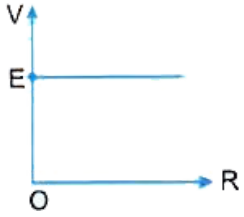
PHYSICS

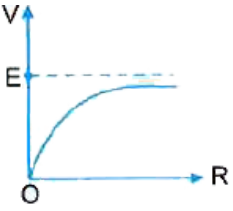
BOOKS - U-LIKE PHYSICS (HINGLISH)

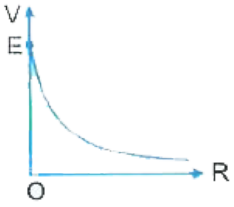
CBSE EXAMINATION PAPER 2020 (SOLVED)

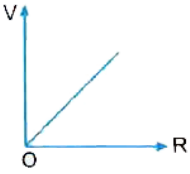
Section A Select The Most Appropriate Option From Those Given Below Each Quation

1. A cell of emf (E) and internal resistance r is connected across a variable external resistance . R. The graph of terminal potential difference V as a function of R is

A. 

B. 

C. 

D. 

Answer: b

View Text Solution

2. A uniform wire of resistance 2R is bent in the form of a circle. The effective resistance between the ends of any diameter of the circle is

A. 2R

B. R

C. $\frac{R}{2}$

D. $\frac{R}{4}$

Answer: c

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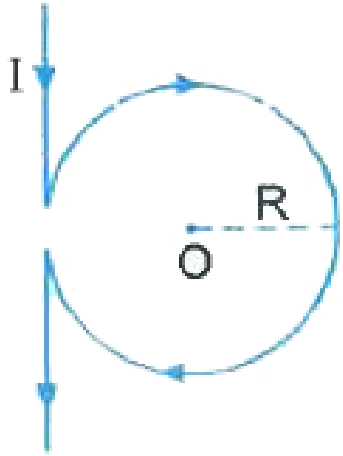
3. A current I flows through a long straight conductor which is bent into a circular loop of radius R in the middle as shown in the figure .



The magnitude of the net magnetic field at point O will be

A. Zero

B. $\frac{\mu_0 I}{2R}(1+\pi)$

C. $\frac{\mu_0 I}{4\pi R}$

D. $\frac{\mu_0 I}{2R}\left(1-\frac{1}{\pi}\right)$

Answer: d

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4. A circular loop of radius r, carrying a current I lines in y - z plane with its centre at the origin. The net magnetic flux through the loop is

A. directly proportional to r.

B. zero

C. inversely proportional to r.

D. directly proportional to I.

Answer: d

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5. The kinetic energy of a proton and that of an α - particle are 4 eV and 1 eV , respectively . The ratio of the de - Broglie wavelengths associated with them , will be

A. $2:1$

B. $1:1$

C. $1:2$

D. $4:1$

Answer: b

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6. A photocell connected in an electrical circuit is placed at a distance 'd' from a source of light . As a result , current I flows in the circuit .

What will be the current in the circuit when the distance is reduced to ' $\frac{d}{2}$?

A. I

B. 2I

C. 4I

D. I/2

Answer: c

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7. A current of 10 A is flowing from east to west in a long straight wire kept on a horizontal table. The magnetic field developed at a distance of 10 cm due north on the table is

A. 2×10^{-5} T , acting downwards.

B. 2×10^{-5} T , acting upwards.

C. 4×10^{-5} T , acting downwards.

D. 4×10^{-5} T , acting upwards.

Answer: a

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8. When a wave undergoes reflection at an interface from rarer to denser medium , adhoc change in its phase is

A. $\frac{\pi}{2}$

B. 0

C. π

D. $\frac{\pi}{4}$

Answer: a

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9. Paschen series of atomic spectrum of hydrogen gas lies in

A. infrared region.

B. ultraviolet region.

C. visible region.

D. partly in ultraviolet and partly in visible region.

Answer: a

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10. In the α - particle scattering experiment , the shape of the trajectory of the scattered α - particles depend upon

A. only on impact parameter.

B. only on the source of α - particles.

C. both impact parameter and source of α - particles.

D. impact parameter and the screen material of the detector.

Answer: a

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Section A Fill In The Blanks With Appropriate Answer

1. Torqure acting on an electric dipole in an electric field is maximum when the angle

between the electric field and the dipole moment is .....

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2. A proton released from rest in an electric field , will start moving towards a region of .....potential in the field.

View Text Solution

3. To minimise the percentage error in the determination of unknown resistance of a conductor in meter bridge experiment , the balance point is adjusted near.....of the wire.

View Text Solution

4. In potentiometer , a long uniform wire is used to .....potential gradient along the wire .

View Text Solution

5. Unpolarised light of intensity I_0 is incident on two crossed polaroids. The intensity of light transmitted by the combination will be ..... .

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6. Name the particle emitted spontaneously in the following nuclear reaction.

$^{32}_{15}P \rightarrow {}^{32}_{16}S + \overrightarrow{v} + \ldots\ldots\ldots .$

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Section A Answer The Following

1. The work done in moving a charge particle between two points in a uniform electric field, does not depend on the path followed by the particle . Why ?

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2. Define 'magnetic declination' at a place on earth.

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3. An a.c. source with variable frequency is connected to a parallel plate capacitor . How will the displacement current be affected with the decrease in frequency of the source ?

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4. An astronomical telescope may be a refracting type or a reflecting type. Which of the two produces image of better quality ? Justify your answer.

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5. Can a slab of p - type semiconductor be physically joined to another n type semiconductor slab to form p -n junction ? Justify your answer.

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6. In a p - n junction diode the forward bias resistance is low as compared to the reverse bias resistance. Give reason.

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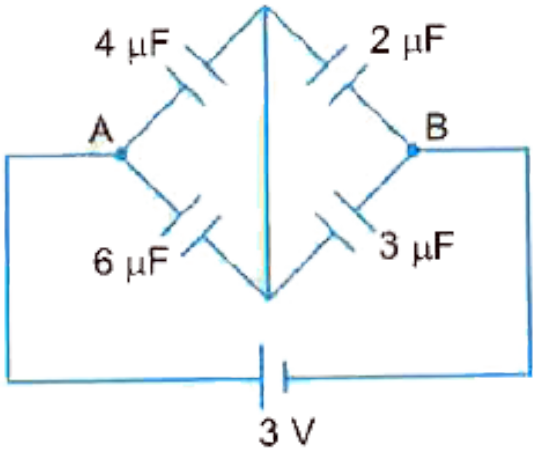
Section B

1. Find the total charge stored in the network of capacitors connected between A and B as

shown in figure.



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2. A hollow conducting sphere of inner radius r_1 and outer radius r_2 has a charge Q on its surface. A point charge - q is also placed at the centre of the sphere .

(a) What is the surface charge density on the (i) inner and (ii) outer surface of the sphere ?

(b) Use Gauss' law of electrostatics to obtain the expression for the electric field at a point lying outside the sphere.

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Section C

1. An infinitely thin straight wire has uniform linear charge density λ . Obtain the

expression. For the electric field (E) at a point lying at a distance x from the wire, using Gauss' law.

(b) Show graphically the variation of this electric field E as a function of distance x from the wire .

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2. (a) Explain the principle of working of a potentiometer.

(b) In a potentiometer, a standard source of

emf 5 V and negligible internal resistance maintains a steady current through the potentiometer wire of length wire of length 10 m. Two primary cells of emf E_1 and E_2 are joined together in a series with (i) same polarity and (ii) opposite polarity. The combination is connected to the potentiometer circuit in each case. The balancing length of the wire in the two cases are found to be 700 cm and 100 m , respectively . Find the values of emf of the two cells.

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3. (a) Differentiate between self inductance and mutual inductance.

(b) The mutual inductance of two coaxial coils is 2 H. The current in one coil is changed uniformly from zero to 0.5 A in 100 ms. Find the :

(i) change in magnetic flux through the other coil.

(ii) emf induced in the other coil during the change.

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4. Explain with the help of a diagram , the working of a step - down transformer. Why is a laminated iron core used in a transformer ?

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5. Name the electro - magnetic waves with their frequency range, produced in

(a) some radioactive decay.

(b) sparks during electric welding.

(c) TV remote.

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6. Two coherent light waves of intensity $5 \times 10^{-2} Wm^{-2}$ each super - impose and produce the interference pattern on a screen. At a point where the path difference between the waves is $\frac{\lambda}{6}$, λ being wavelength of the wave, find the

(a) phase difference between the waves.

(b) resultant intensity at the point.

(c) resultant intensity in terms of the intensity at the maximum.

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7. Two objects P and Q when placed at different positions in front of a concave mirror of focal length 20 cm, form real images of equal size. Size object P is three times size of object Q. If the distance of P is 50 cm from the mirror. Find the distance of Q from the mirror.

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Section D

1. (a) Show that a current carrying solenoid behaves like a small bar magnet . Obtain the expression for the magnetic field at an external point lying on its axis.

(b) A steady current of 2 A flows through a circular coil having 5 turns of radius 7 cm. The coil lies in x - Y plane with its centre at the

origin. Find hte magnitude and direction of the magnetic dipole moment of the coil.

View Text Solution

2. (a) Derive the experience for the forest acting between two long parallel current carrying conductors. Hence , defined 1 A current .

(b) A bar magnet of dipole moment 3 A m^2 . rests with its centre on a frictionless pivot. A force F is applied at right angles to the axis of

the magnet , 10 cm from the pivot . It is observed that an external magnetic field of 0.25 T is required to hold the magnet in equilibrium at an angle of 30° with the field.

Calculate the value of F.

How will the equilibrium be effected if F is withdrawn?

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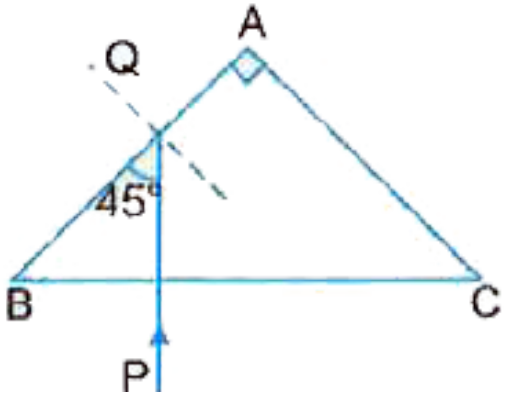
3. (a) Draw the ray diagram showing refraction of ray of light through a glass prism. Derive

the expression for the refractive index n of the material of prism in terms of the angle A ray angle of minimum deviation δ_m

(b) A ray of light PQ enters an isosceles right angles prism ABC of refractive index 1.5 as shown in figure .



(i) Trace the path of the ray through the prism

.

(ii) What will be the effect on the path of the ray if refractive index of the prism is 1.4 ?

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4. (a) Two thin lenses are placed coaxially in contact. Obtain the expression for the facal lengths of the lenses.

(b) A converging of refractive index 1.5 has power of 10 D. When it is completely immersed . In a liquid , it behaves as a diverging lens of

focal length 50 cm. Find the refractive index of the liquid.

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5. (a) Derive the law of radioactive decay $N = N_0 e^{-\lambda t}$

(b) The half - life of $^{238}_{92}U$ undergoing α - decay is 4.5×10^9 years. Find its mean life.

(c) What fraction of the initial mass of a radioactive substance will decay in five half - life periods ?

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6. (a) State the postulates of Bohr's model of hydrogen atom and derive the expression for Bohr radius.

(b) Find the ratio of the longest and the shortest wavelengths amongst the spectral lines of Balmer series in the spectrum of hydrogen atom.

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