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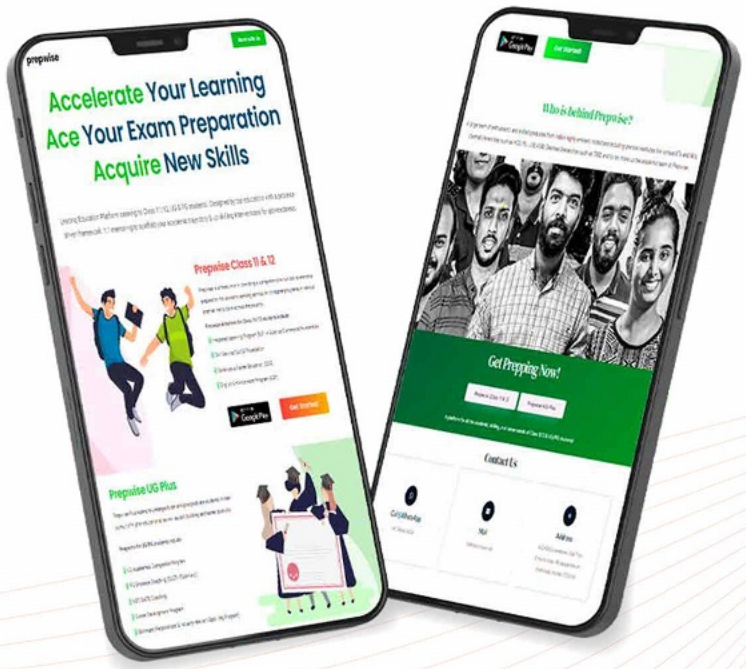

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Previous Year Question Paper

2022

Section II
Physics

Section Name:PHYSICS
Question:

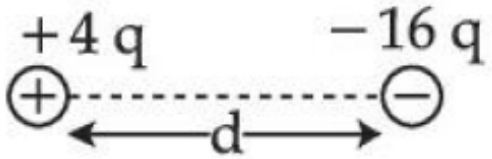
Electrostatic potential at the surface of a conducting sphere of radius 10 cm is 24 V. The value of electrostatic potential at a distance of 15 cm from the centre of sphere :

(1) 0 V
(2) 16 V
(3) 4.8 V
(4) 24 V

A	1
B	2
C	3
D	4

Section Name:PHYSICS
Question:

Two charges $+4q$ and $-16q$ are placed fixed on x-axis separated by distance 12 cm. The position where net force acting on third charge q is zero will be :



(1) 12 cm towards left from 4q
(2) 4 cm towards right from 4q
(3) 12 cm towards right from $-16q$
(4) 4 cm towards left from $+4q$

A	1
B	2
C	3
D	4

The electrostatic force between two charges when placed at a certain distance is F. What will be the new force if distance between them is doubled ?

(1) $\frac{F}{4}$

(2) 2F

(3) $\frac{F}{8}$

(4) $\frac{F}{2}$

A	1
B	2
C	3
D	4

Section Name:PHYSICS
Question:

A charge 'q' is placed at the centre of a cube of side 'a'. The amount of electric flux passing through each face will be :

(1) $\frac{q}{\varepsilon_0}$

(2) $\frac{q}{2\varepsilon_0}$

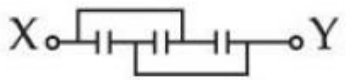
(3) $\frac{q}{3\varepsilon_0}$

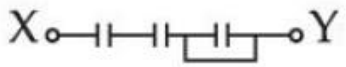
(4) $\frac{q}{6\varepsilon_0}$

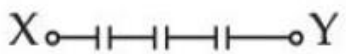
A	1
B	2
C	3
D	4

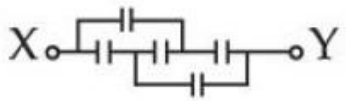
Question:

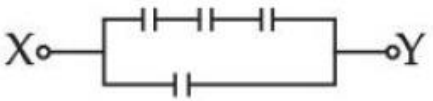
Arrange the following in increasing order of their equivalent capacitance. All capacitors are identical.

(A) 

(B) 

(C) 

(D) 

(E) 

Choose the **correct** answer from the options given below :

(1) (D)<(E)<(B)<(C)<(A)

(2) (D)<(C)<(A)<(B)<(E)

(3) (A)<(E)<(D)<(B)<(C)

(4) (C)<(B)<(D)<(E)<(A)

A	1
B	2
C	3
D	4

Section Name:PHYSICS
Question:

Which among the following is not a property of static electric field lines ?

(1) In a charge free region electric field lines can be taken to be continuous curves without any breaks

(2) Field lines emerges from positive charges

(3) They form closed loops

(4) They always originate normally from the surface of charged conductor

A	1
B	2
C	3
D	4

Question:

Match **List - I** with **List - II**.

	List - I		**List - II**
(A)	Torque on magnetic dipole aligned along the direction of external magnetic field	(I)	+MB
(B)	Potential energy of magnetic dipole aligned along the direction of external magnetic field	(II)	2 MB
(C)	Torque on magnetic dipole kept perpendicular to external magnetic field	(III)	zero
(D)	Workdone in rotating magnetic dipole from stable to unstable equilibrium in magnetic field	(IV)	−MB

Choose the **correct** answer from the options given below :

(1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

(3) (A) - (III), (B) - (II), (C) - (IV), (D) - (I)

(4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

A	1
B	2
C	3
D	4

Section Name:PHYSICS
Question:

The earth's magnetic field at the equator is approximately 0.4 G. The estimated value of earth's dipole moment is (Given : radius of earth = 6400 km) :

(1) 82.84×10^{14} A – m^2

(2) 0.05×10^{23} A – m^2

(3) 2.05×10^{23} A – m^2

(4) 1.05×10^{23} A – m^2

A	1
B	2
C	3
D	4

Section Name:PHYSICS
Question:

A proton and α particle are projected normally in magnetic field with same velocity. The ratio of radii of trajectory of proton to alpha particle is :

(1) 2 : 1
(2) 1 : 2
(3) 4 : 1
(4) 1 : 4

A	1
B	2
C	3
D	4

Section Name:PHYSICS
Question:

A positive charge particle is moving outward in a magnetic field which is directed towards north. The particle will be deflected towards :

(1) East
(2) West
(3) North
(4) South

A	1
B	2
C	3
D	4

Section Name:PHYSICS
Question:

A galvanometer coil has a resistance of 12 Ω and the meter shows full scale deflection for the current 3 mA. The value of shunt required to connect the galvanometer into ammeter of range 0 - 6 A :

(1) 2 mΩ

(2) 3 mΩ

(3) 6 mΩ

(4) 12 mΩ

Section Name:PHYSICS
Question:

Substances when placed in an external magnetic field have tendency to move from a region of weak magnetic field to strong magnetic field are :

(1) Diamagnetic and Ferromagnetic substance

(2) Diamagnetic and Paramagnetic substance

(3) Paramagnetic and Ferromagnetic substance

(4) Only Ferromagnetic substance

Section Name:PHYSICS
Question:

Match **List - I** with **List - II**.

	List - I		**List - II**
(A)	Resonant frequency	(I)	$\frac{E}{\left(\frac{dI}{dt}\right)}$
(B)	Quality factor	(II)	$\sqrt{R^2+(X_L-X_C)^2}$
(C)	Impedance	(III)	$\frac{\omega_0 L}{R}$
(D)	Coefficient of self Inductor	(IV)	$\frac{1}{\sqrt{LC}}$

Choose the **correct** answer from the options given below :

(1) (A) - (IV), (B) - (II), (C) - (III), (D) - (I)
(2) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)
(3) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)
(4) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

Section Name:PHYSICS
Question:

Lenz law is in accordance with :

(1) Conservation of charge

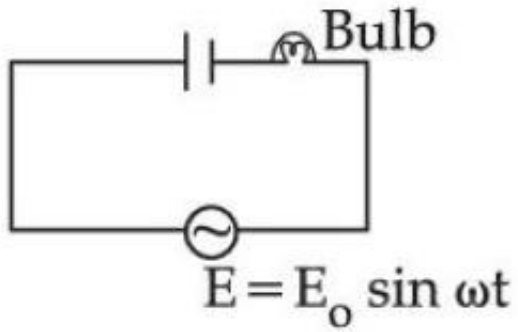
(2) Conservation of flux

(3) Conservation of momentum

(4) Conservation of energy

Question:

A capacitor is connected in series in a circuit as shown with a bulb glowing with certain brightness. If separation between the plates of capacitor is decreased, the brightness of the bulb :



(1) Increase

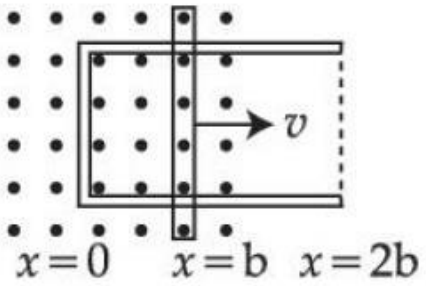
(2) Decrease

(3) Remains the same

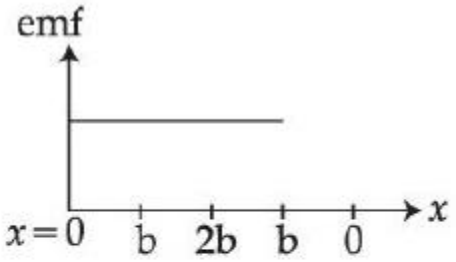
(4) Bulb will not glow now

Question:

In the figure conducting a rod PQ is moved with constant speed ϑ from $x=0$ to $x=2b$ and then return to the same position, i.e $x=0$. A uniform magnetic field is applied from $x=0$ to $x=b$ perpendicular to the page and inwards. The graph which shows variation of induced emf with the distance is :



(1)



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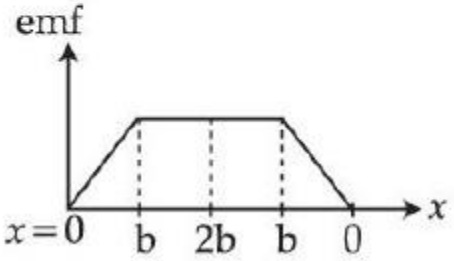

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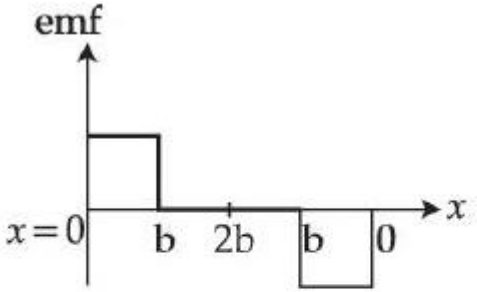
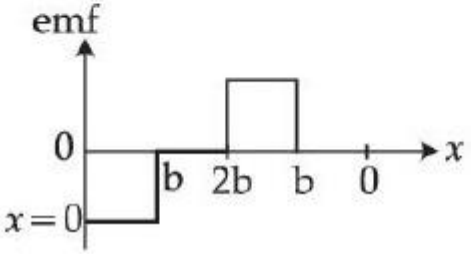


(4)



Question:

A power transmission line feeds input power at 2300 V to a stepdown transformer with its primary bindings have 4000 turns. What should be the number of turns in the secondary in order to get output power of 230 V ?

(1) 200

(2) 400

(3) 40000

(4) 100

Section Name:PHYSICS
Question:

The pedals of a bicycle is attached to a coil of 100 turns and cross section area of 0.10 m^2, which is kept in uniform magnetic field of 0.01 T, perpendicular to the axis of rotation of the coil. What is the maximum voltage generated in the coil, when coil is rotated half a revolution per second ?

(1) 0.05 V

(2) 0.01 V

(3) 0.314 V

(4) 0 V

Section Name:PHYSICS
Question:

The amplitude of the magnetic field part of EM wave travelling in vacuum is $B_0 = 510$ nT. The amplitude of electric field part of the wave is :

(1) 266 N/C
(2) 153 N/C
(3) 100 N/C
(4) 277 N/C

Question:

Match **List - I** with **List - II**.

	List - I		**List - II**
(A)	Vibration of atoms and molecules	(I)	γ-rays
(B)	Radioactive decay of nucleus	(II)	X-rays
(C)	Killing germs in water purifiers	(III)	Infrared rays
(D)	Detection of flaws in metal piece	(IV)	UV radiation

Choose the **correct** answer from the options given below :

(1) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)

(2) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

(3) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

(4) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Section Name: PHYSICS

Question:

Correct relation for the Fresnel distance in diffraction phenomena is :

(Given a : Size of slit)

(1) $Z_F = a/\lambda$

(2) $Z_F = a/\sqrt{\lambda}$

(3) $Z_F = a^2/\lambda$

(4) $Z_F = a/\lambda^2$

Section Name:PHYSICS
Question:

A tall boy sitting at last bench of class is unable to see letters written on the blackboard clearly. What type of eye defect this boy may have ?

(1) Myopia
(2) Hypermetropia
(3) Astigmatism
(4) Colour blindness

Section Name:PHYSICS
Question:

The slits in Young's double slit experiment are exposed to red, blue, green and yellow light, one at a time. The fringe width (β) of interference pattern on a screen, in decreasing order :

(A) β red
(B) β green
(C) β blue
(D) β yellow

Choose the **correct** answer from the options given below :

(1) (A)>(B)>(D)>(C)
(2) (A)>(D)>(C)>(B)
(3) (A)>(D)>(B)>(C)
(4) (A)>(B)>(C)>(D)

Section Name:PHYSICS
Question:

The distance between two slits for getting interference pattern is 2 mm. If one slit is covered diffraction pattern is observed. The width of each slit to obtain 20 maxima of double slit pattern within the central maximum of single slit pattern, will be :

(1) 0.1 mm

(2) 0.2 mm

(3) 0.3 mm

(4) 0.4 mm

Question:

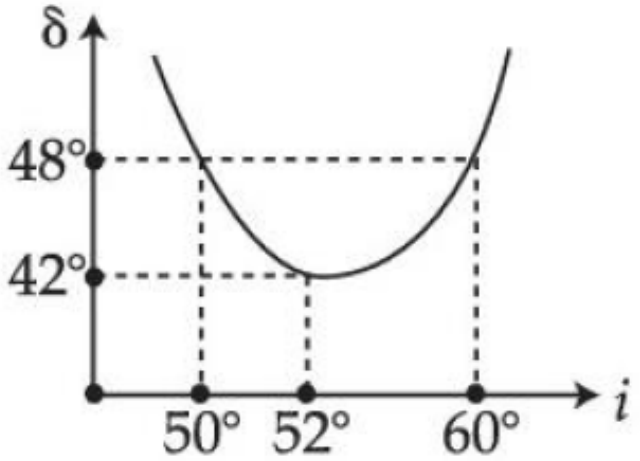
Four lenses (L_1, L_2, L_3, L_4) are given to construct an astronomical telescope. The lens which can be used as an eyepiece, is :

Lens	Aperture (cm)	Power (D)
L_1	8	3
L_2	1	10
L_3	1	6
L_4	4	8

(1) L_1
(2) L_2
(3) L_3
(4) L_4

Section Name:PHYSICS
Question:

The plot shows variation of angle of deviation with angle of incidence for a triangular prism using the data from graph determine prism angle.



(1) 52°
(2) 42°
(3) 62°
(4) 60°

Question:

A convex lens is placed in front of a plane mirror. An object is placed at a distance of 20 cm from the convex lens. It is found that the image formed by the combination coincides with the object itself. The focal length of the lens is :

(1) 40 cm

(2) 10 cm

(3) 30 cm

(4) 20 cm

Section Name:PHYSICS
Question:

Which of the following phenomenon is not based on Total Internal Reflection ?

(1) Formation of rainbow
(2) Image formation by prism
(3) Shining of soap film
(4) Endoscopy

Section Name:PHYSICS
Question:

Match **List - I** with **List - II**.

	List - I (Phenomenon)		**List - II (Cause)**
(A)	Red colour of sky at dawn	(I)	Interference of light
(B)	Mirage	(II)	Atmospheric refraction
(C)	Advanced sunrise	(III)	Scattering of light
(D)	Colour of thin film	(IV)	Total internal reflection

Choose the **correct** answer from the options given below :

(1) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
(2) (A) - (III), (B) - (II), (C) - (IV), (D) - (I)
(3) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(4) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

Section Name:PHYSICS
Question:

Light travels in the form of packet of energy called Photons. Which of the following statement is not correct about a photon ?

(1) Each photon has momentum $P=\frac{h\vartheta}{c}$.

(2) Photons are deflected by electric field and magnetic field

(3) Number of photons increases as intensity of light increases

(4) Energy of photons depends on frequency of light

Section Name:PHYSICS
Question:

De-Broglie wavelength associated with an electron accelerated through a potential difference of 10^4 volts is :

(1) 1.23×10^{-9} m

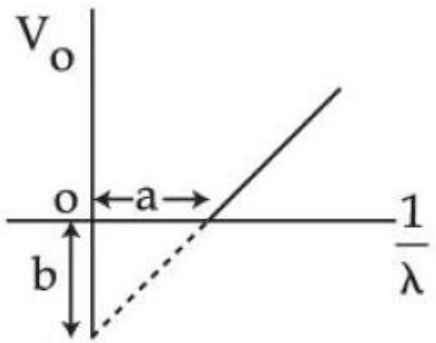
(2) 1.23×10^{-10} m

(3) 1.23×10^{-11} m

(4) 1.23×10^{-12} m

Question:

A radiation of wavelength $\lambda < \lambda_0$ (Threshold wavelength) incident on a photosensitive metal surface. Plot shows the variation of stopping potential with $1/\lambda$. Using graph, the value of plank constant (h) is :



(1) $\frac{eb}{ac}$

(2) $\frac{ab}{c}$

(3) $\frac{bc}{a}$

(4) $\frac{b}{ac}$

Section Name: PHYSICS
Question:

Bohr's atom model is applicable for :

(A) Hydrogen atom
(B) Helium
(C) Singly ionized helium
(D) Lithium
(E) Doubly ionized lithium

Choose the **correct** answer from the options given below :

(1) (A), (B), (C) only
(2) (A), (B), (D) only
(3) (A), (C), (E) only
(4) (A), (D), (E) only

Section Name:PHYSICS
Question:

Match **List - I** with **List - II.**

List - I (Components of Reactor)		**List - II (Example)**	
(A)	Fuel	(I)	D_2O
(B)	Control rod	(II)	H_2O
(C)	Moderator	(III)	PU-239
(D)	Coolant	(IV)	Cd

Choose the **correct** answer from the options given below :

(1) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)
(2) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
(3) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)
(4) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

Section Name:PHYSICS
Question:

In the spectrum of hydrogen, the ratio of longest wave length of Lymon series to longest wave length of Balmier series is :

(1) $\frac{5}{27}$

(2) $\frac{4}{9}$

(3) $\frac{9}{4}$

(4) $\frac{27}{5}$

Question:

Match **List - I** with **List - II**.

	List - I		**List - II**
(A)	α-particle scattering experiment	(I)	Johann Jakob Balmer
(B)	Spectral series	(II)	Enrico fermi
(C)	Discovery of neutron	(III)	Rutherford
(D)	Nuclear fission chain reaction	(IV)	James Chadwick

Choose the **correct** answer from the options given below :

(1) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)

(2) (A) - (I), (B) - (III), (C) - (IV), (D) - (II)

(3) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

(4) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Section Name: PHYSICS
Question:

According to Binding energy curve, arrange the following elements in ascending order of Binding energy per nucleons.

(A) ^{56}Fe

(B) ^{6}Li

(C) ^{3}H

(D) ^{238}U

(E) ^{100}Mo

Choose the **correct** answer from the options given below :

(1) (A), (B), (D), (C), (E)

(2) (C), (B), (D), (E), (A)

(3) (B), (A), (D), (E), (C)

(4) (D), (C), (B), (A), (E)

Question:

Two nuclei with mass number 216 and 64 have their radii R_1 and R_2, respectively. The ratio $\frac{R_1}{R_2}$ is equal to :

(1) 3 : 2
(2) 1 : 3
(3) 1 : 2
(4) 2 : 3

Section Name:PHYSICS
Question:

The least length of wire antenna required for effective transmission of signal of frequency 1 MHz is :

(1) 15 km

(2) 3750 m

(3) 300 m

(4) 75 m

Section Name:PHYSICS
Question:

The frequency of a signal can be changed through :

(1) Amplification
(2) Modulation
(3) Attenuation
(4) Rectification

Question:

Read the following paragraph and answer the question based on it.

According to Ohm's law current flowing through a conductor (I) is directly proportional to the potential difference (V) across the conductor provided physical conditions of conductor remain the same. The physical parameter like length (l), area of cross section (A) and nature of material of conductor. The slope of graph between the potential difference (V) and current (I) gives the resistance of conductor. The resistance of conductors change with temperature. Resistance is the opposition offered by the conductor to the flow of current and it depends on length, area of cross-section and nature of the material. Resistors can be combined in series as well as is parallel combination. In series combination equivalent resistance of circuit increases while in parallel combination equivalent resistance decreases. Identify the materials whose resistivity decreases with increase in temperature.

(A) Aluminium

(B) Silicon

(C) Iron

(D) Copper

(E) Germanium

Choose the **correct** answer from the options given below :

(1) (B) & (E) only

(2) (A) & (C) only

(3) (C) & (D) only

(4) (A) & (B) only

Section Name:PHYSICS
Question:

Read the following paragraph and answer the question based on it.

According to ohm's law current flowing through a conductor (I) is directly proportional to the potential difference (V) across the conductor provided physical condition of conductor remain the same. The physical parameter like length (l), area of cross section (A) and nature of material of the slope of graph between the potential difference (V) and current (I) gives the resistance of conductor. The resistance of conductors change with temperature. Resistance is the opposition offered by the conductor to the flow of current and it depends on length, area of cross-section and nature of the material. Resistors can be combined in series as well as is parallel combination. In series combination equivalent resistance of circuit increases while in parallel combination equivalent resistance decreases. What will be the percentage increase in the resistance of a conductor if its length is increased by 20 % by stretching ?

(1) 20 %

(2) 40 %

(3) 44 %

(4) 120 %

Section Name:PHYSICS
Question:

Read the following paragraph and answer the question based on it.

According to ohm's law current flowing through a conductor (I) is directly proportional to the potential difference (V) across the conductor provided physical condition of conductor remain the same. The physical parameter like length (l), area of cross section (A) and nature of material of the slope of graph between the potential difference (V) and current (I) gives the resistance of conductor. The resistance of conductors change with temperature. Resistance is the opposition offered by the conductor to the flow of current and it depends on length, area of cross-section and nature of the material. Resistors can be combined in series as well as is parallel combination. In series combination equivalent resistance of circuit increases while in parallel combination equivalent resistance decreases. Two resistance 2 Ω and 3 Ω are connected in parallel and a resistance of 1 Ω is connected in series with the combination. The equivalent resistance of circuit will be :

(1) $\frac{11}{5}\ \Omega$

(2) $\frac{11}{6}\ \Omega$

(3) $\frac{5}{6}\ \Omega$

(4) $\frac{5}{11}\ \Omega$

Question:

Read the following paragraph and answer the question based on it.

According to ohm's law current flowing through a conductor (I) is directly proportional to the potential difference (V) across the conductor provided physical condition of conductor remain the same. The physical parameter like length (l), area of cross section (A) and nature of material of the slope of graph between the potential difference (V) and current (I) gives the resistance of conductor. The resistance of conductors change with temperature. Resistance is the opposition offered by the conductor to the flow of current and it depends on length, area of cross-section and nature of the material. Resistors can be combined in series as well as is parallel combination. In series combination equivalent resistance of circuit increases while in parallel combination equivalent resistance decreases. Resistance of a carbon resistor is $27 \times 10^4 \pm 10$ % ohm, consisting of following colours. Arrange them in correct order.

(A) Yellow

(B) Violet

(C) Red

(D) Silver

Choose the **correct** answer from the options given below :

(1) (D)→(A)→(B)→(C)

(2) (B)→(C)→(A)→(D)

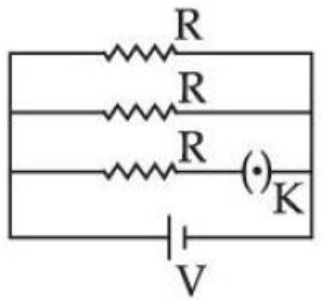
(3) (A)→(B)→(C)→(D)

(4) (C)→(B)→(A)→(D)

Question:

Read the following paragraph and answer the question based on it.

According to ohm's law current flowing through a conductor (I) is directly proportional to the potential difference (V) across the conductor provided physical condition of conductor remain the same. The physical parameter like length (l), area of cross section (A) and nature of material of the slope of graph between the potential difference (V) and current (I) gives the resistance of conductor. The resistance of conductors change with temperature. Resistance is the opposition offered by the conductor to the flow of current and it depends on length, area of cross-section and nature of the material. Resistors can be combined in series as well as is parallel combination. In series combination equivalent resistance of circuit increases while in parallel combination equivalent resistance decreases. The current drawn from the cell in the given circuit in 9 A. The value of current drawn when key K is opened will be :



(1) 6 A

(2) 9 A

(3) 3 A

(4) 4.5 A

Section Name:PHYSICS
Question:

Case study

Opto electric devices are those devices in which carriers are generated by photons. Photo diodes, and solar cells are typical examples of opto electric devices. Photo diode is a special purpose p-n junction diode fabricated with a transparent window to allow light to fall on the diode. Photo diode can be used as a photo detector to detect optical signals. On the other hand light emitting diode convert electrical energy into light. LEDs find extensive use in remote controls , burgear alarm systems, optical communication, etc. A solar cell is basically a p-n junction which generates emf when solar radiation falls on the p-n junction. Solar cells are used the power electronic devices in satellites and space vehicles and also as power supply to some calculators.

The semi conductor used for making red LED, is :

(1) $GaAs_{0.6}P_{0.4}$ (Eg~1.9 eV)

(2) GaAs (Eg~1.4 eV)

(3) Si (Eg~1.1 eV)

(4) $CuInSe_2$ (Eg~1.04 eV)

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Question:

Case study

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Solar cell generates emf when solar radiation falls on the p-n junction :

(1) Its junction area is kept large and external biasing is applied

(2) Its junction area is kept small and no external biasing is applied

(3) Its junction area is kept large and reverse biasing is applied

(4) Its junction area is kept large and forward biasing is applied

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Case study

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Photo diodes are preferably used in reverse bias, because :

(1) The Photo diodes cannot be forward biased

(2) Current in the forward bias is known to be very less (~μA)

(3) Current in the reverse bias is known to be more (~mA)

(4) Fractional change on minority carrier dominated reverse bias current is more easily measurable

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I-V characteristic of solar cell is drawn in :

(1) I^{st} Quadrant

(2) II^{nd} Quadrant

(3) III^{rd} Quadrant

(4) IV^{th} Quadrant

Question:

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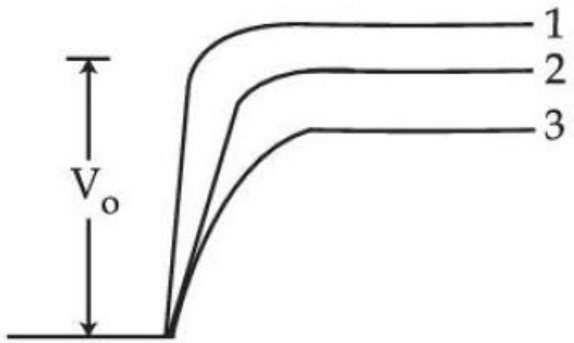
In figure V_0 is the potential barrier across a p-n junction, when no battery is connected across the junction.



(1) 1 corresponds to forward bias and 3 corresponds to reverse bias

(2) 1 and 3 both corresponds to reverse bias

(3) 1 and 3 both corresponds to forward bias

(4) 1 corresponds to reverse and 3 corresponds to forward bias