

Maharashtra State Board
Class IX
Science and Technology Term II
Paper – I Solutions

1. (A)

(1)

- (i) When the oscillations are perpendicular to the direction of propagation of a wave, the waves are called transverse waves.
- (ii) $2\text{NaOH} + \text{CO}_2 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$
- (iii) 25% aqueous solution of salt is called saturated brine.

(B)

- (i) False. In a convex mirror, the outer surface is the reflecting surface.
- (ii) True.

2.

(1)

- (d) A structure resembling the shell of snail in the inner ear is called cochlea.

Inner Ear



- (2) A dye used in lipstick which causes stomach disorders is Carmine.

(3) Frequency of sound = 30 Hz

We know that

$$\text{frequency } (\nu) = \frac{1}{T}$$

$$\nu = \frac{1}{30} = 0.3 \text{ seconds}$$

If the frequency of the source of sound is 30 Hz, then the time period of the sound wave is 0.3 seconds.

(4) 2

Propane (C_3H_8) is a chain of carbon atoms containing two carbon-carbon single bonds.

(5)

(b) 10 cm

By the New Cartesian sign convention,

Object is placed at left of a concave mirror

$\therefore$ object distance (u) = -15cm

real and inverted image is formed at 30 cm

$\therefore$ image distance (v) = -30 cm

By the mirror formula,

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

$$\therefore \frac{1}{-30} + \frac{1}{-15} = \frac{1}{f}$$

$$\therefore \frac{1}{f} = -0.1 \text{ cm}$$

$$\therefore f = -10 \text{ cm}$$

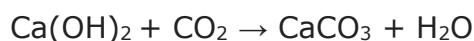
Negative sign indicates that the focus of a mirror lies on the left side of a concave mirror

3.

(1) Applications of ultrasonic sound:

- (i) To sterilize milk by killing bacteria so as to keep it for a longer duration
- (ii) To obtain images of internal organs
- (iii) In echocardiography, to study heartbeats
- (iv) To clean intricate parts of machines, where the hands cannot reach
- (v) To locate cracks in metal blocks
- (vi) To communicate between ships

- (2) Lime water turns milky when carbon dioxide is passed through it due to the formation of calcium carbonate precipitate.



- (3) If the inner surface of a spherical mirror is a reflecting surface, then the mirror is called a concave mirror.

Applications: (any two)

- (a) Used by dentists to see the enlarged image of teeth
- (b) Used by doctors as a head light to focus light from a lamp on body parts such as ears, eyes, nose and throat
- (c) In flood lights, to get a bright beam of light
- (d) In equipment where solar energy is used to converge most of the light at the focus of a mirror

- (4) Ceramics is used in electrical instruments for coating because they

- Can withstand high temperature
- Are water resistant and an electrical insulator

- (5)

- a) A surface which reflects most of the sound is a good reflector.

Examples: Flat and hard surfaces such as the table and walls

- b) A surface which absorbs most of the sound is a bad reflector.

Examples: Clothes, curtains, other porous materials

- (6) A dye is a coloured substance applied to an article to impart that colour to the article.

Adverse effects of dyes:

- i. Dyeing hair can lead to hair loss, damage of hair texture, burning of skin and adverse effect on the eyes.
- ii. Lipstick contains carmine, a dye, which can cause stomach disorders.
- iii. Making natural colours from plants destroys them, resulting in deterioration of the environment.

(7)

Magnification of an image = -2 cm

Magnification (M) is given by

$$M = \frac{\text{height of an image}}{\text{height of an object}} = \frac{h_2}{h_1}$$

$$\therefore -2 = \frac{h_2}{1.5}$$

$$\therefore h_2 = 1.5 \times (-2) = -3 \text{ cm}$$

Thus the size of an image is 3 cm and

and the negative sign indicates that the image is inverted and real

And as the size of an image is twice as that of object, image formed is magnified.

Thus the nature of an image is real, inverted and magnified.

4.

(1) The chemical name of baking powder is sodium hydrogen carbonate or sodium carbonate.

Molecular formula: NaHCO_3

Baking powder mixed with tartaric acid is used in making cakes. The carbon dioxide produced during the reaction causes bread or cake to rise making them soft and spongy.

(2)

a) Pole (P): The centre of a mirror is called a pole.

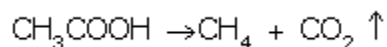
b) Centre of curvature (C): The centre of the sphere of which the mirror is a part is called the centre of curvature.

c) Principal axis: The straight line passing through the centre of curvature and the pole is called the principal axis.

(3) Production of biogas is an anaerobic process.

It involves two stages:

- i. Production of acids: Organic acids are produced by the action of microbes on biodegradable complex organic compounds.
- ii. Production of methane gas: Methane gas is produced by the action of methanogenic bacteria on organic acids.



(4)

Velocity of sound (v) depends on the following three physical conditions:

a) Temperature (T):

The velocity of sound is directly proportional to the square root of the temperature of the medium.

$$\rightarrow v \propto \sqrt{T}$$

i.e. if temperature is increased by four times, then the velocity of sound gets doubled.

b) Density of gas (ρ):

Velocity of sound is inversely proportional to the square root of the density of a medium.

$$\rightarrow v \propto \frac{1}{\sqrt{\rho}}$$

Thus, the velocity gets reduced by half of its value if the density of gas increases by four times.

c) Molecular weight of gas (M):

The velocity of sound is inversely proportional to the square root of the molecular weight of the gaseous medium.

$$\rightarrow v \propto \frac{1}{\sqrt{M}}$$

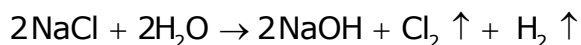
Thus, the velocity of sound is reduced to half of its value if the molecular weight is increased by four times.

(5) Properties of NaCl:

- Common salt is a colourless and crystalline ionic compound.
- There is no water of crystallisation in its crystalline structure.
- It is a neutral salt and is salty in taste.

Uses of NaCl:

- It is used for the production of salts such as Na_2CO_3 and NaHCO_3 .
- It is used in the production of chlorine gas.
- When an electric current is passed through a saturated solution of sodium chloride (brine), it is electrolysed. Hydrogen gas is released at the cathode, while chlorine gas is released at the anode.



(6)

wavelength (λ) = 25 cm = 0.25 m

a) Sound waves emitted per second = 1375

$\therefore$ frequency (ν) = 1375 Hz

b) We know time period is inversely proportional to frequency

$$\therefore T = \frac{1}{\nu} = \frac{1}{1375} = 7.2 \times 10^{-4} \text{ s}$$

c) velocity of sound (v) = $\nu\lambda$

$$= 1375 \times 0.25$$

$$= 343.75 \text{ m/s}$$

Hence velocity of sound = 343.75 m/s

(7) Difference between alpha, beta, gamma rays:

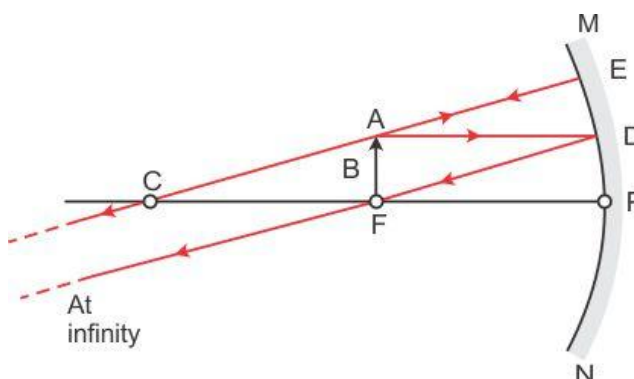
Property	Alpha Rays (α)	Beta Rays (β)	Gamma Rays (γ)
Nature	Current of He^{2+}	Current of e^-	Electromagnetic radiation
Penetrating Power	Can penetrate aluminium sheets of thickness $< 0.02 \text{ mm}$	Can penetrate aluminium sheets of thickness of 2 mm (100 times that of alpha particles)	Can penetrate 15 cm thick lead screen (1000 times that of alpha particles)
Ionisation Power	Very high	Low	Very low

5.

(1)

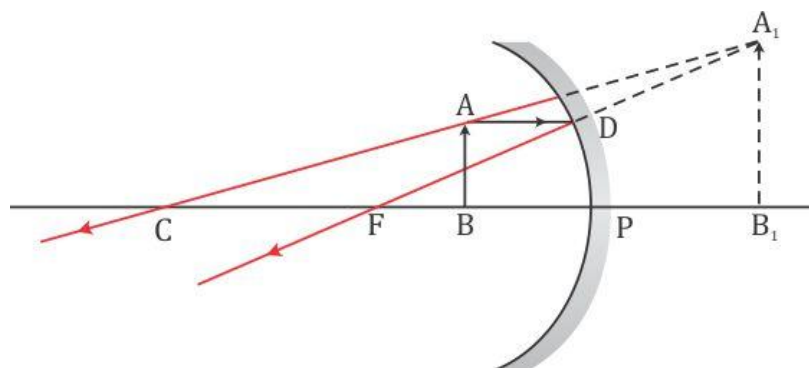
a)

Position of object	Position of image	Size of image	Nature of image
At focus	At infinity	Highly magnified	Real and inverted



b)

Position of object	Position of image	Size of image	Nature of image
Between pole and focus	Behind mirror	Magnified	Virtual and erect



(2) Coal is a solid fossil fuel which is most commonly used in our country.

It contains carbon, hydrogen and oxygen. It also contains nitrogen, phosphorus and sulphur.

We obtain 80% of our energy requirement from organic fuels.

Types of coal:

i. Peat

Peat is the first stage in the formation of coal. It is brown.

Sample Paper – 2 Solutions

It contains a high proportion of water and less than 60% of carbon. So, less heat is obtained from peat.

ii. Lignite

It is the second stage in the formation of coal. Peat is compressed between sediment layers to form lignite.

Lignite contains **60%–70%** carbon.

It is also brown, but it is harder than peat.

iii. Bituminous

It is the third stage in the formation of coal.

It contains **70%–90%** carbon.

It is black and hard.

iv. Anthracite

It is the purest variety of coal.

It is the oldest stage in the formation of coal.

Its carbon content is about **95%**.

It is hard, dense and black.