PHYSICS

BOOKS - MTG PHYSICS (ENGLISH)

PRACTICE PAPPER

Practice Papper 1

1. The phenomenon by which light travels in an optical fibres is

A. a) total internal reflection

B. b) scattering

C. c) diffraction

D. d) refraction

Answer: A

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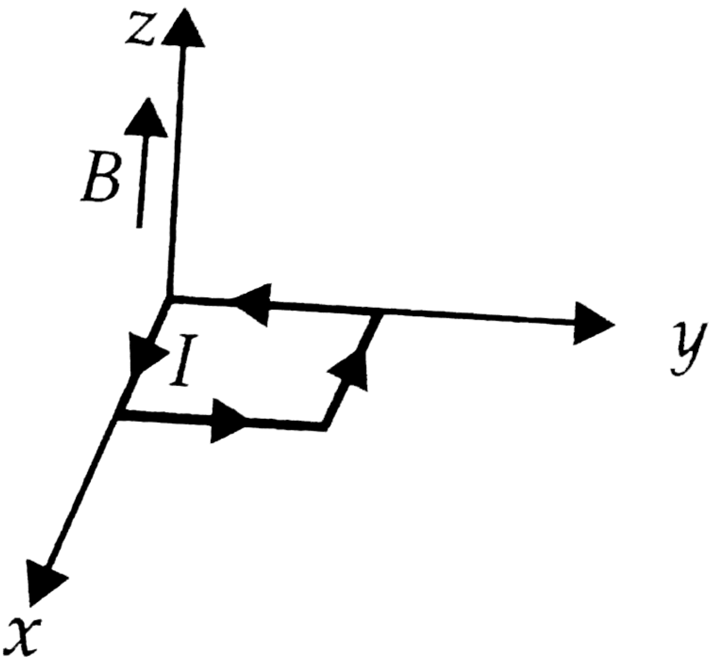
2. A uniform magnetic field of 1000 G is established along the positive z-direction. A rectangular loop of sides 10 cm and 5 cm carries a current of 12 A. What is the torque on the loop as shown in the figure?



A. Zero

B. $1.8 \times 10^{-2} Nm$

C. $1.8 \times 10^{-3} Nm$

D. $1.8 \times 10^{-4} Nm$

Answer: A

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3. The length of a telescope is 36 cm . The focal lengths of its lenses can be

A. a) 30 cm, 6cm

B. b) $-30cm, \ -6cm$

C. c) $30cm, \ -6cm$

D. d) $-30cm, 6cm$

Answer: A

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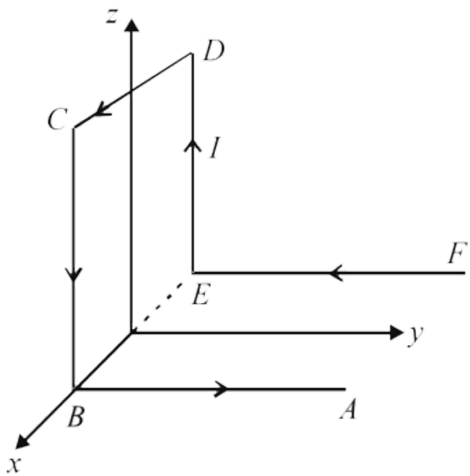
4. A wire $ABCDEF$ (with each side of length L) bent as shown in figure and carrying a current I is placed in a uniform magnetic induction B parallel to the positive $y - direction$. The force experienced by the wire is .... In the .... direction .



A. a) 2 BIL

B. b) $\dfrac{BIL}{2}$

C. c) BIL

D. d) $\frac{BIL}{4}$

Answer: C

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5. A straight wire carring current I is turned into a circular loop. If the magnitude of magnetic moment associated with it in M.K.S. unit is M, the length of wire will be

A. a) $\frac{4\pi I}{M}$

B. b) $\sqrt{\frac{4\pi M}{I}}$

C. c) $\sqrt{\frac{4\pi I}{M}}$

D. d) $\frac{M\pi}{4I}$

Answer: B

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6. In a series LCR circuit, the voltage across the resistance, capacitance and inductance is 10 V each. If the capacitance is short circuited, the voltage across the inductance will be

A. 10V

B. $10\sqrt{2}V$

C. $\frac{10}{\sqrt{2}}V$

D. 20V

Answer: C

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7. An electron of mass m when accelerated through a potential difference V has de - Broglie wavelength λ. The de - Broglie wavelength associated with a proton of mass M accelerated through the same potential difference will be

A. $\frac{\lambda m}{M}$

B. $\lambda\sqrt{\frac{m}{M}}$

C. $\frac{\lambda M}{m}$

D. $\lambda\sqrt{\frac{M}{m}}$

Answer: B

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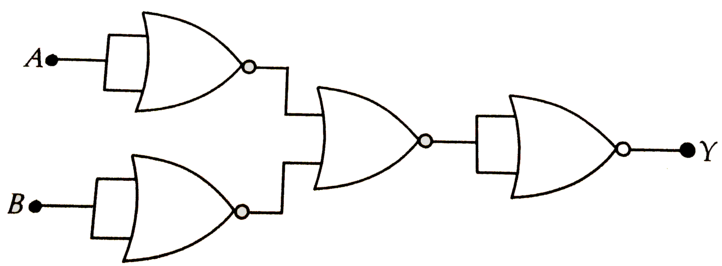
8. The circuit as shown in the figure is equivalent to



A. AND gate

B. NOT gate

C. OR gate

D. NAND gate

Answer: D

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9. The critical angle of a certain medium is $\sin^{-1}\left(\frac{3}{5}\right)$.

The polarizing angle of the medium is :

A. $\sin^{-1}\left(\frac{4}{5}\right)$

B. $\tan^{-1}\left(\frac{5}{3}\right)$

C. $\tan^{-1}\left(\frac{3}{4}\right)$

D. $\tan^{-1}\left(\frac{4}{3}\right)$

Answer: B

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10. If K_1 and K_2 are maximum kinetic energies of photoelectrons emitted when lights of wavelenth λ_1 and λ_2 respectively incident on a metallic surface.

A. $K_1 > (K_2/3)$

B. $K_1 < (K_2/3)$

C. $K_1 = 3K_2$

D. $K_2 = 3K_1$

Answer: B

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11. A coil having an inductance of 0.5 H carries a current which is uniformly varying from zero to 10 ampere in 2 second. The e.m.f. (in volts) generated in the coil is

A. 10

B. 5

C. 2.5

D. 1.25

Answer: C

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12. If a star can convert all the He nuclei completely into oxygen nuclei. The energy released per oxygen nuclei is (Mass of the helium nucleus is 4.0026 amu and mass of oxygen nucleus is 15.9994 amu)

A. $10.24 MeV$

B. $23.9 MeV$

C. $7.56 MeV$

D. 5MeV

Answer: A

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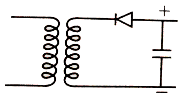
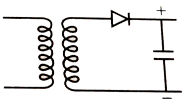
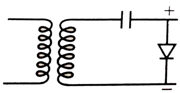
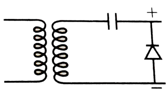
13. Which is the correct diagram of a half- wave reactifier?

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: B

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14. A place electromagnetic wave

$$F_s = 100\cos\left(6\times 10^8 t + 4x\right)V/m$$

Propagates in a medium of dielectric constant. The refractive index is

A. 1.5

B. 2.0

C. 2.4

D. 4.0

Answer: B

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15. when an electron jumps from the fourth orbit to the second orbit, one gets the

A. second line of Paschen series

B. Second line of Balmer series

C. first line of Pfund series

D. second line of Lyman series

Answer: B

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16. Two sources of light of wavelengths 2500 Å and 3500 Å are used in Young's double slit expt. simultaneously. Which orders of fringes of two wavelength patterns coincide?

A. 3^{rd} order of 1^{st} and 5^{th} order of 2^{nd}

B. 7^{th} order of 1^{st} and 5^{th} order of 2^{nd}

C. 5^{th} order of 1^{st} and 3^{rd} order of 2^{nd}

D. 5^{th} order of 1^{st} and 7^{th} order of 2^{nd}

Answer: B

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17. A carrier wave of peak voltage 12 V is used to transmit a message signal. What should be the peak voltage of the modulating signal in order to have a modulation index of 75%?

A. 5V

B. 9V

C. 12 V

D. 15 V

Answer: B

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18. A concave lens forms the image of an object such that the distance between the object and image is 10cm and the magnification produced is 1/4. The focal length of the lens will be

A. $-6.2cm$

B. $-4.4cm$

C. $-8.6cm$

D. $-10cm$

Answer: B

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19. The circular plates A and B of a parallel plate air capacitor have a diameter of 0.1 m and are $2 \times 10^{-3} m$ apart. The plates C and D of a similar capacitor have a diameter of $0.12 m$ and are $3 \times 10^{-3} m$ apart. Plate A is earthed. Plates B and D are connected together. Plate C is connected to the positive pole of a 120V battery whose negative is earthed. The energy stored in the system is

A. $0.1224 \mu J$

B. $0.2224 \mu J$

C. $0.3224 \mu J$

D. $0.4224 \mu J$

Answer: A

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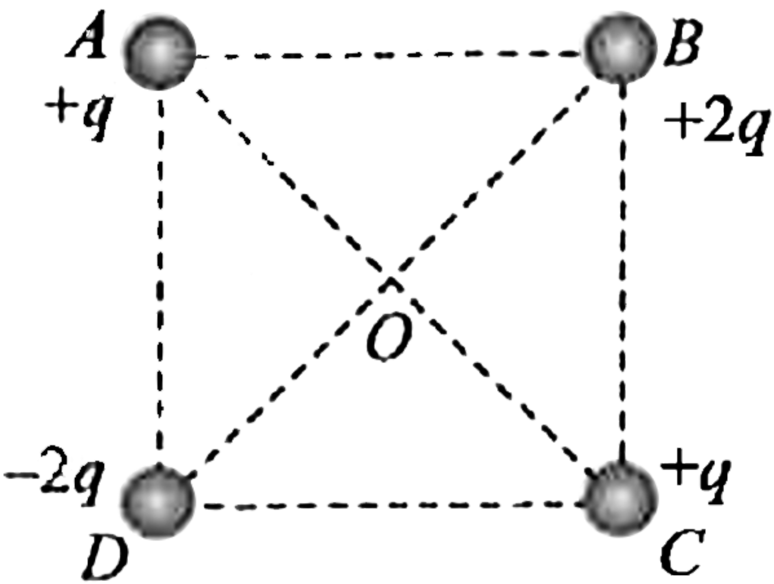
20. Four charges are arranged at the corners of a square ABCD, as shown in the adjoining figure. The force on the charge kept at the centre O is



A. along the diagonal BD

B. along the diagonal AC

C. zero

D. perpendicular to side AB

Answer: D

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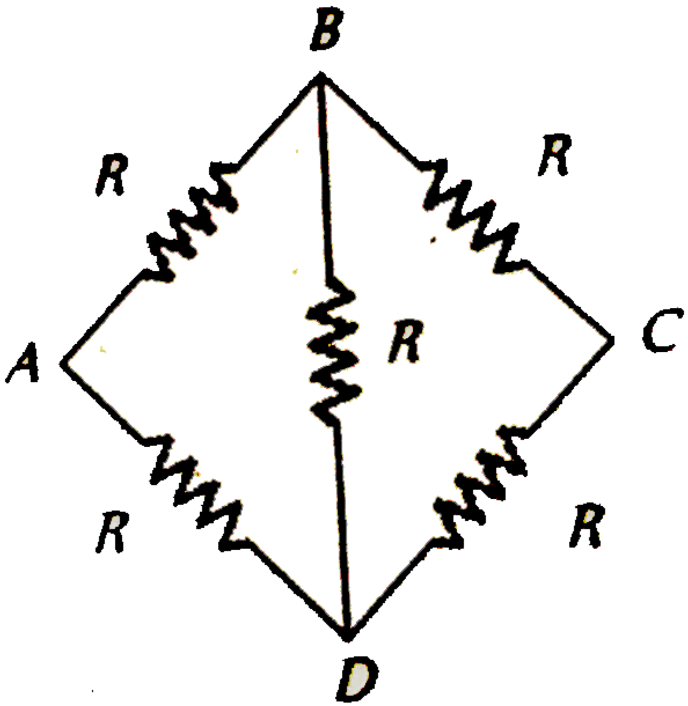
21. Five equal resistances each of value R are connected in a form shown alongside. The equivalent resistance of the network



A. $\frac{1}{2}R$

B. 2R

C. $\frac{5}{8}R$

D. $\frac{8}{5}R$

Answer: C

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22. A potentiometer wire of length 100cm has a resistance of 10Ω. It is connected in series with a resistance and a cell of emf 2V and of negligible interal resistance. A source of emf 10mV is balanced against a length of 40cm of the potentiometer wire. What is the value of external resistance?

A. 790Ω

B. 890Ω

C. 990Ω

D. 1090Ω

Answer: A

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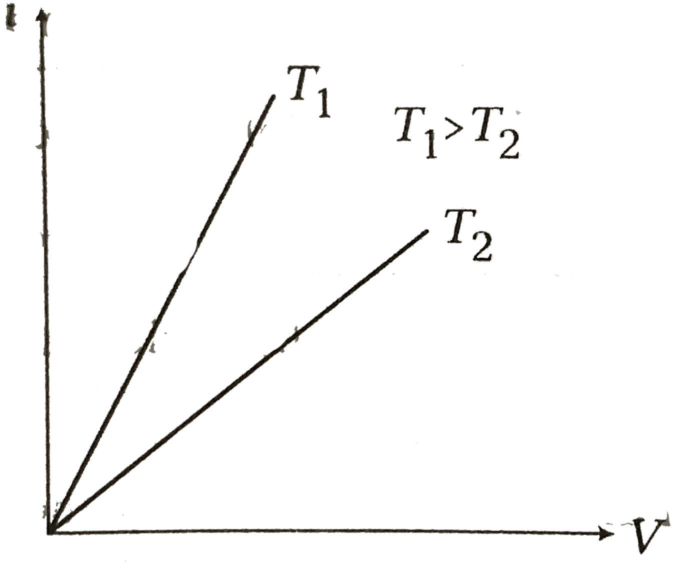
23. Assertion : Current versus potential difference (i-V) graph for a conductor at two different temperatures T_1 and T_2 is shown in figure. Hence $T_1 > T_2$.



Reason : Resistance of a conductor increases with rise in temperature.

A. $\cos 2\theta$

B. $\sin 2\theta$

C. $\cot 2\theta$

D. $\tan 2\theta$

Answer: C

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24. The fraction of atoms of radioactive element that decays in 6 days is $\frac{7}{8}$. The fraction that decays in 10 days will be

A. $\frac{77}{80}$

B. $\frac{71}{80}$

C. $\frac{31}{32}$

D. $\frac{15}{16}$

Answer: C

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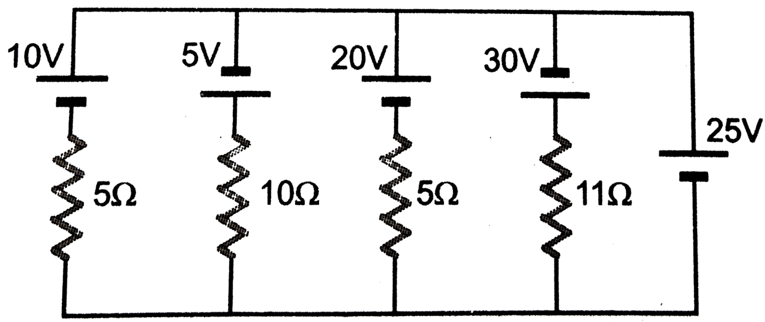
25. In the circuit shown in figure the current flowing through 25 V cell is



A. $7.2A$

B. $10A$

C. $12A$

D. $14.2A$

Answer: C

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26. Five sinusoidal waves have the same frequency $500Hz$ but their amplitudes are in the ratio $2:1/2:1/2:1:1$ and their phase angles $0, \pi/6, \pi/3, \pi/2$ and π, respectively . The phase angle of resultant wave obtained by the superposition of these five waves is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: B

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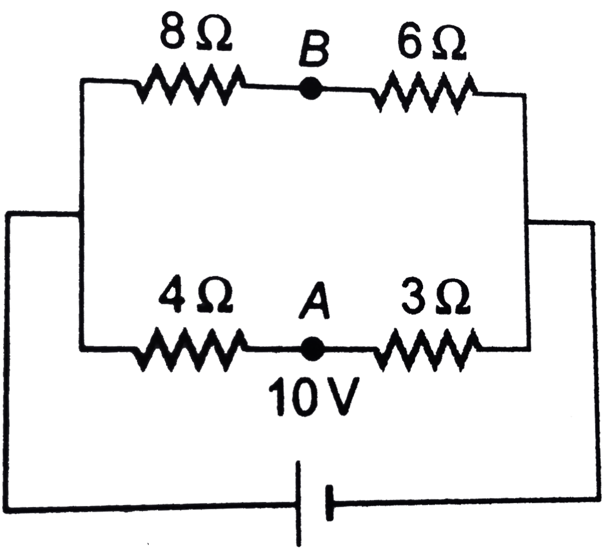
27. The potential difference between points A and B is



A. 2

B. 5

C. 11

D. 18

Answer: B

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28. The magnetic flux (ϕ) in a closed circuit of resistance 20Ω varies with time (t) according to the equation $\phi = 7t^2 - 4t$ where ϕ is in weber and t is in seconds. The magnitude of the induced current at t =0.25s is

A. 25mA

B. $0.025mA$

C. 47 mA

D. 175 mA

Answer: A

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29. In an AC circuit, a resistance of $R ohm$ is connected in series with an inductance L. If phase angle between volage and current be 45°, the value of inductive reactance will be

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

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

C. R

D. cannot be found with given data

Answer: C

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30. The potential field of an electric field $\overrightarrow{E} = \left(y\hat{i} + x\hat{j}\right)$ is

A. V = -(x+y) + constant

B. V = constant

C. $V = -(x^2 + y^2) + \text{ constant}$

D. V = -xy + constant

Answer: D

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31. Electric charges $q, q, -2q$ are placed at the corners of an equilateral triangle ABC of side l. The magnitude of electric dipole moment of the system is

A. ql

B. $\sqrt{3}ql$

C. zero

D. 4ql

Answer: B

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32. An electric of $5A$ is passing through a circuit containing three arrengement in parallel if the length and radius of the wires are in the ratio $2:3:4$ and $3:4:5$ then the ratio of current passing through wires should be

A. $3:6:10$

B. $4:9:16$

C. $9 : 16 : 25$

D. $54 : 64 : 75$

Answer: D

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33. The masses of neutron, proton and deuteron in amu are 1.00893, 1.00813 and 2.01473 respectively. The packing fraction of the deuteron in amu is

A. 11.65×10^{-4}

B. 23.5×10^{-4}

C. 33.5×10^{-4}

D. 47.15×10^{-4}

Answer: A

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34. Shunt required in an ammeter of resistance R to decreases its deflection from 30 A to 10 A is

A. R/4

B. R/3

C. R/2

D. R

Answer: C

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35. In Young's double-slit experiment, the slit are 0.5 mm apart and the interference is observed on a screen at a distance of 100 cm from the slits, It is found that the ninth bright fringe is at a distance of 7.5 mm from the second dark fringe from the center of the fringe pattern. The wavelength of the light used in nm is

A. $\frac{2500}{7}$

B. 2500

C. 5000

D. $\frac{5000}{7}$

Answer: C

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36. At a given palce on the earth's surface, the horizontal component of earth's magnetic field is $3 \times 10^{-5}T$ and resultant magnetic field is $6 \times 10^{-5}T$. The angle of dip at this place is

A. 30°

B. 40°

C. 50°

D. 60°

Answer: D

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37. Which one of the following combinations of radioactive decay results in the formation of an isotope of original nucleus ?

A. One alpha, four beta

B. One alpha, two beta

C. One alpha, one beta

D. Four alpha, one beta

Answer: B

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38. Quantity that remains unchanged in a transformer is

A. voltage

B. current

C. frequency

D. none of these

Answer: C

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39. The first line of the lyman series in a hydrogen spectrum has a wavelength of 1210 Å. The corresponding line of a hydrogen like atom of $Z = 11$ is equal to

A. 4000 Ã…

B. 100 Ã…

C. 40 Ã…

D. 10 Ã…

Answer: D

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40. A ray of light in incident on a glass plate at an angle of 60°. What is the refractive index of glass if the reflected and refracted rays are perpendicular to each other?

A. $\frac{1}{2}$

B. $\sqrt{\frac{3}{2}}$

C. $\frac{3}{2}$

D. $\sqrt{3}$

Answer: D

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41. In a sample of radioactive material, what percentage of the initial number of active nuclei will decay during one mean life ?

A. 63%

B. 69.3%

C. 37%

D. 50%

Answer: A

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42. Critical angle of glass is θ_1 and that of water is θ_2.

The critical angle for water and glass surface would be

$(\mu_g = 3/2, \mu_w = 4/3)$

A. between θ_1 and θ_2

B. greater than θ_2

C. less than θ_1

D. less than θ_2

Answer: B

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43. Consider a uniform electric field $E = 3 \times 10^3 \hat{i} N / C$. (a) What is the flux of this field through a square of 10 cm on a side whose plane is parallel to the yz plane ? (b) What is the flux through the same square if the normal to its plane makes a 60° angle with the x-axis ?

A. $10 NC^{-1} m^2$

B. $20 NC^{-1} m^2$

C. $30 NC^{-1} m^2$

D. $40 NC^{-1} m^2$

Answer: C

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44. If the electric amplitude of the electromagnetic wave is $5Vm^{-1}$, its magnetic amplitude will be

A. $5 \times 10^{-8}T$

B. $1.67 \times 10^{-8}T$

C. $1.67 \times 10^{-10}T$

D. $5 \times 10^{-10}T$

Answer: C

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45. In an NPN transistor the collector current is $24 mA$. If $80\ \%$ of electrons reach collector it base current in mA is

A. 36

B. 26

C. 16

D. 6

Answer: B

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46. An electron moving in a circular orbit of radius r makes n rotations per second per second. The magnetic moment of the orbital electron is

A. zero

B. $\pi r^2 ne$

C. $\pi r^2 n^2 e$

D. $\dfrac{r^2 ne}{2\pi}$

Answer: D

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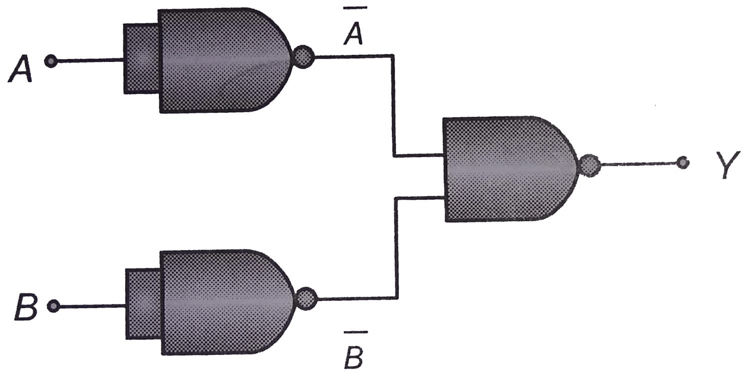
47. The combination of the gates shown in the figure below produces



A. OR gate

B. AND gate

C. NOR gate

D. XOR gate

Answer: B

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48. The charge flowing through a resistance R varies with time t as $Q = at - bt^2$. The total heat produced in R is

A. $\frac{a^3R}{b}$

B. $\frac{a^3R}{2b}$

C. $\frac{a^3R}{3b}$

D. $\frac{a^3R}{6b}$

Answer: A

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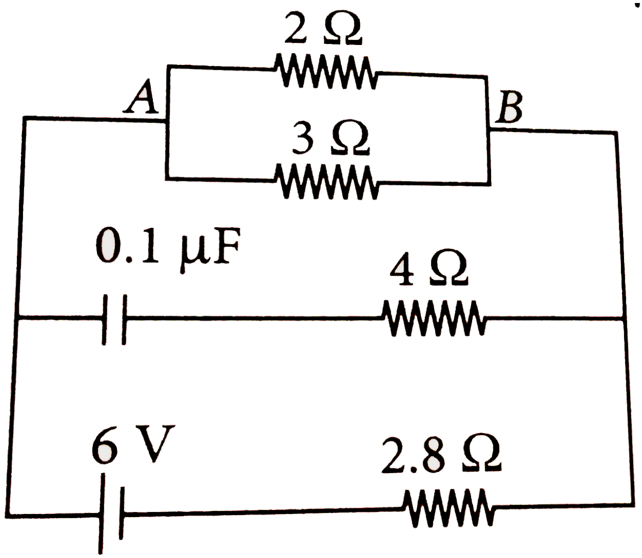
49. The steady state current in a 2Ω resistor when the internal resistance of the battery is negligible and the capacitance of the condenser is $0.1\mu F$ is



A. $0.6A$

B. $0.9A$

C. $1.5A$

D. $0.3A$

Answer: B

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50. An electric bulb is marked 100W, 230V. If the supply voltage drops to 115V, what is the heat and light energy produced by the bulb in 20min? Calculate the current flowing through it.

A. 10 kJ

B. 15 kJ

C. 20 kJ

D. 30 kJ

Answer: D

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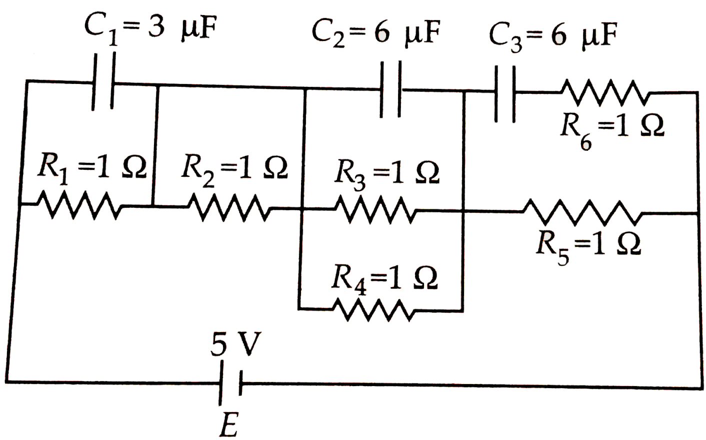
Practice Papper 2

1. In the circuit given, the charge on capacitor C_3 at steady state is



A. $6\mu C$

B. $12\mu C$

C. $18\mu C$

D. $24\mu C$

Answer: B

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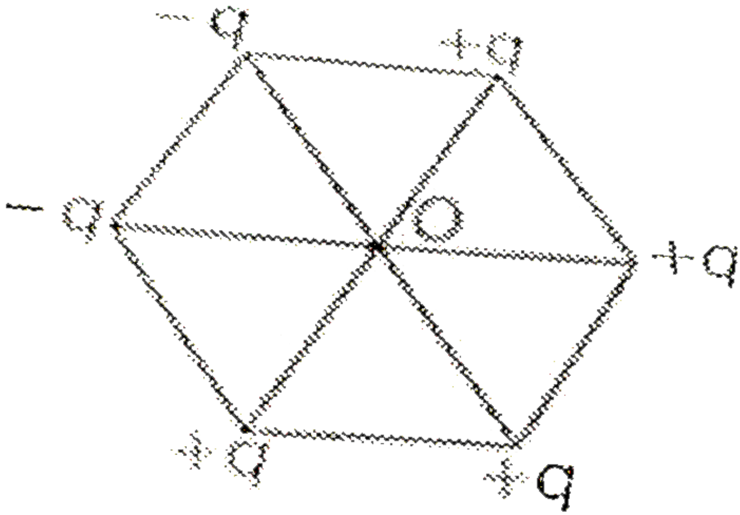
2. Six point charges are arrange at the vertices of a regular hexagon of side length a (shown in figure).



Find the magnitude of electric field at the centre of regular hexagon.

A. $-q$

B. $\frac{-q}{6}$

C. $+1.83q$

D. $-1.83q$

Answer: D

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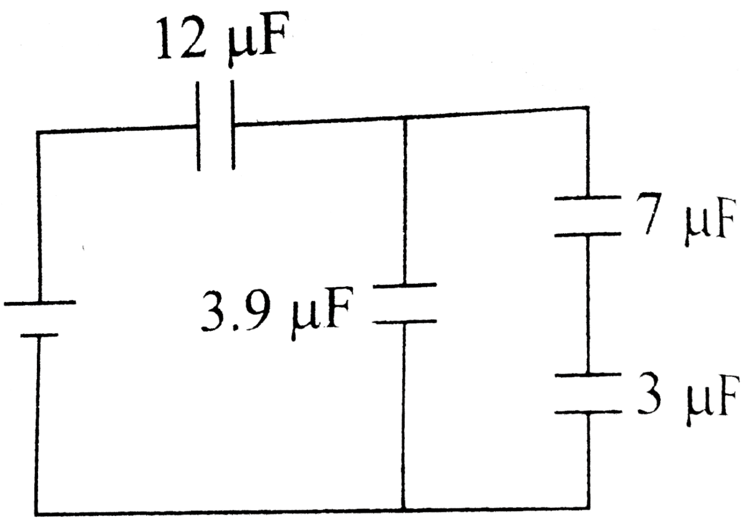
3. Four capacitors and a battery are connected as shown in. If the potential difference aross the $7\mu F$ capacitor is $6V$, then which of the following statement(s) is//are correct?



A. The potential drop across the $12\mu F$ capacitor is

10 V.

B. The charge on the $3\mu F$ capacitor is $42\mu C$.

C. The potential drop across the $3\mu F$ capacitor is

10V.

D. The emf of the battery is 30 V.

Answer: C

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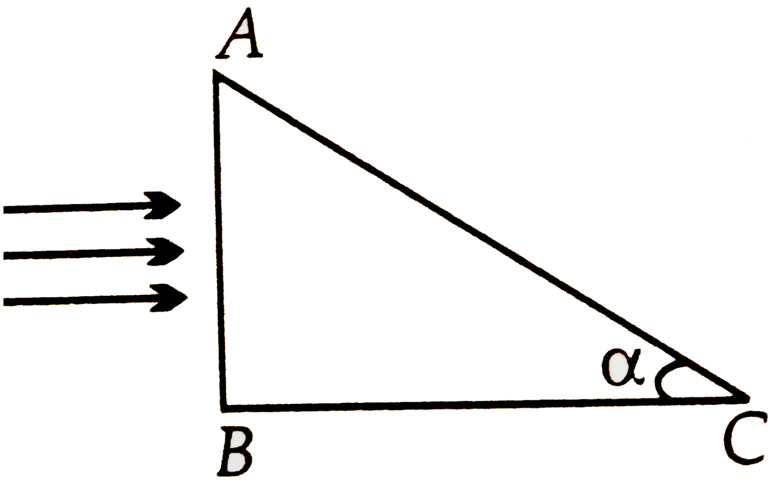
4. A ray of light is incident normally on the prism $\left(\mu = \frac{3}{2}\right)$ immersed in a liquid as shown in the figure.

The largest value for the angle α so that ray is totally reflected at the face AC is 30°. The refractive index of the given liquid is



A. $\frac{\sqrt{3}}{2}$

B. $\frac{3}{4}$

C. $\frac{4}{3}$

D. $\frac{3\sqrt{3}}{4}$

Answer: D

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5. In certain Young's double slit experiment, the slit separation is 0.05 cm. The slit to screen distance is 100 cm. When blue light is used the distance from central fringe to the fourth order fringe is $0.36cm$. What is the wavelength of blue light ?

A. 4000 Ã...

B. 4300 Ã...

C. 4400 Ã...

D. 4500 Ã...

Answer: D

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6. The electric resistance of a certain wire of iron is R . If its length and radius are both doubled, then

A. the resistance will be doubled and the specific resistance will be halved.

B. the resistance will be halved and the specific resistance will remain unchanged.

C. the resistancce will be halved and the specific resistance will be doubled.

D. both the resistance and the specific resistance, will remain unchanged.

Answer: B

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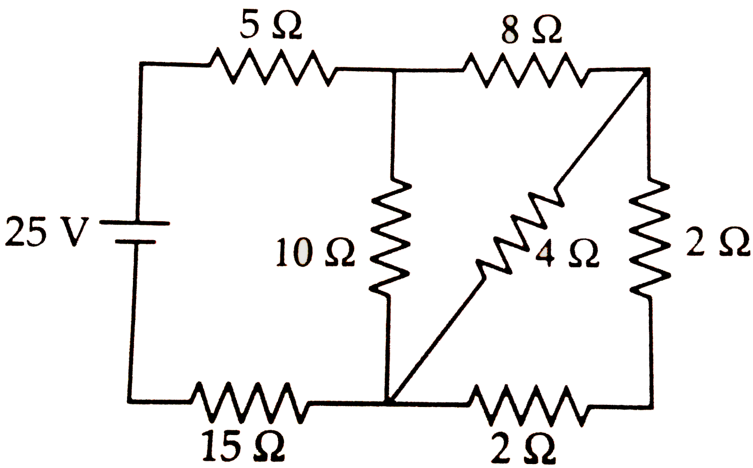
7. For the circuit shown in the figure, the current in the 4Ω resistor is



A. $0.5A$

B. $0.25A$

C. 1A

D. $1.5A$

Answer: B

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8. A wire when connected to 220 V mains supply has power dissipation P_1. Now the wire is cut into two equal pieces which are connected in parallel to the same supply. Power dissipation in this case is P_2. Then $P_2 : P_1$ is

A. 1

B. 2

C. 3

D. 4

Answer: D

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9. An electron of mass M_e, initially at rest, moves through a certain distance in a uniform electric field in time t_1. A proton of mass M_p also initially at rest, takes time t_2 to move through an equal distance in this uniform electric field. Neglecting the effect of gravity, the ratio t_2 / t_1 is nearly equal to

A. $\left(\frac{m_p}{m_e}\right)^{1/2}$

B. $\left(\frac{m_e}{m_p}\right)^{1/2}$

C. 1

D. 1836

Answer: A

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10. When a resistance of 100Ω is connected in series with a galvanometer of resistance R, then its range is

V. To double its range, a resistance of 1000Ω is connected in series. Find the value of R.

A. 1100

B. 1000

C. 900

D. 800

Answer: C

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11. The self inductance of a solenoid that has a cross-sectional area of $1cm^2$, a length of 10 cm and 1000 turns of wire is

A. $0.86mH$

B. $1.06mH$

C. $1.26mH$

D. $1.46mH$

Answer: C

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12. How many alpha and beta particles are emitted when uranium $._{92}^{238}U$ decays to lead $._{82}^{206}Pb$?

A. 12,6

B. 10, 4

C. 8, 6

D. 8,8

Answer: C

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13. The time period of oscillation of a bar magnet suspended horizontaliy along the magnetic meridian is T_0. If this magnet is replaced by another magnet of the same size and pole strength but with double the mass, the new time period will be

A. $\frac{T_0}{2}$

B. $\frac{T_0}{\sqrt{2}}$

C. $\sqrt{2}T_0$

D. $2T_0$

Answer: C

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14. Two resistances are connected in the two gaps of a meter bridge. The balance point is $20cm$ from the zero end. When a resistance 15Ω is connected in series with the smaller of two resistance, the null point+ shifts to $40cm$. The smaller of the two resistance has the value.

A. 3

B. 6

C. 9

D. 12

Answer: C

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15. In an inductor of self-inductance L=2 mH, current changes with time according to relation $i = t^2 e^{-t}$. At what time emf is zero ?

A. 4s

B. 3s

C. 2s

D. 1s

Answer: C

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16. The binding energy per nucleon for C^{12} is $7.68 MeV$ and that for C^{13} is 7.47 MeV. What is the energy required to remove a neutron from C^{13} ?

A. $0.21 MeV$

B. $2.52 MeV$

C. $4.95 MeV$

D. $2.75 MeV$

Answer: C

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17. A. Wavelength of microwaves is greater than that of ultraviolet rays.

B. The wavelength of infrared rays is lesser than that of ultraviolet rays.

C. The wavelength of microwaves is lesser than that of infrared rays

D. Gamma ray has shortest wavelength in the electomagnetic specturum

Choose the correct option.

A. A and B are true

B. B and C are true

C. C and D are true

D. A and D are true

Answer: D

Watch Video Solution

18. The frequency of 1st line Balmer series in H_2 atom is v_0. The frequency of line emitted by single ionised

He atom is

A. $2v_0 Hz$

B. $4v_0 Hz$

C. $(v_0 / 2)Hz$

D. $(v_0 / 4)Hz$

Answer: B

Watch Video Solution

19. An α particle and a proton having same momentum enter into a region of uniform magnetic field and move in circular paths. The ratio of the radii of curvature of their paths, $\frac{R_\alpha}{R_p}$ in the field is

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. 1

D. 4

Answer: A

Watch Video Solution

20. The wavelength of radiation emitted is λ_0 when an electron jumps from the third to the second orbit of hydrogen atom. For the electron jump from the fourth to the second orbit of hydrogen atom, the wavelength of radiation emitted will be

A. $(16/25)\lambda_0$

B. $(20/27)\lambda_0$

C. $(27/20)\lambda_0$

D. $(25/16)\lambda_0$

Answer: B

Watch Video Solution

21. The intensity ratio of the maxima and minima in an interference pattern produced by two coherent sources of light is $9:1$. The intensities of the used light sources are in ratio

A. $3:1$

B. $4:1$

C. $9:1$

D. $10:1$

Answer: B

Watch Video Solution

22. What is the conductivity of a semiconductor (in $\Omega^{-1}m^{-1}$) if electron density $= 5 \times 10^{12} cm^{-3}$ and hole density $= 8 \times 10^{13} cm^{-3}$?

$\left(\mu_e = 2.3 V^{-1} s^{-1} m^2, \mu_h = 0.01 m^2 V^{-1} s^{-1}\right)$

A. a. 5.634

B. b. 1.968

C. c. 3.421

D. d. 8.964

Answer: B

Watch Video Solution

23. A wave is represented by the equation

$$y = 0.1 \sin(100\pi t - kx)$$

If wave velocity is $100ms^{-1}$, its wave number is equal to

A. $1m^{-1}$

B. $2m^{-1}$

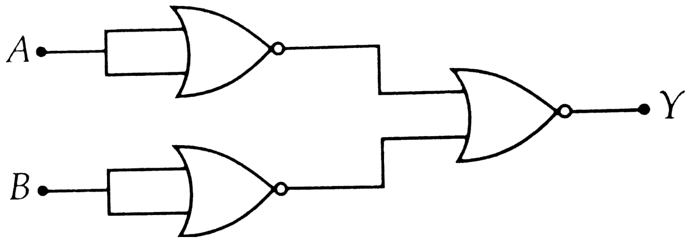
C. πm^{-1}

D. $2\pi m^{-1}$

Answer: A

Watch Video Solution

24. Identify the operation performed by the circuit as shown in the figure.



A. NOT

B. AND

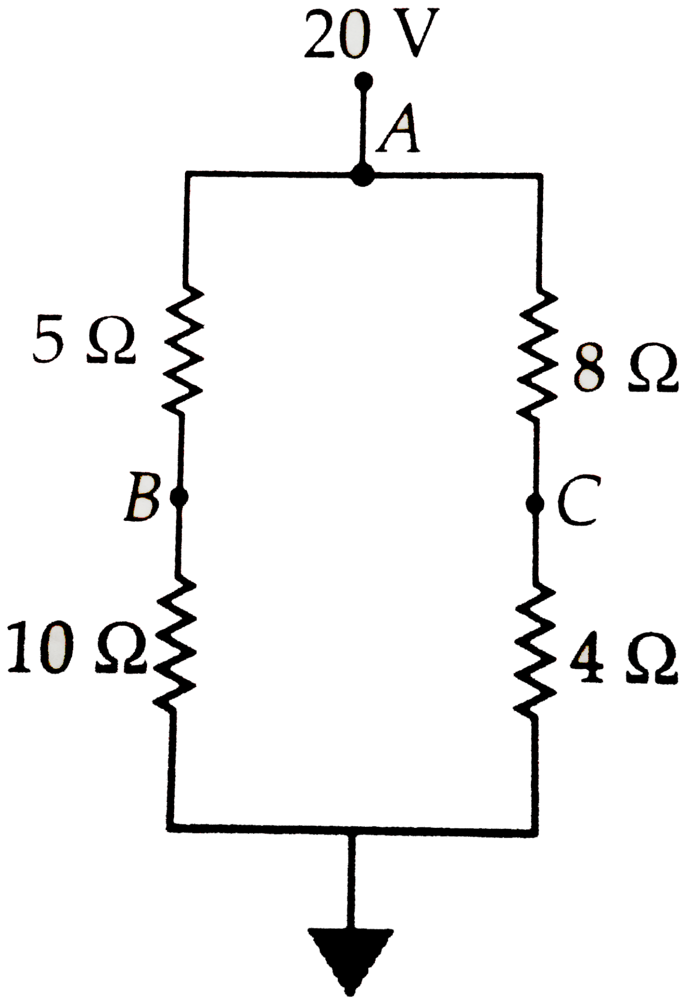
C. OR

D. NAND

Answer: B

Watch Video Solution

25. What is the potential difference between the points A and B in the circuit diagram shown in figure ?



A. $\frac{20}{3}V$

B. $\frac{10}{3}V$

C. $\frac{20}{\sqrt{3}}V$

D. $\frac{10}{\sqrt{3}}V$

Answer: A

Watch Video Solution

26. By a change of current from 5 A to 10 A in 0.1 s, the self induced emf is 10 V. The change in the energy of the magnetic field of a coil will be

A. 5J

B. 6J

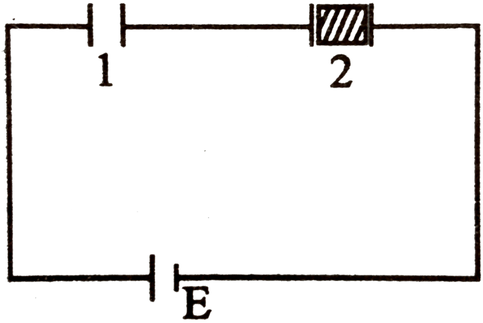
C. $7.5J$

D. 9J

Answer: C

Watch Video Solution

27. Two identical capacitors 1 and 2 are connected in series to a batery as shown in figure. Capacitor 2 contains a dielectric slab of dieletric constant k as shown. Q_1 and Q_2 are the charges stored in the capacitors. Now the dielectirc slab us removed and the corresponding charges are Q'_1 and Q'_2. Then



A. $\dfrac{Q'_1}{Q_1} = \dfrac{K+1}{K}$

B. $\dfrac{Q'_2}{Q_2} = \dfrac{K+1}{2}$

C. $\dfrac{Q'_2}{Q_2} = \dfrac{K+1}{2K}$

D. $\dfrac{Q'_1}{Q_1} = \dfrac{K}{2}$

Answer: C

Watch Video Solution

28. A square frame of side l carries a current produces a field B at its centre. The same current is passed through a circular loop having same perimeter as the square. The field at its centre is B', the ratio of B/B' is

A. $\frac{8}{\pi^2}$

B. $\frac{8\sqrt{2}}{\pi^2}$

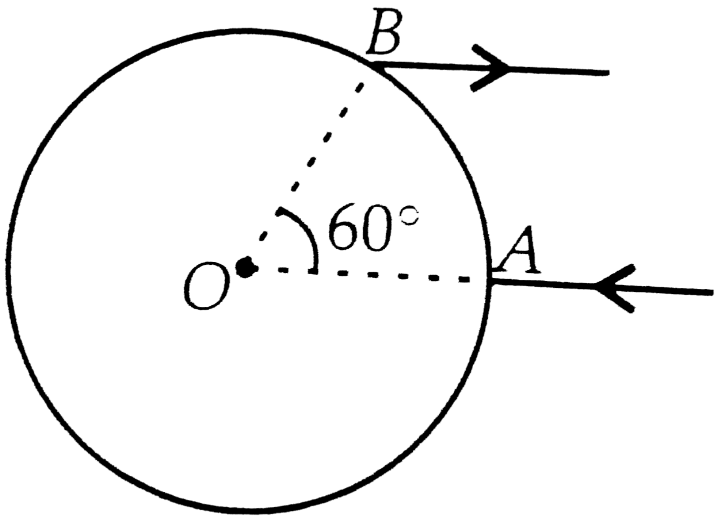
C. $\frac{16}{\pi^2}$

D. $\frac{16\sqrt{2}}{\pi^2}$

Answer: B

Watch Video Solution

29. A uniform wire of resistance 36Ω is bent in the form of a circle. The effective resistance across the points A and B is



A. 5Ω

B. 15Ω

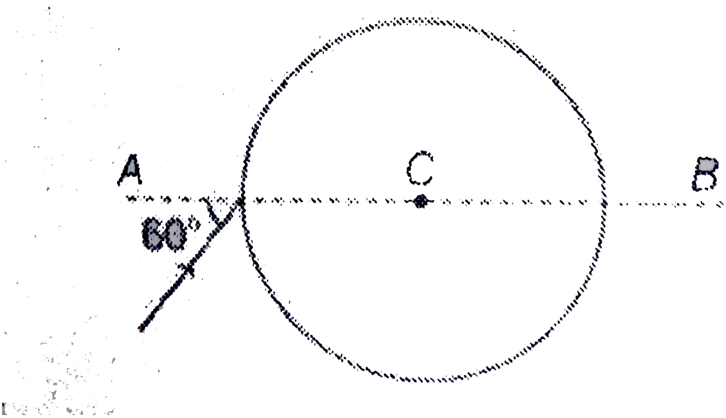
C. 7.2Ω

D. 30Ω

Answer: A

Watch Video Solution

30. A ray of light falls on a transparent sphere with centre at C as shown in figure. The ray emerges from the sphere parallel to line AB. The refractive index of the sphere is



A. $\mu = \sqrt{2}$

B. $\mu = \sqrt{\frac{3}{2}}$

C. $\mu = \sqrt{3}$

D. $\mu = \sqrt{\frac{5}{2}}$

Answer: C

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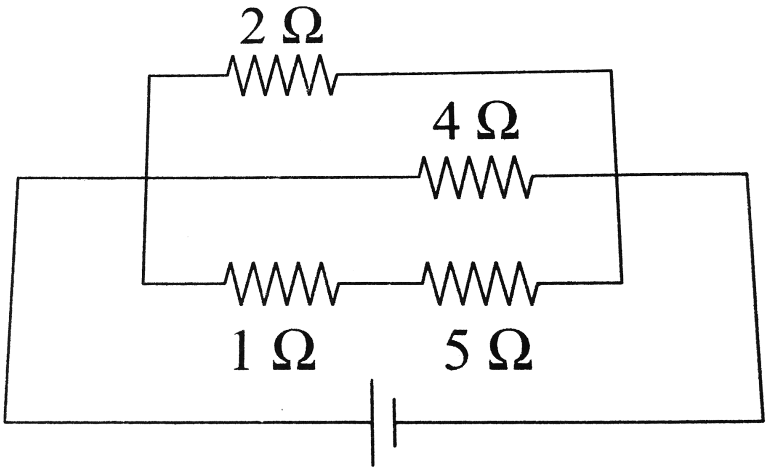
31. A current of $3A$ flows through the 2Ω resistor as shown in the circuit. The power dissipated in the 5Ω

resistor is



A. 1W

B. 5W

C. 4W

D. 2W

Answer: B

Watch Video Solution

32. What is orbital angular momentum of an electron in $3d$ orbital.

A. $\sqrt{2}\left(\frac{h}{2\pi}\right)$

B. $\sqrt{3}\left(\frac{h}{2\pi}\right)$

C. $\sqrt{6}\left(\frac{h}{2\pi}\right)$

D. $\sqrt{12}\left(\frac{h}{2\pi}\right)$

Answer: C

Watch Video Solution

33. Two identical magnetic dipoles of magnetic moments $1 \cdot 0 Am^2$ each are placed at a separation of $2m$ with their axes perpendicular to each other. What is the resultant magnetic field at a point midway between the dipoles?

A. $\sqrt{5} \times 10^{-7} T$

B. $5 \times 10^{-7} T$

C. $\sqrt{2} \times 10^{-7} T$

D. $10^{-7} T$

Answer: A

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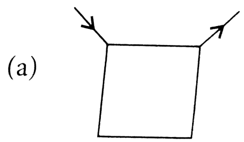
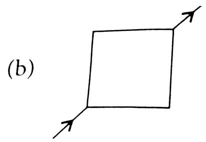
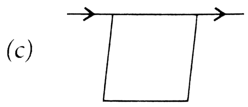
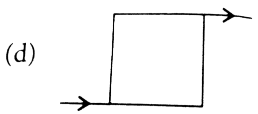
34. Current flows through uniform square frames as shown. In which case is the magnetic field at the centre of the frame not zero ?

A. 

B. 

C. 

D. 

Answer: C

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35. The conducting circular loops of radii R_1 and R_2 are placed in the same plane with their centres coinciding. If $R_1 > \; > R_2$, the mutual inductance M between them will be directly proportional to

A. $\frac{R_1}{R_2}$

B. $\frac{R_2}{R_1}$

C. $\frac{R_1^2}{R_2}$

D. $\frac{R_2^2}{R_1}$

Answer: D

Watch Video Solution

36. The intensity of the light coming from one of the slits in a Young's double slit experiment is double the intensity from the other slit. Find the ratio of the maximum intensity to the minimum intensity in the interference fringe pattern observed.

A. $2:1$

B. $34:1$

C. $9:1$

D. $8:1$

Answer: C

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37. Let v_1 be the frequency of series limit of Lyman series, v_2 the frequency of the first line of Lyman series and v_3 the frequency of series limit of Balmer series. Then which of the following is correct ?

A. $v_1 - v_2 = v_3$

B. $v_2 - v_1 = v_3$

C. $v_3 = \frac{1}{2}(v_1 + v_2)$

D. $v_1 + v_2 = v_3$

Answer: A

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38. The focal length of a biconvex lens of refractive index 1.5 is 0.06m. Radii of curvature are in the ratio 1:2. Then radii of curvature of two lens surfaces are

A. $0.045m, 0.09m$

B. $0.09m, 0.18m$

C. $0.04m, 0.08m$

D. $0.06m, 0.12m$

Answer: A

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39. A metallic surface is irradiated by a monochromatic light of frequency v_1 and stopping potential is found to be V_1. If the light of frequency v_2 irradiates the surface, the stopping potential will be

A. $V_1 + \frac{h}{e}(v_1 + v_2)$

B. $V_1 + \frac{h}{e}(v_1 - v_2)$

C. $V_1 + \frac{e}{h}(v_2 - v_1)$

D. $V_1 - \frac{h}{e}(v_1 + v_2)$

Answer: B

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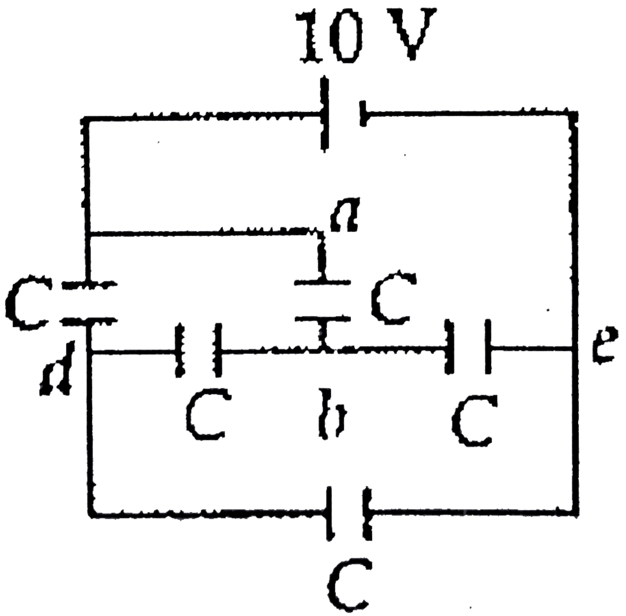
40. What is the energy stored in the capacitor between terminals a and b of the network shown in the figure ? (Capacitance of each capacitance $C = 1 \mu F$)



A. 75J

B. 100 J

C. 150J

D. 125 J

Answer: A

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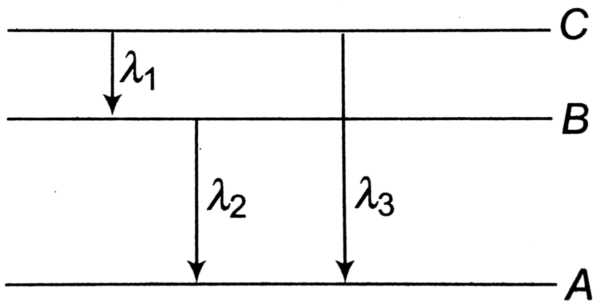
41. Energy levels A, B, C of a certain atom corresponding to increasing values of energy i.e., $E_A < E_B < E_C$. If $\lambda_1, \lambda_2, \lambda_3$ are the wavelengths of radiations correspnding to the transitions C to B, B to A and C to A respectively, which of the following statements is correct?



A. $\lambda_3 = \lambda_1 + \lambda_2$

B. $\lambda_1 + \lambda_2 + \lambda_3 = 0$

C. $\lambda_3^2 = \lambda_1^2 + \lambda_2^2$

D. $\lambda = \dfrac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$

Answer: D

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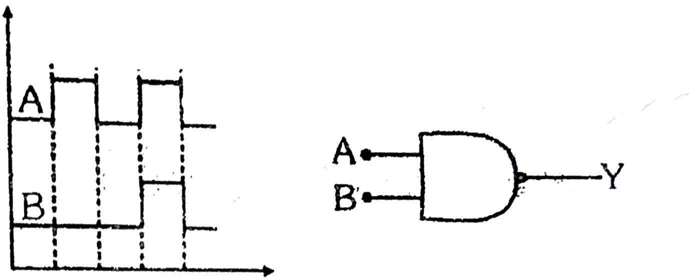
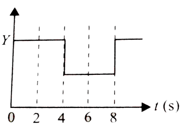
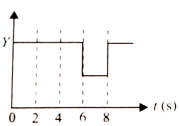
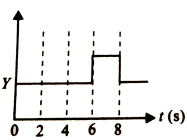
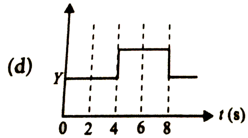
42. The real time variation of input signals A and B are as shown below. If the inputs are fed into NAND gate, then select the output signal from the following :-



A. (a) 

B. (b) 

C. (c) 

D. 

Answer: B

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43. A particle of mass m and charge Q is placed in an electric filed W which varies with time t as E = $E_0 \sin \omega t$. It will undergo simple harmonic motion of amplitude.

A. $\dfrac{QE_0^2}{m\omega^2}$

B. $\dfrac{QE_0}{m\omega^2}$

C. $\sqrt{\dfrac{QE_0}{m\omega^2}}$

D. $\frac{QE_0}{m\omega}$

Answer: B

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44. In common emitter amplifier, the current gain is 62. The collector resistance and input resistance are $5k\Omega$ an 500Ω respectively. If the input voltage is 0.01V, the output voltage is

A. $0.62V$

B. $6.2V$

C. $62V$

D. $620V$

Answer: B

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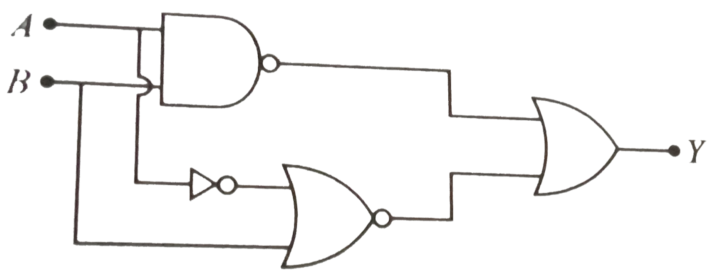
45. The Boolean expression for the given circuit is



A. $\overline{A.\,B}$

B. A+B

C. $\overline{A}+B$

D. $A + \overline{B}$

Answer: A

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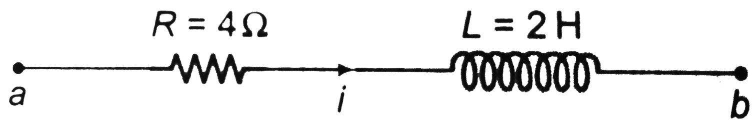
46. In the figure shown $i = 10e^{-4t}$ A. Find V_L and V_{ab}



A. $\frac{-40}{e}V$

B. $\frac{40}{e}V$

C. $40eV$

D. $-40eV$

Answer: A

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47. The total energy of a hydrogen atom in its ground state is $-13.6eV$. If the potential energy in the first excited state is taken as zero then the total energy in the ground state will be

A. $-3.4eV$

B. $3.4eV$

C. $-6.8eV$

D. $6.8eV$

Answer: C

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48. An ac source is of $\frac{200}{\sqrt{2}}$ V, 50 Hz. The value of voltage after $\frac{1}{600}s$ from the start is

A. 200 V

B. $\frac{200}{\sqrt{5}}$

C. 100 V

D. 50 V

Answer: D

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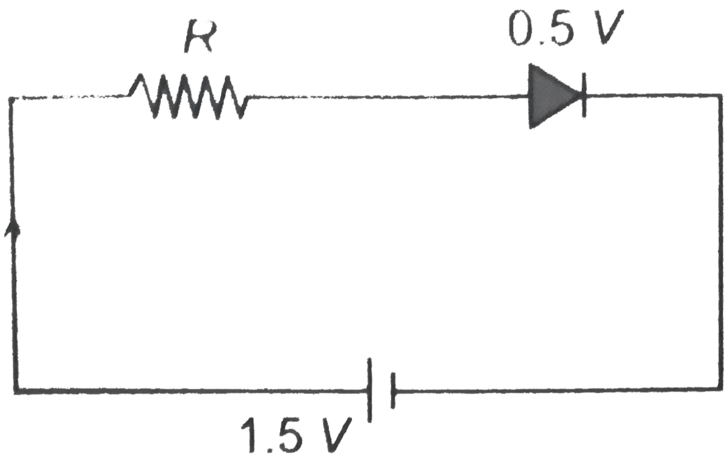
49. The diode used in the circuit shown in the figure has a constant voltage drop of $0.5V$ at all currents and a maximum power rating fo 100 milliwatts. What should be the value of the resistor R, connected in series with the diode for obtaining maximum current?



A. 6.76Ω

B. 20Ω

C. 5Ω

D. 5.6Ω

Answer: C

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50. The half-life of a radioactive isotope X is 50 yr. It decays to an other element Y which is stable. The two elements X and Y were found to be in the ratio of $1:15$ in a sample of a give rock. The age of the rock was estimated to be

A. 100 years

B. 150 years

C. 200 years

D. 250 years

Answer: C

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Practice Papper 3

1. When a pentavalent imputrity is added in Ge crystal then, what type of semiconductor is obtained ?

A. a p-type

B. an n-type

C. intrinsic

D. none of these

Answer: B

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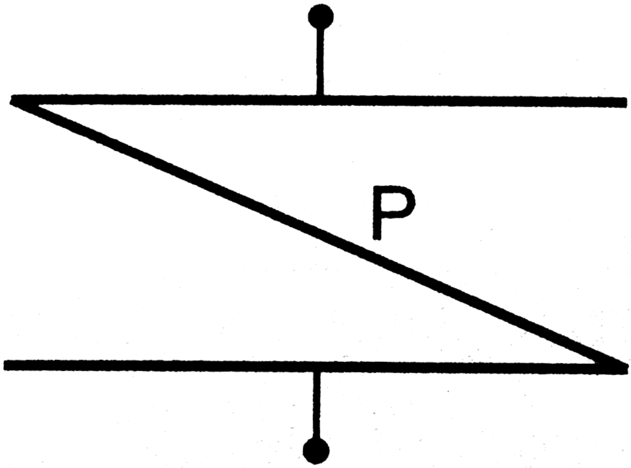
2. A thin metal plate P is inserted between the plates of a parallel-plate capacitor of capacitance C in such a way that its edges touch the two plates (figure 31-

Q2).The capacitance now becomes.



A. 2C

B. C/2

C. C and D are true

D. infinity

Answer: D

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3. A positively charged thin metal ring of radius R is fixed in the xy plane with its centre at the origin O. A negatively charged particle P is released from rest at the point $(0, 0, z_0)$ where $z_0 > 0$. Then the motion of P is

A. periodic for all values of Z_0 satisfying $0 < Z_0 < \infty$

B. simple harmonic for all values of Z_0 satisfying $0 < Z_0 \leq R$

C. approximately simple harmonic provided $Z_0 < < R$

D. such that P crosses O and continues to move along the negative Z-axis towards $Z = -\infty$

Answer: C

Watch Video Solution

4. A voltmeter having a resistance of 1800Ω employed to measure the potential difference across a 200Ω resistor which is connected to the terminals of a dc power supply having an emf of 50 V and an internal resistance of 20Ω. What is the percentage decrease in the potential difference across the 200Ω resistor as a result of connecting the voltmeter across it?

A. 1%

B. 5%

C. 10%

D. 25%

Answer: A

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5. A microammeter has as resistance of 100Ω and full scale range of $50\mu A$. It can be used a voltmeter or as ahigher range ammeter provided a resistance is added to it. Pick the correct range and resistance combinations

50 V range with $10k\Omega$ resistance in series

b.$10V$ range with $200k\Omega$ resistance in series

c. 5mA rangw with 1Ω resistance in parallel

$10mA$ range with 1Ω resistance in parallel

A. 50 V range with $10k\Omega$ resistance in series

B. 10 V range with $200k\Omega$ resistance in series.

C. 5mA range with 2Ω resistance in parallel

D. 10 mA range with 2Ω resistance in parallel

Answer: B

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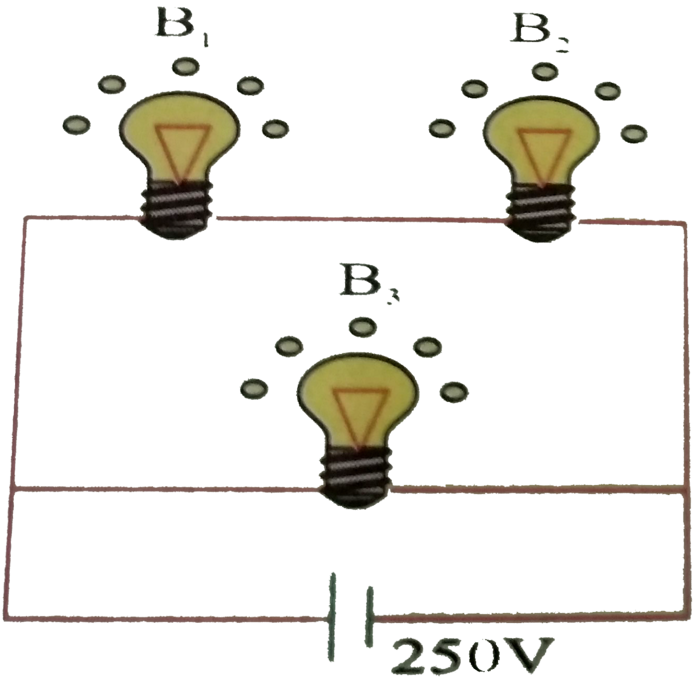
6.



A 100 W bulb B_1 and two 60 W bulbs B_2 and B_3, are connected to a 250V source, as shown in the figure now W_1, W_2 and W_3 are the output powers of the bulbs B_1, B_2 and B_3 respectively then

A. $W_1 > W_2 = W_3$

B. $W_1 > W_2 > W_3$

C. $W_1 < W_2 = W_3$

D. $W_1 < W_2 < W_3$

Answer: D

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7. A short conducting rod P of length $3.0cm$ is placed parallel to an near the centre of a long conducting rod Q of length 3.0 m. Conductors P and carry currents of 3.0 A and 4.0 A respectively in the same direction. The two conductors are separated by a distance of $2.0cm$ in air. What is the force experienced by the long conductor Q ?

A. $1.6 \times 10^{-6} N$

B. $2.6 \times 10^{-6} N$

C. $3.6 \times 10^{-6} N$

D. $4.6 \times 10^{-6} N$

Answer: C

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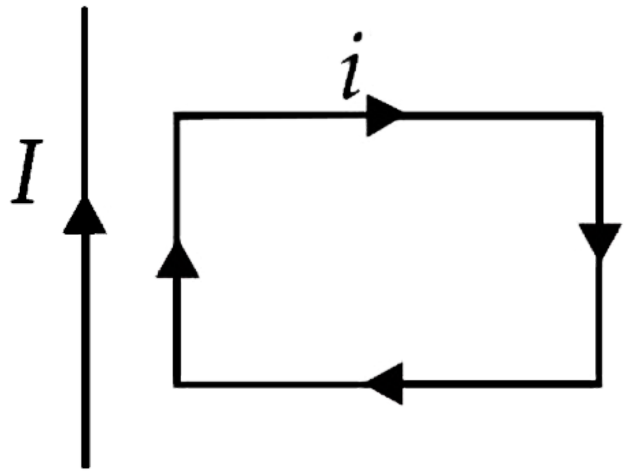
8. A rectangular loop carrying a current i is situated near a long straight wire such that the wire is parallel to one of the sides of the loop and is in the plane of the loop . If steady current I is established in the wire as shown in the figure ,



A. rotate about an axis parallel to the wire

B. move away from the wire

C. move towards the wire

D. remain stationary

Answer: C

Watch Video Solution

9. An electron and a proton enter a magnetic field at right angles to the field with the same kinetic energy

A. the electron trajectory will be less curved than the proton trajectory

B. the proton trajectory will be less curved than the electron trajectory

C. both trajectories will be equally curved

D. both particles move in straight lines

Answer: B

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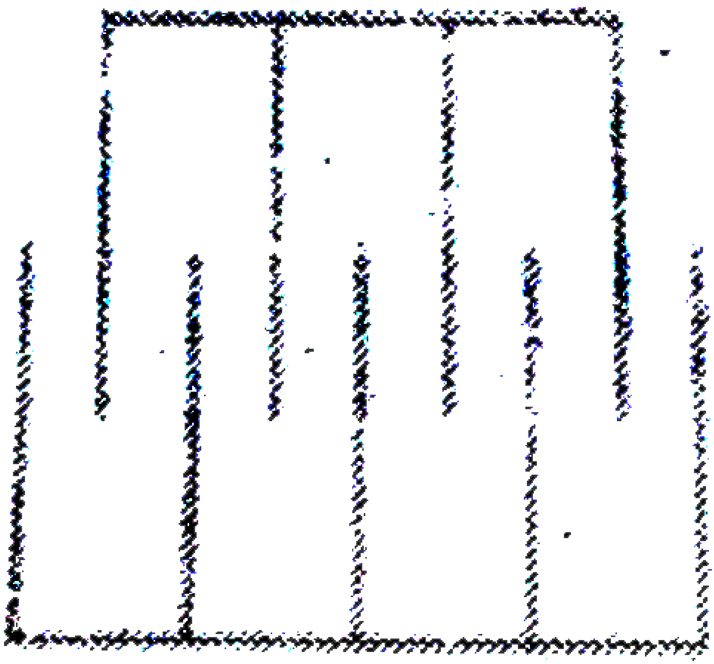
10. A gang capacitor is formed by interlocking a number of plates as shown in figure. The distance between the consecutive plates is 0.885 cm annd the overlapping area of the plates is 5 cm^2. The capacity of the unit is



A. $1.06\mu F$

B. $4pF$

C. $6.36pF$

D. $12.72pF$

Answer: B

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11. A galvanometer of resistance 25Ω is connected to a battery of 2 volt along with a resistance in series. When the value of this resistance is 3000Ω, a full scale deflection of 30 units is obtained in the galvanometer.

In order to reduce this deflection to 20 units, the resistance in series will be

A. 4512Ω

B. 5413Ω

C. 2000Ω

D. 6000Ω

Answer: A

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12. A rectangular coil of 20 turns and area of cross-section $25cm^2$ has a resistance of $100ohm$. If a magnetic field which is perpendicular to the plane of the coil changes at the rate of 1000 telsa per second, the current in the coil is

A. 1A

B. 50 A

C. $0.5A$

D. $5A$

Answer: C

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13. For perfectly coupled coils, the coupling coefficient should be equal to

A. one

B. zero

C. infinite

D. more than one

Answer: A

Watch Video Solution

14. A $200\mu F$ capacitor in series with a 100Ω resistance is connected to a 240 V, 50 Hz supply. What is the maximum current in the circuit ?

A. $1.4A$

B. $3.4A$

C. $4.4A$

D. $2.4A$

Answer: B

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15. The overall efficiency of a transformer is 90%.The transformer is rated for an output of 9000 watt.The primary voltage is 1000 volt.The ratio of turns in the primary to the secondary coil is 5:1.The iron losses at full load are 700 watt.The primary coil has a resistance of 1ohm. In the above, the copper loss in the primary coil is

A. 400 W

B. 200 W

C. 100 W

D. 300 W

Answer: C

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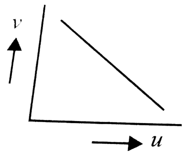
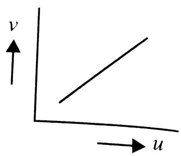
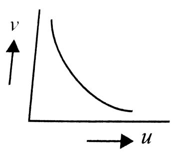
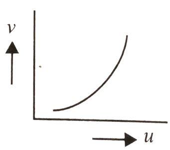
16. In an experiment to find focal length of a concave mirror, a graph is drawn between the magnitudes of (u) and (v). The graph looks like.

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: C

Watch Video Solution

17. In a reflecting astronomical telescope, if the objetcive (a spherical mirror) is replaced by a parabolic mirror of the same focal length and aperture, then

A. the final image will be erect

B. a large image will be obtained

C. the telescope will gather more light

D. spherical aberration will be absent

Answer: D

Watch Video Solution

18. Which one of the following is a possible nuclear reaction ?

A. $._{10}^{5} B + ._{2}^{4} He \rightarrow ._{7}^{13} N + ._{1}^{1} H$

B. $._{11}^{23} Na + ._{1}^{1} H \rightarrow ._{10}^{20} Ne + ._{2}^{4} He$

C. $._{93}^{239} Np \rightarrow ._{94}^{239} Pu + ._{-1} \beta^{0} + \bar{v}$

D. $._{7}^{11} N + ._{1}^{1} H \rightarrow ._{6}^{12} C + ._{-1} \beta^{0} + \bar{v}$

Answer: C

Watch Video Solution

19. A $5W$ source emits monochromatic light of wavelength 5000Å. When placed $0.5m$ away , it liberates photoelectrons from a photosensitive metallic surface . When the source is moved to a distance of $1.0m$ the number of photoelectrons liberated will be reduced by a factor of

A. 8

B. 16

C. 2

D. 4

Answer: D

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20. Calculate in how many months , $\left(\frac{3}{4}\right)^{th}$ of the substance will dacay, If half-life of the radioactive substance is 2 months.

A. 3 months

B. 4 months

C. 8 months

D. 12 months

Answer: C

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21. Which of the following statements is not true?

A. The resistance of intrinsic semiconductor decreases with increase of temperature.

B. Doping pure Si with trivalent impurities give p-type semiconductor.

C. The majority carriers in n-type semiconductors are holes

D. A p-n junction can act as a semiconductor diode

Answer: C

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22. The transfer ratio of a transistor is 50. The input resistance of the transistor when used in the common -emitter configuration is $1k\Omega$. The peak value for an $A.C.$ input voltage of $0.01V$ peak is

A. $100\mu A$

B. $0.01\mu A$

C. $0.25\mu A$

D. $500\mu A$

Answer: D

Watch Video Solution

23. Given below are four logic gates symbol (figure). Those for OR, NOR and NAND are respectively

A. (d), (c), (a)

B. (b), (c), (a)

C. (a), (b), (c)

D. (a), (c), (d)

Answer: A

Watch Video Solution

24. An AND gate

A. is equivalent to a parallel switching current

B. is equivalent to a series switching current

C. has two outputs and one inputs

D. has two outputs and two inputs

Answer: B

Watch Video Solution

25. The VHF band ranges from

A. 30 to 300 MHz

B. 30 to 3000 MHz

C. 20 to 2000 MHz

D. 30 to 300 MHz

Answer: A

Watch Video Solution

26. The circular plates A and B of a parallel plate air capacitor have a diameter of 0.1 m and are $2 \times 10^{-3} m$ apart. The plates C and D of a similar capacitor have a diameter of $0.12m$ and are $3 \times 10^{-3} m$ apart. Plate A is earthed. Plates B and D are connected together. Plate C is connected to the positive pole of a 120V battery whose negative is earthed. The energy stored in the system is

A. $0.1224\mu J$

B. $0.2224\mu J$

C. $0.3224\mu J$

D. $0.4224\mu J$

Answer: A

Watch Video Solution

27. If the input and output power of an optical fibre of length 150 m are $10\mu W$ and $9\mu W$ respectively then loss in dB/km is approximately

A. -1

B. -2

C. -3

D. -4

Answer: C

Watch Video Solution

28. A thin prism of angle 15° made of glass of refractive index $\mu_1 = 1.5$ is combined with another prism of glass of refractive index $\mu_2 = 1.75$. The combination of the prism produces dispersion without deviation. The angle of the second prism should be

A. 5°

B. 7°

C. 10°

D. 12°

Answer: C

Watch Video Solution

29. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1.0 mm wide and the resulting

diffraction pattern is

observed on a screen 2m away. What is the distance

between the first dark

fringe on either side of the central bright fringe?

A. $1.2cm$

B. $1.2mm$

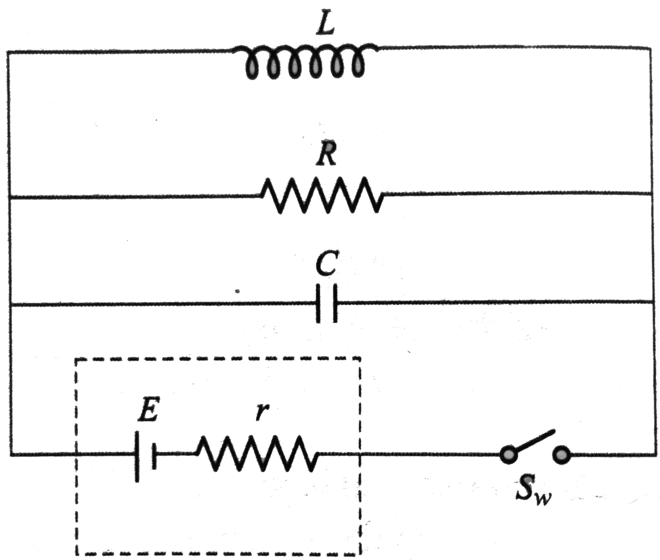
C. $2.4cm$

D. $2.4mm$

Answer: D

Watch Video Solution

30. A pure inductor L, a capactior C and a resistance R are connected across a battery of emf E and internal resistance r as shows in Fig. Switch S_W is closed at $t = 0$, select the correct altermative (S).



A. Current through resistance R is zero all the time.

B. Current through resistance R is zero at t = 0 and

$t \to \infty$.

C. Maximum charge stored in the capacitor is $C\varepsilon$.

D. Maximum energy stored in the inductor is equal

to the maximum energy stored in the capacitor.

Answer: B

Watch Video Solution

31. Two radioactive materials X_1 and X_2 have decay constant 11λ and λ respectively. If initially they have same number of nuclei, then ratio of number of nuclei of X_1 to X_2 will be $\frac{1}{e}$ after a time

A. $\frac{1}{10\lambda}$

B. $\frac{1}{11\lambda}$

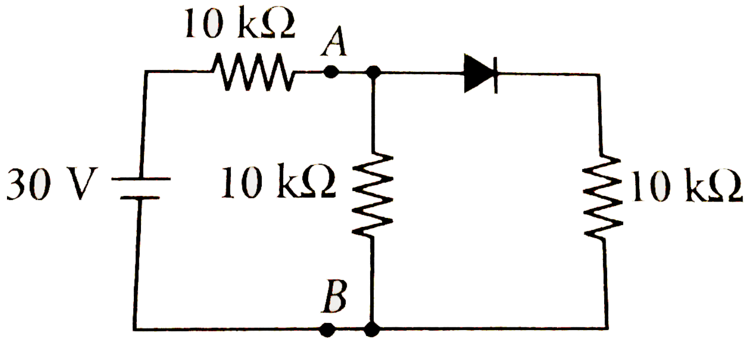
C. $\frac{11}{10\lambda}$

D. $\frac{1}{9\lambda}$

Answer: D

Watch Video Solution

32. In the given circuit, the potential difference between A and B is



A. 0

B. 5V

C. 10V

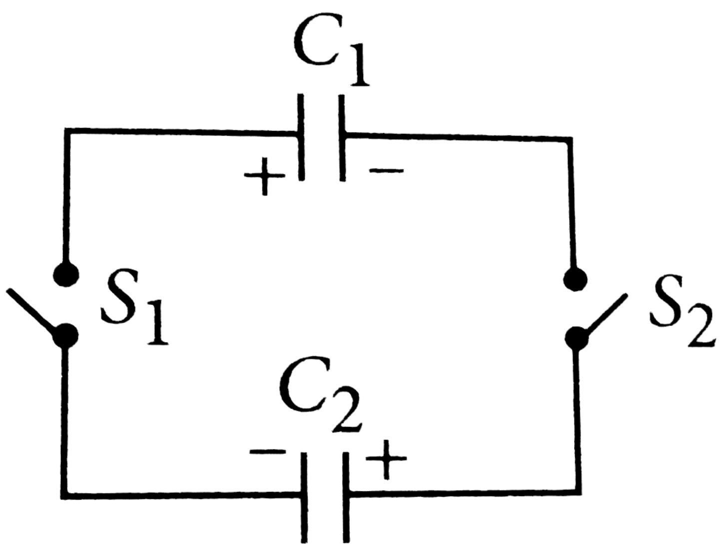
D. 15 V

Answer: C

Watch Video Solution

33. Two capacitors $C_1 = 2\mu F$ and $C_2 = 1\mu F$ are charged to same potential $V = 100V$, but with opposite polarity as shown in the figure.

The switches S_1 and S_2 are closed. The ratio of final energy to the initial energy of the system is



A. 1

B. $\frac{1}{2}$

C. $\frac{1}{9}$

D. $\frac{1}{4}$

Answer: C

Watch Video Solution

34. A proton has kinetic energy E = 100 keV which is equal to that of a photon. The wavelength of photon is λ_2 and that of proton is λ_1. The ratio of λ_2 / λ_1 is proportional to

A. E^2

B. $E^{1/2}$

C. E^{-1}

D. $E^{-1/2}$

Answer: D

Watch Video Solution

35. A particle of mass m and charge q has and initial velocity $\overrightarrow{v} = v_0\hat{j}$. If an electric field $\overrightarrow{E} = \overrightarrow{\ } (0)\hat{i}$ and magnetic field $\overrightarrow{B} = B_0\hat{i}$ act on the particle, its speed will double after a time :

A. $t = \dfrac{2mv_0}{qE_0}$

B. $t = \dfrac{2B_0q}{mv_0}$

C. $t = \frac{\sqrt{3} B_0 q}{m v_0}$

D. $t = \frac{\sqrt{3} m v_0}{q E_0}$

Answer: D

Watch Video Solution

36. A transformer with efficiency 80% works at $4kW$ and $100V$. If the secondary voltage is $200V$, then the primary and secondary currents are respectively

A. 40A, 16 A

B. 16 A, 40 A

C. 20 A, 40 A

D. 40 A, 20 A

Answer: A

Watch Video Solution

37. A current of 0.5 A is passed through the coil of a galvanometer having 500 turns and each turns has an average area of $3 \times 10^{-4} m^2$ if a torque of 1.5 N-m is required for this coil carrying same current to set it parallel to a magnetic field calculate the strength of the magnetic field

A. 20T

B. 25 T

C. 23 T

D. 21 T

Answer: A

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38. The primary and secondary coils of a transformer have 50 and 1500 turns respectively. If the magnetic flux ϕ linked with the primary coil is given by $\phi = \phi_0 + 4t$, where ϕ is in webers, t is time in second and ϕ_0 is a constant, the output voltage across the secondary coil is

A. 90 V

B. 120 V

C. 220 V

D. 30V

Answer: B

Watch Video Solution

39. Two electric bulbs, each designed to operate with a power of 500W in 220V line, are in series with a $110V$ line. What will be the power generated by each bulb?

A. $31.25W$

B. $21.25W$

C. $11.25W$

D. $9.25W$

Answer: A

Watch Video Solution

40. If the capacitance of each capacitor is C, then effective capacitance of the shown network across any two junction is

A. 2C

B. C

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

D. 5C

Answer: A

Watch Video Solution

41. A radioactive isotope X has a half life of 3 seconds. At t=0, a given sample of this isotope contains 8000 atom. Calculate (i) its decay constant (ii) average life (iii) the time t_1, when 1000 atoms of the isotope X remain in the sample (iv) number of decay/sec in the sample at $t = t_1$ sec.

A. 2s

B. 4s

C. 7s

D. 9s

Answer: D

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42. When in hydrogen like ion, electron jumps from n = 3, to n = 1, the emitted photon has frequency $2.7 \times 10^{15} Hz$. When electron jumps from n = 4 to n = 1, the frequency is

A. $1.6 \times 10^{15} Hz$

B. $2.8 \times 10^{15} Hz$

C. $6.4 \times 10^{15} Hz$

D. $4.8 \times 10^{15} Hz$

Answer: B

Watch Video Solution

43. An equilateral triangle of side length l is formed from a piece of wire of uniform resistance. The current I is as shown in figure. Find the magnitude of the magnetic field at its centre O.

A. $\dfrac{\sqrt{3}\mu_0 I}{2\pi l}$

B. $\dfrac{3\sqrt{3}\mu_0 I}{2\pi l}$

C. $\dfrac{\mu_0 I}{2\pi l}$

D. zero

Answer: D

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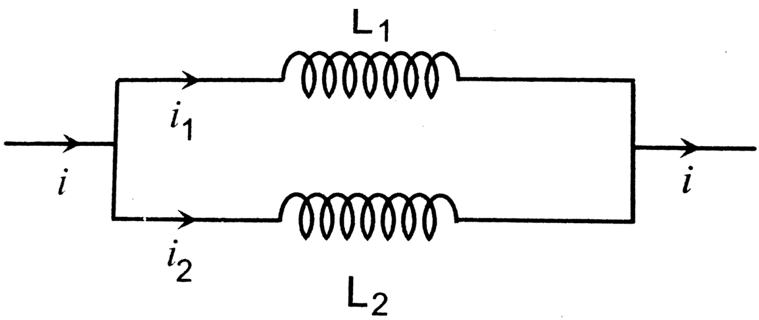
44. Two inductors L_1 and L_2 are connected in parallel and a time varying current flows as shown.

The ratio of current i_1 / i_2 is?



A. $\dfrac{L_2}{L_1}$

B. $\dfrac{L_1}{L_2}$

C. $\dfrac{L_2^2}{(L_1 + L_2)^2}$

D. $\dfrac{L_1^2}{(L_1 + L_2)^2}$

Answer: A

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45. An a.c. source is connected across an LCR series circuit with $L = 100 mH, C = 0.1 \mu F$ and $R = 50 \Omega$. The frequency of ac to make the power factor of the circuit, unity is

A. $\frac{10^4}{2\pi} Hz$

B. $\frac{10^3}{2\pi} Hz$

C. $\frac{10^{-4}}{2\pi} Hz$

D. $\frac{10^{-3}}{2\pi} Hz$

Answer: A

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46. When light of wavelength 400nm is incident on the cathode of photocell, the stopping potential recorded is 6V. If the wavelength of the incident light is to 600nm, calculate the new stopping potential.

[Given

$h = 6.6 \times 10^{-34} Js, c = 3 \times 10^{8} m/s, e = 1.6 \times 10^{-19} C$

]

A. $1.03V$

B. $2.42V$

C. $4.97V$

D. $3.58V$

Answer: C

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47. A surface irradiated with light $\lambda = 480 nm$ gives out electrons with maximum velocity v ms^{-1}, the cut off wavelength being 600 nm. The same surface would release electrons with maximum velocity $2vms^{-1}$ if it is irradiated by light of wavelength.

A. 325 nm

B. 360 nm

C. 384 nm

D. 300 nm

Answer: D

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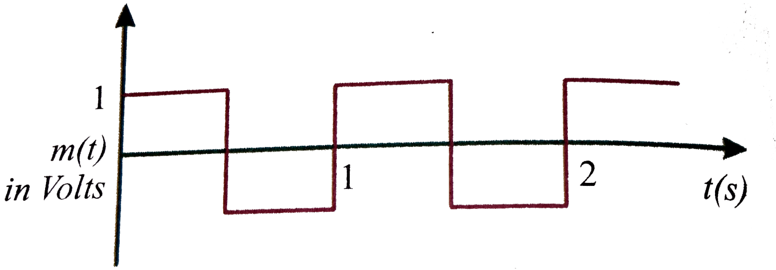
48. A modulating signal is a square wave as shown in figure.



The carrier wave is given by

$c(t) = 2\sin(8\pi t)$volt.

The modulation index is

A. 0.2

B. 0.3

C. 0.4

D. 0.5

Answer: D

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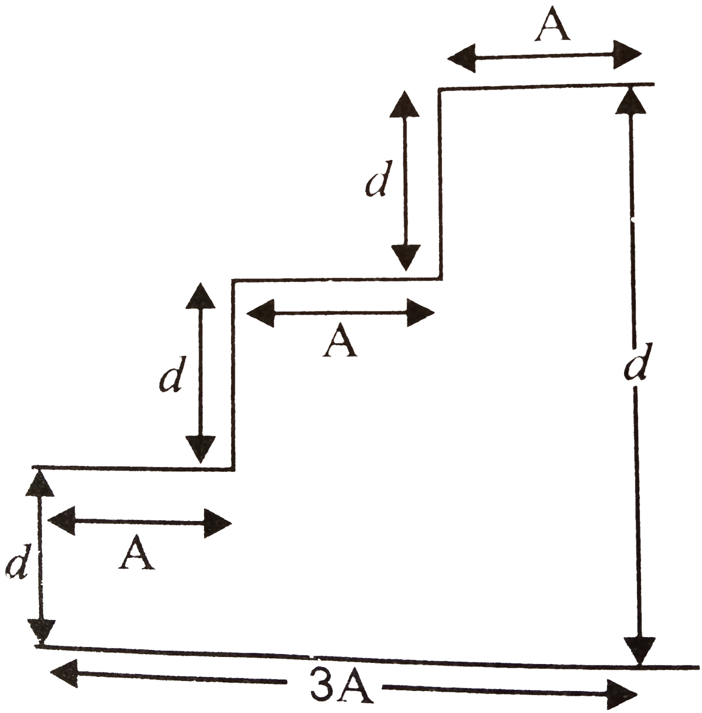
49. The expression for the equivalent capacitance of the system shown in Fig. is (A is the corss-sectional area of one of the planes) :



A. $\varepsilon_0 A / 3d$

B. $\dfrac{3\varepsilon_0 A}{d}$

C. $\varepsilon_0 A / 6d$

D. $\dfrac{11\varepsilon_0 A}{6d}$

Answer: D

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50. A $100V$ a.c. source of frequency $500Hz$ is connected to a LCR circuit with $L = 8.1$ millihenry, $C = 12.5\mu F$ and $R = 10$ ohm, all connected in series. What is the potential difference across the resistance?

A. 25 V

B. 50 V

C. 75 V

D. 100 V

Answer: D

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Practice Paper 1

1. The phenomenon by which light travels in an optical fibres is

A. a) total internal reflection

B. b) scattering

C. c) diffraction

D. d) refraction

Answer: A

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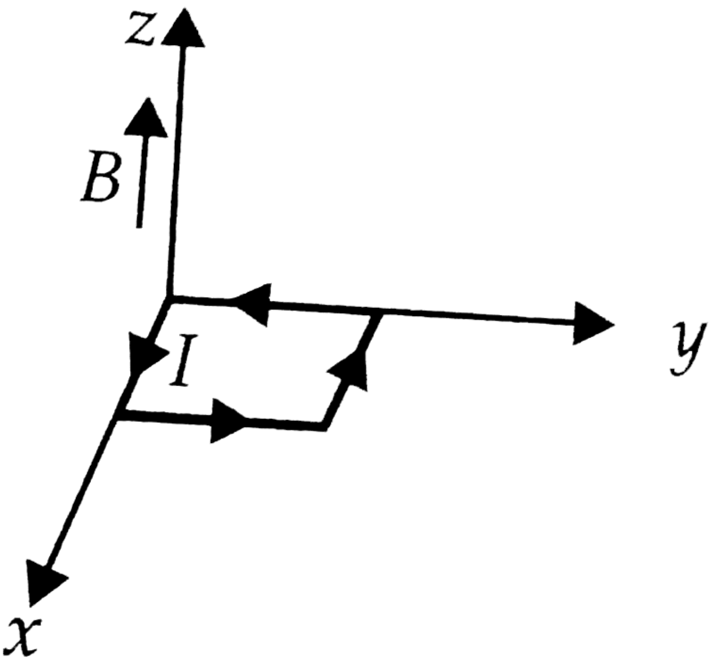
2. A uniform magnetic field of 1000 G is established along the positive z-direction. A rectangular loop of sides 10 cm and 5 cm carries a current of 12 A. What is the torque on the loop as shown in the figure?



A. Zero

B. $1.8 \times 10^{-2} Nm$

C. $1.8 \times 10^{-3} Nm$

D. $1.8 \times 10^{-4} Nm$

Answer: A

Watch Video Solution

3. The length of a telescope is 36 cm . The focal lengths of its lenses can be

A. a) 30 cm, 6cm

B. b) $-30cm, \ -6cm$

C. c) $30cm, \ -6cm$

D. d) $-30cm, 6cm$

Answer: A

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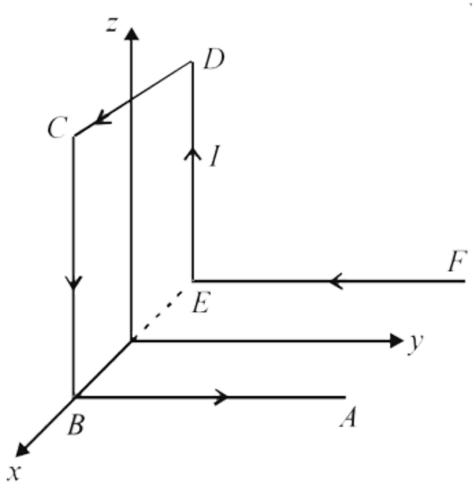
4. A wire $ABCDEF$ (with each side of length L) bent as shown in figure and carrying a current I is placed in a uniform magnetic induction B parallel to the positive $y - direction$. The force experienced by the wire is .... In the .... direction .



A. a) 2 BIL

B. b) $\frac{BIL}{2}$

C. c) BIL

D. d) $\frac{BIL}{4}$

Answer: C

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5. A straight wire carring current I is turned into a circular loop. If the magnitude of magnetic moment associated with it in M.K.S. unit is M, the length of wire will be

A. a) $\frac{4\pi I}{M}$

B. b) $\sqrt{\frac{4\pi M}{I}}$

C. c) $\sqrt{\frac{4\pi I}{M}}$

D. d) $\frac{M\pi}{4I}$

Answer: B

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6. In a series LCR circuit, the voltage across the resistance, capacitance and inductance is 10 V each. If the capacitance is short circuited, the voltage across the inductance will be

A. 10V

B. $10\sqrt{2}V$

C. $\frac{10}{\sqrt{2}}V$

D. 20V

Answer: C

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7. An electron of mass m when accelerated through a potential difference V has de - Broglie wavelength λ. The de - Broglie wavelength associated with a proton of mass M accelerated through the same potential difference will be

A. $\frac{\lambda m}{M}$

B. $\lambda\sqrt{\dfrac{m}{M}}$

C. $\dfrac{\lambda M}{m}$

D. $\lambda\sqrt{\dfrac{M}{m}}$

Answer: B

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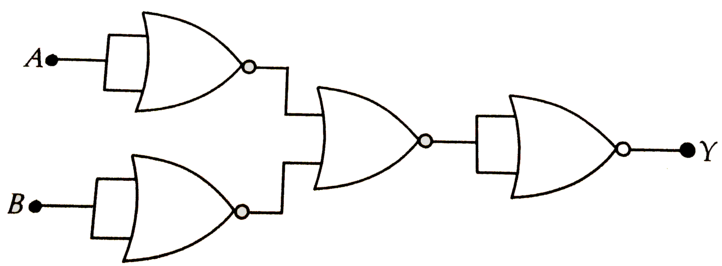
8. The circuit as shown in the figure is equivalent to



A. AND gate

B. NOT gate

C. OR gate

D. NAND gate

Answer: D

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9. The critical angle of a certain medium is $\sin^{-1}\left(\frac{3}{5}\right)$.

The polarizing angle of the medium is :

A. $\sin^{-1}\left(\frac{4}{5}\right)$

B. $\tan^{-1}\left(\frac{5}{3}\right)$

C. $\tan^{-1}\left(\frac{3}{4}\right)$

D. $\tan^{-1}\left(\frac{4}{3}\right)$

Answer: B

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10. If K_1 and K_2 are maximum kinetic energies of photoelectrons emitted when lights of wavelenth λ_1 and λ_2 respectively incident on a metallic surface.

A. $K_1 > (K_2/3)$

B. $K_1 < (K_2/3)$

C. $K_1 = 3K_2$

D. $K_2 = 3K_1$

Answer: B

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11. A coil having an inductance of 0.5 H carries a current which is uniformly varying from zero to 10 ampere in 2 second. The e.m.f. (in volts) generated in the coil is

A. 10

B. 5

C. 2.5

D. 1.25

Answer: C

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12. If a star can convert all the He nuclei completely into oxygen nuclei. The energy released per oxygen nuclei is (Mass of the helium nucleus is 4.0026 amu and mass of oxygen nucleus is 15.9994 amu)

A. $10.24 MeV$

B. $23.9 MeV$

C. $7.56 MeV$

D. 5MeV

Answer: A

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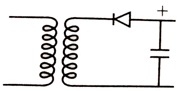
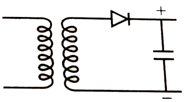
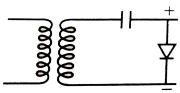
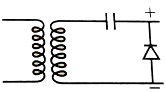
13. Which is the correct diagram of a half- wave reactifier?

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: B

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14. A place electromagnetic wave

$$F_s = 100 \cos\left(6 \times 10^8 t + 4x\right) V / m$$

Propagates in a medium of dielectric constant. The refractive index is

A. 1.5

B. 2.0

C. 2.4

D. 4.0

Answer: B

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15. when an electron jumps from the fourth orbit to the second orbit, one gets the

A. second line of Paschen series

B. Second line of Balmer series

C. first line of Pfund series

D. second line of Lyman series

Answer: B

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16. Two sources of light of wavelengths 2500 Å and 3500 Å are used in Young's double slit expt. simultaneously. Which orders of fringes of two wavelength patterns coincide?

A. 3^{rd} order of 1^{st} and 5^{th} order of 2^{nd}

B. 7^{th} order of 1^{st} and 5^{th} order of 2^{nd}

C. 5^{th} order of 1^{st} and 3^{rd} order of 2^{nd}

D. 5^{th} order of 1^{st} and 7^{th} order of 2^{nd}

Answer: B

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17. A carrier wave of peak voltage 12 V is used to transmit a message signal. What should be the peak voltage of the modulating signal in order to have a modulation index of 75%?

A. 5V

B. 9V

C. 12 V

D. 15 V

Answer: B

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18. A concave lens forms the image of an object such that the distance between the object and image is 10cm and the magnification produced is 1/4. The focal length of the lens will be

A. $-6.2cm$

B. $-4.4cm$

C. $-8.6cm$

D. $-10cm$

Answer: B

Watch Video Solution

19. The circular plates A and B of a parallel plate air capacitor have a diameter of 0.1 m and are $2 \times 10^{-3} m$ apart. The plates C and D of a similar capacitor have a diameter of $0.12m$ and are $3 \times 10^{-3} m$ apart. Plate A is earthed. Plates B and D are connected together. Plate C is connected to the positive pole of a 120V battery whose negative is earthed. The energy stored in the system is

A. $0.1224 \mu J$

B. $0.2224 \mu J$

C. $0.3224 \mu J$

D. $0.4224 \mu J$

Answer: A

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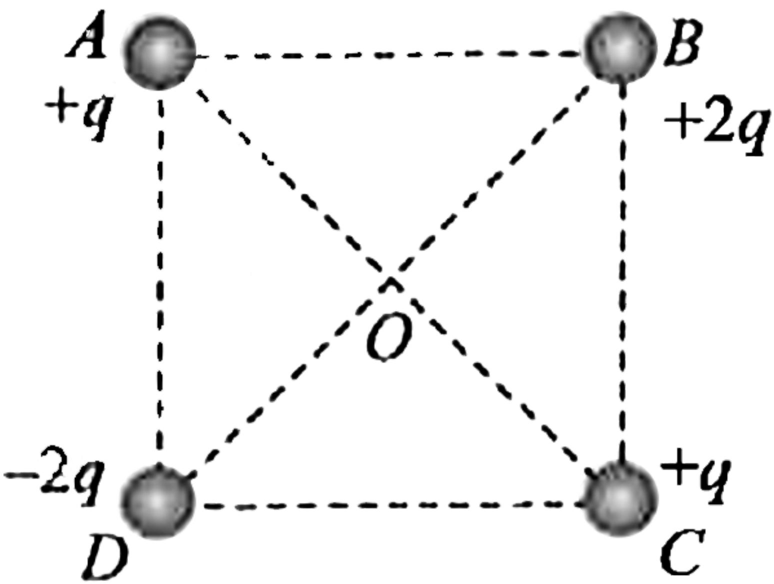
20. Four charges are arranged at the corners of a square ABCD, as shown in the adjoining figure. The force on the charge kept at the centre O is



A. along the diagonal BD

B. along the diagonal AC

C. zero

D. perpendicular to side AB

Answer: D

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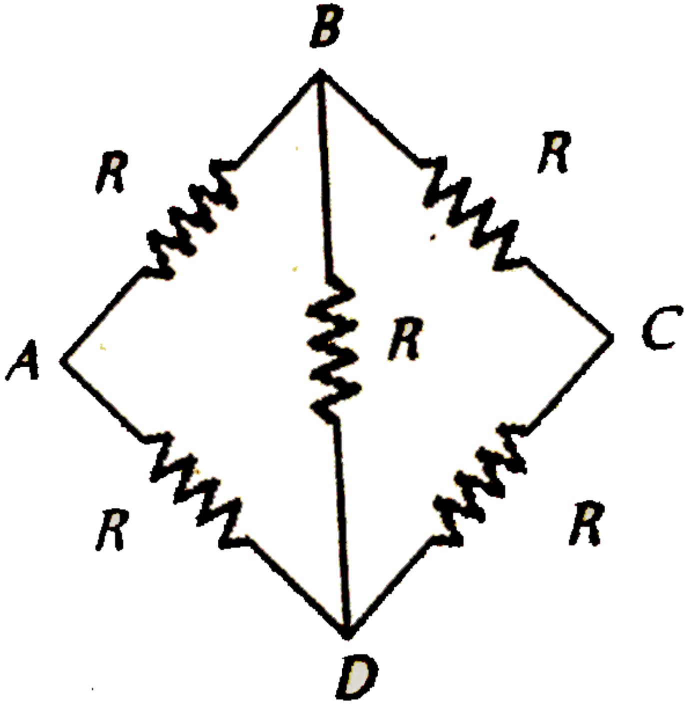
21. Five equal resistances each of value R are connected in a form shown alongside. The equivalent resistance of the network



A. $\frac{1}{2}R$

B. 2R

C. $\frac{5}{8}R$

D. $\frac{8}{5}R$

Answer: C

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22. A potentiometer wire of length 100cm has a resistance of 10Ω. It is connected in series with a resistance and a cell of emf 2V and of negligible interal resistance. A source of emf 10mV is balanced against a length of 40cm of the potentiometer wire. What is the value of external resistance?

A. 790Ω

B. 890Ω

C. 990Ω

D. 1090Ω

Answer: A

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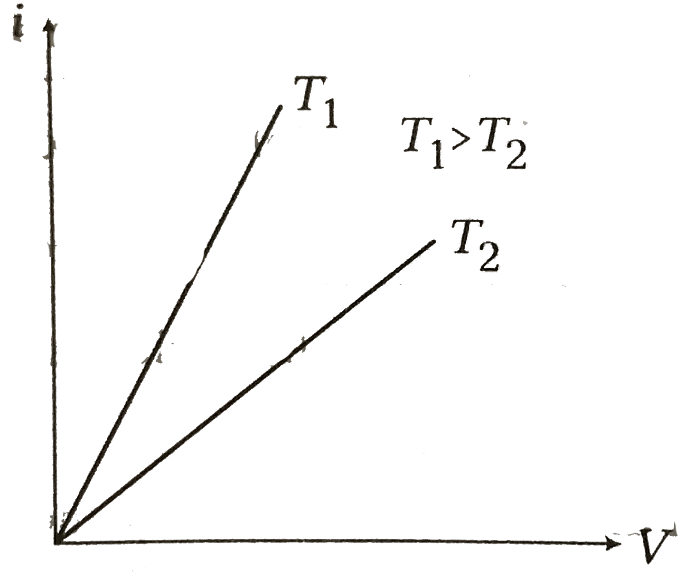
23. Assertion : Current versus potential difference (i-V) graph for a conductor at two different temperatures T_1 and T_2 is shown in figure. Hence $T_1 > T_2$.



Reason : Resistance of a conductor increases with rise in temperature.

A. $\cos 2\theta$

B. $\sin 2\theta$

C. $\cot 2\theta$

D. $\tan 2\theta$

Answer: C

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24. The fraction of atoms of radioactive element that decays in 6 days is $\frac{7}{8}$. The fraction that decays in 10 days will be

A. $\frac{77}{80}$

B. $\frac{71}{80}$

C. $\frac{31}{32}$

D. $\frac{15}{16}$

Answer: C

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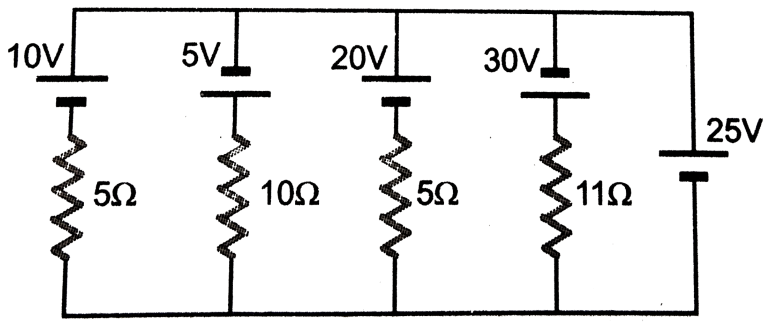
25. In the circuit shown in figure the current flowing through 25 V cell is



A. $7.2A$

B. $10A$

C. $12A$

D. $14.2A$

Answer: C

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26. Five sinusoidal waves have the same frequency $500Hz$ but their amplitudes are in the ratio $2:1/2:1/2:1:1$ and their phase angles $0, \pi/6, \pi/3, \pi/2$ and π, respectively . The phase angle of resultant wave obtained by the superposition of these five waves is

A. 30°

B. 45°

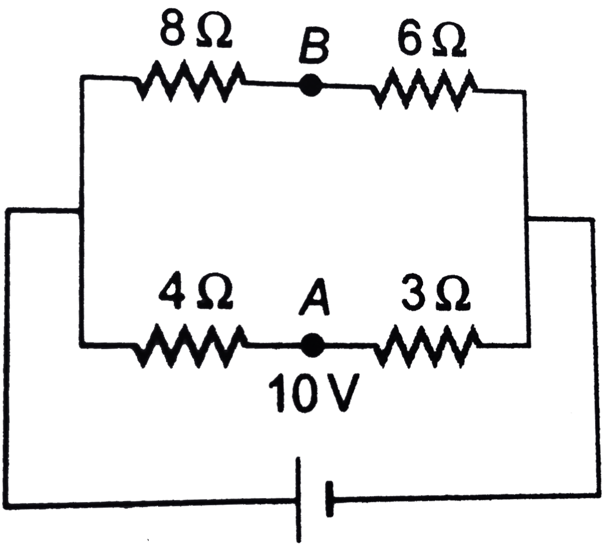
C. 60°

D. 90°

Answer: B

Watch Video Solution

27. The potential difference between points A and B is



A. 2

B. 5

C. 11

D. 18

Answer: B

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28. The magnetic flux (ϕ) in a closed circuit of resistance 20Ω varies with time (t) according to the equation $\phi = 7t^2 - 4t$ where ϕ is in weber and t is in seconds. The magnitude of the induced current at t =0.25s is

A. 25mA

B. $0.025 mA$

C. 47 mA

D. 175 mA

Answer: A

Watch Video Solution

29. In an AC circuit, a resistance of $R ohm$ is connected in series with an inductance L. If phase angle between volage and current be 45°, the value of inductive reactance will be

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

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

C. R

D. cannot be found with given data

Answer: C

Watch Video Solution

30. The potential field of an electric field $\vec{E} = \left(y\hat{i} + x\hat{j}\right)$ is

A. V = -(x+y) + constant

B. V = constant

C. $V = -(x^2 + y^2) +$ constant

D. V = -xy + constant

Answer: D

Watch Video Solution

31. Electric charges $q, q, -2q$ are placed at the corners of an equilateral triangle ABC of side l. The magnitude of electric dipole moment of the system is

A. ql

B. $\sqrt{3}ql$

C. zero

D. 4ql

Answer: B

Watch Video Solution

32. An electric of $5A$ is passing through a circuit containing three arrengement in parallel if the length and radius of the wires are in the ratio $2:3:4$ and $3:4:5$ then the ratio of current passing through wires should be

A. $3:6:10$

B. $4:9:16$

C. $9 : 16 : 25$

D. $54 : 64 : 75$

Answer: D

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33. The masses of neutron, proton and deuteron in amu are 1.00893, 1.00813 and 2.01473 respectively. The packing fraction of the deuteron in amu is

A. 11.65×10^{-4}

B. 23.5×10^{-4}

C. 33.5×10^{-4}

D. 47.15×10^{-4}

Answer: A

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34. Shunt required in an ammeter of resistance R to decreases its deflection from 30 A to 10 A is

A. R/4

B. R/3

C. R/2

D. R

Answer: C

Watch Video Solution

35. In Young's double-slit experiment, the slit are 0.5 mm apart and the interference is observed on a screen at a distance of 100 cm from the slits, It is found that the ninth bright fringe is at a distance of 7.5 mm from the second dark fringe from the center of the fringe pattern. The wavelength of the light used in nm is

A. $\frac{2500}{7}$

B. 2500

C. 5000

D. $\frac{5000}{7}$

Answer: C

Watch Video Solution

36. At a given palce on the earth's surface, the horizontal component of earth's magnetic field is $3 \times 10^{-5} T$ and resultant magnetic field is $6 \times 10^{-5} T$. The angle of dip at this place is

A. 30°

B. 40°

C. 50°

D. 60°

Answer: D

Watch Video Solution

37. Which one of the following combinations of radioactive decay results in the formation of an isotope of original nucleus ?

A. One alpha, four beta

B. One alpha, two beta

C. One alpha, one beta

D. Four alpha, one beta

Answer: B

Watch Video Solution

38. Quantity that remains unchanged in a transformer is

A. voltage

B. current

C. frequency

D. none of these

Answer: C

Watch Video Solution

39. The first line of the lyman series in a hydrogen spectrum has a wavelength of 1210 Å. The corresponding line of a hydrogen like atom of $Z = 11$ is equal to

A. 4000 Ã…

B. 100 Ã…

C. 40 Ã…

D. 10 Ã…

Answer: D

Watch Video Solution

40. A ray of light in incident on a glass plate at an angle of 60°. What is the refractive index of glass if the reflected and refracted rays are perpendicular to each other?

A. $\frac{1}{2}$

B. $\sqrt{\frac{3}{2}}$

C. $\frac{3}{2}$

D. $\sqrt{3}$

Answer: D

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41. In a sample of radioactive material, what percentage of the initial number of active nuclei will decay during one mean life ?

A. 63%

B. 69.3%

C. 37%

D. 50%

Answer: A

Watch Video Solution

42. Critical angle of glass is θ_1 and that of water is θ_2.

The critical angle for water and glass surface would be

$(\mu_g = 3/2, \mu_w = 4/3)$

A. between θ_1 and θ_2

B. greater than θ_2

C. less than θ_1

D. less than θ_2

Answer: B

Watch Video Solution

43. Consider a uniform electric field $E = 3 \times 10^3 \hat{i} N/C$. (a) What is the flux of this field through a square of 10 cm on a side whose plane is parallel to the yz plane ? (b) What is the flux through the same square if the normal to its plane makes a 60° angle with the x-axis ?

A. $10 NC^{-1} m^2$

B. $20 NC^{-1} m^2$

C. $30 NC^{-1} m^2$

D. $40 NC^{-1} m^2$

Answer: C

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Watch Video Solution

44. If the electric amplitude of the electromagnetic wave is $5Vm^{-1}$, its magnetic amplitude will be

A. $5 \times 10^{-8}T$

B. $1.67 \times 10^{-8}T$

C. $1.67 \times 10^{-10}T$

D. $5 \times 10^{-10}T$

Answer: C

Watch Video Solution

45. In an NPN transistor the collector current is $24 mA$. If 80% of electrons reach collector it base current in mA is

A. 36

B. 26

C. 16

D. 6

Answer: B

Watch Video Solution

46. An electron moving in a circular orbit of radius r makes n rotations per second per second. The magnetic moment of the orbital electron is

A. zero

B. $\pi r^2 ne$

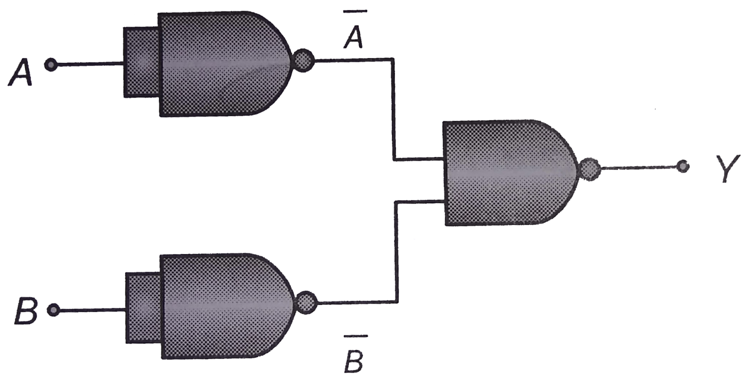
C. $\pi r^2 n^2 e$

D. $\dfrac{r^2 ne}{2\pi}$

Answer: D

Watch Video Solution

47. The combination of the gates shown in the figure below produces



A. OR gate

B. AND gate

C. NOR gate

D. XOR gate

Answer: B

48. The charge flowing through a resistance R varies with time t as $Q = at - bt^2$. The total heat produced in R is

A. $\frac{a^3 R}{b}$

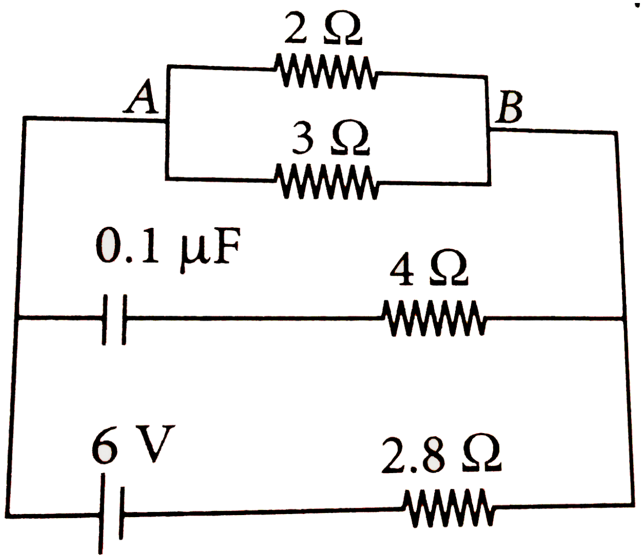
B. $\frac{a^3 R}{2b}$

C. $\frac{a^3 R}{3b}$

D. $\frac{a^3 R}{6b}$

Answer: A

49. The steady state current in a 2Ω resistor when the internal resistance of the battery is negligible and the capacitance of the condenser is $0.1\mu F$ is



A. $0.6A$

B. $0.9A$

C. $1.5A$

D. $0.3A$

Answer: B

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50. An electric bulb is marked 100W, 230V. If the supply voltage drops to 115V, what is the heat and light energy produced by the bulb in 20min? Calculate the current flowing through it.

A. 10 kJ

B. 15 kJ

C. 20 kJ

D. 30 kJ

Answer: D

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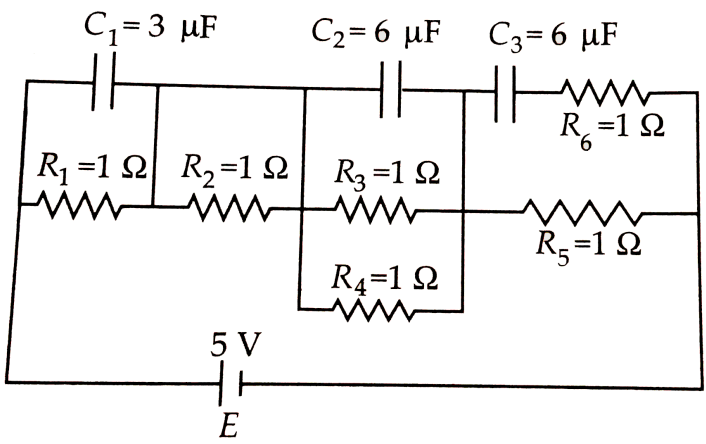
Practice Paper 2

1. In the circuit given, the charge on capacitor C_3 at steady state is



A. $6\mu C$

B. $12\mu C$

C. $18\mu C$

D. $24\mu C$

Answer: B

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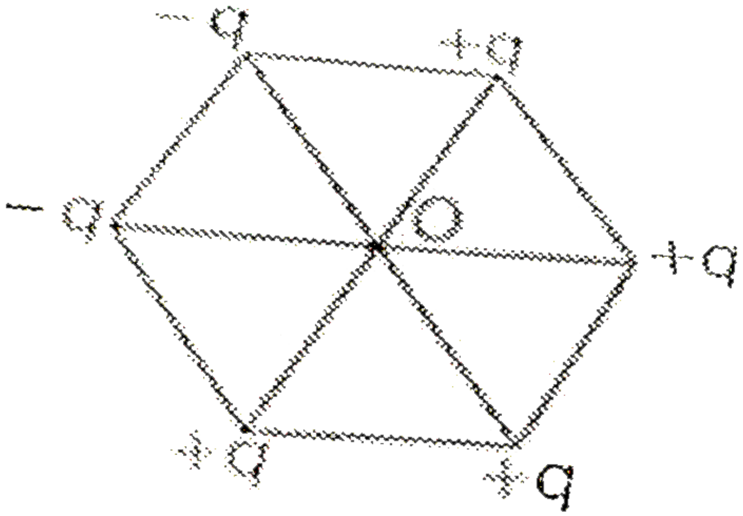
2. Six point charges are arrange at the vertices of a regular hexagon of side length a (shown in figure).



Find the magnitude of electric field at the centre of regular hexagon.

A. $-q$

B. $\dfrac{-q}{6}$

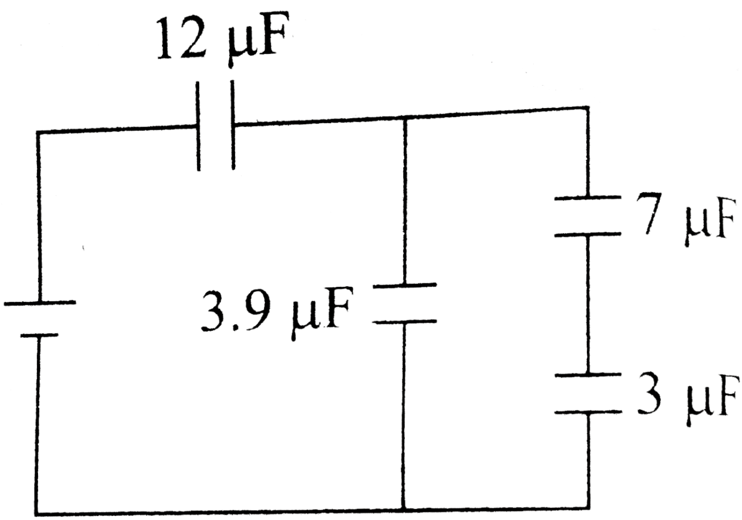
C. $+1.83q$

D. $-1.83q$

Answer: D

Watch Video Solution

3. Four capacitors and a battery are connected as shown in. If the potential difference aross the $7\mu F$ capacitor is $6V$, then which of the following statement(s) is//are correct?



A. The potential drop across the $12\mu F$ capacitor is

10 V.

B. The charge on the $3\mu F$ capacitor is $42\mu C$.

C. The potential drop across the $3\mu F$ capacitor is

10V.

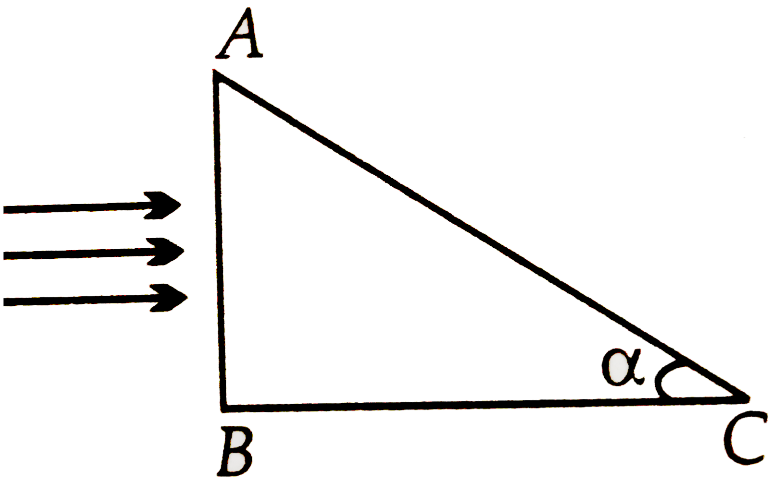
D. The emf of the battery is 30 V.

Answer: C

Watch Video Solution

4. A ray of light is incident normally on the prism $\left(\mu=\frac{3}{2}\right)$ immersed in a liquid as shown in the figure.

The largest value for the angle α so that ray is totally reflected at the face AC is 30°. The refractive index of the given liquid is



A. $\frac{\sqrt{3}}{2}$

B. $\frac{3}{4}$

C. $\frac{4}{3}$

D. $\frac{3\sqrt{3}}{4}$

Answer: D

Watch Video Solution

5. In certain Young's double slit experiment, the slit separation is 0.05 cm. The slit to screen distance is 100 cm. When blue light is used the distance from central fringe to the fourth order fringe is $0.36cm$. What is the wavelength of blue light ?

A. 4000 Ã…

B. 4300 Ã…

C. 4400 Ã…

D. 4500 Ã…

Answer: D

Watch Video Solution

6. The electric resistance of a certain wire of iron is R . If its length and radius are both doubled, then

A. the resistance will be doubled and the specific resistance will be halved.

B. the resistance will be halved and the specific resistance will remain unchanged.

C. the resistancce will be halved and the specific resistance will be doubled.

D. both the resistance and the specific resistance,

will remain unchanged.

Answer: B

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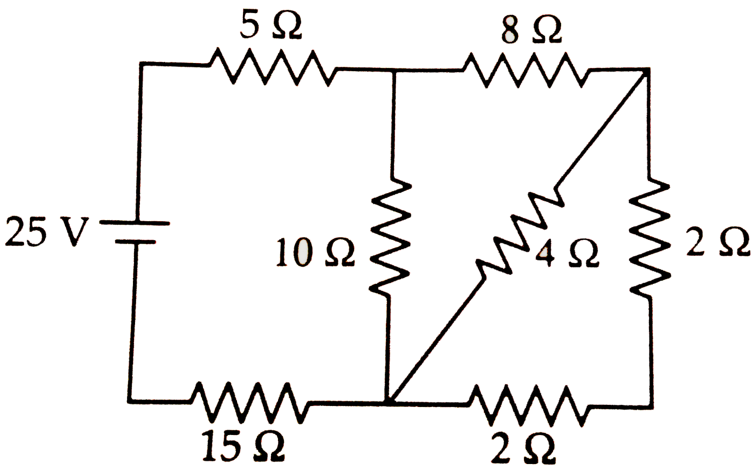
7. For the circuit shown in the figure, the current in the

4Ω resistor is



A. $0.5A$

B. $0.25A$

C. 1A

D. $1.5A$

Answer: B

Watch Video Solution

8. A wire when connected to 220 V mains supply has power dissipation P_1. Now the wire is cut into two equal pieces which are connected in parallel to the same supply. Power dissipation in this case is P_2. Then $P_2 : P_1$ is

A. 1

B. 2

C. 3

D. 4

Answer: D

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9. An electron of mass M_e, initially at rest, moves through a certain distance in a uniform electric field in time t_1. A proton of mass M_p also initially at rest, takes time t_2 to move through an equal distance in this uniform electric field. Neglecting the effect of gravity, the ratio t_2 / t_1 is nearly equal to

A. $\left(\frac{m_p}{m_e}\right)^{1/2}$

B. $\left(\frac{m_e}{m_p}\right)^{1/2}$

C. 1

D. 1836

Answer: A

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10. When a resistance of 100Ω is connected in series with a galvanometer of resistance R, then its range is

V. To double its range, a resistance of 1000Ω is connected in series. Find the value of R.

A. 1100

B. 1000

C. 900

D. 800

Answer: C

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11. The self inductance of a solenoid that has a cross-sectional area of $1cm^2$, a length of 10 cm and 1000 turns of wire is

A. $0.86mH$

B. $1.06mH$

C. $1.26mH$

D. $1.46mH$

Answer: C

Watch Video Solution

12. How many alpha and beta particles are emitted when uranium $._{92}^{238}U$ decays to lead $._{82}^{206}Pb$?

A. 12,6

B. 10, 4

C. 8, 6

D. 8,8

Answer: C

Watch Video Solution

13. The time period of oscillation of a bar magnet suspended horizontaliy along the magnetic meridian is T_0. If this magnet is replaced by another magnet of the same size and pole strength but with double the mass, the new time period will be

A. $\frac{T_0}{2}$

B. $\frac{T_0}{\sqrt{2}}$

C. $\sqrt{2}T_0$

D. $2T_0$

Answer: C

Watch Video Solution

14. Two resistances are connected in the two gaps of a meter bridge. The balance point is $20cm$ from the zero end. When a resistance 15Ω is connected in series with the smaller of two resistance, the null point+ shifts to $40cm$. The smaller of the two resistance has the value.

A. 3

B. 6

C. 9

D. 12

Answer: C

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15. In an inductor of self-inductance L=2 mH, current changes with time according to relation $i = t^2 e^{-t}$. At what time emf is zero ?

A. 4s

B. 3s

C. 2s

D. 1s

Answer: C

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16. The binding energy per nucleon for C^{12} is $7.68 MeV$ and that for C^{13} is 7.47 MeV. What is the energy required to remove a neutron from C^{13} ?

A. $0.21 MeV$

B. $2.52 MeV$

C. $4.95MeV$

D. $2.75MeV$

Answer: C

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17. A. Wavelength of microwaves is greater than that of ultraviolet rays.

B. The wavelength of infrared rays is lesser than that of ultraviolet rays.

C. The wavelength of microwaves is lesser than that of infrared rays

D. Gamma ray has shortest wavelength in the electomagnetic specturum

Choose the correct option.

A. A and B are true

B. B and C are true

C. C and D are true

D. A and D are true

Answer: D

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18. The frequency of 1st line Balmer series in H_2 atom is v_0. The frequency of line emitted by single ionised

He atom is

A. $2v_0 Hz$

B. $4v_0 Hz$

C. $(v_0 / 2) Hz$

D. $(v_0 / 4) Hz$

Answer: B

Watch Video Solution

19. An α particle and a proton having same momentum enter into a region of uniform magnetic field and move in circular paths. The ratio of the radii of curvature of their paths, $\frac{R_\alpha}{R_p}$ in the field is

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. 1

D. 4

Answer: A

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20. The wavelength of radiation emitted is λ_0 when an electron jumps from the third to the second orbit of hydrogen atom. For the electron jump from the fourth to the second orbit of hydrogen atom, the wavelength of radiation emitted will be

A. $(16/25)\lambda_0$

B. $(20/27)\lambda_0$

C. $(27/20)\lambda_0$

D. $(25/16)\lambda_0$

Answer: B

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21. The intensity ratio of the maxima and minima in an interference pattern produced by two coherent sources of light is $9:1$. The intensities of the used light sources are in ratio

A. $3:1$

B. $4:1$

C. $9:1$

D. $10:1$

Answer: B

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22. What is the conductivity of a semiconductor (in $\Omega^{-1}m^{-1}$) if electron density $= 5 \times 10^{12} cm^{-3}$ and hole density $= 8 \times 10^{13} cm^{-3}$?

$(\mu_e = 2.3V^{-1}s^{-1}m^2, \mu_h = 0.01m^2V^{-1}s^{-1})$

A. a. 5.634

B. b. 1.968

C. c. 3.421

D. d. 8.964

Answer: B

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23. A wave is represented by the equation

$y = 0.1 \sin(100\pi t - kx)$

If wave velocity is $100ms^{-1}$, its wave number is equal to

A. $1m^{-1}$

B. $2m^{-1}$

C. πm^{-1}

D. $2\pi m^{-1}$

Answer: A

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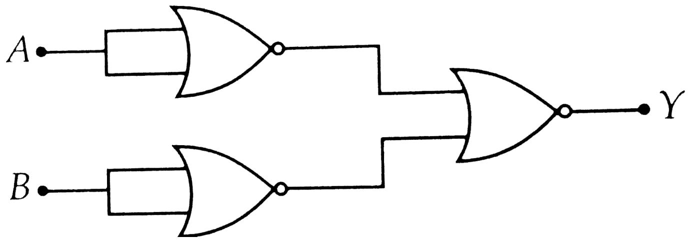
24. Identify the operation performed by the circuit as shown in the figure.



A. NOT

B. AND

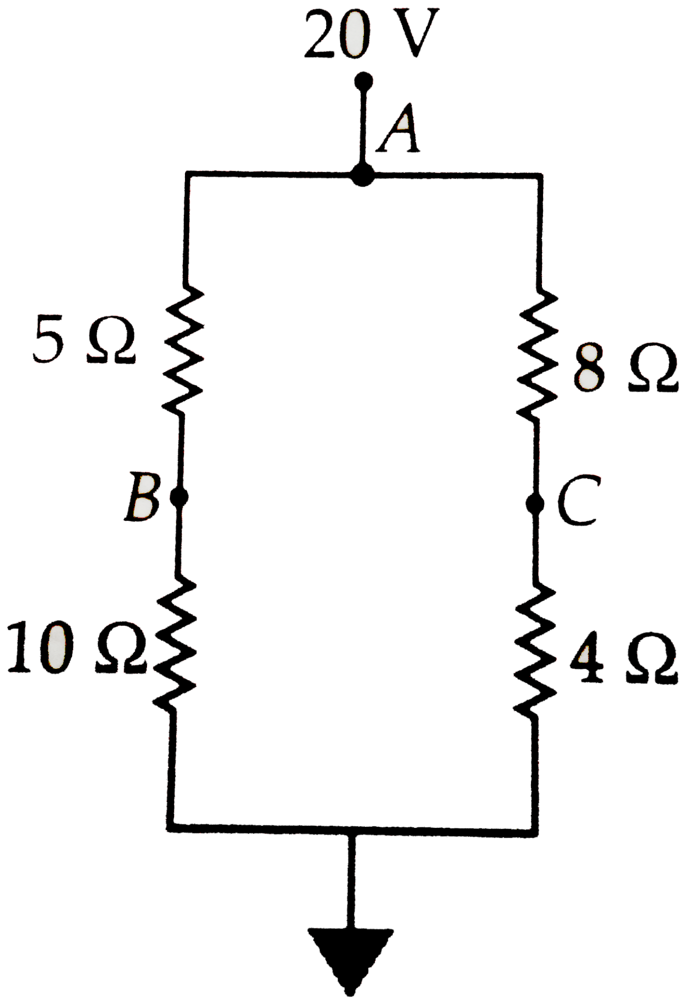
C. OR

D. NAND

Answer: B

Watch Video Solution

25. What is the potential difference between the points A and B in the circuit diagram shown in figure ?



A. $\frac{20}{3}V$

B. $\frac{10}{3}V$

C. $\frac{20}{\sqrt{3}}V$

D. $\frac{10}{\sqrt{3}}V$

Answer: A

Watch Video Solution

26. By a change of current from 5 A to 10 A in 0.1 s, the self induced emf is 10 V. The change in the energy of the magnetic field of a coil will be

A. 5J

B. 6J

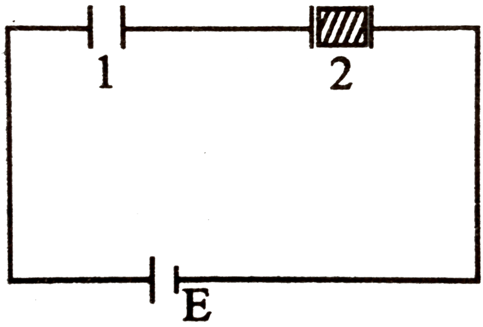
C. $7.5J$

D. 9J

Answer: C

Watch Video Solution

27. Two identical capacitors 1 and 2 are connected in series to a batery as shown in figure. Capacitor 2 contains a dielectric slab of dieletric constant k as shown. Q_1 and Q_2 are the charges stored in the capacitors. Now the dielectirc slab us removed and the corresponding charges are Q'_1 and Q'_2. Then



A. $\dfrac{Q'_1}{Q_1} = \dfrac{K+1}{K}$

B. $\dfrac{Q'_2}{Q_2} = \dfrac{K+1}{2}$

C. $\dfrac{Q'_2}{Q_2} = \dfrac{K+1}{2K}$

D. $\dfrac{Q'_1}{Q_1} = \dfrac{K}{2}$

Answer: C

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28. A square frame of side l carries a current produces a field B at its centre. The same current is passed through a circular loop having same perimeter as the square. The field at its centre is B', the ratio of B / B' is

A. $\frac{8}{\pi^2}$

B. $\frac{8\sqrt{2}}{\pi^2}$

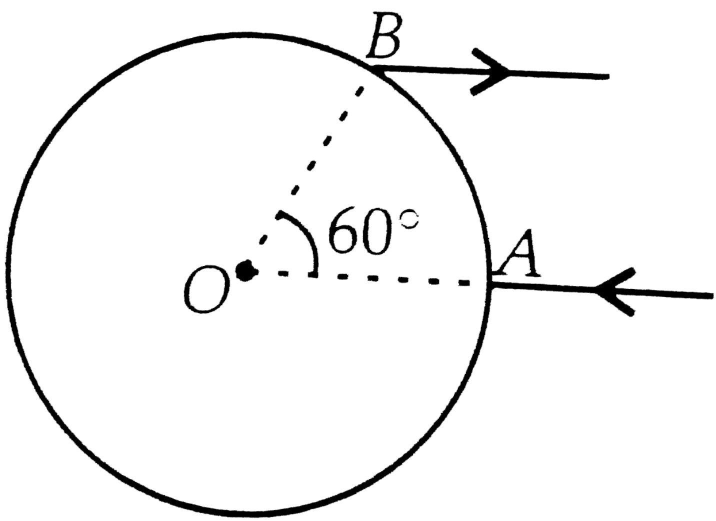
C. $\frac{16}{\pi^2}$

D. $\frac{16\sqrt{2}}{\pi^2}$

Answer: B

Watch Video Solution

29. A uniform wire of resistance 36Ω is bent in the form of a circle. The effective resistance across the points A and B is



A. 5Ω

B. 15Ω

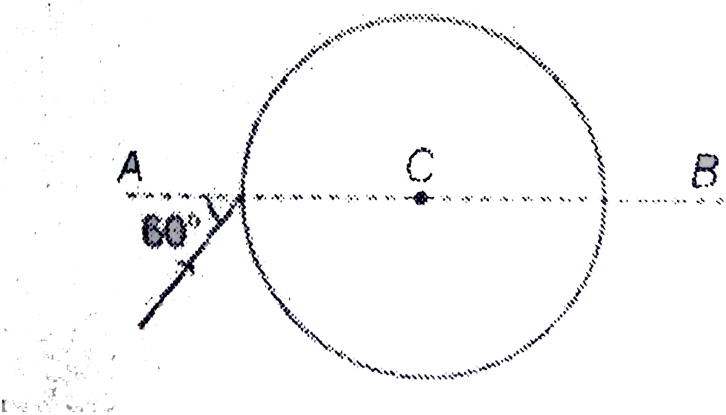
C. 7.2Ω

D. 30Ω

Answer: A

Watch Video Solution

30. A ray of light falls on a transparent sphere with centre at C as shown in figure. The ray emerges from the sphere parallel to line AB. The refractive index of the sphere is



A. $\mu = \sqrt{2}$

B. $\mu = \sqrt{\frac{3}{2}}$

C. $\mu = \sqrt{3}$

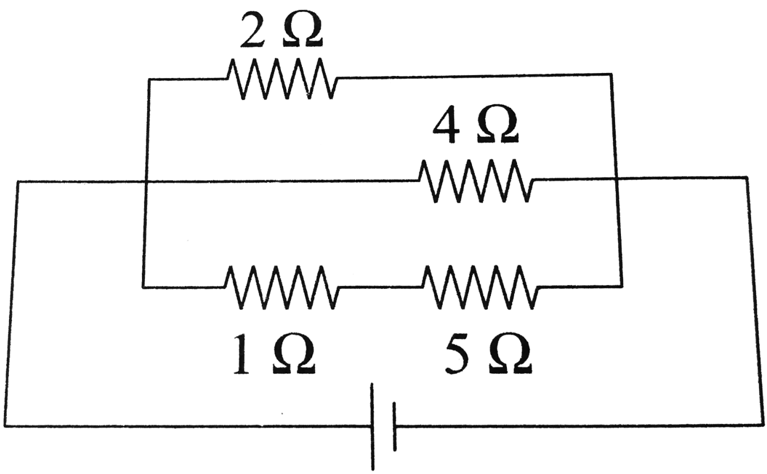
D. $\mu = \sqrt{\frac{5}{2}}$

Answer: C

Watch Video Solution

31. A current of $3A$ flows through the 2Ω resistor as shown in the circuit. The power dissipated in the 5Ω

resistor is



A. 1W

B. 5W

C. 4W

D. 2W

Answer: B

Watch Video Solution

32. What is orbital angular momentum of an electron in $3d$ orbital.

A. $\sqrt{2}\left(\frac{h}{2\pi}\right)$

B. $\sqrt{3}\left(\frac{h}{2\pi}\right)$

C. $\sqrt{6}\left(\frac{h}{2\pi}\right)$

D. $\sqrt{12}\left(\frac{h}{2\pi}\right)$

Answer: C

Watch Video Solution

33. Two identical magnetic dipoles of magnetic moments $1 \cdot 0 Am^2$ each are placed at a separation of $2m$ with their axes perpendicular to each other. What is the resultant magnetic field at a point midway between the dipoles?

A. $\sqrt{5} \times 10^{-7} T$

B. $5 \times 10^{-7} T$

C. $\sqrt{2} \times 10^{-7} T$

D. $10^{-7} T$

Answer: A

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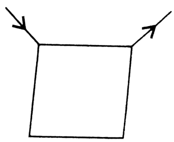
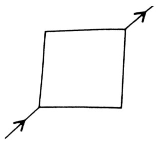
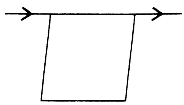
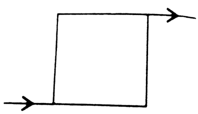
34. Current flows through uniform square frames as shown. In which case is the magnetic field at the centre of the frame not zero ?

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: C

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35. The conducting circular loops of radii R_1 and R_2 are placed in the same plane with their centres coinciding. If $R_1 > \; > R_2$, the mutual inductance M between them will be directly proportional to

A. $\frac{R_1}{R_2}$

B. $\frac{R_2}{R_1}$

C. $\frac{R_1^2}{R_2}$

D. $\frac{R_2^2}{R_1}$

Answer: D

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36. The intensity of the light coming from one of the slits in a Young's double slit experiment is double the intensity from the other slit. Find the ratio of the maximum intensity to the minimum intensity in the interference fringe pattern observed.

A. $2:1$

B. $34:1$

C. $9:1$

D. $8:1$

Answer: C

Watch Video Solution

37. Let v_1 be the frequency of series limit of Lyman series, v_2 the frequency of the first line of Lyman series and v_3 the frequency of series limit of Balmer series. Then which of the following is correct ?

A. $v_1 - v_2 = v_3$

B. $v_2 - v_1 = v_3$

C. $v_3 = \frac{1}{2}(v_1 + v_2)$

D. $v_1 + v_2 = v_3$

Answer: A

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38. The focal length of a biconvex lens of refractive index 1.5 is 0.06m. Radii of curvature are in the ratio 1:2. Then radii of curvature of two lens surfaces are

A. $0.045m, 0.09m$

B. $0.09m, 0.18m$

C. $0.04m, 0.08m$

D. $0.06m, 0.12m$

Answer: A

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39. A metallic surface is irradiated by a monochromatic light of frequency v_1 and stopping potential is found to be V_1. If the light of frequency v_2 irradiates the surface, the stopping potential will be

A. $V_1 + \frac{h}{e}(v_1 + v_2)$

B. $V_1 + \frac{h}{e}(v_1 - v_2)$

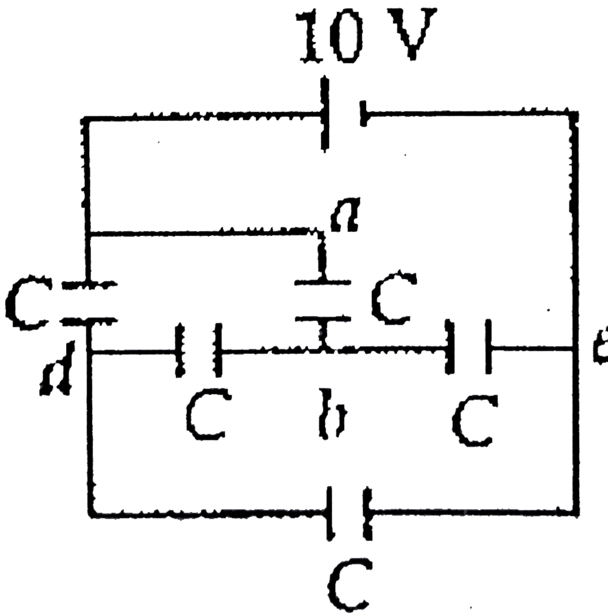
C. $V_1 + \frac{e}{h}(v_2 - v_1)$

D. $V_1 - \frac{h}{e}(v_1 + v_2)$

Answer: B

Watch Video Solution

40. What is the energy stored in the capacitor between terminals a and b of the network shown in the figure ? (Capacitance of each capacitance $C = 1\mu F$)



A. 75J

B. 100 J

C. 150J

D. 125 J

Answer: A

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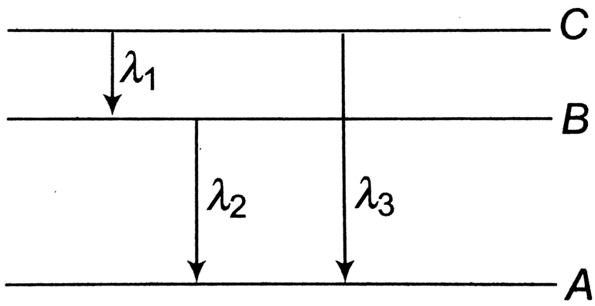
41. Energy levels A, B, C of a certain atom corresponding to increasing values of energy i.e., $E_A < E_B < E_C$. If $\lambda_1, \lambda_2, \lambda_3$ are the wavelengths of radiations correspnding to the transitions C to B, B to A and C to A respectively, which of the following statements is correct?



A. $\lambda_3 = \lambda_1 + \lambda_2$

B. $\lambda_1 + \lambda_2 + \lambda_3 = 0$

C. $\lambda_3^2 = \lambda_1^2 + \lambda_2^2$

D. $\lambda = \dfrac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$

Answer: D

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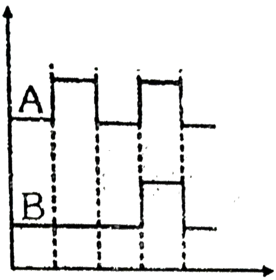
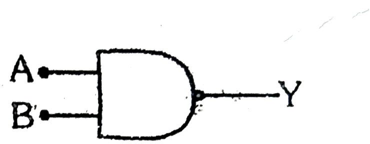
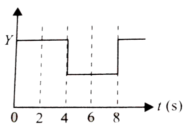
42. The real time variation of input signals A and B are as shown below. If the inputs are fed into NAND gate, then select the output signal from the following :-

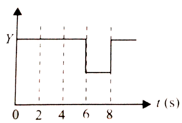




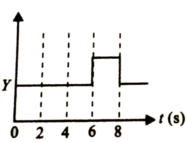
A. (a)

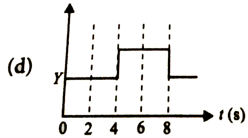


B. (b)



C. (c)



D. 

Answer: B

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43. A particle of mass m and charge Q is placed in an electric filed W which varies with time t as E = $E_0 \sin \omega t$. It will undergo simple harmonic motion of amplitude.

A. $\frac{QE_0^2}{m\omega^2}$

B. $\frac{QE_0}{m\omega^2}$

C. $\sqrt{\frac{QE_0}{m\omega^2}}$

D. $\frac{QE_0}{m\omega}$

Answer: B

Watch Video Solution

44. In common emitter amplifier, the current gain is 62. The collector resistance and input resistance are $5k\Omega$ an 500Ω respectively. If the input voltage is 0.01V, the output voltage is

A. $0.62V$

B. $6.2V$

C. $62V$

D. $620V$

Answer: B

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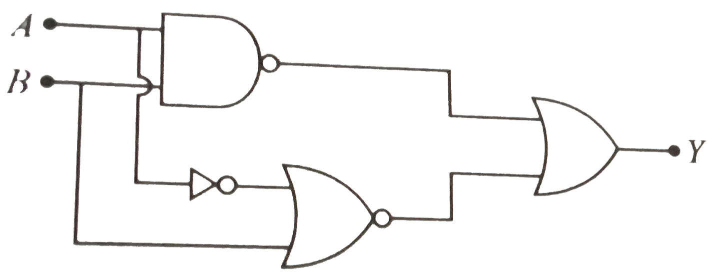
45. The Boolean expression for the given circuit is



A. $\overline{A.\,B}$

B. A+B

C. $\overline{A}+B$

D. $A + \overline{B}$

Answer: A

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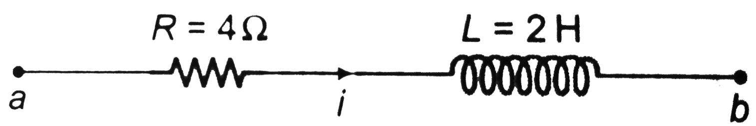
46. In the figure shown $i = 10e^{-4t}$A. Find V_L and V_{ab}



A. $\frac{-40}{e}V$

B. $\frac{40}{e}V$

C. $40eV$

D. $-40eV$

Answer: A

Watch Video Solution

47. The total energy of a hydrogen atom in its ground state is $-13.6eV$. If the potential energy in the first excited state is taken as zero then the total energy in the ground state will be

A. $-3.4eV$

B. $3.4eV$

C. $-6.8eV$

D. $6.8eV$

Answer: C

Watch Video Solution

48. An ac source is of $\frac{200}{\sqrt{2}}$ V, 50 Hz. The value of voltage after $\frac{1}{600}s$ from the start is

A. 200 V

B. $\frac{200}{\sqrt{5}}$

C. 100 V

D. 50 V

Answer: D

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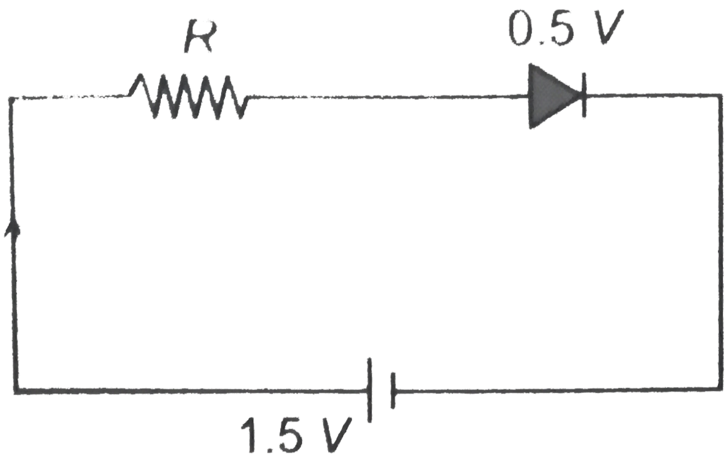
49. The diode used in the circuit shown in the figure has a constant voltage drop of $0.5V$ at all currents and a maximum power rating fo 100 milliwatts. What should be the value of the resistor R, connected in series with the diode for obtaining maximum current?



A. 6.76Ω

B. 20Ω

C. 5Ω

D. 5.6Ω

Answer: C

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50. The half-life of a radioactive isotope X is 50 yr. It decays to an other element Y which is stable. The two elements X and Y were found to be in the ratio of $1:15$ in a sample of a give rock. The age of the rock was estimated to be

A. 100 years

B. 150 years

C. 200 years

D. 250 years

Answer: C

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Practice Paper 3

1. When a pentavalent imputrity is added in Ge crystal then, what type of semiconductor is obtained ?

A. a p-type

B. an n-type

C. intrinsic

D. none of these

Answer: B

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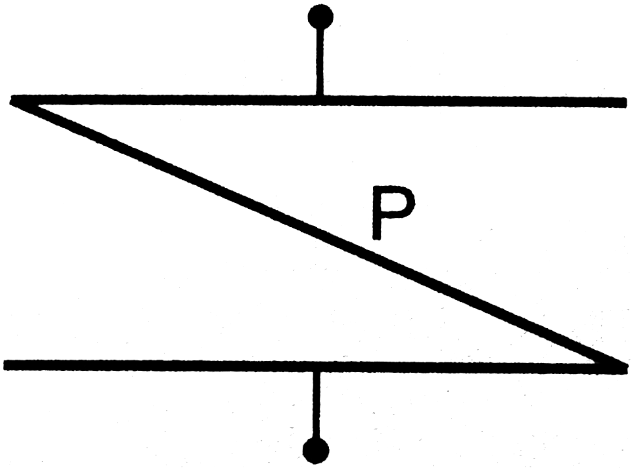
2. A thin metal plate P is inserted between the plates of a parallel-plate capacitor of capacitance C in such a way that its edges touch the two plates (figure 31-

Q2).The capacitance now becomes.



A. 2C

B. C/2

C. C and D are true

D. infinity

Answer: D

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3. A positively charged thin metal ring of radius R is fixed in the xy plane with its centre at the origin O. A negatively charged particle P is released from rest at the point $(0, 0, z_0)$ where $z_0 > 0$. Then the motion of P is

A. periodic for all values of Z_0 satisfying $0 < Z_0 < \infty$

B. simple harmonic for all values of Z_0 satisfying $0 < Z_0 \leq R$

C. approximately simple harmonic provided $Z_0 < < R$

D. such that P crosses O and continues to move along the negative Z-axis towards $Z = -\infty$

Answer: C

Watch Video Solution

4. A voltmeter having a resistance of 1800Ω employed to measure the potential difference across a 200Ω resistor which is connected to the terminals of a dc power supply having an emf of 50 V and an internal resistance of 20Ω. What is the percentage decrease in the potential difference across the 200Ω resistor as a result of connecting the voltmeter across it?

A. 1%

B. 5%

C. 10%

D. 25%

Answer: A

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5. A microammeter has as resistance of 100Ω and full scale range of $50\mu A$. It can be used a voltmeter or as ahigher range ammeter provided a resistance is added to it. Pick the correct range and resistance combinations

50 V range with $10k\Omega$ resistance in series

b.$10V$ range with $200k\Omega$ resistance in series

c. 5mA rangw with 1Ω resistance in parallel

$10mA$ range with 1Ω resistance in parallel

A. 50 V range with $10k\Omega$ resistance in series

B. 10 V range with $200k\Omega$ resistance in series.

C. 5mA range with 2Ω resistance in parallel

D. 10 mA range with 2Ω resistance in parallel

Answer: B

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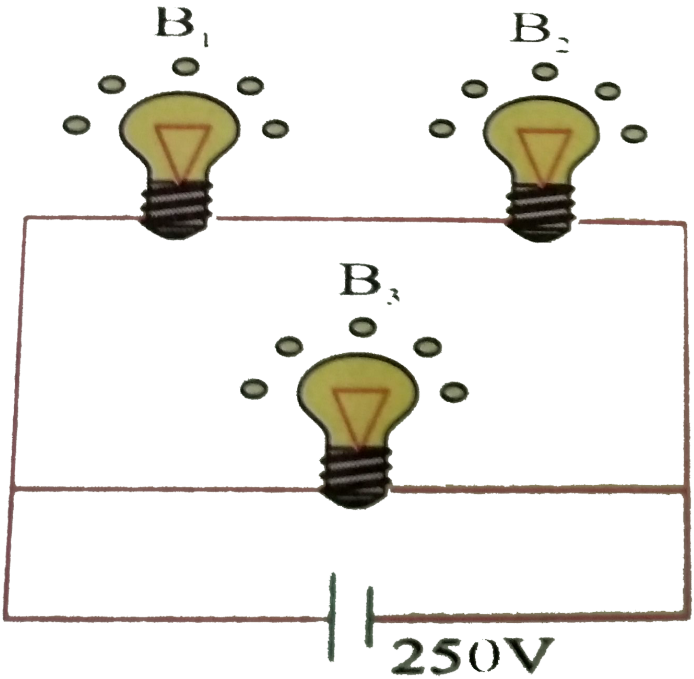


6.

A 100 W bulb B_1 and two 60 W bulbs B_2 and B_3, are connected to a 250V source, as shown in the figure now W_1, W_2 and W_3 are the output powers of the bulbs B_1, B_2 and B_3 respectively then

A. $W_1 > W_2 = W_3$

B. $W_1 > W_2 > W_3$

C. $W_1 < W_2 = W_3$

D. $W_1 < W_2 < W_3$

Answer: D

Watch Video Solution

7. A short conducting rod P of length $3.0cm$ is placed parallel to an near the centre of a long conducting rod Q of length 3.0 m. Conductors P and carry currents of 3.0 A and 4.0 A respectively in the same direction. The two conductors are separated by a distance of $2.0cm$ in air. What is the force experienced by the long conductor Q ?

A. $1.6 \times 10^{-6} N$

B. $2.6 \times 10^{-6} N$

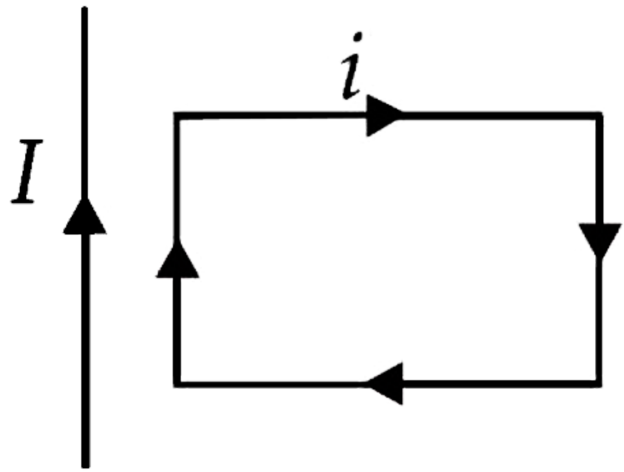
C. $3.6 \times 10^{-6} N$

D. $4.6 \times 10^{-6} N$

Answer: C

Watch Video Solution

8. A rectangular loop carrying a current i is situated near a long straight wire such that the wire is parallel to one of the sides of the loop and is in the plane of the loop . If steady current I is established in the wire as shown in the figure ,



A. rotate about an axis parallel to the wire

B. move away from the wire

C. move towards the wire

D. remain stationary

Answer: C

Watch Video Solution

9. An electron and a proton enter a magnetic field at right angles to the field with the same kinetic energy

A. the electron trajectory will be less curved than the proton trajectory

B. the proton trajectory will be less curved than the electron trajectory

C. both trajectories will be equally curved

D. both particles move in straight lines

Answer: B

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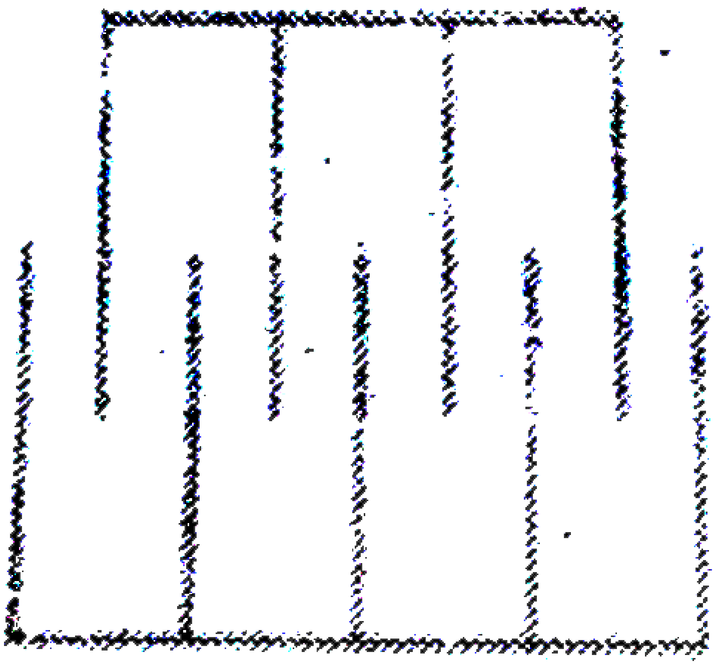
10. A gang capacitor is formed by interlocking a number of plates as shown in figure. The distance between the consecutive plates is 0.885 cm annd the overlapping area of the plates is 5 cm^2. The capacity of the unit is



A. $1.06\mu F$

B. $4pF$

C. $6.36pF$

D. $12.72pF$

Answer: B

Watch Video Solution

11. A galvanometer of resistance 25Ω is connected to a battery of 2 volt along with a resistance in series. When the value of this resistance is 3000Ω, a full scale deflection of 30 units is obtained in the galvanometer.

In order to reduce this deflection to 20 units, the resistance in series will be

A. 4512Ω

B. 5413Ω

C. 2000Ω

D. 6000Ω

Answer: A

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12. A rectangular coil of 20 turns and area of cross-section $25cm^2$ has a resistance of $100ohm$. If a magnetic field which is perpendicular to the plane of the coil changes at the rate of 1000 telsa per second, the current in the coil is

A. 1A

B. 50 A

C. $0.5A$

D. $5A$

Answer: C

Watch Video Solution

13. For perfectly coupled coils, the coupling coefficient should be equal to

A. one

B. zero

C. infinite

D. more than one

Answer: A

Watch Video Solution

14. A $200\mu F$ capacitor in series with a 100Ω resistance is connected to a 240 V, 50 Hz supply. What is the maximum current in the circuit ?

A. $1.4A$

B. $3.4A$

C. $4.4A$

D. $2.4A$

Answer: B

Watch Video Solution

15. The overall efficiency of a transformer is 90%.The transformer is rated for an output of 9000 watt.The primary voltage is 1000 volt.The ratio of turns in the primary to the secondary coil is 5:1.The iron losses at full load are 700 watt.The primary coil has a resistance of 1ohm. In the above, the copper loss in the primary coil is

A. 400 W

B. 200 W

C. 100 W

D. 300 W

Answer: C

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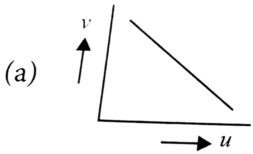
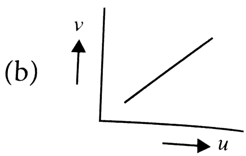
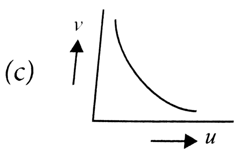
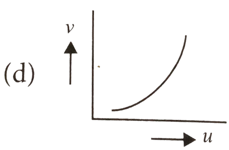
16. In an experiment to find focal length of a concave mirror, a graph is drawn between the magnitudes of (u) and (v). The graph looks like.

A. 

B. 

C. 

D. 

Answer: C

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17. In a reflecting astronomical telescope, if the objetcive (a spherical mirror) is replaced by a parabolic mirror of the same focal length and aperture, then

A. the final image will be erect

B. a large image will be obtained

C. the telescope will gather more light

D. spherical aberration will be absent

Answer: D

Watch Video Solution

18. Which one of the following is a possible nuclear reaction ?

A. $._{10}^{5}B + ._{2}^{4}He \rightarrow ._{7}^{13}N + ._{1}^{1}H$

B. $._{11}^{23}Na + ._{1}^{1}H \rightarrow ._{10}^{20}Ne + ._{2}^{4}He$

C. $._{93}^{239}Np \rightarrow ._{94}^{239}Pu + ._{-1}\beta^{0} + \bar{v}$

D. $._{7}^{11}N + ._{1}^{1}H \rightarrow ._{6}^{12}C + ._{-1}\beta^{0} + \bar{v}$

Answer: C

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19. A $5W$ source emits monochromatic light of wavelength 5000Å. When placed $0.5m$ away , it liberates photoelectrons from a photosensitive metallic surface . When the source is moved to a distance of $1.0m$ the number of photoelectrons liberated will be reduced by a factor of

A. 8

B. 16

C. 2

D. 4

Answer: D

Watch Video Solution

20. Calculate in how many months , $\left(\frac{3}{4}\right)^{th}$ of the substance will dacay, If half-life of the radioactive substance is 2 months.

A. 3 months

B. 4 months

C. 8 months

D. 12 months

Answer: C

Watch Video Solution

21. Which of the following statements is not true?

A. The resistance of intrinsic semiconductor decreases with increase of temperature.

B. Doping pure Si with trivalent impurities give p-type semiconductor.

C. The majority carriers in n-type semiconductors are holes

D. A p-n junction can act as a semiconductor diode

Answer: C

Watch Video Solution

22. The transfer ratio of a transistor is 50. The input resistance of the transistor when used in the common -emitter configuration is $1k\Omega$. The peak value for an $A.C.$ input voltage of $0.01V$ peak is

A. $100\mu A$

B. $0.01\mu A$

C. $0.25\mu A$

D. $500\mu A$

Answer: D

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23. Given below are four logic gates symbol (figure). Those for OR, NOR and NAND are respectively

A. (d), (c), (a)

B. (b), (c), (a)

C. (a), (b), (c)

D. (a), (c), (d)

Answer: A

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24. An AND gate

A. is equivalent to a parallel switching current

B. is equivalent to a series switching current

C. has two outputs and one inputs

D. has two outputs and two inputs

Answer: B

Watch Video Solution

25. The VHF band ranges from

A. 30 to 300 MHz

B. 30 to 3000 MHz

C. 20 to 2000 MHz

D. 30 to 300 MHz

Answer: A

Watch Video Solution

26. The circular plates A and B of a parallel plate air capacitor have a diameter of 0.1 m and are $2 \times 10^{-3} m$ apart. The plates C and D of a similar capacitor have a diameter of $0.12 m$ and are $3 \times 10^{-3} m$ apart. Plate A is earthed. Plates B and D are connected together. Plate C is connected to the positive pole of a 120V battery whose negative is earthed. The energy stored in the system is

A. $0.1224\mu J$

B. $0.2224\mu J$

C. $0.3224\mu J$

D. $0.4224\mu J$

Answer: A

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27. If the input and output power of an optical fibre of length 150 m are $10\mu W$ and $9\mu W$ respectively then loss in dB/km is approximately

A. -1

B. -2

C. -3

D. -4

Answer: C

Watch Video Solution

28. A thin prism of angle 15° made of glass of refractive index $\mu_1 = 1.5$ is combined with another prism of glass of refractive index $\mu_2 = 1.75$. The combination of the prism produces dispersion without deviation. The angle of the second prism should be

A. 5°

B. 7°

C. 10°

D. 12°

Answer: C

Watch Video Solution

29. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1.0 mm wide and the resulting diffraction pattern is observed on a screen 2m away. What is the distance between the first dark fringe on either side of the central bright fringe?

A. $1.2cm$

B. $1.2mm$

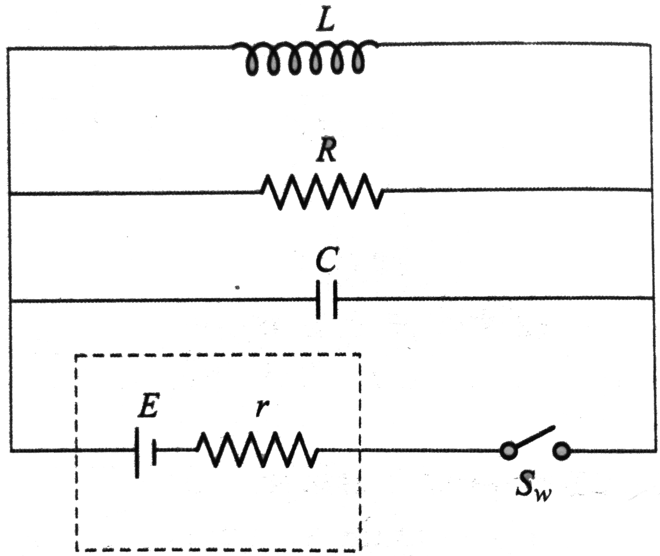
C. $2.4cm$

D. $2.4mm$

Answer: D

Watch Video Solution

30. A pure inductor L, a capactior C and a resistance R are connected across a battery of emf E and internal resistance r as shows in Fig. Switch S_W is closed at $t = 0$, select the correct altermative (S).



A. Current through resistance R is zero all the time.

B. Current through resistance R is zero at t = 0 and $t \to \infty$.

C. Maximum charge stored in the capacitor is $C\varepsilon$.

D. Maximum energy stored in the inductor is equal to the maximum energy stored in the capacitor.

Answer: B

Watch Video Solution

31. Two radioactive materials X_1 and X_2 have decay constant 11λ and λ respectively. If initially they have same number of nuclei, then ratio of number of nuclei of X_1 to X_2 will be $\frac{1}{e}$ after a time

A. $\frac{1}{10\lambda}$

B. $\frac{1}{11\lambda}$

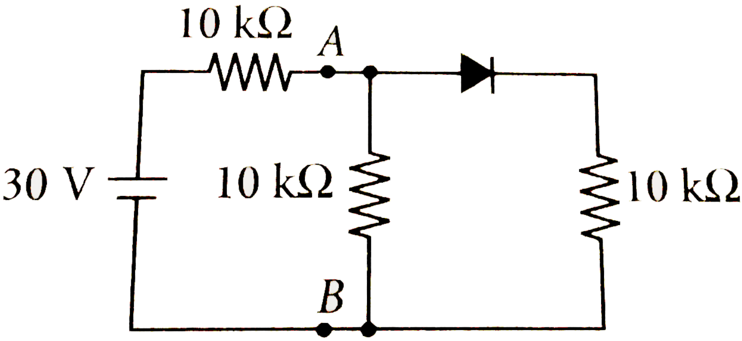
C. $\frac{11}{10\lambda}$

D. $\frac{1}{9\lambda}$

Answer: D

Watch Video Solution

32. In the given circuit, the potential difference between A and B is



A. 0

B. 5V

C. 10V

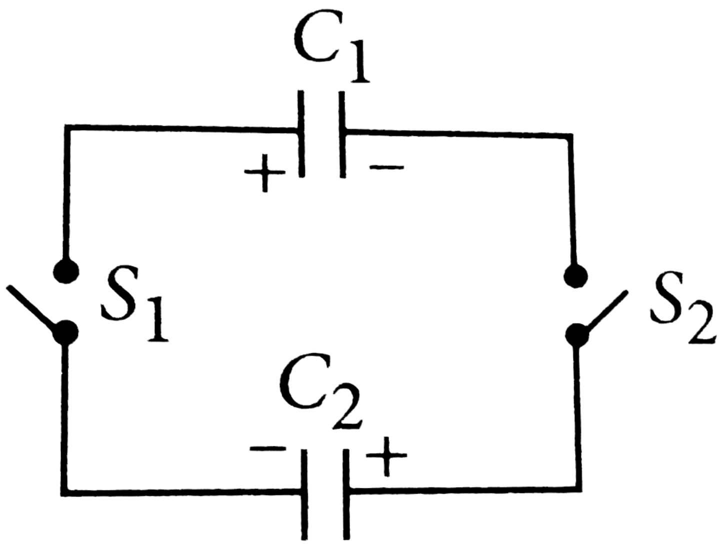
D. 15 V

Answer: C

Watch Video Solution

33. Two capacitors $C_1 = 2\mu F$ and $C_2 = 1\mu F$ are charged to same potential $V = 100V$, but with opposite polarity as shown in the figure.

The switches S_1 and S_2 are closed. The ratio of final energy to the initial energy of the system is



A. 1

B. $\frac{1}{2}$

C. $\frac{1}{9}$

D. $\frac{1}{4}$

Answer: C

Watch Video Solution

34. A proton has kinetic energy E = 100 keV which is equal to that of a photon. The wavelength of photon is λ_2 and that of proton is λ_1. The ratio of λ_2 / λ_1 is proportional to

A. E^2

B. $E^{1/2}$

C. E^{-1}

D. $E^{-1/2}$

Answer: D

Watch Video Solution

35. A particle of mass m and charge q has and initial velocity $\overrightarrow{v} = v_0\hat{j}$. If an electric field $\overrightarrow{E} = \overrightarrow{\quad}(0)\hat{i}$ and magnetic field $\overrightarrow{B} = B_0\hat{i}$ act on the particle, its speed will double after a time :

A. $t = \dfrac{2mv_0}{qE_0}$

B. $t = \dfrac{2B_0q}{mv_0}$

C. $t = \frac{\sqrt{3}B_0 q}{m v_0}$

D. $t = \frac{\sqrt{3} m v_0}{q E_0}$

Answer: D

Watch Video Solution

36. A transformer with efficiency 80% works at $4kW$ and $100V$. If the secondary voltage is $200V$, then the primary and secondary currents are respectively

A. 40A, 16 A

B. 16 A, 40 A

C. 20 A, 40 A

D. 40 A, 20 A

Answer: A

Watch Video Solution

37. A current of 0.5 A is passed through the coil of a galvanometer having 500 turns and each turns has an average area of $3 \times 10^{-4} m^2$ if a torque of 1.5 N-m is required for this coil carrying same current to set it parallel to a magnetic field calculate the strength of the magnetic field

A. 20T

B. 25 T

C. 23 T

D. 21 T

Answer: A

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38. The primary and secondary coils of a transformer have 50 and 1500 turns respectively. If the magnetic flux ϕ linked with the primary coil is given by $\phi = \phi_0 + 4t$, where ϕ is in webers, t is time in second and ϕ_0 is a constant, the output voltage across the secondary coil is

A. 90 V

B. 120 V

C. 220 V

D. 30V

Answer: B

Watch Video Solution

39. Two electric bulbs, each designed to operate with a power of 500W in 220V line, are in series with a $110V$ line. What will be the power generated by each bulb?

A. $31.25W$

B. $21.25W$

C. $11.25W$

D. $9.25W$

Answer: A

Watch Video Solution

40. If the capacitance of each capacitor is C, then effective capacitance of the shown network across any two junction is

A. 2C

B. C

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

D. 5C

Answer: A

Watch Video Solution

41. A radioactive isotope X has a half life of 3 seconds. At t=0, a given sample of this isotope contains 8000 atom. Calculate (i) its decay constant (ii) average life (iii) the time t_1, when 1000 atoms of the isotope X remain in the sample (iv) number of decay/sec in the sample at $t = t_1$ sec.

A. 2s

B. 4s

C. 7s

D. 9s

Answer: D

Watch Video Solution

42. When in hydrogen like ion, electron jumps from n = 3, to n = 1, the emitted photon has frequency $2.7 \times 10^{15} Hz$. When electron jumps from n = 4 to n = 1, the frequency is

A. $1.6 \times 10^{15} Hz$

B. $2.8 \times 10^{15} Hz$

C. $6.4 \times 10^{15} Hz$

D. $4.8 \times 10^{15} Hz$

Answer: B

Watch Video Solution

43. An equilateral triangle of side length l is formed from a piece of wire of uniform resistance. The current I is as shown in figure. Find the magnitude of the magnetic field at its centre O.

A. $\dfrac{\sqrt{3}\mu_0 I}{2\pi l}$

B. $\dfrac{3\sqrt{3}\mu_0 I}{2\pi l}$

C. $\dfrac{\mu_0 I}{2\pi l}$

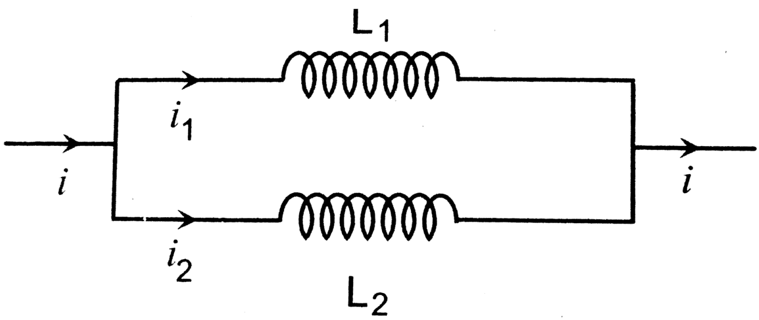
D. zero

Answer: D

Watch Video Solution

44. Two inductors L_1 and L_2 are connected in parallel and a time varying current flows as shown.

The ratio of current i_1 / i_2 is?



A. $\frac{L_2}{L_1}$

B. $\frac{L_1}{L_2}$

C. $\frac{L_2^2}{(L_1 + L_2)^2}$

D. $\frac{L_1^2}{(L_1 + L_2)^2}$

Answer: A

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45. An a.c. source is connected across an LCR series circuit with $L = 100 mH, C = 0.1 \mu F$ and $R = 50 \Omega$. The frequency of ac to make the power factor of the circuit, unity is

A. $\frac{10^4}{2\pi} Hz$

B. $\frac{10^3}{2\pi} Hz$

C. $\frac{10^{-4}}{2\pi} Hz$

D. $\frac{10^{-3}}{2\pi} Hz$

Answer: A

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46. When light of wavelength 400nm is incident on the cathode of photocell, the stopping potential recorded is 6V. If the wavelength of the incident light is to 600nm, calculate the new stopping potential.

[Given

$h = 6.6 \times 10^{-34} Js, c = 3 \times 10^{8} m/s, e = 1.6 \times 10^{-19} C$

]

A. $1.03V$

B. $2.42V$

C. $4.97V$

D. $3.58V$

Answer: C

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47. A surface irradiated with light $\lambda = 480nm$ gives out electrons with maximum velocity v ms^{-1}, the cut off wavelength being 600 nm. The same surface would release electrons with maximum velocity $2vms^{-1}$ if it is irradiated by light of wavelength.

A. 325 nm

B. 360 nm

C. 384 nm

D. 300 nm

Answer: D

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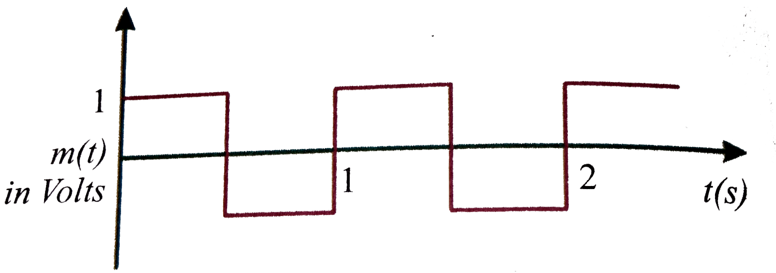
48. A modulating signal is a square wave as shown in figure.



The carrier wave is given by

$c(t) = 2\sin(8\pi t)$volt.

The modulation index is

A. 0.2

B. 0.3

C. 0.4

D. 0.5

Answer: D

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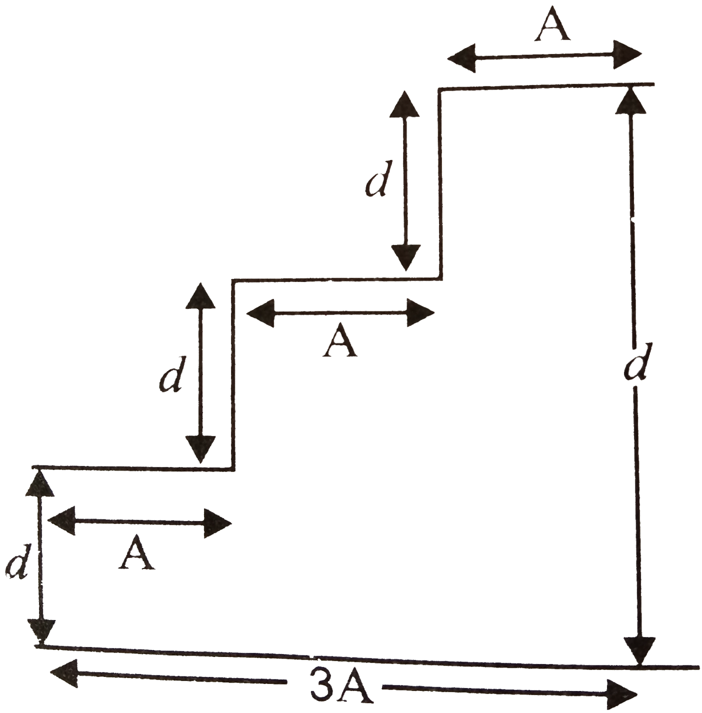
49. The expression for the equivalent capacitance of the system shown in Fig. is (A is the corss-sectional area of one of the planes) :



A. $\varepsilon_0 A / 3d$

B. $\dfrac{3\varepsilon_0 A}{d}$

C. $\varepsilon_0 A / 6d$

D. $\dfrac{11\varepsilon_0 A}{6d}$

Answer: D

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50. A $100V$ a.c. source of frequency $500Hz$ is connected to a LCR circuit with $L = 8.1$ millihenry, $C = 12.5\mu F$ and $R = 10$ ohm, all connected in series. What is the potential difference across the resistance?

A. 25 V

B. 50 V

C. 75 V

D. 100 V

Answer: D

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