ICSE 2025 EXAMINATION

Sample Question Paper - 14

Physics

Time: 2 Hours. **Total Marks: 80**

General Instructions:

1. *Attempt **all** questions from **Section A** and **any three** questions from **Section B**.*
2. *The intended marks of questions or parts of questions are given in brackets [ ].*

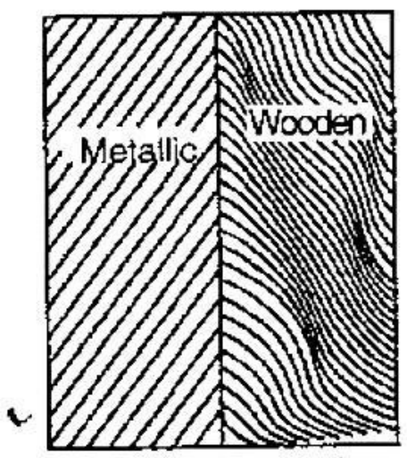
SECTION A

*(Attempt **all** questions)*

Question 1 [15]

Choose the correct answers to the questions from the given options. (Do not copy the questions, write the correct answer only.)

i) Two halves of a body are metallic and wooden, respectively as shown. In which half the centre of gravity will be situated.



(a) In metallic half
(b) In wooden half
(c) In line joining the metallic and wooden half
(d) Outside on a plane perpendicular to the plane of the body.

ii) An ink dot appears to be raised when viewed under a glass slab due to:
(a) reflection of light.
(b) refraction of light.
(c) scattering of light.
(d) dispersion of light

iii) The relation between CGS and S.I. unit of moment of force is:
(a) 1 Nm= 10^5 dyne cm
(b) 1 Nm = 10^5 dyne
(c) 1 Nm= 10^7 dyne cm
(d) 1 dyne cm = 10^7 N m

iv) The lever for which the mechanical advantage is less than 1 has the :
(a) Fulcrum at mid-point between load and effort.
(b) Load between effort and fulcrum.
(c) Effort between fulcrum and load.
(d) Load and effort acting at the same point.

v) **Assertion (A):** A simple pendulum oscillating in air executes damped vibrations.
Reason (R): Damped vibrations decrease in amplitude due to the presence of resistive force.
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true and R is not the correct explanation of A
(c) Assertion is false but reason is true.
(d) Assertion is true reason is false.

vi) Two sounds of same loudness and same pitch produced by two different instruments differ in their:
(a) Amplitudes
(b) Frequencies
(c) Waveforms
(d) All of the above.

vii) An object of height 10 cm is placed in front of a concave lens of focal length 20 cm at a distance 25 cm from the lens. Is it possible to capture this image on a screen? Select the correct option from the following:
(a) Yes, as the image formed will be real.
(b) Yes, as the image formed will be erect.
(c) No, as the image formed will be virtual.
(d) No, as the image formed will be inverted.

viii) 1 joule= _____ erg
(a) 10^9
(b) 10^7
(c) 10^5
(d) 10^6

ix) The potential difference between India's live and neutral wires is _____.
(a) 240 V
(b) 220 V
(c) 440 V
(d) 420 V

x) Resistance of a wire is _____.
(a) directly proportional to area of cross section of the wire.
(b) directly proportional to square root of area of cross section of the wire.
(c) Inversely proportional to area of cross section of the wire.
(d) Inversely proportional to area of cross section of the wire.

xi) The rule which gives the direction of magnetic force experienced by a current-carrying conductor when placed in a magnetic field is _____.
(a) Fleming's right-hand rule
(b) Fleming's left-hand rule
(c) Fleming's thumb rule
(d) Fleming's left thumb rule

xii) Which of the following require more heat to raise its temperature to 10^0C?
(a) 1 g of ice at 0 °C
(b) 1 g of water at 0 °C
(c) both A and B require equal heat
(d) None of the above

xiii) A radioactive source emits three types of radiation. Which radiation has zero mass?
(a) Alpha
(b) Beta
(c) Gamma
(d) All of the above

xiv) In which of the following timings of reflection of the whistle can the echo not be heard?
(a) 0.05 s
(b) 0.12 s
(c) 0.2 s
(d) 0.11 s

xv) The deviation produced by an equilateral prism does not depend on:
(a) the angle of incidence.
(b) the size of the prism.
(c) the material of the prism.
(d) the colour of light used.

Question 2

i) Complete the following by choosing the correct answer from the bracket:

(a) Sound of single frequency is called _____ *[noise/tone/music/note].*

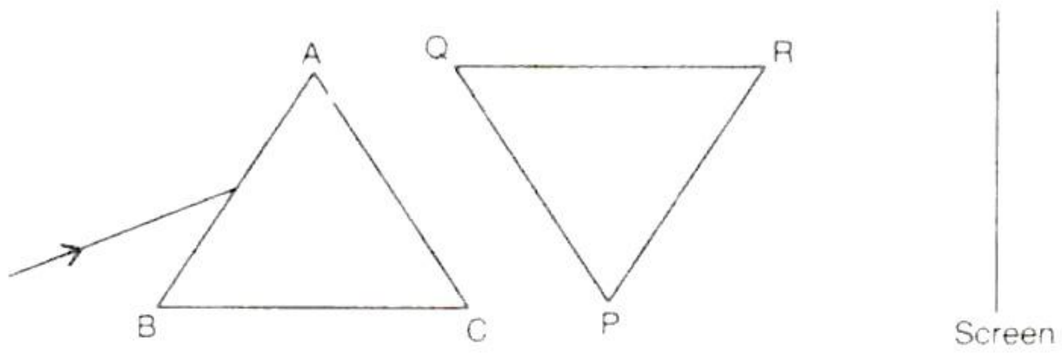
(b) When a spring is held fixed at one end and the other end is stretched, the spring tends to regain its original shape due to _____ *[Compressive Force/Tensile Force/Restoring Force].*

(c) The rate of change in momentum is equal to _____ *[energy/force/acceleration].*

(d) The virtual and erect image is formed by the convex lens if the object is placed _____ *[At infinity/Between F and 2F/Between focus (F) and optical centre O].*

(e) Total internal reflection occurs when a ray of light passes from a _____*[rarer/denser/transparent/opaque]* medium to a _____ *[rarer/denser/transparent/opaque]* medium.

ii) Complete the figures shown below with appropriate rays. [2]



iii) Answer the following questions: [2]

(a) What is the direction of magnetic field lines inside a bar magnet and outside of it?

(b) What does the degree of closeness of the field lines represent?

Question 3

i) [3]

(a) In what respect is the roaring of a lion different from the buzzing of a mosquito?

(b) Two lamps of power P_1 and P_2 ($P_1 > P_2$) are connected in series. Which one glows brighter and why?

(c) When does the nucleus of an atom become radioactive?

ii) Suppose your mass is 42 kg. Express your weight in SI units (Take $g = 9.8\ ms^{-2}$). [2]

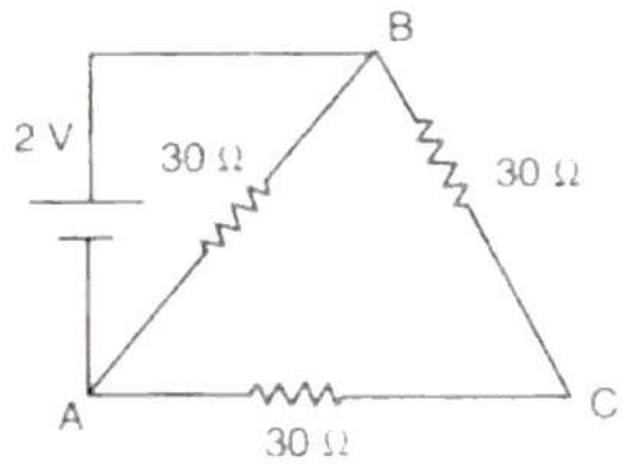
iii) State two differences between a single fixed pulley and a single movable pulley. [2]

iv) Why are α-particle tracks observed in a cloud chamber found to be much shorter than β-particle tracks in the same chamber, though they emerge from a radioactive sample with almost the same speed? [2]

v) An iron ball requires 6000 J of heat to raise its temperature by 20°C. Calculate the heat capacity of the iron ball. [2]

vi) Calculate the minimum distance required between the source and the large obstacle for a distinct echo to be heard. Take speed of sound = 340 m/s. Time taken by sound to reach the listener after reflection = 0.1 s. [2]

vii) Calculate the current in the circuit shown in the figure below. [2]



SECTION B

*(Attempt **any four** questions from this Section)*

Question 4

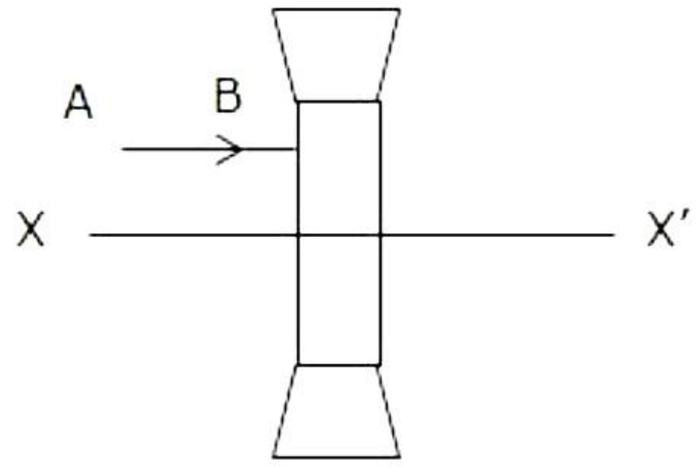
i) A ray of light is normally incident on one face of an equilateral glass prism. Answer the following:

(a) What is the angle of incidence on the first face of the prism? Also give the angle of refraction from the first face of the prism.

(b) What will be the angle of incidence at the second face of the prism?

(c) Will the light ray suffer minimum deviation by the prism?

ii) The diagram below shows a lens as a combination of a glass block and two prisms.

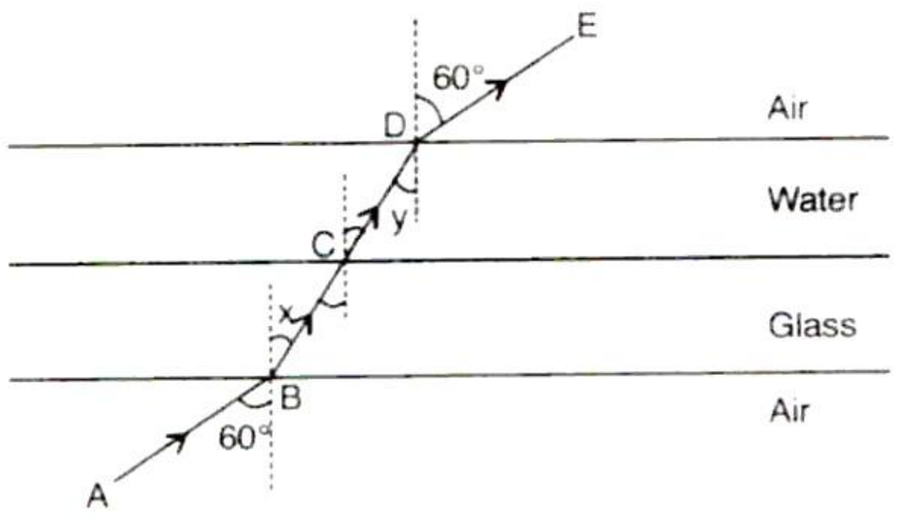


(a) Name the lens formed by the combination.

(b) What is the line XX' called?

(c) Complete the path of the incident ray AB after passing through the lens.

iii) Define refractive index. The figure shows a glass slab of uniform thickness lying horizontally.



Above it, is a layer of water. A ray of light AB is incident on the lower surface of glass which is refracted successively at B, C and D, the points where it crosses the interfaces. Calculate: [4]

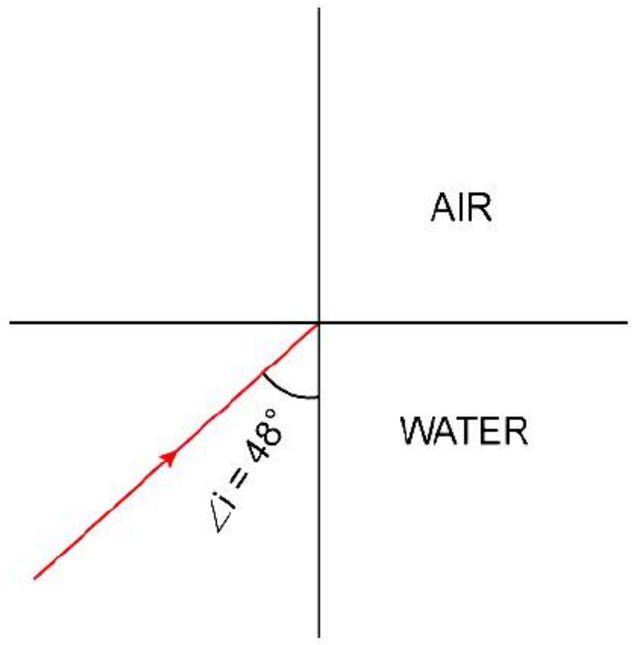
(a) $\angle x$

(b) $\angle y$

(c) Refractive index for light passing from water to glass. Refractive indices of glass and water are 3/2 and 4/3 respectively.

Question 5

i) A ray of light travels from water to air as shown in the diagram given below:



(a) Copy the diagram and complete the path of the way.

(b) Given the critical angle for water is 48o. State the condition so that internal reflection occurs in the above diagram.

ii) A lens forms the image of an object placed at a distance 15 cm from it, at a distance 60 cm in front of it.

Object distance, u = -15 c

Image distance, v = -60 c

Find:

(a) the focal length,

(b) the magnification,

(c) the nature of image.

iii) [4]

(a) The sky at noon appears white. Give the reason.

(b) The color of the sky, in the direction of the sun, is blue. Explain.

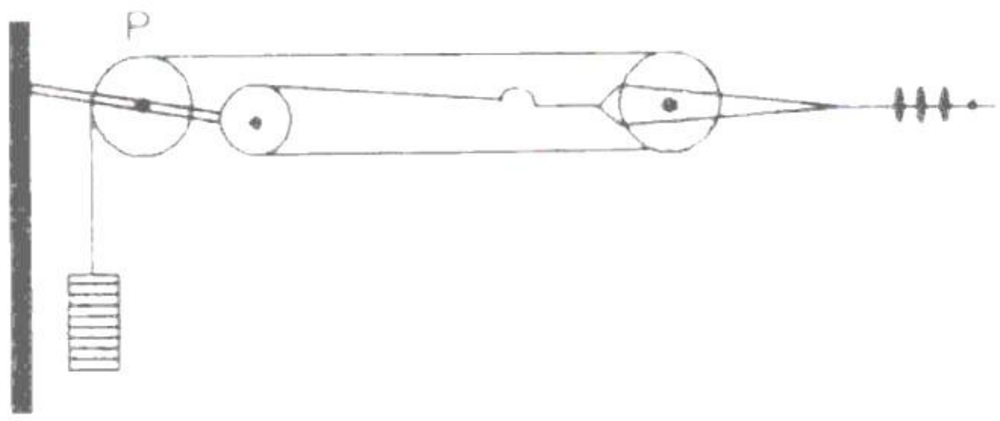
(c) How would the sky appear when seen from space (or moon)? Give reason for your answer.

(d) A beam of blue, green and yellow light passes through the Earth's atmosphere. Name the color which is scattered:

1. the least
2. the most

Question 6

i) The figure given below shows a wire of Rail's electrification system being held taut by pulleys. [3]

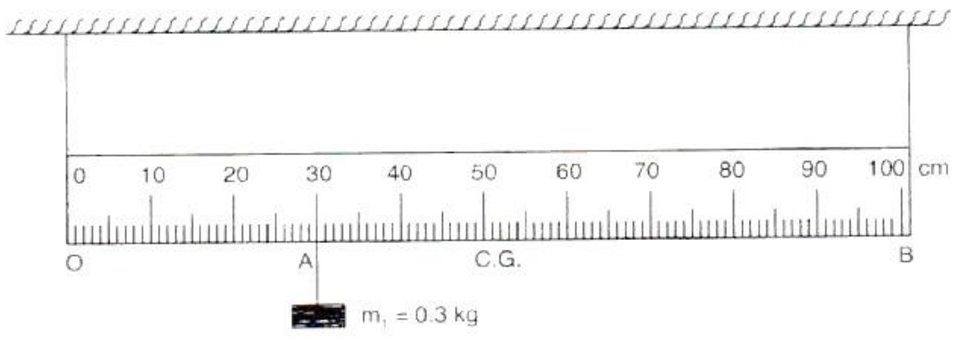


(a) By what factor is the force multiplied?

(b) What is the purpose of the pulley P?

(c) Why are pulleys used at all?

ii) A meter scale of mass 0.2 kg is suspended by two strings at each end as shown in the figure. [3]



A body of mass 0.3 kg is suspended by a weightless string at 0.3 m mark. Calculate the tensions in the string by which the meter scale is suspended. (Take g = 10 m/s^2)

iii) [4]

(a) Is that true that Steeper the inclined plane, less is the effort needed to push a load up the plane? Justify your answer.

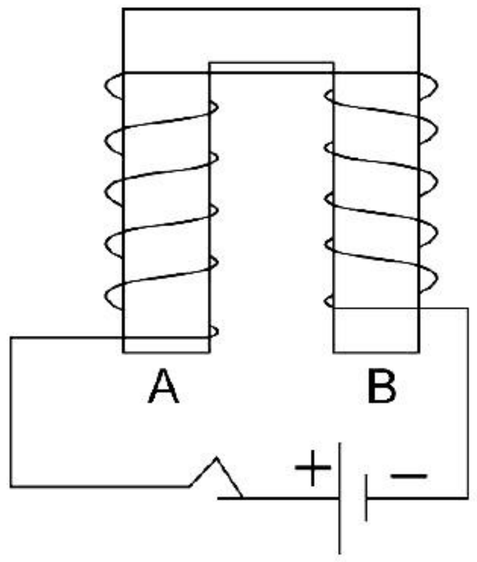
(b) Give one example of motion in which speed remains uniform, but the velocity changes.

(c) 6.4 kJ of energy causes a displacement of 64 m in a body in the direction of force in 2.5 seconds. Calculate

1) the force applied.
2) power in horsepower (hp)
   [Take 1 hp = 746 W]

Question 7

i) The diagram shows a coil wound around a U shape soft iron bar AB. [3]



(a) What is the polarity induced at the ends A and B when the switch is pressed?

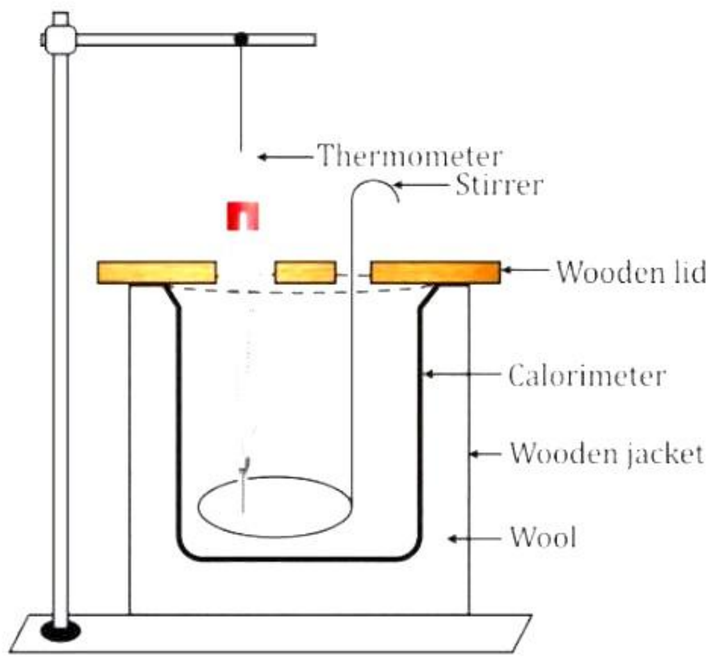
(b) Suggest one way to strengthen the magnetic field in the electromagnet.

(c) What will be the polarities at A & B if the direction of current is reversed in the circuit?

ii) 160 g of molten silver at its melting point 960 °C is allowed to solidify at the same temperature and gives out 16800 J of heat. What is the specific latent heat of silver in SI unit? If the mean specific heat capacity of silver is 230 J/kg°C, how much additional heat does it give out in cooling to - 40°C? [3]

iii) [4]

Priya had a calorimeter which is filled with water at room temperature (27° C) and an iron ball which weighs 0.1 kg.



Answer the following questions based on the given information.

[Consider: Specific heat capacity of water = 4200 J/kg K]

(a) What will be specific heat capacity of iron ball, if Priya placed it inside calorimeter and observed that 5000 J of heat energy is required to raise the temperature by 10° C?

(b) Find the heat energy required to raise the temperature of 1 kg of water from 27° C to 57°.

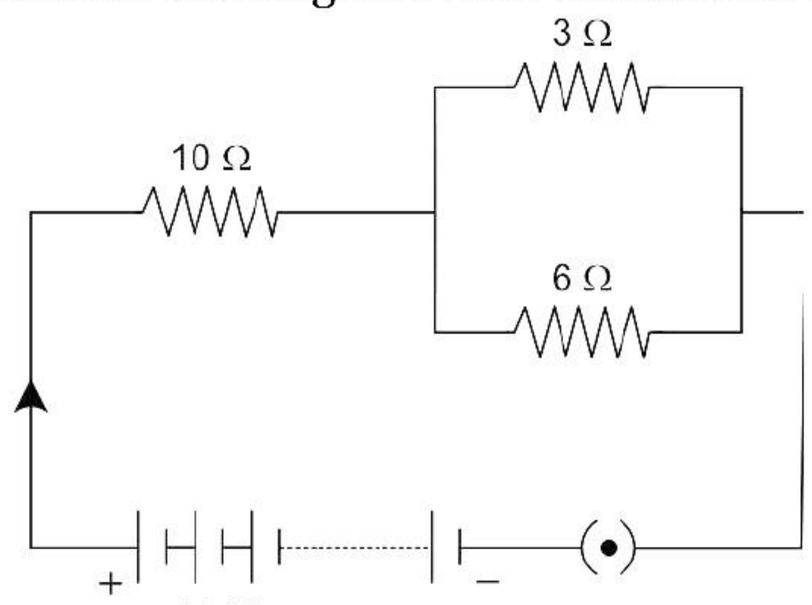
(c) What is the principle of method of mixture?

(d) What other name is given to it? Name the law on which this principle is based.

Question 8

i) [3]

(a) Consider the circuit shown in the diagram. Find the current in 3 Ω resistor.

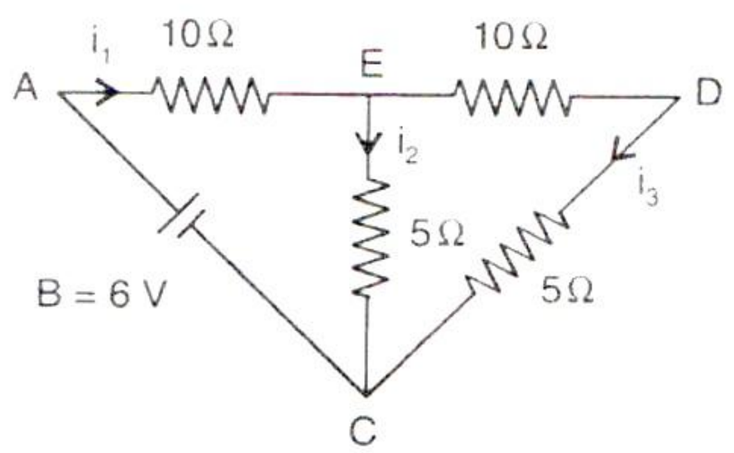


(b) Current flows opposite to the direction of flow of electrons. Is it a scalar quantity or a vector quantity? Why.

ii) [3]

(a) What is meant by the electromotive force of a cell?

(b) A cell B of 6 V and negligible internal resistance is connected to the combination of resistors shown in the figure.



What is the effective value of the resistance connected across the terminals of the cell? What are the values of the current i_1 and i_3?

iii) [4]

(a) Define term reverberation.

(b) State one condition for a body to execute free vibrations.

(c) Two men at a distance of 0.68 km from each other stand at the same distance from a vertical hillock. One of them fires a shot and other hears its echo 3 s after hearing the direct sound. Find the distance of the men from the hillock assuming the velocity of sound to be 340 m/s.

Question 9

i) What is an echo? Suppose a student standing at one end of a closed corridor 86 m long blows a short blast on a whistle and notes a series of echoes. If the time from the blast to the fifth echo is 2.5 s, calculate the speed of sound. [3]

ii) [3]

(a) What is the difference between an α - particle and a helium atom?

(b) What other name is given to nuclear fusion? Give the reason.

(c) Name two origins of background radiation.

iii) [4]

(a) In what unit does the electric meter in a house measure the electrical energy consumed? What is its value in S.I. unit?

(b) A house is fitted with 20 lamps of 60 watt each, 10 fans consuming 0.5 A each and an electric kettle of resistance $110\,\Omega$. If energy is supplied at 220 V and costs Rs.3.25 per kW h, calculate the bill for November if these appliances run for 6 hours a day.

Solution

SECTION A

Solution 1

Choose the correct answers to the questions from the given options. (Do not copy the questions, write the correct answer only.)

i) Correct answer – a: In metallic half

The centre of gravity lies on the heavier side. It will, therefore, lie in the metallic half.

ii) Correct answer – b: refraction of light.

Due to refraction, an ink dot appears to be raised when viewed under a glass slab. This is in accordance with the equation.

$$n_{glass} = \frac{\text{real depth}}{\text{apparent depth}}$$

iii) Correct answer – c: 1 Nm = 10^7 dyne cm

Moment of force = force x perpendicular distance from the line of action

Thus, S.I unit of moment of force is Nm and SI unit is dyne cm.

1 N = 10^5 dyne

1 m = 100 cm

Thus, 1 Nm = 10^7 dyne cm

iv) Correct answer – c: Effort is between fulcrum and load.

Hint: Levers, for which the mechanical advantage is less than 1, always have the effort arm shorter than the load arm.

v) Correct answer – a: Both assertion and reason are true.

The periodic vibrations of a body of decreasing amplitude in the presence of resistive or frictional force are called damped vibrations. A simple pendulum oscillating in air is an example of damped vibrations.

Since both statements are true and the reason correctly explains why the assertion is true, the correct answer is:

vi) Correct answer – c: Waveforms

Explanation: The waveform of a sound depends on the number of the subsidiary notes and their relative amplitude along with the principal note. The resultant vibration obtained by the superposition of all these vibrations gives the waveform of sound.

vii) Correct answer – c: No, as the image formed will be virtual.
As the lens used is concave, the image formed will be virtual and erect; such images cannot be obtained on the screen.

viii) Correct answer –b: 10^7 erg
1 Joule = 10^7 erg

ix) Correct answer – b: 220 V
The potential difference between India's live and neutral wires is 220 V.

x) Correct answer – d: Inversely proportional to the area of the cross-section of the wire.
The resistance of a wire is inversely proportional to the area of the cross-section of the wire.

xi) Correct answer – b: Fleming's left-hand rule
Fleming's left-hand rule gives the direction of magnetic force experienced by a current-carrying conductor when placed in a magnetic field.

xii) Correct answer – a: 1 g of ice at 0°C
Ice at 0^0C requires an additional latent heat (mL) to convert into water at 0^0C.

xiii) Correct answer – c: Gamma
A radioactive source emits three types of radiation, out of which gamma radiation has zero mass.

xiv) Correct answer –a: 0.05 s
For the echo to be heard, the minimum time must be 1/10th of the second.
i.e., 0.1 of second. So, the echo cannot be heard at 0.05 s.

xv) Correct answer – b: size of the prism
The deviation produced by an equilateral prism does not depend on the size of the prism.

Solution 2

i)

(a) It is different with respect to the frequency and amplitude. The frequency of a lion's roar is much lower, and the amplitude is much higher than the frequency and amplitude of the buzzing of a mosquito.

(b) The lamp of the lower power P_2 will glow brighter because it has a greater resistance. $R \propto \frac{1}{P}$, and hence, at the same current through each bulb in a series combination, the energy conversion rate in the lower power bulb P_2 (i.e., i^2R) will be higher.

(c) The nucleus of an atom becomes radioactive if its atomic number exceeds 82.

ii) Weight, $w = m \times 9.8$

$= 42\ kg \times 9.8\ m\ s^{-2} = 411.6\ N$

iii)

Single fixed pulley	Single movable pulley
1. It is fixed to a rigid support.	1.It is not fixed to a rigid support.
2. Its mechanical advantage is one.	2.Its mechanical advantage is two.
3. Its velocity ratio is one.	3.Its velocity ratio is two.
4.The weight of pulley itself does not affect its mechanical advantage.	4. The weight of pulley itself reduces its mechanical advantage.
5.It is used to change the direction of effort	5.It is used as force multiplier.

iv) α-Particles have greater ionising power than β-particles and are heavier than β particles. So, they lose their energy much before β-particles because of collisions. This is why their track lengths are shorter than those of β-particles.

v) Given,

$Q = 6000\ J$

$\Delta T = 20^{\circ}C, \quad C' = ?$

Heat capacity is given as

$$C' = \frac{Q}{\Delta T}$$

$$= \frac{6000\ J}{20^{\circ}C} = 300\ J\ {}^{\circ}C^{-1}$$

vi) The minimum distance required between the source and the large obstacle for a distinct echo to be heard is

$$d = \frac{v \times t}{2}$$

$$= \frac{340 \text{ x } 0.1}{2}$$

$$d = 17\ m$$

vii) Equivalent resistance R is given by

$$\frac{1}{R} = \frac{1}{(R_{BC} + R_{CA})} + \frac{1}{R_{AB}}$$

As resistances BC and CA are in series and BCA is in parallel with AB, we have

$$\frac{1}{2} = \frac{1}{(30+30)} + \frac{1}{30} = \frac{3}{60} \Rightarrow R = 20\,\Omega$$

$$i = \frac{V}{R} = \frac{2V}{20\,\Omega} = \frac{1}{10} = 0.1\,A$$

Solution 3

i)

(a) Sound of a single frequency is called **tone**.

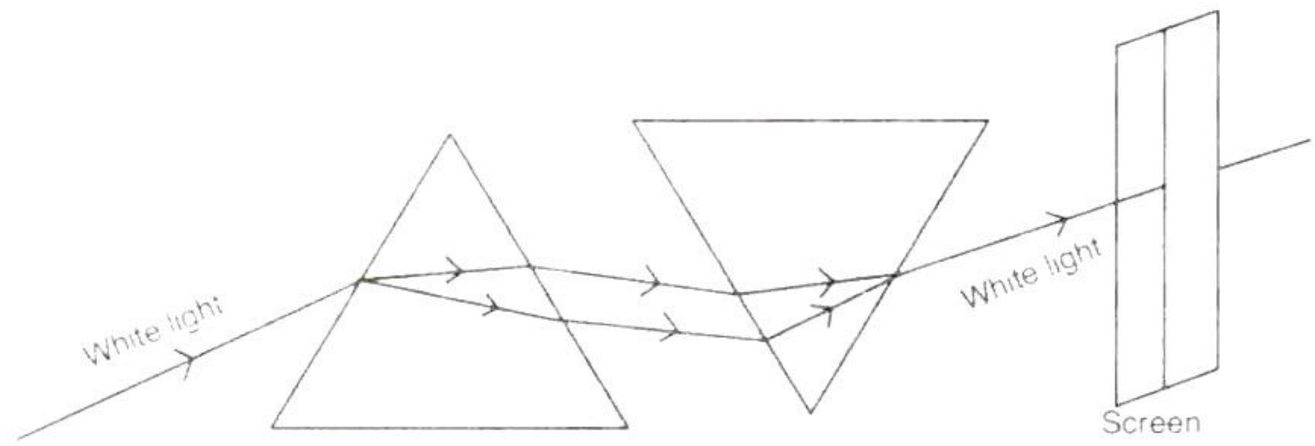
(b) When a spring is held fixed at one end and the other end is stretched, the spring tends to regain its original shape due to **Restoring Force.**

(c) The rate of change in momentum is equal to **force**.

(d) The virtual and erect image is formed by the convex lens if the object is placed **between focus (F) and optical centre O.**

(e) Total internal reflection occurs when a ray of light passes from a **denser** medium to a **rarer** medium.

ii)



iii)

(a) The direction of magnetic field lines outside a bar magnet is from the North seeking pole to the south seeking pole, while inside the magnet, it is from the south to the North seeking pole.

(b) The degree of closeness of the magnetic field line determines the strength of the magnetic field. Stronger is the field at places where field lines are crowded.

SECTION B

Solution 4

i)

(a) If the incident ray normal to prism, then angle of incidence is 0^o. In this case the angle of refraction from the first face $r_1 = 0^o$.

(b) As the prism is equilateral so $A=60^o$ and $r_1=0^o$. So at the second face of the prism, the angle of incidence will be 60^o.

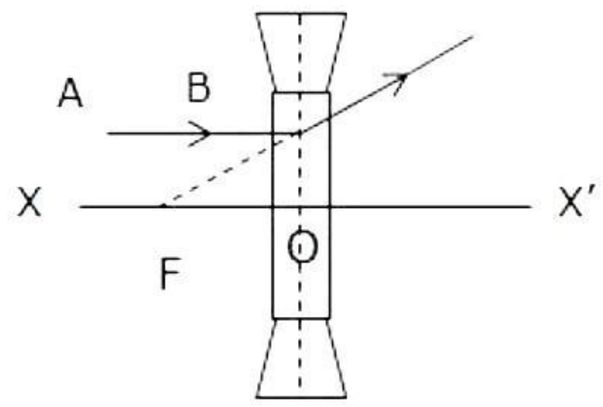
(c) No, the light will not suffer minimum deviation.

ii)

(a) The combination forms concave lens.

(b) XX' is known as principal axis.

(c) Complete diagram is drawn as



iii) The ratio of the sine of the angle of incidence and sine of the angle of refraction is a constant for the same pair of media. This constant ratio is called the refractive index of the second medium with respect to the first. It is represented by Greek letter μ(mew) or n.

(a)

$$_a\mu_g = \frac{\sin 60}{\sin x}$$

$$\sin x = \frac{\sin 60}{_a\mu_g} = \frac{\sqrt{3}/2}{3/2} = \frac{1}{\sqrt{3}}$$

$$\angle x = \sin^{-1}\left(\frac{1}{\sqrt{3}}\right) = 35.26^0$$

$$_g\mu_w = \frac{\sin x}{\sin y} \qquad \left\{ _g\mu_w = \frac{\mu_w}{\mu_9} = \frac{4/3}{3/2} = \frac{8}{9} \right\}$$

(b)

$$\sin y = \frac{\sin x}{{}_g\mu_w}$$

$$= \frac{(1/\sqrt{3})}{8/9} = \frac{9}{8\sqrt{3}} = 0.6495$$

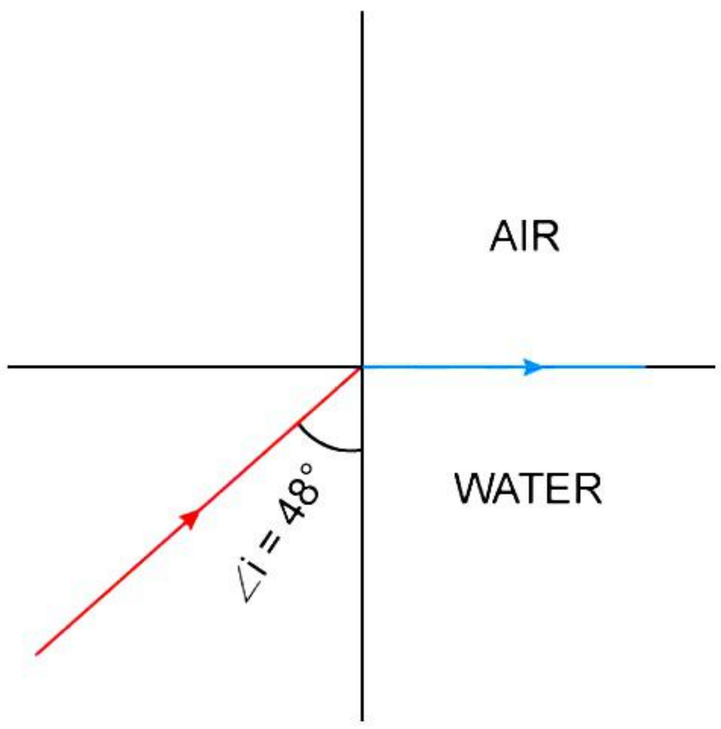
$$\angle y = 40.50^0$$

(c) $${}_w\mu_g = \frac{1}{{}_g\mu_w} = \frac{1}{8/9} = \frac{9}{8} = 1.125$$

Solution 5

i)

(a) The image formed by the lens is virtual and between the object and the lens. Hence, the lens used is a concave lens.



(b) The condition for the occurrence of internal reflection in the above diagram is that the angle of incidence should be greater than the given critical angle for water, i.e., i > 48°.

ii)

(a) Lens formula is,

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

$$\therefore \frac{1}{-60} - \frac{1}{-15} = \frac{1}{f}$$

$$\therefore \frac{1}{f} = \frac{1}{15} - \frac{1}{60} = \frac{3}{60}$$

$$\therefore f = 20 \text{ cm}$$

(b) For a lens, magnification is:

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

$$\therefore m = \frac{-60}{-15}$$

$$\therefore m = +4$$

(c) The nature of the image is erect, virtual and magnified.

iii)

(a) At noon, the sun is above our heads, so we get light rays directly from the sun without much scattering of any colour. Further, light must travel less depth of atmosphere; hence, the sky is seen as white.

(b) As light travels through the atmosphere, it gets scattered in different directions by the air molecules present in its path. Due to its short wavelength, the blue light is scattered more than the red light of long wavelength. Thus, the light reaching our eye directly from the sun is rich in red, while the light reaching our eye from all other directions is scattered blue. Therefore, the sky in a direction other than the sun's direction is seen as blue.

(c) On the moon, since there is no atmosphere, there is no scattering of sunlight on the moon's surface. Hence, to an observer on the surface of the moon (space), no light reaches the eye of the observer except the light directly from the sun. Thus, the sky will have no colour and will appear black to an observer on the moon's surface.

(d)

1. Yellow light has the highest wavelength out of the three radiations. Hence, it gets scattered the least.
2. Blue light has the lowest wavelength out of the three radiations. Hence, it gets scattered the most.

Solution 6

i)

(a) The force is multiplied by 3.

(b) Changes the direction of force.

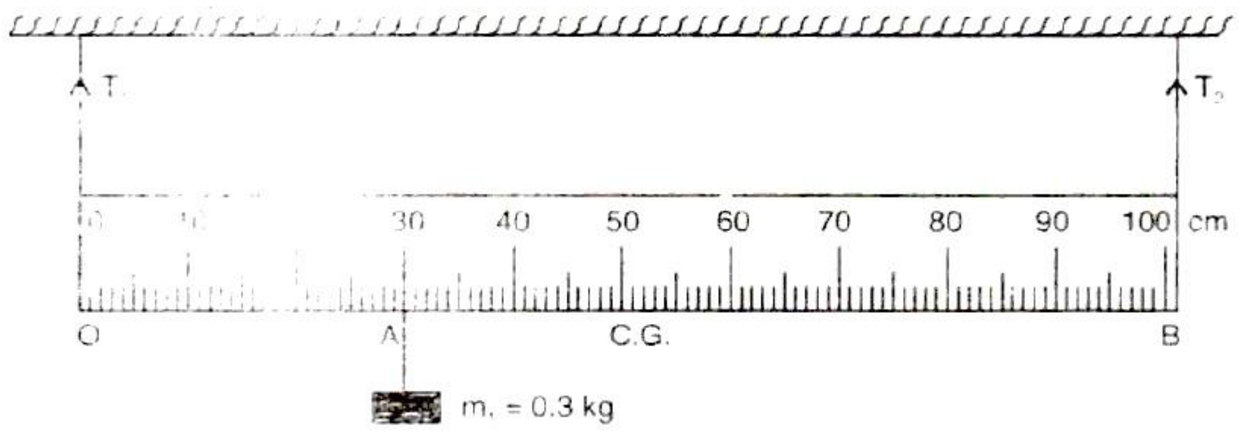
(c) Pulleys allow the length of wire to change with the temperature and simultaneously prevent sagging of the wire, maintaining constant tension in the wire.

ii)

Let the tensions in the string be T_1 and T_2, respectively.

Mass of the scale = 0.2 kg

Mass of suspended body m_1 = 0.3 kg



According to the principle of moments,

$T_1 + T_2 = m_1g + Mg$

$= (0.3 + 0.2)g$

$= 0.5 \times 10 = 5$ N

Taking moment about point O

$T_2 \times OB - (m_1g) \times OA - Mg \times OC = 0$

$T_2 \times 1\text{ m} - 0.3\text{ kg} \times 10\text{ m/s}^2 \times 0.3\text{ m} - 0.2\text{ kg} \times 10\text{ m/s}^2 \times 0.5\text{ m} = 0$

$T_2 - 0.9\text{ N} - 1\text{ N} = 0$

$T_2 = 1.9$ N

$T_1 + 1.9\text{ N} = 5$ N

or $T_1 = 3.1$ N

iii)

(a) No, the Steeper the inclined plane, the more effort is needed to push a load up the plane.

(b) The motion of a cyclist on a circular track is an example of motion in which speed remains uniform, but the velocity changes.

(c)

1) Now,

Force applied, $F = \frac{6.4\ kJ}{64\ m} = 100\ N$

2) $Power, P = \frac{W}{t} = \frac{6.4\ kJ}{2.5\ s} = 2560\ W$

i.e., $P = \frac{2560}{746} hp = 3.4\ hp$

Solution 7

i)

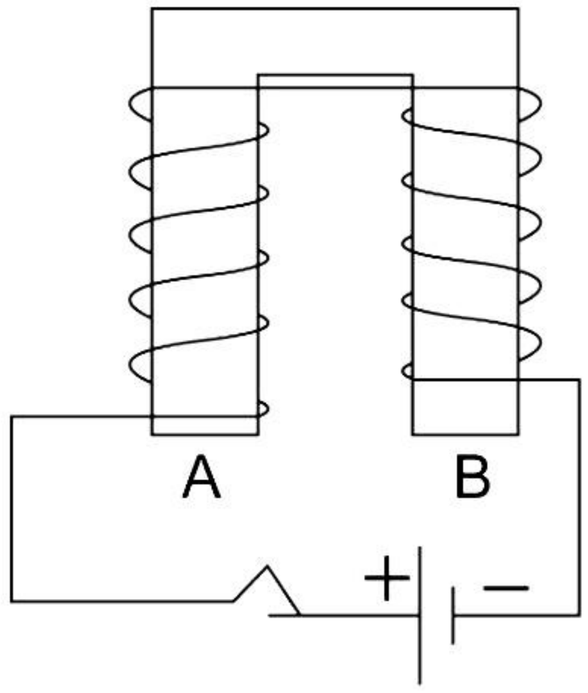


Diagram showing a coil wound around a U-shape soft iron bar AB.

(a) At A, current flows in the clockwise direction in the coil. Hence, by the clock rule, polarity induced at A is the South Pole.
At B, current flows in the anti-clockwise direction in the coil. Hence, by the clock rule, polarity induced at B is the North Pole.

(b) By increasing the current, the strength of the magnetic field intensity is increased.

(c) If the direction of current is reversed, then polarity at A is the North Pole and polarity at B is the South Pole.

ii) Let the specific heat of silver be L.

According to the question,

$160\ g \times L = 16800\ J$

$L = \frac{16800\ J}{160\ g} = 150\ J/g = 105000\ L/kg$

Heat given out by silver in cooling from 960° C to -40° C

$= 0.160\ kg \times 230\ J/kg\ °C \times (-10 - 960)\ °C$

$= -36800\ J$ (Here –ve sign shows that heat is released)

iii)

(a) Given that,

Heat energy, $Q = 500\ J$

Change in temperature, $\Delta t = 10\ K$

Mass of ball, $m = 0.1\ kg$

Now,

Specific heat capacity of iron ball, $c_1 = \frac{Q}{m\Delta t} \ldots (\because m_1 c_1 \Delta t)$

$\therefore c_1 = \frac{500}{0.1 \times 10} = 500\ J/kg\ K$

(b) Given that,

Mass of water, m = 1 kg

Specific heat capacity of water, c = 4200 J/kg K

Change in temperature, $\Delta t = 57 - 27 = 30°C$ or 30 K

Now,

Heat energy required, $Q = mc\Delta T$

$\therefore Q = 1 \times 4200 \times 30 = 1{,}26{,}000$ J

(c) The principle of method of mixture:

Heat energy lost by the hot body = Heat energy gained by the cold body.

(d) This principle is based on law of conservation of energy.

Solution 8

i)

(a)

$$\text{Current in the circuit} = \frac{12V}{10\Omega + \frac{6\Omega \times 3\Omega}{6\Omega + 3\Omega}} = \frac{12V}{10\Omega + 2\Omega} = 1A$$

Since the resistors in the parallel combination (3 ohm and 6 ohm) have values in the ratio 1:2,

1A current will be divided in the ratio of 2:1.

i.e., $\frac{2}{3}A, \frac{1}{3}A$ Current through 3 Ω resistor $= \frac{2}{3}A = 0.67A$

(b) Even though current flows opposite to the direction of flow of electrons, It is a scalar quantity because:

- Current in a circuit is added algebraically.
- Current remains same throughout the cross section of the wire, even if it varies.
- It does not obey the laws of vector addition.

ii)

(a) Electromotive force of a cell is defined as the maximum potential difference between the two electrodes of a cell when cell is an open circuit.

(b) Given that,

Resistance along CDE=10 Ω+5 Ω=15 Ω

Since CDE is parallel with 5 Ω resistance in CE

Therefore, combined resistance between C and E is given.

$$R = \frac{15\ \Omega \times 5\ \Omega}{15\ \Omega + 5\ \Omega} = \frac{75}{20}\ \Omega = 3.75\Omega$$

$$\text{Current } i_1 = \frac{V}{R} = \frac{6\ V}{13.75\ \Omega} = 0.44\ A$$

Since 15 Ω is parallel to 5 Ω

$$\therefore \quad i_3 = \frac{0.44 \times 5}{15 + 5} = 0.44 \times \frac{5}{20} = 0.11\ A$$

iii)

(a) Reverberation is the reflection of sound off of surfaces. It is the persistence of sound after the original sound is produced. Reverberation can be caused by reflections off of walls, floors, ceilings, and other objects in a room.

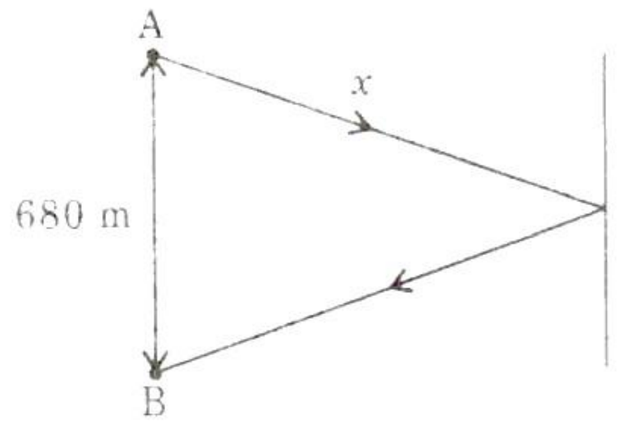
(b) The free vibrations of a body occur only in vacuum because the presence of medium offers some resistance due to which the amplitude of the vibration does not remain constant, but it continuously decreases.

(c)

Let A fires the shot,

Time taken by sound directly to reach B is

$$t_1 = \frac{d}{v} = \frac{680\ m}{340\ m/s} = 2\ s$$



Time for reflected sound,

$t_2 = t_1 + 3 = 2\ s + 3\ s = 5\ s$

But $t_2 = \frac{2x}{v}$

or $x = \frac{v\ t_2}{2} = \frac{340\ m/s \times 5\ s}{2} = 850\ m$

Solution 9

i) The sound heard on reflection from a distant obstacle (such as a cliff, a hillside etc.) after the original sound has ceased, is called an echo.

Given that,

The distance of the corridor, d = 86m

To hear the echo, sound has to travel twice the total distance of the corridor i.e. = 2d = 172 m

Since the fifth echo was heard at 2.5 sec, time of first echo = 2.5/5 = 0.5 sec

Speed of sound = total distance travelled/ time taken

= 172/0.5 = 344 m/s

ii)

(a) α - Particle is doubly ionized helium atom.

(b) Nuclear fusion is also known as thermo-nuclear reaction. This is because nuclear fusion takes place at very high temperature.

(c) Origins of background radiation:

1. Cosmic radiations
2. Radioactive rocks
3. Radioactive potassium and carbon in the body
4. X-rays from television screens

iii)

(a) The electric meter in a house measures the electrical energy consumed in kWh. Its value in S.I. unit is.1 kWh= 3.6×10^6J.

(b) Given that.

The Power consumed by 20 lamps, P = VI:

P = 20 × 60

P = 1200 W

Power consumed by 10 fans, P = VI:

P = 220 V × 0.5A × 10

P = 1100 W

Power consumed by electric kettle, $P = V^2/R$:

$P = (220)^2/110 = 44W$

Total power consumed = 1200 W+1100 W+44W

=2344 W =2.344 kW

Total power consumed in a month = 2.344 × 6 × 30 = 421.92

Total cost of the bill = 3.25 × 421.92 = Rs 1371.24/-