PHYSICS

BOOKS - NTA MOCK TESTS

JEE MOCK TEST 13

Physics

1. A beam of ultraviolet radius hacking wavelength between $100nm$ and $200nm$ is inclined on a sample of atomic hydrogen gas.

Assuming that the atoms are in ground state which wavelength will have low intensity in the transmitted beam? If the energy of a photon is equal to the ground state it has large probability of being observed by an atom in the ground state

A. 104nm

B. 103nm

C. 105 nm

D. 100 nm

Answer: B

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2. A particle of mass m is dropped from a height h above the ground. Simultaneously another particle of the same mass is thrown vertically upwards from the ground with a speed of $\sqrt{2gh}$. If they collide head-on completely inelastically, then the time taken for the combined mass to reach the ground is

A. $\sqrt{\frac{3h}{4g}}$

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

C. $\sqrt{\frac{h}{2g}}$

D. $\sqrt{\frac{h}{4g}}$

Answer: B

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3. Two identical short bar magnets, each having magnetic moment M, are placed a distance of $2d$ apart with axes perpendicular to each other in a horizontal plane. The

magnetic induction at a point midway between them is

A. $\frac{\sqrt{2}\mu_0 M}{4\pi d^3}$

B. $\frac{\sqrt{3}\mu_0 M}{4\pi d^3}$

C. $\frac{\mu_0 M}{2\pi d^3}$

D. $\frac{\sqrt{5}\mu_0 M}{4\pi d^3}$

Answer: D

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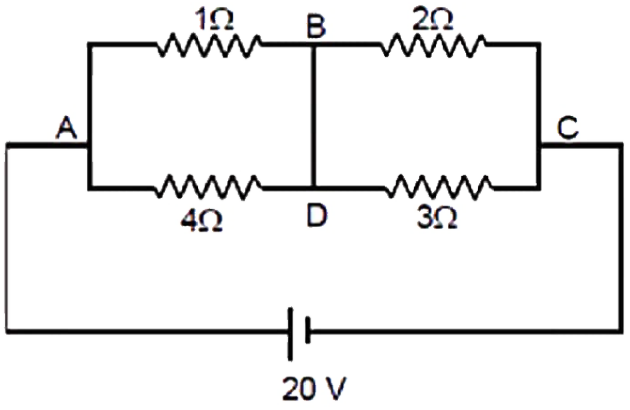
4. In the given circuit diagram , a connecting wire of negligible resistance is joining the points B and D, the current in the connecting wire is



A. zero

B. 2A

C. 0.4 A

D. 4A

Answer: B

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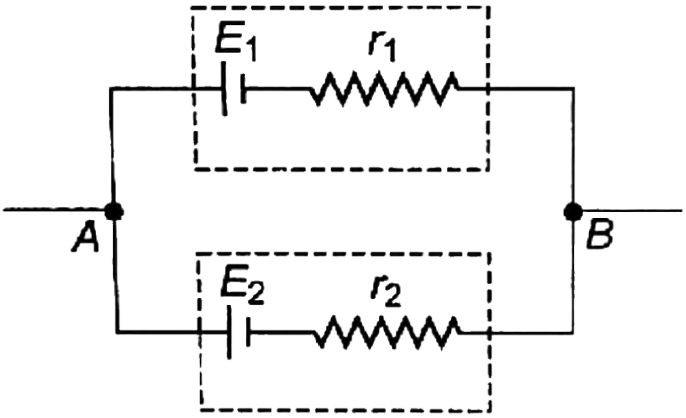
5. Two batteries of emf E_1 and $E_2(E_2 > E_1)$ and internal resistance r_1 and r_2 respectively are connected in parallel as shown in the figure. Then, which of the followings

statements is correct ?



A. The equivalent emf E is smaller than E_1

B. The equivalent emf $E = E_1 + E_2$

C. The equivalent emf E is greater than E_2

D. The equivalent emf E of two cells is between E_1 and E_2 always.

Answer: D

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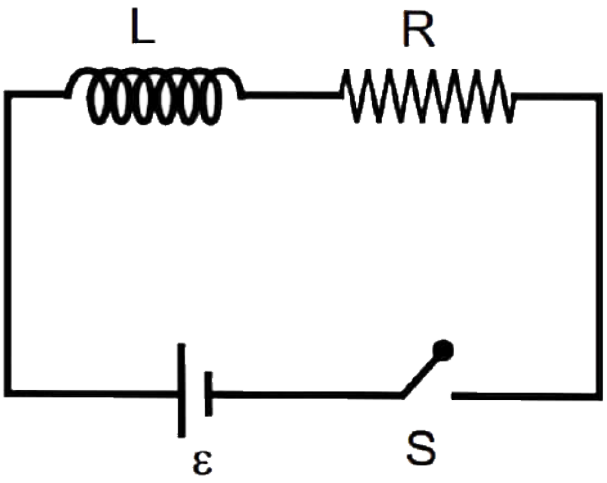
6. The figure below shows a battery of emf ε connected to an inductor L and resistance R in series. If the switch is closed at t=0, then the total charge that flows from the battery in

time constant of the circuit is



A. $\frac{\varepsilon L}{R^2}\left(1-\frac{1}{e}\right)$

B. $\frac{\varepsilon L}{2eR^2}$

C. $\frac{\varepsilon L}{4eR^2}$

D. $\frac{\varepsilon L}{eR^2}$

Answer: D

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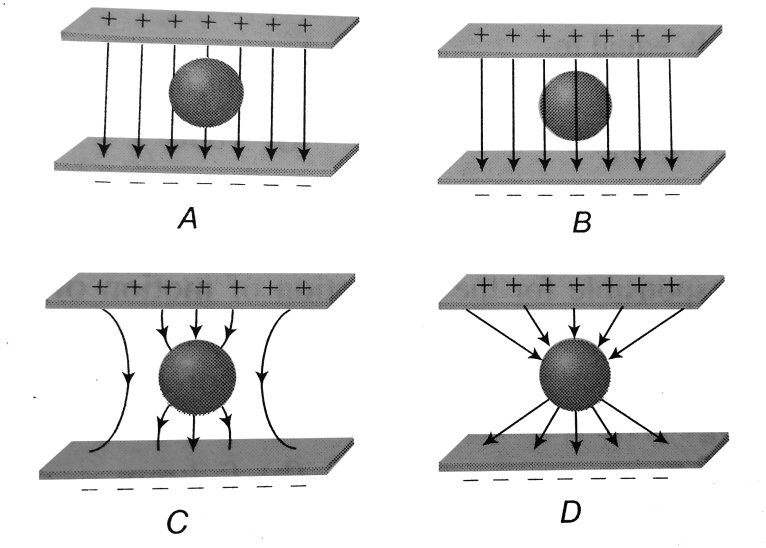
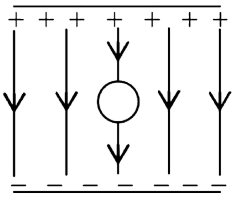
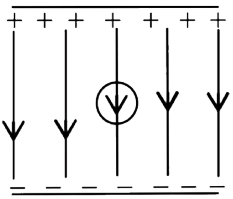
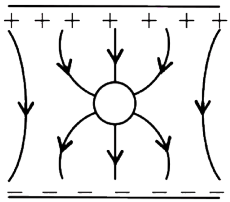
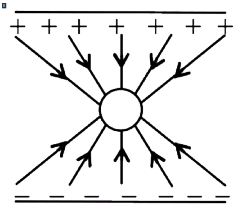
7. An uncharged sphere of metal is placed in between two charged plates as shown. The lines of force look like



A. 

B. 

C. 

D. 

Answer: C

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8. A small charged ball is hovering in the state of equilibrium at a height h over a very large horizontal uniformly charged sheet. If a disc of radius r $(r << h)$, is removed from the plate directly underneath the ball, then the acceleration of the ball will be

A. $\frac{g}{2}\left(\frac{r}{h}\right)^2$

B. $\frac{g}{2}\left(\frac{h}{r}\right)^2$

C. $\frac{g}{4}\left(\frac{r}{h}\right)^2$

D. $\frac{g}{4}\left(\frac{h}{r}\right)^2$

Answer: A

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9. A planet of small mass m moves around the sun of mass M along an elliptrical orbit such that its minimum and maximum distance from sun are r and R respectively. Its period of revolution will be:

A. $T = \pi\sqrt{\frac{(r+R)^3}{2GM_s}}$

B. $T = \pi\sqrt{\frac{(r+R)^3}{3GM_s}}$

C. $T = \pi\sqrt{\frac{(r+R)^3}{GM_s}}$

D. $T = \pi\sqrt{\frac{2(r+R)^3}{GM_s}}$

Answer: A

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10. A body takes 5 minutes for cooling from $50^\circ C$ to $40^\circ C$ Its temperature comes down to $33.33^\circ C$ in next 5 minutes. Temperature of surroundings is

A. $15^\circ C$

B. $20^\circ C$

C. $25^\circ C$

D. $10^\circ C$

Answer: B

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11. Pressure P, Volume V and temperature T of a certain material are related by the

$P = \frac{\alpha T^2}{V}$. Here α is constant. Work done by the material when temparature changes from T_0 to $2T_0$ while pressure remains constant is :

A. $3\alpha T_0^2$

B. $5\alpha T_0^2$

C. $\frac{2}{3}\alpha T_0^2$

D. $7\alpha T_0^2$

Answer: A

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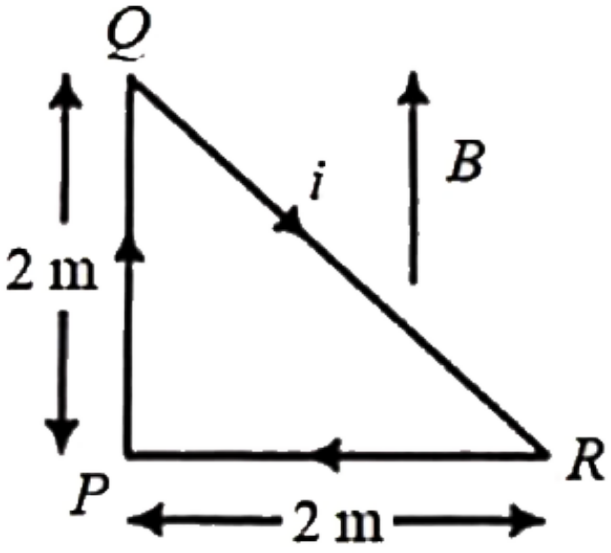
12. A loop PQR carries a current $i = 2A$ as shown in the figure. A uniform magnetic field B = 2T exists in space parallel to the plane of the loop . The magnetic torque on the loop is



A. 16Nm

B. 8 Nm

C. zero

D. 4 Nm

Answer: B

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13. An object of mass 10kg is connected to the lower end of a massless string of length 4m hanging from the ceiling. If a force F is applied horizontally at the mid-point of the string, the

top half of the string makes an angle of 45° with the vertical , then the magnitude of F is

A. 75N

B. 90N

C. 100N

D. 70 N

Answer: C

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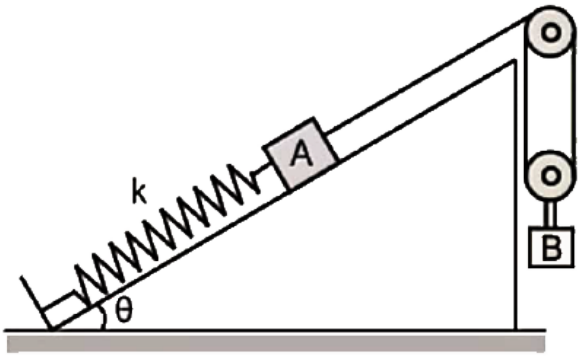
14. Friction is absent everywhere and the threads, spring and pulleys are massless. If $m_A = m_B = M$, then the angular frequency of the system for small oscillations will be



A. $\sqrt{\frac{2k}{4m}}$

B. $\sqrt{\frac{4k}{5m}}$

C. $\sqrt{\frac{6k}{7m}}$

D. $\sqrt{\frac{8k}{5m}}$

Answer: B

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15. The work done by the force $\vec{F} = 6\hat{i} + 2\hat{j}$ N in displacing an object from $\vec{r_1} = 3\hat{i} + 8\hat{j}$ to $\vec{r_2} = 5\hat{i} - 4\hat{j}$ m , is

A. 12 J

B. $-36J$

C. 36J

D. $-12J$

Answer: D

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16. Two bodies are in equilibrium when suspended in water from the arms of balance. The mass of one body is 36 g and its density is

$9g/cm^3$ If the mass of the other is 46 g, its density in g/cm^3 is

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

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

C. 3

D. 5

Answer: C

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17. A sound wave of frequency f propagating through air with a velocity C, is reflected from a surface which is moving away from the source with a constant speed V. Find the frequency of the reflected wave, measured by the observer at the position of the source.

A. $\dfrac{f(c+2v)}{c+v}$

B. $\dfrac{f(c+v)}{c-v}$

C. $\dfrac{f(c-v)}{c+v}$

D. $\dfrac{f(c-v)}{c-2v}$

Answer: C

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18. In CGS system of units, the density of a material is $4gcm^{-3}$. What will be the value of the density of the material in a system of units in which unit of length is 10 cm and unit of mass is 100 g ?

A. 0.04

B. 0.4

C. 40

D. 400

Answer: C

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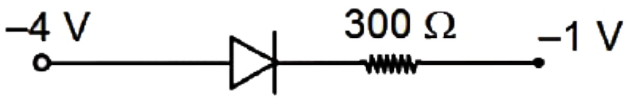
19. The current in the branch of a circuit shown below is



A. 0A

B. $10^{-2}A$

C. $1A$

D. 0.10A

Answer: A

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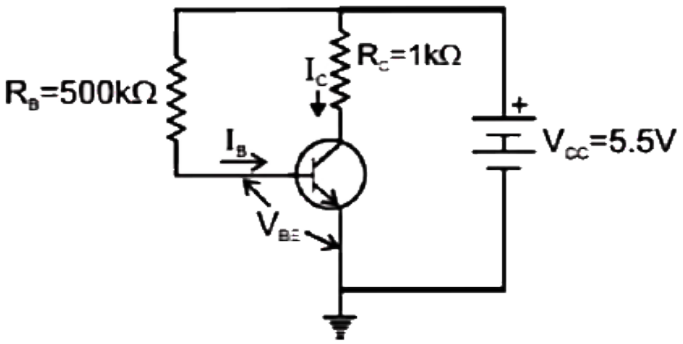
20. In the circuit shown in figure,the base current I_B is $10\mu A$ and the collector current is 5.2 mA . The voltage (V_{BE}) across the base

and emitter is



A. 0.1V

B. 0.5V

C. 0.25V

D. 0.7V

Answer: B

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21. A motor generates an output power of 220 W at an angular velocity of 2100 rpm. Calculate the torque (in Nm) produced by the motor ? [Take $\pi = \frac{22}{7}$]

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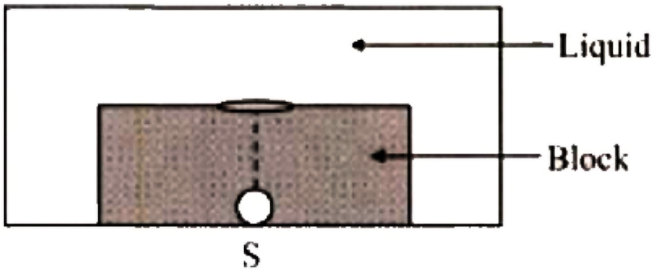
22. A point source S is placed at the bottom of a 12 mm high transparent block of diamond (refractive index = 2.4) . The block is immersed

in an optically rarer liquid as shown in the figure. It is found that the light emerging from the block to the liquid forms a circular bright spot of diameter 18 mm on the top of the block. What is the refractive index of the liquid ?



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23. The ratio of amplitudes of two coherent waves in Young's double-slit experiemnt is $\frac{A_1}{A_2} = \frac{1}{3}$. What is the ratio of maximum and minimum intensities of fringes ?

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24. A pendulum clock (fitted with a small heavy bob that is connected with a metal rod) is 3 seconds fast each day at a temperature of $15^\circ C$ and 2 seconds slow at a temperature of

$30^{\circ} C$. Find the temperature (in $^{\circ} C$) at which will show the correct time.

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25. A metal surface having a work function $\phi = 2.2 \times 10^{-19} J$, is illuminated by the light of wavelengh 1320Å. What is the maximum kinetic energy (in eV) of the emitted photoelectron ? [Take $h = 6.6 \times 10^{-34} Js$]

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