ICSE 2024 EXAMINATION

PHYSICS

SAMPLE PAPER - 5

Time Allowed : 2 hours *Max. Marks : 80*

Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during first 15 minutes.
This time is to be spent in reading the question paper.
The time given at the head of this Paper is the time allowed for writing the answers.
Section A is compulsory. Attempt any four questions from Section B.
The intended marks for questions or parts of questions are given in brackets [ ].

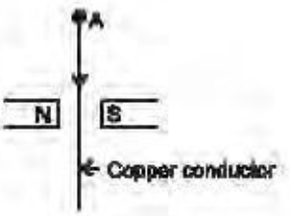
SECTION - A (40 Marks)

(Attempt *all* questions from this Section)

Question 1 : Choose the correct answers to the questions from the given options: [15]

(i) When an electric bulb is switched ON the electric energy
- (a) directly changes to light energy
- (b) first changes to light energy and then changes to heat energy
- (c) first changes to heat energy and then to light energy
- (d) none of the above.

(ii) A copper conductor pivoted at A is placed between pole pieces of a strong magnet as shown in diagram, and the direction of current in it is shown by arrow head. The direction in which conductor moves is:



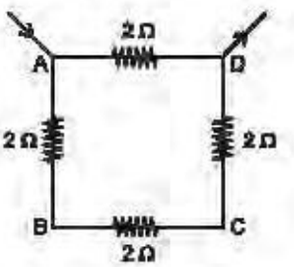
- (a) out of plane of paper
- (b) into the plane of paper
- (c) conductor does not move
- (d) none of these.

(iii) A radioactive nuclei ejects a charged particle and changes into another radioactive nuclei as shown by nuclear equation.

$$ {}_{z}X^{A} \xrightarrow{\text{- charged particle}} {}_{z-2}X^{A-4}_{1} $$

The charged particle given by ${}_{z}X^{A}$ is:
- (a) a proton
- (b) an electron
- (c) helium nuclei
- (d) a positron

(iv) The equivalent resistance of the resistor connected in the form of rectangle is:



- (a) 1.5 Ω
- (b) 3 Ω
- (c) 4 Ω
- (d) 2.5 Ω

(v) When a copper conductor gets heated up on the passage of electric current there is a change in its resistance and specific resistance
- (a) The resistance of conductor increases, but there is no change in sp. resistance.
- (b) The resistance of conductor increases, but sp. resistance of conductor decreases.
- (c) The resistance of conductor decreases, but sp. resistance of conductor increases
- (d) The resistance of conductor as well as its sp. resistance increases.

(vi) The C.G. of a triangular lamina is:
- (a) at the intersection of its medians
- (b) at the intersection of its right bisectors

(c) at the intersection of perpendicular drawn from its vertices

(d) none of these.

(vii) When the ray of light travelling in a denser medium to a rarer medium is reflected back into the denser medium at the surface of separation the phenomenon which takes place is called:

(a) refraction (b) dispersion (c) total internal refection (d) reflection.

(viii) The unit of work in terms of mass, length and time is:

(a) kg ms^{-1} (b) kgm^2s^{-2} (c) kgm^2s^{-3} (d) $kgm^{-2}s^2$

(ix) The mathematical relation between momentum (p) and kinetic energy (K.E) is:

(a) $p = \sqrt{mK.E}$ (b) $p = \sqrt{2mK.E}$ (c) $p = \sqrt{\frac{m}{2}K.E}$ (d) $p = \sqrt{\frac{K.E}{2m}}$

(x) One kilowatt hour of electric energy is equal to:

(a) 6.3 kJ (b) 6.3 MJ (c) 3.6 kJ (d) 3.6 MJ

(xi) An optical material which always forms a virtual, erect image, such that it is always of the same size as the size of object is:

(a) convex lens (b) concave lens (c) convex mirror (d) plane mirror

(xii) Sound vibrations which can be used for welding metals having high melting point are:

(a) Infrasonic vibrations (b) sonic vibrations (c) ultrasonic vibrations (d) ultraviolet vibrations

(xiii) Materials A (sp. heat capacity $0.21Jg^{-1}C^{-1}$) and a material B (sp. heat capacity 2.7 $Jg^{-1}°C^{-1}$) and at same temperature and of same mass are placed in bright sunlight for one hour. The material which show higher rise in temperature is:

(a) A (b) B (c) both are at same temp. (d) none of these

(xiv) A force of 50 N causes a displacement of 20 m of a body. The energy spent is equal to:

(a) 1100 J (b) 1000 J (c) 900 J (d) 500 J

(xv) A pulley system has 5 pulleys in all. The actual mechanical advantage of this system is:

(a) 5 (b) more than 5 (c) less than 5 (d) none of these

ANSWERS

(i) (c) **(ii)** (a) **(iii)** (c) **(iv)** (a) **(v)** (d) **(vi)** (a) **(vii)** (c) **(viii)** (b) **(ix)** (b) **(x)** (d)
(xi) (d) **(xii)** (c) **(xiii)** (a) **(xiv)** (b) **(xv)** (c)

Question 2

(i) (a) Give two properties common to all electromagnetic waves. [3]

(b) Give one use of infrared radiation.

(ii) Draw a labelled circuit diagram for the verification of Ohm's law. [2]

(iii) A metal ball of mass 60 g falls on a concrete floor from a vertical height of 2.8 m and rebounds to a height of 1.5 m. Find the change in kinetic energy in SI units. [g = $10ms^{-2}$] [2]

(iv) Explain, why is single fixed pulley used despite no gain in mechanical advantage. [2]

(v) (a) How is the e.m.f. across primary and secondary coils of a transformer related with the number of turns of coil in them? [2]

(b) On which type of current do transformers work?

(vi) (a) Name a nuclear radiation which on accepting two electrons change to helium gas. [2]

(b) State one property of the above radiation.

(vii) Two bulbs P ond Q are rated 40W-220V and 60W-220V are connected in parallel combination to a 220V supply. Calculate the current drawn by the bulbs from supply line. [2]

Question 3

(i) (a) With reference to terms mechanical advantage, velocity ratio and efficiency of machine, name the term which will not change for a machine of a given design. [2]

(b) Define the term stated by you in (a) above.

(ii) (a) Why is white light considered polychromatic in nature? [2]

(b) Give the range of wavelength of electromagnetic waves which are visible to us.

(iii) An ultrasonic wave is sent from a ship towards the bottom of sea. It is found that time interval between sending and receiving of the wave is 2.5 seconds. Calculate the depth of sea, if the velocity of sound is $1400\,ms^{-1}$ in water. [2]

(iv) A ray of light strikes the surface of a rectangular glass block such that the angle of incidence is (a) zero degree (b) 42 degree. Sketch a diagram to show approximate path taken by the ray in each case as it passes through glass block and emerges from it. [2]

(v) (a) What name is given to atoms of a substance which have same atomic number, but different mass number? [2]

(b) What is the difference in atomic structure of these atoms?

SECTION - B (40 Marks)

(Attempt *any four* questions from this Section)

Question 4

(i) 6.4 kJ of energy causes a displacement of 64 m in a body in the direction of force in 2.5 s. Calculate: [3]

(a) force applied on the body.

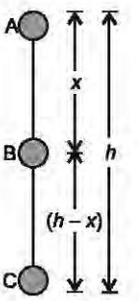
(b) power acting on body in horse power [Take 1 HP = 746 W]

(ii) A pulley system consists of two pulleys, one fixed and the other movable. [3]

(a) Draw the labelled diagram of the arrangement and show clearly all the forces acting on it.

(b) What change can be made in the movable pulley of this system to increase the mechanical advantage of system?

(iii) An object of mass '*m*' is allowed to fall freely from point A as shown in the figure alongside. Calculate the total energy possessed by the object at: [4]



(a) Point A.

(b) Point B

(c) Point C

(d) Which physical law is verified by your calculations in parts (a), (b) and (c)?

Question 5

(i) State in brief, the meaning of each of the following: [3]

(a) Heat capacity of a body is $50\,J°C^{-1}$.

(b) The specific latent of fusion of ice is $336000\,Jkg^{-1}$.

(c) The specific heat capacity of copper is $0.4\,Jg^{-1}°C^{-1}$.

(ii) (a) What is the principle of method of mixtures? [2]

(b) Name and state the law on which this principle is based.

(iii) 150 g of water is contained in a vessel of mass 100 g and at 30°C. Into the vessel is placed 'W' mass of ice at 0°C, such that temperature of mixture drops to 5°C, when all ice melts. If sp. heat capacity of water and vessel are $4.2\,Jg^{-1}°C^{-1}$ and $0.4Jg^{-1}°C^{-1}$ respectively and sp. latent heat of ice is $336Jg^{-1}$ calculate: [5]

(a) Heat energy given out by water at 30°C.

(b) Heat energy given out by vessel at 30°C.

(c) Heat energy absorbed by ice to form water at 5°C.

(d) Total heat energy given out by water and vessel.

(e) The mass W of the ice.

$$\therefore W = \frac{16750}{357}\ g \simeq \mathbf{47.0\ g}$$

Question 6

(i) The ore of Uranium found in nature contains $_{92}U^{238}$ and $_{92}U^{235}$. Although both the isotopes are fissionable, it is found out experimentally that one of the two isotopes is more easily fissionable. [3]

(a) Name the isotope of Uranium which is easily fissionable.

(b) Give a reason for your answer.

(c) Write a nuclear reaction when Uranium 238 emits an alpha particle to form a Thorium (Th) nucleus.

(ii) (a) Name the characteristic of sound which enables a person to differentiate between two sounds with equal loudness, but having different frequencies. [3]

(b) Define the characteristic named by you in (ii) (a).

(c) Name the characteristic of sound which enables a person to differentiate between two sounds of same loudness and same frequency, but produced by different musical instruments.

(iii) (a) A person is tuning his radio set at a particular station. What is person trying to do to tune it? [4]

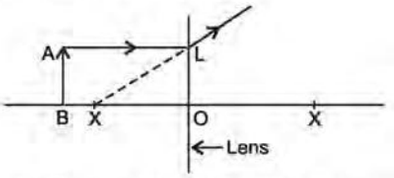
(b) Name the phenomenon involved in tuning radio-set.

(c) Define the phenomenon named by you in part (iii) (b).

Question 7

(i) How does the value of angle of deviation produced by a prism change with an increase in the value of (a) angle incidence (b) wavelength of light? [3]

(ii) [4]



(a) Copy and complete the diagram.

(b) What is name given to the lens?

(iii) (a) State two conditions for total internal reflection. [3]

(b) Fill in the blank space:

The perpendicular shift in the path of incident ray while emerging out from a denser medium is called _____.

Question 8

(i) (a) Define volt. [4]

(b) State two factors which determine the resistance of a conductor.

(c) How does the resistance of ionic compounds change with the rise in temperature?

(ii) Two cells of e.m.f. 1.5 V and internal resistance of 1.5 Ω each are connected in parallel. The arrangment is connected to 2.5 Ω resistor. [3]

(a) Draw circuit diagram of arrangement.

(b) Calculate current flowing through 2.5 Ω resistor.

(iii) (a) What do you understand by the term electric power? [3]

(b) A current of 5 A is flowing through the filament of a bulb of resistance 4 Ω. Calculate electric power of the bulb.

(c) If the current flows for 1 minute in (iii (b)), calculate the electric energy expended by the bulb.

Question 9

(i) (a) Draw a neat labelled diagram of a d.c. motor. [3]

(b) Write any one use of a d.c. motor.

(ii) (a) What do you understand by the term radioactivity? [3]

(b) Fill in the blank spaces:

When a radioactive nucleus ejects an .....(1)..... particle, its mass number decreases by .....(2)..... a.m.u. and atomic number by 2 amu.

(iii) A radioactive nucleus can emit three types of radiation. [4]

(a) Name all the three types of radiation.

(b) Name the radiation which is most penetrating.

(c) Name the radiation which is electromagnetic in nature.

(d) Name the radiation which has largest mass.

❖ ❖ ❖

SOLUTION

Time Allowed : 2 hours *Max. Marks* : **80**

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SECTION - A (40 Marks)
(Attempt *all* questions from this Section)

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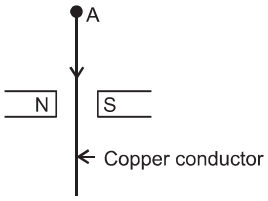

(a) out of plane of paper (b) into the plane of paper
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(iii) A radioactive nuclei ejects a charged particle and changes into another radioactive nuclei as shown by nuclear equation.

$$ {}_{z}X^{A} \xrightarrow[\text{particle}]{-\text{ charged}} {}_{z-2}X_{1}^{A-4} $$

The charged particle given by ${}_{z}X^{A}$ is:
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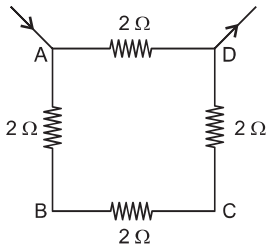

(a) 1.5 Ω (b) 3 Ω
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ANSWERS

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Question 2

(i) (a) Give two properties common to all electromagnetic waves. [3]

(b) Give one use of infrared radiation.

(ii) Draw a labelled circuit diagram for the verification of Ohm's law. [2]

(iii) A metal ball of mass 60 g falls on a concrete floor from a vertical height of 2.8 m and rebounds to a height of 1.5 m. Find the change in kinetic energy in SI units. [g = $10\,ms^{-2}$] [2]

(iv) Explain, why is single fixed pulley used despite no gain in mechanical advantage. [2]

(v) (a) How is the e.m.f. across primary and secondary coils of a transformer related with the number of turns of coil in them? [2]

(b) On which type of current do transformers work?

(vi) (a) Name a nuclear radiation which on accepting two electrons change to helium gas. [2]

(b) State one property of the above radiation.

(vii) Two bulbs P ond Q are rated 40 W - 220 V and 60 W - 220 V are connected in parallel combination to a 220 V supply. Calculate the current drawn by the bulbs from supply line. [2]

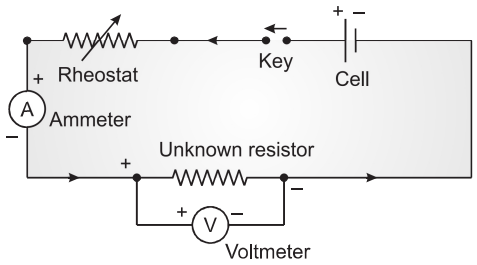
Solution :

(i) (a) 1. Electromagnetic waves remain unaffected by strong electric or magnetic fields.
2. All electromagnetic waves travel in vacuum or air with a speed of $3 \times 10^8\ ms^{-1}$.

(b) Infrared rays causing heat effect and hence used by doctors to relieve the joint pain of the patients.

(ii)

Circuit diagram for the verification of Ohm's law



(iii) Change in K.E = change in P.E = mg (2·8 – 1·5)

$$= \frac{60}{1000} \text{ kg} \times 10 \text{ ms}^{-2} \times 1{\cdot}3 \text{ m} = \mathbf{0{\cdot}780\ J}$$

(iv) 1. It is always easier to apply effort in downward direction rather than upward direction. Single fixed pulley helps in changing the direction of effort.

2. One can use his body weight while working on this pulley.

(v) (a) $\frac{\text{The e.m.f. across the primary coil}}{\text{The e.m.f. across the secondary coil}} = \frac{\text{The number of turns in the primary coil}}{\text{The number of turns in the secondary coil}}$.

(b) Transformer works on an alternating current.

(vi) (a) Alpha radiation on accepting 2 electrons change into helium gas.

(b) Alpha radiation deflected towards the negatively charged plate.

(vii) Current in P, $(I_1) = \frac{P}{V} = \frac{40}{220} = \frac{2}{11}A$

Current in Q, $(I_2) = \frac{P}{V} = \frac{60}{220} = \frac{3}{11}A$

$\therefore$ Total current drawn by P and Q $= \left(\frac{2}{11} + \frac{3}{11}\right)A = \frac{5}{11}A = \mathbf{0{\cdot}454\ A}$

Question 3

(i) (a) With reference to terms mechanical advantage, velocity ratio and efficiency of machine, name the term which will not change for a machine of a given design. [2]

(b) Define the term stated by you in (a) above.

(ii) (a) Why is white light considered polychromatic in nature? [2]

(b) Give the range of wavelength of electromagnetic waves which are visible to us.

(iii) An ultrasonic wave is sent from a ship towards the bottom of sea. It is found that time interval between sending and receiving of the wave is 2.5 seconds. Calculate the depth of sea, if the velocity of sound is 1400 ms^{-1} in water. [2]

(iv) A ray of light strikes the surface of a rectangular glass block such that the angle of incidence is (a) zero degree (b) 42 degree. Sketch a diagram to show approximate path taken by the ray in each case as it passes through glass block and emerges from it. [2]

(v) (a) What name is given to atoms of a substance which have same atomic number, but different mass number? [2]

(b) What is the difference in atomic structure of these atoms?

Solution :

(i) (a) Velocity ratio of a machine does not change.

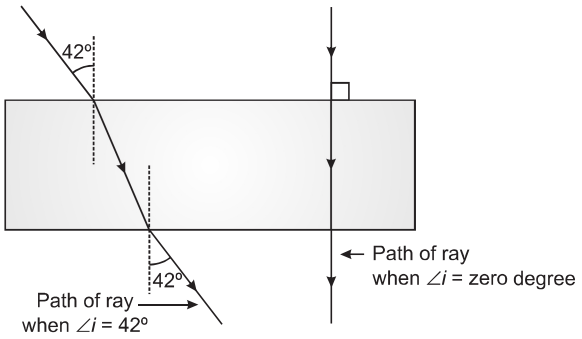
(b) The ratio of distance through which effort acts to the distance through which load moves is called velocity ratio.

(ii) (a) White light on passing through a prism splits into seven colours (VIBGYOR). It is because of mixture of these colours, so, white light is called polychromatic light.

(b) Electromagnetic waves of wavelength 8000 Å to 4000 Å are visible to human eye.

(iii) Depth of sea $= \frac{V \times t}{2} = \frac{1400 \text{ ms}^{-1} \times 2{\cdot}5 \text{ s}}{2} = \mathbf{1750\ m}$.

(iv)



(v) (a) Atoms of a same substance are called isotopes.

(b) Isotopes have same number of protons and electrons, but different number of neutrons.

SECTION - B (40 Marks)

(Attempt *any four* questions from this Section)

Question 4

(i) 6.4 kJ of energy causes a displacement of 64 m in a body in the direction of force in 2.5 s. Calculate: [3]

(a) force applied on the body.

(b) power acting on body in horse power [Take 1 HP = 746 W]

(ii) A pulley system consists of two pulleys, one fixed and the other movable. [3]

(a) Draw the labelled diagram of the arrangement and show clearly all the forces acting on it.

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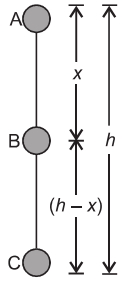
(iii) An object of mass '*m*' is allowed to fall freely from point A as shown in the figure alongside. Calculate the total energy possessed by the object at: [4]



(a) Point A.

(b) Point B

(c) Point C

(d) Which physical law is verified by your calculations in parts (a), (b) and (c)?

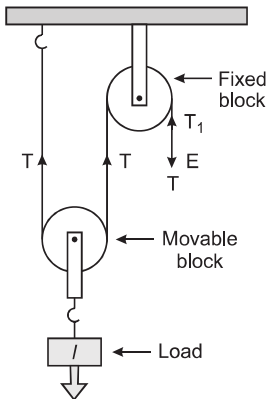
Solution :

(i) (a) Force = Energy ÷ displacement = $\frac{6400\,\text{J}}{64\,\text{m}}$ = **100 N**.

(b) Power = Energy ÷ Time = 6400 J ÷ 2·5 s = 2560 W

$\therefore$ Power in (H.P) = $\frac{2560}{746}$ = **3·4 HP**.

(ii) (a) Diagram drawn alongside.



(b) By making the movable block of some lighter alloy or high quality plastic, the weight of movable block is reduced. This in turn increases the mechanical advantage.

(iii) (a) Total energy at A = P.E + K.E = $mgh + \frac{1}{2}mv^2 = mgh + \frac{1}{2}m(0)^2 = \boldsymbol{mgh}$.

(b) At B applying, $v^2 - u^2 = 2as \quad \Rightarrow v^2 - (0)^2 = 2gx$ or $v^2 = 2gx$

$\therefore$ Total energy at B = P.E + K.E = $mg\,(h - x) + \frac{1}{2}mv^2$

$= mgh - mgx + \frac{1}{2}m\,(2gx) = mgh - mgx + mgx = \boldsymbol{mgh}$.

(c) At C applying, $v^2 - u^2 = 2as$

$\Rightarrow v^2 - (0)^2 = 2g \times h$ or $v^2 = 2gh$

$\therefore$ Total energy at C = P.E + K.E $= mg \times 0 + \frac{1}{2} m\,(2gh) = \boldsymbol{mgh}$.

(d) Law of conservation of energy is varified in above calculations.

Question 5

(i) State in brief, the meaning of each of the following: [3]

(a) Heat capacity of a body is $50\,J\,^oC^{-1}$.

(b) The specific latent of fusion of ice is $336000\,Jkg^{-1}$.

(c) The specific heat capacity of copper is $0.4\,Jg^{-1}\,^oC^{-1}$.

(ii) (a) What is the principle of method of mixtures? [2]

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(a) Heat energy given out by water at 30°C.

(b) Heat energy given out by vessel at 30°C.

(c) Heat energy absorbed by ice to form water at 5°C.

(d) Total heat energy given out by water and vessel.

(e) The mass W of the ice.

Solution :

(i) (a) From it implies, that a given mass of a substance will need 50 J of heat energy, when its temperature rises by 1°C.

(b) From it implies that 1 *g* of ice at 0°C on complete melting, will need 336000 J of energy so as to form water at 0°C.

(c) From it implies if 1*g* of copper is heated through 1°C, in order to do so it will absorb 0·4 J of heat energy.

(ii) (a) According to this principle,

Heat energy absorbed a cold body = Heat energy given out by hot body.

(b) It is based on law of conservation of energy, which states that, in a system the energy can neither be created, nor can it be destroyed, no matter it can change in form.

(iii)

Substance	Mass	S.H.C./S.L.H.	Initial temp.	Final temp. = 5°
Water	150 g	4·2 $Jg^{-1}\,°C^{-1}$	30° C	$\theta_f = (30 - 5) = 25°C$
Vessel	100 g	0·4 $Jg^{-1}\,°C^{-1}$	30 °C	
Ice	? (W)	336 Jg^{-1}	0 °C	$\theta_R = (5 - 0) = 5°C$

(a) Heat energy given out by water at 30°C = $mc\,\theta_f = 150 \times 4{\cdot}2 \times 25 =$ **15750 J**

(b) Heat energy given out by vessel = $mc\theta_f = 100 \times 0.4 \times 25 =$ **1000 J**

(c) Heat energy absorbed by ice to form water at 0°C = $m.L_{ice} = W \times 336$

Heat energy absorbed by water at 0°C to attain temperature of 5°C = $m.c\theta_R = W \times 4.2 \times 5 = 21W$

$\therefore$ Total heat absorbed by ice = 336W + 21W = **357W**

(d) Total heat energy given out by water and vessel = 15750 J + 1000 J = 16750 J

(e) By the principle of calorimetry,

Heat absorbed = Heat given out

$\Rightarrow$ 357 W = 16750 J

$\therefore W = \frac{16750}{357}$ g $\simeq$ **47.0 g**

Question 6

(i) The ore of Uranium found in nature contains $_{92}U^{238}$ and $_{92}U^{235}$. Although both the isotopes are fissionable, it is found out experimentally that one of the two isotopes is more easily fissionable. [3]

(a) Name the isotope of Uranium which is easily fissionable.

(b) Give a reason for your answer.

(c) Write a nuclear reaction when Uranium 238 emits an alpha particle to form a Thorium (Th) nucleus. [3]

(ii) (a) Name the characteristic of sound which enables a person to differentiate between two sounds with equal loudness, but having different frequencies. [3]

(b) Define the characteristic named by you in (ii) (a).

(c) Name the characteristic of sound which enables a person to differentiate between two sounds of same loudness and same frequency, but produced by different musical instruments.

(iii) (a) A person is tuning his radio set at a particular station. What is person trying to do to tune it? [4]

(b) Name the phenomenon involved in tuning radio-set.

(c) Define the phenomenon named by you in part (iii) (b).

Solution :

(i) (a) ${}_{92}U^{235}$ is easily fissionable.

(b) ${}_{92}U^{235}$ fissions with low-energy thermal neutrons because the binding energy resulting from the absorption of a neutron is greater than the critical energy required for fission.

(c) ${}_{92}U^{238} \rightarrow {}_{90}Th^{234}$ + Alpha particle (${}_{2}He^{4}$)

(ii) (a) The characteristics of sound is called pitch of sound.

(b) The sensation produced in the listener by two different notes of same loudness but different frequencies is called pitch.

(c) The characteristics is called timbre or quality of sound. It depends on waveform of sound.

(iii) (a) While tuning a radio set, the person tries to match the frequency of his radio set, with that of broadcasting radio-station so that resonance takes place and he can hear the sound clearly.

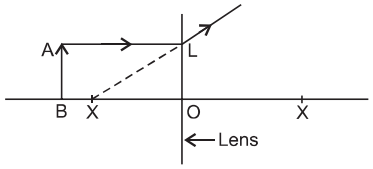
(b) The phenomenon taking place is called electromagnetic resonance.

(c) When the frequency of a given radio set corresponds to the frequency impressed by broadcasting radio-station, electromagnetic resonance takes place with the result, the signal gets amplified.

Question 7

(i) How does the value of angle of deviation produced by a prism change with an increase in the value of (a) angle incidence (b) wavelength of light? [3]

(ii) [4]



(a) Copy and complete the diagram.

(b) What is name given to the lens?

(iii) (a) State two conditions for total internal reflection. [3]

(b) Fill in the blank space:

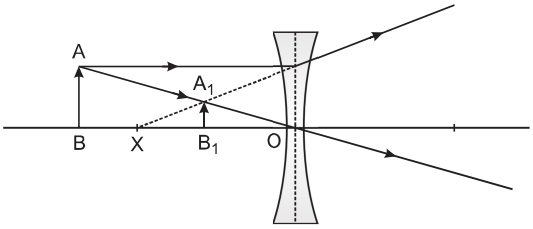
The perpendicular shift in the path of incident ray while emerging out from a denser medium is called _____.

Solution :

(i) (a) Assume initial angle of incidence is 30°. As the angle incidence is increased the angle of deviation decreases, till a stage is reached when its value is minimum. On further increasing the angle of incidence, the angle of deviation increases.

(b) With the increase in wavelength of light the angle of deviation decreases.

(ii) (a)



(b) Lens is a concave.

(iii) (a) 1. The ray of light must travel from denser medium to rarer medium.

2. The angle of incidence in denser medium should be greater than critical angle.

(b) Lateral displacement.

Question 8

(i) (a) Define volt. [4]

(b) State two factors which determine the resistance of a conductor.

(c) How does the resistance of ionic compounds change with the rise in temperature?

(ii) Two cells of e.m.f. 1.5 V and internal resistance of 1.5 Ω each are connected in parallel. The arrangment is connected to 2.5 Ω resistor. [3]

(a) Draw circuit diagram of arrangement.

(b) Calculate current flowing through 2.5 Ω resistor.

(iii) (a) What do you understand by the term electric power? [3]

(b) A current of 5 A is flowing through the filament of a bulb of resistance 4 Ω. Calculate electric power of the bulb.

(c) If the current flows for 1 minute in (iii (b)), calculate the electric energy expended by the bulb.

Solution :

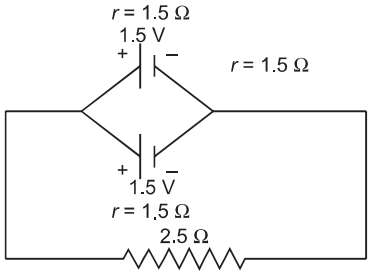
(i) (a) When one coulomb of electric charge ($6{\cdot}25 \times 10^{18}$ electrons) is brought from infinity to a given point in an electric field, such that one joule of work is done, then the electric potential at that point is one volt.

(b) 1. Resistance of conductor is directly proportional to the length of conductor.

2. Resistance of conductor is inversely proportional to the area of cross-section of conductor.

(c) The resistance of ionic compounds decrease with the rise in temperature.

(ii) (a) Circuit diagram shown.



(b) Total resistance of cells in parallel, $\frac{1}{r_p} = \frac{1}{1{\cdot}5} + \frac{1}{1{\cdot}5} = \frac{2}{1{\cdot}5}$

$\therefore\ r_p = \frac{1{\cdot}5}{2} = 0{\cdot}75\ \Omega$

$\therefore$ Current in $2{\cdot}5\ \Omega$ resistor $= \frac{E}{R + r_p} = \frac{1{\cdot}5}{2{\cdot}5 + 0{\cdot}75} = \frac{1{\cdot}5}{3{\cdot}25} =$ **0·46 A**

(iii) (a) Rate of doing electric work is called electric power.

(b) Electric power (P) $= I^2.R = (5)^2 \times 4 =$ **100 W**.

(c) Electric energy expended $= P \times t = 100\ W \times 60s =$ **6000 J**.

Question 9

(i) (a) Draw a neat labelled diagram of a d.c. motor. [3]

(b) Write any one use of a d.c. motor.

(ii) (a) What do you understand by the term radioactivity? [3]

(b) Fill in the blank spaces:

When a radioactive nucleus ejects an .....(1)..... particle, its mass number decreases by .....(2)..... a.m.u. and atomic number by 2 amu.

(iii) A radioactive nucleus can emit three types of radiation. [4]

(a) Name all the three types of radiation.

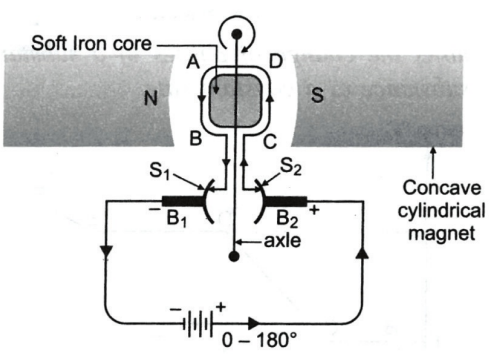
(b) Name the radiation which is most penetrating.

(c) Name the radiation which is electromagnetic in nature.

(d) Name the radiation which has largest mass.

Solution :

(i) (a)



(b) In electric appliances, like fan, juicer, mixer, grinder, washing machine, etc., an electric motor is used to produce rotational motion by the use of electricity.

(ii) (a) The phenomenon due to which nucleus of certain element spontaneously decays into the nucleus of another element with the ejection of alpha, beta or gamma particles is called radioactivity.

(b) 1. Alpha 2. Four

(iii) (a) 1. Alpha particles 2. Beta particles 3. Gamma radiation.

(b) Gamma radiations are most penetrating.

(c) Gamma radiation is electromagnetic in nature.

(d) Alpha particles have largest mass.

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