

ICSE Board 2010
CLASS X
PHYSICS

Maximum Marks: 80

Time: One hour and a half

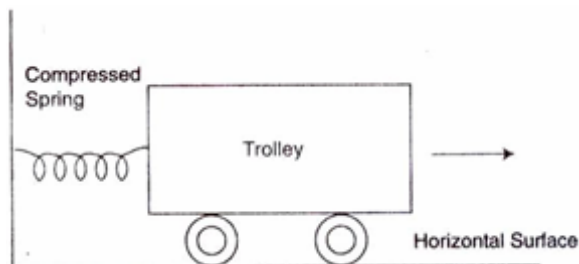
-
1. Answer to this Paper must be written on the paper provided separately.
 2. You will **not** be allowed to write during the first **15** minutes. This time is to be spent in reading the Question Paper.
 3. The time given at the head of this Paper is the time allowed for writing the answers.
 4. **Section I** is compulsory. Attempt **any four** questions from **Section II**.
 5. The intended marks for questions or parts of questions are given in brackets [].
-

SECTION-I (40 Marks)

(Attempt **all** questions from this Section)

Question 1.

- (a) Name the device used for measuring:
 - (i) mass
 - (ii) weight. [2]
- (b) A boy weighs 360 N on the earth : [2]
 - (i) What would be his approximate weight on the moon?
 - (ii) What is the reason for your answer?
- (c) A body is acted upon by a force. State two conditions under which the work done could be zero. [2]
- (d) A spring is kept compressed by a small trolley of mass 0.5 kg lying on a smooth horizontal surface as shown in the figure given below :



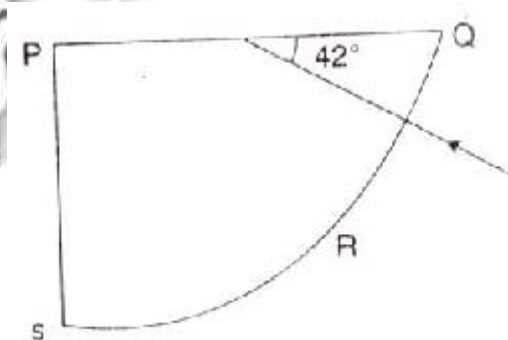
What potential energy did the spring possess when compressed? [2]

- (e) Name the subjective property :
(i) of sound related to its frequency.
(ii) of light related to its wavelength. [2]

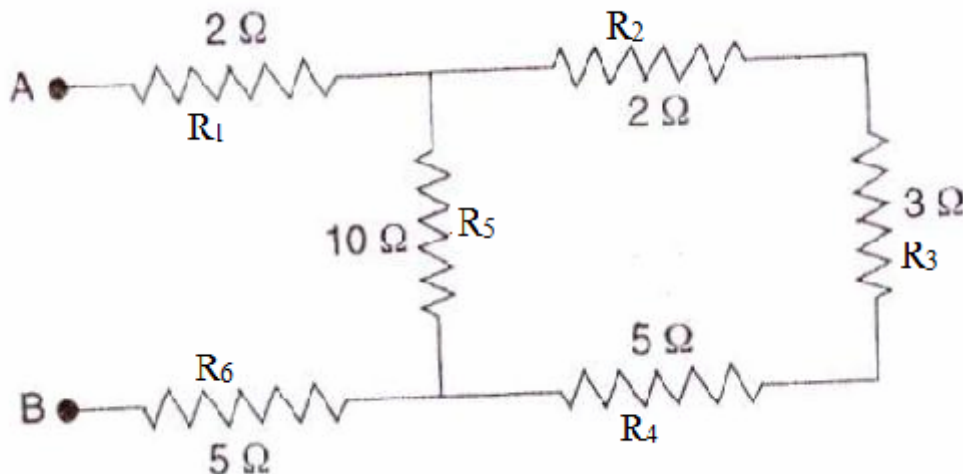
Question 2.

- (a) (i) Why is the mechanical advantage of a lever of the second order always greater than one?
(ii) Name the type of single pulley that has a mechanical advantage greater than one? [2]
- (b) (i) What is meant by refraction of light?
(ii) What is the cause of refraction of light? [2]
- (c) 'The refractive index of diamond is 2.42'.
What is meant by this statement? [2]
- (d) We can burn a piece of paper by focusing the sun rays by using a particular type of lens.
(i) Name the type of lens used for the above purpose.
(ii) Draw a ray diagram to support your answer. [2]
- (e) A ray of light enters a glass slab PQRS, as shown in the diagram. The critical angle of the glass is 42° . Copy this diagram and complete the path of the ray till it emerges from the glass slab.

Mark the angles in the diagram wherever necessary. [2]



- (a) State two differences between light waves and sound waves. [2]
- (b) Two waves of the same pitch have their amplitudes in the ratio 2:3.
 (i) What will be the ratio of their loudness?
 (ii) What will be the ratio of their frequencies? [2]
- (c) Give two differences between a d.c. motor and an a.c. generator. [2]
- (d) Six resistances are connected together as shown in the figure. Calculate the equivalent resistance between the points A and B. [2]

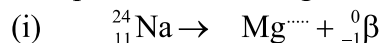


- (e) (i) Which part of an electrical appliance is earthed ?
 (ii) State a relation between electrical power, resistance and potential difference in an electrical circuit. [2]

Question 4.

- (a) A device is used to transform 12V a.c. to 200 V a.c.
 (i) What is the name of this device ?
 (ii) Name the principle on which it works. [2]
- (b) (i) Which material is the calorimeter commonly made of ?
 (ii) Give one reason for using this material. [2]
- (c) (i) Name a metal that is used as an electron emitter.

(d) Complete the following nuclear changes:



- (e) (i) Which radiation produces maximum biological damage ?
(ii) What happens to the atomic number of an element when the radiation named by you in part (i) above, are emitted? [2]

Section-II (40 Marks)

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

Question 5.

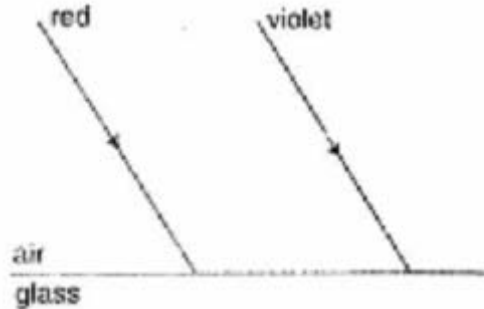
- (a) (i) Define the term momentum.
(ii) How is force related to the momentum of a body?
(iii) State the condition when the change in momentum of a body depends only on the change in its velocity. [3]
- (b) A body of mass 50 kg has a momentum of 3000 kg ms⁻¹. Calculate:
(i) the kinetic energy of the body.
(ii) the velocity of the body. [3]
- (c) (i) Write a relation expressing mechanical advantage of a lever?
(ii) Write an expression for the mechanical advantage of an inclined plane.
(iii) Give two reasons as to why the efficiency of a single movable pulley system is always less than 100%. [4]

Question 6.

- (a) A stick partly immersed in water appears to be bent. Draw a ray diagram to show the bending of the stick when placed in water and viewed obliquely from above. [3]
- (b) A ray of monochromatic light is incident from air on a glass slab:
(i) Draw a labelled ray diagram showing the change in the path of the ray till it emerges from the glass slab.
(ii) Name the two rays that are parallel to each other.
(iii) Mark the lateral displacement in your diagram. [3]
- (c) An erect, magnified and virtual image is formed, when an object is placed between the optical centre and principal focus of a lens.
(i) Name the lens.
(ii) Draw a ray diagram to show the formation of the image with the above stated characteristics. [4]

Question 7.

- (a) Two parallel rays of Red and Violet travelling through air, meet the air-glass boundary as shown in the above figure:
- (i) Will their paths inside the glass be parallel?
Give a reason for your answer.
- (ii) Compare the speeds of the two rays inside the glass. [3]



- (b) (i) A man stands at a distance of 68 m from a cliff and fires a gun. After what time interval will he hear the echo, if the speed of sound in air is 340 ms^{-1} ?
- (ii) If the man had been standing at a distance of 12 m from the cliff would he have heard a clear echo? [3]
- (c) (i) In what unit does the domestic electric meter measure the electrical energy consumed? State the value of this unit in S.I. Unit.
- (ii) Why should switches always be connected to the live wire?
- (iii) Give one precaution that should be taken while handling switches. [4]

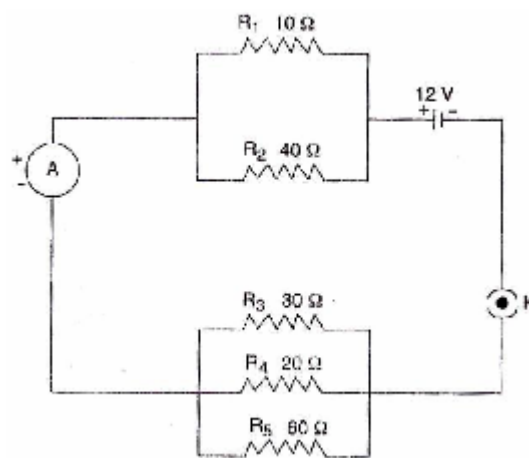
Question 8.

- (a) Calculate the quantity of heat that will be produced in a coil of resistance 75Ω if a current of 2A is passed through it for 2 minutes. [3]
- (b) (i) A substance has nearly zero resistance at a temperature of 1K. What is such a substance called?
- (ii) State any two factors which affect the resistance of a metallic wire. [3]

(c) Five resistors of different resistances are connected together as shown in the figure. A 12 V battery is connected to the arrangement. Calculate:

- (i) the total resistance in the circuit.
- (ii) the total current flowing in the circuit.

[4]



Question 9.

- (a)
 - (i) Define the term 'specific latent heat of fusion' of a substance.
 - (ii) Name the liquid which has the highest specific heat capacity.
 - (iii) Name two factors on which the heat absorbed or given out by a body depends.
- (b)
 - (i) An equal quantity of heat is supplied to two substances A and B. The substance A shows a greater rise in temperature. What can you say about the heat capacity of A as compared to that of B?
 - (ii) What energy change would you expect to take place in the molecules of a substance when it undergoes:
 - 1. a change in its temperature ?
 - 2. a change in its state without any change in its temperature?
- (c) 50 g of ice at 0°C is added to 300 g of a liquid at 30°C. What will be the final temperature of the mixture when all the ice has melted ? The specific heat capacity of the liquid is $2.65 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$ while that of water is $4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$. Specific latent heat of fusion of ice = 336 J g^{-1} .

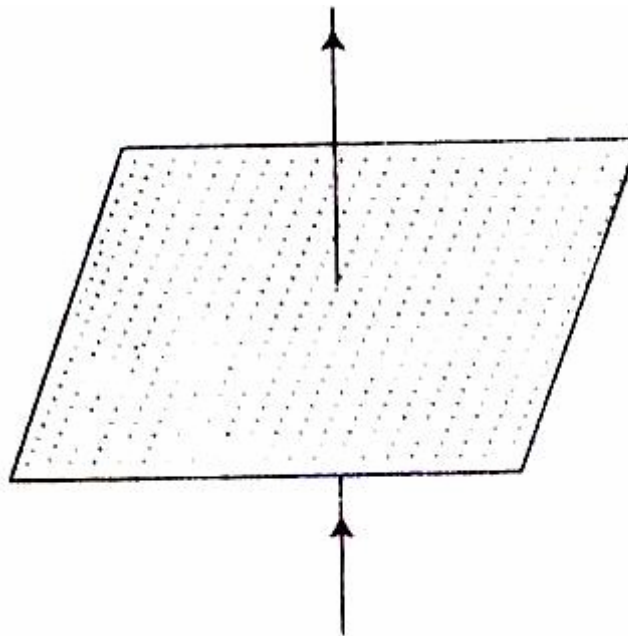
[4]

Question 10.

- (a)
 - (i) Name the radioactive radiations which have the least penetrating power.
 - (ii) Give one use of radio isotopes.
 - (iii) What is meant by background radiation ?

[3] www.examrace.com

- (b) (i) A straight wire conductor passes vertically through a piece of cardboard sprinkled with iron filings. Copy the diagram and show the setting of iron filings when a current is passed through the wire in the upward direction and the cardboard is tapped gently. Draw arrows to represent the direction of the magnetic field lines. [3]



- (ii) Name the law which helped you to find the direction of the magnetic field lines.
- (c) (i) State two ways by which the magnetic field of a solenoid can be made stronger.
- (ii) What material is used for making the armature of an electric bell? Give a reason for using this material. [4]

ICSE Board 2010
CLASS X
PHYSICS

Maximum Marks: 80

Time: One hour and a half

-
1. Answer to this Paper must be written on the paper provided separately.
 2. You will **not** be allowed to write during the first **15** minutes. This time is to be spent in reading the Question Paper.
 3. The time given at the head of this Paper is the time allowed for writing the answers.
 4. **Section I** is compulsory. Attempt **any four** questions from **Section II**.
 5. The intended marks for questions or parts of questions are given in brackets [].
-

SECTION-I (40 Marks)

(Attempt **all** questions from this Section)

Answer 1.

- (a) Answer is not given due to change in the present syllabus.
- (b) Answer is not given due to change in the present syllabus.
- (c) Two conditions under which the work done is zero :
 - (i) when displacement = 0
 - (ii) when displacement is normal to the direction of force applied.
- (d) **Given :** $m = 0.5 \text{ kg}$, $v = 2 \text{ ms}^{-1}$
By law of conservation of energy P.E = K.E
$$U = \frac{1}{2}mv^2$$
$$= \frac{1}{2} \times 0.5 \times 2^2$$
$$= 1 \text{ Joule}$$
- (e)
 - (i) The subjective property of sound related to its frequency is pitch.
 - (ii) The subjective property of light related to its wavelength is colour.

Answer 2.

- (a)
 - (i) The mechanical advantage of a lever of the second order is

always greater than one because its effort arm is always longer than the load arm.

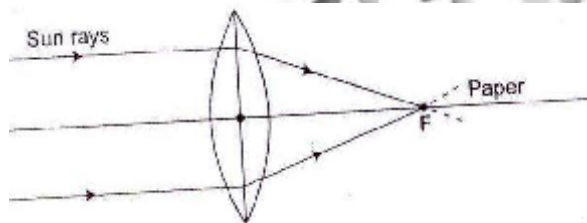
- (ii) Single movable pulley has a mechanical advantage greater than one.

- (b) (i) **Refraction of light** : The phenomenon in which a ray of light deviates from its original path while traveling from one optical medium is called refraction of light.

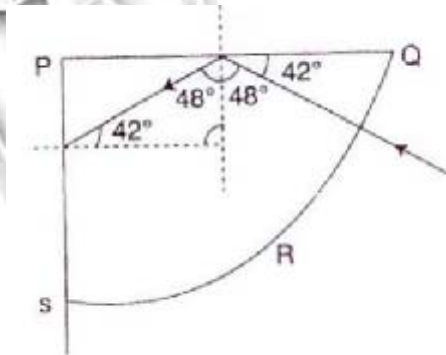
(ii) **Cause of refraction** : Speed of light changes as it passes from one medium to another medium.

- (c) The refractive index of diamond with respect to air is 2.42 and light travels in air 2.42 times faster than in diamond.

- (d) (i) Convex lens.
(ii) Ray diagram



- (e) Diagram



Answer 3.

- (a) Two differences between light waves and sound waves.

Light waves	Sound waves
-------------	-------------

(i) Light waves do not require a medium for propagation.

(ii) Light waves travel with a speed of 3×10^8 m/s.

(i) Sound waves require a medium for propagation.

(ii) Sound waves travel with a speed of 332 m/s.

(b) (i) $a_1 : a_2 = 2 : 3$

$$\therefore I \propto a^2$$

$$\frac{I_1}{I_2} = \frac{a_1^2}{a_2^2} = \frac{2^2}{3^2} = \frac{4}{9}$$

$$\Rightarrow I_1 : I_2 = 4 : 9$$

(i) Ratio of frequencies = 1 : 1

(c) Two differences between d.c. motor and a.c. generator are given below:

D.C. Motor	A.C. Generator
(i) It is a device which converts electrical energy into mechanical energy.	(i) It is a device which converts mechanical energy into electrical energy.
(ii) It works on the principle of force acting on a current carrying conductor placed in a magnetic field.	(ii) It works on the principle of electromagnetic induction.

(d) The resistors R_2 , R_3 and R_4 are in series.

$$\begin{aligned} \therefore R' &= R_2 + R_3 + R_4 \\ &= 2 + 3 + 5 = 10 \Omega \end{aligned}$$

Now R' and R_5 are in parallel.

$$\begin{aligned} \frac{1}{R''} &= \frac{1}{R'} + \frac{1}{R_5} \\ &= \frac{1}{10} + \frac{1}{10} = \frac{2}{10} = \frac{1}{5} \\ \therefore R'' &= 5 \Omega \end{aligned}$$

Now R_1 , R'' and R_6 are in series between the points A and B. The equivalent resistance between A and B is

$$\begin{aligned} R &= R_1 + R'' + R_6 \\ &= 2 + 5 + 5 = 12 \Omega \end{aligned}$$

- (e) (i) Metal body of an electrical appliance is earthed.
(ii) In an electrical circuit, electrical power

$$P = \frac{V^2}{R}$$

where V = potential difference and R = resistance.

Answer 4.

- (a) (i) Step-up transformer
(ii) Step-up transformer works on the principle of electromagnetic induction.
- (b) (i) Copper
(ii) It is good conductor of heat.
- (c) (i) Thoriated tungsten (tungsten coated with carbon and thorium) is used as an electron emitter.
(ii) Thoriated tungsten is used since it has a work function of only 2.6eV and it needs to be heated to only 2000K to emit electrons.
- (d) (i) ${}_{11}^{24}\text{Na} \rightarrow {}_{12}^{24}\text{Mg} + {}_{-1}^0\beta$
(ii) ${}_{92}^{238}\text{U} \rightarrow {}_{90}^{234}\text{Th} + {}_2^4\text{He} + \text{Energy}$
- (e) (i) Gamma radiation produces maximum biological damage.
(ii) No change in the atomic number of an element when the gamma radiations are emitted.

Section-II (40 Marks)

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

Answer 5.

- (a) (i) The momentum of a body is the product of the mass of the body and its velocity. i.e. $p=mv$
(ii) Force is equal to the rate of change of momentum.
(iii) If mass of the body m remains constant then the change in momentum of the body depends only on the change in its velocity.
- (b) (i) $m=50 \text{ kg}$, $p=3000 \text{ kg ms}^{-1}$

$$\therefore v = \frac{p}{m} = \frac{3000}{50} = 60 \text{ ms}^{-1}$$

$$\text{Kinetic energy of the body} = \frac{1}{2}mv^2$$

$$= \frac{1}{2} \times 50 \times (60)^2 = 25 \times 3600$$

$$= 90000 \text{ J}$$

(ii) Velocity of the body $v = 60 \text{ ms}^{-1}$.

(c) (i) Mechanical advantage of a lever = $\frac{\text{Effort arm}}{\text{Load arm}}$

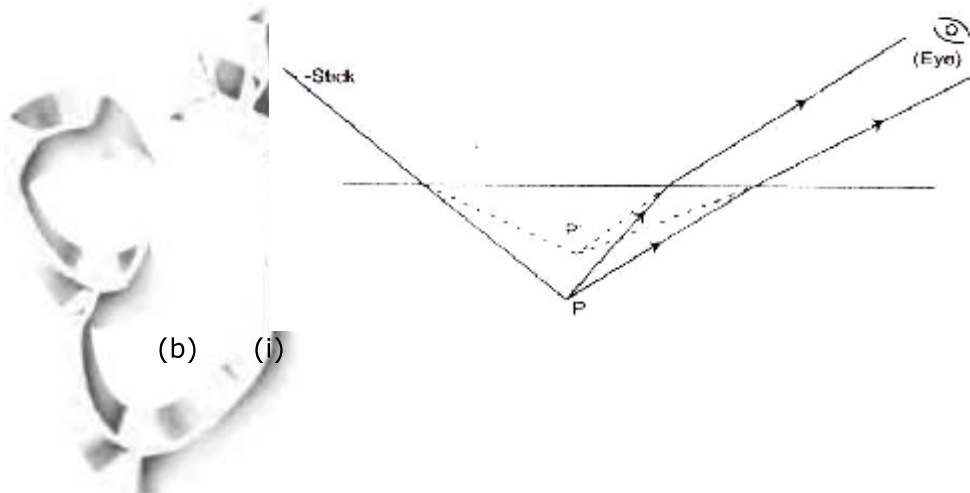
(ii) Mechanical advantage of an inclined plane = $\frac{\text{Load}}{\text{Effort}} = \frac{L}{L \sin \theta} = \frac{1}{\sin \theta}$

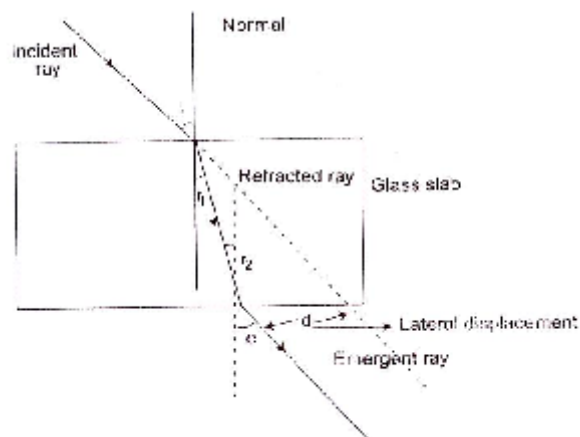
where θ is the angle which inclined plane makes with the horizontal.

(iii) The efficiency of a single movable pulley system is always less than 100% because of friction of the pulley, bearing or at axle and also the weight of the pulley.

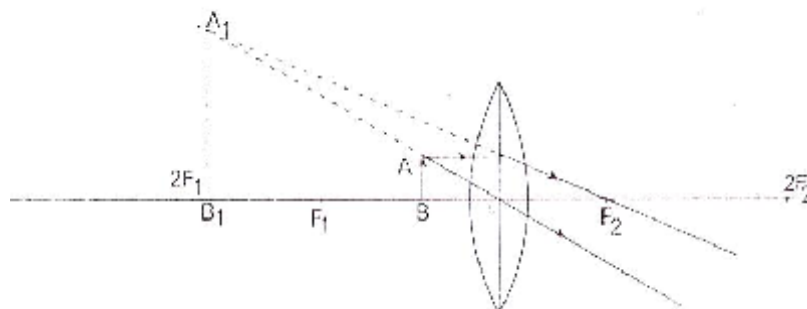
Answer 6.

(a)





- (ii) Incident ray and emergent rays are parallel to each other.
 (iii) Lateral displacement is marked by d in the diagram.
- (c) (i) The lens is convex.
 (ii)



Answer 7.

- (a) (i) No.

Reason : Deviation suffered by each ray will be different because refractive index is different for different colours of light.

- (ii) Speed of red and violet light inside the glass = 1:1

- (b) (i) $d=68$, $v=340 \text{ ms}^{-1}$.

$$\therefore \text{time taken} = \frac{\text{total distance}}{\text{speed}}$$

$$= \frac{68}{340} = \frac{1}{5}$$

$$= 0.2\text{s (second)}$$

So echo is heard after $2t$ i.e

$$0.2 \times 2 = 0.4 \text{ sec.}$$

- (ii) If man had been standing at a distance 12m then

$$t = \frac{2d}{v} = \frac{2 \times 12}{340}$$

$$= \frac{24}{340}$$

$$= 0.07 \text{ s}$$

which is less than 0.1 s.

Hence man cannot hear a clear echo.

- (c) (i) The domestic electric meter measures the electrical consumption in kilowatt-hour (kWh).

$$1 \text{ kWh} = 1 \text{ kilowatt} \times 1 \text{ hour}$$

$$= 1000 \text{ Js}^{-1} \times 60 \times 60$$

$$= 3.6 \times 10^6 \text{ J in S.I. unit.}$$

- (ii) The switch should always be connected to the live wire, so that current is cut off to that appliance to which it is connected.
- (iii) A switch should not be touched with wet hands.

Answer 8.

(a) $R=75\Omega$, $i= 2\text{A}$, $t= 2 \text{ minutes}$

$$= 2 \times 60 \text{ s}$$

$$= 120\text{s}$$

Heat energy produced in the coil

$$H = i^2 R t$$

$$= 2^2 \times 75 \times 120$$

$$= 300 \times 120 = 36000 \text{ J}$$

- (b) (i) Super conductor.
- (ii) Length of wire and area of cross section of wire.
- (c) (i) From figure, R_1 and R_2 are parallel.

$$\therefore \frac{1}{R'} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$= \frac{1}{10} + \frac{1}{40} = \frac{5}{40} = \frac{1}{8}$$

$$\therefore R' = 8\Omega$$

R_3, R_4 and R_5 are also parallel,

$$\therefore \frac{1}{R''} = \frac{1}{R_3} + \frac{1}{R_4} + \frac{1}{R_5}$$

$$= \frac{1}{30} + \frac{1}{20} + \frac{1}{60} = \frac{6}{60} = \frac{1}{10}$$

$$\therefore R'' = 10\Omega$$

$\therefore$ Total resistance in the circuit

$$= R' + R''$$

$$= 8 + 10 = 18\Omega$$

(ii) $V = 12$ volt.

$\therefore$ Total current flowing in the circuit

$$= \frac{V}{R}$$

$$= \frac{12}{18} = \frac{2}{3} = 0.667 \text{ A.}$$

Answer 9.

- (a) (i) **Specific latent heat of fusion:** The specific latent heat of fusion of a Substance is the heat energy released when a unit mass of substances converts from liquid to solid state without the change in temperature.
 (ii) Water has the highest specific heat capacity.
 (iii) The mass and specific heat capacity are two factors on which the heat absorbed or given out by a body depends.

- (b) (i) Heat capacity of substance B is more than substance A.
 (ii) (1) The energy of the molecules increases with the increase in temperature.
 (2) Depending upon the state to which the matter is changing, the energy of the molecules will increase or decrease, i.e. if a solid changes into liquid without the change in temperature, the energy would increase and vice versa.

- (c) $m_1 = 50 \text{ g}$, $t_1 = 0^\circ\text{C}$, $m_2 = 300 \text{ g}$, $t_2 = 30^\circ\text{C}$.
 Heat energy taken by ice to melt = $50 \times 336 \text{ J}$
 $= 16800 \text{ J}$

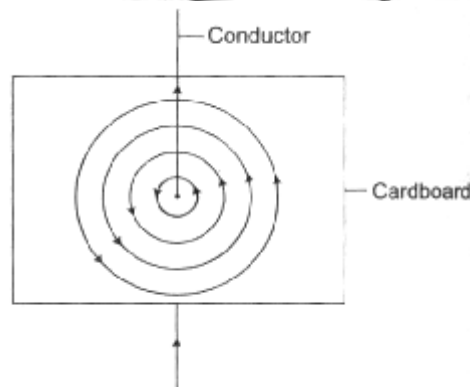
$$\begin{aligned}
 & \text{Heat energy given by liquid} = \text{Heat taken by water} \\
 & \Rightarrow 300 \times 2.65 \times (30-t) = 16800 + 50 \times t \times 4.2 \\
 & \Rightarrow 23850 - 795 t = 16800 + 210 t \\
 & \Rightarrow -795 t - 210 t = 16800 - 23850 \\
 & \Rightarrow -1005 t = -7050 \\
 & \Rightarrow t = \frac{7050}{1005} = 7.014^{\circ}\text{C}
 \end{aligned}$$

Answer 10.

- (a) (i) α -radiations have the least penetrating power.
 (ii) Radio isotopes are used to cure many diseases such as leukaemia, cancer etc. by radiation therapy.
- (iii) Background radiations are the radioactive radiations to which we all are exposed even in the absence of an actual visible radioactive source. Its total dose is not very large, so it does not cause any serious biological damage to us.

(b)

(i)



(ii) Right hand thumb rule helped to find the direction of magnetic field lines.

(c) (1) (i) By increasing current.

(ii) By increasing no. of turns.

(ii) A soft iron metal piece is used for making the armature of an electric bell.

Reason : Soft iron can be easily magnetised.