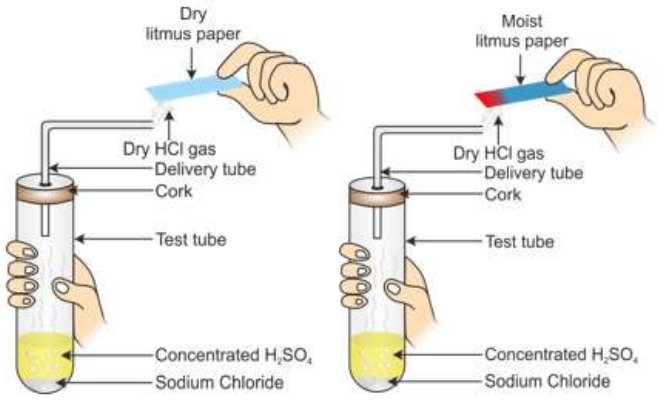
CBSE
Class X Science
Sample Paper – 5 (Reference Solutions)
2024-25

SECTION - A

1. Correct option – b : Carbon dioxide
Carbon dioxide turns lime water milky.

2. Correct option- d: (i) and (iv)
When an acid (e.g. hydrochloric acid) reacts with a base (e.g. sodium hydroxide), neutralization reaction occurs to form salt and water as follows along with release of heat.
$HCl + NaOH \rightarrow NaCl + H_2O$ + heat

3. Correct option – b: only (ii)



Moist blue litmus paper turns red as ionization of HCl into H^+ and Cl^- ions takes place in the aqueous medium that makes the moist litmus paper acidic due to the presence of H^+ ions.

4. Correct option –c: Photolytic decomposition reactions
Photolytic decomposition reaction is the chemical reaction which proceeds with absorption of light. For example: photolytic decomposition of silver chloride in the presence of sunlight.

5. Correct option- a: A

	Zn	Na_2CO_3
HCl	√	√
NaOH	√	×

Since zinc is more reactive than hydrogen and can displace it from HCl, sodium carbonate also reacts with HCl and gives a salt; NaCl. Zinc reacts with NaOH, but sodium carbonate does not react with NaOH since both are bases.

6. Correct option- d: II and IV
Since zinc is more reactive than copper and iron so it displaces copper and iron from their solution to form zinc sulphate and deposition of the free metal on the rod.

7. Correct answer – b: Acetic acid.
Alkaline $KMnO_4$ oxidises ethanol to ethanol gets to ethanoic acid or acetic acid.

8. Correct option b. Dark reaction
1 - Granum, 2 - Stroma, 3 - Thylakoids.
Dark reactions of photosynthesis take place in the stroma of chloroplast.

9. Correct option c. Part 4
1 - Cuticle, 2 - Upper Epidermis, 3 - Palisade tissue/chloroplast, 4 - Xylem,
5 - Stomata
Xylem helps in the conduction of water and minerals in plants.

10. Correct option – a: 17
In a monohybrid cross, the phenotypic ratio of the F_2 generation is 3 (tall) : 1 (dwarf).
Hence, ¼ of the plants would be dwarf. Hence, out of 68 plants, 17 would be dwarf.

11. Correct option – a : A
A – Stigma, B – Style, C – Ovary, D – Petal.
The top of the pistil is called the stigma, which is a sticky surface receptive to pollen.

12. Correct option – b: Receptor → Sensory Neuron → Relay Neuron → Motor Neuron → Effector.
In a reflex arc, the stimulus is picked up by a receptor which conducts the information to sensory neuron. In the spinal cord, the stimulus is passed to the relay neuron which in turn passes the signal to motor neuron. This motor neuron conducts the information to the effector organ which shows the response.

13. Correct answer – b: doubled
According to Ohm's law we know that, if the resistance is halved, then the current gets doubled.

14. Correct answer – a: Statement 1 is true, statement 2 is true but, Statement 2 is correct explanation for statement 1.
As we know according to the Oersted experiment any current-carrying conductor will have a magnetic field around itself and as a result, the magnetic needle deflects when placed near such coil. And if we increase the magnitude of current the magnitude of magnetic needles deflection also increases, as a result, if we change the polarity of current through the conductor the direction of deflection also changes.

15. Correct answer – b: Decomposers
Microorganisms such as bacteria and fungi break down the dead remains and waste products of organisms. These microorganisms are called decomposers as they break down complex organic substances into simple inorganic substances.

16. Correct answer – b: Refrigeration equipment
The synthetic chemicals responsible for ozone layer destruction are chlorofluorocarbons. These can be found in everyday products such as air conditioners, refrigerators, and aerosol cans.

17. Both A and R are true, and R is the correct explanation of A.
The aqueous solutions of glucose and alcohol do not show acidic character because aqueous solutions of glucose and alcohol do not give H^+ ions.

18. A is false but R is true.
The method of spore formation occurs in both unicellular and multicellular organisms. So, the assertion is false.
Rhizopus and *Mucor* are multicellular fungi which reproduce by spore formation method. So, the reason statement is true.

19. A is false but R is true.
A food chain can have a maximum of five to six trophic levels because a lot of energy is lost as heat at each trophic level on account of metabolism. So, only a small amount of energy becomes available to the next trophic level. This limits the number of trophic levels in a food chain. So, the assertion is false, but the reason statement is true.

20. Both A and R are true, and R is the correct explanation of A.
As we know when the circuit is closed (Switch is ON), the electric field is established instantly which causes drift at every portion of circuit. This sets up the electric current in the entire circuit instantly. Thus, at the moment when switch is ON electric bulb glows.

SECTION - B

21. This set up is of "Electrolysis of Brine".
At cathode: x = H_2 gas
Near cathode: z = NaOH solution
At anode: y = Cl_2 gas
The chemical reaction is as follows:
$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g) + Cl_2(g)$

22. Variation is beneficial to the species but not necessarily for the individual because it allows a species to adapt to the changing environment. Variations at the individual level will not help in evolving, but would result in ageing, so variation from any source in an individual can be harmful. Some variations found in a few individuals of a population would lead to some chance for them to survive, rest will be wiped out. At species level, these variations bring about differences in generations which leads to evolution.

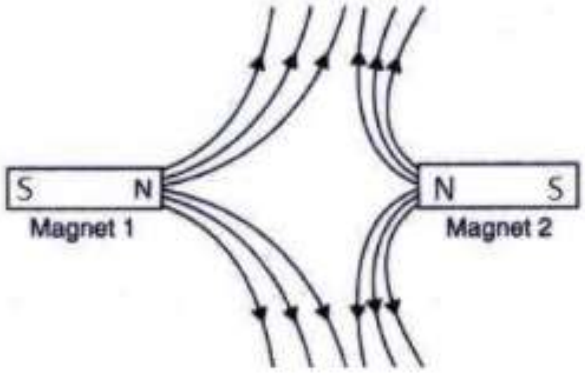
23. Acid is formed in the mouth after sugary food (chocolates and sweets) has been consumed. This acid lowers the pH in the mouth. Tooth decay starts when the pH of acid formed in the mouth falls below 5.5. This is because the acid becomes strong enough to attack the enamel of our teeth and corrode it.

OR

If the distances between soil-contacting organs and chlorophyll-containing organs are small, energy and raw materials can easily diffuse to all parts of the plant body. But if these distances become large because of changes in the plant body design, diffusion processes will not be sufficient to provide raw material in leaves and energy in roots. Diffusion is a very slow process. It would take years to supply the water from roots to leaves (upward). Hence, a proper system of transportation is essential in such situations.

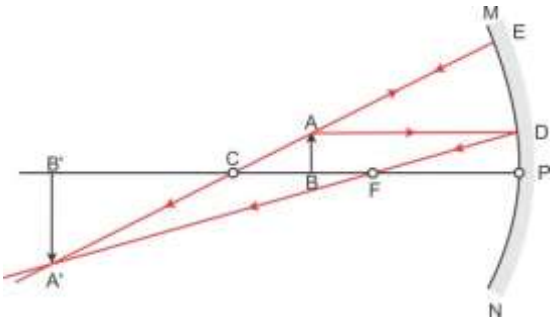
24.

i)



ii) Magnet 2 is weaker because its field lines are smaller than that of the magnet.

25.



Now for the given case as we can see, when an object is placed between centre of curvature and focus the image formed will be beyond the centre of curvature and its nature will be enlarged, real and inverted.

OR

Focal length of lens needed to correct distant vision will be

Distant vision $f = \frac{1}{P} = -\frac{1}{0.5} = -2\ m.$

Here negative sign shows that the lens needed for correction is concave lens.

Focal length of lens needed to correct Near vision will be

Near vision $f = \frac{1}{P} = \frac{1}{1.5} = 0.67\ m.$

26. In the given food web, water fleas feed on insect larvae and are in turn fed upon by water beetles. So, if water fleas get eliminated, then the population of insect larvae will increase and that of water beetles will decrease. As small fish are dependent on water beetles for food, a decrease in the population of water fleas will cause a decrease in their population as well. The population of frogs remains unaffected as frogs also depend on insect larvae for food.

SECTION - C

27. Type A reaction is exothermic reaction. Carbon burns in oxygen to form carbon dioxide and heat energy is produced.

Chemical reactions which proceed with the evolution of heat energy are called exothermic reactions.

Example of exothermic reaction is, when water is added to quick lime (calcium oxide), slaked lime (calcium hydroxide) is produced with a lot of heat energy.

$CaO + H_2O \rightarrow Ca(OH)_2$ + Heat

Type B is an endothermic reaction.

Chemical reactions which proceed with the absorption of heat energy are called endothermic reactions.

28.

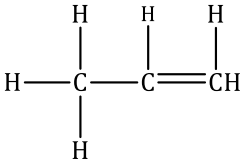
(a) Reddish brown deposit of copper will be formed since displacement has taken place.

(b) E>B>A>C>D. This is because, if more the metal reacts, then more reactive it is. After counting number of displacements, a metal will give, E is the most reactive and D is least reactive.

(c) Container of metal D can be used for this purpose as it does not react with any of them.

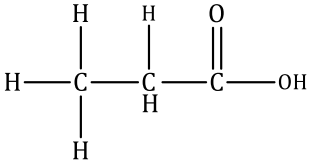
OR

(a) Hydrocarbon containing 3 carbon atoms and functional group 'alkene' is propene or prop-1-ene.



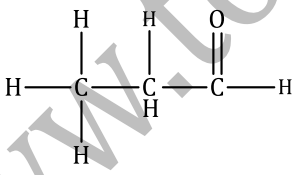
prop-1-ene

(b) Hydrocarbon containing 3 carbon atoms and functional group 'carboxylic acid' is propanoic acid.



propanoic acid

(c) Hydrocarbon containing 3 carbon atoms and 'aldehyde' group is propanal.



propanal

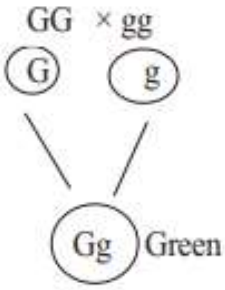
29.

(a) Riddhi's action was voluntary because the action of rushing out of the room was under her conscious control. The smoke and smell were perceived by her sensory receptors and signals were sent to the brain. The brain then signaled the effector organ , i.e., the legs to move out of the room.

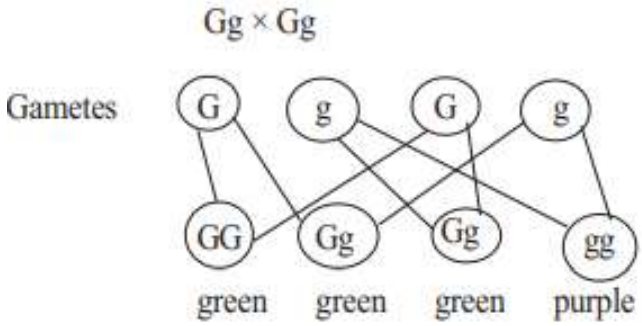
(b) In case of a spinal cord injury, signals coming from the nerves as well as the signals coming to the receptors will be disrupted. Both these signals meet in a bundle in the spinal cord. Hence, both these signals get disrupted.

30.

(a) Parental phenotype: green stem and purple stem
Parental genotype: GG × gg
F_1 progeny would be green-stemmed tomato plants.



(b) F_1 plants are self-pollinated
Gg × Gg



Percentage of purple-stemmed plants (gg) = 25%

(c) F_2 progeny ratio of GG and Gg = 1:2

31.

a)

The resisitors are connected in parallel and so the current through each resistor is different.

Current through 5Ω resistor is $I_1 = \frac{6}{5} = 1.2$ A

Current through 10Ω resistor is $I_1 = \frac{6}{10} = 0.6$ A

Current through 30Ω resistor is $I_1 = \frac{6}{30} = 0.2$ A

b) Total current in the circuit, I = I1 + I2 + I3 = 1.2 + 0.6 + 0.2 = 2 A

c)

Total effective reisitance of the circuit is

$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{5} + \frac{1}{10} + \frac{1}{30}$$

$$\rightarrow \frac{1}{R_P} = \frac{10}{30}$$

$$\rightarrow R_P = 3\Omega$$

32.

(a) Spectacles having bifocal lens

(b) $u = \infty$

$v = -50$ cm

Using lens formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{-50} - \frac{1}{\infty}$$

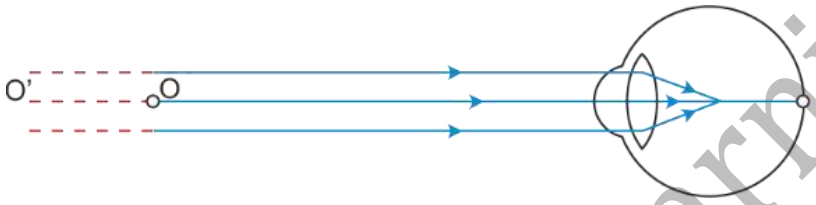
$f = -50$ cm

Power of lens, $P = \frac{1}{f} = \frac{100}{-50} = -2D$

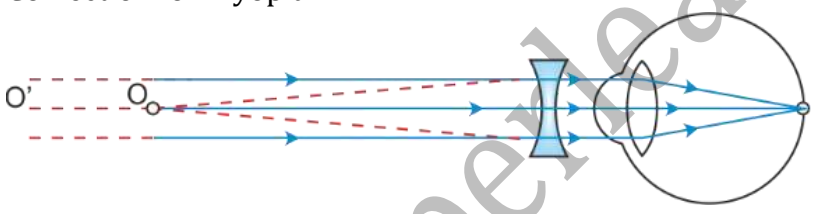
Nature of lens – concave

(c)

A Myopic eye:



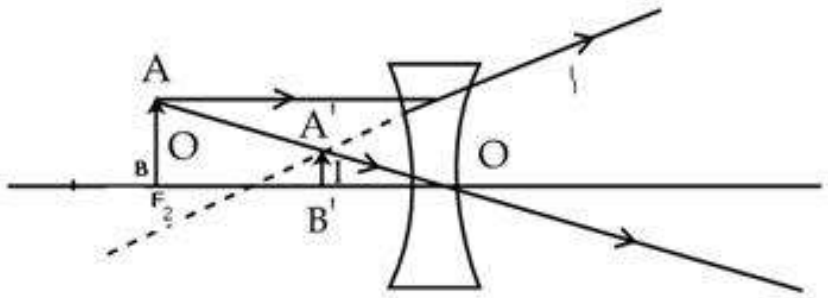
Correction for myopia:



33.

(a) We must use concave lens since the image is virtual, erect, diminished.

(b)

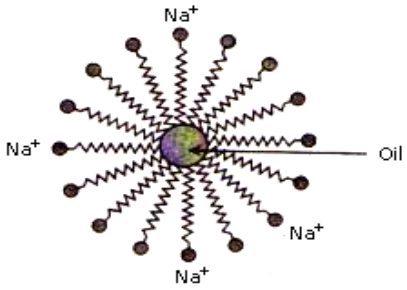


(c) The nature of image formed by the convex mirror is virtual, erect and diminished irrespective of the position of the object.

SECTION – D

34.

(a) Cleansing action of soap:



Formation of Micelles

- Soap on mixing with water forms a concentrated solution and causes foaming.
- The long non-polar end of soap gravitates towards and surrounds the dirt and absorbs the dust in it.
- The short polar end with the carboxylate ion repels the water away from the dirt.
- A spherical aggregate of soap molecules is formed in the soap solution in water and is called a micelle.
- Thus, the soap molecule dissolves the dirt, and our clothes get clean.

(b) Copper sulphate crystals ($CuSO_4.5H_2O$) are blue, and on heating strongly, they become white in colour.

Copper sulphate crystals lose all the water of crystallisation which show up as water droplets. This experiment is about water of crystallization.

$$CuSO_4.5H_2O \xrightarrow{Heat} CuSO_4 + 5H_2O$$

Blue White

On addition of 2-3 drops of water to anhydrous copper sulphate, it gets hydrated and again turn back blue.

OR

(b) On complete combustion of hydrocarbons, the products obtained are CO_2, water vapour and large amount of heat and light.

It is a colourless, odourless gas which turns most blue litmus faintly red.

When carbon dioxide is bubbled through lime water, a solid precipitate of calcium carbonate is formed, making the lime water milky.

$Ca(OH)_{2(aq)} + CO_{2(g)} \rightarrow CaCO_{3(s)} + H_2O_{(l)}$

The gas is collected by the downward displacement of water.

(a)

Sr. No.	Covalent Compounds	Ionic Compounds
1	Covalent compounds are formed by sharing of electrons.	Ionic compounds are formed by exchange of electrons or donating or accepting electrons.
2	They are bad conductors of heat and electricity.	They are good conductors of heat and electricity.

35.

(a) The pieces of potato that bear nodes, can only give rise to new plants by producing shoots and roots. But the pieces which do not bear nodes cannot produce new plants. Thus, from a whole potato only some pieces that bear nodes give rise to roots and shoots. This is an example of vegetative propagation which is an asexual mode of reproduction in plants.

(b) Asexual reproduction does not involve the fusion of gametes and new individuals arise from a single parent. For example, budding, fusion and fragmentation are different methods of asexual reproduction. Parthenogenesis is a process of development of an organism from an unfertilised egg. For example, honey, bees, aphids etc. develop by parthenogenesis.

(c) When a cell reproduces, DNA replication occurs which forms two similar copies of DNA.

OR

(a)

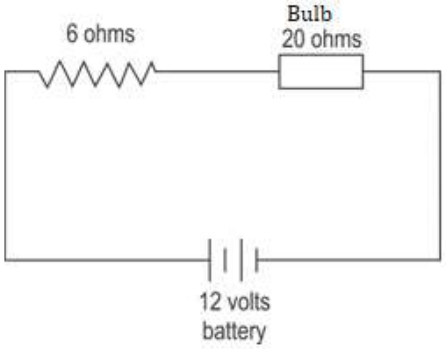
(i) The brain and the spinal cord lie in the skull and the vertebral column respectively. They have an important role to play because all bodily activities are controlled by them. A stimulus from any part of the body is always carried to the brain or spinal cord for the correct response. A response to a stimulus is also generated in the central nervous system. Therefore, the brain and the spinal cord are called the central nervous system.

(ii) Neurotransmitters are broken down by an enzyme just after passing an impulse from one neuron to the other to make the synapse ready for the transmission of the next impulse.

(b) Plants respond to light by showing growth movement towards light (phototropism). This growth movement of the plant part (stem) is caused by the action of auxin hormone. The auxin hormone is synthesised in the meristematic tissue at the tip of the stem. Auxin diffuses uniformly down the stem in plants that are kept in the open and receive sunlight from above. Due to the presence of auxin equally on both the sides, the stem grows up straight because both the sides of the stem show growth at the same place. But when sunlight is unidirectional, auxin gets accumulated towards the shady region of the shoot. This causes the cells to elongate and stem to bend towards light.

36.

a)



(b) Total resistance of the circuit is Rt= 6 + 20 = 26Ω

(c)

$$\text{Current I} = \frac{\text{Voltage}}{\text{Resistance}}$$

$$= \frac{V}{R_t}$$

$$= \frac{12}{26} = 0.46\ A$$

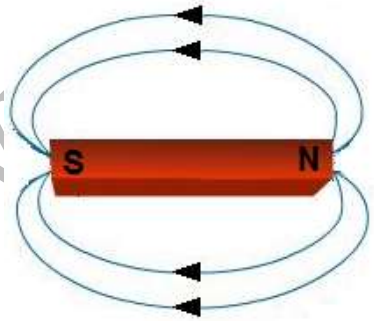
In series, current flowing through resistances is same.
Therefore, potential difference across resistance wire
$V_r = 0.46 \times 6 = 2.76$ V

(d) Potential difference across bulb would be
$V_b = I R_b$
$\therefore V_b = 0.46 \times 20 = 9.2$ V

OR

i) The space around a magnet in which the force of attraction and repulsion due to the magnet can be detected is called the magnetic field.

ii) Magnetic field lines around a magnet:



iii) Properties of magnetic field lines: (any 2)

(i) Field lines originate from the North Pole and end at the South Pole.

(ii) Magnetic field lines come closer to one another near the poles of a magnet, but they are widely separated at other places.

(iii) Field lines do not intersect each other.

SECTION - E

37.

(a)

(i) R needs to be kept in kerosene as it reacts violently with water. Example: Sodium metal.

(ii) Metal Q and example of metal which can be represented by Q is magnesium since Mg starts floating due to the bubbles of hydrogen gas sticking to its surface. As the Bubbles move up it pulls Mg with it.

(b) The increasing order of reactivity series is: S < P < Q < R, as according to reactivity series: R > Q > P > S

P= Al, Q=Mg, R=Na or K, S=Cu/Ag/Au/Pt

The metal which can form amphoteric oxide is P. Al forms Al_2O_3. Al is amphoteric in nature since it reacts with both acid and base. Hence, P=Al (Aluminium).

OR

(c) Anisha would have felt the heat at end B.

This is because iron is a good conductor of heat.

Uses of iron based on this property:

A. Iron is used to make cooking utensils.

B. In iron machine or *Istri* to press clothes.

38.

(a) The F_1 offspring are round seeds (phenotype) with a genotype as Rr.

(b) F_1 generation: Rr (round) and Rr (round)

Gametes: R, r, R, r

F_2 generation: Rr × Rr

	R	r
R	RR (Round seeds)	Rr (Round seeds)
r	Rr (Round seeds)	rr (Wrinkled seeds)

(c) The above cross involves law of dominance.

Law of Dominance - Out of a pair of contrasting characters present together, only one can express itself while the other remains suppressed. The one that expresses is the dominant character and the one unexpressed is the recessive. The recessive character can be expressed only when the pair consists of both recessives (homozygous recessive).

OR

Mendel used pea plants for his experiments.

- Common name – Garden pea
- Scientific name – *Pisum sativum*

<u>Mendel selected pea plant for his hybridisation studies because:</u>

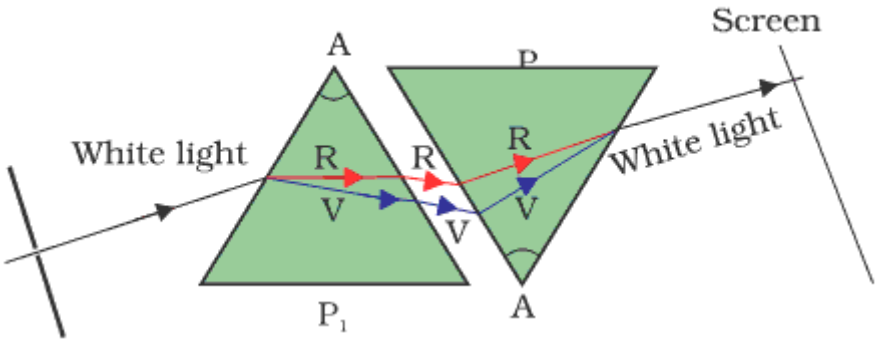
(i) Many varieties were available in alternative forms of a character.

(ii) The life span of a pea plant is short, and many generations can be obtained and studied in less time.

39.

(a) The color sequence is Violet, Indigo, Blue, Green, Yellow, Orange, and Red i.e., VIBGYOR.

(b) When the second identical prism is placed in an inverted position with respect to the first prism recombination of the spectrum of white light takes place.



(c) The phenomenon of splitting light into its component colours is called dispersion of light. When white light passes through a glass prism, it spreads out into a band of different colours called the spectrum of light. The colours in the spectrum of white light are violet, indigo, blue, green, yellow, orange and red. Formation of a rainbow is an example of dispersion of light in nature. In this case, raindrops act as a glass prism, and you get dispersion of sunlight. Dispersion takes place because the refractive index of material such as glass or water, is different for different colours. It is maximum for violet colour and minimum for red colour. Hence through prism violet light is deviated the most and red light is deviated the least. The other colours lie in between.

OR

(d) Select a white colored wall on which the sun rays fall. Stand in front of a wall such a way that the sun rays fall on your back. Hold a tube through which water is flowing. Place your finger in the tube to obstruct the flow of water. Water comes out through the small gaps between the tube and your finger like a fountain. While you are showering the water, you can see the colours of rainbow on the wall. The beautiful colours of rainbow are due to dispersion of the sunlight by millions of tiny water droplets.