

**Mizoram Board
Class X Science
Sample Paper 2 – Solution**

1. (i) When the light goes from one medium to another, the velocity and the wavelength (colour) of light do change, only the frequency of the light does not change.
2. (i) When white light falls on a glass prism, each colour in it is refracted by a different angle, from which red colour is least deviated and violet most.
3. (i) In short circuit, the resistance becomes almost negligible
4. (ii) Magnetic lines of force always originate from the North Pole and end at its South Pole.
5. (i) Bio-gas contains up to 75% methane.
6. (i) The electronic configuration of group 16 elements is 2, 8, 6. They need 2 electrons to complete their octet state so their valency is 2
7. (iv) Covalent bonds are formed by sharing of electrons between atoms and both atoms achieve a stable electronic configuration. Rests are compounds having ionic bonding.
8. (i) Anodising is a process of forming a thick oxide layer of aluminum. This aluminium oxide coat makes it resistant to further corrosion
9. (iii) CH_3COOH is a weak acid because it ionises only partially in aqueous solution and produce ions as well as molecules.
10. (ii) Breakdown of pyruvate into carbon dioxide and water requires oxygen and takes place within the mitochondria.
11. (iii) Adrenaline reduces blood supply to the digestive system by causing contraction of muscles around small arteries in these organs.
12. (ii) Mango can reproduce by grafting in which two closely related varieties can join together so as to give the desired characteristics.
13. (i) *Homo habilis* found in East African grasslands were slightly different in structures of earlier found structures. They are more or less like the humans and thus given the name *Homo habilis*.

14. (iii) The wildlife and nature enthusiasts do not depend on the forests but conserve nature in its pristine form.
15. Translocation is the movement of soluble materials such as minerals, proteins, hormones and sugars within the plant.
16. Water harvesting refers to all the processes and steps that are taken for scientific conservation of fresh water.
17. Food is transported in the plants in the form of sucrose.
18. Aqua regia is the freshly prepared mixture of concentrated hydrochloric acid and concentrated nitric acid in the ratio 3:1. It can even dissolve metals like gold and platinum.
19. Acids present in pickles or curd will react with metals like copper or zinc and produce poisonous salts harmful for health.
20. Resistivity depends on the nature of the substance and temperature. It does not depend on the dimensions, so resistivity of both is same. However the resistance of the thin wire will be more than that of the thick wire.
21. The sky looks dark to astronomers because there is no atmosphere. From earth, the sky looks blue due to scattering of light by the particles of atmosphere.

22.

Resistivity of silver, $\rho = 1.6 \times 10^{-6} \Omega\text{m}$

Length of wire, $l = 10 \text{ m}$

Cross-sectional area, $A = 2 \times 10^{-3} \text{ m}^2$

Resistance is

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

$$\therefore R = \frac{1.6 \times 10^{-6} \times 10}{(2 \times 10^{-3})^2} = 4 \Omega$$

23.

(i) X: Copper (Cu)

Y: Copper oxide (CuO)

(ii) First: Oxidation of X; Second: Reduction of Y

Or

Copper sulphate is the oxidizing agent as it gives oxygen to zinc and zinc is reducing agent as it accepts oxygen

- 24.** Decomposers break complex organic substances into simple organic substances which go into the soil and are again taken up by plants by microorganisms. In this way, decomposers facilitate recycling of matter to maintain balance in the ecosystem.
- 25.** Salts of strong acids and bases are neutral with pH value of 7. Salts of a strong acid and weak base are acidic with pH value less than 7 and those of strong base and weak acid are basic in nature, with pH value more than 7.
- 26.** The principle behind working of electric motor is that any current carrying coil experiences a rotational force or torque in a magnetic field. The direction of rotation depends on flow of current and the magnetic field.
- 27.** It bears adventitious buds in the notches along the leaf margin. When the buds fall on the soil they develop into new plant under favourable conditions.
- 28.** The refractive index of second medium with respect to first medium is defined as the ratio of the sine of angle of incidence in the first medium to the sine of the angle of refraction in the second medium.
Refractive index of a medium is always greater than 1 (it cannot be less than 1) because the speed of light in any medium is always less than that in vacuum.
- 29.** Natural resources are misused by people for their own selfish goals and motives. For example, these goals can be in the form of requirement of land that causes irrational cutting of trees or need of raw material which results in destruction of biodiversity to get only specific products.
- 30.** A reflex action is an involuntary, automatic and nearly instantaneous response to a stimulus.
Steps involved in reflex action:
- The sense organ (skin) is stimulated with a prick, and the stimulus is received by skin receptor cells.
 - Sensory nerves send this impulse to the spinal cord.
 - An association neuron transmits this impulse to the motor neuron.
 - The motor neuron relays the impulse to the muscles of the effector organ (hand).

- 31.** Natural selection is the process whereby organisms better adapted to their environment tend to survive and produce more offspring, whereas other less favourable traits tend to become eliminated. Continuous competition between individuals for environmental resources creates a 'struggle for existence and this struggle makes sure that certain organisms fail to survive or reproduce'.

Examples include

- i. Galapagos finches all have different types of beaks. During drought, the finches with the larger beaks survived better than those with the smaller beaks. During rainy times, more small seeds were produced and the finches with smaller beaks fared better.
- ii. A habitat has red bugs and green bugs. Birds prefer the taste of red bugs, so soon there are many green bugs and few red bugs. Green bugs reproduce and make more green bugs and eventually there are no more red bugs.
- iii. In one ecosystem, lizards which had long legs could climb better to avoid floods and reach the food.

Or

Biodegradable substances: Substances which can be broken down by microorganisms such as bacteria and fungi are called biodegradable substances. Examples: Paper, vegetable and fruit peels, human excreta

Non-biodegradable substances: Substances which cannot be broken down by microorganisms into simpler and harmless substances are called non-biodegradable substance. Examples: Polythene bags, aluminium cans and DDT

Effects of biodegradable substances:

- They produce a foul smell causing air pollution. If thrown in water, they cause water pollution.
- They serve as a breeding ground for flies and mosquitoes which are carriers of malaria.

Effects of non-biodegradable substances:

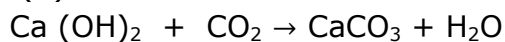
- Non-biodegradable pesticides and fertilisers run off with rainwater into water bodies and cause water pollution and affect the soil making it acidic or alkaline.
- Some non-biodegradable pesticides enter the food chain and badly affect humans and other organisms.

32. Steps to discourage the use of alcohol:

- (a) By not getting attracted towards this habit, by stopping my friends as well and asking them to keep it in control if they do consume alcohol
- (b) By making posters, banners and writing articles on this issue
- (c) By sensitising people about the harmful effects of liquor consumption

33. $\text{CaCO}_3 + \text{dil. H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + \text{H}_2\text{O} + \text{CO}_2$

(A) (B)



(Lime water) (A)

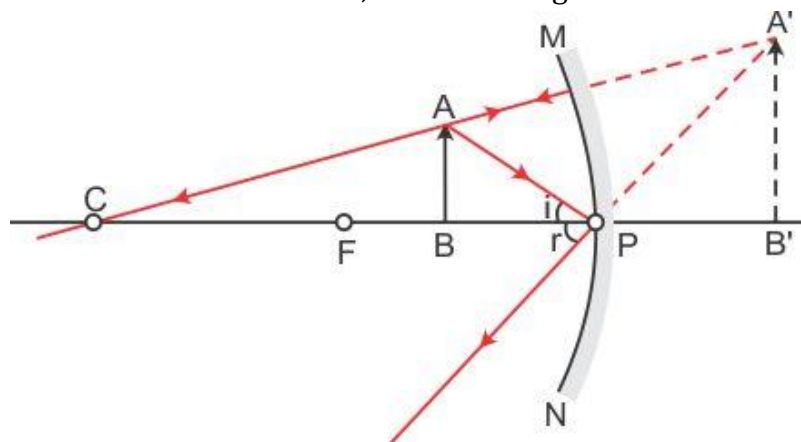
A: CaCO_3 (Limestone)

B: CO_2 (g)

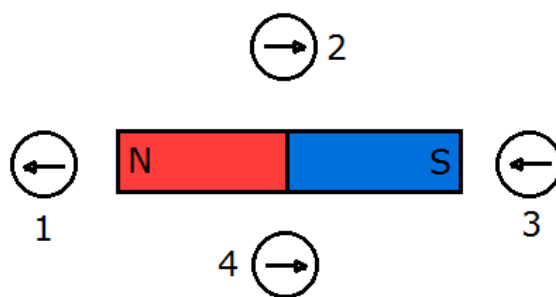
34. Focal length of the concave mirror f is -12 cm.

The student wants to obtain an erect image. A concave mirror produces an erect image when the object is between the pole and the focus. Hence, the range of the object distance should be $0-12$ cm from the mirror.

The image so formed would be virtual, erect and magnified.



35. Directions shown by the four needles would be



For a bar magnet, the field lines emanate from the North Pole and end at the South Pole. Hence, the field lines are directed towards the right for compasses 2 and 4 and towards the left for compass 3.

- 36.** Solar cooker with concave mirror reflector is more efficient. Because concave mirror can focus the heat radiations to the material kept inside to increase the temperature.

Concave mirror is used in headlight of vehicles or as shaving mirror.

- 37.** Photosynthesis occurs in two phases—light reaction and dark reaction.
Light Reaction: This phase occurs in the thylakoids of the chloroplast.
Various events occurring in photosynthesis:

- Absorption of light energy
- Splitting of water molecules into hydrogen and oxygen atoms
- Formation of ATP and NADPH₂

Dark Reaction: This phase occurs simultaneously with the light-dependent reaction. In this phase, carbon dioxide is converted to glucose by using ATP and NADPH produced during the light reaction.

Factors which affect the rate of photosynthesis:

Light:

- Rate of photosynthesis increases when light gets brighter.
- Rate of photosynthesis increases linearly with increasing light intensity.

Carbon dioxide concentration:

- Increase in the concentration of carbon dioxide increases the rate of photosynthesis.
- Rate of photosynthesis increases linearly with increasing carbon dioxide concentration.
- Increased carbon dioxide concentration is beneficial for greenhouse crops such as tomatoes.

Temperature

- Higher the temperature, greater is the rate of photosynthesis.
- Rate of photosynthesis slows down when the temperature is more than 40°C because the enzymes involved in the chemical reactions of photosynthesis are temperature sensitive and are destroyed at higher temperatures.

Water

- Water stress causes leaves to wilt, thereby reducing their surface area and metabolic activity.

38.

(a) A conductor offers resistance to the flow of current. Hence, work must be done by the current continuously to keep itself flowing.

When an electric charge Q moves against a potential difference V , the work done is $W = QV$.

From the definition of current,

$$I = \frac{Q}{t}$$

$$\therefore Q = It$$

From Ohm's law,

$$V = IR$$

$$\therefore W = It \times IR = I^2 R t,$$

assuming that all this work goes in producing heat energy.

Therefore, the heat produced in a conductor of resistance ' R ' when current ' I ' is flowing for time ' t ' is

$$H = I^2 R t$$

(b) When resistors are connected in series:

$$R_s = R + R = 2R$$

$$\therefore H_s = \frac{V^2}{R_s} = \frac{V^2}{2R} \quad \dots\dots (1)$$

When resistors are connected in parallel:

$$\frac{1}{R_p} = \frac{1}{R} + \frac{1}{R} = \frac{2}{R}$$

$$\therefore R_p = \frac{R}{2}$$

$$\therefore H_p = \frac{V^2}{R_p} = \frac{2V^2}{R} \quad \dots\dots (2)$$

From (1) and (2),

$$\frac{H_s}{H_p} = \frac{V^2}{2R} \times \frac{R}{2V^2} = \frac{1}{4}$$

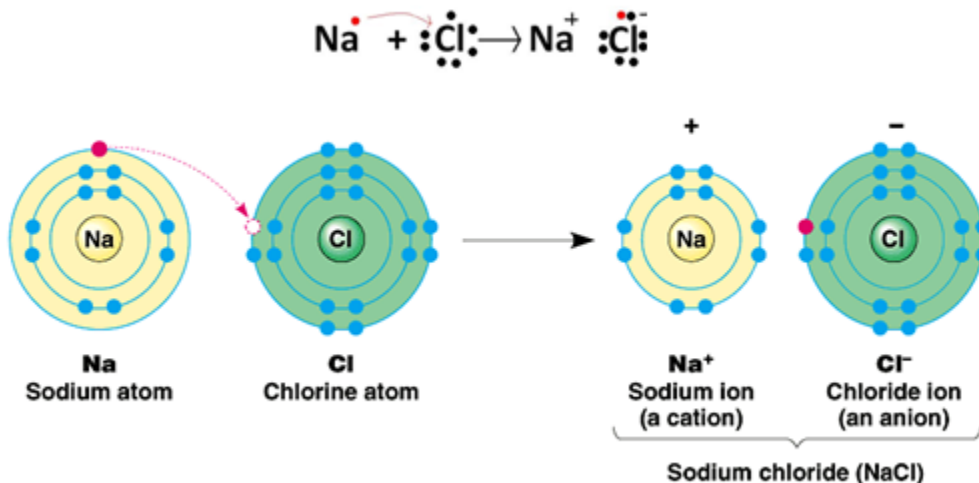
$$\therefore H_p = 4H_s$$

39. Metals in the low reactivity series are obtained by heating their oxides alone. Mercury is obtained by heating mercurous oxide. Metals high up in the reactivity series are obtained by electrolytic reduction. Sodium is obtained by the electrolysis of its molten chlorides.

(a) Electronic configuration of sodium (Na) = 2, 8, 1

Electronic configuration of chlorine (Cl) = 2, 8, 7

Formation of sodium chloride by the transfer of electrons



(b) Highly exothermic; (ii) the metal starts floating