PHYSICS

Answer Keys to Self-Assessment Sample Paper - 1

Answer 1

a) The rate of change of momentum of a body is equal to the applied force and takes place in the direction in which the force acts.

b) i) The weight of a body placed at the centre of the earth is zero. This is because the mass at the exact centre of the earth is zero. Gravitational force exists only if there is mass in the object. ii) An ideal machine is that in which there is no dissipation of energy in any manner. In an ideal machine, the work output is equal to the work input, i.e., efficiency of an ideal machine is 100%

c) Given load =250gf, load arm =28cm,
effort arm = 7cm and effort =E.
Now, load × load arm = effort × effort arm
250×28=E×27
E=7250×28=1000gf=1kgf or 10N

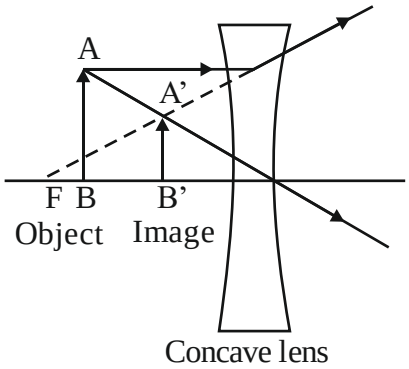
d) i) When a number of forces acting on a body produce no change in its state of rest or of motion the body is said to be in equilibrium.
ii) An object is in equilibrium if:

1. The resultant force acting on the object is zero.
2. The sum of the moments acting on an object must be zero.

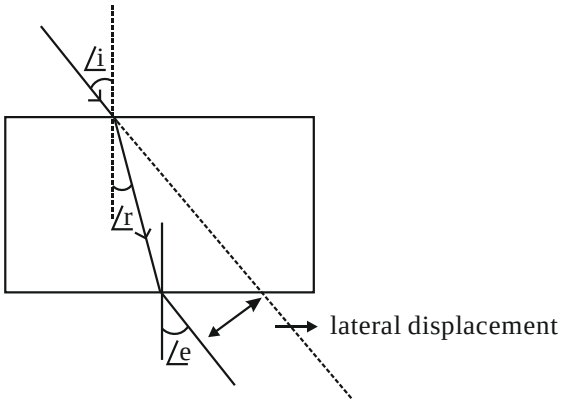
e) p = 200 W
t = 4s
work done = p x t = 200 x 4 = 800J
displacement = W/F = 800J/100N = 8m.

Answer 2

a) i) concave lens. ii) A ray diagram to show the formation of the image with the above stated characteristics.



b)



$$n_{ga} = \frac{\sin i}{\sin r}$$

c) The four regions of electromagnetic spectrum (other than visible light) in their increasing order of wavelength are:

- Ultraviolet rays
- Infrared
- Microwaves
- Radio waves.

d) The speed of sound in air increases with increasing temperature. The speed of sound is more on a hot day than on a cold day. Since, the speed of sound is more on a hot day, therefore we will hear an echo sooner on a hot day than on a cold day.

e) i) Ultrasound is the name given to sound waves that have frequencies greater than 20,000Hz (20 kHz). This is above the normal hearing range for humans, so we cannot hear ultrasound.
ii) It is termed as Echo. Echo is a reflection of sound that arrives at the listener with a delay after the direct sound.

Answer 3

a) Given: d = 850 metre, t =? speed v = 350 m/sec
∴ t = 2d/v
⇒ t = 2 x 850/350 ⇒ 2 x 17/7 = 4.86 sec.

b) Electricity bill is measured in units where 1 unit is equal to kWh which is the unit of energy. Hence, when we pay for our electricity bill, we pay for the amount of electrical energy consumed by us.

c) Mica is a good insulator of both electricity and heat and can withstand high temperature. It is also transparent. These properties were found suitable for use in electric iron,
It electrically insulates the filament from the body of the iron which can become accidentally live if there is a breakdown of insulation.
It transmits the heat from the filament to the plate of the iron, as the heat is transmitted by

radiation and not by conduction. Radiation follows the laws of optics. Though it is a thermal insulator, it permits transmission of heat because of being transparent through radiation.

d) fuse wire protect an electric circuit because the fuse has high melting point. In case of any excuse flow of current before the electricity damage anything the fuse wire melts

e) The specific heat capacity, or the amount of heat needed to raise the temperature of a specific substance in a specific form one degree Celsius, for water is 4.187 kJ/kgK, for ice 2.108 kJ/kgK, and for water vapor (steam) 1.996 kJ/kgK.

Answer 4

a) 1. The length of vibrating air column affects its frequency. More the length of vibrating air column, lesser is its frequency. 2. Decibel (dB) is the unit used for measuring sound level.

b) (i) The given body requires 60J of heat energy to raise its temperature through 1K.
(ii) 1kg of lead requires 130J of heat energy to raise its temperature through 1K.

c) According to Einstein's mass-energy equivalence
E = mc2 E = 1kg x [3 x 108ms-1]2 Energy released E = 1 x 3 x 108 x 3 x 108 = 9 x 1016 J

d) Isotope → Isotopes are atoms with the same number of protons but differ in numbers of neutrons. Isotopes are different forms of a single element.

Example - Carbon 12 and Carbon 14 are both isotopes of carbon, one with 6 neutrons and one with 8 neutrons.

e) On emitting a β particle, the number of nucleons in the nucleus (i.e. protons and neutrons) remains same, but the number of neutrons is decreased by one and the number of protons is increased by one.
If a radioactive nucleus P with mass number A and atomic number Z emits a beta particle to form a daughter nucleus Q with mass number A and atomic number Z+1, then the change can be represented as follows:

$$^{A}_{Z}P \xrightarrow{\beta \text{ particle}} {}^{A}_{z+1}Q + {}^{0}_{-1}e$$

(a) Atomic number 'Z' is not conserved. It is increased by 1.
(b) Mass number A is conserved.

Answer 5

(a) (i)Work is said to be done when a force applied to an object moves that object. We can calculate work by multiplying the force by the movement of the object.

W = F × d The SI unit of work is the joule (J)

(ii) In physics, we can define energy as the capacity to do work.

For the potential energy, the formula is

P.E. = mgh

The SI unit of energy is joules (J), which is named in honour of James Prescott Joule.

(iii) Power can be defined as the rate at which work is done i.e. energy converted.

The formula for power is

P = W/t

The unit of power is watt (W).

b) (i) The S.I. unit of force in newton.
One newton is the force which when acts on a body of mass 1kg, produces an acceleration of 1m/s2. i.e., 1newton=1kg×1m/s2
(ii) The formula for the Work done is as follows
Work = Force * Displacement of the object.
So, work is related to force directly proportional if the displacement remains constant for multiple cases and situation.

(iii) Kinetic energy of the body K. E=1/2mv2
So, K. E∝v2
If speed of the body is halved, its kinetic energyis reduced by a factor of 4

c) (i)The work done is equal to the change in potential energy. The final potential energy is gravitational potential energy (= mgh). Now, as the height from ground is same, the difference in potential energy will come only due to the difference in mass of the persons. So, the potential energy will be the ratio of the masses of the two persons.

(ii) Given: m_1 = 40 kgf, m_2 = 30 kgf, $h_1 = h_2$, t_1 = 4 minutes = 4 x 60 sec, t_2 = 3 minutes = 3 x 60 sec.
Comparing work done by them:

$$\frac{work\ done\ by\ a\ boy}{work\ done\ by\ a\ girl} = m_1gh_1/\ m_2gh_2 = m_1/m_2 = \frac{40}{30} = 4{:}3$$

(ii) Comparing power developed by them:

$$\frac{\text{Power developed by boy}}{\text{Power developed by girl}}$$

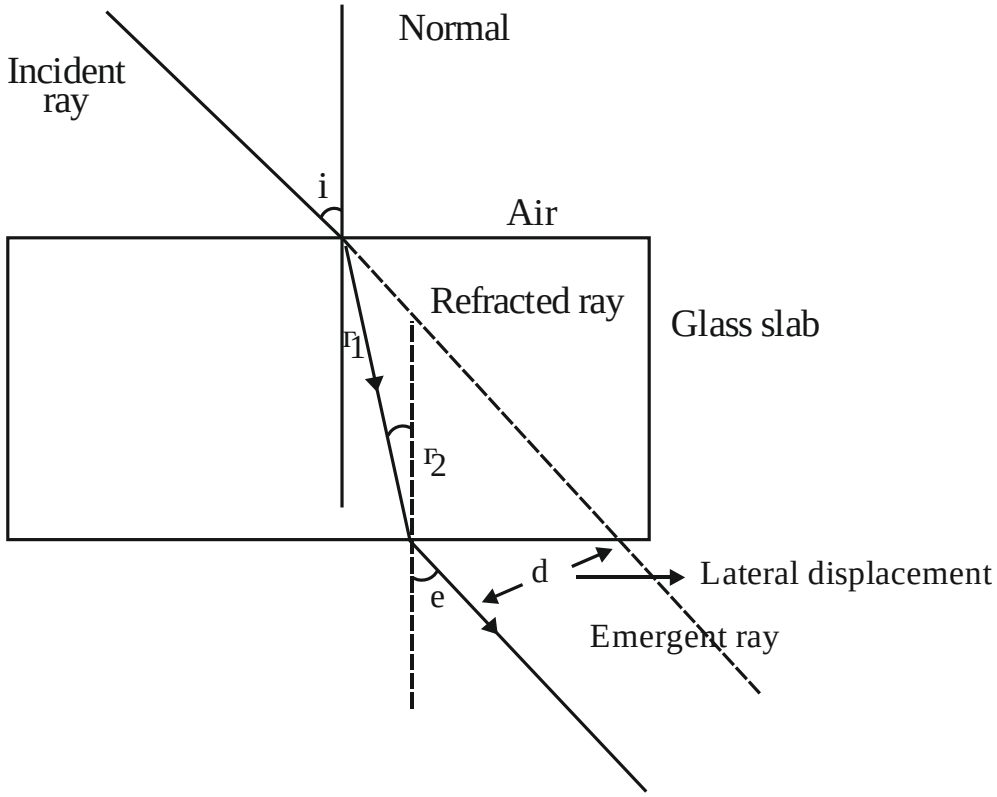
$$= \frac{\text{Work done by boy/ time taken to climbs up the stairs in seconds}}{\text{Work done by girl/ time taken to climbs up the stairs in seconds}}$$

$$= \frac{\frac{2400}{4\times60}}{\frac{1800}{3\times60}}$$

$= \frac{2400}{4\times60} \times \frac{3\times60}{1800} = 1:1$

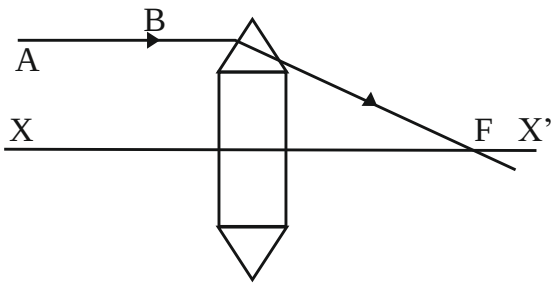
Answer 6

(a) (i)



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

b) i) It's because of a phenomenon called refraction
ii) Since the body moves from a rarer to denser medium, the velocity must decrease.
the amplitude of the wave would also decrease.
Since v=fλ and frequency being a property of the source (cannot change with medium), the wavelength must decrease .
iii) no change
iv) The completed ray diagram is shown.



(i) The lens formed by the combination is the convex lens.
(ii) The line XX' is called the principal axis.
(iii) The focus has been marked by the letter F in the diagram.

Answer 7

(a) (i)Yes.
(ii) the vibrations caused in the table are the forced vibrations.
(iii) It leads to resonance if the natural frequency of vibrations of the table top becomes equal to the frequency of the vibrating tuning fork.

b) The periodic vibrations of a body of decreasing amplitude in the presence of resistive force are called the damped vibrations. The amplitude of the free vibrations remains constant and vibrations continue forever. But the amplitude of damped vibrations decreases with time and ultimately the vibrations ceases. For eg, when a slim branch of a tree is pulled and then released, it makes damped vibrations. A tuning fork vibrating in air excute damped vibrations.

c) i) 1) f = 256 wavelength = 1.3

v = 256*1.3

= 332.8m/s

2) v = 332.8m/s wavelength = 2.6

f = 332.8/2.6

= 128
so, the first sound will be shiller than second

ii) (1) Pitch of the sound increases (2) Loudness increases

Answer 8

a) Circuit diagram

i) Total internal resistance r = 4 × 0.2 = 0.8Ωc

Total e.m.f. = 4 × 2 = 8v

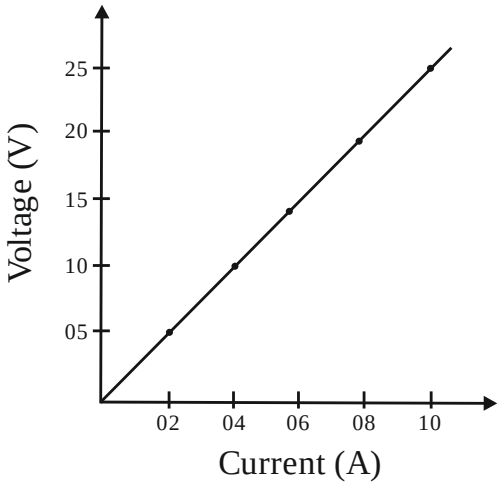
Current recorded by ammeter

R1 across= 1/R1 = 1/3+ 1/6 = R1 = 2Ω

Total resistance 0.8 +2.5 + 2 = 4.3 Ω

ii) I = v/R =6/4.3 =1.39 A

iii) droop in potential across the terminals of the battery E – V = Ir = 2 × 8/4.3 = 3.72v



b)
(i) 1.25 V
(ii) 0.3 A
(iii) The graph is linear so resistance can be found from any value of the given table. For instance: When V = 2.5 Volt Current is I = 1.0 amp According to ohm's law: R = V/I R = 2.5/1.0 = 2.5 ohm

c) (i) a) A three pin plug is used to supply electricity to any electrical appliance whose body is earthed. The third big pin of the plug helps us to do this earthing. The user of the electrical appliance is then protected against accidental electrical shocks. b) The main switch is connected right at the starting point of the household wiring. This enables us to switch off (or 'on') the supply of electricity to the household, as per our need (ii) The energy E in joules (J) is equal to the voltage V in volts (V), times the electrical charge Q in coulombs (C), or : joule = volt × coulomb or J=V*C

emf=I(R+r)−−−(a)
When I=0.5, R=2ohm
we know that,
emf =V
Therefore, Eq (a)become V=0.5(2+r) =>1/2(2+r)
2V=2+r−−−(1)
When I=0.25, R=5ohm
Therefore Eq(a)become
V=0.25(5+r)=>1/4(5+r)
4V=5+r−−−(2)
Subtract eq (1) from (2)
4V−2V=5+r−2−r
2V=3
V=3/2

V=1.5v

Answer 9

a) i) Temperature is a quantity which conveys the thermal state of a body (i.e., the degree of hotness or coolness of the body). It determines the direction of flow of heat when two bodies at different temperature are placed in contact. The S.I. unit of temperature is Kelvin .
ii) Radiator in car.

b) Let, mass of water used =m
Since, Heat gained = Heat lost
$m1c\Delta t1=mL+m2c\Delta t2$
$400\times4.2\times n\ (50.5-10) = m\times336+m\times4.2\times10$
Therefore, the mass of water used, m=142.43g

c) i) When cloth soaked in spirit it fills the gap between the cloth ,so if it covers the bulb it reduces the light coming out ,so the heat decreases, then temperature recorded by the thermometer decreases
ii)let the final temperature be T
s be specific heat of water
amount of heat in bucket, hot water is equal to the final mixed water
8 *25 * s + 2 * 80 * s = (8+2) * s * T
T = 36 deg C

Answer 10

a) i) Given: Composition of atomic nucleus A=84 protons and 128 neutrons.
Mass number of A=84+128=212
Atomic number of A=84
The nucleus A emits an alpha particle, the mass number decreases by 4 and the atomic number decreases by 2.
$84212A-\alpha82208B$
Number of protons in B=82
Number of neutrons in B=208−82=126
(ii) $82208B-\beta83208C$
Number of protons in C=83
Number of neutrons in C=208−83=125
(iii) The composition of nucleus C does not change if it emits gamma radiations.

b) A nuclear reactor produces and controls the release of energy from splitting the atoms of certain elements. In a nuclear power reactor, the energy released is used as heat to make steam to generate electricity.

The process of increasing the percentage of Uranium-235 from 0.7 percent in natural uranium to about 3 to 5 percent for use in fuel for nuclear reactors. Enrichment can be done through gaseous diffusion, gas centrifuges, or laser isotope separation.

The normal operating condition of a reactor, in which nuclear fuel sustains a fission chain reaction. A reactor achieves criticality (and is said to be critical) when each fission event releases enough neutrons to sustain an ongoing series of reactions.

c) i) Radiocarbon dating is a method carbon -14.
ii)

Alpha particle	**Beta particle**
It is a helium atom and contains two neutrons and two protons.	It is an electron, or a positron emitted by the decay of nucleus.
Heavier than beta and gamma particles.	Much lighter than alpha particles.

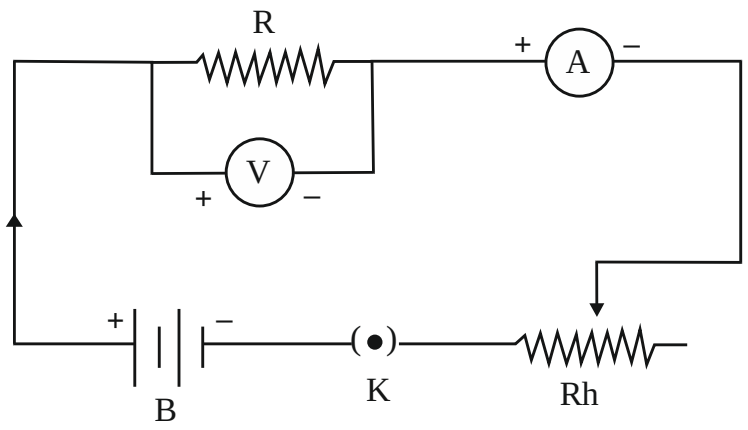
PHYSICS

Answer Keys to Self-Assessment Sample Paper - 2

Answer 1

a) A copper vessel along with copper stirrer used in the measurement of heat energy is called calorimeter. Calorimeter is made of copper because
i) it takes the temperature of the contents within it very quickly.
ii) it has a very low specific heat capacity and hence takes very amount of heat energy from the contents within it.

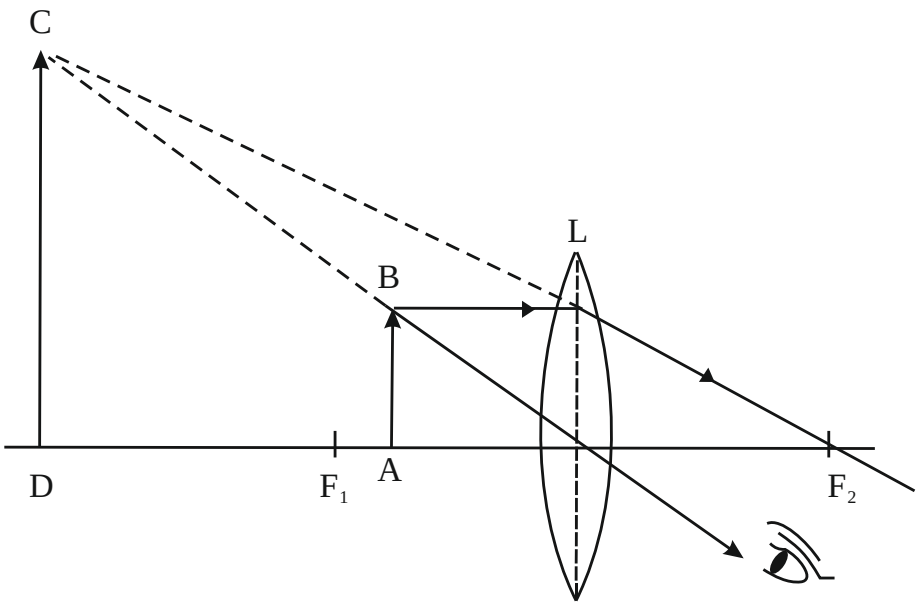
b)



A = A mmeter
V = Vo ltmeter
R = Resistor
B = Battery
K = Key
Rh = Rheostat

c) Radioactivity is the nuclear phenomena because when it decays, it emits the part of nucleus or radiations due to excitation of nucleus.

d)



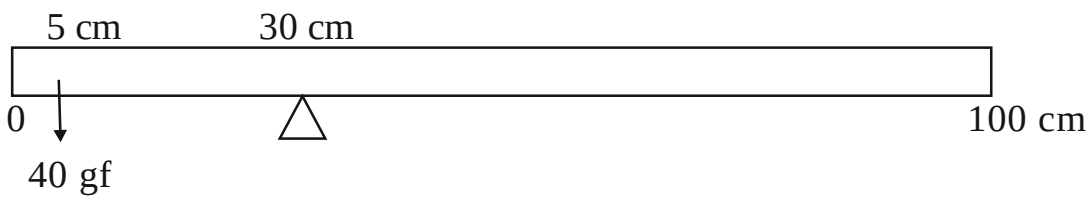
e) When a body moves vertical direction under the gravity, then Change in kinetic energy + change in potential energy = 0
e.g., $\Delta K.E + \Delta P.E = 0$

change in potential energy $=mgh= 0.06 \times 10 \times 1.5 = 0.9J$

Change in kinetic energy=0.9J

Answer 2

a)



$\tau = r \times F$
Let the mass of the ruler be M grams.
Centre of mass of the ruler is at its center.
Therefore, centre of mass of the ruler is 20 cm away from the hinge.
It is given that the ruler is in equilibrium position.
Balancing the torques due to the mass of the rod and due to the 40 grams mass suspended from the ruler about the hinge:
40*25 = M*20
M = 50 grams.
Hence, the mass of the ruler is 50 grams.

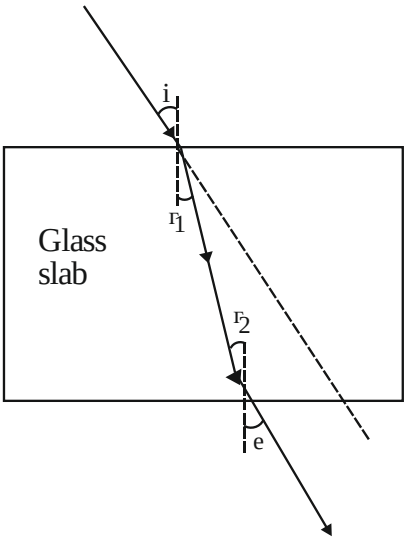
b) For incidence angle zero degree and 90 degree, the ray will not be deviated.

c) Concave lens always forms an erect, virtual image irrespective of the position of the object on the principal axis.

d) Virtual Depth of the coin is 15−3.75=11.25cm

Refractive index =virtual depth real depth=15/11.25=1.33

e)



Answer 3

a) The SI unit of Energy is joules
1eV=1.6×10^-19 J

b) The earth pin is long so that the earth connection is made first. This ensures the safety of the user because if the appliance is defective, the fuse will blow off. The earth pin is made thicker so that even by mistake it cannot be inserted into the hole for the live or neutral connection of the socket

c) i) microphones; Sound energy to electrical energy. ii) when candle burns chemical energy is converted into light energy and heat energy.

d) We would prefer the parallel wiring. This is done for the following reasons: (i) In parallel wiring, each lamp can have its independent switch and the disconnection (putting off) of one of them will not affect the other lamps. (ii) All lamps have the same potential difference (equal to that of the mains) across the terminals and are thus able to work as per their specified rating.

e) i] If amplitude of sound wave changes then Loudness changes. ii] If wave form changes then it effects its pitch

Answer 4

a) v = 3 x 10^8
f = 15 x 10^6
λ = v /f = 3 x 10^8 / 15 x 10^6
λ = 20 m

b) (i) The resistance of a wire increases with increases in the length of wire (R ∝ l).

(ii) The resistance of a wire decreases with increase in its thickness (R ∝ l a where a = πr^2, the area of cross-section of the wire).

(iii) The resistance of a metallic wire increases with increase in its temperature.

c) Cathode Ray Tube is used to produce images. CRT technology used commonly in televisions and computer monitors. Oscilloscopes, devices used to measure, and display voltages also use CRT displays.

d) Decay are divided into -
1) alpha decay
X (A, Z) →X (A-4, Z-2)
2) beta decay
X (A, Z) →X (A, Z+1)
3) gamma decay
X (A, Z) →X (A, Z)

e) Alpha radiation: - As smoke detectors for industrial purpose.

Beta radiation: - Monitoring paper thickness in industries.

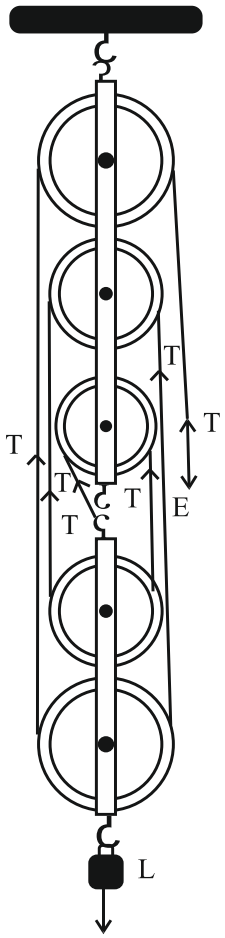
Gamma radiation: -As tracers for detecting leakage in pipes.

Answer 5

a) Volume of water V=30000 L=30000×10−3 m3=30 m3
Density of water ρ=1000 kg m3
Mass of water m=ρ×V=1000×30=30000 kg
Work done W=mgh=30000×10×45=1.35×107 J
Time t=10 min=10×60=600 s
Power P=tW=6001.35×107=22500 W

b) In the upcoming future the non-renewable sources of energy may get exhausted because of which the requirements would not be fulfilled. So non-renewable sources which would last long in the longer run and would not get exhausted are encoura

c) i)



VR = 5, ŋ =80%

(ii) MA = VR x ŋ%

= 5 x 80/100 = 4

iii) p=wd/t
=f*s/t
=10000*2/10
=2000 W

Answer 6

a) The perpendicular distance between the original path of incident ray and emergent ray coming out of glass slab is called as Lateral Displacement.
Lateral displacement depends upon:
→ Thickness of glass slab
→ Incidence angle
→ Refractive index of glass slab.

b) u=-15cm
f=+10cm
By mirror formula
1/v=1/f-1/u
=5/30
F=+6cm

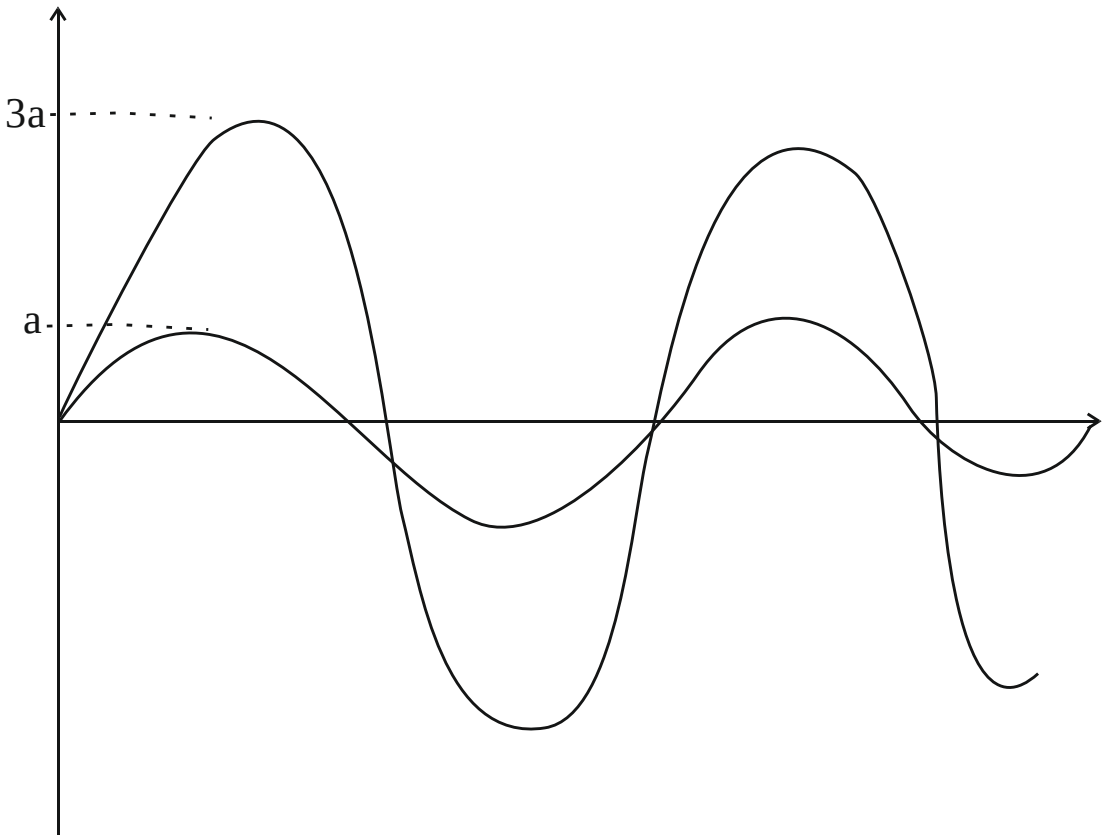
The image is virtual, erect, diminished.

c) i) Two properties common to all the electromagnetic radiation are:
→Electromagnetic radiation can travel through empty space.
→Electromagnetic radiation are not deflected by electric radiation.

ii) Infrared Radiation:
→ used in detection of tumors.
→ observe growth of crops.
UV radiation:
→ Important role in production of vitmin O.

Answer 7

a)

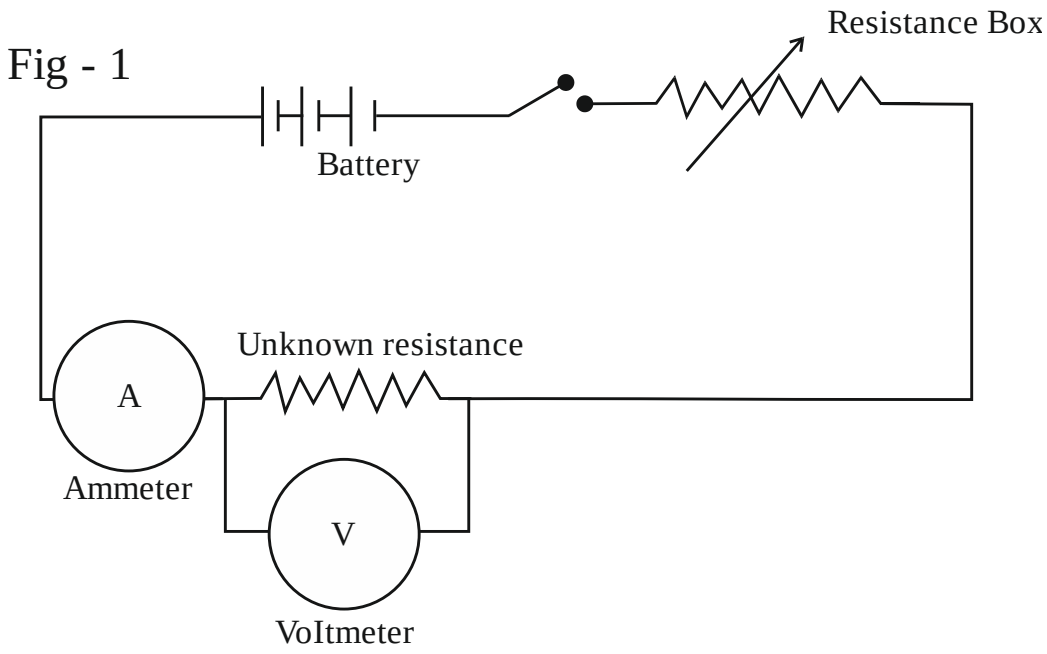


ii) washing machine shakes due to an imbalance

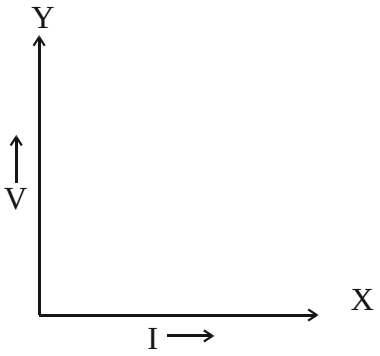
iii) Minimum distance from the source to the reflected object must be 17.2 m and 0.1 second of sound interval must be there.

b) t= 5 s
At the beginning, let s be the distance between John and the hill
∴v=t2s=52s
John then moves 320 m towards the hill in 3s,
∴v=t′2(s−320) =32(s−320)
Since velocities are same,
∴52s=32(s−320)
or s = 800m
velocity = v=52×800=320m/s

c)



Answer 8



a) Given: $I_1 = 0.6$ A, $R_1 = 2\Omega$ and $I_2 = 0.3$ A, $R_2 = 8\Omega$

Let the e.m.f of the cell is E and its internal resistance is r.

From I = E/R + r

0.6 = E/2 + r and 0.3 = E/8 + r

∴ E = 0.6(2 + r) = 1.2 + 0.6 r and E = 0.3(8 + r) = 2.4 + 0.3r

Thus, 1.2 + 0.6r = 2.4 + 0.3r or 0.6r – 0.3r = 2.4 – 1.2

Or 0.3r = 1.2 or r = 1.2/0.3 = 4 Ω

And E = 1.2 + 0.6 x 4 = 1.2 + 2.4 = 3.6V.

b) i) resistance of circuit when key K is open

When the key is open, the only resistance left will be the 5 Ω resistance in series with 0.5 Ω source resistance,

hence net resistance = 5 + 0.5 = 5.5 Ω

ii) current drawn from cell when key is open

When the key is open, net resistance = 5.5 Ω

=> current = voltage/ resistance

=> I = 3.3/5.5 = 0.6 A

hence current will be 0.6 Ampere.

c) Energy consumed by bulbs in one month = 6*100*8*30 / 1000 = 144 kWh
Energy consumed by heater in one month = 1*2*0.5*30 = 30 kWh
Energy consumed by fans in one month = 5*50*6*30 / 1000 = 45 kWh

Total Energy consumed = (144 + 30 + 45) kWh = 219 kWh

Total cost = 219 * ₹ 3.50 = ₹ 766.50

Answer 9

a) i) The specific latent heat of fusion of ice is the amount of heat required to change 1 kg of ice to water without a change in temperature.
ii) This heat supplied is used in the change of state. This heat is known as Latent heat.

b) I)liquid a is good conductor of heat as it takes less heat to rise temp by 10c as compared to liquid b.
ii)liquid b as it will absorb more heat compared to liquid a for same rise in temp.

c) A calorimeter of mass 60g contains 180g of water at 29°C . Find the final temperature of the mixture when 37.2g of ice at -10°C is added to it(specific heat capacity of water=4200J/kg/k, latent heat of ice=336×10^3 J/kg, specific heat capacity of ice=2100J/kg/k, specific heat capacity of the calorimeter is 0.42J/g/°C

Answer 10

a) i) *Background radiation* is a measure of the level of ionizing *radiation* present in the environment at a particular location which is not due to deliberate introduction of *radiation* sources. *Background radiation* originates from a variety of sources, both natural and artificial.

ii) equation for the alpha decay of uranium is:
$^{238}_{92}U \rightarrow ^{234}_{90}Th + ^{4}_{2}\alpha$

iii) Amount of radioactivity cannot be controlled by changing temperature and pressure because radioactivity is a nuclear phenomenon. Hence, amount of radioactivity will remain the same, only if the nucleus is still excited and not stable.

b) nuclear fusion is a process in which one or more light nuclei fuse together to generate a relatively heavier nucleus in which in there is some mass deficiency that is released as energy, and the quantity of energy released follows

the fusion of two hydrogen nuclei to form deuterium (the H-H fusion reaction):$H + H \rightarrow D + \beta^{+} + \nu$,

c) (I)The live terminal of the three pin plug helps us to connect our appliance to the live (or high voltage wire) of the mains. The neutral terminal connects the other end of the appliance to the ground potential wire of the mains. The earth terminal helps us to connect the body of the appliance to a wire whose other end is buried deep in moist earth. This earthing of the body of the appliance acts as a safety measure and saves the user from dangerous shocks.

(II)The earth pin being thicker can never enter live or neutral sockets thus a given electric appliance gets connected only in one proper electrical position, where the live wire, neutral and earthings are connected correctly. The earth pins being longer, get connected to earth terminal first, thus ensuring that user will not get electric shock, because the current will melt the fuse in case the electrical appliance is short circuited.

PHYSICS

Answer Keys to Self-Assessment Sample Paper - 3

Answer 1

a) Centripetal force acts towards the centre where centrifugal force acts away from the centre. When these two are equal body starts moving in a circle. Hence these both are in opposite direction. Though same in magnitude and opposite direction these forces do not form action reaction pair i mean newton third law because as these both forces act on the same body.

b) i) Turning effect of force acting on a body about an axis is called moment of force. It is equal to the product of magnitude of force and the perpendicular distance of the line of action of force from the axis of rotation
ii) If the moment of force is assigned a negative sign then, the turning tendency of the force will be clockwise.

c) Class II lever has a mechanical advantage always greater than 1. To increase mechanical advantage effort arm must be increased and load arm must be decreased

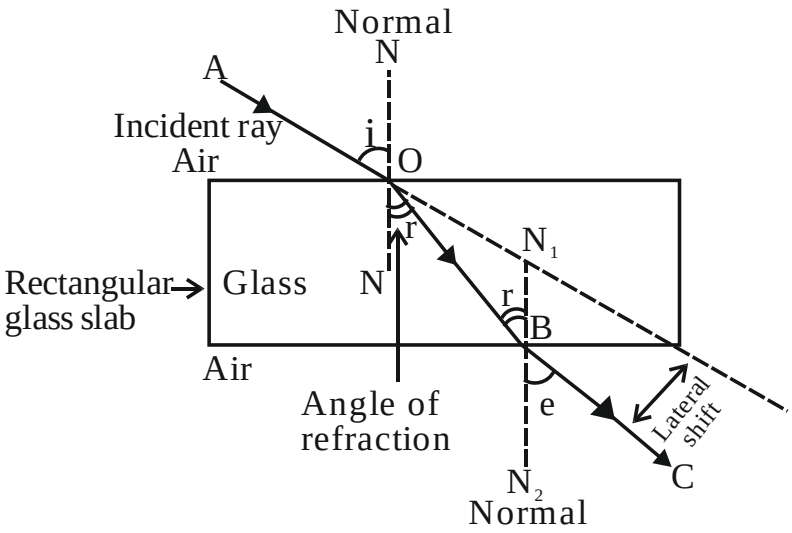
d) i) II class ii) MA =EFFORT / LOAD=100/25=4

e) The angle between force and displacement should be $\theta = 90°$ for minimum work.

The angle between force and displacement should be $\theta = 0°$ for maximum work.

Answer 2

a) Ray diagram of refraction through a glass slab.



b) Speed of sound in air $v=330$ m/s
Wavelength of sound wave $\lambda=vv$
where v is the frequency of sound wave.
Minimum frequency heard by human ear $v_{min}=20$ Hz
So, maximum wavelength of sound wave $\lambda_{max}=v_{min}v$
$\therefore \lambda_{max}=20330=16.5$ m
Maximum frequency heard by human ear $v_{max}=20$ kHz$=20000$ Hz
So, minimum wavelength of sound wave $\lambda_{min}=v_{max}v$
$\therefore \lambda_{min}=20000330=16.5\times10-3$ m$=16.5$ mm

c) Distance between the plane and radar $d=300$ km
Distance traveled by radio waves $D=2d=2\times300=600$ km
$\therefore$ $D=600\times103$ m
Speed of radio waves $v=3\times108$ m/s
So, time taken by radar to detect the radio waves $t=vD$
$\therefore$ $t=3\times108600\times103=2\times10-3$ s

d) 1) Length: Inversely proportional
2) Tension: Directly proportional.
E. $P=VI$

$3000=220\times I$

$I=3000/220=13.63$

Answer 3

a) Virtual images cannot be obtained on the screen because the image formed is from the light rays that do not meet but appear to meet when they are produced backwards. The image obtained will always be erect.

b) In radar, a transmitter with an oscillator is used to generate radio waves, and a waveguide links the transmitter to the antenna. In sonar, electrical energy is supplied directly to a hydrophone array which converts it to sound waves.

c) Given,

Velocity, $V=1450$m/s
Time $t=6.9$ s
We have
Distance = speed × time
That is,
$2d=V\times t$
So,
$d=1450\times6.9/2$

=5002.3m

d) Mica is preferred to other insulators in an electric iron because mica is a bad conductor of electricity, but it easily conducts away heat. So when current flows through nichrome wire, the heating element is fully protected against any leakage of electric current, whereas heat is easily conducted.

e) Strength of induced current depends on:
(1): The obstruction offered in the flow of electrons (or current) by the material of the wire, is called its resistance.
(2): The S.I. unit of electrical resistance is ohm (Ω). The resistance of a conductor is said to be 1 ohm if 1 ampere current flows through it when the potential difference across its end is 1 volt.

Answer 4

a) Water might have been placed in some higher atmospheric pressure conditions. That is why it has higher boiling point.
b) We can take that work done is equal
So,
$mgs=mc\Delta t$
therefore
$\Delta t=gs/c$
g=10, s=150, c=4200
answer $\Delta t=0.3571°C$

c) $_{2}U^{238} - _{2}He^{4} \rightarrow {}_{90}Th^{234}$

(α – particle)

$_{90}Th^{234} - _{-1}e^{0} \rightarrow {}_{91}Pa^{234}$

(β – particle)

d) i) In an ideal transformer, the output power is equal to. input power. But in an actual transformer, the output power is less than the input power
ii) The core is laminated to reduce these to a minimum as they interfere with the efficient transfer of energy from the primary coil to the secondary one. The eddy currents cause energy to be lost from the transformer as they heat up the core - meaning that electrical energy is being wasted as unwanted heat energy.

e) (i) The resistance of a wire increases with increases in the length of wire (R ∝ l).
(ii) The resistance of a wire decreases with increase in its thickness (R ∝ l/a where a = πr2, the area of cross-section of the wire

Answer 5

a) i) Position of weight is 25 cms
Half of 50 is 25 and weight declared 20gm. So, difference is 5 gm. Which is equivalent to the double of 20 gm and multiplication of 12 cm.

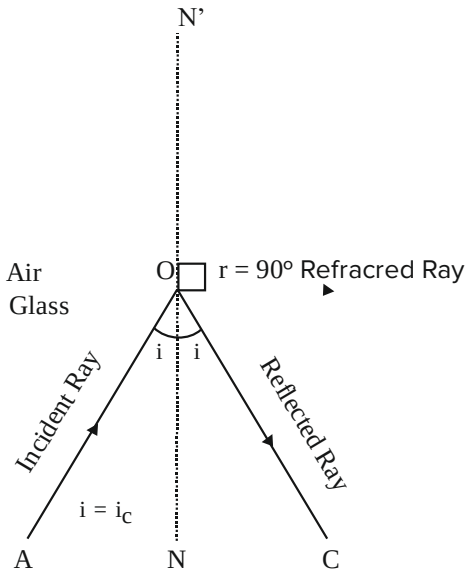
ii) the handle of the door is provided at the free end because larger the distance from the hinge, lesser will be the force required to open the door.

b) i) Load to be lifted Fload=50 kgf
Case 1: Fixed pulley is used.
MA for single fixed pulley MA=1
Thus, effort applied by the boy Feffort=MAFload=150=50 Kgf
Case 2: Movable pulley is used.
MA for movable pulley MA=2
Thus, effort applied by the boy Feffort=MAFload=250=25 Kgf
So, effort to be applied by the boy is less in case when he used a movable pulley because MA for a movable pulley is greater than 1.
ii) In uniform linear motion, the speed and direction of motion is fixed and so, it is not accelerated. In uniform circular motion, the speed is constant but the direction of motion changes continuously and hence, it is accelerated. Example- Motion of earth around the sun.

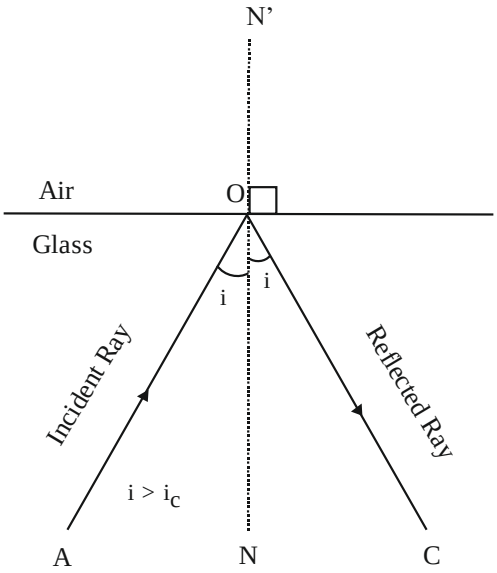
iii) the process used is called nuclear fission, Nuclear energy originates from the splitting of uranium atoms – a process called fission. This generates heat to produce steam, which is used by a turbine generator to generate electricity

c)
1. Distance moved by effort = 15/4 = 3.75 m
2. Work done by effort = 50×10 × (15/4) = 1875Joules
3. Mechanical advantage = 175/50 = 3.5
4. Efficiency = (mechanical advantage/velocity ratio) × 100 = (3.5/4) × 100 = 87.5

d)



(1) Critical angle

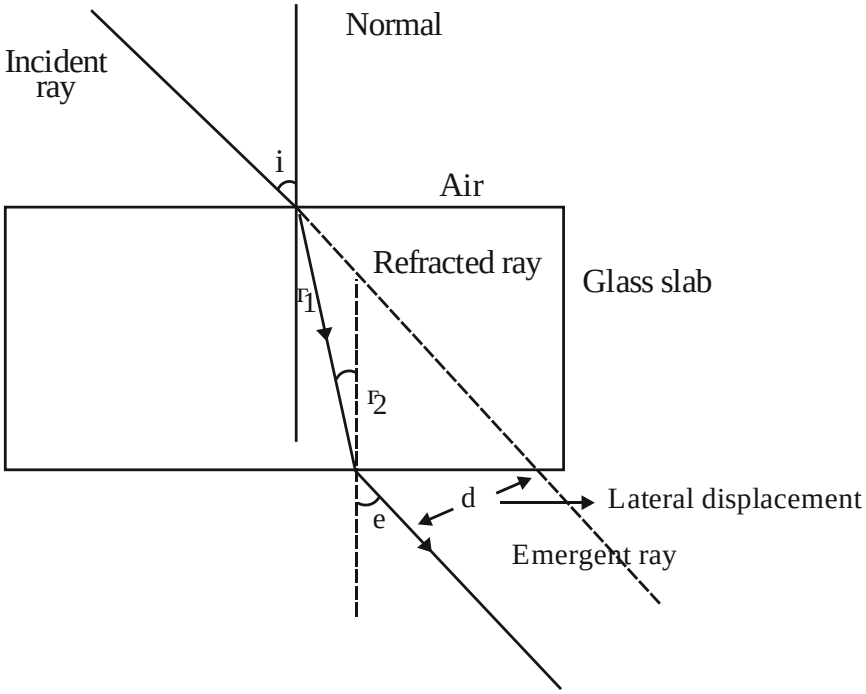


(2) Total Internal reflection

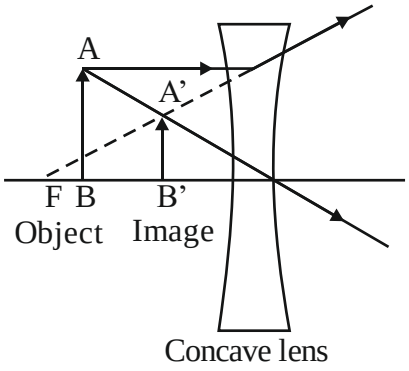
ii) Critical angle is the angle of incidence in the denser medium corresponding to which the angle of refraction in the rarer medium is 90^o .

$$\mu = \frac{1}{\sin C}$$

b)



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



Answer 7

a) Echo is defined as a sound repeating by sound wave reflection, having a lasting or far reaching impact, or repeating what someone else has said. An example of echo is the repeating of a sound created by footsteps in an empty marble hallway.
ii) The applications of echo:
1. Dolphins detect their enemy and obstacles by emitting the ultrasonic waves and hearing their echo. 2. In medical science, the echo method of ultrasonic waves is used for imaging human organs such as the liver, gall bladder, etc. This is called ultrasonography.

b)
Here, Mass of water mw=100g
Mass of ice, mi=10g
Specific heat of water, Sw=1calg−1oC−1
Latent heat of fusion of ice, Lfi=80calg−1

Let T be the final temperature of the mixture.
Amount of heat lost by water
=mwsw(△T) w=100×1×(50−T)
Amount of heat gained by ice
=miLfi+misw(△T)i=10×80+10×1×(T−0)
According to principle of calorimetry:
Heat lost = Heat gained
100×1×(50−T)=10×80+10×1×(T−0)
500−10T=80+T
11T=420orT=38.2oC

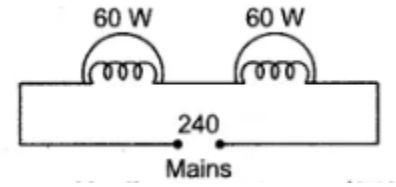
c)
(i): Vibration (b) has the largest amplitude.
(ii): c vibrates in the fundamental mode. So, c has the least frequency.
(iii): Frequency of (a), fa=3v///32L
Frequency of (c), fc=v/2L
(iv): Wavelength of (a), λa=2L/3
Wavelength of (b), λb=L

Answer 8

a) i) From $P = V^2/R$

Resistance of bulb (R) = V^2/P = 240 x 240/60 = 960Ω

ii) (a)



(b) Resistance of bulbs in series = (960 + 960)Ω = 1920Ω

∴ Current in series circuit I = V/R = 240/1920 = 0.125 A

∴ Rate of conservation of energy in any one bulb in 1 second = I^2Rt

= $(0.125)^2$ x 960 x 1 = 15.5

(c) Power of 1 bulb in series circuit = 15W

So power of 2 bulb in series circuit = 2 x 15 W = 30 W.

b) (i) The heat produced is proportional to the square of current passed in the wire.

(ii) The heat produced is proportional to the resistance of the wire.

(iii) The heat produced is proportional to the time of passage of current in the wire.

c) The similarity between d.c motor and a.c. generator is that they both are electrical machines which work based on the principle of Electromagnetic Induction.

d) In this circuit, 8Ω and 12Ω are connected in parallel, and these parallel resistors are connected in series with 7.2Ω.
8Ω and 12Ω are in parallel, their equivalent resistance:
R1=81+121=245
R=4.8Ω
Now, Equivalent resistance (series connection) of the circuit =4.8+7.2=12Ω
V=IReq
I=ReqV=126=0.5A
Potential Difference across 7.2Ω resistor =I×R=0.5×7.2=3.6V

Answer 9

a) Let, mass of water used =m
Since, Heat gained = Heat lost
m1cΔt1=mL+m2cΔt2
m×4.2×(60−10)=(40×336)+(40×4.2×(10−0))
m×4.2×50=(40×336)+1680
Therefore, the mass of water used, m=42×513440+1680=21015120=72g

b) i) ince melting of ice needs heat, so it will absorb heat in form of latent heat and temperature will remain constant until it melts.
ii) Radiator in car

c) (i) Substance B is a good conductor of heat.
(ii) Substance B is a good conductor of heat because specific capacity of B is less then that of A.
(iii) Substance A is more useful in car radiator.
(iv) A

Answer 10

a) i) when the number of neutrons becomes greater than that of protons, then the nucleus becomes unstable
ii) The Radioactivity of an element when it undergoes a chemical change to form a chemical compound. Radioactivity of an element is not affected by the chemical
change as radioactivity is a nuclear phenomenon and doesn't involve extra-nuclear electrons.

iii)a large nucleus like that of uranium fissions by splitting into two smaller nuclei, along with a few neutrons, the release of heat energy (kinetic energy of the nuclei), and gamma rays.

b) i) Helium gas.
ii) Radioactive (or nuclear) waste is a byproduct from nuclear reactors, fuel processing plants, hospitals, and research facility.
iii) Deep geological disposal is widely agreed to be the best solution for final disposal of the most radioactive waste produced

c) (i) (1) α, β and γ radiations are arranged in the ascending order with respect to their penetrating power as: α<β<γ
(2) α, β and γ radiations are arranged in the ascending order with respect to their ionizing power as: γ<β<α
(3) α, β and γ radiations are arranged in the ascending order with respect to their biological effect as: α<β<γ
ii) In a nuclear reaction conservation of charge number and mass number must hold good. Alpha particles are positively charged particle with charge +2e+2e and mass 4m4m. Emission of an α−α-particle reduces the mass of the radionuclide by 44 and its atomic number by 22. β−β-particles are negatively charged particles with rest mass as well as charge same as that of electrons, γ−γ-particles carry no charge and mass

PHYSICS

Answer Keys to **Self-Assessment** Sample Paper - 4

Answer 1

a) Given : $r_1 : r_2 = 2 : 3$

Area of cross section of wire = $a = \pi r^2$

$\therefore a_1 : a_2 = r_1^2 : r_2^2 = 4 : 9$

Resistance of wire $R \propto 1/a$

$\therefore \quad R_1/R_2 = a_2/a_1 = 9/4.$

b) i) The compressed spring has elastic potential energy due to its compressed state.
ii) When it is released, the potential energy of the spring changes into kinetic energy which does work on the ball if placed on it and changes into kinetic energy of the ball due to which it flies away.

c) i) hat point in a body or system around which its mass or weight is evenly distributed or balanced and through which the force of gravity acts. An example of center of gravity is the middle of a seesaw. ii) If the moment of force is assigned a negative sign then, the turning tendency of the force will be clockwise.

d) Let the distance of 40 kg. from the mean position be 'x' m.
Using principle of moments,
$30 \times 2 = 40 \times x$
$x = 1.5$m.
A boy of mass 40 kg should sit at 1.5m from the middle of see-saw.

e) II CLASS LEVER

Answer 2

a) i) The refractive index of a transparent medium is least for red light.
ii) The refractive index of a transparent medium is most for violet light.

b) i) equiconvex lens ii) A lens is called an equiconvex or equiconcave when radii of curvature of the two surfaces of lens are equal.

c) 1. There is always an amount of air present in the crack.
2. When rays of light travelling through glass, strike the glass air interface at an angle, greater than critical angle of glass, they are totally reflected.

3.When these reflected rays reach our eyes , then to eyes they appear to come from the crack, which in turns appears to be silvery.

d) i. ISOTOPES ii. Such atoms have same number of protons but different number of neutrons.

e) The earth pin is long so that the earth connection is made first. This ensures the safety of the user because if the appliance is defective, the fuse will blow off. The earth pin is made thicker so that even by mistake it cannot be inserted into the hole for the live or neutral connection of the socket

Answer 3

(a) (i) Its focal length increases. (ii) Thin lens.

(b) (i) Ratio of intensities will be 1: 9. (ii) Ratio of frequencies will be 1:1.

(c) (i) Increases. (ii) Decreases.

(d) (i) If a body is made to vibrate with its fundamental frequency by an external source, then the vibrations are called resonant vibrations. (ii) Quality.

(e) No, as it does not possess a helium nucleus.

Answer 4

a) i) An AC generator or Dynamo is used to convert mechanical energy to electrical energy
ii) It works on the Faraday's Law of Electromagnetic Induction.

b) Heat capacity is the ratio of the amount of heat energy transferred to an object to the resulting increase in its temperature. Specific heat capacity is a measure of the amount of heat necessary to raise the temperature of one gram of a pure substance by one-degree K.

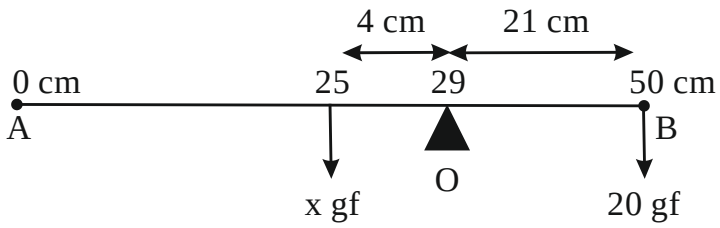
c) Heat gained = Heat lost
$150\times4.4\times(25-50)=60\times c\times(100-25)$
$150\times4.2\times5=60\times c\times75$
Specific heat capacity (c)=$0.7Jg^{-1}oC^{-1}$

d) (i) Speed of gamma radiations in air = 3 x 108 ms-1. (ii) Zinc Sulphide

e) Two sources of background radiations: $K-40$ and $C-14$

Answer 5

a) (i) Let the weight of the half metre rule be x gf and it acts at the 25 cm mark (centre of gravity).



(ii) Anti-clockwise moment (ACWM) = x * 4 gf cm Clockwise moment (CWM) = 20 x 21 gf cm in equilibrium, the weight of the half metre rule is 105 gf

b) (i) In the case of single movable pulley,
MA > 1⇒ effort arm > load arm
and in the case of a single fixed pulley.
MA = 1⇒load arm = effort arm
∴ Effort applied in the single fixed pulley is less as compare single movable pulley.

(ii) In uniform linear motion, the speed and direction of motion is fixed and so, it is not accelerated. In uniform circular motion, the speed is constant but the direction of motion changes continuously and hence, it is accelerated. Example- Motion of earth around the sun.

(iii) The process used for producing electricity using the nuclear energy is known as nuclear power plan

c) (i) $V.R. = \frac{\text{Distance moved by effort } (d\text{E})}{\text{Distance moved by load } (d\text{L})}$

$$4 = \frac{(d\text{E})}{15}$$

$$\therefore \text{Distance moved by effort } (d\text{E})$$

$$= 4 \, x \, 15 = 60 \, m$$

(ii) Work done by the effort

= E x dE

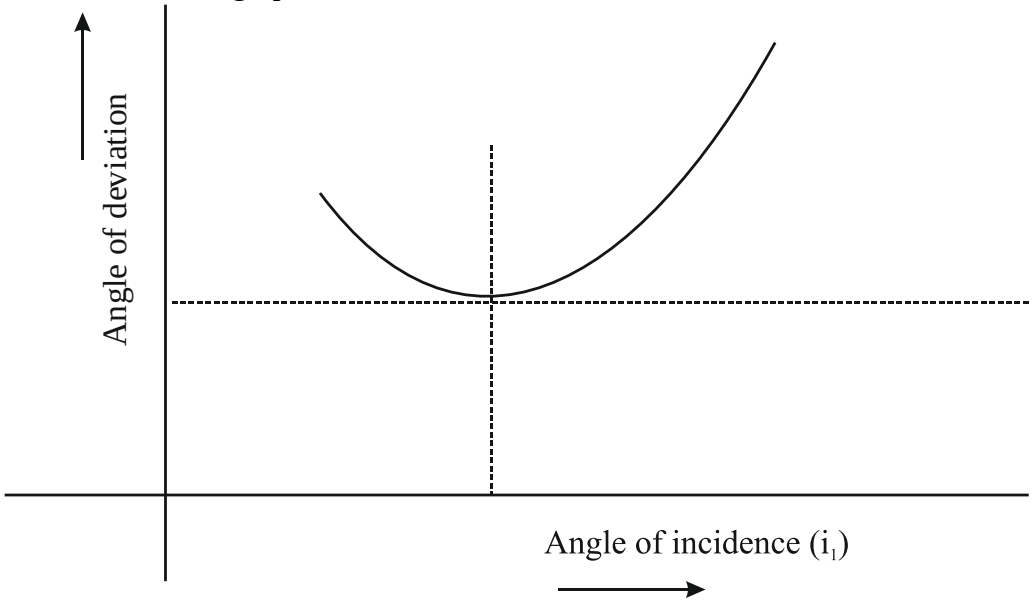
= 500 x 60 J = 30,000 J

(iii) $\text{M. A.} = \frac{L}{E} = \frac{1750}{500} = 3 \cdot 5$

(iv) $\text{Efficiency } ( ) = \frac{\text{M.A.}}{\text{V.R.}} \text{x } 100\% = \frac{3 \cdot 5}{4} \text{x } 100\% = 87.5\%$

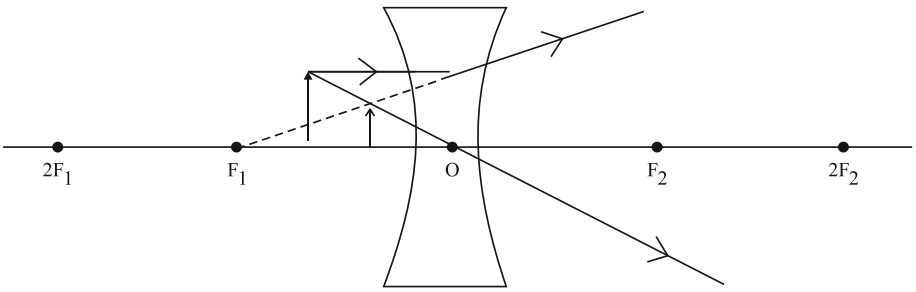
Answer 6

(a) As the. angle of incidence increases the angle of deviation decreases becomes minimum and then increases. The graph is as shown:



(b) (i)

Concave lens. (ii) The ray diagram is as shown:



(c) Given u = – 24 cm, f= + 8 cm, v =?

(i) Real, inverted and diminished.
(ii) Using the lens formula

I/f=1/v-1/u

V=12 cm

(iii) Using the expression

M=-v/u = ½

Answer 7

a) 1. Ultrasonic waves. 2. Because their frequency lies beyond the limits of audibility (20Hz—20,000Hz) 3. To locate the position of the object under water and to find the depth of sea.

b) (i) ∵ S = d/t ⇒ 350 = 50/t ∴ t = 1/7sec = 0.14sec. (ii) Echo will be heard because the conditions required for the formulation of echo are fulfilled.

- 17m minimum distance should be there.
- Persistence of hearing is 0.1sec. As both the conditions are satisfied. So, echo will be heard.

c) (1) Fuse and (2) Switch.

(ii) Fuse is used to limit the flow of current. Switch is used to start or stop the flow of current.

Answer 8

(a) (i) All appliances will continue to work even if one of the appliances does not work.

(ii) High resistivity and low melting point. (iii) The ground wires.

(b) (i) Diagram (ii) A is connected to the live wire and B to neutral wire.

(c) (i) RS = 5 + 0.5 = 5.5 Ω (ii) I = V/R = 3.3/5.5 = 0.6A 5×5 (iii) RP = 5*5/5+5 == 2.5 Ω, thus total resistance is RT = 2.5 +0.5 = 3.0

Answer 9

a) (i) Heat capacity of a substance is defined as the amount of heat energy given or released in changing the temperature of unit mass of substance by 1 oC.
It is calculated as S=mΔTQ
(ii)Its SI unit is J/KgoC.
(iii) Relation between Heat Capacity and Specific Heat Capacity is given by C=mS
where C is the Heat Capacity of the substance, S is the Specific Heat Capacity of the substance and m is the mass of the substance.
b) (i)the slope of AB and CD is same, that is gradient value is similar, but the length of CD is more than AB. It is because more energy is required from converting liquid to gas than from solid to liquid. (ii)As far as the melting and boiling points are concerned, t1 is the melting point while t3 is the boiling point

c) By conservation of energy, we have, 140 × 4.2 × (50 - T) = 60 × (336 + 4.2 × T)
from above equation, we get T = 11 ^{o}C

Answer 10

a) Power consumed in watt hours

= 100 × 8 + 100 × 8 + 1000 × 8 = (800 + 800 + 8000) Wh = 9600 Wh

Electric energy consumed in kWh (units) = 9600 ×1000 = 9.6 kWh.

Cost at 2 per unit or per kWh = 2 × 9.6 = 19.20 RS (i)

ii) DC motors are suitable for many applications – including conveyors, turntables, and others for which adjustable speed and constant or low-speed torque are required

b) (i)

NUCLEAR FISSION	NUCLEAR FUSION
▪ A heavy nucleus breaks up to form two lighter ones. ▪ It involves a chain reaction, which can lead to dangerous meltdowns. ▪ The heavy nucleus is bombarded with neutrons. ▪ There is established, decades-old technology to control fission. ▪ Nuclear waste, a byproduct of fission, is an environmental challenge.	▪ Two nuclei combine to form a heavier nucleus. ▪ There is no chain reaction involved. ▪ Light nuclei have to be heated to extremely high temperature. ▪ Scientists are still working on a controlled fusion reactor that offers more energy than it consumes. ▪ There is no nuclear waste. ▪ Raw materials are very easily sourced.

▪ Raw material like plutonium or uranium is scarce and costly.	▪ Fusion reactions have energy densities many times greater than nuclear fission.

(ii) always wear gloves when handling radioactive substances. Regularly check the radiation level of these gloves. Never touch anything with potentially contaminated gloves, use paper tissues instead. wear shoe covers in rooms where the floor may be contaminated

c) (i) Given: Composition of atomic nucleus A=84 protons and 128 neutrons.
Mass noumber of A=84+128=212
Atomic number of A=84
The nucleus A emits an alpha particle, the mass number decreases by 4 and the atomic number decreases by 2.
$_{84}^{212}A - \alpha _{82}^{208}B$
Number of protons in B=82
Number of neutrons in B=208−82=126
(ii) $_{82}^{208}B - \beta _{83}^{208}C$
Number of protons in C=83
Number of neutrons in C=208−83=125
(iii)Mass noumber of A=84+128=212
(iv) The composition of nucleus C does not change if it emits gamma radiations.

PHYSICS

Answer Keys to Self-Assessment Sample Paper - 5

Answer 1

a) (i) Single fixed pulley. (ii) Drawing water from well.

b) To produce more torque (or to rotate it easily), jack screw is provided with a long arm.

c) i) converts energy of light directly into electrical energy ii) converts heat directly into electricity.

d) i) linear velocity ii) m/s^2

e) i) Work done by a force when the force is in the direction of displacement
= Force × Displacement of the point of application of the force in the direction of force.
(ii) Work done by a force when the force is at an angle (θ) to the direction of displacement = Force × component of displacement in the direction of force.
= Force ×d cos θ
[d is the displacement of the body at the angle θ to the direction of force]

Answer 2

a) (i) Refractive index of water w.r.t air =n1n2=34 and refractive index of air w.r.t water =n2n1=43 =0.75
(ii) Angle of incidence = 0^o, when a ray of light is incident as a normal ray on the surface of separation of two different medium.

b) The cause of refraction of light is that light travels with different speeds in different media. This Change in the speed of light when it moves from one medium to another causes it to bend.

c) The refractive index of glass is 1.5 for white light means white light travels in air 1.5 times faster than in glass.

d) (i) The angle of incidence in a denser medium for which angle of refraction in rarer medium is 90° is called critical angle. (ii) Refractive index (μ) = 1/sin C

e) On the moon, since there is no atmosphere, therefore there is no scattering of sun light incident on the moon surface. Hence to an observer on the surface of 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 surface.

Answer 3

a) Electromagnetic waves travel at the speed of light.

v = f λ where v = velocity, f = frequency, λ = wavelength

v = 3 x 10^8

f = 15 x 10^6

λ = v /f = 3 x 10^8 / 15 x 10^6

λ = 20 m

b) i) Electric Fuse: copper wire. ii)Connecting wire: copper wire. iii)Filament of Bulb: Tungsten. iv)Electric toaster: NICHROME alloy

c) calculate R.

d) Power of water =2 kw=2000w
Mass of water =200kg
difference in temperature ΔT=70−10=60oC
energy required to heat the water = energy given by water in time t=pt
energy required to increase temperature of water by 60oC,
Q=msΔT
S= specific heat =4200J/kgoC

pt=msΔT
2000×t=200×4200×60
t=25200
or t=25.2×103sec.

e) Missouri is in higher latitude than Dehradun.
And also the sun ray falls straight on Dehradun and slanted on Mussoorie.

Answer 4

a) (i) As Boiling point is directly proportional to pressure. Hence, the boiling point of water is lower in Shimla than in Delhi.

b) As the specific heat capacity of liquid X is higher than the liquid Y, so for same mass and same heat energy, the rise in temperature for X will be less than that of Y.

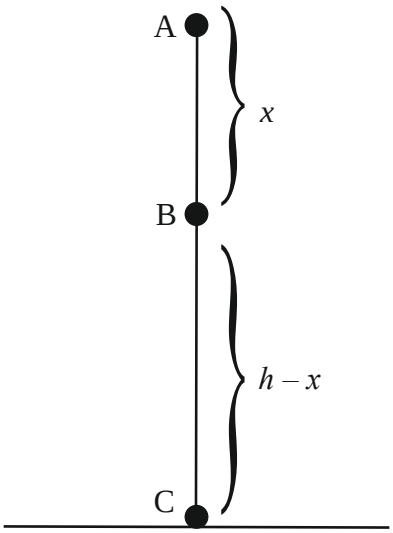
c) α-particles are a highly ionizing form of particle radiation and have low penetration depth. They can be stopped by a few centimeters of air, or by the skin. i.e., they cannot penetrate the human skin, so are used in radio therapy.

d) 32P is the radioactive isotope of phosphorous element.
As it has a greater number of neutrons than number of protons.

e) Energy released = 0.205 x 931 MeV = 190.86 MeV

Answer 5

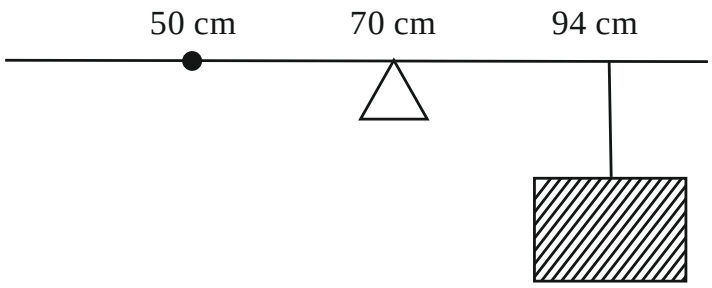
a) (i) It states that for a body falling freely the total mechanical energy remains conserved.
(ii) Suppose a ball of mass 'm' falls under the effect of gravity as shown in figure.
Let us find the kinetic and the potential energy of the ball at various points of its free fall. Let the ball fall from point A at a height h above the surface of the earth.



At Point A: At point A, the ball is stationary; therefore, its velocity is zero.
Therefore, kinetic energy, T = 0 and potential energy, U = mgh
Hence, total mechanical energy at point A is
E = T + U = 0 + mgh = mgh … (i)
At Point B : Suppose the ball covers a distance x when it moves from A to B. Let v be the velocity of the ball point B. Then by the equation of motion v^2-u^2 = 2aS, we have
v^2 - 0 = 2gx or v^2 = 2gx Therefore,
Kinetic energy, T = 1/2 mv^2 = 1/2 x m x (2gx)
= mgx
And Potential energy, U = mg (h - x)
Hence, total energy at point B is
E = T + U = mgx + mg(h-x) = mgh …(ii)
At Point C : Suppose the ball covers a distance h when it moves from A to C. Let V be the velocity of the ball at point C just before it touches the ground. Then by the equation of motion v^2 - u^2 = 2aS, we have V^2 - 0 = 2gh or V^2 = 2gh.
Therefore,
Kinetic energy,
T = 1/2 mV^2 = 1/2 x m x (2gh) = mgh
and Potential energy, U = 0
Hence, total energy at point E = T + U
= mgh + 0 = mgh … (iii)

Thus, it is clear from equations (i), (ii) and (iii), that the total mechanical energy of a freely falling ball remains constant

(iii) Diagram of the given arrangement is shown below.



$m_2 = 0.05$ kg

(b) As the given meter scale is a uniform scale. So, its centre of gravity lies at 50 cm. Let mass of meter scale be W_1 kg.
By principle of moments,

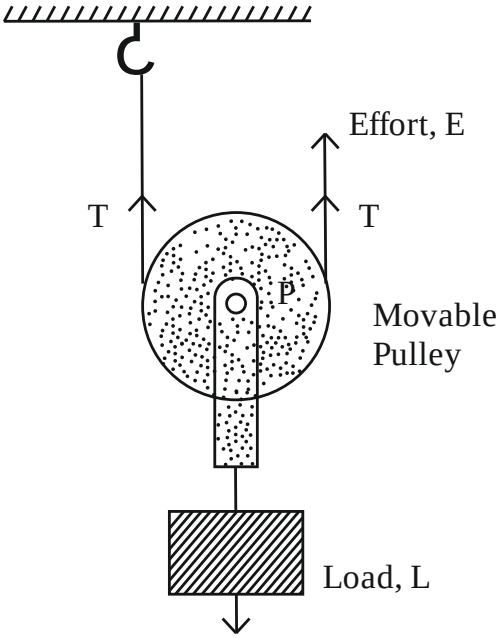
$m_1x_1 = m_2x_2$

$m_1 \times (70 - 50) = 0.05 \times (95 - 70)$

$m_1 = 0.05 \times 25/20$

$= 0.0625$ kg.

c) (a) Single movable pulley acts as a force multiplier.



Single movable pulley

(b) Given: velocity ratio of a pulley system (VR) = 4
Efficiency of the pulley system (η) = 90%
We know that

(i) $(\eta) = \frac{\text{Mechanical advantage (MA)}}{\text{Velocity ratio (VR)}}$

$90\% = \frac{MA}{4}$

$MA = \frac{90}{100} \times 4 = 3.6$

(ii) Load, L = 300 N, MA = 3.6, Effort, E = ?

$MA = \frac{L}{E}$

$E = \frac{L}{MA} = \frac{300N}{3.6} = 83.33$ N

Answer 6

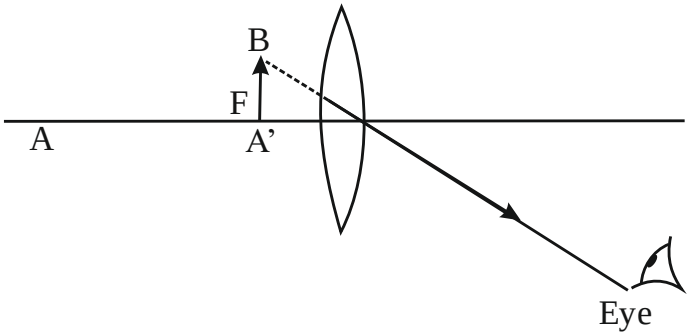
a) (i) When a convex lens is dipped in water its focal length changes and relative refractive index changes which makes it less converging.

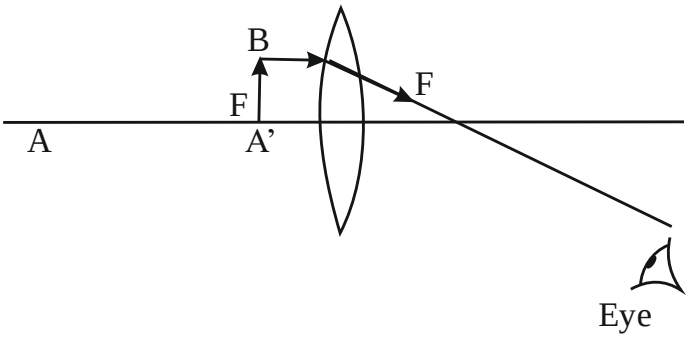
(ii) This means that the speed of light in diamond will reduce by a factor of 2.42 as compared to its speed in air. ... In other words, the speed of light in diamond is 1/2.42 times the speed of light in vacuum.

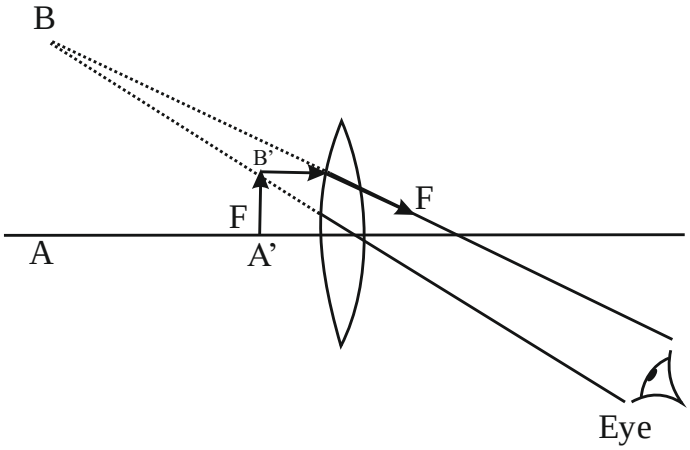
b) The rough focal length of a convex lens is obtained by forming sharp image of a very distant object on a screen. The distance of the screen from the lens gives us the rough focal length of the lens.

his method is not applicable to a concave lens, as image formed by a concave lens is virtual and it cannot be taken on a screen.

c) The image is virtual, erect, and larger than the object.

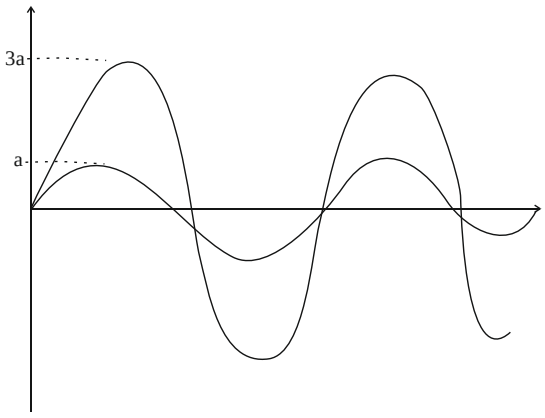






Answer 7

a) i)



ii) Forced vibrations occur if a system is continuously driven by an external agency. A simple example is a child's swing that is pushed on each downswing.

iii)The distance between the sound source and the reflecting surface must not be less than 17 metres where the time period between hearing the original sound and its echo should not be less than 0.1 of a second.

b) i) As the water level in the bucket rises, the length of the air column of the bucket goes on decreasing and the sound emitted goes on becoming more and more shrill. Thus, we can estimate from a distance that the bucket has been filled with water
ii)astronauts cannot talk with each other because there is no medium on moon for sound to travel, there is only vaccum.

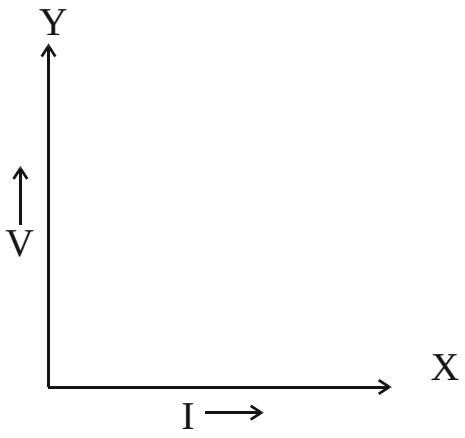
Since sound waves are mechanical, they cannot propagate through vaccum. That is why they can't talk

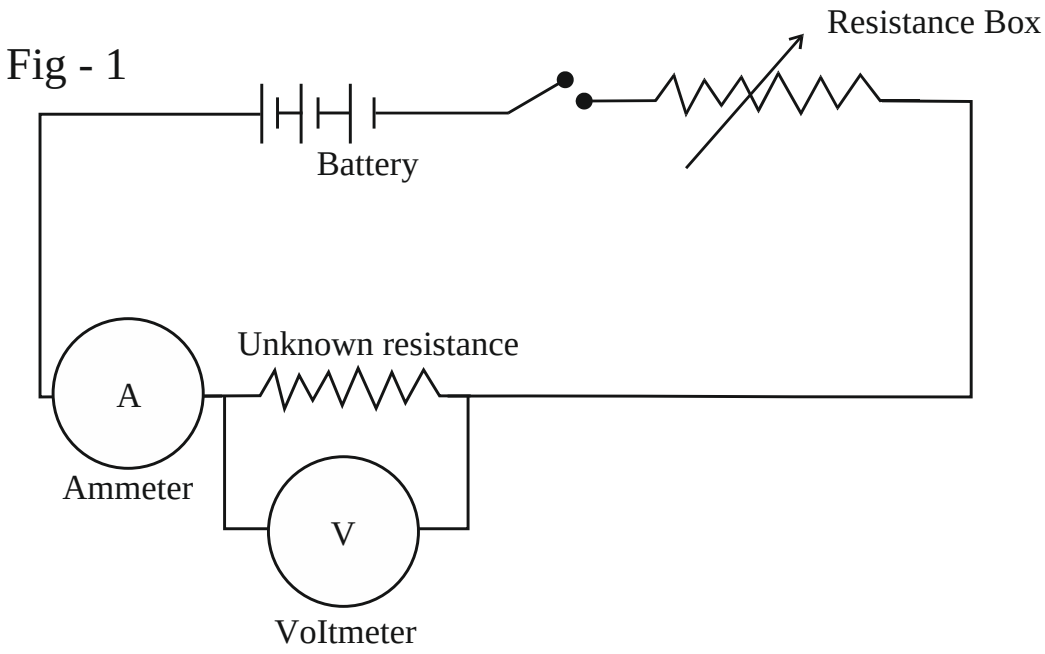
They use radio waves to talk as radio waves are non-mechanical and can propagate through vaccum

c) Given :
Time=5 sec
Let d be the distance between John and the hill at the beginning.
$V = 2d/t$
$=2d / 5$ ---------- eq (1)
He then moves 320m towards hill.
Therefore distance is (d-320)m
Therefore $V=2(d-320)/2$ ---------- eq (2)
Since velocities are same
$2d/5 = 2(d-320)/3$
$6d=10d-3200$
$4d=3200$
$d=800m$
Velocity $=V=2x800/5=320$ m/s

Answer 8

a)





b) FIND R AND

use V=IR

c)

Energy consumed by bulbs in one month = 6*100*8*30 / 1000 = 144 kWh

Energy consumed by heater in one month = 1*2*0.5*30 = 30 kWh

Energy consumed by fans in one month = 5*50*6*30 / 1000 = 45 kWh

Total Energy consumed = (144 + 30 + 45) kWh = 219 kWh

Answer 9

a) The term calorie can be defined as the energy needed to raise the temperature of 1 gram of water by 1 °C.
1 cal=4.18 J
Heat absorbed by a substance is given by H = msθ H = Heat capacity × rise of temperature. Since, H is same for both A and B, it is a clear that heat capacity is inversely proportional to the rise of temperature. Since, the rise of temperature A is more its heat capacity must be less. ∴ Heat capacity of A is less than that of B.

b) i) For any work with an open radioactive source, wear: disposable gloves (latex or nitrile gloves are generally suitable)

ii) Implementation of radiation protection and contamination control procedures. Use of proper protective equipment. Adherence to approved operating and maintenance procedure

iii) A lockbox, locked refrigerated/freezer or locked lab must be part of your plan to ensure safe, secure storage of radioactive materials

c) (i) Heat energy imparted by water in fall of its temperature from 40^oC to 0^oC = mass x specific heat capacity x falls in temperature
= 10 x 4200 x (40 - 0) J
(ii) If m kg of ice melts at 0^oC by the heat energy imparted by water, then Heat imparted - mL
10 x 4200 x (40 - 0) J = m x 336 x 1000 J
Therefore, m = 10 x 4200 x (40 - 0) J/336 x 1000 J=5
Remaining ice = 10 - 5 = 2 kg. Thus 2 kg ice remains unmelted at 0^oC.
(iii) Final temperature of mixture will be 0^oC (since the mixture will contain 10 kg of water at 0^oC + 5 kg ice melted water at 0^oC + 2 kg unmelted ice at 0^0C).
(iv) Mass of water at 0^oC in mixture = 10 + 5= 15 kg.

Answer 10

a) The hazardous wastes could even leads us the mutation of genes resulting in cancer. the best way of their disposal is deep well injections followed by protective covering of perforated wells around it...

b) Abundant energy: Fusing atoms together in a controlled way releases nearly four million times more energy than a chemical reaction such as the burning of coal, oil or gas and four times as much as nuclear fission reactions (at equal mass).

c) As we know, energy $E=\Delta mc2$
$=1.5\times10–3\times(3\times108)\text{^}2$ J

d) During nuclear fission reaction mass defect is converted in to energy release
Mass defect=0.4amu
So,
Energy released=0.4×931Mev
=372.4 Mev