PHYSICS | ICSE SAMPLE PAPER

Section – A

1. **(i)** **(a)** As $r = \dfrac{mv}{qB}$

(ii) **(c)** $d = 30$ cm, $d' = 30 - 12 = 18\,\text{cm}$

$$n = \frac{d}{d'} = \frac{30}{18} = 1.67$$

(iii) **(c)** 1 erg $= 10^{-7}$ J

(iv) **(c)** 234

(v) **(c)** (A) is true but (R) is false.

(vi) **(c)** γ - rays

(vii) **(c)** 15 m

(viii) **(a)** $v = f\lambda = 500 \times 0.4 = 200\,\text{m/s}$

$$t = \frac{d}{v} = \frac{600}{200} = 3\,\text{s}$$

(ix) **(b)** As $V \propto I$

(x) **(d)** Soft iron

(xi) **(d)** $MA = \dfrac{\text{Load}}{\text{Effort}} = \dfrac{2000\,\text{N}}{250\,\text{N}} = 8$

(xii) **(c)** 3 : 2

$$ms_a(30-26) = ms_B(26-20)$$

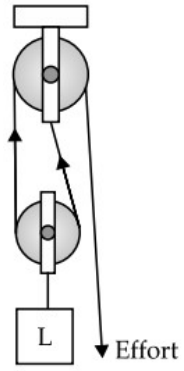
$$\Rightarrow \quad \frac{s_A}{s_B} = \frac{6}{4} = 3:2$$

(xiii) **(b)** 32 °F

(xiv) **(c)** $\lambda_m > \lambda_v > \lambda_x$

(xv) **(d)** Inverted image formed by a convex lens can be diminished or enlarged.

2. **(i)** **(a)**



(b) Mechanical advantage $= \dfrac{2T}{T} = 2$

(ii) **(a)** 0-50 cm part will weigh more because its balanced point is at 40 cm.

(b) When the ruler is pivoted at centre, then $50 \times 10 = 50 \times x$
(x is the minimum weight)
So, $x = 10$g

(iii) **(a)** The position of intersections of the medians i.e. the centroid is the triangle is the centre of gravity of triangular media.

(b) Algebraic sum of the moments will be zero since the line of action coincides with the axis of rotation.

(iv) The weight of the beam will produce a clockwise moment and the applied force F will produce a clockwise moment.

Equating the moments of the force,

$120 \times 0.2 = F \times 0.8$

$\therefore \quad F = 30$ N

(v) $$P_{\text{sumit}}/P_{\text{Amit}} = \frac{\frac{W_{\text{Sumit}}}{t_{\text{Sumit}}}}{\frac{W_{\text{Amit}}}{t_{\text{Amit}}}} = \frac{\frac{600}{10}}{\frac{300}{20}} = 4:1$$

(vi) When the geyser is connected to 220V supply and it will consume 240 Joule energy per second.

(vii) Applying the formula $d = v \times \frac{0.1}{2}$

For Oxygen, $x = 340 \times \frac{0.1}{2} = 17\,\text{m}$

For Benzene, $y = 200 \times \frac{0.1}{2} = 10\,\text{m}$

So, $x : y = 17 : 10$

3. **(i)** **(a)** No. Concave lens always process virtual image of smaller size.

(b) There will be no change in focal length. Since, the refractive index and the radius of curvature do not change. Only intensity of light will change.

(ii) **(a)** Electrical component will be fuse. Miniature Circuit breaker (MCB) can be used as a switch.

(b) Live wire.

(iii) Total amount of heat absorbed, $Q = m \times L = 200 \times 146 = 29200$ J.

(iv) **(a)** Alternating current.

(b) 50 Hz.

(v) $_{92}U^{235} + {}_0n^1 \rightarrow {}_{46}\text{Ba}^{(141)} + {}_{(36)}\text{Kr}^{92} + 3{}_0\text{n}^1$

Section – B

4. **(i)** Time taken = 1 minute 40 seconds = 100 s

Speed of sound $= 1500\,\text{ms}^{-1}$

So, distance of the obstacle $= \frac{1}{2}(1500 \times 100) = 75000$ m

(ii) **(a)** The statement is false.

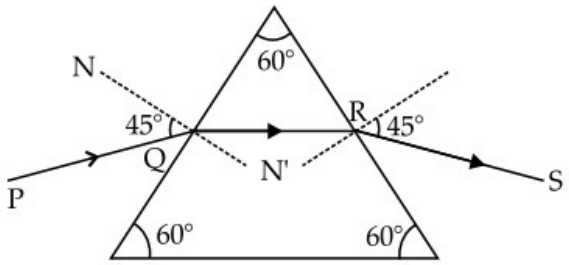
Diamond is a denser medium compared to vacuum. Hence, in it light cannot cover longer distance than that in vacuum.

(b) Speed of light in vacuum $= \frac{10x}{t_1}$

Speed of light in the medium $= \frac{x}{t_2}$

So, refractive index of the medium $= \frac{\frac{10x}{t_1}}{\frac{x}{t_2}} = \frac{10t_2}{t_1}$

(iii) **(a)**



(b) Angle of deviation depends on

- Angle of incidence
- Refractive index

5. **(i)** Applying lens formula,

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

Or, $\frac{1}{60}-\frac{1}{u}=\frac{1}{10}$

Or, $\frac{1}{u}=\frac{1}{60}-\frac{1}{10}$

$\therefore \quad u = -12$ cm

So, the object should be placed at a distance 12 cm in front of the lens.

(ii) **(a)** $\mu=\frac{\text{Real depth}}{\text{Apparent depth}}$

Or, $\mu-1=\frac{\text{Real depth – apparent depth}}{\text{apparent depth}}$

Or, $\frac{4}{3}-1=\frac{3\,\text{mm}}{\text{apparent depth}}$

Or, $\frac{1}{3}=\frac{3\,\text{mm}}{\text{apparent depth}}$

$\therefore$ Apparent depth = 9 mm

$\therefore$ Real depth = 9 mm + 3 mm = 12 mm

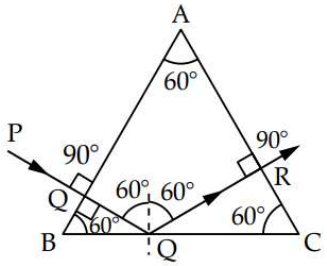
(b) $\mu=\frac{1}{\sin\theta_c}$

Here, all alphabets are in their usual meaning.

(iii) **(a)**

- The light ray should travel from denser to rarer medium.
- Angle of incidence should be greater than the critical angle.

(b)



6. **(i)** Work done = Change in kinetic energy.

Initial velocity = 18 km/h $= 18 \times \frac{5}{18} = 5\,\text{m/s}$

Final velocity = 54 km/h $= 54 \times \frac{5}{18} = 15\,\text{m/s}$

So, work done $= \frac{1}{2} 120 (15^2 - 5^2) = 12000\ \text{J}$

(ii) **(a)** All are class I levers since, the fulcrum is in between the load and effort.

(b) $\text{Mechanical advantage} = \frac{\text{Effort arm}}{\text{Load arm}}$

For *X*, effort arm is greater than the load arm. Hence, it has the maximum mechanical advantage.

(iii) **(a)** Kinetic energy at $Q = \frac{1}{2} mv^2 = \frac{1}{2} \times 40 \times 10^2 = 2000\,\text{J}$

(b) If the height of *P* is *h*, then $mgh = \frac{1}{2} mv^2$

or, 40 × 10 × *h* = 2000

$\therefore$ *h* = 5 m

(c) At *R*,

Potential energy = *mgh* = 40 × 10 × 3 = 1200 J

Energy loss due to friction = 500 J

So, Kinetic energy at *R* = 2000 – 1200 – 500 = 300 J

7. **(i)** **(a)** Ultrasonic wave.

(b) Lata cannot clearly distinguish the sound reflected from cliff A. Since the distance is less than the minimum distance required to hear a distinct echo.

So, she will hear the sound reflected from cliff *B* as 1st echo.

So, she will hear the 1st echo after time $t = \frac{2d}{v} = \frac{2 \times 160}{320} = 1\,\text{s}.$

(ii) **(a)** ${}^{234}_{90}X \rightarrow {}^{230}_{88}Y + {}^{4}_{2}\text{He} \rightarrow {}^{234}_{91}\text{Z} + {}^{0}_{-1}e$

(b) U-235

(iii) **(a)** Resonance.

(b) **Resonance:** The phenomenon when a body vibrates with increased amplitude under the influence of external periodic force whose frequency is equal to the natural frequency of vibration of the body.

(c) Air in sound box vibrates with higher amplitude due to vibrating string of musical instruments. This is an example of resonance.

8. **(i)** **(a)** *X* is a company fuse or pole fuse. It does not have a fixed current rating. It depends on the load capacity of the connection.

(b) *Z* can connect & disconnected live and neutral line simultaneously. But the switch which is used to operate domestic appliances connect & disconnected live line only.

(c) Unit is kWh.

(ii) **(a)** Nuclear fission.

(b) *X* = 236

(c) Neutrons.

(iii) **(a)** 10Ω and 6Ω are in series. Hence, equivalent resistance $R_1 = 16\Omega$.

12Ω and 4Ω are in series. Hence, equivalent resistance $R_2 = 16\Omega$

R_1 and R_2 are in parallel. Hence, the equivalent resistance $= R_{eq} = 8\Omega$

(b) Current $I = \frac{V}{R_{eq}} = \frac{4V}{8\Omega} = 0.5A$

(c) Current in both the resistors are equal because both the arms have same resistance value.

9. **(i)** Mass of ice at 0° C $= m_1 = 30\,\text{g}$

Heat absorbed to be converted into water at 0°

$Q = m_1 \times L = 30 \times 336J$

Heat absorbed rise of temperature from 0° C to 20°C,

$Q = m_1 \times c \times \Delta t = 30 \times 4.2 \times 20J$

Heat lost by water at 70° C to come down to 20°C,

$Q = m_2 \times c \times \Delta t = m_2 \times 4.2 \times 50\,\text{J}$

From the principle of calorimetry, Heat absorbed = Heat lost

Or, $30 \times 336 + 30 \times 4.2 \times 20 = m_2 \times 4.2 \times 50$

Or, $12600 = 210\,\text{m}_2$

$\therefore \quad m_2 = 60\,g$

$\therefore$ Mass of water at 70°C = 60 g

(ii) **(a)** **Principle of calorimetry:** When two or more bodies at different temperatures are brought in contact, then heat lost by a hot body is equal to the heat gained by the cold body, provided there is no heat loss in the environment.

(b) Copper is generally used for calorimeter.

(c) The material used for calorimeter should have a very low specific heat capacity.

(iii) **(a)** Maxwell's right hand thumb rule.

(b) Deflection being clockwise, the direction of current is from *X* to *Y*.

(c) As *R* increases, current decreases. So, strength of magnetic field decreases and hence, the density of magnetic lines of force decreases.