

CLASS X (2020-21)
SCIENCE (CODE 086)
SAMPLE PAPER-3

Time : 3 Hours**Maximum Marks : 80****General Instructions :**

- (i) The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.
- (ii) Section–A – question no. 1 to 20 - all questions and parts thereof are of one mark each. These questions contain multiple choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.
- (iii) Section–B – question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should be in the range of 30 to 50 words.
- (iv) Section–C – question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should be in the range of 50 to 80 words.
- (v) Section–D – question no. 34 to 36 are long answer type questions carrying 5 marks each. Answer to these questions should be in the range of 80 to 120 words.
- (vi) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
- (vii) Wherever necessary, neat and properly labelled diagrams should be drawn

Section A

1. Which one of these has a higher concentration of H^+ ions ? [1]

1 M HCl or 1 M CH_3COOH

Ans :

1 M HCl has a higher concentration of H^+ (aq.) ions as it ionises completely.

or

A few drops of sulphuric acid are added to water before electrolysis, why?

Ans :

Water is not a good conductor of electricity. Few drops of sulphuric acid makes it better conductor of electricity.

2. What is an alkali? [1]

Ans : An alkali is a base that dissolves in water.

3. At what pH rain water is said to be acidic ? [1]

Ans :

When $pH < 5.5$, the rain water becomes acidic.

4. What are the units of power of a lens? [1]

Ans :

If the focal length is measured in metre then the unit of power of a lens is dioptre.

5. Which colour of white light suffers (i) least deviation and (ii) maximum deviation when a beam of white light passes through a glass prism? [1]

Ans :

Longer wavelength light (red) suffers least deviation and shorter wavelength (violet) suffers maximum deviation when white light is passed through a prism.

6. State the laws of reflection. [1]

Ans :

Laws of Reflection

- a. The incident ray, the reflected ray and the normal at the point of incidence are always in the same plane.
- b. $\angle i = \angle r$. The incident angle is always equal to the reflection angle.

or

How many images are formed by two parallel mirrors?

Ans :

The images formed by two parallel plane mirrors will be infinite.

7. Why are magnetic field lines closed curves? [1]

Ans :

By convention the magnetic field lines are the path traced by north pole which emerges from north pole and goes to the south pole and inside the magnet the direction of field lines are from south pole to north pole, forming continuous closed path.

8. How is the induced current in a secondary coil related to current in a primary coil? [1]

Ans :

Induced current in a secondary coil may be more or lesser than the current in primary coil depending upon the number of turns in secondary.

9. State which has a higher resistance a 50 W or a 25 W lamp bulb and how many times? [1]

Ans :

Given, $P_1 = 50 \text{ W}$

$P_2 = 25 \text{ W}$

Let their resistances are R_1 and R_2 respectively.

As, we know that,

$$P = \frac{V^2}{R} \text{ or } R = \frac{V^2}{P}$$

$$R_1 = \frac{V^2}{50} \Omega \text{ and } R_2 = \frac{V^2}{25} \Omega$$

$$\frac{R_1}{R_2} = \frac{25}{50} = \frac{1}{2}$$

or $R_1 = \frac{1}{2}R_2$

i.e. 50 W bulbs has $\frac{1}{2}$ resistance than 25 W bulb.

or

Define resistivity of a material.

Ans :

$$R = \rho \frac{l}{A}$$

or Resistivity, $\rho = R \frac{A}{l}$

If $A = 1$, $l = 1$ then

$\rho = R$ i.e. resistivity of a material is the resistance of a conductor of this material whose length and area of cross-section both are unity.

or

Resistivity of a material is the resistance of a conductor of this material whose volume is unity.

10. Name the type of blood vessels, which carry blood from organs to the heart. [1]

Ans : Veins.

11. Which tropic movement is responsible for the growth of pollen tubes towards ovules? [1]

Ans : Chemotropism.

or

Why endocrine glands release their secretions into the blood?

Ans :

It is because endocrine glands are ductless.

12. How is the age of fossil determined? [1]

Ans :

The age of fossil fuels is determined through carbon-dating or time dating method.

or

What is evolution?

Ans :

Gradual unfolding of organisms from pre-existing organisms through change is called evolution.

13. What is acid rain? [1]

Ans :

The rain water in which oxides of sulphur and nitrogen (acidic) get dissolved form acid rain.

For question numbers 14, 15 and 16, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :

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

14. **Assertion :** Plaster of Paris should be stored in moisture proof containers.

Reason : Plaster of Paris on coming in contact of moisture, absorbs water and reacts chemically to form hydrated calcium sulphate, which sets to form a hard mass. [1]

Ans : (a) Assertion is true and reason is correct explanation of assertion.

15. **Assertion :** Iron is found in the free state in nature.

Reason : Iron a highly reactive element. [1]

Ans : (d) Assertion (A) is false but reason (R) is true.

or

Assertion : Different metals have different reactivities with water and dilute acids.

Reason : Reactivity of a metal depends on its position in the reactivity series.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

The metals placed at the top of the series are most reactive.

16. **Assertion :** Consumers are present at the first trophic level.

Reason : Consumers or heterotrophs fix energy making it available for autotrophs. [1]

Ans : (e) Both Assertion and Reason are false.

17. **Read the following and answer any four question from (17.1) to (17.5) :** **1 × 4**

Chemistry is one of the most sophisticated branches of science, would not have been the same if Russian scientist Dmitri Ivanovich Mendeleev had not come up with the periodic table on March 6, 1869. Until 1863, the world was aware of only 56 known elements. The rate of scientific progress was such that every year, a new element was being discovered. It was during this time periodic table. He published the periodic table in his book- "The Relation between the Properties and Atomic Weights of the Elements". He had found a definitive pattern following which each element could be placed according to their atomic weight. He noticed that elements that are similar in their similar chemical properties either had the atomic weight or had a regular increase. He also predicted the properties of the missing (yet to be discovered) elements and gave them Sanskrit names.

17.1 Which of the following statement about the Mendeleev's periodic table is correct ?

- (a) It has 8 vertical columns known as groups.
 (b) It has 18 horizontal rows known as periods.
 (c) It has 7 horizontal rows known as groups
 (d) It has 18 vertical columns known as periods

Ans : (a) It has 8 vertical columns known as groups.

17.2 According to Mendeleev's periodic law, the elements were arranged in the periodic table in the order of :

- (a) decreasing atomic numbers
 (b) increasing atomic numbers
 (c) decreasing atomic masses

(d) increasing atomic masses

Ans : (d) increasing atomic masses

17.3In Mendeleev's periodic table, gaps were left for the elements to be discovered later on. An element which found a vacant place in the periodic table later on is :

- (a) Se
- (b) Ge
- (c) Si
- (d) Be

Ans : (b) Ge

17.4Gallium was named by Mendeleev as :

- (a) Eka-aluminium
- (b) Eka-silicon
- (c) Eka-germanium
- (d) Eka-zinc

Ans : (a) Eka-aluminium

17.5Which of the following statement is correct in regard to Mendeleev's periodic table ?

- I. Position of isotopes could not be explained.
 - II. It is true for elements upto calcium only.
 - III. It could accommodate noble gases when they were discovered
 - IV. It assigned correct position to hydrogen.
- (a) I and II only
 - (b) I and III only
 - (c) I, II and III
 - (d) IV only

Ans : (b) I and III only

18. Answer question numbers 18.1-18.4 on the basis of your understanding of the following paragraph and the related studied concepts. 1 × 4

In the series combination, the resistances are joined end to end. For a series combination of resistors, $R_s = \sum R_i$ and current through each resistor is same

but their potential difference between their ends are different according to their resistors. When two or more resistors are combined in such a way that their first ends are connected to one point and the second ends to another point. In a parallel combination of resistors, $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$ and potential drop across each resistor is same but current in different resistances are different.

18.1If we connect n bulbs each with a rated power P in series, then the total power consumed by combination at rated current is

- (a) Pn
- (b) Pn^2
- (c) P/n
- (d) P^2n

Ans : (c) P/n

When resistors are in series combination, then

$$R_s = R_1 + R_2 + \dots R_n$$

$$\frac{V^2}{P_s} = \frac{V_1^2}{P_1} + \frac{V_2^2}{P_2} + \dots + \frac{V_n^2}{P_n}$$

When bulbs are of equal power, then

$$\frac{V^2}{P_s} = \frac{nV^2}{P}$$

$$P_s = \frac{P}{n}$$

18.2If we connect n bulbs each with a rated power P in parallel, then the total power consumed by combination at rated voltage is

- (a) Pn
- (b) Pn^2

(c) P^2/n

(d) P/n

Ans : (a) Pn

When resistors are in parallel combination, then

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}$$

or
$$\frac{P_p}{V^2} = \frac{P_1}{V^2} + \frac{P_2}{V^2} + \dots + \frac{P_n}{V^2}$$

$$P_p = P_1 + P_2 + \dots + P_n$$

or
$$P_p = nP$$

18.3The power consumed by n equal resistance in parallel is x times that of power consumed in series, if the voltage supply is same. The value of x is

- (a) n
- (b) n^2
- (c) n^3
- (d) $n^{1/2}$

Ans : (b) n^2

Power consumed in series, $P_s = \frac{V^2}{nR}$ and in parallel,

$$P_p = \frac{V^2}{(R/n)}$$

$$P_p = n^2 P_s$$

18.4If resistors 4Ω , 5Ω and 6Ω are connected in series with 5 V battery, then the total power consumed by the combination is

- (a) $\frac{5}{3} \text{ W}$
- (b) $\frac{5}{4} \text{ W}$
- (c) $\frac{9}{4} \text{ W}$
- (d) $\frac{1}{2} \text{ W}$

Ans : (a) $\frac{5}{3} \text{ W}$

Power consumed, $P = \frac{V^2}{R} = \frac{(5)^2}{4+5+6} = \frac{5}{3} \text{ W}$

19. Read the following and answer any four question from (19.1) to (19.5) : 1 × 4

A concave mirror forms image of an object thrice in its size on a screen. Magnification of a mirror gives information about the size of the image relative to the object. It is defined as the ratio of size of image to the size of object. It is represented by m .

$$m = \frac{\text{Size of image}}{\text{Size of object}}$$

Sign of magnification by mirror gives the information about the nature of the image produce by it.

19.1The nature of formed image is

- (a) Real and inverted
- (b) Virtual and erect
- (c) Virtual, and enlarged
- (d) None of these

Ans : (a) Real and inverted

19.2If the object x distance from the pole of mirror, then image distance from the pole is.

- (a) $-2x$
- (b) $-3x$
- (c) $-4x$
- (d) $-x$

Ans : (b) $-3x$

Here,

$$u = -x,$$

$$m = \frac{-v}{u}$$

or
$$-3 = \frac{-v}{-x}$$

$$v = -3x$$

19.3 If the radius of curvature of mirror is R, then the relation between object distance, image distance and focal length of the mirror is.

- (a) $\frac{1}{x} + \frac{1}{2x} = \frac{2}{R}$ (b) $\frac{1}{x} + \frac{1}{3x} = \frac{2}{R}$
 (c) $\frac{1}{x} + \frac{1}{3x} = \frac{2}{R^2}$ (d) $\frac{1}{(x)^2} + \frac{1}{(3x)} = \frac{2}{R}$

Ans : (b) $\frac{1}{x} + \frac{1}{3x} = \frac{2}{R}$

$$\frac{1}{x} + \frac{1}{3x} = \frac{2}{R} \quad [f = R/2]$$

19.4 When an object is placed at infinity then the nature of image will be.

- (a) real, inverted, highly diminished
 (b) virtual, inverted, diminished
 (c) virtual, inverted, infinitely large
 (d) real, erect and smaller

Ans : (a) real, inverted, highly diminished

19.5 An object is placed at the centre of curvature of a concave mirror. The distance between its image and the pole is

- (a) equal of f (b) between f and $2f$
 (c) equal of $2f$ (d) greater than $2f$

Ans : (d) greater than $2f$

20. Different magnetic field patterns are produced by current-carrying conductors having different shapes. 1 × 4

The magnetic field lines around a straight conductor (straight wire) carrying current are concentric circles whose centres lie on the wire. It has been shown by experiments that the magnitude of magnetic field produced by a straight current carrying wire at a given point is : (i) directly proportional to the current passing in the wire, and (ii) inversely proportional to the distance of that point from the wire.

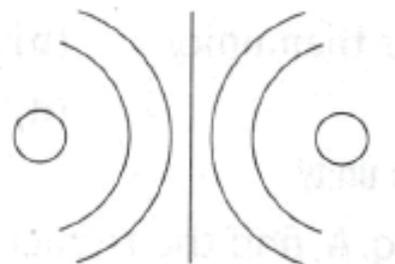
The magnetic field lines are circular near the current carrying circular loop. As we move away, the concentric circles representing magnetic field lines become bigger and bigger and at the centre the magnetic field lines are straight.

20.1 The direction of magnetic field developed around a current-carrying conductor can be easily found by the use of :

- (a) Fleming’s left-hand rule
 (b) Left-hand thumb rule
 (c) Right-hand thumb rule
 (d) Fleming’s right hand rule

Ans : (c) Right-hand thumb rule

20.2 The diagram given below represents magnetic field caused by a current-carrying conductor which is :



- (a) a solenoid (b) a long straight wire
 (c) a circular coil (d) a short straight wire

Ans : (c) a circular coil

20.3 The strength of magnetic field due to a straight conductor depends on the :

- (a) nature of conductor
 (b) current passing through the wire
 (c) direction of current
 (d) all of above

Ans : (b) current passing through the wire

20.4 Which of the following correctly describes the magnetic field near a long straight wire?

- (a) The field consists of straight lines perpendicular to the wire
 (b) The field consists of straight lines parallel to the wire
 (c) The field consists of radial lines originating from the wire
 (d) The field consists of concentric circles centred on the wire

Ans : (d) The field consists of concentric circles centred on the wire

20.5 The strength of magnetic field inside a long current carrying straight solenoid is :

- (a) same at all points
 (b) minimum in the middle
 (c) found to increase from one end to the other
 (d) more at the ends than at the centre.

Ans : (a) same at all points

Section B

21. What are enzyme? Do they play some role in our digestive system too? [2]

Ans :

They are chemically proteinaceous biocatalyst, which increase or decrease the rate of a biochemical reaction.

The enzyme present in our digestive system help to breakdown of complex molecules of food into simpler ones.

or

What is the role of large intestine?

Ans :

Water re-absorption occurs through villi, undigested food is stored in rectum and thrown out through anus. Exit is regulated by anal sphincter.

22. What is meant by hydro-tropism? Give an example.

[2]

Ans :

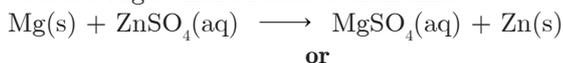
The response of a plant towards water is called hydro-tropism. The roots of plants show positive hydro-tropism.

23. Which of the following listed metals can displace zinc from its salt solution? Give reason for your answer with a chemical equation: [2]

Copper, Lead, Magnesium, Silver

Ans :

Magnesium can displace zinc from zinc salt solution because Mg is more reactive than zinc:



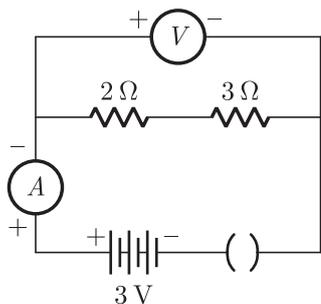
The reaction of metal X with Fe_2O_3 is highly exothermic and is used to join railway tracks. Identify metal X. Write the chemical equation for the reaction.

Ans :

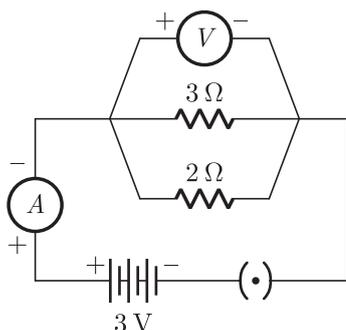
X is Al.



24. Find the voltmeter readings for the circuits I and II shown. [2]



(I)



(II)

Ans :

Only circuit II, with a dot within the symbol of the plug key, is a closed circuit in which current is flowing and will show non-zero voltage. The voltmeter reading, for the set up shown, in II would be (nearly) equal to the voltage of the battery (i.e. 3 V).

25. Give reasons for the following : [2]

- i. Non-metals, in general, do not displace hydrogen from dilute acids.
- ii. Aluminium easily combines with oxygen but still it can be used for making kitchen utensils.

Ans :

- i. Elements those are more reactive than hydrogen can displace it from dilute acids. Non-metals are less reactive than hydrogen and hence cannot displace it from dilute acids.
- ii. Aluminium on reaction with oxygen forms a layer of aluminium oxide which prevents its further corrosion and hence it can be used for making utensils.

26. List in a tabular form two differences between a voltmeter and an ammeter. [2]

Ans :

	Voltmeter	Ammeter
1.	It is used to measure potential difference across two points in an electric circuit.	It is used to measure electric current in an electric circuit.
2.	Its resistance is very high.	Its resistance is very low.
3.	An voltmeter is connected in parallel in an electric circuit.	An ammeter is connected in series in an electric circuit.

Section C

- 27.** i. Name the plant used by Mendel to carry out his experiments. [3]
 ii. Study the following cross and answer the questions that follow :

Parents	Green and Round seed	×	Yellow and Wrinkled seed
F_1 Generation			All Green and Round seeds

F_2 Generation	Green and Round (9)	Green and Wrinkled (3)
	Yellow and Round (3)	Yellow and Wrinkle

- (a) List the dominant and recessive characters.
- (b) Are the characters linked or independent?

Ans :

- i. Garden Pea (*Pisum sativum*)
- ii.
 - (a) Dominant characters are green colour and round shape.
 Recessive characters are yellow colour and wrinkled shape.
 - (b) These characters are independent.

or

- i. Differentiate between sensory neurons and motor neurons.
- ii. How is brain protected in our body?
- iii. Name the part of the brain responsible for precision of voluntary actions and maintaining body posture and balance of the body.

Ans :

- i. Sensory neurons bring the impulses received by the sense organs to the brain and the spinal cord.

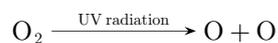
The motor neurons carry the message from the brain and the spinal cord to the affected muscles or the glands.

- ii. Brain is protected by the cranial bones and meninges.
 - iii. Cerebellum is responsible for precision of voluntary actions, maintaining body posture and balance of the body.
28. The ozone layer is formed high up in the atmosphere by the action of ultraviolet radiation on oxygen gas. The damage of the ozone layer leads to variation in rainfall, ecological disturbances and other effects in global food supply. United Nations Environment programme (UNEP) has signed an agreement to limit this damage in 1986. [3]

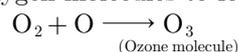
- i. Where is ozone layer found in the atmosphere?
- ii. How is ozone layer formed in the atmosphere?
- iii. How can you contribute in saving the ozone layer?

Ans :

- i. The ozone layer is found in the stratosphere.
- ii. The ultraviolet radiation coming from the sun splits oxygen gas into free oxygen atoms.



These very reactive oxygen atoms react with oxygen molecules to form ozone molecules.



- iii. Use of synthetic chemicals such as chlorofluorocarbons (CFCs) used as refrigerants and in fire extinguishers, methane (CH_4) and oxides of nitrogen (N_2O) should be minimised for saving the ozone layer. By organising an awareness camp we can make people aware about the ill effects of destruction of ozone layer.
29. Write equations to show the presence of all ions in the aqueous solutions of : [3]

- i. CH_3COOH
- ii. H_3PO_4
- iii. HI

Ans :

- i. $\text{CH}_3\text{COOH} + \text{H}_2\text{O} \rightleftharpoons \text{CH}_3\text{COO}^-(\text{aq}) + \text{H}_3\text{O}^+$
- ii. $\text{H}_3\text{PO}_4 + 3\text{H}_2\text{O} \rightleftharpoons 3\text{H}_3\text{O}^+ + \text{PO}_4^{3-}(\text{aq})$
- iii. $\text{HI} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{I}^-(\text{aq})$

30. Mention the components of the transport system in highly organised plants. State the functions of these components. [3]

Ans :

Transport system in highly organised plants consists of xylem and phloem.

- i. **Xylem**—Xylem moves water and minerals obtained from the soil. It consists of tracheids, vessels, xylem fibres and xylem parenchyma.
- ii. **Phloem**—Phloem transports products of photosynthesis from the leaves to other plant parts. It consists of sieve tubes, companion cells, phloem fibres and phloem parenchyma.

31. (i) Name all the digestive enzymes present in our

digestive system.

- (ii) Explain the process of digestion of carbohydrates, fats and proteins. [3]

Ans :

- i. The digestive enzymes present in our digestive system are:

Salivary amylase, pepsin, trypsin, lipase, pancreatic amylase and lipase.

- ii. **Carbohydrates** : It is acted upon by salivary amylase in mouth, which converts complex insoluble starch into simple sugar form. The food with carbohydrate which is not digested in mouth, then it is digested by amylase from the pancreas to form glucose.

Fats : Bile from liver breaks the big globules of fats into smaller ones and is acted upon by lipase from pancreas, which digest fats into fatty acids.

Proteins : Proteins are first digested by pepsin in stomach to form peptones. This is further digested by trypsin from pancreas to form amino acids.

The enzymes present in small intestine finally convert protein to amino acids, complex carbohydrates into glucose and fats into fatty acids and glycerol.

32. Why does the sun appear reddish early in the morning? Will this phenomenon be observed by an observer on the moon? Justify your answer with a reason. [3]

Ans :

Early in the morning, the sun is near the horizon, sunlight reaches us after covering a longer distance through thick layers of atmosphere. So the most of the blue light and other light of shorter wavelengths are scattered away by the particles in the atmosphere. The light that reaches us is of longer wavelengths such as red light thus giving a reddish appearance.

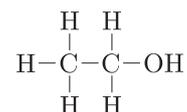
This phenomenon will not be observed by an observer on the moon because of the absence of atmosphere on the moon.

33. What is ethanol? Draw the structure of ethanol molecule. How does ethanol behave with the following:

- i. Sodium
 - ii. Excess of con. sulphuric acid at 443 K ?
- Write chemical equation for each reaction. [3]

Ans :

Ethanol is the second member of the homologous series of alcohols.



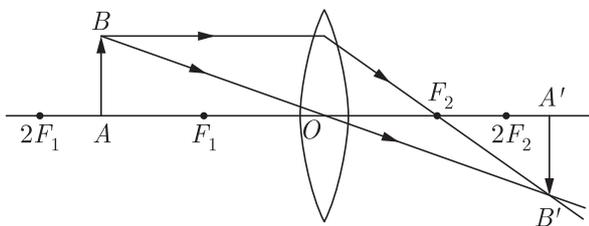
- i. Ethanol reacts with sodium to liberate hydrogen gas.



- ii. Concentrated hydrochloric acid dehydrates ethanol to ethene.



Section D



Here, $u = -20\text{ cm}$
 $f = +10\text{ cm}$;
 $v = ?$

Using the lens formula, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$; or $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

$$\frac{1}{v} = \frac{1}{(+10\text{ cm})} + \frac{1}{(-20\text{ cm})}$$

$$\frac{1}{v} = \frac{1}{10\text{ cm}} - \frac{1}{20\text{ cm}}$$

$$= \frac{2-1}{20\text{ cm}} = \frac{+1}{20\text{ cm}}$$

$v = +20\text{ cm}$

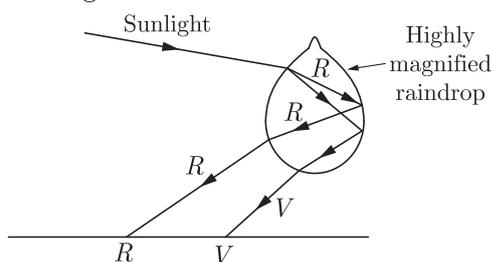
Thus, the image is formed on the other side of the lens at a distance of 20 cm from its optical centre.

or

- What is meant by dispersion of light?
- Describe the formation of rainbow in the sky.
- With the help of a labelled diagram, explain why the sun appears reddish at the sunrise and the sunset.

Ans :

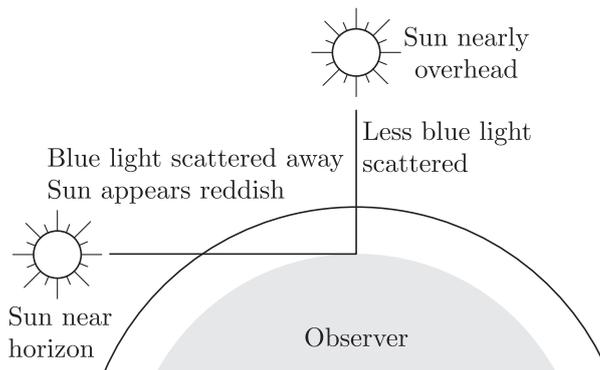
- Dispersion of light :** The phenomenon due to which a white light splits into its component colours, when passed through a prism. White light is combination of seven different colours of light having different wavelengths. More is the wavelength of light, less is the angle of deviation for the same material and same angle of incidence. This is caused of dispersion of white light.



- The rainbow is produced due to the dispersion of sunlight by tiny droplets of water suspended in air, just after rain.

From the figure when the sunlight is incident on the side A of the droplet of water, it gets refracted as well dispersed. The dispersed rays on striking the surface B of tiny droplets, suffer total internal reflection and moves towards surface A, the rays further suffer refraction and emerge out as the band of colours in the form of a circular arc (rainbow) along the horizon. The

- red colour appears upper arc and violet colour on the innermost arc of the rainbow
- Light from the sun near the horizon passes through thicker layers of air and a longer distance through the earth's atmosphere before reaching our eyes.



Near the horizon most of the blue light and shorter wavelengths of sunlight are scattered away by the particles. Light of longer wavelength reaches us, thus giving the reddish appearance of the sun.

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