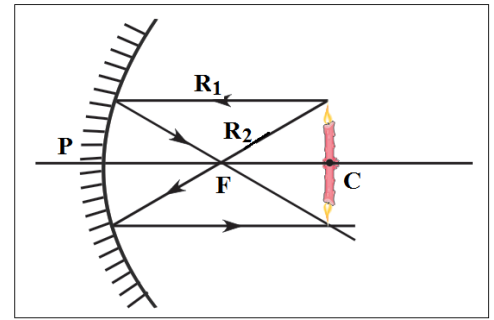
1. Make a wooden/ iron frame in in the shape of TV dish.
2. Cut the acrylic mirror sheets in to 8 or 12 pieces in the shape of isosceles triangles.
3. Stick the triangle mirrors to the dish as shown in the figure.
4. Your solar heater/cooker is ready.



25. To form the image on the object itself, how should we place the object in front of a concave mirror?

Explain with a ray diagram. (AS5)

1. The object is placed on the centre of curvature of concave mirror.
2. The reflected rays are converge at centre of curvature only.
3. So, a real and inverted image with size equal to the size of the object.



26. How do you appreciate the role of spherical mirrors in our daily life? (AS6)

1. Spherical mirrors are used as rear-view mirror in the vehicles.
2. Dentists are also used the spherical mirrors.
3. Spherical mirrors are used in many large telescopes to observe the universe.
4. So, I appreciate spherical mirrors in our daily life.

27. How do you appreciate the use of reflection of light by a concave mirror in making of TV antenna dishes? (AS6)

1. A concave mirror can converge the reflected rays to its focal points.
2. Because by this property of a concave mirror, the shape of TV dish antenna is designed.
3. Hence, I really appreciate the use of reflection of light by a concave mirror in making of TV antenna dishes.

28. Have you ever observed the images of the sky in rain water pools on earth? Explain the reflection of light in this context? (AS6)

1. The surface of rain water in pools act as a plane mirror.
2. So we can observe the virtual image of sky due to reflection of light from surface of rain pool.

29. Discuss the merits and demerits of using mirrors in building elevating? (AS7)

Merits. -

1. They absorb heat energy.
2. They make the building attractive.
3. They are used to cool inside the building.

Demerits. -

1. Some mirrors used in buildings are easily breakable.
2. Birds confused because of the reflection of mirrors in building elevation.
3. It causes disturbance at night time because reflection confuses the vehicles.

30. Why do we prefer a convex mirror as a rear-view mirror in the vehicles? (AS7)

1. Convex mirror always produce an erect and virtual image of the behind vehicle in the small
2. So, we prefer a convex mirror as a rear-view mirror in the vehicles. mirror.

కాలం నియంత్రే, తన దారే మన తలరాత - కాలం ఒక శాసనం!

Time a dictator its path rules Our fate line- Undeserved hope a sheer wasteland indeed.

Acids, Bases and Salts

1. Five solutions A, B, C, D and E when tested with universal indicator showed p^H as 4, 1, 11, 7 and 9 respectively, which solution is, (AS1)

a) Neutral b) strongly alkaline c) strongly acidic d) weakly acidic e) weakly alkaline

f. Arrange the p^H in increasing order of hydrogen ion concentration.

a. The solution 'D' is whose p^H value 7 is neutral.

b. The solution 'C' is whose p^H value is 11, strongly alkaline.

c. The solution 'B' is whose p^H value is 1, strongly acidic.

d. The solution 'A' is whose p^H value is 4, weakly acidic.

e. The solution 'E' is whose p^H value is 9, weakly alkaline.

f. The Arrangement p^H in increasing order of hydrogen ion concentration is 11,9,7,4 and 1.

2. What is a neutralization reaction? Give two examples. (AS1)

The reaction of an acid with a base to give a salt and water is known as neutralization reaction.



3. What happens when an acid or base is mixed with water? (AS1)

1. When an acid or base is mixed with water its concentration is decreases.

2. In this process heat is liberated.

4. Why does tooth decay start when the p^H of mouth is lower than 5.5? (AS1)

If the p^H of the mouth will be less than 5.5 then the tooth enamel is corroded.

5. Why does distilled water not conduct electricity, whereas rain water does? (AS1)

1. The p^H value of distilled water is 7 and neutral, is a bad conductor of electricity as it does not contain ions which carry electricity.

2. The p^H of the rain water is less than 7 and is slightly acidic in nature. It contains ions to carry electricity.

6. Dry hydrogen chloride gas does not turn blue litmus whereas hydrochloric acid does. Why? (AS1)

1. Hydrogen Chloride gas is not an acid. Hence it does not turn blue litmus paper.

2. When hydrogen chloride gas is mixed with water hydrochloric acid is formed.

3. Hence, it turns blue litmus.

7. Why pure acetic acid does not turn blue litmus to red? (AS2)

1. An acid does not show acidic behavior in the absence of water.

2. So, pure acetic acid does not turn blue litmus to red.

8. A milkman adds a very small amount of baking soda to fresh milk. (AS2)

a) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?

b) Why does this milk take a long time to set as curd?

a. He shifts the pH of the fresh milk from 6 to alkaline so that in basic form it will not spoil easily.

b. This milk takes a long time to set as curd because the lactic acid produced reacts with the baking soda.

9. Plaster of Paris should be stored in moisture – proof container. Explain why? (AS2)

1. Plaster of Paris is a white powder and on mixing with water, it sets into hard solid mass due to the formation of Gypsum.

2. So, it should be stored in moisture – proof container.

10. Fresh milk has a pH of 6. How does the pH change as it turns to curd? Explain your answer. (AS3)

1. When milk is turns to curd the lactobacillus keeps growing and it breaking down the lactose in to lactic acid which acidified the milk even further.

2. So, the p^H value of the curd is changed.

11. Compounds such as alcohols and glucose contain hydrogen but are not categorized as acids.

Describe an activity to prove it. (AS3)

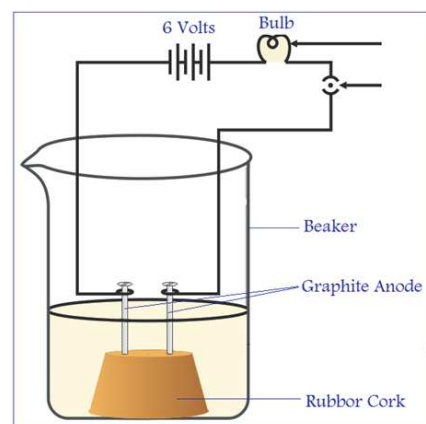
1. Prepare a solution of glucose and alcohol.

2. This solution is keeping in a beaker and arranges the two electrodes as shown in the figure.

3. We will notice that the bulb does not glow in both glucose and alcohol solutions.

4. This indicates that solutions of both glucose and alcohol do not have H^+ ions which carry electricity through them.

5. Hence, the compounds of glucose and alcohol are not categorized as acids.



12. What is meant by “water of crystallization” of a substance? Describe an activity to demonstrate water of crystallization. (AS7)

Water of crystallization. Water of crystallization is the fixed number of water molecules chemically attaches to each formula unit of a salt in its crystalline form.

1. Take a few crystals of copper sulphate in a dry test tube and heat the test tube.

2. After heating the blue colour of the copper sulphate turns to white.

3. Add few drops of water to white coloured copper sulphate returns to blue colour.

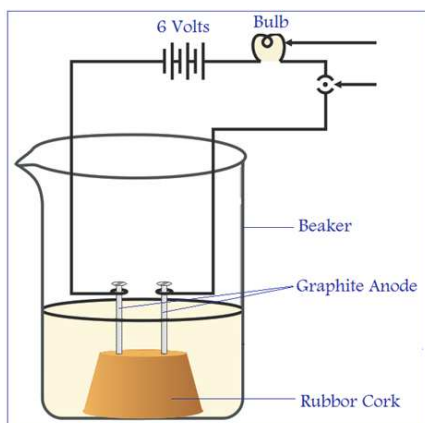
4. In the above activity, copper sulphate crystals which seem to be dry contain the water of crystallization.

5. When these crystals are heated, water present in crystals is evaporated and the salt turns white.

13. Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid is added to test tube A, while acetic acid is added to test tube B. The concentrations taken for both the acids are same in which test tube the reaction occurs more vigorously and why? (AS4)

1. The fizzing will occur more vigorously in the test tube 'A'.
2. Because Hydrochloric acid is Strong and easily disassociated and produced H^+ ions than that of acetic acid.
3. These H^+ ions form as hydrogen gas which is responsible for the occurrence of vigorous fizzing in the test tube 'A'.

14. Draw a neat diagram showing acid solution in water conducts electricity? (AS5)



15. Why the naphthalene balls move up and down? Describe an experiment in support of your answer and explain the procedure, (AS5)

1. Naphthalene balls moves up because the surrounding carbon dioxide gas bubbles which lift the naphthalene balls up.
2. Naphthalene balls moves down due to their weight.

Experiment: 1. Take a clean glass beaker of 500 ml/1000ml capacity.

2. Add small quantity of baking soda, acetic acid in the water.

3. Carbon dioxide gas is formed in the solution appears as bubbles in the solution and stick with the naphthalene balls moves up.

4. After reaching the upper, they move down due to their weight.

16. How do you prepare your own indicator using beetroot? Explain? (AS5)

Aim: To prepare own indicator using beetroot.

Required Material: - Beetroot, Knife, Bowl, mixy and spoon etc.

Procedure: 1. Take the beetroot and cleaned them with water.

2. Obtain the beetroot juice by using the mixy.

3. Now add 5 to 6 drops of this juice, an indicator, to the organic juice of 5 to 6 drops and mix it.

4. A change in colour is seen.

5. This indicates the presence of acidic nature in the organic juice.

17. How does the flow of acid rain water into a river make the survival of aquatic life in a river difficult? (AS7)

1. When the pH value of the rain water is less than 5.6, it is called acid rain.
2. When acid rain flows into the river, it lowers the pH value of the river water, the survival of aquatic life in such rivers becomes difficult.

18. What is baking powder? How does it make the cake soft and spongy? (AS7)

Baking powder. Baking powder is a mixture of baking soda and a mild edible acid such as tartaric acid.

1. When baking powder is heated or mixed in water, the following reaction takes place.
$$\text{NaHCO}_3 + \text{H}^+ \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{Sodium salt of acid.}$$
2. Carbon dioxide produced during the reaction causes bread or cake to rise making them soft and spongy.

19. Give two important uses of washing soda and baking soda? (AS7)

Uses of washing soda.

1. It is used in glass and soap and paper industries.
2. It is also used for removing permanent hardness of water.

Uses of baking soda.

1. Baking soda is an ingredient in antacids.
2. It is also used in fire extinguishers and acts as mild antiseptic.

Svante Arrhenius (1859-1927)



Arrhenius was born near Uppsala, Sweden. He presented his thesis, on the conductivities of electrolyte solutions, to the University of Uppsala in 1884. For the next five years he travelled extensively and visited a number of research centers in Europe. In 1895 he was appointed professor of physics at the newly formed University of Stockholm, serving its rector from 1897 to 1902. From 1905 until his death he was Director of physical chemistry at the Nobel Institute in Stockholm. He continued to work for many years on electrolytic solutions. In 1899 he discussed the temperature dependence of reaction rates on the basis of an equation, now usually known as Arrhenius equation. He worked in a variety of fields, and made important contributions to immunochemistry, cosmology, the origin of life, and the causes of ice age. He was the first to discuss the 'green house effect' calling by that name. He received Nobel Prize in Chemistry in 1903 for his theory of electrolytic dissociation and its use in the development of chemistry.

విశ్లేషణ విమర్శ పదును పేట్టే సానరాళ్ళు-ముఖస్తుతి నల్లమందు!

Analysis, criticism, are sharpening skills- But flattery, an opium,

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Chapter 5

Refraction at Plane Surface

1. Why is it difficult to shoot a fish swimming in water? (AS1)

1. It is very difficult to shoot a fish swimming in water.
2. Because its position appears to be shifted up from its original position due to reflection.

2. The speed of the light in a diamond is 1, 24, 000 km/s. Find the refractive index of diamond if the speed of light in air is 3, 00,000 km/s. (AS1) (Ans: 2.42)

Given :- Speed of light in a Diamond = 1, 24, 000 km/s
Speed of light in air = 3, 00,000 km/s.

$$\text{Refractive index of a Diamond} = \frac{\text{Speed of light in air}}{\text{speed of light in a diamond}} = \frac{3,00,000}{1,24,000} = 2.419 = 2.42$$

3. Refractive index of glass relative to water is $\frac{9}{8}$. What is the refractive index of water relative to glass? (AS1) (Ans: $\frac{8}{9}$)

Given :- Refractive index of glass relative to water is $= \frac{9}{8} = \frac{\text{Speed of light in water}}{\text{Speed of light in air}}$

$$\text{Refractive index of water relative to glass} = \frac{\text{Speed of light in air}}{\text{Speed of light in water}} = \frac{8}{9}$$

4. The absolute refractive index of water is $\frac{4}{3}$. What is the critical angle of it? (AS1) (Ans: 84.5°)

Given :- The absolute refractive index of water = $\frac{4}{3}$

$$\frac{1}{\sin C} = \frac{4}{3} \rightarrow \sin C = \frac{3}{4} \rightarrow \sin C = 0.75 \rightarrow \sin C = \sin 84.5^\circ \rightarrow C = 84.5^\circ$$

5. Determine the refractive index of benzene if the critical angle of it is 42° . (AS1) (Ans: 1.51)

Given :- The critical angle of Benzene = 42°

$$\text{Refractive index of Benzene} = \frac{1}{\sin C} = \frac{1}{\sin 42} = \frac{1}{0.6691} = \frac{10000}{6691} = 1.51$$

6. Explain the formation of mirage ?(AS1)

Mirage :- Mirage is an optical illusion where it appears that water is collected on the road at a distant place but when we get there, we don't find any water.

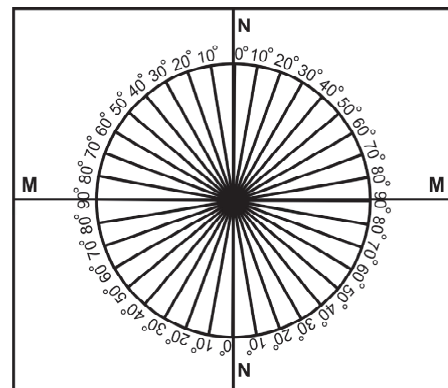
Formation :- 1. During the hot summer day, air just above the road surface is very hot and the air at higher altitudes is cool.

2. Light travels faster through the thinner hot air than through, the denser cool air above it.
3. When light falls from tall object such as tree or from the sky passes through a medium just above the road.
4. Due to the refraction of light ,we fell the illusion of water being present on road.
5. This is called a mirage.

7. How do you verify experimentally that $\frac{\sin i}{\sin r}$ is constant ? (AS1)

Aim: - To verify that $\frac{\sin i}{\sin r}$ is a constant.

Materials required:- A plank, white chart, protractor, scale, small black painted plank, a semi circular glass disc of thickness nearly 2cm pencil and laser light.



Procedure :- 1. Make a chart as shown in the figure.

2. Place a semi-circle glass disc so that its diameter coincides with the line "MM"
3. Send a laser light along a line which makes 15° with "NN".
4. Measure its corresponding angle of refraction by observing light coming from outside of the glass slab.
5. Repeat this experiment with various values of angle of incidence, refraction and noted below.

S.No	i	r	Sin i	Sin r	$\frac{\sin i}{\sin r}$

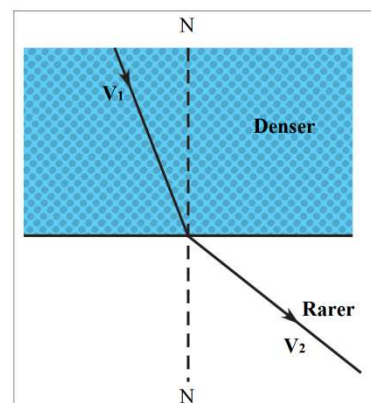
6. From the above table we observe that $\frac{\sin i}{\sin r}$ is a constant.

8. Explain the phenomenon of total internal reflection with one or two activities?(AS1)

1. Take a cylindrical transparent vessel and place a coin at the bottom of the vessel.
2. Now pour water until you get the image of the coin on the water surface.
3. Formation of the image of the coin is due to total internal reflection.

9. How do you verify experimentally that the angle of refraction is more than angle of incidence when light rays travel from denser to rarer medium ? (AS1)

1. Consider that a light travels from medium-1 with speed V_1 to medium-2 with speed V_2 as shown in the figure.
2. Here $V_2 < V_1$ means medium-1 is denser medium and medium-2 is rarer medium.
3. When light travels from denser medium to rarer medium the angle of incident is less than the angle refraction.
4. This means angle of refraction is more than angle of incident when light travels from denser medium to rarer medium.



10. Take a bright metal ball and make it black with soot in a candle flame. Immerse it in water. How does it appear and why? (Make hypothesis and do the above experiment). (AS2)

1. The metallic ball appeared to be raised up in the water.
2. The path of the ray changes its direction at the interface, separating the two media i.e air and water.

11. Take a glass vessel and pour some glycerin into vessel and next pour water up to the brim.

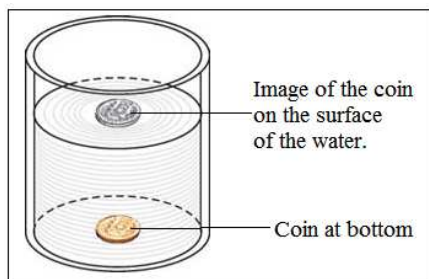
Take a quartz glass rod. Keep it in the vessel. Observe glass rod by the sides of glass vessel.

*What changes do you notice? * What could be the reasons for these changes? (AS2)

1. We cannot see the glass rod in glycerin, but we can see the rod in water.
2. We also observe a clear image of glass rod in water.

Reason: - Glycerin and glass have same refractive index. So we are unable to see the glass rod in glycerin.

12. Do activity-7 again. How can you find critical angle of water? Explain your steps briefly. (AS3)



1. You might have observed a coin kept at the bottom of a vessel filled with water appears to be raised.

2. The refractive index of water is 1.33

3. So critical angle of water, $\sin C = \frac{1}{\text{Refractive index } (n)} = \frac{1}{1.33}$

$$\sin C = 0.7518$$

$$\sin C = \sin 48.7^\circ \rightarrow C = 48.7^\circ$$

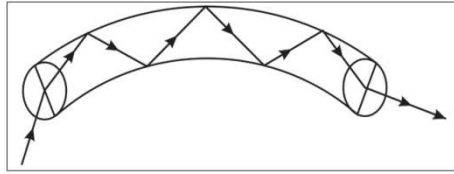
4. The critical angle of water = 48.7°

13. Collect the values of refractive index of the following media. (AS4)

Water, coconut oil, flint glass, crown glass, diamond, benzene and hydrogen gas.

S.No	Material Medium	Refractive index
1	Water	1.33
2	Coconut oil	1.445
3	Flint glass	1.65
4	Crown glass	1.52
5	Diamond	2.42
6	Benzene	1.50
7	Hydrigen	-----

14. Collect information on working of optical fibers. Prepare a report about various uses of optical fibres in our daily life. (AS4)



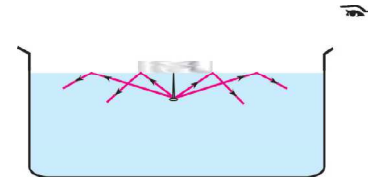
Optical fibers: - 1. Fibers works on the principle of total internal reflection.

2. Fiber is made up of plastic or glass and its diameter is one micro meter (10^{-6} m).
3. Optical fibers are used to test the intestines of a human body.
4. Fiber optics are used to transmit the communication signals through light pipes.

15. Take a thin thermocol sheet. Cut it in circular discs of different radii like 2cm, 3cm, 4cm, 4.5cm, 5cm etc and mark centers with sketch pen. Now take needles of length nearly 6cm. Pin a needle to each disc at its centre vertically. Take water in a large opaque tray and place the disc with 2cm radius in such a way that the needle must be inside the water as shown in figure. Now try to view the free end (head) of the needle from surface of the water.

a). Did you able to see the head of the needle?

Now do the same with other discs of different radii. Try to see the head of the needle, each time.



Note: the position of your eye and the position of the disc on water surface should not be changed while repeating the activity with other discs.

b). At what maximum radius of disc, did you not able to see the free end of the needle?

c). Why didn't you able to view the head of the nail for certain radii of the discs?

d). Does this activity help you to find the critical angle of the medium (water)?

e). Draw a diagram to show the passage of light ray from the head of the nail in different situations. (AS4)

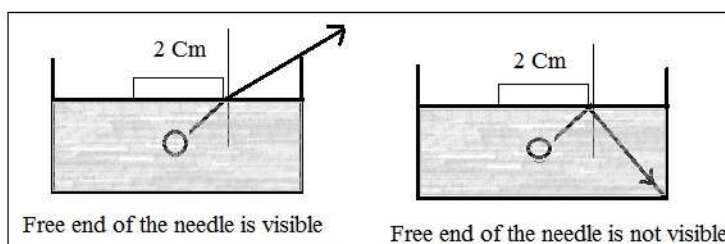
1. Yes, we can see the head of the needle.
2. At radius of 6 cm, we cannot see the free end of the needle.
3. Because the light ray coming from the object undergoing total internal reflection by touching the surface of disc.
4. Yes, this activity helps us to find the critical angle of the medium (water).

$$\sin C = \frac{\text{Refractive index of air } (n_2)}{\text{Refractive index of water } (n_1)} = \frac{1.003}{1.33} = 0.7521$$

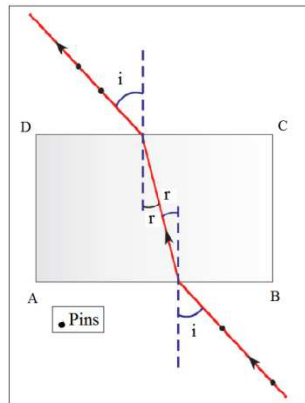
$$\sin C = \sin 48.7^\circ$$

$$\text{Critical angle, } C = 48.7^\circ$$

5.

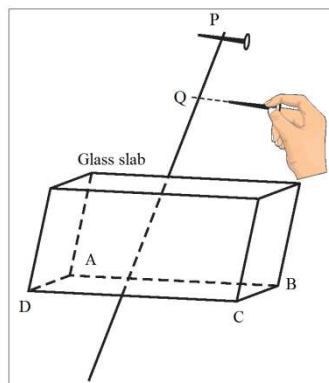


16. Explain the refraction of light through the glass slab with a neat ray diagram. (AS5)



1. Place a piece of chart on a plank and Clamp it.
2. Place a glass slab in the middle of the paper. Draw border line along the edges of the slab by using a pencil.
3. Name the vertices of the rectangle as A, B, C and D.
4. Make the arrangement as shown in the figure.
5. The refraction of light through the glass slab is as shown in the figure.
6. From the figure we noticed that the incident ray and emergent ray are parallel.

17. Place an object on the table. Look at the object through the transparent glass slab. You will observe that it will appear closer to you. Draw a ray diagram to show passage of light ray in this situation. (AS5)



18. What is the reason behind the shining of diamond and how do you appreciate it? (AS6)

1. Total internal reflection is the main reason behind the shining of diamond.
2. Diamond has high refractive index (2.41) and very low critical angle (24.4°).
3. These are responsible for total internal reflection to take place in it.
4. So, I appreciate the diamond for shining.

19. How do you appreciate the role of Fermat principle in drawing a ray diagram? (AS6)

1. Fermat principle shows that light always takes the path of least amount of time.
2. This principle enables us to draw the ray diagram to explain the phenomena of light.
3. This principle also enables us to draw the ray diagram of reflection of light.
4. So, we appreciate the role of Fermat principle in drawing a ray diagram.

20. A light ray is incident on air-liquid interface at 45° and is refracted at 30° . What is the refractive index of the liquid? For what angle of incidence will the angle between reflected ray and refracted ray be 90° ? (AS7) (Ans. 1.414, 54.7°)

Given. - The angle of incidence, $i = 45^\circ$

The angle of refraction, $r = 30^\circ$

$$\text{Refractive index of a liquid (n)} = \frac{\sin i}{\sin r} = \frac{\sin 45}{\sin 30} = \frac{\frac{1}{\sqrt{2}}}{\frac{1}{2}} = \frac{1}{\sqrt{2}} \times \frac{2}{1} = \sqrt{2} = 1.414$$

The refractive index of a liquid is 1.414

We know angle of refraction (r) = 90° - Angle of incident

$$\text{Refractive index (n)} = \frac{\sin i}{\sin r} \rightarrow 1.414 = \frac{\sin i}{\sin (90-i)} \rightarrow \frac{\sin i}{\cos i} = 1.414 \rightarrow \tan i = 1.414$$

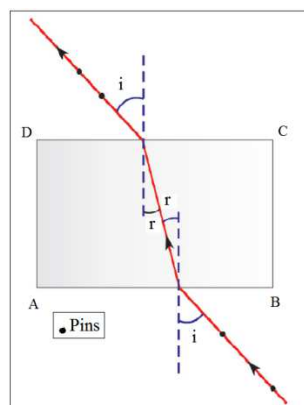
$$\rightarrow \tan i = \tan 54.7^\circ \rightarrow \angle i = 54.7^\circ$$

$$\text{Critical angle} = 54.7^\circ$$

21. Explain why a test tube immersed at a certain angle in a tumbler of water appears to have a mirror surface for a certain viewing position? (AS7)

1. When the glass tube is immersed in the water it appears to have a mirror surface.
2. Because they get total internally reflected.
3. So they appear to come from the surface of the tube itself.

22. What is the angle of deviation produced by the glass slab? Explain with ray diagram. (AS7)



1. Place a piece of chart on a plank and Clamp it.
2. Place a glass slab in the middle of the paper. Draw border line along the edges of the slab by using a pencil.
3. Name the vertices of the rectangle as A, B, C and D.
4. Make the arrangement as shown in the figure.
5. The refraction of light through the glass slab is as shown in the figure.
6. From the figure we noticed that the incident ray and emergent ray are parallel.

23. In what cases a light ray does not deviate at interface of two media? (AS7)

A light ray does not deviate at interface of two media when it is incident normally at a point on the interface of two media.

24. A ray of light travels from an optically denser to rarer medium. The critical angle of the two media is 'c'. What is the maximum possible deviation of the ray? (AS7) (Ans.Π-2c)

Given: - The critical angle = C

The maximum angle of deviation of the ray = $\Pi - (C+C) = \Pi - 2C$

25. When we sit at camp fire, objects beyond the fire seen swaying. Give the reason for it. (AS7)

1. When we sit at camp fire, objects beyond the fire seen swaying.
2. This happens due to refraction of light
3. The rays of light get reflected when they pass through hot air to cold air.
4. So we observe the objects beyond the fire seen swaying.

26. Why do stars appear twinkling? (AS7)

Stars appear twinkling due to multiple refraction at different layers of air of different densities; the light undergoes all the way to reach our eye.

27. Why does a diamond shine more than a glass piece cut to the same shape? (AS7)

1. Diamond exhibits the property of total internal reflection due to its high refractive index and low critical angle.
2. So, diamond shines more than a glass piece cut to the same shape.

BOOK BINDER BECAME AN EXPERIMENTAL PHYSICIST

Michael Faraday (1791–1867)



Michael Faraday was an experimental physicist. He had no formal education. He came from a poor family. His father was a brick layer. He learned the formal education in the lap of his mother. He worked in a book-binding shop during his early years. He used to read books that came for binding. This way Faraday developed his interest in science. He got an opportunity to listen to some public lectures by Humphrey Davy of Royal Institute. He made careful notes of Davy's lectures and sent them to Davy. Soon he was made an assistant in Davy's laboratory at the Royal Institute. Faraday made several path-breaking discoveries that include electromagnetic induction and the laws of electrolysis. Several universities conferred on him the honorary degrees but he turned down such honours. Faraday loved his science work more than any honour.

బడి పై వాల్ సీతాకోక చిలుకలు పిల్లలు - మకరంధం విజ్ఞానం.

Children flocking butterflies on school precincts – Knowledge, their, finest nectar.

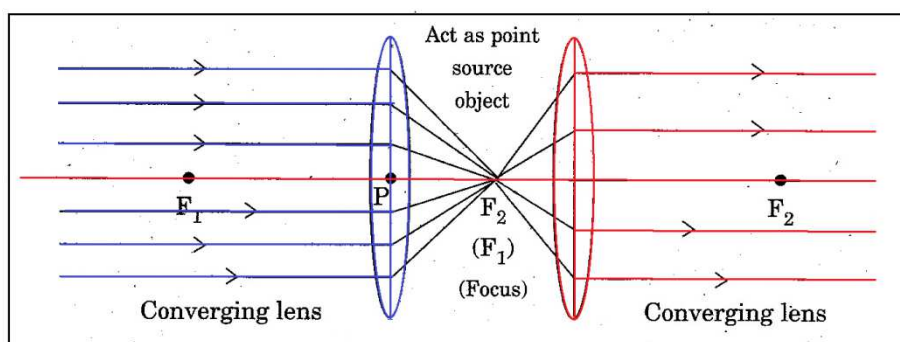
Writer: G. Sree Kar M.Sc, B.Ed (9700842884, 9440234404)

Refraction at Curved Surface

1. A man wants to get a picture of a zebra. He photographed a white donkey after fitting a glass, with black stripes, on to the lens of his camera. What photo will he get? Explain. (AS1)

1. He will get an image of white donkey because every part of lens forms an image.
2. So, if we cover the lens with strips still it forms a complete image.
3. However, the intensity of the image will be reduced.

2. Two converging lenses are to be placed in the path of parallel rays so that the rays remain parallel after passing through both lenses. How should the lenses be arranged? Explain with a neat ray diagram. (AS1)



1. Arrange the two converging lenses are to be placed in the path of parallel rays in such a way that they should have common focal point between them.
2. The parallel rays of the first lens form a point source at the focal point.
3. Next the light rays travel in all directions and falls on the second lens and get refracted.
4. The refracted rays also travel parallel to each other and also to the principle axis.
5. Thus, forms a parallel beam of light rays.

3. The focal length of a converging lens is 20cm. An object is 60cm from the lens. Where will the image be formed and what kind of image is it? (AS1)

Given: - Focal length, $f = 20$ Cm
 Object distance, $u = -60$ Cm (In front of lens take as - ve sign)
 Image distance, $v = ?$

Formula :- $\frac{1}{f} = \frac{1}{u} + \frac{1}{v} \Rightarrow \frac{1}{v} = \frac{1}{f} + \frac{1}{u} \Rightarrow \frac{1}{v} = \frac{1}{20} + \frac{1}{-60} \Rightarrow \frac{1}{v} = \frac{1}{20} - \frac{1}{60} \Rightarrow \frac{1}{v} = \frac{3-1}{60} \Rightarrow \frac{1}{v} = \frac{2}{60} \Rightarrow v = 30$ cm

\therefore A real, diminished, inverted image formed at 30cm from the lens.

$$\text{Linear Magnification, } m = \frac{v}{u} = \frac{30}{-60} = \frac{-30}{60} = \frac{-1}{2}$$

Since m is negative, the image is real and inverted.

4. A double convex lens has two surfaces of equal radii 'R' and refractive index $n = 1.5$. Find the focal length 'f'. (AS1)

Given:-

Refractive index = 1.5

Let $R_1 = R$ and $R_2 = -R$

$$\begin{aligned} \text{Lens makers formula is } \frac{1}{f} &= (n-1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right] \\ &= (1.5-1) \left(\frac{1}{R} - \frac{1}{-R} \right) \\ &= (1.5-1) \left(\frac{1}{R} + \frac{1}{R} \right) \\ &= 0.5 \left(\frac{1+1}{R} \right) \\ &= 0.5 \times \frac{2}{R} \\ \frac{1}{f} &= \frac{1}{R} \\ \therefore f &= R \end{aligned}$$

\therefore The focal length is equal to radii of curvature.

5. Write the lens makers formula and explain the terms in it? (AS1)

$$\text{Lens makers formula is } \frac{1}{f} = (n-1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$$

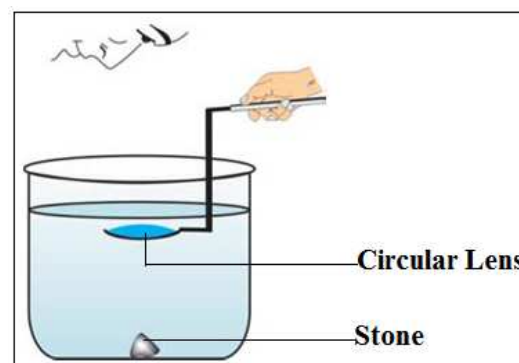
Here f = Focal length

R_1 and R_2 are radii of curvature.

n = Refractive index.

6. How do you verify experimentally that the focal length of a convex lens is increased when it is kept in water? (AS1)

1. The arrangements are shown as shown in the figure.
2. Set the distance between stone and lens that is equal to less than the focal length of the lens.
3. We can see the image of the stone.
4. Now increase the distance between lens and stone until we cannot view the image of the stone.
5. This shows that the focal length of lens has increased in water.



7. How do you find the focal length of the lens experimentally? (AS1)

1. Take the lens on v-type stand and keep it on a table such that it focuses towards the distant object.
2. A white coated screen is placed on the other side of the lens and gets the clear image of the object.
3. At this position measure the distance between the lens and the screen which is equal to the focal length of the lens.

$$\text{i.e. } \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

8. Harsha tells Siddhu that the double convex lens behaves like a convergent lens. But Siddhu knows that Harsha's assertion is wrong and corrected Harsha by asking some questions. What are the questions asked by Siddhu? (AS2)

1. What is the convergent lens?
2. Is there a lens which is called as a convergent lens other than double convex lens?
3. Siddhu corrected Harsha's assertion as: "A double convex lens is also known as convergent lens"

9. Assertion (A): A person standing on the land appears taller than his actual height to a fish inside a pond. (AS2)

Reason (R):- Light bends away from the normal as it enters air from water.

Which of the following is correct? Explain.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true and R is not the correct explanation of A.
- c) A is true but R is false. d) Both A and R are false.
- e) A is false but R is true.

Both A and R are true and R is the correct explanation of A.

Explanation: - 1. Let the actual height of the person be 'x' feet.

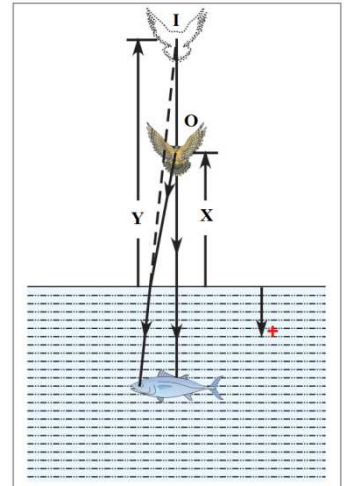
$$2. \frac{\text{Refractive index of air}}{\text{refractive index of water}} = \frac{\text{Actual height of the man}}{\text{Apparent height of the man}}$$

$$3. \frac{1}{1.33} = \frac{x}{\text{Apparent height of the man}}$$

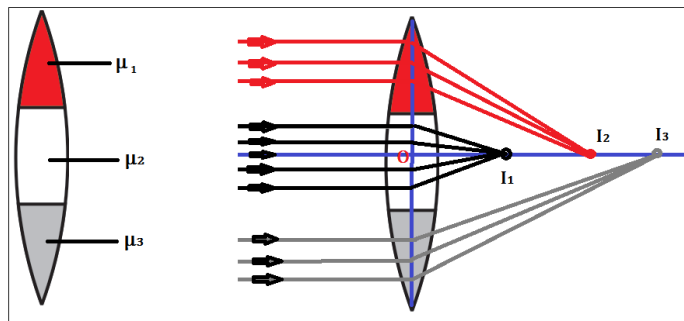
$$4. \text{Apparent height of the man} = 1.33X$$

$$= 1.33 \text{ times of the actual height of the person.}$$

5. Hence the standing on the land appears taller than his actual height to a fish inside a pond.



10. A convex lens is made up of three different materials as shown in the figure. How many of images does it forms? (AS2)

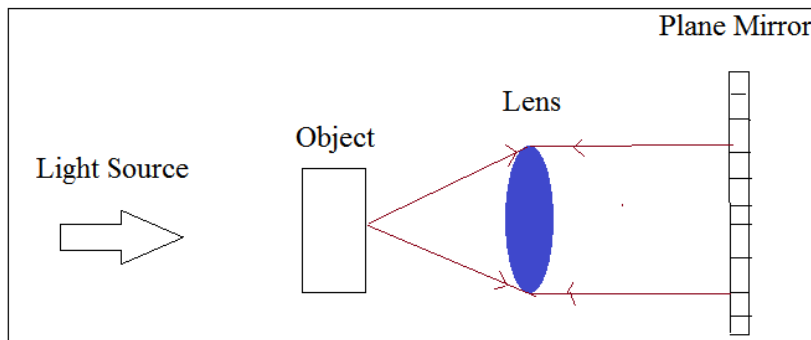


1. A convex lens is made up of three different materials and its refractive indexes are μ_1 , μ_2 and μ_3 respectively.
2. They form three different images for a same object at their three different foci as shown in the figure.

11. Can virtual image be photographed by a camera? (AS2)

Yes, a virtual image can be photographed by a camera.

12. You have a lens. Suggest an experiment to find out the focal length of the lens. (AS3)



1. Place the lens in a lens holder on the bench.
2. Position the wire gauge, object, a lamp and a plane mirror as shown in the figure.
3. Move the lens backwards or frontwards in relation to the object until you catch a clear image on the screen.
4. Calculate the distance between the lens and object. It is equal to focal length of the lens.

13. Let us assume a system that consists two lenses with focal length f_1 and f_2 respectively. How do you find the focal length of the system experimentally, when (AS3)

- i) Two lenses are touching each other
- ii) They are separated by a distance 'd' with common optical axis.

i) Focal lens of combination of two lenses are touching each other:-

1. We know the lens formula $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

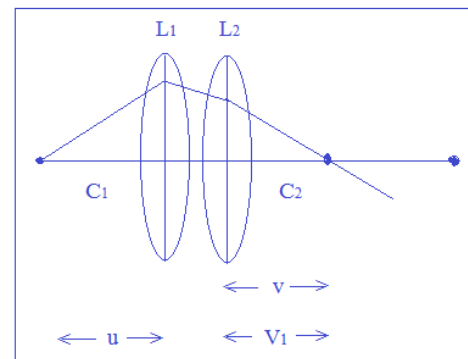
2. For the two lenses, we have $\frac{1}{f_1} = \frac{1}{v_1} - \frac{1}{u}$ ----- (1)

$$\frac{1}{f_2} = \frac{1}{v} - \frac{1}{v_1}$$
 ----- (2)

3. Adding equation (1) and (2), we have $\frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{v_1} - \frac{1}{u} + \frac{1}{v} - \frac{1}{v_1}$

$$\frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{v} - \frac{1}{u}. \text{ Here } f \text{ is the equivalent focal length of the combination.}$$

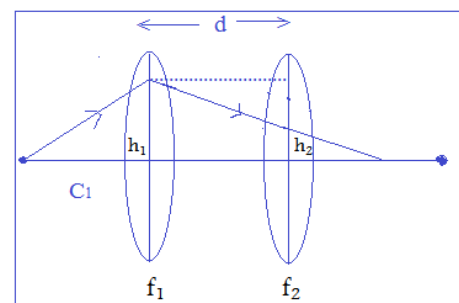
4. Thus $\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2}$



ii) Focal lens of combination of two lenses are touching each other:-

1. When two lens are separated by a distance 'd' and its focal lengths are f_1 and f_2 .

2. Then focal length, $\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 f_2}$



14. Collect the information about the lenses available in an optical shop. Find out how the focal length of a lens may be determined by the given 'power' of the lens. (AS4)

- The lenses available in the optical shop is below,
Glass, concave lens, convex lens photo chromic lenses, single vision lenses, sport glasses, occupational lenses etc.
- The focal length of a lens is determined by using the formula, Power (D) = $\frac{1}{f}$.
- Here f is the focal length of a lens.

Power of lens in diopters	Type of lens	Focal length
0.25	Convex	400 cm
0.5	Convex	200 cm
-2	Concave	50 cm
-0.5	Concave	-100 cm
1	Convex	100 cm
-0.25	Concave	-400 cm

15. Collect the information about lenses used by Galileo in his telescope? (AS4)

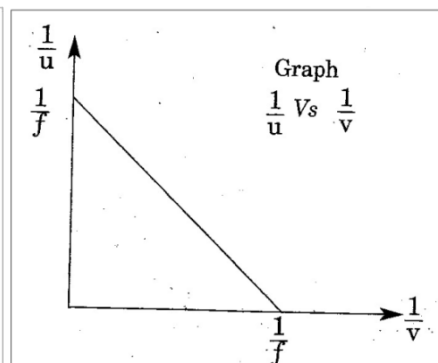
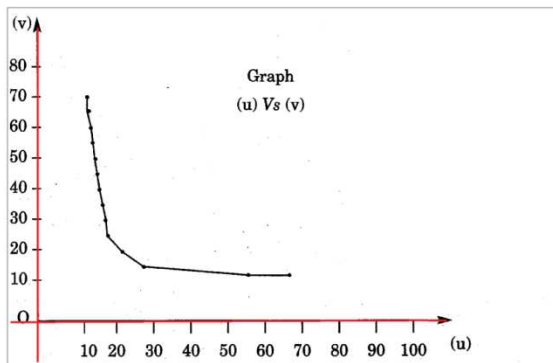
- Galilean telescope has one convex lens and one concave lens.
- The concave lens serves as the ocular lens or the eyepiece, while the convex lens serves as the object.
- The lens are situated on either side of a tube such that focal point of the ocular lens is same as the focal point for the objective lens.

16. Use the data obtained by activity-2 in table-1 of this lesson and draw the graphs of u vs. v and $\frac{1}{u}$ vs. $\frac{1}{v}$.

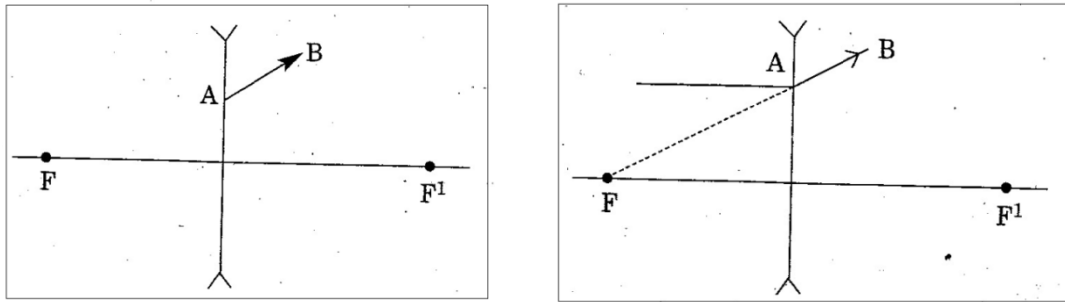
(AS5)

Table

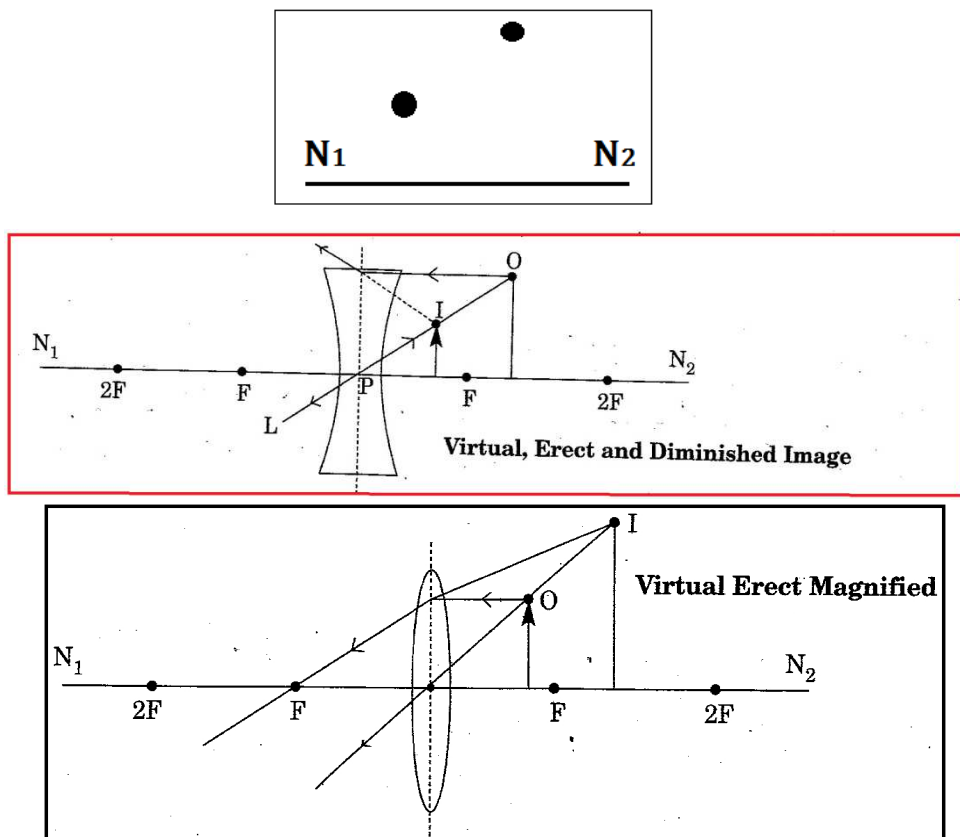
V	70	65	60	55	50	45	40	35	30	25	20	15	12	11
u	11	11.5	12	12.5	13	13.5	14	14.5	15	16.5	20	25	50	60



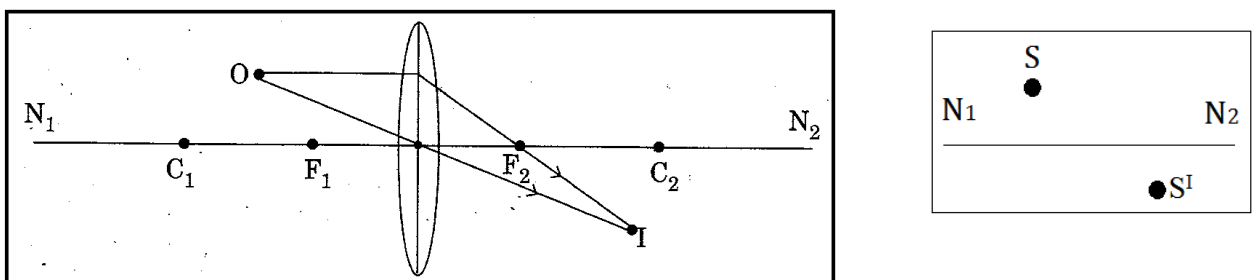
17. Figure shows ray AB that has passed through a divergent lens. Construct the path of the ray up to the lens if the position of its foci is known. (AS5)



18. Figure shows a point light source and its image produced by a lens with an optical axis N_1N_2 . Find the position of the lens and its foci using a ray diagram. (AS5)

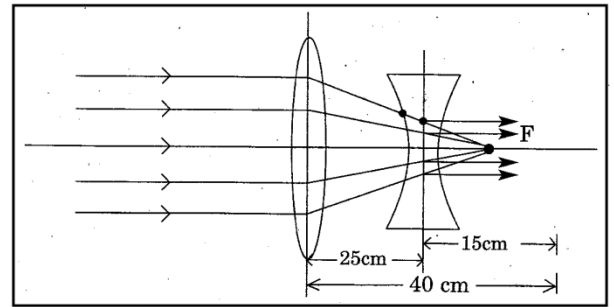


19. Find the focus by using a ray diagram using the position of source S and the image SI (AS5)



20. A parallel beam of rays is incident on a convergent lens with a focal length of 40cm. Where a divergent lens with a focal length of 15 cm should be placed for the beam of rays to remain parallel after passing through the two lenses? Draw a ray diagram. (AS5)

1. The focal length of converging lens is 40 cm.
2. The focal length of diverging lens is 15 cm.
3. The separation between them (d) = $40 - 15 = 25$ Cm
4. The diverging lens has to be placed in the focal length of the convergent lens.



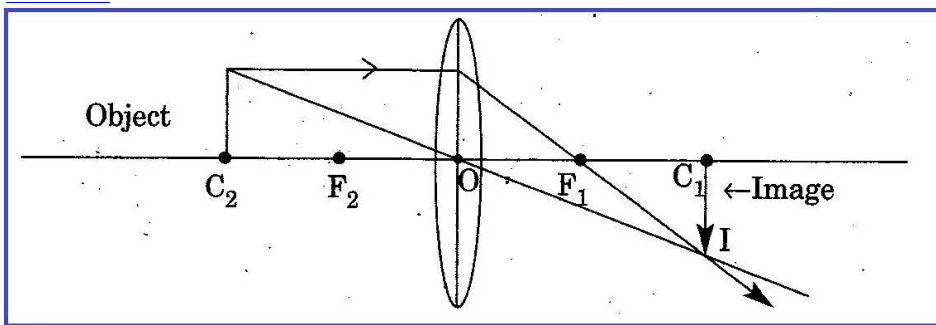
21. Draw a ray diagram for the following positions and explain the nature and position of image.

- 1). Object is placed at C_2
- 2). Object is placed between F_2 and optic centre P. (AS5)

Convex Lens :- 1). Object is placed at C_2

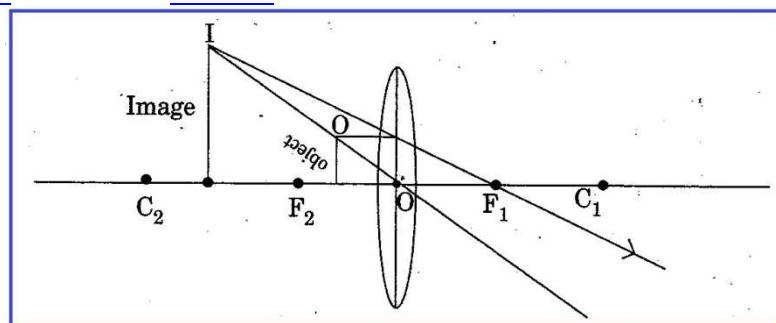
Nature. - Real and inverted

Position. - Formed at C_1 having same size as that of object.



- 2). Object is placed between F_2 and optic centre P.

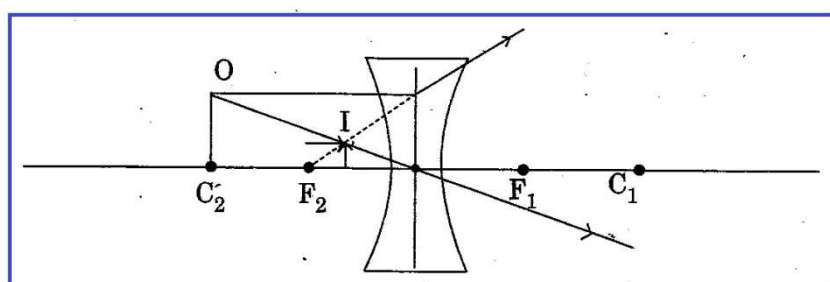
Nature. - Virtual Position. Same side of the object, magnified.



Concave Lens:- 1). Object is placed at C_2

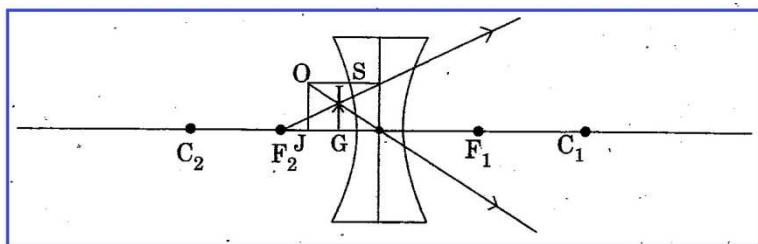
Nature:- Virtual and erect

Position.- Size as that of object, diminished.



2). Object is placed between F_2 and optic centre P.

Nature: - Virtual, erect Position: Same side of the object, diminished.



22. How do you appreciate the coincidence of the experimental facts with the results obtained by a ray diagram in terms of behaviour of images formed by lenses? (AS6)

1. We are getting exactly same type of image as prescribed in ray diagrams by lenses.
2. So, everyone should have to appreciate this and the work of scientists who made a lot of effort on ray diagrams successfully in getting same type of images as obtained from experiments.

23. Find the refractive index of the glass which is a symmetrical convergent lens if its focal length is equal to the radius of curvature of its surface. (AS7) (Ans: 1.5)

1. The given lens is a symmetrical convergent lens. i.e. $R_1=R_2=R$ and $f=R$.
2. Refractive index of air is 1. Let μ be the refractive index of the lens.

$$\begin{aligned}
 3. \frac{1}{f} &= (\mu-1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right] \Rightarrow \frac{1}{R} = (\mu-1) \left[\frac{1}{R} - \frac{1}{(-R)} \right] \\
 &\Rightarrow \frac{1}{R} = (\mu-1) \left[\frac{1}{R} + \frac{1}{R} \right] \\
 &\Rightarrow \frac{1}{R} = (\mu-1) \left[\frac{2}{R} \right] \\
 &\Rightarrow 2(\mu-1) = 1 \\
 &\Rightarrow \mu-1 = \frac{1}{2} \\
 &\Rightarrow \mu = 1 + \frac{1}{2} \\
 &\Rightarrow \mu = \frac{3}{2} \\
 &\Rightarrow \mu = 1.5
 \end{aligned}$$

\therefore The refractive index of the glass is 1.5

24. Find the radii of curvature of a convexo –concave convergent lens made of glass with refractive index $n=1.5$ having focal length of 24cm. One of the radii of curvature is double the other.

(Ans: $R_1=6\text{cm}, R_2=12\text{cm}$) (AS7)

Given :- Refractive index of the glass, $n=1.5$

Focal length , $f= 24$

Let the radius of curvature of convex surface = R_1

Let the radius of curvature of concave surface = $R_2 = 2R_1$

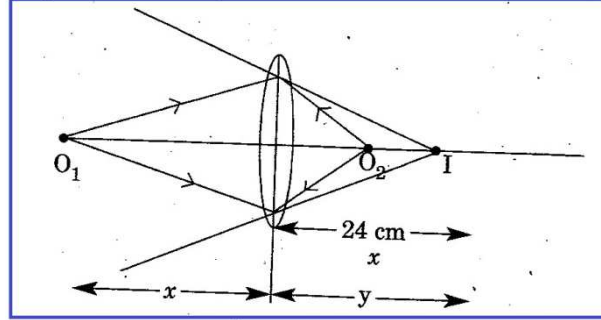
Formula :- $\frac{1}{f} = (\mu-1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right] \Rightarrow \frac{1}{24} = (1.5-1) \left[\frac{1}{R_1} - \frac{1}{2R_1} \right]$

$$\Rightarrow \frac{1}{24} = (0.5) \left[\frac{2-1}{2R_1} \right] \quad \Rightarrow \frac{1}{24} = (0.5) \left[\frac{1}{2R_1} \right]$$

$$\Rightarrow \frac{1}{2R_1} = \frac{1}{24 \times 0.5} \quad \Rightarrow 2R_1 = 24 \times 0.5 \quad \Rightarrow R_1 = \frac{24 \times 0.5}{2} = 6 \text{ Cm}$$

$$R_2 = 2R_1 = 2 \times 6 = 12 \text{ Cm}$$

25. The distance between two point sources of light is 24cm .Where should a convergent lens with a focal length of f=9cm be placed between them to obtain the images of both sources at the same point? (AS7)



Given :-

Focal length, $f = 9 \text{ Cm}$

Suppose x is the distance of the first object from the lens.

Let $u = -x$ and $v = y$

$$\text{Lens formula } \frac{1}{f} = \frac{1}{u} - \frac{1}{v} \Rightarrow \frac{1}{9} = \frac{1}{-x} - \frac{1}{y} \Rightarrow \frac{1}{y} = \frac{1}{9} - \frac{1}{x} \text{ ----(1)}$$

For the second object O_2 where image is also formed at I .

Let $u = -(24-x)$ $v = y$

$$\text{Lens formula } \frac{1}{9} = \frac{1}{-(24-x)} - \frac{1}{y} \Rightarrow \frac{1}{y} = \frac{1}{(24-x)} - \frac{1}{9} \text{ ----(2)}$$

$$\text{From (1) and (2), we have } \frac{1}{(24-x)} - \frac{1}{9} = \frac{1}{9} - \frac{1}{x} \Rightarrow x^2 - 24x + 108 = 0$$

Solving for x gives $x = 18 \text{ Cm}$ and $x = 6 \text{ Cm}$

\therefore Lens should be placed 18 cm and 6 cm to the right of the first object.

26. Suppose you are inside the water in a swimming pool near an edge. A friend is standing on the edge.

Do you find your friend taller or shorter than his usual height? Why? (AS7)

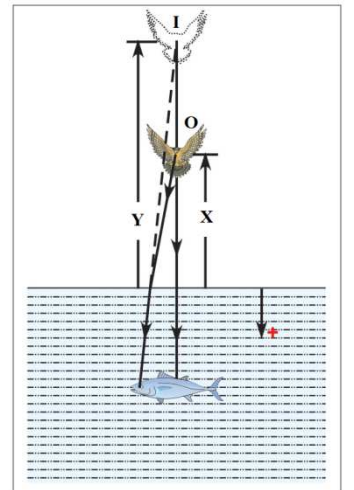
1. Let the actual height of the person be ' x ' feet.

$$2. \frac{\text{Refractive index of air}}{\text{Refractive index of water}} = \frac{\text{Actual height of the man}}{\text{Apparent height of the man}}$$

$$3. \frac{1}{1.33} = \frac{x}{\text{Apparent height of the man}}$$

4. Apparent height of the man = 1.33XActual height
= 1.33 times of the actual height of the person.

5. Hence, you find your friend is taller his usual height.



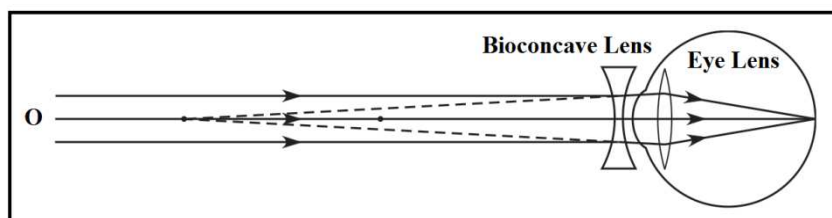
సువ్వు చేసిన సాయం నీకే సాయపడుతుంది- చెట్టుకిందే నీడ!

Your help assists you; forever-Shadow rests under trees only.

Human eye and Colourful world

1. How do you correct the eye defect, Myopia? (AS1)

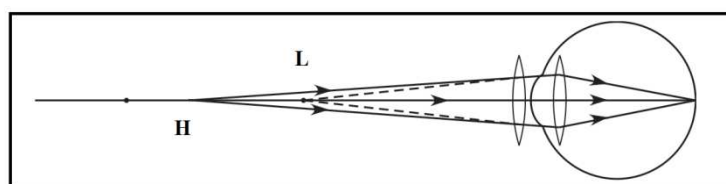
- Myopia:** –
1. The defect in which people cannot see objects beyond far point is called Myopia.
 2. Myopia is also known as ‘near sightednesses’.



- Correction:** –
1. Eye lens can form clear image on retina, when an object is placed between far point and point of least distance of clear vision.
 2. If we could able to bring the image of the object kept beyond far point, between the far point and the point of least distance of clear vision using a lens, this image act as an object for eye lens.
 3. This can be possible only when a concave lens is used.

2. Explain the correction of the eye defect, Hypermetropia?

- Hypermetropia:** –
1. The defect in which people cannot see objects before near point is called Hypermetropia.
 2. Hypermetropia is also known as ‘farsightednesses’.



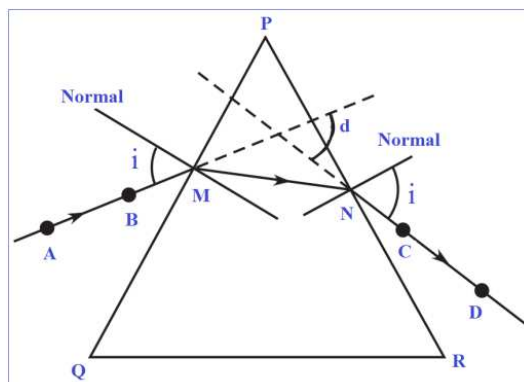
- Correction:** –
1. Eye lens can form clear image on retina when any object is placed beyond near point.
 2. To correct the defect of hypermetropia, we need to use a lens which forms image of object beyond near point between near point (H) and least distance of clear vision (L).
 3. This can be possible only when a double convex lens is used.

3. How do you find experimentally the refractive index of material of a prism (AS1?)

Aim: – To find the refractive index of the prism.

Material required: – Prism, piece of white chart of size 20x20 cm, pencil, pins, scale & protractor.

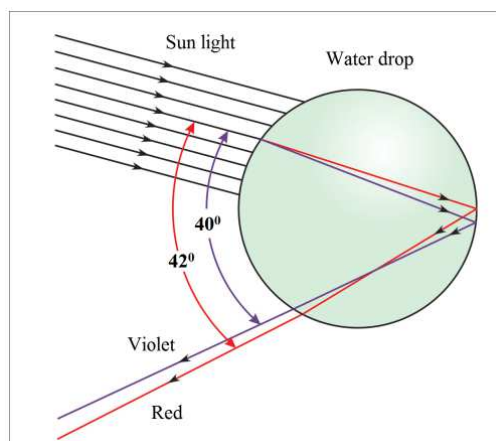
Procedure: -



1. Place the prism on the white chart and draw the boundary lines by using a pencil.
2. Remove the prism and name the vertices as P, Q and R.
3. Calculate the angle of the prism ($A=60^\circ$) and noted in your book.
4. Now fix two pins vertically on the line at points A and B as shown in the figure.
5. Observe the other side of the prism and fix another two pins such that AB and CD appear to lie along the straight line.
6. The angle of incident and angle of emergent are intersect at one point is called angle of deviation (D).
7. The refractive index of a prism is calculated by using the formula,

$$n = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

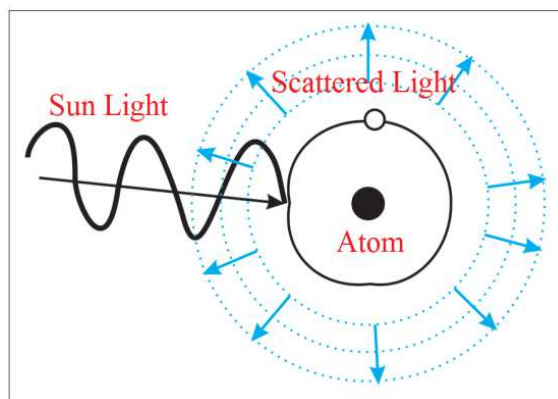
4. Explain the formation of Rainbow? (AS1)



Formation of Rainbow: - 1. The beautiful colours of rainbow are due to dispersion of the sunlight by millions of tiny water droplets.

2. Let us consider a case of an individual water drop.
3. The ray of sunlight enters the drop near its top surface.
4. At this first refraction, the white light is dispersed into its spectrum of colours, violet being deviated the most and red the least.
5. Reaching the opposite side of the drop, each colour is reflected back into the drop because of total internal reflection.
6. If you see at an angle between 40° and 42° , you will observe remaining colours of VIBGYOR.

5. Explain briefly the reason for the Blue of the sky? (AS1)

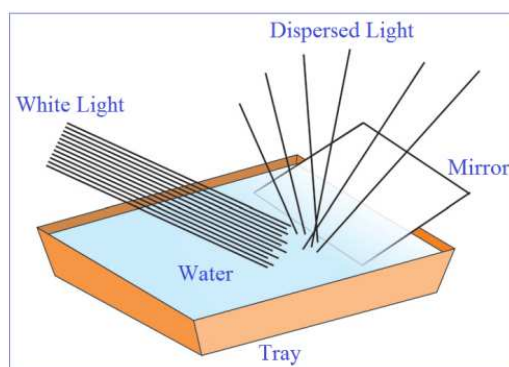


1. The reason for the appearance of sky in blue colour is due to the phenomenon of scattering of sunlight by the atoms or molecules present in the sky.
2. Our atmosphere contains Nitrogen and Oxygen.
3. When sun rays falls on these atoms, the size of these molecules are comparable to the wavelength of blue light.
4. These molecule act as scattering centers for scattering of Blue light.
5. So the sky appears to be Blue in colour.

6. Explain two activities for the formation of artificial rainbow? (AS1)

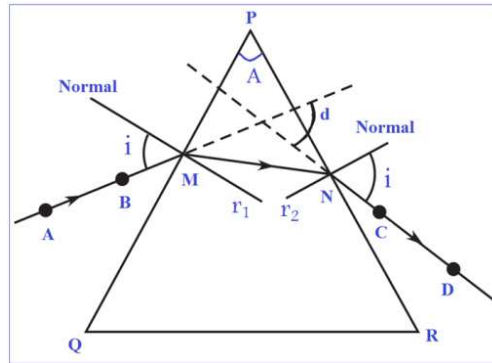
- Activity-1:** -
1. Take a prism and place it in between the light source and white wall.
 2. Sent a light source such that the rays are falls on the prism through the narrow slit of a wooden plank.
 3. Switch on the light. Adjust the height of the prism such that the light falls on one of the lateral surfaces.
 4. We observed that the emergent light forms an artificial rainbow on the wall.

Activity-2: -



1. Take a tray and fill it with water.
2. Place a mirror in the water such that it makes an angle to the water surface.
3. Now focus white light on the mirror through the water as shown in figure.
4. Try to obtain colour on a white card board sheet kept above the water surface.
5. We observe that a white ray of light splits into certain different colours called VIBGYOR.

7. Derive the refractive index of the material in the case of prism? (AS1)



1. Consider the following ray diagram, from triangle OMN, we get $d = (i_1 + i_2) - (r_1 + r_2)$ ----- (1)

2. From triangle PMN, $A = r_1 + r_2$ ----- (2)

3. From (1) and (2), we have $A + d = r_1 + r_2 + (i_1 + i_2) - (r_1 + r_2)$

$$= r_1 + r_2 + i_1 + i_2 - r_1 - r_2$$

$$A + d = i_1 + i_2 \text{----- (3)}$$

4. Using Snell's law at M, $n_1 = 1$, $i = i_1$, $n_2 = n$ and $r = r_1$ gives, $\sin i_1 = n \sin r_1$ ----- (4)

5. At N with $n_1 = n$, $i = r_2$, $n_2 = 1$ and $r = i_2$ gives $n \sin r_2 = \sin i_2$ ----- (5)

6. When $i_1 = i_2$, angle of deviation (d) becomes angle of minimum deviation (D).

7. Then equation (3) becomes $A + D = i_1 + i_1 = 2i_1 \Rightarrow i_1 = \frac{(A+D)}{2}$

8. If $i_1 = i_2$, then $r_1 = r_2$. So from equation (2), we get $2r_1 = A$ (or) $r_1 = \frac{A}{2}$.

9. Substitute i_1 and r_1 in equation (4), we get $\sin \left(\frac{A+D}{2} \right) = n \sin \left(\frac{A}{2} \right)$

$$\therefore n = \frac{\sin \left(\frac{A+D}{2} \right)}{\sin \left(\frac{A}{2} \right)}$$

10. This is the refractive index of the prism.

8. Light of wavelength λ_1 enters a medium with refractive index n_2 from a medium with refractive index

n_1 . What is the wavelength of light in second medium? (Ans: $\lambda_2 = \lambda_1 \frac{n_1}{n_2}$) (AS 1)

1. The wave length of the first medium is λ_1 and refractive index is n_1 .

2. The wave length of the first medium is λ_2 and refractive index is n_2 .

3. From Snell's law, we have $\frac{\lambda_1}{n_2} = \frac{\lambda_2}{n_1} \Rightarrow \frac{n_1}{n_2} = \frac{\lambda_2}{\lambda_1} \Rightarrow \lambda_2 = \lambda_1 \frac{n_1}{n_2}$.

9. Assertion (A): The refractive index of a prism depends only on the kind of glass of which it is made of and the colour of light. (AS 2)

Reason (R) :- The refractive index of a prism depends on the refracting angle of the prism and the angle of minimum deviation.

a. Both A and R are true and R is the correct explanation of A.

b. Both A and R are true and R is not the correct explanation of A.

c. A is true but R is false.

d. Both A and R are false.

e. A is false but R is true.

Both A and R are true and R is not the correct explanation of A.

Reason: - 1. It is found that as the refractive index of material decreases, the angle of deviation decreases.

2. This means, the angle of deviation depends on the refractive index of the material of the prism.

10. Assertion (A):- Blue colour of sky appears due to scattering of light.

Reason (R):- Blue colour has shortest wavelength among all colours of white light. (AS 2)

- a. Both A and R are true and R is the correct explanation of A.
- b. Both A and R are true and R is not the correct explanation of A.
- c. A is true but R is false.
- d. Both A and R are false.
- e. A is false but R is true.

A is true but R is false.

Explanation :- 1. Sky appears blue due to scattering of light.

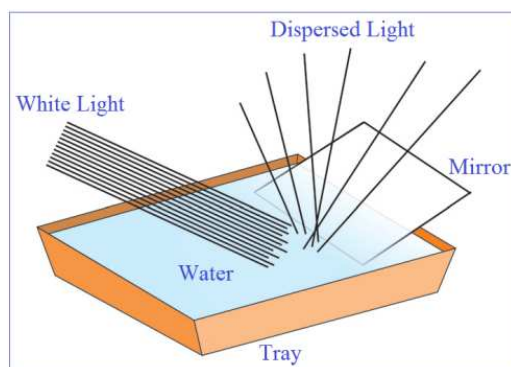
2. Violet colour has the shortest wavelength among all the colours of white light.

11. Suggest an experiment to produce rainbow in your classroom and explain procedure. (AS 3)

Aim: - Production of rainbow in a class room.

Material required:- Light source, mirror, plastic tray, water etc.

Procedure:-

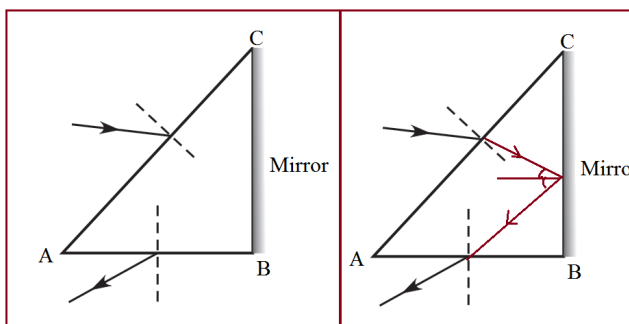


- 1. Take a tray and fill it with water.
- 2. Place a mirror in the water such that it makes an angle to the water surface.
- 3. Now focus white light on the mirror through the water as shown in figure.
- 4. Try to obtain colour on a white card board sheet kept above the water surface.
- 5. We observe that a white ray of light splits into certain different colours called VIBGYOR.

12. Prisms are used in binoculars. Collect information why prisms are used in binoculars. (AS4)

- 1. The size of binoculars is reduced by prism.
- 2. We get good image with more brightness.
- 3. Object size and optical quality should be increased by using prisms in binoculars.

13. Incident ray on one of the face (AB) of prism and emergent ray from the face AC are given in the following figure. Complete the ray diagram. (AS5)



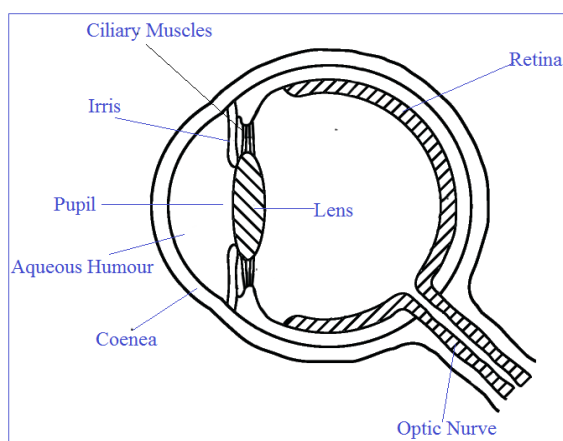
14. How do you appreciate the role of molecules in the atmosphere for the blue colour of the sky? (AS6)

1. The Blue appearance of sky is due to the molecules of N₂ and O₂ present in the atmosphere.
2. The sizes of these molecules are comparable to the wave length of Blue light.
3. These molecules act as scattering centers for scattering of blue light.
4. So, we appreciate the role of molecules in the atmosphere for the blue colour of the sky.

15. Eye is the only organ to visualize the colourful world around us. This is possible due to accommodation of eye lens. Prepare a six line stanza enlighten your wonderful feelings. (AS 6)

Eyes are very helpful.
 Which makes our world colourful.
 Eyes make you beautiful.
 If you take the eyes careful.
 Our life is always Wonderful.
 Finally we live peaceful.

16. How do you appreciate the working of Ciliary muscles in the eye? (AS 6)



1. Ciliary muscle is helpful to change its focal length by changing radii of curvature of eye lens.
2. When the eye is focused on a distant object, the ciliary muscles are relaxed so that the focal length of eye lens has its maximum value as a result we see the object clearly.
3. When the eye is focused on a closer object the ciliary muscles are strained and focal length of eye-lens decreases and we see the object clearly.

4. This process of adjusting focal length is called “accommodation”.
5. So we appreciate the working of Ciliary muscles in the eye.

17. Why does the sky sometimes appear white? (AS7)

1. In a hot day due to rise in the temperature, the water vapours of atmosphere is increases.
2. These water molecules scatter the colours of other frequencies (other than blue).
3. All such colours of other frequencies reach your eye and white colour is appeared to you.

18. Glass is known to be transparent material. But ground glass is opaque and white in colour. Why? (AS7)

1. We know glass is a frozen liquid.
2. If we rub the glass it loss some of the water molecules contain in it.
3. So, it appears as to be opaque and white on colour.

19. If a white sheet of paper is stained with oil, the paper turns transparent. Why? (AS7)

1. Paper is white solid material and observant.
2. When it absorbs the water, it becomes transparent.
3. Oil is a liquid that paper will absorb only the oil does not dry in the paper.

20. A light ray falls on one of the faces of prism at an angle 40° so that it suffers angle of minimum deviation of 30° . Find the angle of prism and angle of refraction at the given surface. (Ans: $50^\circ, 25^\circ$) (AS7)

Given:- Angle of incident $i_1 = 40^\circ$
 Angle of minimum deviation, $D = 30^\circ$

$$\text{We know } A+D = 2i \Rightarrow A = 2i - D = 2 \times 40^\circ - 30^\circ = 80^\circ - 30^\circ = 50^\circ \Rightarrow A = 50^\circ$$

$$\text{Angle of refraction} = \frac{A}{2} = \frac{50}{2} = 25^\circ$$

21. The focal length of a lens suggested to a person with Hypermetropia is 100cm. Find the distance of near point and power of the lens. (Ans. 33.33cm, 1D) (AS7)

Given:- The focal length of the lens, $f = 100\text{cm}$
 Image distance (V) = Distance of near point = $-d$
 Object distance, $u = -25\text{ cm}$

$$\text{Lens formula, } \frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{100} = \frac{1}{d} - \frac{1}{(-25)} \Rightarrow \frac{1}{d} = \frac{1}{25} - \frac{1}{100} \Rightarrow \frac{1}{d} = \frac{4-1}{100} \Rightarrow \frac{1}{d} = \frac{3}{100} \Rightarrow d = \frac{100}{3} = 33.33\text{cm.}$$

$$\text{Power of lens, } p = \frac{100}{f} = \frac{100}{100} = 1 \text{ Diopter.}$$

మంచైనా చెడైనా ఆలోచనను బట్టి-దృష్టిని బట్టి దృశ్యం!

A good deed or a bad act springs only through our thought process-Scene occurs according to glance.

Writer : G. Sree Kar M.Sc , B.Ed (9700842884, 9440234404)

Structure of Atom

1. What information does the electronic configuration of an atom provide? (AS1)

1. The sequence of filling up of electrons into an orbital is called electronic configuration.
2. It provides an understanding of the electronic behavior of the atom, in turn, its reactivity.

2. a. How many maximum number of electrons can be accommodated in a principal energy shell?

b. How many maximum number of electrons can be accommodated in a sub shell?

c. How many maximum number of electrons can be accommodated in an orbital?

d. How many sub shells will be present in a principal energy shell?

e. How many spin orientations are possible for an electron in an orbital?

- a. The maximum number of electron can be accommodated in a principal energy shell is ' $2n^2$ ', where n is the principle quantum number.
- b. The maximum number of electrons can be accommodated in a sub shell is $2(2l+1)$, where $l = 0, 1, 2, 3, \dots$
- c. The maximum number of electrons can be accommodated in an orbital is 2.
- d. The number of sub shells will be present in a principal energy shell is 'n'
- e. The spin orientation of the electron is clockwise (\uparrow) and anticlockwise (\downarrow) direction. They are represented by $+\frac{1}{2}$ and $-\frac{1}{2}$.

3. In an atom the number of electrons in m shell is equal to the number of electrons in the K and L shell.

Answer the following questions? (As1)

a. Which is the outer most shell?

N-Shell.

b. How many electrons are there in its outermost shell?

2-electrons.

c. What is the atomic number of an element?

The atomic number of the element is 22.

d. Write the electronic configuration of the element?

$1S^2 2S^2 2P^6 3S^2 3P^6 4S^2 3d^2$

4. Rainbow is an example for continuous spectrum – explain? (AS1)

1. A group of wavelengths is called a spectrum.
2. Seven colours namely Violet, Indigo, Blue, Green, Yellow, Orange and Red (VIBGYOR) in a rainbow.
3. The colours in a rainbow spread continuously from one point to another.
4. Therefore rainbow is a continuous spectrum.

5. How many elliptical orbits are added by Somerfield in third Bohr's orbit? What was the purpose of Adding these elliptical orbits? (AS1)

Somerfield added two elliptical orbits to Bohr's third orbit.

Purpose:

1. Behr's atomic model fails to explain atomic spectra.
2. So, Somerfield modified Bohr's atomic model by adding elliptical orbits to explain the fine spectrum.

6. What is an absorption spectrum? (AS1)

1. Absorption spectrum is an electromagnetic spectrum in which a decrease in intensity of radiation at specific wavelengths or ranges.
2. It forms a pattern of dark bands or lines.

7. What is an orbital? How is it different from Bohr's orbit? (AS1)

Orbital. The region in space around the nucleus where the probability of finding the electron is maximum is called an orbital.

Difference between an orbital and Bohr's orbit.

Orbital	Bohr's orbit
1. The region in space around the nucleus where the probability of finding the electron is maximum is called an orbital.	1. The path of the electron around the nucleus with high speed and electron in a particular orbit its energy is constant.
2. These are designed by K, L, M, N, O etc.	2. These are designed by s, p, d, f etc.

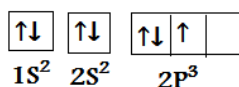
8. Explain the significance of three Quantum numbers in predicting the position ns of an electron in an atom. (AS1)

1. The principle quantum number (n) gives the size and energy of the orbit.
2. The angular momentum quantum number (l) gives the shape of the sub-shell.
3. The magnetic quantum number (m) gives the orientation of the orbital in the presence of magnetic field.

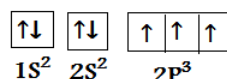
9. What is $n\ell^x$ method? How it is useful? (AS1)

1. The short hand notation of electronic configuration is $n\ell^x$.
2. It gives the information as shown below,
3. In $n\ell^x$ method, n = Principle quantum number.
 x = number of electrons in in orbital.
 l = Azimuthal quantum number or angular momentum quantum number.

10. Following orbital diagram shows the electron configuration of nitrogen atom. Which rule does not support this? (AS1) N ($z=7$) -



1. According to Hund's rule, electron pairing takes place all the available degenerate orbitals are completely filled by one electron in each.
2. So, the correct electron configuration of Nitrogen is,



11. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$ is the electron configuration of Cu ($Z = 29$) which rule is violated while Writing this configuration. What might be the reason for writing this configuration?

1. According to Aufbau's principle the electron occupies the orbital having the least energy.
2. So, the electronic configuration of Copper is $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^9$.
3. But the experimental electronic configuration of copper is $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$.
4. Because half-filled or fulfilled orbitals have more stability.

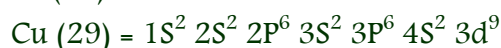
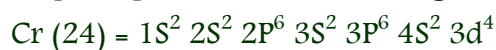
12. Write the four quantum numbers for the differentiating electron of sodium (Na) atom? (AS1)

1. The atomic number of Sodium (Na) is 11.
2. Electronic configuration is $1s^2 2s^2 2p^6 3s^1$.
3. The differentiating electron is 3s orbital.
4. The four quantum numbers of Na are,

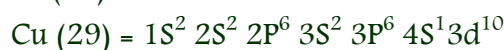
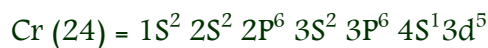
Orbital	n	l	m_l	m_s
3s	3	0	0	$+\frac{1}{2}$ or $-\frac{1}{2}$

13. Why are Chromium and Copper exceptions to electron configuration? (AS1)

1. According to Aufbau's principle the electronic configuration of Cu and Cr is as follows.



2. We know half filled or full filled orbitals are more stable.
3. So experimentally the electronic configuration of copper and Chromium is,



14. i. An electron in an atom has the following set of four quantum numbers to which orbital it belong to.

n	l	m_l	m_s
2	0	0	$+\frac{1}{2}$

ii. Write the four quantum numbers for $1s^1$ electron.

1. According to given set of four quantum numbers, the orbital to which the electron belongs to 2S.
 2. By nl^x method, it is $2s^1$.
- ii. The four quantum number values for $1s^1$ electron are as follows.

Orbital	n	l	m_l	m_s
$1s^1$	2	0	0	$+\frac{1}{2}$

15. Which electronic shell is at a higher energy level K or L? (AS2)

L- Shell is at higher energy level. Because it is far from nucleus than K-shell.

16. Collect the wave lengths and corresponding frequencies of three primary colours red, blue and green? (AS4)

Red, Blue and green are the primary colours.

Colour	Wavelength	frequency
Red	700 nm	4.28×10^{14} Hz
Blue	470 nm	6.38×10^{14} Hz
Green	530 nm	5.66×10^{14} Hz

17. The wave length of a radio wave is 1.0 m. Find its frequency. (As7)

Given: Wavelength, $\lambda = 1.0$ m

Speed of light in vacuum, $c = 3 \times 10^8$ m/s.

Frequency, $\nu = ?$

Formula: $c = \nu\lambda \Rightarrow \nu = \frac{c}{\lambda} = \frac{3 \times 10^8}{1.0} = 3 \times 10^8$ Hz.

18. What is an emission spectrum?

Emission Spectrum: Emission spectrum is the spectrum of frequencies of electromagnetic radiation due to an atoms electron making a transition from a high energy state o low energy state.

Max Karl Ernst Ludwig Planck



Max Karl Ernst Ludwig Planck Was a German theoretical physicist who originated quantum theory, which won him the Nobel Prize in Physics in 1918. Planck made many contributions to theoretical physics, but his fame rests primarily on his role as originator of the quantum theory. This theory revolutionized human understanding of atomic and subatomic processes.

Niels Henrik David Bohr

Niels Henrik David Bohr was a Danish physicist who made foundational contributions to understanding atomic structure and quantum theory, for which he received the Nobel Prize in Physics in 1922. Bohr was also a philosopher and a promoter of scientific research.



పుస్తకానికి విలువ తెచ్చే ది విషయమే కాని ముస్తాబు కాదు-మేడిపండు విప్పితే పురుగు.

Value addition to a book not its make up but subject content- Focus 'glomerata' when opened insects surge out.

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The Periodic Table

1. Newlands proposed the law of octaves. Mendeleeff suggested eight groups for elements in his table.

How do you explain these observations in terms of modern concepts? (AS1)

1. According to Newlands, every eight element starting from a given element resembles in its properties to that of the starting element.
2. Mandeleef divided periodic table into horizontal rows and vertical columns called periods and groups. Modern periodic table also given this same.
3. According to Mendeleeff the elements of same group have similar chemical properties. Modern periodic table also proposed the same thing.
4. According to Mendeleeff, the elements of a particular group possess same common valency. The same was also proposed by modern periodic table.

2. What are the limitations of Mendeleeff's periodic table? How could the modern periodic table remove various animation of Mendeeff's table? (AS1)

Limitations of Mendeleeff's periodic table.

1. Anomalous pair of elements. Certain elements of highest atomic weights precede those with lower atomic weight.

Ex. – Tellurium and Iodine.

2. Dissimilar elements placed together. Elements with dissimilar properties were placed in same group as sub-group A and sub-group B.

Ex. Chlorine is VIIA and Manganese is of VIIB. But chlorine is non-metal and Manganese is a metal.

3. Mosley proposed the periodic table based on the atomic number. This arrangement is eliminated the problem of anomalous series.

Ex. Although Te has more atomic weight than I. It has atomic number less by one unit when compared to I.

3. Define the modern periodic Law. Discuss the construction of the long form of the periodic table. (AS1)

Modern Periodic Law. The properties of the elements are the periodic functions of their atomic number.

Long form of the eriodic table . 1. The modern periodic table has 7 horizontal rows called periodic and 18 vertical columns called groups.

2. The first periodic has two elements.
3. Second and third period have 8 elements in each.
4. Fourth and fifth periods have 18 elements in each.
5. Fifth period has 18 elements.
6. Sixth period has 32 elements. It is the longest period.
7. Seventh period is incomplete.
8. Lanthanides and Actinides are placed at the bottom of the periodic table.

4. Explain how the elements are classified into s, p, d and f- block elements in the periodic table and give the advantage of this kind of classification. (AS1)

Based upon the electronic configuration the modern periodic table is divided into s, p, d and f- block elements.

S- Block elements: 1. The valency electrons enter into s-orbital is called s- block elements.
2. The general electronic configuration of s-block elements is ns^1 to ns^2 .

P- Block elements: 1. The valency electron enter into p-orbital is called p-block elements.
2. The general electronic configuration of p-block elements is $ns^2 np^1$ to $ns^2 np^6$.

d- Block elements: 1. The valency electron enter into d- orbital is called d-block elements.
2. The general electronic configuration of d-block elements is $(n-1) d^{1-10} ns^{1 \text{ or } 2}$.

f- Block elements: 1. Inner transition elements are called f- block elements.
2. The lanthanides and actinides are belongs to f-block elements.

5. Given below is the electronic configuration of elements A, B, C, D (AS1)

A. $1S^2 2S^2$ B. $1S^2 2S^2 2P^6 3S^2$ C. $1S^2 2S^2 2P^6 3S^2 3P^3$ D. $1S^2 2S^2 2P^6$

1. Which are the elements coming within the same period?

A and D i.e. Be and Ne coming within the same period.

2. Which are the ones coming within the same group?

A and B i.e. Be and Mg coming within the same group.

3. Which are the noble gas elements?

D. i.e. noble gas element.

4. To which group and period does the element 'C' belong?

Element C i.e. 'P' belongs to 3rd period and VA group.

6. Write down the characteristics of the elements having atomic number 17.

1. Electronic configuration. 2. Period number. 3. Group number. 4. Element family.
5. No. of valence electrons. 6. Valency . 7. Metal or nonmetal.

1. Electronic configuration = $1S^2 2S^2 2P^6 3S^2 3P^5$
2. Period number = 3
3. Group number = VII A
4. Element family = Halogen family.
5. No. of valence electrons = 7
6. Valency = 1
7. Metal or nonmetal = Non-metal.

7. a. State the number of valency electrons, the group number and the period number of each element given in the following table? (AS1)

Element	Valence electron	Group Number	Period Number
Sulphur	6	16(VIA)	3
Oxygen	6	16(VIA)	2
Magnesium	2	2(IIA)	3
Hydrogen	1	I(IA)	1
Fluorine	7	17(VIIA)	2
Aluminum	3	13(IIIA)	3

b. state whether the following elements belong to a group (G), period (P) or neither group nor period (N) (AS1)

Elements	G/P/N
Li, C, O	P
Mg, Ca, Ba	G
BR, Cl, F	G
C, S, Br	N
Al, Si, Cl	P
LI, NA, K	G
C, N, O	P
K, Ca, Br	N

8. Elements in a group have generally possess similar properties, but elements along a period have different properties. How do you explain this statement? (AS1)

1. In a group from top to bottom the valency electronic configuration is same.
2. So in a group generally possess similar properties.
3. In a period from left to right the atomic number is increases. Therefore elements have different valency electronic configuration.
4. Hence elements along a period possess different chemical properties.

9. S- block and P- block elements except 18th group elements are sometimes calls 'Representative elements' based on their abundant availability in the nature. Is it justified? Why?

1. These are the elements which are taking part in chemical reactions because of incompletely filled outer most shell.
2. These elements undergo chemical reactions to obtain nearest Noble gas configuration by losing or sharing of electrons.
3. So, they are called representative elements.

10. Complete the following table by using the periodic table. (AS1)

Period Number	Filling up orbital's (Sub-shell)	Maximum number of electrons filled in all the sub-shell	Total number of electrons in the period
1	1S	2	2
2	2S, 2P	8	8
3	3S, 3P	8	8
4	4S, 3d, 4P	18	18
5	5S, 4d, 5P	18	18
6	6S, 4f, 5d, 6P	32	32
7	7S, 5f, 6d, 7P	32	Incomplete

11. Complete the following table using the periodic table? (AS1)

Period number	Total no. of electrons	Elements		Total number of electrons in			
		From	to	S-block	P-Block	d-block	f-Block
1	2	H	He	2	-	-	-
2	8	Li	Ne	2	6	-	-
3	8	Na	Ar	2	6	-	-
4	18	K	Kr	2	6	10	-
5	18	Rb	Xe	2	6	10	-
6	32	Cs	Rn	2	6	10	14
7	Incomplete	Fr	---	2	3	10	14

12. the electronic configuration of the elements X, Y, and Z are given below?

a) X=2 b) Y=2, 6 c) Z= 2, 8, 2

i). Which element belongs to second period?

Y belongs to second period.

ii). Which element belongs to second group?

Z belongs to second group.

iii). Which element belongs to 18th group?

X belongs to 18th group.

13. Identify the elements that have the larger atomic radius in each pair of the following and mark it with a symbol (✓) (AS1) I. Mg or Ca ii. Li or Cs iii. N or P iv. B or Al

i. Mg or Ca (✓) ii. Li or Cs (✓) iii. N or P (✓) iv. B or Al (✓)

14. Identify the elements that have the lower ionization energy in each pair of the following and mark it with a symbol (✓) (AS1) i. Mg or Na ii. Li or O iii. Br or F iv. K or Br

i. Mg or Na (✓) ii. Li (✓) or O iii. Br (✓) or F iv. K (✓) or Br

15. In period 2, element X is to the right of element Y. Then, find the element that has

- (i) Low nuclear charge **Ans .** Y has low nuclear charge.
(ii) Low atomic size **Ans:** X has low atomic size.
(iii) High ionization energy **Ans :** X has higher ionization energy.
(iv) High electro negativity **Ans :** X has hi electro negativity.
(v) More metallic character **Ans :** Y has more metallic character.

16. How does the metallic character change when move i. down a group. ii. Across period? (AS1)

1. When we move from top to bottom in a group, the metallic character increases.
2. When we move left to right in a period, the metallic character decreases.

17. Why was the basis of classification of elements changed from the atomic mass to the atomic number? (AS1)

1. The physical and chemical properties of atoms of elements depend on number of electrons and their arrangement in the atom.
2. Hence, the basis of classification of the elements changed from the atomic mass to the atomic number.

18. What is a periodic property? How does the following change in a group and period? Explain? (AS1)

- i. (a) Atomic radius (b) Ionization energy (c) Electron affinity (d) Electron negativity
ii. Explain the ionization energy order in the following sets of elements.

a. Na, Al, Cl b. Li, Be, B c. C, N, O d. F, Ne, Na e. Be, Mg, Ca

Periodic property: The property in which there shall be a regular gradation is called periodic property.

S.No	Periodic property	Period	Group
1	Atomic radius	Decreases	Increases
2	Ionization energy	Do not follow any regular trend.	Decreases
3	Electron affinity	Increases	Decreases
4	Electron negativity	Increases	Decreases

ii. a. Na < Al < Cl b. Li < Be < B c. C < N < O d. F < Ne < Na e. Be > Mg > Ca

19. Name two elements you would expect to chemical reactions similar to Mg. What is the basis for your choice? (AS2)

1. The two elements which have chemical properties similar to Magnesium are Calcium and Strontium.
2. The basis for my choice is that they belong to same group (i.e. IIA group), we know that the element belongs to same group has similar properties.

20. On the basis of atomic number predict to which block the elements with atomic number 9, 37, 46 and 64 belongs to? (AS2)

1. The element with atomic number 9 belongs to P-block.
2. The element with atomic number 37 belongs to S-block.
3. The element with atomic number 46 belongs to d-block.
4. The element with atomic number 64 belongs to f-block.

21. using the periodic table, predict the formula of compound formed between and element X of group 13 and another element Y of group 16. (AS2)

1. The valency of 13th group element X is 3.
2. The valency of 16th group element Y is 2.
3. The formula of the compound is X₂Y₃.

22. An element X belongs to 3rd period and group 2 of the periodic table. State (a) The no. of valence electrons (b) The valency (c) Whether it is metal or a nonmetal (AS2)

1. The number of valency electrons is 2.
2. The valency of element is +2.
3. It is a metal.

23. An element has atomic number 19. Where would you expect this element in the periodic table and why? (AS2)

1. The element with atomic number 19 is in 4th period and first group of the periodic table.
2. Because the electronic configuration of this element is 1S² 2S² 2P⁶ 3S² 3P⁶ 4S¹.
3. The outer most orbital has only one electron. Hence, it belongs to first group.

24. Aluminum does not react with water at room temperature but reacts with both dil. HCl and Na OH solutions. Verify the statements experimentally. Write your observations with chemical equations. From these observations, can we conclude that 'Al' is a metalloid? (AS3)

1. Aluminium reacts with Dil. Hydrochloric acid (HCl) and produces H₂ gas and AlCl₃.



2. Aluminium reacts with NaOH solution and liberate hydrogen gas.



3. Aluminium does not react with water at room temperature. But we know the metals react with water at room temperature.
4. From this, Aluminium are in between a metal and non metal. So, it behaves like a metalloid.

25. Collect the information about the reactivity of VIIIA group elements (noble gases) from internet or from your school library and prepare a report on their special character when compared to other elements of periodic table? (AS4)

The information about the VIIIA elements are,

1. Helium, Neon, Argon, Krypton, Xenon, and Radon are inert gases or noble gases or "O'group elements.
2. Helium and Neon do not form chemical compounds.
3. Xenon, Krypton and Argon show very less reactivity.
4. The valency electronic configuration of inert gases is $ns^2 np^6$ except Helium (ns^2).

26. Collect the information regarding metallic character of elements of IA group and prepare report to support the idea of metallic character increases in a group as we move from top to bottom? (AS4).

1. The elements with three or less electrons in their outer shell are considered to be metals.
2. IA group elements are called Alkali metals.
3. Alkali metals have one electron in their outer shell which is loosely bound.
4. Alkali metals have largest atomic radii among the element in their respective periods.
5. Alkali metals have greater metallic character because they easily losses the valency electrons.

27. How do you appreciate the role of electronic configuration of the atoms of elements in periodic classification? (AS6)

I appreciate the role of electronic configuration of the atoms of the elements for the following reasons.

1. Modern periodic table is based on the electronic configuration of the elements.
2. The chemical properties of the elements depend on valence electrons.
3. The element present in the same group have same valence electronic configuration.
4. Thus, the construction of modern periodic table mainly depends on electronic configuration.

28. Without knowing the electronic configuration of the atoms of elements Mandeleeff still could arrange the elements nearly close to the arrangement in the modern periodic table. How can you appreciate this? (AS6)

1. Mandeleff gave more important to the chemical properties of elements while arranging the elements.
2. So, the arrangement of elements is close to the arrangement of elements in modern periodic table.
3. He left some gaps for elements which he assumed to be existed, later those elements are discovered.
4. Hence, I appreciate the effort of Mendeleeff.

29. Comment of the position of hydrogen in periodic table? (AS7)

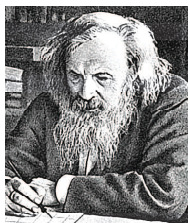
1. The element Hydrogen belongs to IA group of the periodic table.
2. Hydrogen electronic configuration is $1S^1$.
3. Like alkali metals hydrogen combines with Halogens, Oxygen and Sulphur to form compound having similar formulae.
4. Hydrogen exists as diatomic molecule and it combines with metal and non-metals to form covalent compounds.
5. So, no fixed position to be given to hydrogen in the periodic table.

30. How the positions of the elements in the periodic table help you to predict its chemical properties?

Explain with an example? (AS7)

1. In the modern periodic table every group have definite valences.
2. So, we predict how they can react with different elements and form compounds.
3. For example, alkali metals react with Oxygen, hydrogen and chlorine etc. in the following way,
 - i. $4M + O_2 \rightarrow 2M_2O$ (M= Alkali metal)
 - ii. $2M + Cl_2 \rightarrow 2 MCl$ (M=Alkali metal)
 - iii. $2M + H_2 \rightarrow 2MH$ (M= Alkali metal)
4. The compounds and the reactions are predicted on the basis of valency from the periodic table.

Dmitri ivanovich Mendeleeff.



Why is Mendeleev considered to be the '*father*' of the Periodic Table whilst others, such as Newlands, Meyer and De Chantcourtois are considered to be also-rans? First he put elements into their correct places in the table. In some cases the relative atomic mass had been wrongly calculated by others. By correcting the relative atomic mass he put the element in the correct place. At the time, relative atomic masses (then called atomic weights) were laboriously determined using the formula,

$$\text{atomic weight} = \text{equivalent weight} \times \text{valency.}$$

ఓర్పులో వింటేనే నేర్పుగా భోధిస్తుంది నికల్లం-మౌనం మాహా కావ్యం!

When we lend our ears Unhesitatingly Silence Teaches more effectively- Speechless trait Shins as a magnum opus.

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Chemical Bonding

1. List the factors that determine the type of bond that will be formed between two atoms? (AS1)

1. The strength of force of attraction or repulsion between atoms.
2. Number of electrons in valence shell.

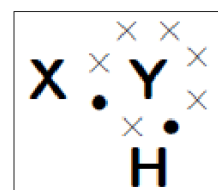
2. Explain the difference between the valence electrons and the covalence of an element. (AS1)

Valence electrons: The electrons present in the outer most shell of an atom are called its valence electrons.

Covalence of an atom: The total number of orbital's available in valence shell is known as covalence whether the orbital's are completely filled or empty.

3. A chemical compound has the following Lewis notation: (AS1)

- a. How many valence electrons does element Y have? Ans: 6
- b. What is the valence of element Y? Ans: 2
- c. What is the valence of element X? Ans: 1
- d. How many covalent bonds are in the molecule? Ans: Two
- e. Suggest a name for the elements X and Y.



Ans. 'X' is hydrogen and 'Y' is oxygen. The molecule formed here is H₂O (Water).

4. Why do only valence electrons involve in bond formation? Why not electron of inner shells? (AS1)

1. The inner shell electrons are strongly attracted by nucleus of an atom when compared to the valence electrons.
2. So, the valence electrons of an atom will be attracted by the nucleus of a closer by atom.
3. Therefore, valence electrons involve in bond formation of between the two atoms.

5. Explain the formation of sodium chloride and calcium oxide on the basis of the concept of electron transfer from one atom to another atom. (AS1)

Formation of Sodium chloride: 1. Sodium chloride is formed from the elements of Sodium (Na) and Chlorine (Cl).

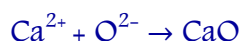
2. When sodium loses one electron to get an octant configuration in its valence shell and forms a cation (Na⁺).
3. Chlorine has shortage of one electron to get octet configuration in its valence shell and forms an anion (Cl⁻).
4. So, Transfer of electron between 'Na' and 'Cl' atoms, result in the formation of Sodium Chloride as follows.



Formation of Calcium oxide: 1. Calcium oxide forms from the elements Calcium and Oxygen.

2. When Calcium atom loses two electrons to get octant configuration in its valence shell and forms a cation (Ca²⁺).

3. Oxygen has shortage of two electrons to get octant configuration in its valence shell and forms an anion (O^{2-})
4. So, Transfer of electron between 'Ca' and 'O' atoms, result in the formation of Calcium oxide as follows.



6. A, B, and C are three elements with atomic number 6, 11 and 17 respectively. (AS1)

i. which of these cannot form ionic bond? Why?

ii. Which of these cannot form covalent bond? Why?

iii. Which of these can form ionic as well as covalent bonds?

- i.**
 1. 'A' cannot form ionic bond. Its valence electrons are 4.
 2. It is difficult to lose or gain of 4 electrons to get octant configuration.
 3. So, it forms covalent bond.
- ii.**
 1. 'B' cannot form covalent bond. Its valence electrons are 1 only.
 2. So, it is easy to donate for other atom and become an ion.
 3. So, it can form ionic bond.
- iii.**
 1. Element 'C' can perform ionic as well as covalent bonds.
 2. Atomic number of Cl is 17. It is able to donate participate with Na ion in ionic bond and with Hydrogen in HCl molecule as covalent bond.

7. How bond energies and bond lengths of molecule helps us in predicting their chemical properties?

Explain with examples? (AS1)

1. Bond Length. Bond length is the equilibrium distance between the nuclei of two atoms which form a covalent bond.

2. Bond energy: Bond energy is the energy needed to break a covalent bond between two atoms of a diatomic covalent compound in its gaseous state.

3. If the nature of the bond between the same to atoms changes the bond length also changes.
4. For examples bond lengths between the two carbon atoms are in ethane is 1.54 \AA , Ethylene is 1.34 \AA and acetylene is 1.20 \AA .
5. Melting and boiling points are also being determined from the knowledge of bond energies and bond lengths.

8. Predict the reason for low melting point for covalent compounds when compared with ionic compounds? (AS2)

1. The force of attraction among covalent molecules are weak.
2. The melting point for covalent is low when compared with ionic compounds due to weak Vander Wall's force of attraction between the covalent molecules.
3. Only small amount of heat energy is required to break this weak molecular force.
4. Hence, covalent compounds have low melting and boiling points.

9. Collect the information about properties and uses of covalent compounds and prepare a report? (AS4)

Properties of covalent Compounds. 1. Covalent compounds are usually liquids or gases some of them are solids.

2. Covalent compounds have low melting and low boiling points.

3. Covalent compound do not conduct electricity.

4. Covalent compound shoe directional compound.

Uses of Covalent Compounds. 1. Covalent compound form 99% to our body.

2. Water is a polar covalent compound.

3. Tea, coffee and food items are covalent compounds.

4. Air we breathe it contain covalent molecules of Oxygen, Nitrogen and carbon dioxide.

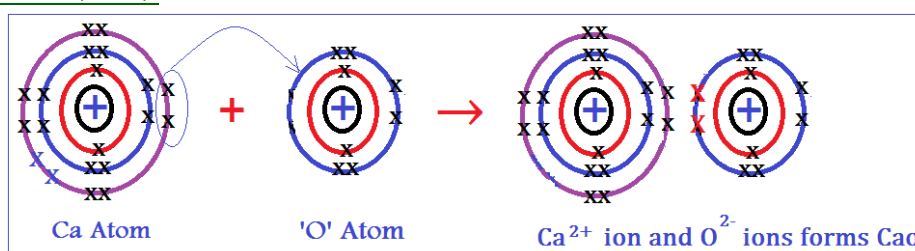
10. Draw simple diagrams to show how electrons are arranged in the following covalent molecules. (AS5)

a. Calcium oxide (CaO)

b. Water (H₂O)

c. Chlorine (Cl₂)

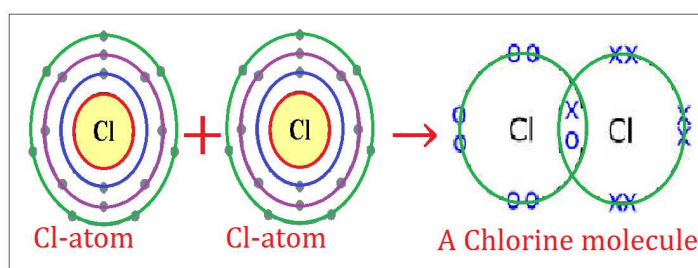
a. Calcium oxide (CaO):



b. Water (H₂O):

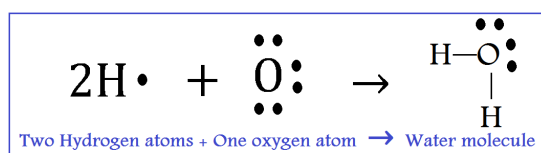


c. Chlorine (Cl₂):



11. Represent the molecule H₂O using Lewis notation. (AS5)

One atom of oxygen shares its two electrons with two hydrogen atoms to form a water molecule.

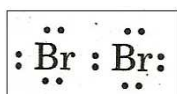


12. Represent each of the following atoms using Lewis notation. a. Beryllium b. Calcium c. Lithium (AS5)

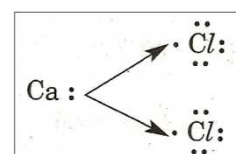
- a. Beryllium.** 1. The atomic number of beryllium is 4 and no. of valence electrons is 2.
2. Its Lewis notation is $\ddot{\text{Be}}$.
- b. Calcium.** 1. The atomic number of calcium is 20 and has two valence electrons.
2. Its Lewis notation is $\ddot{\text{Ca}}$.
- c. Lithium.** 1. The atomic number of lithium is 3 and has one valence electron.
2. Its Lewis notation is $\dot{\text{Li}}$.

13. Represent each of the following molecules using Lewis notation. (AS5)

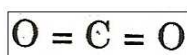
a. bromine gas (Br_2)



b. calcium chloride (CaCl_2)



c. carbon dioxide (CO_2)



d. Which of the three molecules listed above contains a double bond? Ans. CO_2 contain double bond.

14. Two chemical reactions are described below. (AS5)

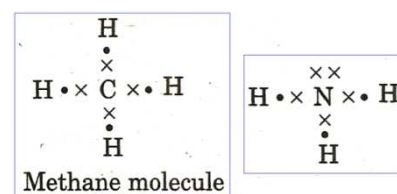
- Nitrogen and hydrogen react to form ammonia
- Carbon and hydrogen bond to form a molecule of methane (CH_4)

For each reaction, give.

- the valence of each of the atoms involved in the reaction. (AS1)
- the Lewis structure of the product that is formed. (AS5)
- the chemical formula of the product. (AS1)
- the name of the product. (AS1)

- a. 1. The valence of nitrogen in ammonia is 3, while the valence of hydrogen is 1.
2. The valence of carbon in methane is 4, while the valence of hydrogen is 1.

b. The Lewis structure of Methane and Ammonia is as follows :



- c. 1. The chemical formula of Ammonia is NH_3 .
2. The chemical formula of Methane is CH_4 .
- d. 1. The name of the product formed when nitrogen and hydrogen reacts is Ammonia.
2. The name of the product formed by the reaction of carbon and hydrogen is Methane.

15. How Lewis dot structure helps in understanding bond formation between atoms? (AS6)

1. We know that only the outer most electrons of an atom take part in the formation of chemical bonding.
2. The valence electron in an atom is represented by putting dots (.) around the symbol of the element.
3. For example, Magnesium atom has 2 valence electrons in its outer most shell and represented by Mg .
4. So, we knowing the dot structure of an atom we easily understood which type of bond is going to be established between them.

16. What is octant rule? How do you appreciate role of the 'octant rule' in explaining the chemical properties of elements? (AS6)

Octant rule: The atoms of the elements tend to get eight electrons in its valence shell by participating the chemical reaction is called octant rule.

Role of octant in chemical properties of elements. 1. All the inert gases have octant configuration except helium.

2. So, they do not participate any chemical reactions.
3. If any group of elements try to get octant configuration by losing or sharing of electrons because of stability.
4. In this way, the octant rule helps in explaining the chemical properties of elements.

17. Explain the formation of the following molecules using valence bond theory. (AS1)

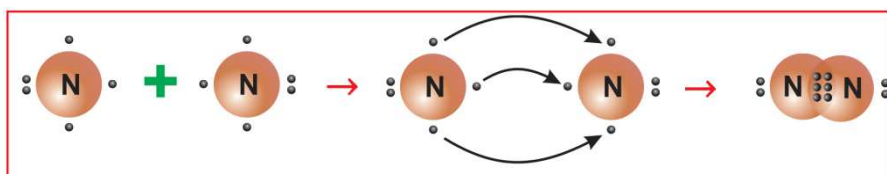
a) Formation of N_2 molecule.

b) Formation of O_2 molecule.

a) Formation of N_2 molecule.

1. The electronic configuration of 'N' atom is $1s^2 2s^2 2p^3$.

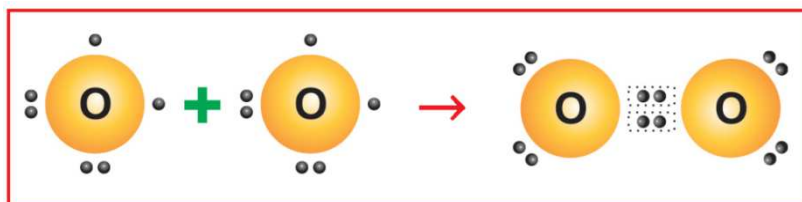
2. Nitrogen has three unpaired electrons in the 'P' orbital.
3. When two nitrogen atoms approach each other, the bond is formed in between two nitrogen atoms by sharing of electrons.
4. Therefore, there is a triple bond between two nitrogen atoms in N_2 molecule.



b) Formation of O_2 molecule.

1. The electronic configuration of oxygen atom is $1s^2 2s^2 2p^4$.

2. Oxygen has two unpaired electrons in the 'P' orbital.
3. When two oxygen atoms approach each other, the bond is formed in between two oxygen atoms by sharing of electrons.
4. Therefore, there is a double bond between two oxygen atoms in O_2 molecule.

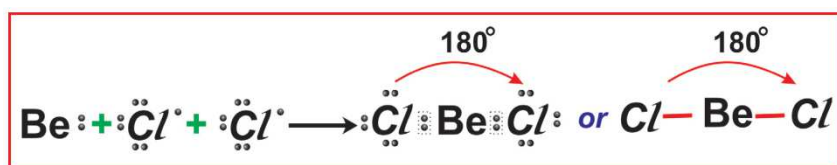


18. What is hybridization? Explain the formation of the following molecules using hybridization (AS1)

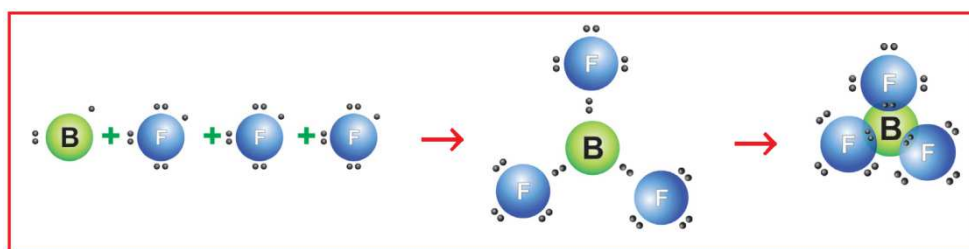
- a). BeCl_2 b). BF_3

Hybridization. Hybridization is the concept of mixing atomic orbitals into new hybrid orbital's suitable for the pairing of electrons to form chemical bonds in valence bond theory.

- Formation of BeCl_2 :**
1. The electronic configuration of 'Be' is $1s^2 2s^2$.
 2. At excited state its electronic configuration is $1s^2 2s^1 2p_x^1$.
 3. The electronic configuration of 'Cl' is $1s^2 2s^2 2p^6 3s^2 3p_x^2 3p_y^2 3p_z^1$.
 4. Now the $2p_x^1$ orbital of 'Be' atom reacts with $3p_z^1$ orbital of 'Cl' and forms BeCl_2 as shown below.



- Formation of BF_3 :**
1. The electronic configuration of 'B' is $1s^2 2s^2 2p_x^1$.
 2. At excited state its electronic configuration is $1s^2 2s^1 2p_x^1 2p_y^1$.
 3. The electronic configuration of 'F' is $1s^2 2s^2 2p^6 3s^1$
 4. Now the three $2s^1$ orbital's of the 'B' atom react with $2s^1 2p_x^1 2p_y^1$ orbital of 'F' and forms BF_3 as shown below.



Niels Bohr (1885–1962)



Niels Bohr, a Danish physicist received his Ph.D. from the University of Copenhagen in 1911. He then spent a year with J.J. Thomson and Ernest Rutherford in England. In 1913, he returned to Copenhagen where he remained for the rest of his life. In 1920 he was named Director of the Institute of theoretical Physics. After first World War, Bohr worked energetically for peaceful uses of atomic energy. He received the first Atoms for Peace award in 1957. Bohr was awarded the Nobel Prize in Physics in 1922.

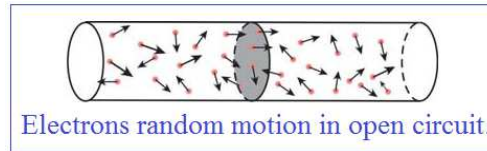
Writer : Gali SreeKar M.Sc, B.Ed (9700842884, 9440234404)

Chapter-11

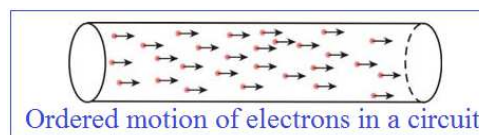
Electricity

1. Explain how electro flow causing electric current with Lorentz–Drude theory of electrons. (AS1)

1. Drude and Lorentz proposed the conductors like metals contain large number of free electrons and this arrangement is called lattice.
2. The electrons move randomly in lattice space of conductor in an open circuit as shown below.



3. When the ends of the conductor are connected to a battery, the electrons are arranged in ordered motion as shown in the figure.



4. This ordered motion of electrons is called electric current.

2. How does a battery work? Explain. (AS1)

Working of a Battery: – 1. In a battery the chemical energy converted into the electrical energy.

2. Battery consists of two metal plates and a chemical.
3. The electrolyte between the two metal plates consists of positive and negative ions.
4. Depending on the nature of the chemical positive ions move towards one of the plate and negative ions move opposite direction.
5. As a result for the constant potential energy forms between the two terminals of a battery.
6. This is the working of a battery.

3. Write the differences between potential difference and emf. (AS1)

Potential differences:–Work done by the electric force on unit charge is called potential differences.

$$V = \frac{W}{q}$$

Electro Motive Force (emf):– The work has done by the cell to move unit positive charge from negative terminal to positive terminal of the battery.

$$\text{emf} = \frac{W}{q}$$

4. How can you verify that the resistance of a conductor is temperature depends? (AS1)

1. When a conductor is connected to a battery, the free electrons start moving with a drift speed in a specified direction.
2. During the motion, the electrons collide with positive ions of the lattice and come to halt.
3. This means that they loss mechanical energy in the form of heat.
4. This proves that the resistance of a conductor is temperature dependent.

5. Why do you mean by electric Shock? Explain how it takes place? (AS1)

1. The electric shock is a combined effect of potential difference, electric current and resistance of the human body.
2. When current flows through the human body, it chooses the path which offers low resistance.
3. The current passing through the human body, the current and resistance of human body goes on charging inversely.
4. Hence, the electric shock is a combined effect of potential difference, electric current and resistance of the human body.

6. Derive $R = \rho \frac{l}{A}$ (AS1)

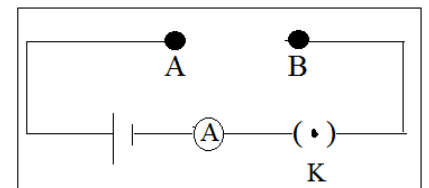
1. The resistance of a conductor is directly proportional to the length of the conductor.
i.e., $R \propto l \dots\dots (1)$
2. The resistance of a conductor is inversely proportional to the area of a cross section of the conductor.

i.e., $R \propto \frac{1}{A} \dots\dots (2)$

3. From (1) and (2), we get $R \propto \frac{l}{A} \Rightarrow R = \rho \frac{l}{A}$, Where ‘ ρ ’ is a constant called specific resistance.

7. How o you verify that resistance of a conductor is proportional to the length of the conductor for constant cross section area and temperature? (AS1)

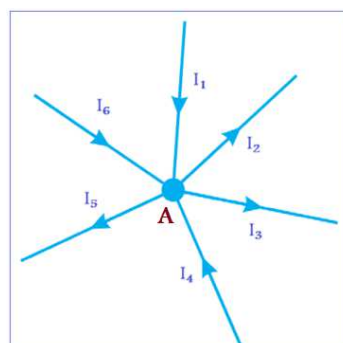
1. Make a circuit as shown in the figure.
2. Connect one of the iron spoke say 10 cm length between A and B.
3. Measure the value of current using the current note down in your note book.
4. Repeat this for other lengths of the iron spokes.
5. We note that the current decreases with increasing the length of the spoke.
6. So we note that resistance of a conductor is proportional to its length.



8. Explain Kirchhoff's laws with examples? (AS1)

Kirchhoff's laws: - Kirchhoff, in 1842, gave two general laws which are extremely useful in analyzing electric circuits. They are 1. The Junction law 2. The Loop law

1. **The Junction Law:** - 1. The junction is a point where three or more conducting wires meet.
2. In the figure A is called junction.
3. From the figure, we have Therefore, $I_1 + I_4 + I_6 = I_2 + I_3 + I_5$.

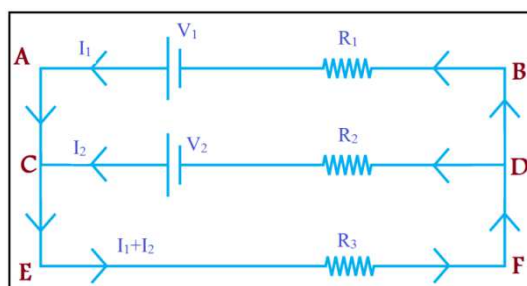


2. The Loop Law: - 1. Let us apply Kirchoff's second law to the above figure, for the loop

$$\text{ACDBA, } I_1 R_1 - I_2 R_2 = V_1 - V_2$$

$$2. \text{ For the loop EFDCE, } I_2 R_2 + (I_1 + I_2) R_3 = V_2$$

$$3. \text{ For the loop EFBAE, } I_1 R_1 + (I_1 + I_2) R_3 = V_1$$

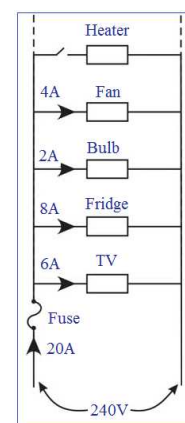


9. What is the value of 1KWH in Joules? (AS1)

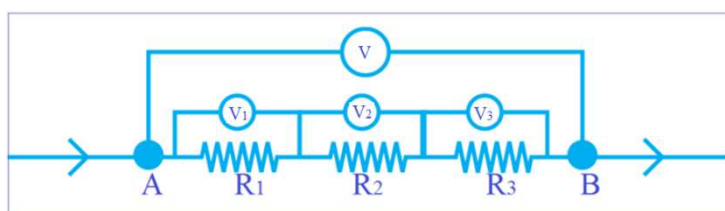
$$1\text{KWH} = 3.6 \times 10^5 \text{ Joules.}$$

10. Explain overloading of household current? (AS1)

1. The line wires that are entering into the meter have a potential difference about 240V and limit of current from the mains is 5-20A.
2. If we consume above 20A, then circuit results in overheating that may cause a fire.
5. This is called overloading as shown in the figure.
4. To prevent the damage due to overloading we connect electric fuse to the household circuit as in the above figure.



11. Deduce the expression for the equivalent resistance of the three resistors connected in series. (AS1)



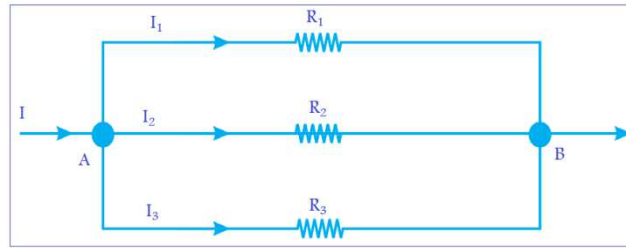
1. Connections are made as shown in the figure.
2. From Ohm's law at $V_1 = I R_1$, $V_2 = I R_2$ and $V_3 = I R_3$
3. Since the resistors are connected in series, $V = V_1 + V_2 + V_3$
4. Substituting the values of voltages in the above equation $I R = I R_1 + I R_2 + I R_3$

$$I R = I (R_1 + R_2 + R_3)$$
5. Thus, $R = R_1 + R_2 + R_3$

12. Why did we use fuses in household circuits? (AS1)

1. The fuses are consists of a thin wire of low melting point.
2. When the current in the fuse exceeds 20A, the wire will heat up and melt.
3. Hence all the electric devices are saved from damage that could be caused by overload.
4. Thus, we can save the house holding wiring and devices by using fuses.

13. Deduce the expression for the equivalent resistance of the three resistors connected in parallel. (AS1)



1. Connections are made as shown in the figure.

2. Ohm's law as, $I_1 = \frac{V}{R_1}$, $I_2 = \frac{V}{R_2}$ and $I_3 = \frac{V}{R_3}$.

3. Since the resistors are in parallel, $I = I_1 + I_2 + I_3$

4. Substituting the value of currents in the above equation, $\frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$

$$V \left(\frac{1}{R} \right) = V \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \right)$$

5. Thus, $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \Rightarrow R = \frac{R_1 R_2 R_3}{R_1 + R_2 + R_3}$

14. Silver is better conductor of electricity than copper. Why do we use copper wire for conduction of electricity? (AS1)

1. Silver is costlier than copper.

2. So, we use copper wire for conduction of electricity even though silver is a better conductor of electricity.

15. Two bulbs have ratings 100W, 220V and 60W, 220V. Which one has the greatest resistance? (AS1)

1. We know that, $P = \frac{v^2}{R} \Rightarrow R = \frac{v^2}{P}$

2. For the first bulb, $P = \frac{v^2}{R} = \frac{(220)^2}{100} = \frac{48400}{100} = 484\Omega$

3. For the second bulb, $P = \frac{v^2}{R} = \frac{(220)^2}{60} = \frac{48400}{60} = 806.6\Omega$

4. The second bulb having the 60W, 220W has the greater resistance.

16. Why don't we use series arrangement of electrical appliances like bulb, Television, fan and other in domestic circuits? (AS1)

1. In a series combination, if any electrical appliance is switched off, all the electrical appliances like bulb, TV, fan and other will be off.

2. Therefore, we use parallel arrangement of electrical appliances like bulb, TV, fan and other in domestic circuits.

17. A wire of length 1m and radius 0.1mm has a resistance of 100Ω. Find resistivity of the material? (AS1)

Given: - $l = 1\text{m}$, $r = 0.1\text{ mm} = 1000\text{mm}$, $R = 100\Omega$

Resistivity, $\rho = ?$

Area of cross section of the wire, $A = \pi r^2 = 3.14 \times (0.1)^2 = 0.0314$

$$\text{Resistivity, } \rho = \frac{Rl}{A} = \frac{100 \times 0.0314}{1000} = 0.00314 \text{ Ohm-meter.}$$

18. Why do we consider tungsten as a suitable material for making the filament of a bulb? (AS2)

1. We consider tungsten as a suitable material for making the filament of bulb.
2. Because of its higher resistivity values and the melting point (3422°C).

19. Are the head lights of a car connected in series or parallel? Why? (AS2)

1. The lights of a car are connected in parallel.
2. Because in parallel connections both the head lights and lights get the same power.
3. If one head light goes out the other will still work.

20. Why should we connect the electric appliances in parallel to household circuit? What happens if they are connected in series? (AS2)

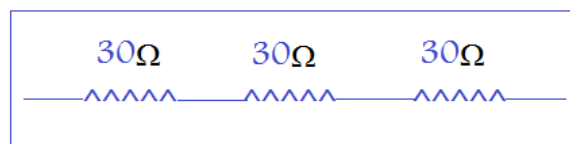
1. The electrical appliances are connected in parallel in household circuit.
2. Because, in parallel connections if any appliances is switched off, the other electrical appliances in the domestic circuit do not get off.

21. How should we connect the fuse in house wiring circuit? In series or in parallel? Why? (AS2)

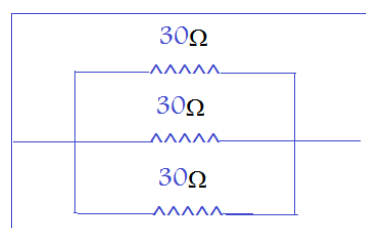
1. We connect the fuse in house wiring circuit is in series combination not in parallel.
2. When the fuse wire is melted due to overheating caused by overloading then the circuit will become open and prevents the flow of current into the household circuit.

22. Suppose that you have three resistors each of value 30Ω . How many resistors can you obtain by Various combinations of these three resistors? Draw diagrams in support of your predictions. (AS2)

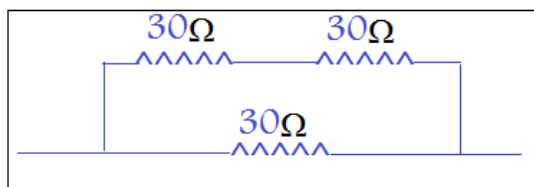
1. Connecting them in series.



2. Connecting them in parallel.



3. Connecting any two of them in series and the remaining third one in parallel.



23. State Ohm's law. Suggest an experiment to verify it and explain the procedure. (AS3)

Ohm's law: - Ohm's law states that the potential difference between the ends of a conductor is directly proportional to the electrical current passing through it.

Aim: - To verify Ohm's law.

Material Required: - Battery, rheostat, Resistance, Ammeter, Voltmeter and wire.

Procedure: - 1. Connections are made as shown in the figure.

2. By changing the position of the rheostat, change the flow of current in the circuit.
3. Note the reading in the voltmeter and ammeter and tabulated below.

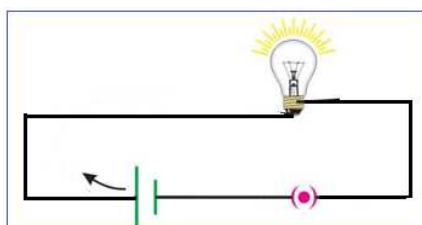
S.No	Voltmeter Reading(V)	Ammeter Reading (i)	$R = \frac{V}{i}$
1.			
2.			
3.			
4.			

4. From the above table we observe that $\frac{V}{i} = \text{constant}$. This is equal to resistance of the wire.
5. So, Ohm's law is verified.

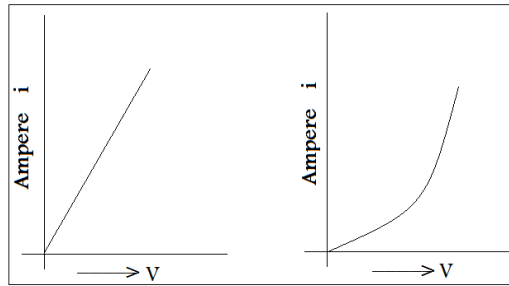
24. A. Take a battery and measure the potential difference. Make a circuit and measure the potential difference when the battery is connected in the circuit. Is there any difference in potential difference of battery? (AS4)

B. Measure the resistance of a bulb (filament) in open circuit with multi-meter. Make a circuit with elements such as bulb, battery of 12V and key in series. Close the key. Then again measure the resistance of the same bulb (filament) for every 30 seconds. Record the observations in a proper table. What can you conclude from the above results? (AS4)

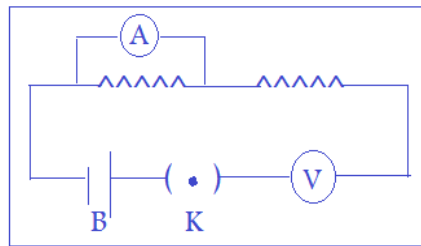
- A. Yes, there is some difference in the potential difference of the battery before using and after connecting.
2. Because when the battery is connected in a circuit, the voltage slowly decreases due to consumption of chemical energy.
- B. 1. Measure the resistance of the bulb by using a multimeter and note your note book.
2. Connect a circuit as shown in the following switch on the circuit.
3. After few minutes, measure the resistance of bulb again and note down in your note book.
4. We noticed that resistance is increases due to the increases of temperature.



25. Draw a graph between V and I where V is the potential difference between the ends of the wire and I is the current through it? What is the shape of the graph? (AS5)



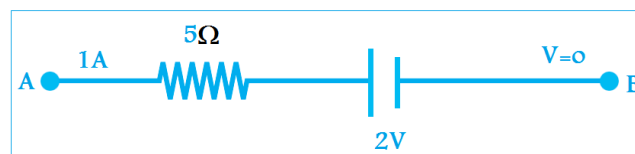
26. Draw a circuit diagram for a circuit in which two resistors A and B are connected in series with a battery, and a voltmeter is connected to measure the potential difference across the resistor A. (AS5)



27. How can you appreciate the role of a small fuse in house wiring circuit in preventing damage to various electrical appliances connected to the circuit?(AS6)

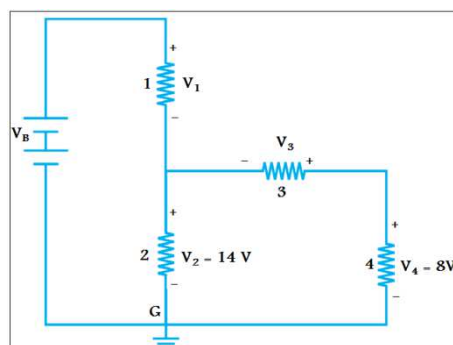
1. The fuse consists of a thin wire of low melting point.
2. When the current in the fuse exceeds 20A, the wire will heat up and melt.
3. The circuit then become open and prevents the flow of current into the household circuit.
4. Thus we save the house holding wiring and devices by using fuses.
5. So, we appreciate the role of a small fuse in house wiring circuit in preventing damage to various electrical appliances connected to the circuit.

28. In the figure below the potential at A is _____ when the potential at B is zero. (AS7)



The potential at A is, $V = iR = 1 \text{ Ampere} \times 5\Omega = 5V$

29. Observe the circuit and answer the questions given below. (AS7)



- Q1. Are resistors 3 and 4 in series? Ans: - No they are not in series. They are in parallel.
- Q2. Are resistors 1 and 2 in series? Ans: - Yes, they are in series.
- Q3. Is the battery in series with any resistors? Ans: - No
- Q4. What is the potential drop across the resistor? Ans: The potential drop across the resistor '3' is $V_3=8V$.
- Q5. What is the total emf in the circuit if the potential drop across the resistor 1 is 6V?

Ans: - The total emf in the circuit = $V_1 + V_2 + V_3 + V_4 = 6 + 14 + 8 + 8 = 36V$.

30. If the resistance of your body is 100000Ω what would be the current that flow in your body when you touch the terminals of a 12V battery? (AS7)

Given: - $V=12V$
 $R = 1,00,000 \Omega$
 $i = ?$

From Ohm's law, $i = \frac{V}{R} = \frac{12}{1,00,000} = 0.00012$ Ampere.

31. A uniform wire of resistance 100Ω is melted and recasts into wire of length double that of the original. What would be resistance of the new wire formed? (AS7)

Given: - $R_1 = 100\Omega$ $l_1 = 'l'$ (Say)
 $R_2 = ?$ $l_2 = 2l$

Formula: - $\frac{R_1}{R_2} = \frac{l_1}{l_2} \Rightarrow \frac{100}{R_2} = \frac{l}{2l} \Rightarrow \frac{100}{R_2} = \frac{1}{2} \Rightarrow R_2 = 200\Omega$

32. A house has 3 tube lights, two fans and a Television. Each tube light draws 40W. The fan draws 80W and the Television draw 60W. On the average, if all the tube lights are kept on for five hours, two fans for 12 hours and the television for five hours every day. Find the cost of electric energy used in 30 days at the rate of Rs. 3.00 per KWH. (AS7)

$$\begin{aligned} \text{Total consumption of current in 30 days} &= \frac{\{(3 \times 40 \times 5) + (2 \times 80 \times 12) + (5 \times 60)\} 30}{1000} \text{ Watts} \\ &= \frac{(600 + 1920 + 300) 30}{1000} = \frac{2820 \times 30}{1000} = \frac{282 \times 3}{10} = 84.6 \text{ Watts} \end{aligned}$$

Cost of 1 unit charge = Rs. 3.00/-

\therefore Cost of 84.6 Watts = $84.6 \times 3 = \text{Rs. } 253.8/-$

33. A uniform wire of resistance 50Ω is equal into five parts. These parts are now connected in parallel.

Then the equivalent resistance of the combination is [A]

- A. 2Ω B. 12Ω C. 250Ω D. 6250Ω

34. A charge is moved from a point A to a point B. The work done to move unit charge during this process is called. [C]

- A) Potential at A B) potential at B
 C) Potential difference between A and B D) current from A to B

35. Joule/ coulomb is the same as [B]

- A) 1 - watt B) 1 - volt C) 1- ampere D) 1 - ohm

36. The current in the wire depends [C]

- A) Only on the potential difference applied B) only on the resistance of the wire
C) On both of them D) none of them

37. Consider the following statements. [A]

- A. In series connection, the same current flows through each element.
B. In parallel connection, the same potential difference gets applied across each element.
A) Both A and B are correct B) A is correct but B is wrong
C) A is wrong but B is correct D) both A and B are wrong

38. The kilowatt hour is the unit of electric power consumption.

39. A thick wire has a less resistance than a thin wire.

40. An unknown circuit draws a current of 2A from a 12V battery its equivalent resistance is 6Ω.

41. The S.I unit of potential differences is Volt.

42. The S.I unit of current is Ampere.

43. Three resistors of values 2Ω, 4Ω and 6Ω are connected in series. The equivalent resistance of combination of resistors is 12Ω.

44. Three resistors of values 2Ω, 4Ω and 6Ω are connected in parallel. The equivalent resistance of combination of resistors is 12/11Ω.

45. The power delivered by a battery of emf 10V is 10W. Then the current delivered by the battery is 1 Ampere.

హంప్రీ డేవీ

సర్ హంప్రీ డేవీ 1778 డిసెంబరు 17న కార్మవాలలోని పెంజన్స్ (ఇంగ్లండ్)లో రాబర్ట్ డేవి, గ్రేస్ మిల్లెట్ దంపతులకు జన్మించాడు. పెంజన్స్ గ్రామర్ పాఠశాలలో ప్రాథమిక విద్యాభ్యాసం కొనసాగింది. ఒక వైద్యుడి దగ్గర అప్రెంటిస్ గా పని చేస్తూ రసాయన శాస్త్రం పై మక్కువ పెంచుకున్నాడు. 1799 లో బ్రిస్టన్ లోని న్యూమాటిక్ ఇన్స్టిట్యూట్ లో సహాయకుడుగా పని చేస్తూనే నైట్రస్ ఆక్సైడ్ యొక్క లక్షణాలను గురించి కొన్ని ముఖ్యమైన విషయాలు కనుగొన్నాడు. దీంతో ఆయన్ను 23 సంవత్సరాల వయసులోనే గ్రేట్ బ్రిటన్ లోని రాయల్ ఇన్స్టిట్యూషన్ వారు రసాయన శాస్త్ర ఆచార్యులుగా నియమించుకున్నారు.

1808లో బేరియం మరియు కాల్షియం మూలకాల్ని కనుగొన్నాడు. మెగ్నీషియం మరియు స్ట్రోనియం మూలకాలని మొట్టమొదటి సారిగా వేరు చేసింది కూడా ఆయనే.

1807లో డేవిడ్ హంప్రీ పొటాషియం హైడ్రాక్సైడ్ నుంచి పొటాషియం తయారుచేశాడు. సోడియం హైడ్రాక్సైడ్ నుంచి సోడియంను వేరుచేశాడు. 1808లో కాల్షియం మూలకాల్ని కనుగొన్నాడు. మెగ్నీషియం, బేరీయం, బేరియం మూలకాలను కూడా గుర్తించాడు. బోగ్గం గనుల్లో ఉపయోగించే రక్షక దీపాల్ని కనుగొన్నాడు. 1810లో క్లోరిన్ వాయువుకి ఆ పేరును ప్రతిపాదించాడు. డేవీ కున్న అద్భుతమైన బోధనా నైపుణ్యం, శాస్త్ర పరిశోధనలో ఆయనకున్న ట్రాక్ రికార్డులు వెరసి ఆయన్ను తన సమకాలికుల్లో అగ్రస్థానాల్ని కట్టబెట్టాయి. ఆ రోజుల్లో బ్రిటన్, ఫ్రాన్స్ దేశాలు రెండూ శత్రువులైనప్పటికీ 1808 లో ఫ్రెంచి ఇన్స్టిట్యూట్ వారి ఆయనకు నెపోలియన్ ప్రజ్ఞను బహూకరించారు. 1812 లో బ్రిటిష్ ప్రభుత్వం ఆయన్ను సర్ బిరుదుతో సత్కరించింది. 1818 లో ఇంకా ఉన్నతమైన బారోనెట్ తో సత్కరించింది. 1820 లో ఆయన రాయల్ సొసైటీకి అధ్యక్షుడయ్యాడు.

చంద్రునిపై ఒక బిలానికి డేవీ పేరు పెట్టారు. నెపోలియన్ బోనా పార్టీ నుంచి ఒక పతకాల్ని పొందాడు. 1819లో హంప్రీ డేవికిసర్ బిరుదు ఇచ్చి గౌరవించారు. 1829 మే 29న 50వ ఏట స్విట్జర్లాండ్లోని జెనీవాలో మరణించాడు.



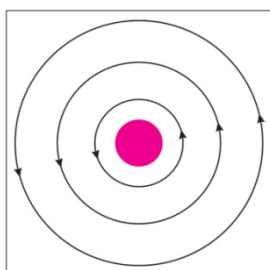
Writer : G. Sree Kar M.Sc , B.Ed (9700842884, 9440234404)

Electromagnetism

1. Are the magnetic lines closed? Explain. (AS1)

1. Magnetic lines are imaginary lines or curves forms around the magnet.
2. Outside of the magnet they extend from north to south.
3. Inside of the bar magnet they may form south to north.
4. So, the magnetic lines are closed curves.

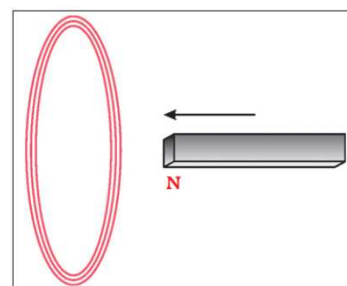
2. See figure, magnetic lines are shown. In what direction does the current through wire flow? (AS1)



1. In the diagram the magnetic lines are in anti-clock wise direction.
2. According ampere right hand rule the direction of current is vertically upwards.

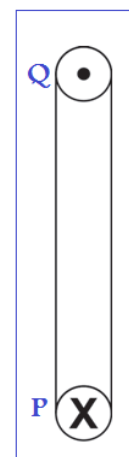
3. A bar magnet with North Pole facing towards coil moves as shown in fig.Q-3. What happens to magnetic flux passing through the coil? (AS1)

If the magnetic flux passing through a coil then current is generated in the coil.



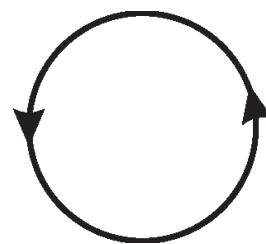
4. A coil is kept perpendicular to page. At P, current flows into the page and at Q it comes out of the page as shown in figure Q-4. What is the direction of magnetic field due to coil? (AS1)

1. At the top i.e. near Q, the direction of magnetic field is anti clock wise direction.
2. At the bottom i.e. near P, the direction of magnetic field is clock wise direction.



5. The direction of current flowing in a coil is shown in figure. What type of magnetic pole is formed at the face that has flow of current as shown in figure? (AS1)

North Pole is forms at the face that has flow of current as shown in the figure.



6. Why do the picture appear distorted when a bar magnet is brought close to the screen of a television? Explain (AS1)

This is due to the fact that magnetic field exerts a force on the moving charge.

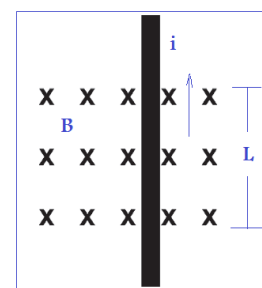
7. Symbol 'X' indicates the direction of a magnetic field into the page. A straight long wire carrying current along its length is kept perpendicular to the magnetic field. What is the magnitude of force experienced by the wire by the magnetic field? In what direction does it act? (AS1)

1. The magnitude of force experienced by the wire by the magnetic field

is, $F = BqV$.

Where 'B' is the magnetic induction, q is the charge and 'V' is the velocity.

2 The force that acts on the wire is perpendicular to the direction of the magnetic field induction.



8. Explain the working of electric motor with a neat diagram. (AS1)

Electric motor: it is a device which converts the electrical energy into mechanical energy.

Principle: when a current carrying in a conductor placed perpendicular to the magnetic field experiences a force.

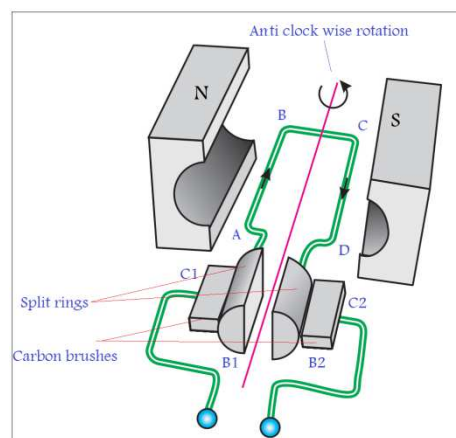
Working: 1. An electric motor consists of a rectangular coil ABCD called armature and kept in between the permanent magnets as shown in the figure.

2. When current is passing through the coil armature gets half rotation.

3. But the Coil continues the rotation because of rotational inertia of motion.

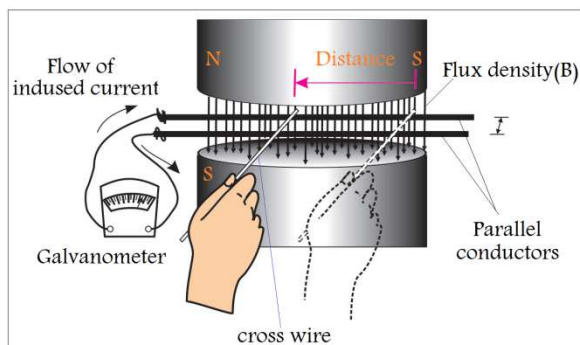
4. In the same way couple rotates the coil in the same direction.

5. It is the working of an electrical motor.



9. Derive Faraday's law of induction from conservation of energy. (AS1)

Faraday's law: The induced emf generated in the closed loop is equal to the rate of change of magnetic flux passing through it.



1. The apparatus are arranged as shown in the figure.
2. Close the circuit by touching the parallel conductors with another bar conductor which is held by your hand.
3. If the cross wire moved to the left we observe the galvanometer deflection right side.
4. If the cross wire moved to the right side we observe the opposite side of the deflection.
5. This means a current will be set up in the circuit only there is an emf in the circuit.

10. The value of magnetic induction of uniform field is 2T. What is the flux passing through the surface of area 1.5 m^2 perpendiculars to field? (AS1)

Given: Magnetic field induction, $B = 2\text{t}$
 Surface area, $A = 1.5 \text{ m}^2$
 Magnetic flus, $\Phi = ?$

Formula: $\Phi = BA = 2 \times 1.5 = 3 \text{ Webers.}$

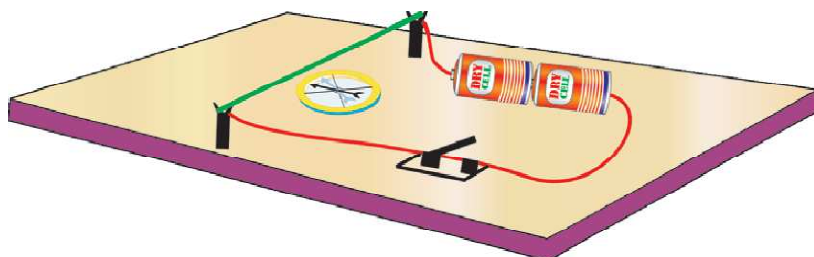
11. An 8N force acts on a rectilinear conductor 20cm long placed perpendicular to magnetic field. Determine the magnetic field induction if the current in the conductor is 40A. (Ans: 1tesla) (AS1)

Given: $F = 8\text{N}$
 $l = 20 \text{ cm or } 20 \times 10^{-2} \text{ m}$
 $i = 40 \text{ A}$
 $B = ?$

Formula: $B = \frac{F}{il} = \frac{8}{40 \times 20 \times 10^{-2}} = \frac{8 \times 10^2}{40 \times 20} = \frac{800}{800} = 1 \text{ Tesla}$

12. Explain with the help of two activities that current carrying wire produces manetic field? (AS1)

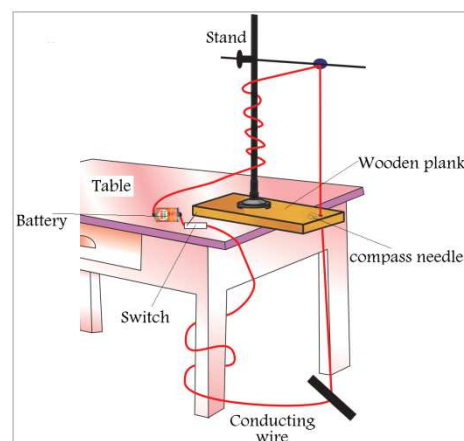
Activity-1:



1. Arrange the equipments as shown in the figure.
2. Place one compass below the wire.
3. Switch on the circuit and we observe the compass needle gets deflected.
4. This deflection is due to the influence of electric field on magnetic field.

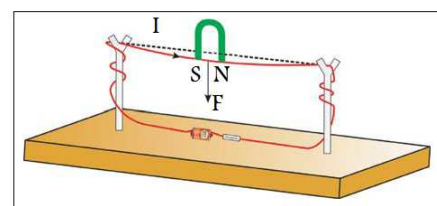
Activity-2: 1. The arrangements are made as shown in the figure.

2. Use 3 volts battery in circuit. Switch on. Current flows through the wire.
3. When current flows, the magnetic needle deflected.
4. Hence, we conclude that the magnetic field surrounds current carrying conductors.



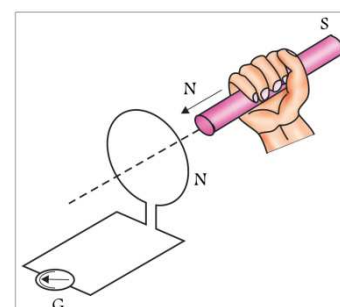
13. How do you verify experimentally that the current carrying conductor experiences a force when it is kept in magnetic field? (AS1)

1. The arrangements are made as shown in the figure.
2. Bring a horse shoe magnet near the copper wire as shown in the figure.
3. The wire is deflecting upwards due to some force acts on it.
4. Repeat this by changing the direction of current in the circuit. We observe the direction of force is also changed.



14. Explain Faraday's law of induction with the help of activity? (AS1)

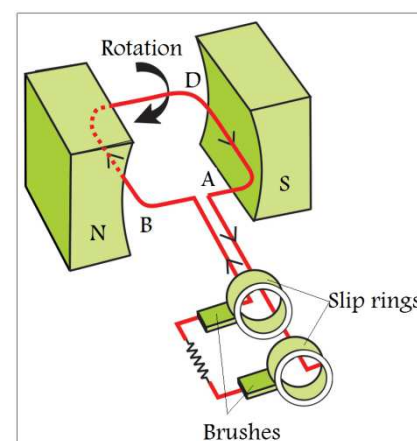
1. Connect the terminals of a coil to sensitive galvanometer as shown in the figure.
2. Push a bar magnet towards the coil whose north pole is facing towards the coil.
3. If the magnet is moved away from the coil, the needle in the galvanometer again deflects but in the opposite direction.
4. Whenever there is a continuous change of magnetic flux linked with closed coil, the current is generated in the coil.
5. This is one form of Faraday's law.



15. Explain the working of AC electric generator with a neat diagram. (AS1)

Working of an Ac elector generator: Electrical generator is a device which converts the mechanical energy into electrical energy.

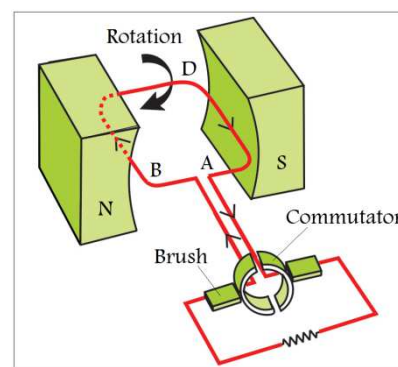
1. Consider the rectangular coil is held between the poles of curve-shaped permanent magnet as shown in the figure.
2. As the coil rotates, the magnetic flux passing through coil changes and an induced current is generated in the coil.
3. The current obtained by this process changes its direction alternatively.
4. This current is called alternating current (AC).



16. Explain the working of DC generator with a neat diagram. (AS1)

Working of a DC generator: 1. Consider the rectangular coil is held between the poles of curve-shaped permanent magnet as shown in the figure.

2. As the coil rotates, the magnetic flux passing through coil changes and an induced current is generated in the coil.
3. The current obtained by this process cannot change its direction.
4. This current is called Direct current (DC).

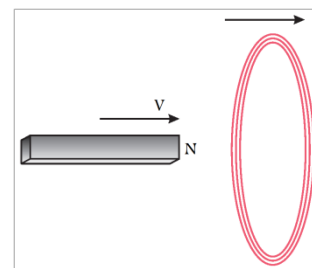


17. Rajkumar said to you that the magnetic field lines are open and they start at North Pole of bar magnet and end at South Pole. What questions do you ask Rajkumar to correct him by saying "field lines are closed"? (AS2)

1. Are the magnetic field lines passing through bar magnet?
2. Do the magnetic lines of force have any direction within the magnet?
3. What is the direction of magnetic lines of force within the magnet?

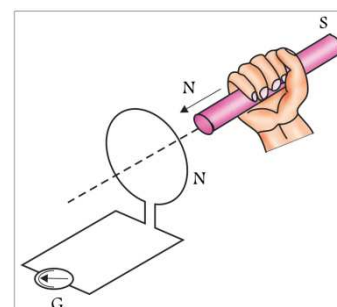
18. As shown in figure both coil and bar magnet moves in the same direction. Your friend is arguing that there is no change in flux. Do you agree with his statement? If not what doubts you have? Frame questions about doubts you have regarding change in flux. (AS2)

1. If both moves in the same direction, is there any change in the linkage of flux with the coil.
2. Do they move with same speed in the same direction?
3. What happens if both magnet and coil move in opposite direction?
4. When North Pole is moved towards the coil what is the direction of current?



19. What experiment do you suggest to understand faraday's law? What material is required? What suggestions do you give to get good results of the experiment? Give precautions. (AS3)

- Experiment:**
1. Connect the terminals of a coil to sensitive galvanometer as shown in the figure.
 2. Push a bar magnet towards the coil whose north pole is facing towards the coil.
 3. If the magnet is moved away from the coil, the needle in the galvanometer again deflects but in the opposite direction.
 4. Whenever there is a continuous change of magnetic flux linked with closed coil, the current is generated in the coil.
 5. This is one form of Faraday's law.

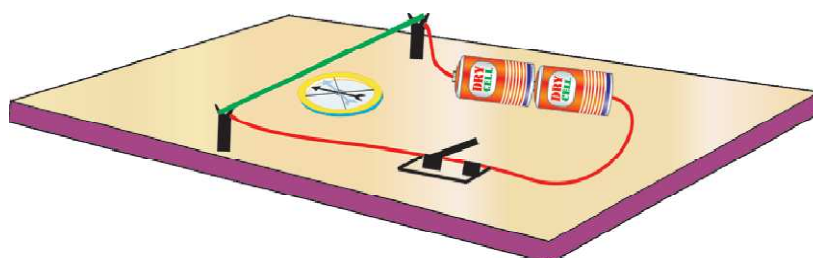


Material Required: 1. Galvano meter 2. A bar magnet 3. A coil of wire.

- Suggestions:**
1. To get more induced current.
 2. The bar magnet should be a strong magnet.

3. The number of turns in the coil should be more.
4. The area of the coil should be more.

20. How can you verify that current carrying wire produces magnetic field with the help of experiment? (AS3)



1. Arrange the equipments as shown in the figure.
2. Place one compass below the wire.
3. Switch on the circuit and we observe the compass needle gets deflected.
4. This deflection is due to the influence of electric field on magnetic field.

21. Collect information about generation of current by using faraday's law. (AS4)

1. Current is generated in electric generator or dynamo with the help of Faraday's law.
2. Faraday's law of electromagnetic induction is also used in the working of a transformer.

22. Collect information about material required and procedure making simple electric motor from internet and make a simple motor on your own. (AS4)

Aim: Preprepare a simple electric motor.

Material Required: 1.5m copper wire (about 25 gauge), 2 safety pins, 1.5 battery, magnets, and rubber bands.

Procedure:

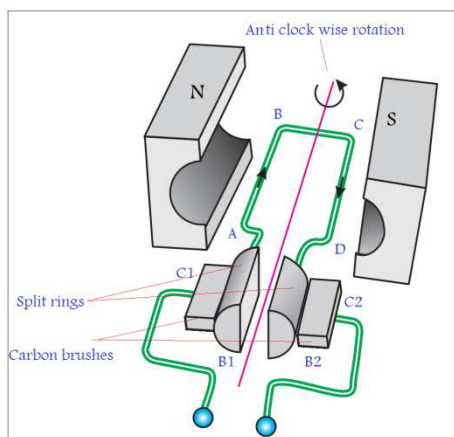
1. Wind the nearly 10-15 turns to make a coil.
2. Copper coil is arranged in between the two safety pins as shown in the figure.
3. The other ends of the pins are fixing vertically as shown in the figure.
4. This completes the simple electric motor.



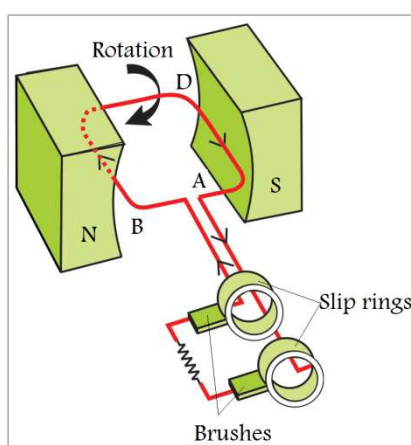
23. Collect information of experiments done by Faraday? (AS4)

1. Dynamo in electromagnetic induction.
2. Magnetic levitation.
3. Homopolar motor in magnetism.
4. Faraday's case.
5. Experiments on electrolysis.

24. Draw a neat diagram of electric motor. Name the parts. (AS5)



25. Draw a neat diagram of AC generator. (AS5)



26. How do you appreciate the faraday's law, which is the consequence of conservation of energy? (AS6)

1. When the bar magnet is moved towards the coil or away from the coil, current is generated in the coil.
2. This mechanical energy is converted in to electrical energy.
3. Hence, I appreciate the Faraday's law which is the consequence of conservation of energy.

26. How do you appreciate the relation between magnetic field and electricity that changed the life style of mankind? (AS6)

1. I appreciate the relation between magnetic field and electricity that changed the life style of mankind, which is as explained below.
2. We know magnetic field induction is,
 - i. Directly proportional to the current. i.e. $B \propto I$ (1)
 - ii. Inversely proportional to the radius of the coil. i.e. $B \propto \frac{1}{r}$ (2)
 - iii. Directly proportional to number of turns. i.e. $B \propto N$ (3)
3. From (1), (2) and (3), we get, $B \propto \frac{iN}{R}$
4. This shows that, if current is more the magnetic field induction is also more.

27. Give a few applications of faraday’s law of induction in daily life. (AS7)

1. During the security check, people made to walk through a large upright coil which produces a weak Ac magnetic field.
2. If we are carrying any significant quantities of iron, the magnetic flux changes and the induced current generated in the coil triggers an alarm.

28. Which of the various methods of current generation protects the nature well? Give examples to support your answer. (AS7)

The various methods of current generation protects the nature well are,

1. When speedily moving wind falls on the blades of a wind mill, it produces the current and is known as “wind power”.
2. The method of production of electricity using solar energy, geothermal energy, tidal energy, wave energy, Bio-mass energy, and energy stored in water etc.

Hans Christian Oersted (1777 - 1851)



One of the leading scientists of the 19th century, played a crucial role in understanding electromagnetism. He gave lectures which were quite popular among the public and also learnt a lot during the tours. During one such lecture in April 1820, Oersted carried out an experiment that was never performed before. He placed a compass underneath a wire and then turned on electric current. The needle of the magnetized compass showed movement. Oersted recognized the significance of what he had just done. Earlier, it was believed that electricity and magnetism were two different forces. Oersted had demonstrated that they were interconnected. Through this observation he showed that electricity and magnetism were related phenomena. Some scientists, influenced by this experiment, continued with the modern field of “electromagnetism”. Their research resulted in several new scientific theories and various vital inventions like the dynamo and the electric motor, created technologies such as the radio, television, and fiber optics.

The unit of magnetic field strength is named the Oersted in his honour. Oersted was made a foreign member of the Royal Swedish Academy of Sciences in 1822.

నిత్యం ఉదయించినా సూర్యుడు అలుపెరుగడు-పని మంతుడికి సాకులుండవు!

Even when rises as routine daily Sun feels no drudgery-An efficient workman pleads, no excuses.

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Chapter 13

Metallurgy

1. List three metals that are found in nature as Oxide ores. (AS1)

S.No	Name of the Metal	Chemical Formula
1	Bauxite	$\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$
2	Zincate	ZnO
3	Hematite	Fe_2O_3

2. List three metals that are found in nature in uncombined form? (AS1)

1. Gold
2. Silver
3. Platinum

3. Write a note on ore dressing in metallurgy? (AS1)

1. Dressing means simply getting rid of as much of the unwanted rocky material as possible before the ore is converted to the metal.
2. The methods of dressing or concentration of ore and gangue.
 - a. Hand Picking
 - b. Washing
 - c. Froth flotation.
 - d. Magnetic Separation.

4. What is an ore? On what basis a mineral is chosen as an ore? (AS1)

- Ore.
1. A mineral form which a metal can be extracted economically and conveniently is called ore.
 2. A mineral as choose as an ore if the mineral is economical and profitable to extract.

5. Write the names of any two ores of iron? (AS1)

The names of two ores of iron are 1. Hematite (Fe_2O_3) 2. Magnetite (Fe_2O_4)

6. How do metals occur in nature? Give examples to any two types of minerals. (AS1)

1. The earth crust is the major source of the metals.
2. Sea water also contains some soluble salts such as sodium chloride and Magnesium Chloride etc.
3. Some metals like Gold (Au), silver (Ag) and copper are available in the nature in free state.
4. The elements or compounds of the metals which occur in nature in the earth's crust are called mines.

Ex. Lime stone and Rock salt.

7. Write short notes on froth floatation process? (AS1)

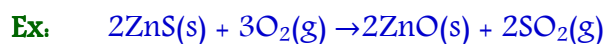
1. This method is mainly useful for sulphide ores which have no wetting property whereas the impurities get wetted.
2. The ore with impurities is finely powdered and kept in water taken in a floatation cell.
3. Air under pressure is blown to produce froth in water.
4. Froth is obtained, takes the ore particles to the surface where as impurities settle at the bottom.
5. Froth is separated and washed to get ore particles.

8. When do you use magnetic separation method for concentration of an ore? Explain with an example? (AS1)

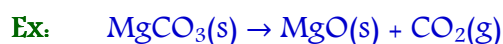
In the ore or impurity, one of them is magnetic substance and the other non-magnetic substance, they are separated using electromagnets.

9. Write short notes on each of the following. 1. Roasting 2. Calcination 3. Smelting. AS1)

1. Roasting. Roasting is a process of heating the ore strongly in a free supply of air or oxygen.

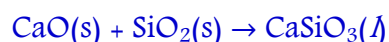
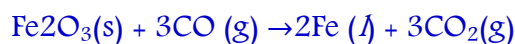


2. Calcination. Calcination is a process of heating the ore strongly in the absence of air or oxygen.



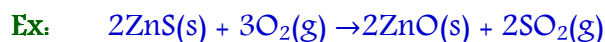
3. Smelting. Roasting is a process of heating the ore strongly in a free supply of air or oxygen.

Ex. The following reactions are takes place inside the furnace.

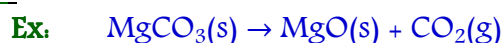


10. What is the difference between roasting and calcinations? Give one example for each? (AS1)

1. Roasting. Roasting is a process of heating the ore strongly in a free supply of air or oxygen.



2. Calcination. Calcination is a process of heating the ore strongly in the absence of air or oxygen.



11. Define the terms 1. Gangue 2. Slag. (AS1)

Gangue. The impurity present in the ore is called Gangue.

Slag. Slag is a feasible material which combines the flux and impurities.

12. Magnesium is an active metal if it occurs as a chloride in nature, which method of reduction is suitable for it extraction? (AS2)

1. The method of reduction which is suitable for chloride of magnesium is electrolytic reduction.

2. Fused MgCl_2 is electrolyzed with steel cathode (+) and graphite anode (-).

3. The metal will be deposited at cathode and chlorine gas is liberated at the anode.



13. Mention two methods which produce very poor metals? (AS2)

1. Electrolytic refining.
2. Distillation.

14. Which method do you suggest for extraction of high reactivity metals? Why? (AS2)

1. The only method to extract high reactivity metals is electrolysis of their fused compounds.
2. Other methods are not adopted because high reactivity metals are more expensive.

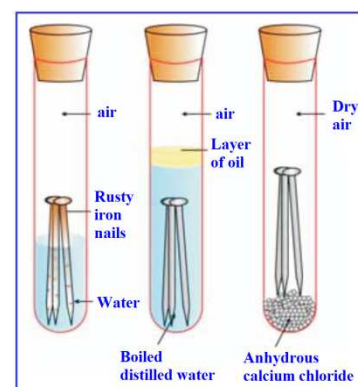
15. Suggest an experiment to prove that presence of air and water is essential occurrences of corrosion and explain the procedure? (AS3)

Aim. To prove that the presence of air and water are essential occurrences of corrosion.

Apparatus. Three test tubes, three corks, Distilled water, anhydrous calcium chloride, clean iron nails and oil etc.

Procedure. 1. Take three test tubes and place clean iron nails in each of them.

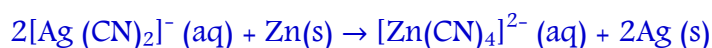
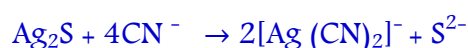
2. Pour some water in the first test tube, add 1 ml of the oil in second and add some calcium chloride in third one.
3. Leave the test tube for few days and then observe.
4. We will observe that iron nails rust in the first test tube.
5. This shows air and water are essential for corrosion.



16. Collect information about extraction of metals of low reactivity Silver, Platinum and Gold and prepare a report? (AS4)

Extraction of Silver. 1. Silver can be extracted from Ag_2S by displacement from their aqueous solution.

2. If we get the Silver the following reactions takes place.



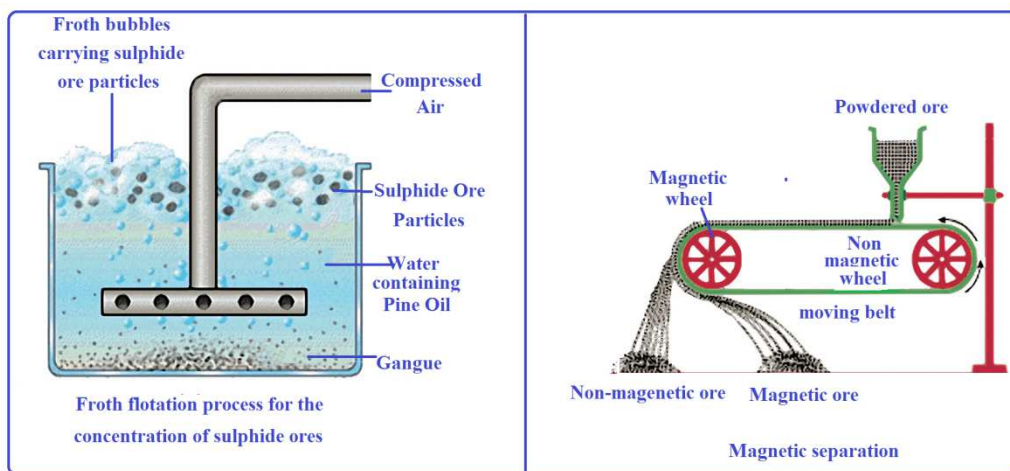
Extraction of Gold. 1. Gold is extracted from gold ore like electrum.

2. Zink is added and a chemical reaction takes place which separate the gold from ore.
3. Pure gold is removed from the solution with a filter press.

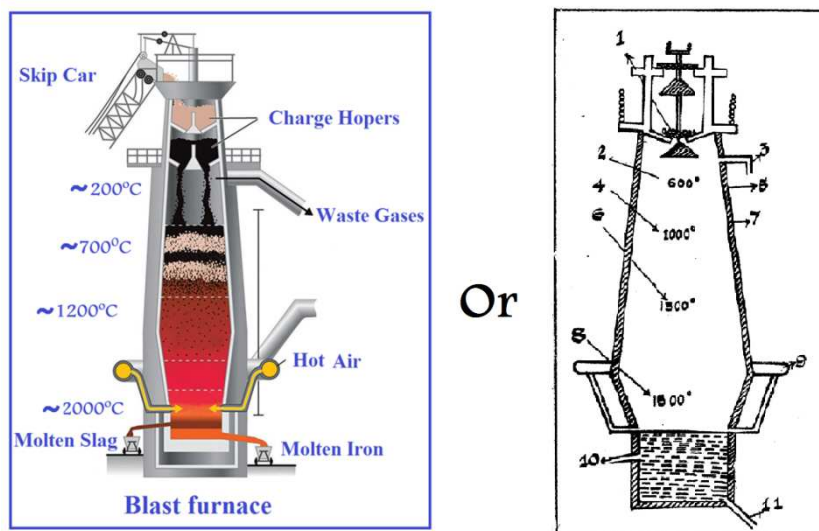
Extraction of Platinum: 1. Platinum is extracted from its ore by complex process and includes milling the ore, a fresh floatation process and smelting at high temperature.

2. This removes the base metals, iron and sulphur and concentrate platinum.
3. In this way, Platinum is extracted from its ore.

17. Draw the diagram showing (i) Froth flotation (ii) Magnetic separation? (AS5)



18. Draw a neat diagram of Reverberatory furnace and label it neatly? (AS5)



19. What is the activity series? How it helps in extraction of metals? (AS6)

Activity Series. 1. Arrangement of the metals in descending order of their reactivity is known as activity series.

2. The activity series of metal is $\frac{K, Na, Ca, Mg, Al}{\text{High reactivity}}$, $\frac{Zn, Fe, Pb, Cu}{\text{Moderate reactivity}}$, $\frac{Ag, Cu}{\text{Low reactivity}}$.

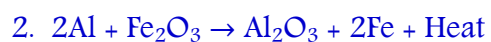
The advantage of activity series in extraction of metals.

1. It is very useful to judge the nature of metal and how it exists.
2. High reactive metals are so reactive that they never found the nature in free state.
3. Moderate reactive metals are found in the earth crust mainly as oxides, sulphides and carbonates.
4. The least reactive metals are found even in free state in nature.

20. What is thermite process? Mention its applications in daily life? (AS7)

Thermite process. Thermite process involves the chemical reaction of metal oxides with aluminum.

Applications in daily life. 1. In this process the reaction of Iron oxide (Fe_2O_3) with Aluminium is used to join the railway tracks or cracked machine parts.



21. Where do we use handpicking and washing methods in our daily life? Give examples. How do you correlate examples with enrichment of ore? (AS7)

If the ore particles and the impurities are different in one of the properties like colour, size etc. are separated by hand picking.

Ex. Separating mud particles and stones from rice, Wheat etc.

Daily life examples for washing. Some vegetables like potatoes, cucumbers and tomatoes are cleaned by controlled flow of water.

Galileo Galilei (1564 – 1642)



Galileo Galilei was born on 15 February 1564 in Pisa, Italy. Galileo, right from his childhood, had interest in mathematics and natural philosophy. But his father Vincenzo Galilei wanted him to become a medical doctor. Accordingly, Galileo enrolled himself for a medical degree at the University of Pisa in 1581 which he never completed because of his real interest in mathematics. In 1586, he wrote his first scientific book *The Little Balance [La Balancitta]*, in which he described Archimedes method of finding the relative densities (or specific gravities) of substances using a balance. In 1589, in his series of essays *De Motu*, he presented his theories about falling objects using an inclined plane to slow down the rate of descent. In 1592, he was appointed professor of mathematics at the University of Padua in the Republic of Venice. Here he continued his observations on the theory of motion and through his study of inclined planes and the pendulum, formulated the correct law for uniformly accelerated objects that the distance the object moves is proportional to the square of the time taken. Galileo was also a remarkable craftsman. He developed a series of telescopes whose optical performance was much better than that of other telescopes available during those days. Around 1640, he designed the first pendulum clock. In his book *Starry Messenger* on his astronomical discoveries, Galileo claimed to have seen mountains on the moon, the milky way made up of tiny stars, and four small bodies orbiting Jupiter. In his books *Discourse on Floating Bodies* and *Letters on the Sunspots*, he disclosed his observations of sunspots. Using his own telescopes and through his observations on Saturn and Venus, Galileo argued that all the planets must orbit the Sun and not the earth, contrary to what was believed at that time.

Writer : Gali Sree Kar M.Sc, B.Ed (9700842884, 9440234404)

Carbon and its Compounds

1. Name the simplest hydrocarbon. (AS1)

'Methane' is the simplest hydrocarbon.

2. What are the general molecular formula of alkanes, alkenes and alkynes. (AS1)

S.No	Hydrocarbon	Formula
1	Alkanes	$C_n H_{2n+2}$
2	Alkenes	$C_n H_{2n}$
3	Alkynes	$C_n H_{2n-2}$

3. Name the carboxylic acid used as a preservative. (AS1)

Vinegar is used widely as a preservative in pickles.

4. Name the product other than water formed on burning of ethanol in air. (AS1)

The product other than water formed on burning of ethanol in air is carbon dioxide (CO_2).



5. Give the IUPAC name of the following compounds. If more than one compound is possible name all of them. (AS1)

i. An aldehyde derived from ethane.

ii. A ketone derived from butane.

iii. A chloride derived from propane.

iv. An alcohol derived from pentane.

i. 1. An aldehyde derived from ethane is ethanol. Its chemical formula is $CH_3 CHO$.

2. Ethanol is the IUPAC name and Acetaldehyde is the general name.

ii. 1. A ketone derived from butane is butanone. Its chemical formula is $CH_3 CO CH_2 CH_3$.

2. Butane is its IUPAC name and Methyl ethyl ketone is its general name.

iii. 1. A chloride derived from propane is propyl chloride and its chemical formula is,



iv. An alcohol derived from pentane is n-pentyl alcohol and its chemical formula is,



6. A mixture of oxygen and ethyne is burnt for welding; can you tell why a mixture of ethyne and air is not used? (AS1)

A mixture of ethyne and air is not used for welding because burning of ethyne in air produces a sooty flame due to incomplete combustion, which is not enough to melt metals for welding.

7. Explain with the help of a chemical equation, how an addition reaction is used in vegetable ghee industry. (AS1)

1. Vegetable oils are unsaturated fats having double bonds between some of their carbon atoms.
2. When a vegetable oil is heated at 400–500^o C with hydrogen in the presence of Nickel as catalyst, then saturated oil called vegetable ghee is formed.
3. This reaction is called hydrogenation of oils.



8. a. What are the various possible structure formulae of a compound having molecular formula C₃H₆O?

b. Give the IUPAC names of the above possible compounds and represent them in structures. (AS1)

c. What is the similarity in these compounds? (AS1)

a. The possible structures of C₃H₆O are, CH₃COCH₃ (or) CH₃CH₂CHO.

- b.
1. The IUPAC name of CH₃COCH₃ is propanone.
 2. The IUPAC name of CH₃CH₂CHO is propanal.

- c.
1. Both of them have C=O in their structure.
 2. This is the similarity in the compounds.

9. Name the simplest ketone and write its molecular formula. (AS1)

Acetone is the simplest ketone. Its molecular formula is CH₃COCH₃ and IUPAC name is propanone.

10. What do we call the self linking property of carbon? (AS1)

The self linking property of carbon is catenation.

11. Name the compound formed by heating ethanol at 443K with excess of conc.H₂SO₄? (AS1)

When ethanol is heated with excess of .Conc. H₂SO₄ at 443K 'Ethane' is formed.



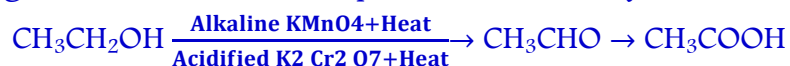
12. Give an example for esterification reaction. (AS1)

The reaction between carboxylic acid and alcohol in the presence of conc. H₂SO₄ to form a sweet odoured substance, ester with functional group is called esterification.



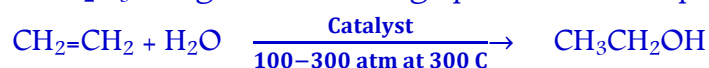
13. Name the product obtained when ethanol is oxidized by either chromic anhydride or alkaline potassium permanganate? (AS1)

Ethanol undergoes oxidation to form the product of acetaldehyde and finally acetic acid.



14. Write the chemical equation represent the reaction of preparation of ethanol from ethane. (AS1)

Ethanol is prepared on large scale from ethane by the addition of water vapor to it in the presence of catalysts like P_2O_5 , Tungsten oxide at high pressure and temperature.



15. Write the IUPAC name of the next homologous of $CH_3OHCH_2CH_3$? (AS1)

The IUPAC name of the next homologous of $CH_3OHCH_2CH_3$ is $CH_3CH_2CH_2CH_2OH$ i.e. 1 butanol.

16. Define homologous series of carbon compounds? Mention any two characteristics of homologous series? (AS1)

Homologous series: the series of carbon compounds in which two successive compounds differ by $-CH_2$ unit is called homologous series.

Characteristics:

1. They have one general formula.

EX: CH_4 , C_2H_6 , C_3H_8 ,etc.

2. Successive compounds in the series possess a difference of $(-CH_2)$ unit.

17. Give the name functional group (i) $-CHO$ (ii) $-C=O$. (AS1)

i. $-CHO$ is Aldehyde. ii. $-C=O$ is Ketone.

18. Why does carbon form compounds mainly by covalent bonding? (AS1)

1. The atomic number of carbon is 6, its electronic configuration is $1s^2 2s^2 2p^2$.
2. Carbon has to satisfy its tetra valence by sharing electrons with other atoms.
3. It has to form four covalent bonds either with its own atoms as well as atoms of other elements.

19. Allotropy is a property shown by which class substances, elements, compounds or mixtures? Explain allotropy with suitable examples? (AS1)

Allotropy: 1. The occurrences of same element in two or more different forms are known as allotropy.
2. Allotropy is a property shown by elements only.

Ex: Graphite and diamond.

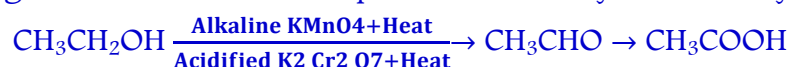
20. Explain how sodium ethoxide is obtained from ethanol? Give chemical equations? (AS1)

When ethanol is react with sodium to liberate hydrogen and form sodium ethoxide.



21. Describe with chemical equation how ethanoic acids may be obtained from ethanol. (AS1)

Ethanol undergoes oxidation to form the product Acetaldehyde and finally Acetic acid.



22. Explain the cleansing action of Soap? (AS1)

Soaps and detergents make oil and dirt present in a cloth dissolve in water, thereby making the cloth clean.

23. Distinguish between esterification and saponification reactions of organic compounds? (AS1)

1. Esterification. The reaction between carboxylic acid and alcohol in the presence of conc. H_2SO_4 to form a sweet odoured substance, ester with functional group is called esterification.



2. Saponification. The process of making soap by the hydrolysis of fats and oils with alkalies is called saponification.



3. We observe that both the reactions are opposite of a single reaction.
4. Forward reaction is esterification and backwards reaction is saponification.

24. Explain the structure of Graphite in terms of bonding and give one property based on this structure. (AS1)

Graphite. 1. Graphite is a grayish black coloured crystalline solid.

2. In a graphite the carbon atoms are in tetrahedral arrangement.
3. It has a metallic luster and soapy to touch. So, it is used as lubricant.
4. It is a good conductor of electricity.
5. It has a density of 2.25 gm/cm^3 .
6. The C-C bond length is 1.42 \AA , and bond angle is 120° .

25. Name the acid present in the vinegar? (AS1)

Acetic acid is present in the vinegar.

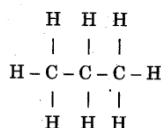
26. What happens when a small piece of sodium is dropped into ethanol? (AS2)

When ethanol is react with sodium to liberate hydrogen and form sodium ethoxide.



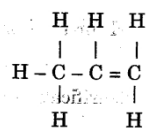
27. Two carbon compounds A and B have molecular formula C_3H_8 and C_3H_6 respectively. Which one of the two is most likely to show addition? Justify your answer? (AS2)

C_3H_8 . 1. The structure of C_3H_8 is



2. It is an alkane called ethane and it cannot participate in addition reaction as it C-C.

C_3H_6 . 1. The structure of C_3H_6 is



2. It is an alkene called propene and participate in addition reaction as it has C=C.

28. Suggest a test to find the hardness of water and explain the procedure? (AS3)

1. Take about 100 ml of tap water in a beaker.
2. Add some soap solution to the beaker and shake it vigorously, lather is formed at the surface.
3. The same activity is performed by sea water, we cannot observe the lather.
4. We conclude that soap does not form lather easily with hard water.

29. Suggest a chemical test to distinguish between ethanol and ethanoic acid and explain the procedure? (AS3)

1. When ethanol is react with sodium to liberate hydrogen and form sodium ethoxide.



2. This action doesn't happen in case of ethanoic acid.

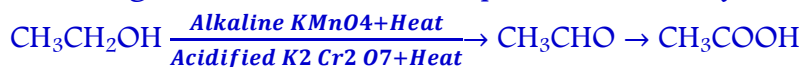
30. An organic compound 'X' with a molecular formula $\text{C}_2\text{H}_6\text{O}$ undergoes oxidation in the presence of alkaline KMnO_4 and forms the compound 'Y', that has molecular formula $\text{C}_2\text{H}_4\text{O}_2$. (AS3)

a. Identify 'X' and 'Y'

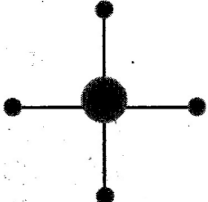


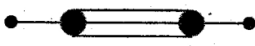
b. Write your observation regarding the product when the compound 'X' is made to react with compound 'Y' which is used as a preservative for pickles.

a. 'X' is ethanol, $\text{CH}_3\text{CH}_2\text{OH}$ and 'Y' is Ethanoic acid, CH_3COOH .

b. Ethanol undergoes oxidation to form the product Acetaldehyde and finally Acetic acid.



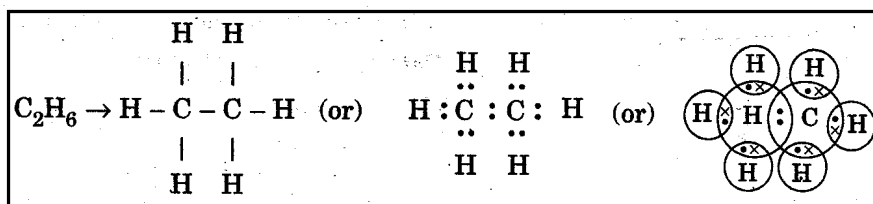
31. Prepare a model of methane, ethane, ethene and ethyne molecules using clay balls and match sticks? (AS4)

<p>1. Methane (CH_4)</p> <p>Structure</p> <pre> H H - C - H H </pre>	<p>Model using clay balls and match sticks</p> 
<p>2. Ethane (C_2H_6)</p> <p>Structure</p> <pre> H H H - C - C - H H H </pre>	<p>Model using clay balls and match sticks</p> 
<p>3. Ethene (C_2H_4)</p> <p>Structure</p> <pre> H H \ / C = C / \ H H </pre>	<p>Model using clay balls and match sticks</p> 
<p>3. Ethyne (C_2H_2)</p> <p>Structure</p> <pre> H - C ≡ C - H </pre>	<p>Model using clay balls and match sticks</p> 

32. Collect information about artificial ripening of fruits by ethylene? (AS4)

1. Sometimes fruits like mango, banana, papaya, sapota and custard apple are often ripen by natural release of ripening hormone from the fruit.
2. Fruits ripened with calcium carbide though develop attractive surface colour, they are inferior in taste, flavor and spoil faster.
3. But the Government of India banned the use of calcium carbide for artificial ripening of fruits under PFA act 8-44AA, 1954.

33. Draw the electronic dot structure of ethane molecule (C₂H₆) (AS5)



34. How do you appreciate the role of esters in everyday life? (AS6)

1. Esters are usually volatile liquids having sweet or pleasant smell.
2. Esters are used in preparing artificial perfumes due to the fact that most of the esters have a pleasant smell.
3. The alkaline hydrolysis of esters is known as saponification.
4. Hence, I appreciate the role of esters in everyday life.

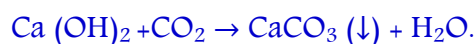
35. How do you condemn the use of alcohol as a social practice? (AS7)

1. Alcohols slow down the activity of nervous system and the brain.
2. Drinking of alcohol causes the blurred vision, dizziness and vomiting.
3. Heavy drinking of alcohol makes a person alcoholic.
4. Heavy drinking of alcohol over a long period of time can damage the stomach, liver and heart.

36. An organic compound with molecular formula C₂H₄O₂ produces brisk effervescence on addition of sodium carbonate / bicarbonate. Answer the following

- a. Identify the carbon compound. (AS1)
- b. Name the gas evolved. (AS1)
- c. How will you test the gas evolved? (AS2)
- d. Write the chemical equation for the above reaction. (AS3)
- e. List two important uses of the above compound. (AS1)

- a. The organic compound is Ethanoic acid or acetic acid.
- b. $\text{CH}_3\text{COOH} + \text{NaHCO}_3 \rightarrow \text{CH}_3\text{COONa} + \text{CO}_2 + \text{H}_2\text{O}$
- c. The gas evolved is carbon dioxide (CO₂).
- d. Pass the evolved gas in to the lime water then it turns to milky white.



37. 1ml glacial acetic acid and 1ml of ethanol are mixed together in a test tube. Few drops of concentrated sulphuric acid is added in the mixture are warmed in a water bath for 5 min.

Answer the following,

- Name the resultant compound formed.
- Represent the above change by a chemical equation.
- What term is given to such a reactions.
- What are the special characteristics of the compound formed?

a. Ethyl acetate.



c. Esterification.

d. It has fruit (or) pleasant smell.

Wöhler Friedrich (1800 – 1882)



German chemist who was a student of Berzelius. In attempting to prepare ammonium cyanate from silver cyanide and ammonium chloride, he accidentally synthesized urea in 1828. This was the first organic synthesis, and shattered the vitalism theory. Wöhler pursued the matter further and discovered that urea and ammonium cyanate had the same chemical formula, but very different chemical properties. This was an early discovery of isomerism, since urea has the formula $\text{CO}(\text{NH}_2)_2$ and ammonium cyanate has the formula NH_4CNO .

యుగాలు తపస్సు చేసినా ఫలించేది క్షణంలోనే - జ్ఞానమే ముక్తి!

Even after a penance for ages together the result reaches you, in a few seconds–Awakening itself is total liberation.

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