PHYSICS

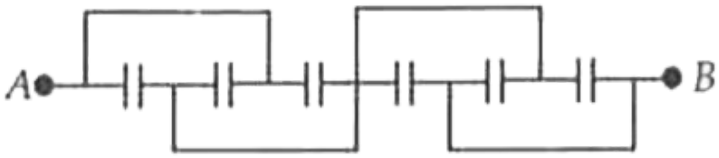
BOOKS - KCET PREVIOUS YEAR PAPERS

KARNATAKA CET 2010

Physics

1. All capacitors used in the diagram are identical and each is capacitance C .Then the effective capacitance between the points A

and B is



A. $1.5C$

B. 6C

C. C

D. 3C

Answer: A

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2. Two identical conducting balls A and B have positive charges q_1 and q_2 respectively. But $q_1 \neq q_2$. The balles are brought together so that they touch each other and then kept in their original positions. The force between them is

A. less than that before the balls touched

B. greater than that before the balls touched

C. same as that before the balls touched

D. zero

Answer: B

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3. Red light of wavelength 625 nm is incident normally on an optical diffraction grating with 2×10^5 lines/m. Including central principal maxima, how many maxima amy be observed on a screen which is far from the grating ?

A. 15

B. 17

C. 8

D. 16

Answer: B

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4. A battery of emf E has an internal resistance 'r'. A variable resistance R is connected to the terminals of the battery. A current I is drawn from the battery. V is the terminal P.D. If R

alone is gradually reduced to zero, which of the folowing best describes I and V ?

A. I approaches zero, V approaches E

B. I approaches E/r, V approaches zero

C. I approaches E/r, V approaches E

D. I approaches infinity, V approaches E

Answer: B

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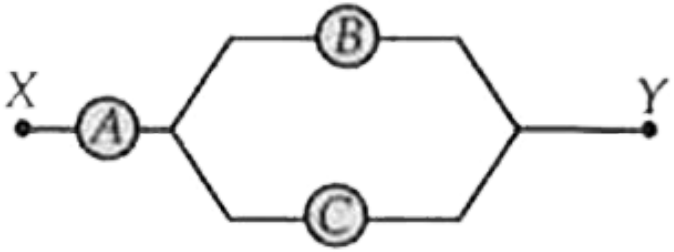
5. The voltmeters A,B, and C having resistance R, 1.5R and 3R respectively are used in a circuit as shown, When a P.D. is applied between X and Y, the reading of the voltmeters are V_1, V_2 and V_3 respectively Then



A. $V_1 = V_2 = V_3$

B. $V_1 < V_2 = V_3$

C. $V_1 > V_2 > V_3$

D. $V_1 > V_2 = V_3$

Answer: A

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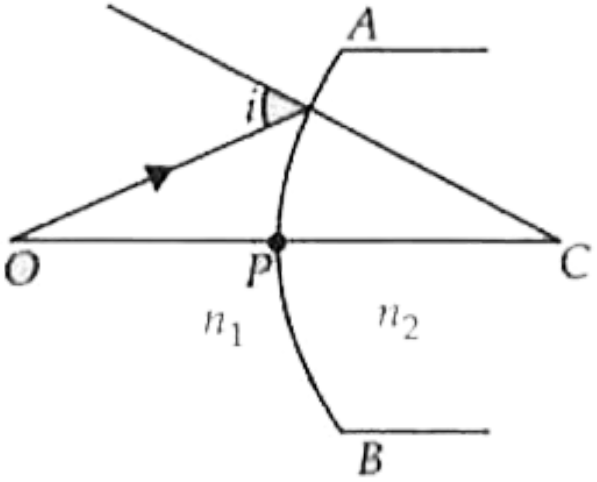
6. A point object O is kept at a distance of $OP = u$. The radius of curvature of the spherical surface APB is CP=R. The refractive index of the media are n_1 and n_2 which are as shown in the diagram Then,



(1) if $n_1 > n_2$, image is virtual for all values of u.

(2) if $n_2 = 2n_1$, image is virtual when $R > u$.

(3) the image is real for all values of u, n_1 and n_2.

Here, the correct statement/s is are

A. only (2)

B. both (1) and (2)

C. only (1)

D. (1),(2) and (3)

Answer: B

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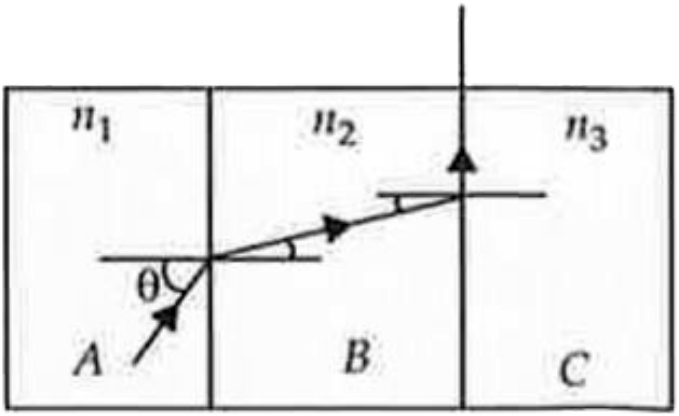
7. A,B and C are the parallel sided transparent media of refractive index n_1, n_2 and n_3 respectively.

The are arranged as shown in the figure. A ray

is incident at an angle θ on the surface of separation of A and B which is as shown in the figure. After the refraction into the medium B, the ray grazes the surface of separation of the media B and C. Then, $\sin\theta$=



A. $\frac{n_3}{n_1}$

B. $\frac{n_1}{n_3}$

C. $\frac{n_2}{n_3}$

D. $\frac{n_1}{n_2}$

Answer: A

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8. A boat has green light of wavelength $\lambda = 500$ nm on the mast. What wavelength would be measured and what colour would be observed for this light as seen by a diver

submerged in water by the side of the boat ?

Given $n_w = \frac{4}{3}$.

A. Green of wavelength 376 nm

B. Red of wavelength 665 nm

C. Green of wavelength 500 nm

D. Blue of wavelength 376 nm

Answer: A

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9. Two beams of red and violet colours are made to pass separately through a prism of $A = 60^\circ$ In the minimum deviation position, the angle of refraction inside the prism will be

A. greater for red colour

B. equal but not 30° for both the colours

C. greater for violet colour

D. 30° for both the colours

Answer: D

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10. The focal length of a plano-convex lens is f and its refractive index is 1.5 it is kept over a plane galss plate with its curved surface touching the glass plate. The gap between the lens and the glass plate is filled by a liquid. As a result the effective focal length of the combination becomes $2f$. Then the refractive index of the liquid is

A. 1.5

B. 2

C. 1.25

D. 1.33

Answer: C

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11. Two simple harmonic motions are represented by $y_1 = 5\left[\sin 2\pi t + \sqrt{3}\cos 2\pi t\right]$ and $y_2 = 5\sin\left(2\pi t + \frac{\pi}{4}\right)$ The ratio of their amplitudes is

A. $1:1$

B. $2:1$

C. $1:3$

D. $\sqrt{3}:1$

Answer: B

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12. A bat flies at steady speed of $4\ \mathrm{m\,s^{-1}}$ emitting a sound of $f = 90 \times 10^3$. Hz It is flying horizontally towards a vertical wall. The

frequency of the reflected sound as detected by the bat will be

(Take velocity of sound in air as $330 \ \mathrm{m\,s^{-1}}$)

A. 88.1×10^3 Hz

B. 87.1×10^3 Hz

C. 92.1×10^3 Hz

D. $89.1 \times 10^3 Hz$

Answer: C

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13. A closed organ pipe and an open organ pipe of same length produce 2 beats/second while vibrating in their fundamental modes. The length of open organ pipe is halved and that of closed pipe is doubled. Then, the number of beats produced per second while vibrating in the fundamental mode is

A. 2

B. 6

C. 8

D. 7

Answer: D

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14. A uniform wire of length L, diameter D and density ρ is stretched under a tension T. The correct relation between its fundamental frequency $'f'$, the length L and the diameter D is

A. $f \propto \frac{1}{LD}$

B. $f \propto \frac{1}{L\sqrt{D}}$

C. $f \propto \frac{1}{D^2}$

D. $f \propto \frac{1}{LD^2}$

Answer: A

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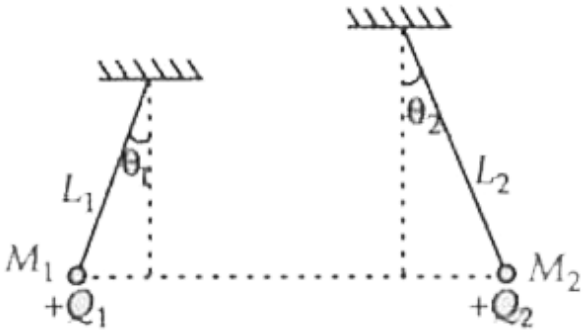
15. Two small spheres of masses M_1 and M_2 are suspended by weightless insulating threads of lengths L_1 and L_2 The spheres carry charges Q_1 and Q_2 respectively. The spheres are suspended such that they are in

level with one another and the threads are inclined to the vertical at angles of θ_1 and θ_2 as shown. Which one of the following conditions is essential, if $\theta_1 = \theta_2$?



A. $M_1 \neq M_2$ but $Q_1 = Q_2$

B. $M_1 = M_2$

C. $Q_1 = Q_2$

D. $L_1 = L_2$

Answer: B

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16. The wavelength of the light used in Young's double slit experiment is λ. The intensity at a point on the screen where the path difference is $\frac{\lambda}{6}$ is I. I_0 mdenotes the maximum intensity then the ration of I and I_0 is

A. 0.866

B. 0.5

C. 0.707

D. 0.75

Answer: D

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17. What is the minimum thickness of a thin film required for constructive interference in the reflected light from it ?

Give, the refractive index of the film = 1.5

wavelength of the light incident on the film = 600 nm

A. 100 nm

B. 300 nm

C. 50 nm

D. 200 nm

Answer: A

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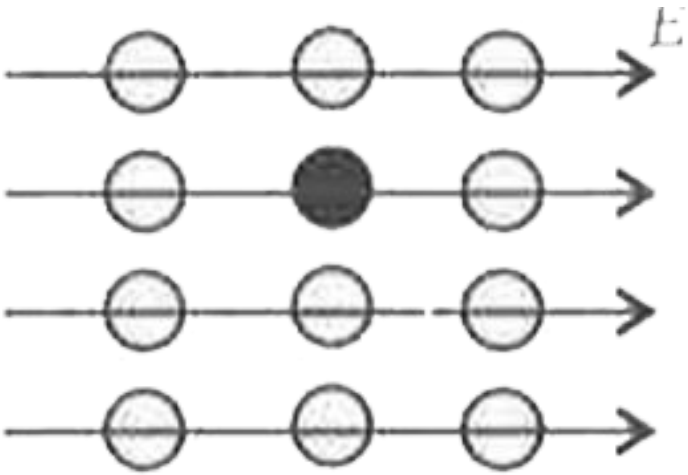
18. There is a uniform electric field of intensity E which is as shown. How many labelled points have the same electrial as the fully shaded point ?



A. 2

B. 3

C. 8

D. 11

Answer: B

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19. Critical angle for certain medium is $\sin^{-1}$ (0.6). The polarizing angle of that medium is

A. $\tan^{-1}[1.5]$

B. $\sin^{-1}[0.8]$

C. $\tan^{-1}[1.6667]$

D. $\tan^{-1}[0.6667]$

Answer: C

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20. Electromagnetic wave consists of periodically oscillating electric and magnetic vectors

A. in mutually perpendicular planes but vibrating with a phase difference of π

B. in mutually perpendicular planes but vibrating with a phase difference of $\frac{\pi}{2}$

C. In randomly oriented planes but vibrating in phase

D. in mutually perpendicular planes but vibrating in phase.

Answer: D

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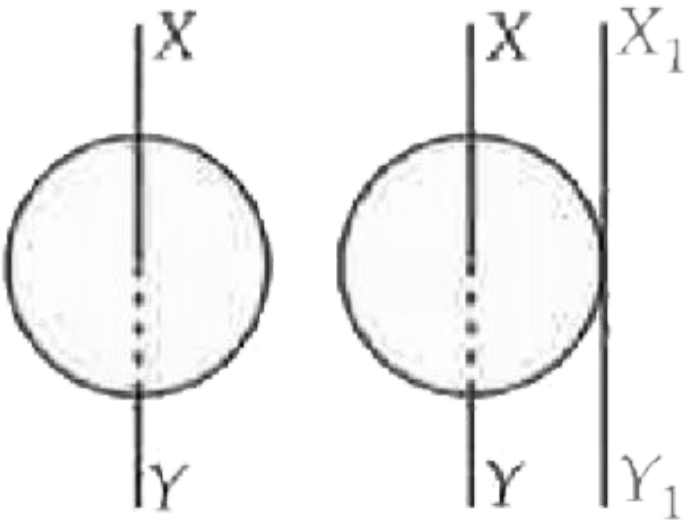
21. The moment of inertia of a circular disc of radius 2m and mass 1 kg about an axis passing through the centre of mass but perpendicular to the plane of the disc is $2\ \mathrm{kg\,m^2}$. Its moment of inertia about an axis parallel to this axis but passing through the edge of the

disc is . . . . . (See the given figure)



A. $8 \ \text{kg m}^2$

B. $4 \ \text{kg m}^2$

C. $10 \ \text{kg m}^2$

D. $6 \ \text{kg m}^2$

Answer: D

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22. An astronaut on a strange planet finds that acceleration due to gravity is twice as that on the surface of earth. Which of the following could explain thin ?

A. Both the mass and radius of the planet are half as that of earth.

B. Radius of the planet is half as that of earth but the mass is the same as that

of earth

C. Both the mass and radius of the planet are twice as that of earth.

D. Mass of the planet is half as that of earth but radius is same as that of earth.

Answer: A

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23. Which of the folliwing substances has the highest elastictiy

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24. Three liquids of equal masses are taken in three identical cubical vessels A,B and C. Their densities are ρ_A, ρ_B and ρ_C respectively. But $\rho_A < \rho_B < \rho_C$. The force exerted by liquid on the base of the cubical vessel is

A. maximum in vessel C

B. minimum in vessel C

C. the same in all the vessels

D. maximum in vessel A

Answer: C

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25. Water is in streamline flow along a horizontal pipe where the area of cross-section is $10\ \mathrm{cm}^2$, the velocity of water is $1\ \mathrm{m\,s}^{-1}$ and the pressure is 2000 Pa. The

pressure at another point where the cross-sectional area is $5 \ \ \mathrm{cm}^2$ is

A. 4000 Pa

B. 2000 Pa

C. 1000 Pa

D. 500 Pa

Answer: D

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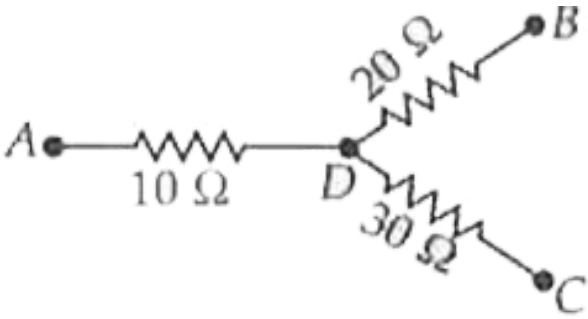
26. In the circuit given here, the point A,B and C are 70 V, zero, 10 V respectively. Then



A. the point D will be at a potential of 60 V.

B. the point D will be at a potential of 20 V.

C. Currents in the paths AD,DB and DC are in the ratio of $1:2:3$

D. currents in the paths AD,DB and DC are in the ratio $3:2:1$.

Answer:

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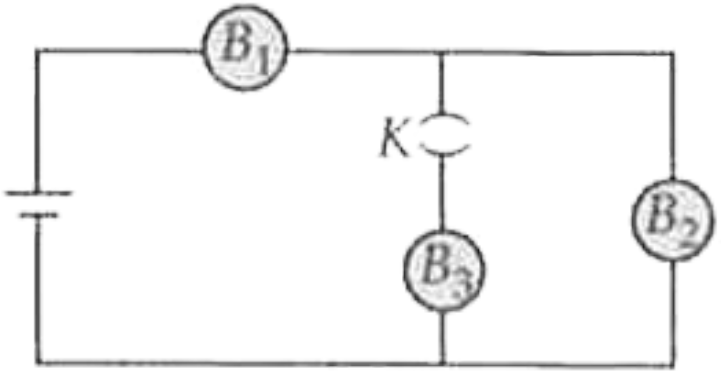
27. B_1B_2 and B_3 are three identical bulbs connected to a battery of steady e.m.f. with key K closed What happens to the brightness of the bulbs B_1 and B_2 when the key is

opened ?



A. Brightness of the bulbs B_1 increases and that of B_2 decreases.

B. Brightness of the bulbs B_1 and B_2 increases.

C. Brightness of the bulb B_1 decreases and that of B_2 increases

D. Brightness of the bulbs B_1 and B_2 decreases.

Answer: C

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28. Magnetic field at the centre of a circular coil of rradius R due to current I flowing through it is B. The magnetic field at a point along the axis at distance R from the centre is

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

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

C. $\frac{B}{\sqrt{8}}$

D. $\sqrt{8}B$

Answer: C

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29. Two thick wires and two thin wires, all of same material and same length from a square in three different ways P,Q and R as shown in

the figure. With correct connections shown, the magnetic field due to the current flow at the centre of the loop will be zero in case of

A. Q and R only

B. p only

C. P and Q only

D. P and R only

Answer: D

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30. There is a uniform magnetic field directed perpendicular and into the plane of the paper. An irregular shaped conducting loop is slowly changing into a circular loop in the plane of the paper. Then

A. current is induced in the loop in the anti-clockwise direction.

B. current is induced in the loop in the clockwise direction.

C. AC is induced in the loop.

D. no current is induced in the loop.

Answer: A

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31. The dimensions of 'resistance' are same as those of . . . . . Where h is the Planck's constant e is the charge .

A. $\frac{h^2}{e^2}$

B. $\frac{h^2}{e}$

C. $\frac{h}{e^2}$

D. $\frac{h}{e}$

Answer: C

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32. A train is moving slowly on a straight track with a constant speed of $2\ \mathrm{m\,s^{-1}}$. A passengers in the train starts walking at a stready speed of $2\ \mathrm{m\,s^{-1}}$ to the back of the

train in the opposite direction of the motion of the train. So to an observer standing on the platform directly in front of that passenger, the velocity of the passenger appears to be

A. $4\ \mathrm{m\,s^{-1}}$

B. $2\ \mathrm{m\,s^{-1}}$

C. $2\ \mathrm{m\,s^{-1}}$ in the opposite direction of the train

D. zero

Answer: D

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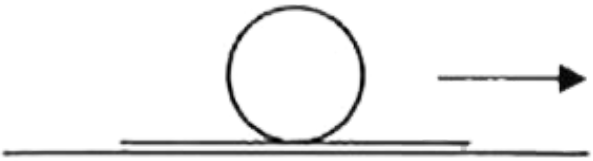
33. A ball rests upon a flat piece of paper on a table to. The paper is pulled horizontally but quickly towards right as shown. Relative to its initial position with respect to the table the ball



(1) remains stationary if there is no friction between the paper and the ball (2) moves to the left if ther is a friction between the paper

and the ball.

(3) moves forward, i.e. in the direction in which the paper is pulled.

Here, the correct statement/s is/ are

A. both (1) and (2)

B. only (3)

C. only (1)

D. only (2)

Answer: A

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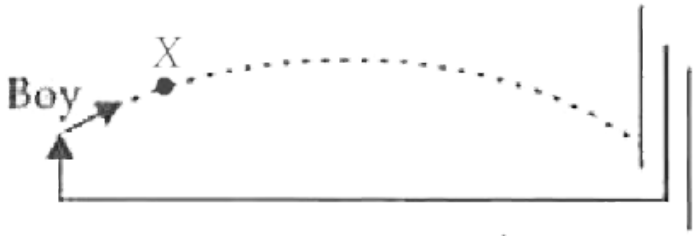
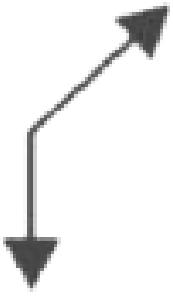
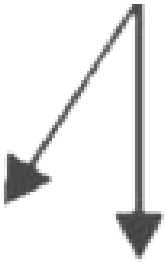
34. A boy throws a cricket ball from the boundary to the wicket - keeper. If the frictional force due to air cannot be ignored, the forces acting on the ball at the position X are represented by



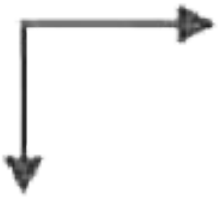


A.

B.



C.



D.

Answer: C

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35. If the linear momentum of a body is increased by $50\,\%$ then the kinetic energy of that body increases by

A. $10\,\%$

B. $125\,\%$

C. $225\,\%$

D. $25\,\%$

Answer: B

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36. The temperature of a gas contained in a closed vessel of constant volume increases by $1^{\circ} C$ when the pressure of the gas is increased by 1% The initial temperature of the gas is

A. 100 K

B. $273^{\circ} C$

C. $100^{\circ} C$

D. 200 K

Answer: A

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37. A motorboat covers a given distance in 6 hours moving downstream on a river. It covers the same distance in 10 hours moving upstream. The time it takes to cover the same distance in still water is

A. 9 hours

B. 7.5 hours

C. 6.5 hours

D. 8 hours

Answer: B

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38. Two slabs are of the thicknesses d_1 and d_2. Their thermal conductivities are K_1 and K_2 respectively They are in series. The free ends of the combination of these two slabs are kept at temperatures θ_1 and θ_2. Assume $\theta_1 > \theta_2$. The temperature θ of their common junction is

A. $\frac{K_1\theta_1 + K_2\theta_2}{\theta_1 + \theta_2}$

B. $\frac{K_1\theta_1 d_1 + K_2\theta_2 d_2}{K_1 d_2 + K_2 d_1}$

C. $\frac{K_1\theta_1 d + K_2\theta_2 d_1}{K_1 d_2 + K_2 d_1}$

D. $\frac{K_1\theta_1 + K_2\theta_2}{K_1 + K_2}$

Answer: C

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39. Hot water cools from $60^\circ C$ to $50^\circ C$ in the first 10 minutes and to $42^\circ C$ in the next 10 minutes Then the temperature of the surrounding is

A. $20^\circ C$

B. $30^\circ C$

C. $15^\circ C$

D. $10^\circ C$

Answer: D

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40. The efficiency of Carnot's heat engine is 0.5 when the temperature of the source is T_1 and that of sink is T_2. The efficiency of another

Carnot's heat engine is also 0.5 Then temperature of source and sink of the second engine are respectively

A. $2T_1, 2T_2$

B. $2T_1, \frac{T_2}{2}$

C. $T_1 + 5, T_2 - 5$

D. $T_1 + 10, T_2 - 10$

Answer: A

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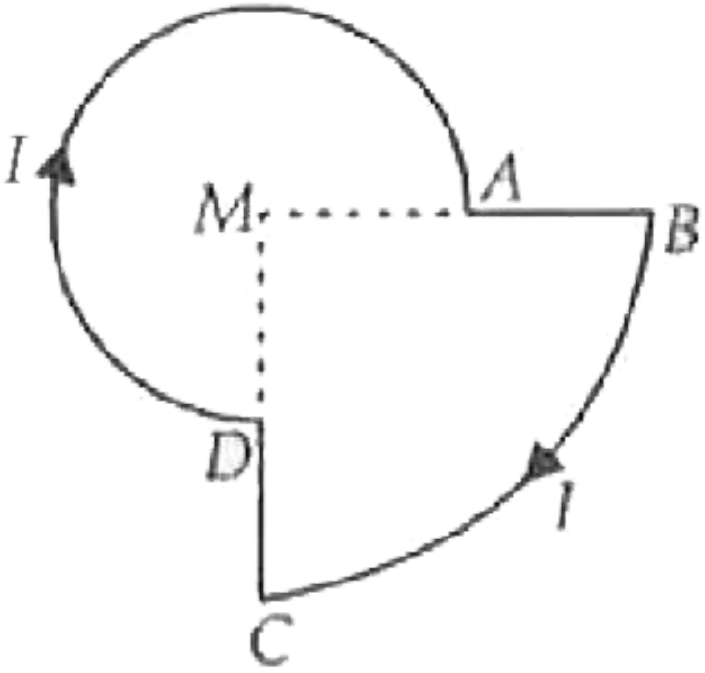
41. A current I is flowing through the loop. The direction of the current and the shape of the loop are as shown in the figure.

The magnetic field at the centre of the loop is

$\frac{\mu_0 I}{R}$

$(MA = R, MB = 2R, \angle DMA = 90^\circ)$



A. $\frac{5}{16}$, but out of the plane of the pape.

B. $\frac{5}{16}$, but into the plane of the paper.

C. $\frac{7}{16}$, but out of the plane of the paper.

D. $\frac{7}{16}$, but into the plane of the paper.

Answer: D

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42. An ideal choke draws a current of 8 A when connected to an AC supply of 100 V, 50 Hz. A pure resistor draws a current of 10 A when

connected to the same source. The ideal choke and the resistor are connected in series and then connected to the AC source of 150 V, 40 Hz. The current in the circuit becomes

A. $\frac{15}{\sqrt{2}}$

B. $8A$

C. $18A$

D. $10A$

Answer: A

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43. The spectrum of an oil flame is an example for

A. line emission spectrum

B. continuous emission spectrum

C. line absorption spectrum

D. band emission spectrum

Answer: B

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44. According to Einstein's photoelectric equation the graph of K.E. of the photoelectron emitted from the metal versus the frequency of the incident radiation gives a straight line graph whose slope

A. depends on the intensity of the incident radiation.

B. depends on the nature of the metal and also on the intensity of incident radiation.

C. is same for all metals and independent of the intensity of the incident radiation.

D. depends on the nature of the metal.

Answer: C

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45. An electron is moving in an orbit of a hydrogen atom from which there can be a maximum of six transitions. An electron is moving in orbit of another hydrogen atom

from which there can be a maximum of three transitions. The ratio of velocity of the electron in these two orbits is

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

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

C. $\frac{5}{4}$

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

Answer: D

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46. v_1 is the frequency of the series limit of Lyman series, v_2 is te frequency of the first line of Lyman series and v_3 is the frequency of the series limit of the Balmer series. Then

A. $v_1 - v_2 = v_3$

B. $v_1 = v_2 - v_3$

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

D. $\frac{1}{v_1} = \frac{1}{v_2} + \frac{1}{v_3}$

Answer: A

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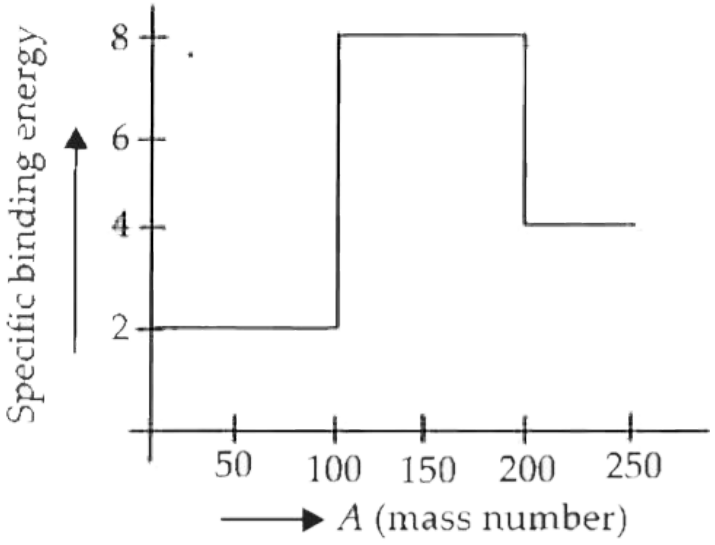
47. Assume the graph of specific binding energy versus mass number is as shown in the figure. Using this graph, select the correct choice from the following :



A. Fusion of two nuclei of mass number lying in the range of $100 < A < 200$ will release energy

B. Fusion of two nuclei of mass number lying in the range of $51 < A < 100$ will release energy.

C. Fusion of two nuclei of mass number lying in the range of $1 < A < 150$ will release energy.

D. Fission of the nucleus of mass number lying in the range of $100 < A < 200$ will release energy when broken into two fragments.

Answer: B

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48. Pick out the correct statement from the following :

A. Energy released per unit mass of the reactant is less in case of fusion reaction.

B. Packing fraction may be positive or may be negative.

C. Pu^{239} is not suitable for a fission reaction

D. For stable nucleus, the specific binding energy is low

Answer: B

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49. A radioactive sample S_1 having the activity A_1 has twice the number of nuclei as another sample S_2 of activity A_2 If $A_2 = 2A_1$, then the ratio of half life of S_1 to the life of S_2 is

A. 4

B. 2

C. 0.25

D. 0.75`

Answer: A

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50. When a neutron is disintegrated to give a β - particle,

A. a neutrino alone is emitted.

B. a proton and neutrino are emitted.

C. a proton alone is emitted

D. a proton and antineutrino are emitted.

Answer: D

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51. The forbidden energy gap in Ge in 0.72 eV Given, $hc = 12400 \text{ eV} - \text{Å}$ The maximum wavelength of radiation that will generate electron hole pair is

A. 172220Å

B. 172.2Å

C. 17222Å

D. 1722Å

Answer: C

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52. Pick out the statement which is not correct

A. At a low temperature, the resistance of a semiconductor is very high.

B. Movement of holes if restricted to the valence band only.

C. Width of the depletion region increases as the forward bias voltage increases in case of a N-P junction diode.

D. In a forward bias condition, the diode heavily conducts.

Answer: C

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53. In a given direction the intensities of the scattered light by a scattering substance for two beams of light are in the ratio of $256:81$ The ratio of the frequency of the first beam to the frequency of the second beam is

A. $64:127$

B. $4:3$

C. $64:27$

D. $2:1$

Answer:

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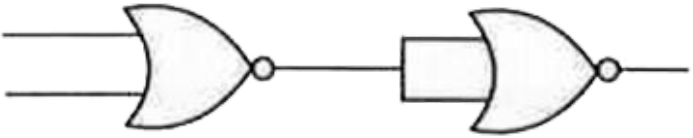
54. Indentify the logic operation performed by the circuit given here.



A. OR

B. NOR

C. NOT

D. NAND

Answer: A

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55. The de-Broglie wavelength of the electron in the ground state of the hydrogen atom is (radius of the first orbit of hydrogen atom $= 0.53\text{Å}$

A. 1.67Å

B. 3.33Å

C. 1.06Å

D. 0.53Å

Answer: B

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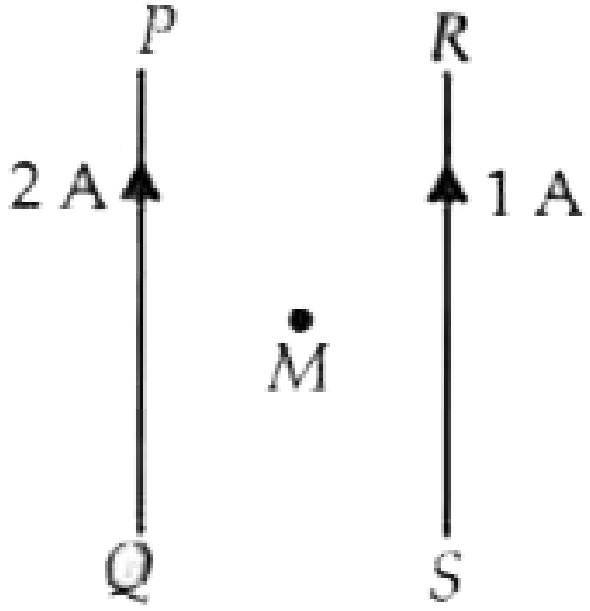
56. PQ and RS are long parallel conductors separated by certain distance. M is the midpoint between them (see the figure). The net magnetic field at M is B. Now the current 2

A is switched off. The field at M now becomes



A. $2B$

B. B

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

D. $3B$

Answer: B

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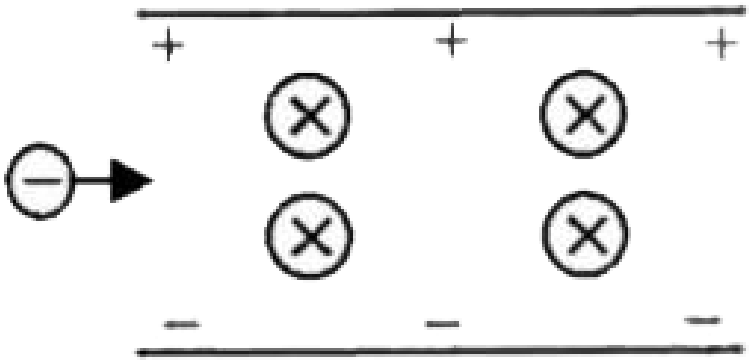
57. An electron enters the space between the plates of a charged capacity as shown. The charge density on the plate is σ. Electric intensity in the space between the plates is E.A uniform magnetic field B also exists in that space perpendicular to the direction of E. The electron moves perpendicular to both $\overrightarrow{E}$ and $\overrightarrow{B}$ without any change in direction

The time taken by the electron to travel a distance l in that space is



A. $\frac{\sigma l}{\varepsilon_0 B}$

B. $\frac{\sigma B}{\varepsilon_0 l}$

C. $\frac{\varepsilon_0 l B}{\sigma}$

D. $\frac{\varepsilon_0 l}{\sigma B}$

Answer: C

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58. In a series resonant R-L-C circuit, the voltage across R is 100 V and the value of $R = 1000\Omega$. The capacitance of the capacitor is 2×10^{-6} F, angular frequency of AC is 200 rad s^{-1}. Then the P.D. across the inductance coil is

A. 100 V

B. 40 V

C. 250 V

D. 400 V

Answer: C

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59. A capacitor and inductance coil are connected in separate AC ccircuits with a bulb glowing in bith the circuits. The bulb glows more brightly when

A. an iron rod is introduced into the inductance coil

B. the number of turns in the inductance coil is increased.

C. separation between the plates of the capacitor is increased.

D. a dielectric is introduced into the gap between the plates of the capacitor

Answer: D

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60. A horizontal metal wire is carrying an electric current from the north to the south. Using a uniform magnetic field, it is to be prevented from falling under gravity. The direction of this magnetic field should be towards the

A. north

B. south

C. east

D. west

Answer: C