NDA-CDS 1 2025

GS

LIVE

PHYSICS

MISCELLANEOUS

CLASS 4

NAVJYOTI SIR

SSBCrack EXAMS

REVISION THROUGH MCQs

Which one of the following energy is stored in the links between the atoms ?

(a) Nuclear energy

(b) Chemical energy

(c) Potential energy

(d) Thermal energy

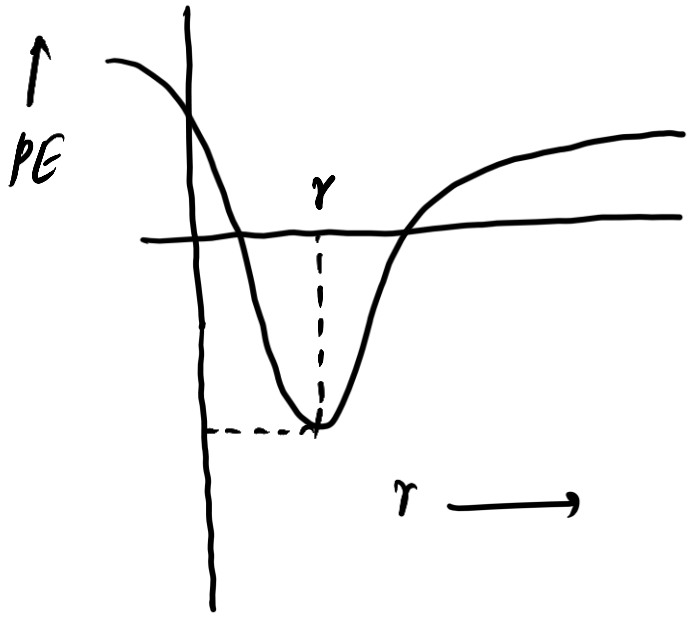
Which one of the following energy is stored in the links between the atoms ?

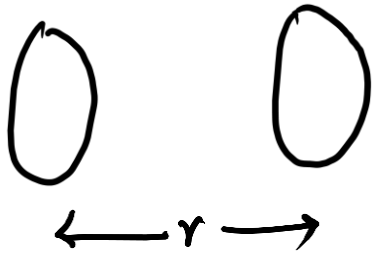
(a) Nuclear energy

(b) Chemical energy

(c) Potential energy

(d) Thermal energy





ANSWER : C

Which of the following statements about latent heat for a given substance is/are correct ?

1. It is fixed at a given temperature. ✓
2. It depends upon the temperature and volume.
3. It is independent of temperature and volume.
4. It depends on the temperature but independent of volume. ✓

Select the correct answer using the code given below :

(a) 2

(b) 1 and 3

(c) 4 only

(d) 1 and 4 ✓

$Q = mL$

$L \longrightarrow$ temperature ✓

volume ✗

Which of the following statements about latent heat for a given substance is/are correct ?

1. It is fixed at a given temperature.
2. It depends upon the temperature and volume.
3. It is independent of temperature and volume.
4. It depends on the temperature but independent of volume.

Select the correct answer using the code given below :

(a) 2

(b) 1 and 3

(c) 4 only

(d) 1 and 4

ANSWER : D

Thermal capacity of a body depends on the

(a) mass of the body only

(b) mass and shape of the body only

(c) density of the body

(d) mass, shape and temperature of the body

$Q = mH$

H → Thermal capacity.

Thermal capacity of a body depends on the

(a) mass of the body only

(b) mass and shape of the body only

(c) density of the body

(d) mass, shape and temperature of the body

ANSWER : A

In which of the following phenomena do heat waves travel along a straight line with the speed of light ?

(a) Thermal conduction

(b) Thermal convection

(c) Thermal radiation

(d) Both, thermal conduction and radiation

In which of the following phenomena do heat waves travel along a straight line with the speed of light ?

(a) Thermal conduction

(b) Thermal convection

(c) Thermal radiation

(d) Both, thermal conduction and radiation

ANSWER : C

Which of the following statements about specific heat of a body is/are correct ?

1. It depends upon mass and shape of the body
2. It is independent of mass and shape of the body
3. It depends only upon the temperature of the body

Select the correct answer using the code given below :

(a) 1 only

(b) 2 and 3

(c) 1 and 3

(d) 2 only

Heat, $Q = mc(\Delta T)$

Specific Heat, $c = \frac{Q}{m\Delta T}$

(fixed for a given substance)

{ c does not depends on mass and temperature of body.

Which of the following statements about specific heat of a body is/are correct ?

1. It depends upon mass and shape of the body

2. It is independent of mass and shape of the body

3. It depends only upon the temperature of the body

Select the correct answer using the code given below :

(a) 1 only

(b) 2 and 3

(c) 1 and 3

(d) 2 only

ANSWER : D

The hydrogen bomb and the uranium bomb are based, respectively on

(a) nuclear fusion and fission

(b) fission and thermonuclear fusion

(c) geothermal fission and fusion

(d) geothermal fusion and fission

Hydrogen bomb ⟶ fusion

Uranium bomb ⟶ fission

The hydrogen bomb and the uranium bomb are based, respectively on

(a) nuclear fusion and fission

(b) fission and thermonuclear fusion

(c) geothermal fission and fusion

(d) geothermal fusion and fission

ANSWER : A

Which of the following represents a relation for 'heat lost = heat gained'?

(a) Principle of thermal equilibrium

(b) Principle of colors

(c) Principle of calorimetry

(d) Principle of vaporization

Which of the following represents a relation for 'heat lost = heat gained'?

(a) Principle of thermal equilibrium

(b) Principle of colors

(c) Principle of calorimetry

(d) Principle of vaporization

ANSWER : (C)

Which one among the following statements with reference to the properties of water is ***not*** correct ?

(a) The specific heat of water is abnormally high.

(b) Latent heat of fusion of water is very low.

(c) Density of water is higher than ice.

(d) Pure water is a non-conductor of electricity.

distilled water (water having no ions)

Which one among the following statements with reference to the properties of water is ***not*** correct ?

(a) The specific heat of water is abnormally high.

(b) Latent heat of fusion of water is very low.

(c) Density of water is higher than ice.

(d) Pure water is a non-conductor of electricity.

ANSWER : (B)

On a day when I am in hurry to go to office, I have a fixed quantity of rice which was just cooked and kept in a bowl. In order to cool it quickly, which one of the following is the best option?

(a) Let it be kept on the table in a room where there is no fan, no air conditioner

(b) Let it be kept in a room with AC set at a temperature around 23 °C and a ceiling fan (or table fan) operating at slow speed

(c) Let it be kept in a bowl of water (at room temperature) and operating a ceiling fan (or table fan) at full speed

(d) Let it be kept in a bowl of water at room temperature only

→ rate of evaporation increases with wind speed,

↓

object cools down,

On a day when I am in hurry to go to office, I have a fixed quantity of rice which was just cooked and kept in a bowl. In order to cool it quickly, which one of the following is the best option?

(a) Let it be kept on the table in a room where there is no fan, no air conditioner

(b) Let it be kept in a room with AC set at a temperature around 23 °C and a ceiling fan (or table fan) operating at slow speed

(c) Let it be kept in a bowl of water (at room temperature) and operating a ceiling fan (or table fan) at full speed

(d) Let it be kept in a bowl of water at room temperature only

ANSWER : (C)

Which one of the following heat transfers is an example of convection ?

(a) Heating of food in a microwave oven → Radiation

(b) Boiling water in a pot on a gas stove → convection

(c) Feeling the warmth in sun → Radiation

(d) Heating a brass rod at one end and observing the temperature rise at the other end → conduction

Which one of the following heat transfers is an example of convection ?

(a) Heating of food in a microwave oven

(b) Boiling water in a pot on a gas stove

(c) Feeling the warmth in sun

(d) Heating a brass rod at one end and observing the temperature rise at the other end

ANSWER : (B)

Which one of the following statements best defines the concept of heat ?

(a) The transformation of energy from one form to another

(b) The conversion of energy into mass and vice-versa due to temperature difference

(c) The transfer of energy due to temperature difference

(d) The change in volume of a substance with temperature

Heat → energy due to temperature difference,

Which one of the following statements best defines the concept of heat ?

(a) The transformation of energy from one form to another

(b) The conversion of energy into mass and vice-versa due to temperature difference

(c) The transfer of energy due to temperature difference

(d) The change in volume of a substance with temperature

ANSWER : (C)

The most important safety method used for protecting home appliances from short circuiting or overloading is

(a) Earthing

(b) use of fuse

(c) use of stabilizers

(d) use of electric meter

abrupt increase in current in circuit.

The most important safety method used for protecting home appliances from short circuiting or overloading is

(a) Earthing

(b) use of fuse

(c) use of stabilizers

(d) use of electric meter

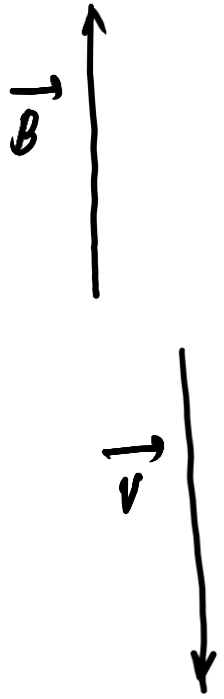
A positive charge is moving towards south in a space where magnetic field is pointing in the north direction. The moving charge will experience :

(a) a deflecting force towards north direction.

(b) a deflecting force towards east direction.

(c) a deflecting force towards west direction.

(d) no deflecting force.



$\theta = 180^\circ$

Force, $F = q(\vec{v} \times \vec{B}) = quB\sin\theta$

$\theta = 180^\circ \Rightarrow \sin 0^\circ = 0 \Rightarrow F = 0$

A positive charge is moving towards south in a space where magnetic field is pointing in the north direction. The moving charge will experience :

(a) a deflecting force towards north direction.

(b) a deflecting force towards east direction.

(c) a deflecting force towards west direction.

(d) no deflecting force.

ANSWER : D

The magnetic field strength of a current-carrying wire at a particular distance from the axis of the wire

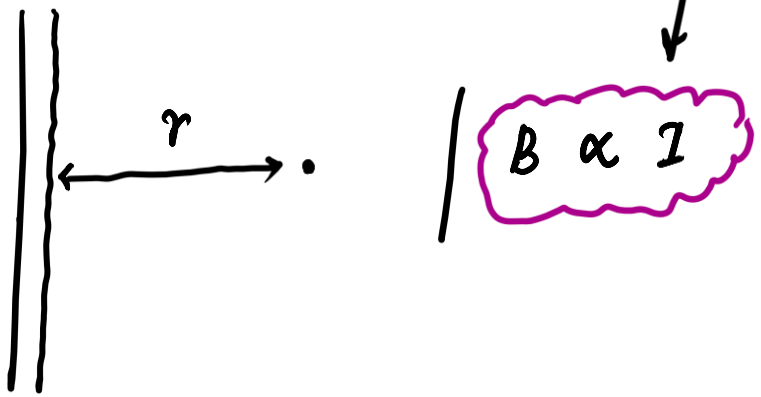
(a) depends upon the current in the wire

(b) depends upon the radius of the wire

(c) depends upon the temperature of the surroundings

(d) None of the above

$$B = \frac{\mu_0 I}{2\pi r}$$



The magnetic field strength of a current-carrying wire at a particular distance from the axis of the wire

(a) depends upon the current in the wire

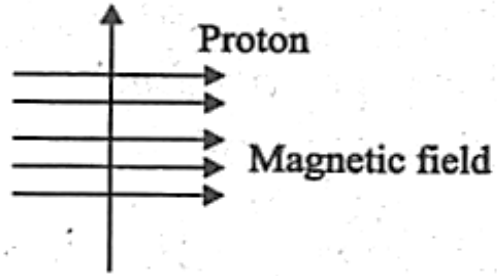
(b) depends upon the radius of the wire

(c) depends upon the temperature of the surroundings

(d) None of the above

ANSWER : D

Consider the following image :



A proton enters a magnetic field at right angles to it, as shown above. The direction of force acting on the proton will be

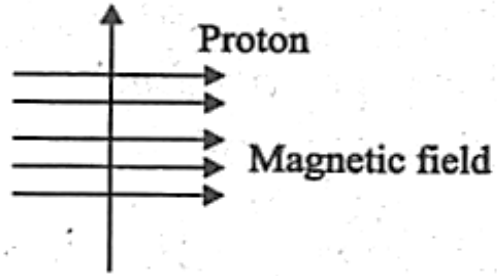
(a) to the right

(b) to the left

(c) out of the page

(d) into the page

Consider the following image :



A proton enters a magnetic field at right angles to it, as shown above. The direction of force acting on the proton will be

(a) to the right

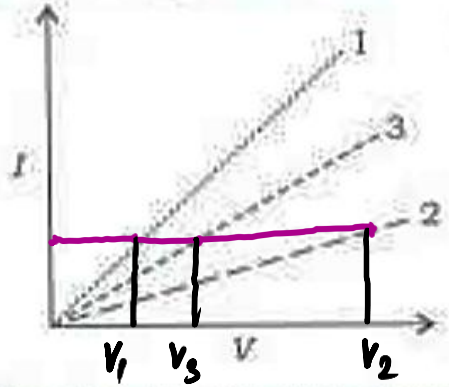
(b) to the left

(c) out of the page

(d) into the page

ANSWER : D

The graphs between current (I) and voltage (V) for three linear resistors 1, 2 and 3 are given below :



$V_1 < V_3 < V_2$

$R_1 < R_3 < R_2$

If R_1, R_2 and R_3 are the resistances of these resistors, then which one of the following is correct?

(a) $R_1 > R_2 > R_3$

(b) $R_1 < R_3 < R_2$

(c) $R_3 < R_1 < R_2$

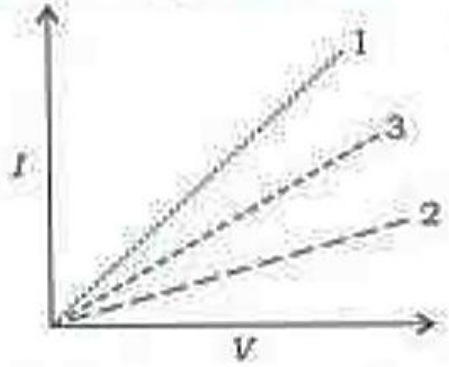
(d) $R_3 > R_2 > R_1$

$V = IR$ (Ohm's Law)

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

for same I, $R \propto V$

The graphs between current (I) and voltage (V) for three linear resistors 1, 2 and 3 are given below :



If R_1, R_2 and R_3 are the resistances of these resistors, then which one of the following is correct?

(a) $R_1 > R_2 > R_3$

(b) $R_1 < R_3 < R_2$

(c) $R_3 < R_1 < R_2$

(d) $R_3 > R_2 > R_1$

ANSWER : B

Which one of the following is the value of 1 kWh of energy converted into joules ?

(a) $1{\cdot}8 \times 10^6$ J

(b) $3{\cdot}6 \times 10^6$ J

(c) $6{\cdot}0 \times 10^6$ J

(d) $7{\cdot}2 \times 10^6$ J

1 kwh

↓

(1000 W) x (3600 s)

= 3.6×10^6 J

Power = Energy (J) / Time (s)

(W)

J ⟶ watt x second

Which one of the following is the value of 1 kWh of energy converted into joules ?

(a) $1{\cdot}8 \times 10^6$ J

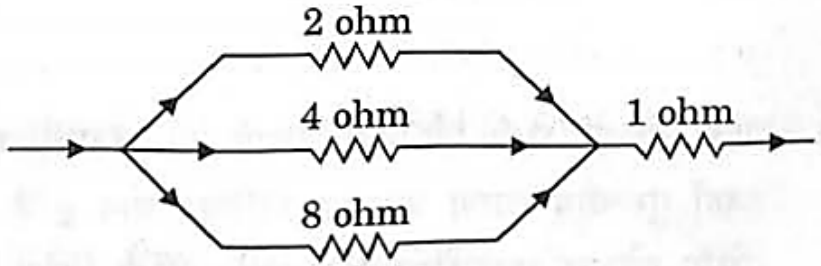
(b) $3{\cdot}6 \times 10^6$ J

(c) $6{\cdot}0 \times 10^6$ J

(d) $7{\cdot}2 \times 10^6$ J

ANSWER : B

Consider the following part of an electric circuit :



The total electrical resistance in the given part of the electric circuit is

(a) $\frac{15}{8}$ ohm

(b) $\frac{15}{7}$ ohm

(c) 15 ohm

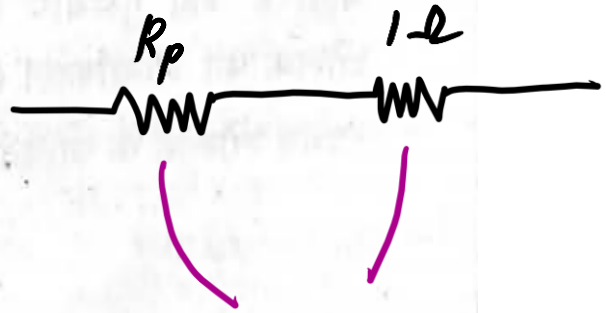
(d) $\frac{17}{3}$ ohm

2, 4 and 8 Ω are in parallel,

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{1}{R_p}$$

$$\frac{1}{R_p} = \frac{4+2+1}{8} = \frac{7}{8}$$

$$R_p = \frac{8}{7}$$

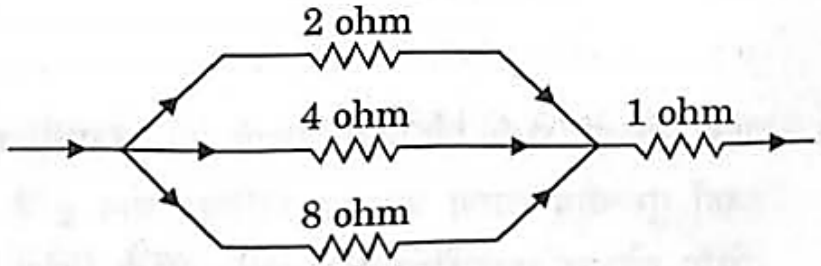


Series

$$R_p + 1 = \frac{8}{7}\,\Omega + 1\,\Omega$$

$$= \frac{15}{7}\,\Omega$$ //

Consider the following part of an electric circuit :



The total electrical resistance in the given part of the electric circuit is

(a) $\frac{15}{8}$ ohm

(b) $\frac{15}{7}$ ohm

(c) 15 ohm

(d) $\frac{17}{3}$ ohm

ANSWER : B

Lightning is due to

(a) The flow of charges between different parts of the cloud

(b) The short-circuiting of charges between the upper and lower surfaces of the cloud

(c) The collection of positively charged particles on the base and collection of negatively charged particles at the top of the cloud

(d) The induction of positive charge on the ground below the negative charge at the base of the cloud

Lightning is due to

(a) The flow of charges between different parts of the cloud

(b) The short-circuiting of charges between the upper and lower surfaces of the cloud

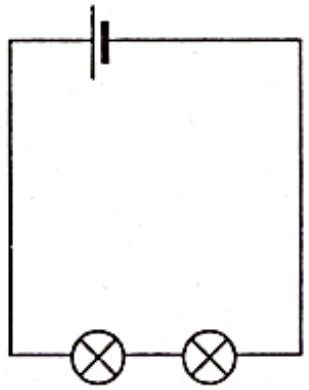
(c) The collection of positively charged particles on the base and collection of negatively charged particles at the top of the cloud

(d) The induction of positive charge on the ground below the negative charge at the base of the cloud

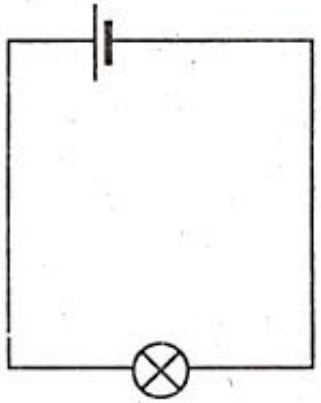
ANS : D

In which one among the following situations, the bulb ⊗ would glow the most ? (Consider all batteries are the same)

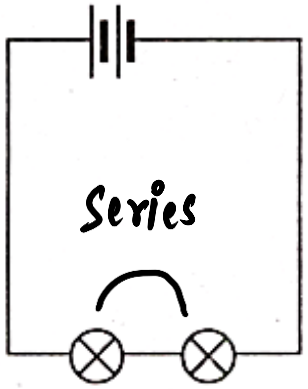
(a)



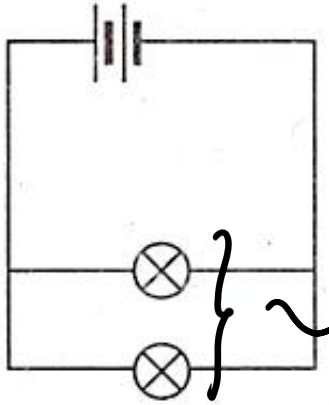
(c)



(b)



(d)



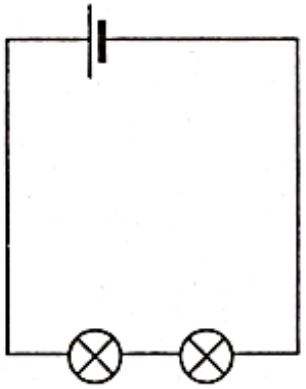
maximum glow → maximum current

higher voltage → 2 cells

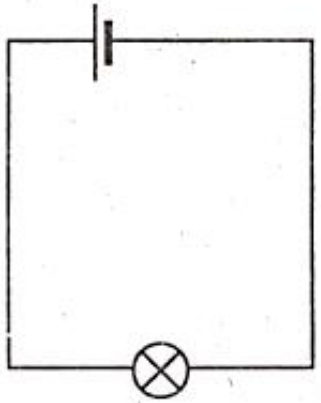
lower resistance → parallel

In which one among the following situations, the bulb ⊗ would glow the most ? (Consider all batteries are the same)

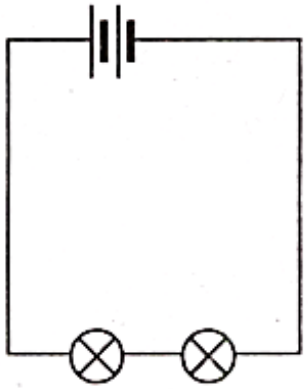
(a)



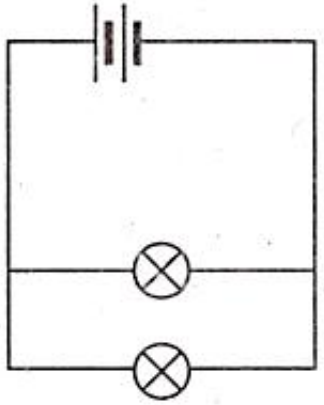
(c)



(b)

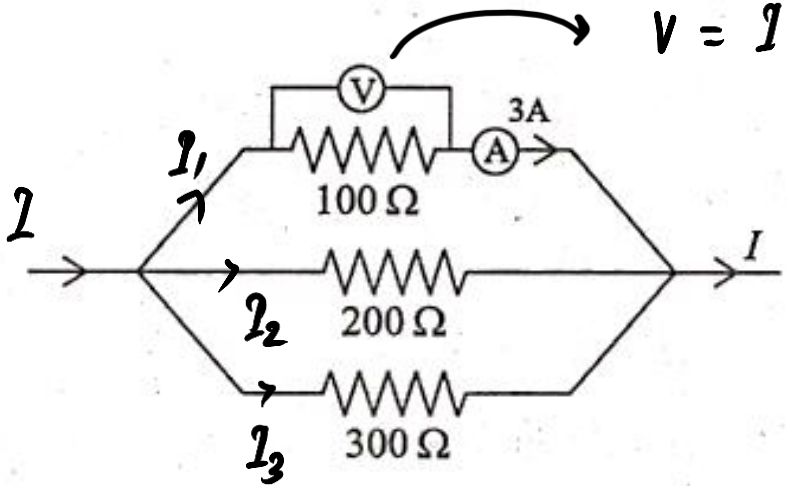


(d)



ANS : D

For an electric circuit given below, the correct combination of voltage (V) and current (I) is



(a) $V = 900$ V; $I = 18$ A

(b) $V = 300$ V; $I = 5{\cdot}5$ A

(c) $V = 600$ V; $I = 1$ A

(d) $V = 300$ V; $I = 2$ A

$V = I \times R = 3\,A \times 100\,\Omega = 300\,V$

200 Ω and 300 Ω are parallel with 100 Ω.

V will be same on all three.

$I = I_1 + I_2 + I_3$

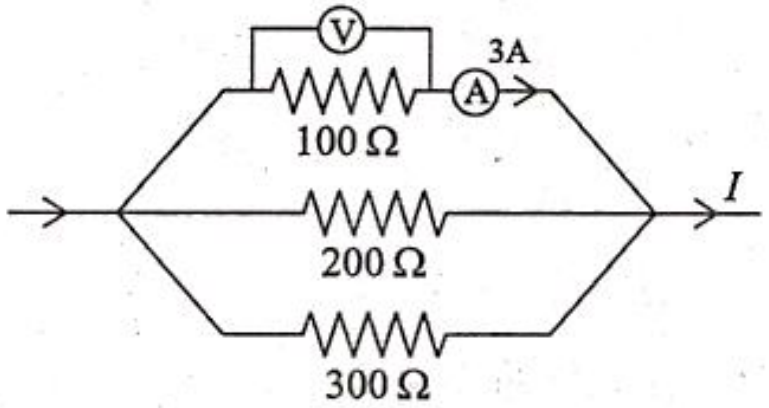
(Kirchoff's 1st law)

$I_2 = \frac{300\,V}{200\,\Omega} = 1{\cdot}5\,A$

$I_3 = \frac{300\,V}{300\,\Omega} = 1\,A$

$I = I_1 + I_2 + I_3 = 3A + 1{\cdot}5\,A + 1\,A = 5{\cdot}5\,A$

For an electric circuit given below, the correct combination of voltage (V) and current (I) is



(a) $V = 900$ V; $I = 18$ A

(b) $V = 300$ V; $I = 5{\cdot}5$ A

(c) $V = 600$ V; $I = 1$ A

(d) $V = 300$ V; $I = 2$ A

ANS : B

An incandescent electric bulb converts 20% of its power consumption into light, and the remaining power is dissipated as heat. The bulb's filament has a resistance of 200 Ω and 2 A current flows through it. If the bulb remains ON for 10 h and the rate of electricity charge is ₹5/unit, then which among the following is the correct amount for the money spent on producing light ?

(a) ₹5

(b) ₹6

(c) ₹7

(d) ₹8

Power, $P = I^2R$

$= (2)^2 \times 200\ \Omega$

$= \underline{800\ W}$

20% of 800 W in light $= \frac{20}{100} \times 800 = \underline{160\ W}$

$= \underline{0.160\ kW}$

10 h $\longrightarrow$ Energy $= 0.160 \times 10\ kWh = 1.6\ kWh$

Cost $\longrightarrow$ $1.6 \times ₹5 = ₹8.0 =$ ₹8

An incandescent electric bulb converts 20% of its power consumption into light, and the remaining power is dissipated as heat. The bulb's filament has a resistance of 200 Ω and 2 A current flows through it. If the bulb remains ON for 10 h and the rate of electricity charge is ₹5/unit, then which among the following is the correct amount for the money spent on producing light ?

(a) ₹5

(b) ₹6

(c) ₹7

(d) ₹8

ANS : D

The AC mains domestic supply current in India changes direction in every

(a) 50 s

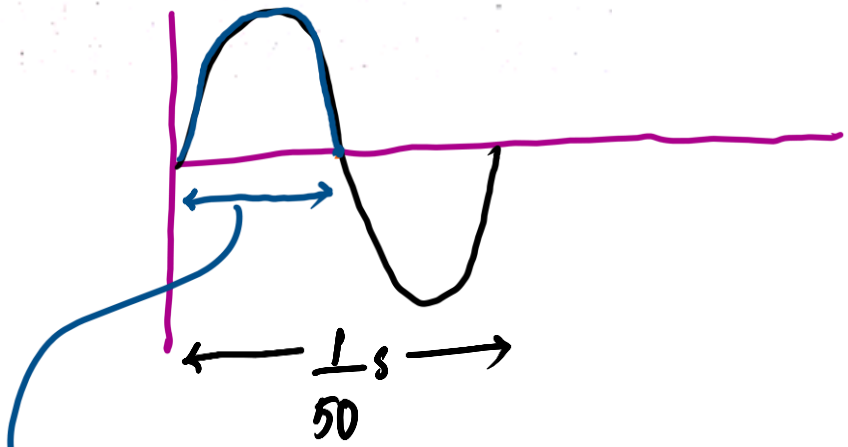
(b) $\frac{1}{50}$ s

(c) 100 s

(d) $\frac{1}{100}$ s

India : 220 V, 50 Hz

US : 110 V, 60 Hz



$\frac{1}{2}\left(\frac{1}{50}\right) = \frac{1}{100}$ s

Frequency (f) = $\frac{1}{\text{Time period (T)}}$

$f = \frac{1}{T} \Rightarrow T = \frac{1}{f}$

The AC mains domestic supply current in India changes direction in every

(a) 50 s

(b) $\frac{1}{50}$ s

(c) 100 s

(d) $\frac{1}{100}$ s

ANS : D

Which one of the following is primarily responsible for conduction of current in a metal ?

(a) Bound electrons

(b) Free electrons

(c) Both bound and free electrons

(d) Ions

Which one of the following is primarily responsible for conduction of current in a metal ?

(a) Bound electrons

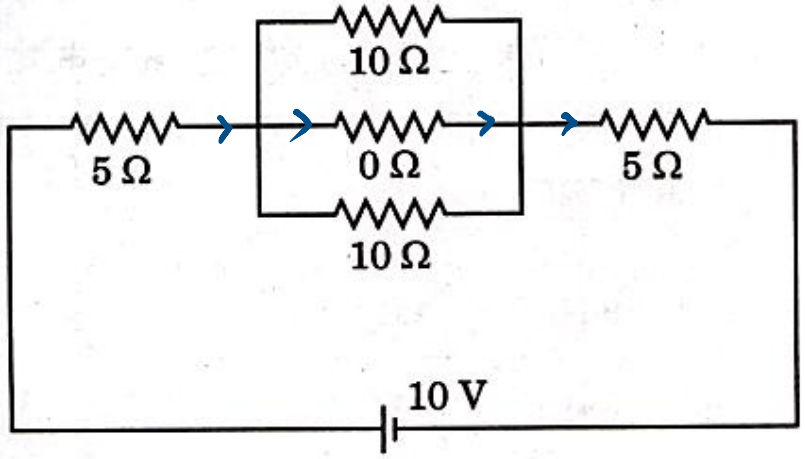
(b) Free electrons

(c) Both bound and free electrons

(d) Ions

ANS : B

Consider the following electric circuit :



The current in the above electric circuit is :

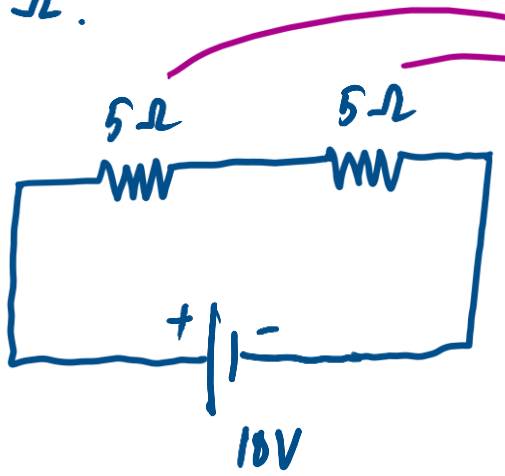
(a) 1 A

(b) (10/15) A

(c) 2 A

(d) 1·5 A

current will directly go through 0 Ω.



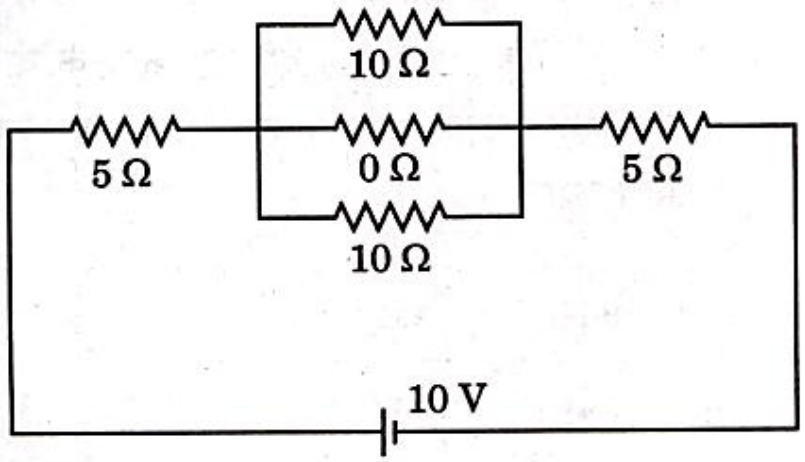
series connection

Total resistance = 5Ω + 5Ω

= 10 Ω

$$\text{Current} = \frac{10\text{V}}{10\,\Omega} = 1\text{ A}$$

Consider the following electric circuit :



The current in the above electric circuit is :

(a) 1 A

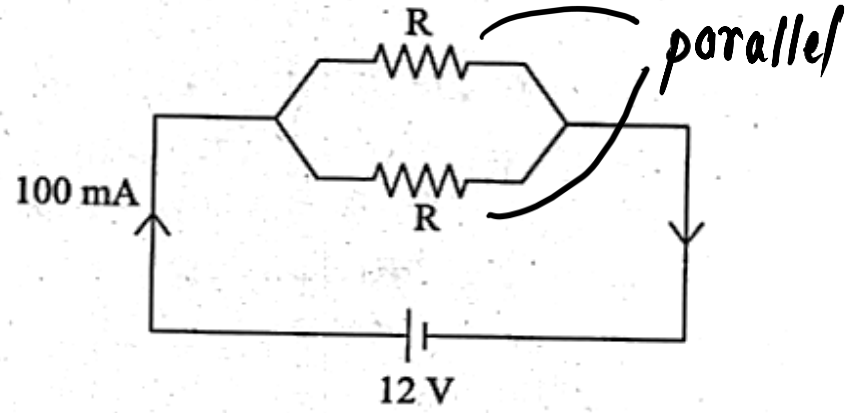
(b) (10/15) A

(c) 2 A

(d) 1·5 A

Answer: (A)

. Two equal resistors R are connected in parallel, and a battery of 12 V is connected across this combination. A dc current of 100 mA flows through the circuit as shown below :



The value of R is

(a) 120 Ω

(b) 240 Ω

(c) 60 Ω

(d) 100 Ω

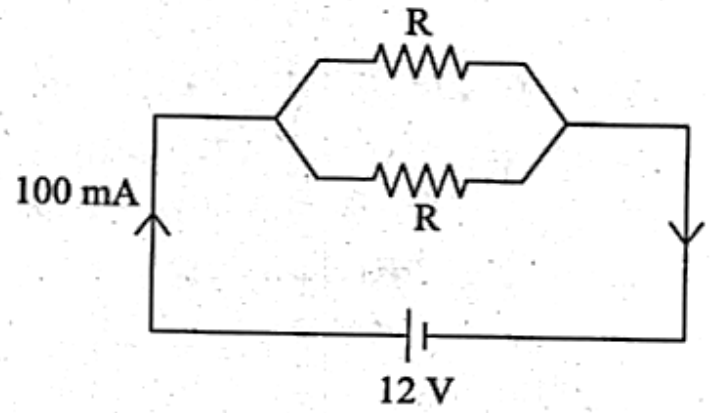
$100\ mA = \frac{12\ V}{\left(\frac{R}{2}\right)}$

$100 \times 10^{-3}\ A = \frac{2 \times 12}{R}$

$R = \frac{2 \times 12}{100 \times 10^{-3}} = \frac{2 \times 1000 \times 3}{25}$

$= 240\ \Omega$

. Two equal resistors R are connected in parallel, and a battery of 12 V is connected across this combination. A dc current of 100 mA flows through the circuit as shown below :



The value of R is

(a) 120 Ω

(b) 240 Ω

(c) 60 Ω

(d) 100 Ω

ANSWER : B

A fuse wire must be

(a) conducting and of low melting point

(b) conducting and of high melting point

(c) insulator and of high melting point

(d) insulator and of low melting point

A fuse wire must be

(a) conducting and of low melting point

(b) conducting and of high melting point

(c) insulator and of high melting point

(d) insulator and of low melting point

ANSWER : A

Let us consider a copper wire having radius r and length l. Let its resistance be R. If the radius of another copper wire is $2r$ and the length is $l/2$ then the resistance of this wire will be

(a) R

(b) $2R$

(c) $R/4$

(d) $R/8$

$$R = \frac{\rho l}{\pi r^2}$$

$$R' = \frac{\rho\left(\frac{l}{2}\right)}{\pi(2r)^2} = \frac{\rho l}{\pi r^2} \times \frac{1}{2 \times 4}$$

$$= \frac{1}{8}\left(\frac{\rho l}{\pi r^2}\right) = \frac{1}{8}(R) = \frac{R}{8}$$

Let us consider a copper wire having radius r and length l. Let its resistance be R. If the radius of another copper wire is $2r$ and the length is $l/2$ then the resistance of this wire will be

(a) R

(b) $2R$

(c) $R/4$

(d) $R/8$

ANSWER : D

In an electric circuit, a wire of resistance 10 Ω is used. If this wire is stretched to a length double of its original value, the current in the circuit would become :

(a) half of its original value.

(b) double of its original value.

(c) one-fourth of its original value.

(d) four times of its original value.

$R = \frac{\rho l}{A}$

$R \propto l$ (if ρ and A are same)

If l is doubled $\Rightarrow$ R is doubled

$V = IR$

$I = \frac{V}{R} \Rightarrow I \propto \frac{1}{R}$ (if V is same)

R is doubled, I will be halved.

In an electric circuit, a wire of resistance 10 Ω is used. If this wire is stretched to a length double of its original value, the current in the circuit would become :

(a) half of its original value.

(b) double of its original value.

(c) one-fourth of its original value.

(d) four times of its original value.

ANSWER : A

When the short circuit condition occurs, the current in the circuit

(a) becomes zero

(b) remains constant

(c) increases substantially

(d) keeps on changing randomly

When the short circuit condition occurs, the current in the circuit

(a) becomes zero

(b) remains constant

(c) increases substantially

(d) keeps on changing randomly

ANSWER : C

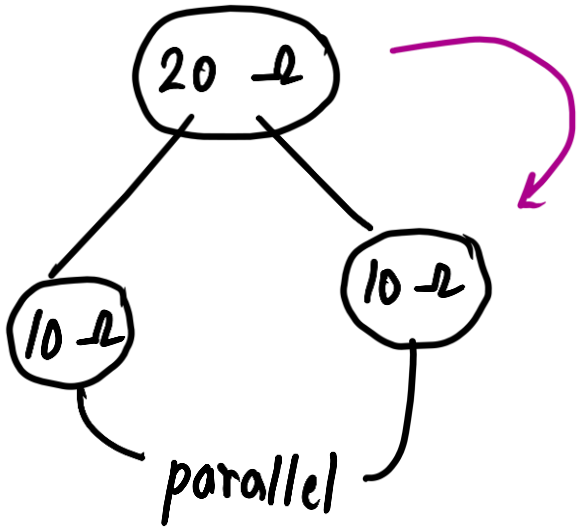
A metallic wire having resistance of 20 Ω is cut into two equal parts in length. These parts are then connected in parallel. The resistance of this parallel combination is equal to

(a) 20 Ω

(b) 10 Ω

(c) 5 Ω

(d) 15 Ω



Length halved

⇓

Resistance halved,

equivalent resistances = $\frac{10}{2}$ = 5 Ω

A metallic wire having resistance of $20\,\Omega$ is cut into two equal parts in length. These parts are then connected in parallel. The resistance of this parallel combination is equal to

(a) $20\,\Omega$

(b) $10\,\Omega$

(c) $5\,\Omega$

(d) $15\,\Omega$

ANSWER : C

Two forces of 5·0 N each are acting on a point mass. If the angle between the forces is 60°, then the net force acting on the point mass has magnitude close to :

(a) 8·6 N
(b) 4·3 N
(c) 5·0 N
(d) 6·7 N

magnitude of resultant of two vectors,

$$R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

θ → angle between two vectors,

if $A = B$

$$R = 2A\cos\frac{\theta}{2} \Rightarrow 2\times5\times\cos\frac{60^\circ}{2} = 10\cos 30^\circ$$

$$= 10\times\frac{\sqrt{3}}{2} = 5\sqrt{3} = 5\times1.732$$

$$= \underline{8.6\ N}$$

Two forces of 5·0 N each are acting on a point mass. If the angle between the forces is 60°, then the net force acting on the point mass has magnitude close to :

(a) 8·6 N

(b) 4·3 N

(c) 5·0 N

(d) 6·7 N

ANSWER : A

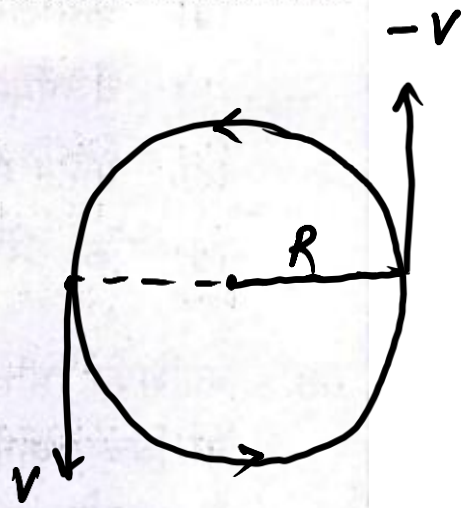
A particle is moving in a circle of radius R with a constant speed v. Its average acceleration over the time when it moves over half the circle is :

(a) $\frac{v^2}{R}$

(b) $\frac{\pi v^2}{2R}$

(c) $\frac{2v^2}{\pi R}$

(d) 0



average acceleration

$$= \frac{\text{change in velocity}}{\text{Time taken}} = \frac{v-(-v)}{\left(\frac{\text{Distance}}{\text{speed}}\right)} = \frac{2v}{\left(\frac{\pi R}{v}\right)} = \left(\frac{2v^2}{\pi R}\right)$$

A particle is moving in a circle of radius R with a constant speed v. Its average acceleration over the time when it moves over half the circle is :

(a) $\frac{v^2}{R}$

(b) $\frac{\pi v^2}{2R}$

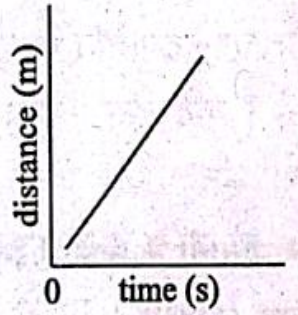
(c) $\frac{2v^2}{\pi R}$

(d) 0

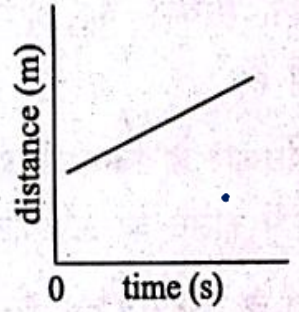
ANSWER : C

Which one of the following graphs represents the equation of motion $v = u + at$; where all quantities are non-zero and symbols carry their usual meanings ?

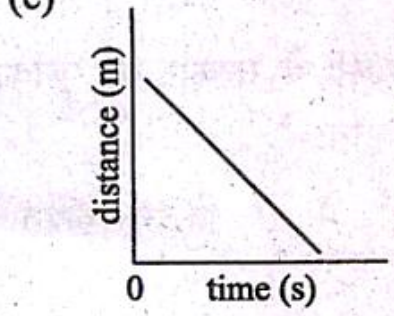
(a)



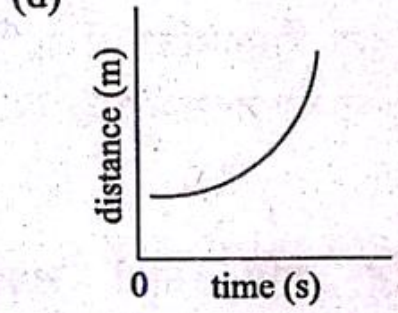
(b)



(c)



(d)



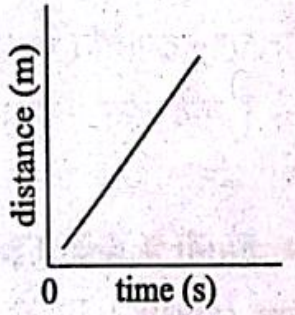
$v = u + at$

a is non-zero

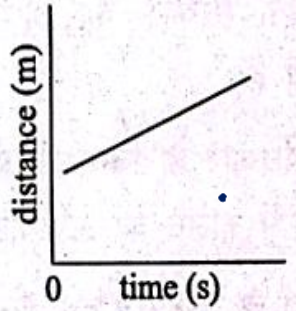
(graph cannot be straight line or linear)

Which one of the following graphs represents the equation of motion $v = u + at$; where all quantities are non-zero and symbols carry their usual meanings ?

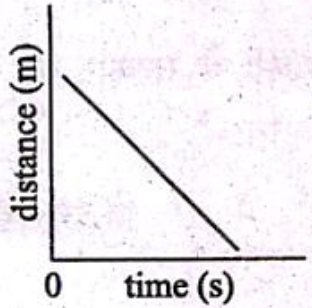
(a)



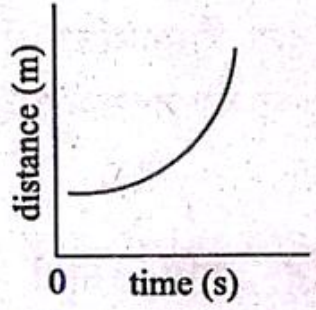
(b)



(c)



(d)



ANSWER : D

A bullet of mass 10 g is horizontally fired with velocity 300 m s^{-1} from a pistol of mass 1 kg. What is the recoil velocity of the pistol?

(a) 0·3 m s^{-1}

(b) 3 m s^{-1}

(c) –3 m s^{-1}

(d) –0·3 m s^{-1}

Conservation of momentum,

$$0 + 0 = (0.01)(300) + 1(v)$$

$$-\frac{3}{1} = v$$

$$v = -3 \text{ m/s}$$

A bullet of mass 10 g is horizontally fired with velocity 300 m s^{-1} from a pistol of mass 1 kg. What is the recoil velocity of the pistol?

(a) 0·3 m s^{-1}

(b) 3 m s^{-1}

(c) –3 m s^{-1}

(d) –0·3 m s^{-1}

ANSWER : C

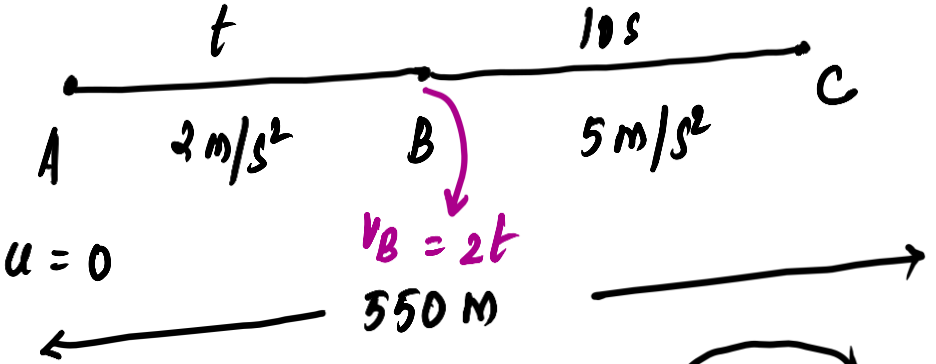
A vehicle starts moving along a straight line path from rest. In first t seconds it moves with an acceleration of 2 m/s^2 and then in next 10 seconds it moves with an acceleration of 5 m/s^2. The total distance travelled by the vehicle is 550 m. The value of time t is

(a) 10 s

(b) 13 s

(c) 20 s

(d) 25 s



A - B

$v_B = u + at$

$v_B = 0 + 2(t)$

$\underline{v_B = 2t}$

B - C

$v_C = v_B + (5)(10)$

$\underline{v_C = 2t + 50}$

$v_B^2 - u_B^2 = 2as_{AB}$

$4t^2 - 0^2 = 2 \times 2 s_{AB} \Rightarrow \boxed{s_{AB} = t^2}$

$v_C^2 - v_B^2 = 2as_{BC}$

$(2t+50)^2 - (2t)^2 = 2 \times 5 \times s_{BC}$

$$(2t + 50)^2 - (2t)^2 = 10 S_{BC}$$

$$200t + 2500 = 10 S_{BC}$$

$$\underline{S_{BC} = 20t + 250}$$

$S_{AB} = t^2$

$$S_{AB} + S_{BC} = 550$$

$$t^2 + 20t + 250 = 550$$

$$t^2 + 20t - 300 = 0$$

$$(t - 10)(t + 30) = 0$$

$$t = 10, -30$$

$t = -30$ (rejected as t cannot be negative)

$t = 10s$

A vehicle starts moving along a straight line path from rest. In first t seconds it moves with an acceleration of 2 m/s^2 and then in next 10 seconds it moves with an acceleration of 5 m/s^2. The total distance travelled by the vehicle is 550 m. The value of time t is

(a) 10 s

(b) 13 s

(c) 20 s

(d) 25 s

Answer: A

Which one of the following forces is non-central and non-conservative ?

(a) Frictional force

(b) Electric force

(c) Gravitational force

(d) Mechanical force

Which one of the following forces is non-central and non-conservative ?

(a) Frictional force

resistive forces

(b) Electric force

(c) Gravitational force

(d) Mechanical force

ANSWER : A

A negative work is done when an applied force **F** and the corresponding displacement **S** are

(a) perpendicular to each other.

(b) parallel to each other.

(c) anti-parallel to each other.

(d) equal in magnitude.

$W = FS\cos\theta$

For $W < 0$ (negative)

$\cos\theta = -1$

$\theta = 180^\circ$

(opposite directions of $\vec{F}$ and $\vec{s}$)

(anti-parallel)

A negative work is done when an applied force **F** and the corresponding displacement **S** are

(a) perpendicular to each other.

(b) parallel to each other.

(c) anti-parallel to each other.

(d) equal in magnitude.

ANSWER : C

Two bodies of mass M each are placed R distance apart. In another system, two bodies of mass 2M each are placed $\frac{R}{2}$ distance apart.

If F be the gravitational force between the bodies in the first system, then the gravitational force between the bodies in the second system will be

(a) 16 F

(b) 1 F

(c) 4 F

(d) None of the above

$$F = \frac{GMM}{R^2} = \frac{GM^2}{R^2}$$

$$F' = \frac{G(2M)(2M)}{\left(\frac{R}{2}\right)^2} = \frac{4GM^2}{\left(\frac{R^2}{4}\right)} = 16\frac{GM^2}{R^2}$$

$$= 16F$$

Two bodies of mass M each are placed R distance apart. In another system, two bodies of mass 2M each are placed $\frac{R}{2}$ distance apart.

If F be the gravitational force between the bodies in the first system, then the gravitational force between the bodies in the second system will be

(a) 16 F

(b) 1 F

(c) 4 F

(d) None of the above

ANSWER : A

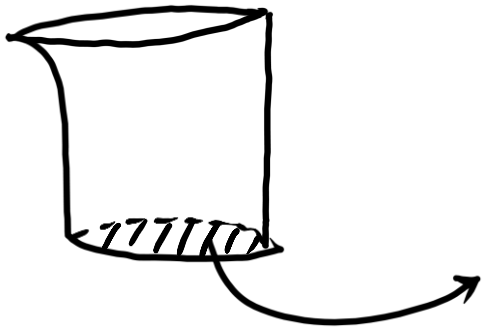
A liquid is kept in a glass beaker. Which one of the following statements is correct regarding the pressure exerted by the liquid column at the base of the beaker ?

(a) The pressure depends on the area of the base of the beaker

(b) The pressure depends on the height of liquid column

(c) The pressure does not depend on the density of the liquid

(d) The pressure neither depends on the area of the base of the beaker nor on the height of liquid column



$P = h \rho g$

- h : height of liquid column
- ρ : density of liquid
- g : acceleration due to gravity

A liquid is kept in a glass beaker. Which one of the following statements is correct regarding the pressure exerted by the liquid column at the base of the beaker ?

(a) The pressure depends on the area of the base of the beaker

(b) The pressure depends on the height of liquid column

(c) The pressure does not depend on the density of the liquid

(d) The pressure neither depends on the area of the base of the beaker nor on the height of liquid column

ANSWER : B

Which one of the following terms ***cannot*** represent electrical power in a circuit?

(a) VI

(b) I^2/R

(c) I^2R

(d) V^2/R

Which one of the following terms ***cannot*** represent electrical power in a circuit?

(a) VI

(b) I^2/R

(c) I^2R

(d) V^2/R

ANSWER : B

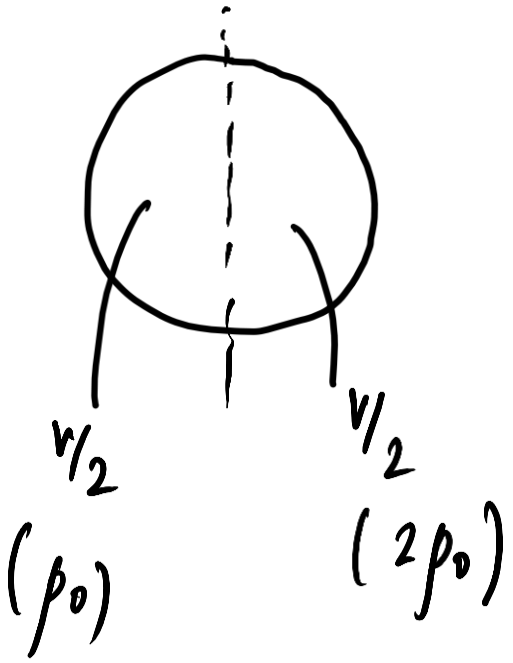
An object is made of two equal parts by volume; one part has density ρ_0 and the other part has density $2\rho_0$. What is the average density of the object?

(a) $3\rho_0$

(b) $\frac{3}{2}\rho_0$

(c) ρ_0

(d) $\frac{1}{2}\rho_0$



$$\frac{\text{Total mass}}{\text{Total volume}} = \frac{\left(\rho_0 \frac{V}{2}\right) + \left(2\rho_0 \frac{V}{2}\right)}{V}$$

$$= \frac{\rho_0}{2} + \rho_0 = \frac{3}{2}\rho_0$$

An object is made of two equal parts by volume; one part has density ρ_0 and the other part has density $2\rho_0$. What is the average density of the object?

(a) $3\rho_0$

(b) $\frac{3}{2}\rho_0$

(c) ρ_0

(d) $\frac{1}{2}\rho_0$

ANSWER : B

The time period of a 1 m long pendulum approximates to

(a) 6 s

(b) 4 s

(c) 2 s

(d) 1 s

$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$T = 2\sqrt{l}$$

$$\pi \approx \sqrt{g}$$

$3.14 \quad 9.8$

$$T = 2 \times \sqrt{1} = 2s$$

The time period of a 1 m long pendulum approximates to

(a) 6 s

(b) 4 s

(c) 2 s

(d) 1 s

ANSWER : C

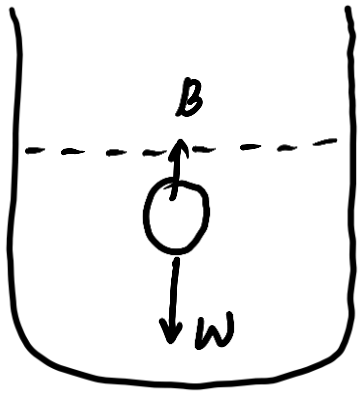
All objects experience a buoyancy when they are immersed in a fluid. Buoyancy is

(a) a downward force

(b) a downward pressure

(c) an upward force

(d) an upward pressure



W → weight

B → Buoyant force
(Buoyancy)

All objects experience a buoyancy when they are immersed in a fluid. Buoyancy is

(a) a downward force

(b) a downward pressure

(c) an upward force

(d) an upward pressure

ANSWER : C

. Two planets orbit the Sun in circular orbits, with their radius of orbit as $R_1 = R$ and $R_2 = 4R$. Ratio of their periods (T_1/T_2) around the Sun will be

(a) 1/16

(b) 1/8

(c) 1/4

(d) 1/2

$T^2 \propto R^3$ (Kepler's 3rd law)

$$\frac{T_1^2}{T_2^2} = \frac{R_1^3}{R_2^3}$$

$$\left(\frac{T_1}{T_2}\right)^2 = \left(\frac{R_1}{R_2}\right)^3 \Rightarrow \left(\frac{T_1}{T_2}\right)^2 = \left(\frac{R}{4R}\right)^3$$

$$\left(\frac{T_1}{T_2}\right)^2 = \frac{1}{64}$$

$$\frac{T_1}{T_2} = \frac{1}{8}$$

. Two planets orbit the Sun in circular orbits, with their radius of orbit as $R_1 = R$ and $R_2 = 4R$. Ratio of their periods (T_1/T_2) around the Sun will be

(a) 1/16

(b) 1/8

(c) 1/4

(d) 1/2

ANSWER : B

A pendulum clock is lifted to a height where the gravitational acceleration has a certain value g. Another pendulum clock of same length but of double the mass of the bob is lifted to another height where the gravitational acceleration is g/2. The time period of the second pendulum would be :

(in terms of period T of the first pendulum)

(a) $\sqrt{2}\,T$

(b) $\frac{1}{\sqrt{2}}T$

(c) $2\sqrt{2}\,T$

(d) T

$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$T' = 2\pi\sqrt{\frac{l}{g/2}}$$

$$= 2\sqrt{2}\,\pi\sqrt{\frac{l}{g}} = \sqrt{2}\left(2\pi\sqrt{\frac{l}{g}}\right)$$

$$= \sqrt{2}\,T$$

A pendulum clock is lifted to a height where the gravitational acceleration has a certain value g. Another pendulum clock of same length but of double the mass of the bob is lifted to another height where the gravitational acceleration is g/2. The time period of the second pendulum would be :

(in terms of period T of the first pendulum)

(a) $\sqrt{2}\,T$

(b) $\frac{1}{\sqrt{2}}T$

(c) $2\sqrt{2}\,T$

(d) T

ANSWER : A

Which one of the following statements is correct for a plane mirror?

(a) Its focal length is zero.

(b) The size of the image of an object placed in front of the mirror is slightly less than that of the object.

(c) The image is virtual, erect and laterally inverted.

(d) Its focal length is 200 cm.

Which one of the following statements is correct for a plane mirror?

(a) Its focal length is zero.

(b) The size of the image of an object placed in front of the mirror is slightly less than that of the object.

(c) The image is virtual, erect and laterally inverted.

(d) Its focal length is 200 cm.

ANSWER : C

In case of a concave mirror, if an object is kept between principal focus F and pole P of the mirror, then which one of the following statements about the image is NOT correct ?

(a) The image will be virtual

(b) The image will be enlarged or magnified

(c) The image will be formed at infinity

(d) The image will be erect

In case of a concave mirror, if an object is kept between principal focus F and pole P of the mirror, then which one of the following statements about the image is NOT correct ?

(a) The image will be virtual

(b) The image will be enlarged or magnified

(c) The image will be formed at infinity

(d) The image will be erect

ANSWER : C

An object is placed in front of a convex mirror. Which one of the following statements is correct?

(a) It will never form an inverted image.

(b) The image moves towards the focus when the object moves towards the mirror.

(c) Depending on the position of the object with respect to the mirror, the image can be inverted and real.

(d) The size of the image becomes larger than that of the object when the object is placed at a distance equal to half the focal length.

An object is placed in front of a convex mirror. Which one of the following statements is correct?

(a) It will never form an inverted image.

(b) The image moves towards the focus when the object moves towards the mirror.

(c) Depending on the position of the object with respect to the mirror, the image can be inverted and real.

(d) The size of the image becomes larger than that of the object when the object is placed at a distance equal to half the focal length.

ANSWER : A

Which one of the following statements about the refractive index of a material medium with respect to air is correct ?

(a) It can be either positive or negative

(b) It can have zero value

(c) It is unity for all materials

(d) It is always greater than one

Which one of the following statements about the refractive index of a material medium with respect to air is correct ?

(a) It can be either positive or negative

(b) It can have zero value

(c) It is unity for all materials

(d) It is always greater than one

ANSWER : D

If the focal length of a convex lens is 50 cm, which one of the following is its power?

(a) +2 dioptre

(b) +0·02 dioptre

(c) –0·5 dioptre

(d) +0·5 dioptre

If the focal length of a convex lens is 50 cm, which one of the following is its power?

(a) +2 dioptre

(b) +0·02 dioptre

(c) –0·5 dioptre

(d) +0·5 dioptre

ANSWER : A

Mirage is an illustration of

(a) only dispersion of light.

(b) only reflection of light.

(c) only total internal reflection of light.

(d) both refraction and total internal reflection of light.

Mirage is an illustration of

(a) only dispersion of light.

(b) only reflection of light.

(c) only total internal reflection of light.

(d) both refraction and total internal reflection of light.

ANSWER : D

The refractive index of fused quartz is 1·46 and that of sapphire is 1·77. If v_q is the speed of light in quartz and v_s is the speed of light in sapphire, then which one of the following relations is correct ?

(a) $v_q > v_s$

(b) $v_s > v_q$

(c) $v_s = v_q$

(d) $v_s = \frac{v_q}{2}$

The refractive index of fused quartz is 1·46 and that of sapphire is 1·77. If v_q is the speed of light in quartz and v_s is the speed of light in sapphire, then which one of the following relations is correct ?

(a) $v_q > v_s$

(b) $v_s > v_q$

(c) $v_s = v_q$

(d) $v_s = \frac{v_q}{2}$

ANSWER : A

The part of the human eye on which the image is formed is

(a) pupil

(b) cornea

(c) retina

(d) iris

The part of the human eye on which the image is formed is

(a) pupil

(b) cornea

(c) retina

(d) iris

ANSWER : C

A glass prism splits white light into different colours. This phenomenon is called dispersion of light by prism. Which one of the following statements is correct ?

(a) Red light will deviate the most and it is because of the reflection of light.

(b) Violet light will deviate the most and it is because of the refraction of light.

(c) Red light will deviate the most and it is because of the refraction of light.

(d) Violet light will deviate the most and it is because of the reflection of light.

A glass prism splits white light into different colours. This phenomenon is called dispersion of light by prism. Which one of the following statements is correct ?

(a) Red light will deviate the most and it is because of the reflection of light.

(b) Violet light will deviate the most and it is because of the refraction of light.

(c) Red light will deviate the most and it is because of the refraction of light.

(d) Violet light will deviate the most and it is because of the reflection of light.

ANSWER : B

Human eye can see objects at different distances with contrasting illuminations. This is due to

(a) far-sightedness

(b) near-sightedness

(c) far-sightedness and near-sightedness

(d) accommodation of eye

Human eye can see objects at different distances with contrasting illuminations. This is due to

(a) far-sightedness

(b) near-sightedness

(c) far-sightedness and near-sightedness

(d) accommodation of eye

ANSWER : D

Which one of the following statements about the speed of sound waves is ***not*** correct?

(a) The speed of sound waves in steel is higher than that in water.

(b) The speed of sound waves in air decreases with increase in temperature.

(c) The speed of sound waves in air increases with increase in temperature.

(d) The speed of sound waves in water is higher than that in air.

Speed of sound wave $\propto \sqrt{T}$

$v_{solid} > v_{liquid} > v_{gas}$

Which one of the following statements about the speed of sound waves is ***not*** correct?

(a) The speed of sound waves in steel is higher than that in water.

(b) The speed of sound waves in air decreases with increase in temperature.

(c) The speed of sound waves in air increases with increase in temperature.

(d) The speed of sound waves in water is higher than that in air.

Answer: B

Which one of the following optical phenomena supports that the light is a transverse wave ?

(a) Refraction
(b) Diffraction
(c) Interference

} Longitudinal + transverse wave

(d) Polarization → only, transverse wave

Which one of the following optical phenomena supports that the light is a transverse wave ?

(a) Refraction

(b) Diffraction

(c) Interference

(d) Polarization

Answer: D

Which one of the following statements is true for sound waves propagating in air ?

(a) Sound is an electromagnetic wave and transverse in nature

(b) Sound is a mechanical wave and longitudinal in nature

(c) Sound is a mechanical wave and transverse in nature

(d) Sound is an electromagnetic wave and longitudinal in nature

→ mechanical wave (needs a medium to travel)

→ longitudinal in nature

(wave propagates in the same direction as particles vibrate)

compressions & rarefactions

Which one of the following statements is true for sound waves propagating in air ?

(a) Sound is an electromagnetic wave and transverse in nature

(b) Sound is a mechanical wave and longitudinal in nature

(c) Sound is a mechanical wave and transverse in nature

(d) Sound is an electromagnetic wave and longitudinal in nature

Answer: B