PHYSICS

BOOKS - NTA MOCK TESTS

JEE MOCK TEST 7

Physics Single Choice

1. Point out the correct set of diamagnetic substances

A. aluminium, sodium calcium and oxygen

B. bismuth, copper, lead and silicon

C. cobalt, nickel, gadolinium and aluminium

D. silver, niobium, magnesium and calcium

Answer: B

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2. An ac source of 50 V (r.m.s value) is connected across a series R - C circuit. If the

r.m.s voltage across the resistor is 40 V, then the r.m.s voltage across the capacitor is

A. 10 V

B. 20 V

C. 30 V

D. 40 V

Answer: C

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3. A conducting ring of radius r and resistance R is placed in region of uniform time varying magnetic field B which is perpendicular to the plane of the ring. It the magnetic field is changing at a rate α, then the current induced in the ring is

A. $\frac{\pi r^2 \alpha}{2R}$

B. $\frac{2\pi r \alpha}{R}$

C. $\frac{\pi r \alpha}{R}$

D. $\frac{\pi r^2 \alpha}{R}$

Answer: D

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4. A conducting liquid bubble of radius a and thickness $t(t << a)$ is charged to potential V. If the bubble collapses to a droplet , find the potential on the droplet.

A. $V_{\text{droplet}} = V\left[\frac{a}{3t}\right]^{\frac{1}{3}}$

B. $V_{\text{droplet}} = V\left[\frac{a}{t}\right]^{\frac{1}{3}}$

C. $V_{\text{droplet}} = V\left[\frac{3a}{t}\right]^{\frac{1}{3}}$

D. $V_{\text{droplet}} = V\left[\frac{3a}{4t}\right]^{\frac{1}{3}}$

Answer: A

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5. Which of the following set of characteristics of a material is suitable for using it as a dielectric in a capacitor?

A. large dielectirc constant and high dielectric strength

B. large dielectric constant and low dielectric strength

C. small dielectric constant and high dielectric strength

D. small dielectric constant and low dielectric strength

Answer: A

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6. An insulated container containing monoatomic gas of molar mass s is moving with a velocity v_0. If the container is suddenly stopped, find the change in temperature.

A. $\frac{M_0 v^2}{2R}$

B. $\frac{M_0 v^2}{3R}$

C. $\frac{2M_0 v^2}{3R}$

D. $\frac{3M_0 v^2}{2R}$

Answer: B

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7. A charged particle with charge q enters a region of constant, uniform and mututally orthogonal fields $\vec{E}$ and $\vec{B}$ with a velocity $\vec{v}$ perpendicular to both $\vec{E}$ and $\vec{B}$, and comes out without any change in magnitude or direction of $\vec{v}$. Then

A. $\vec{v} = \frac{\vec{B} \times \vec{E}}{E^2}$

B. $\vec{v} = \frac{\vec{E} \times \vec{B}}{B^2}$

C. $\vec{v} = \frac{\vec{B} \times \vec{E}}{B^2}$

D. $\vec{v} = \dfrac{\vec{E} \times \vec{B}}{E^2}$

Answer: B

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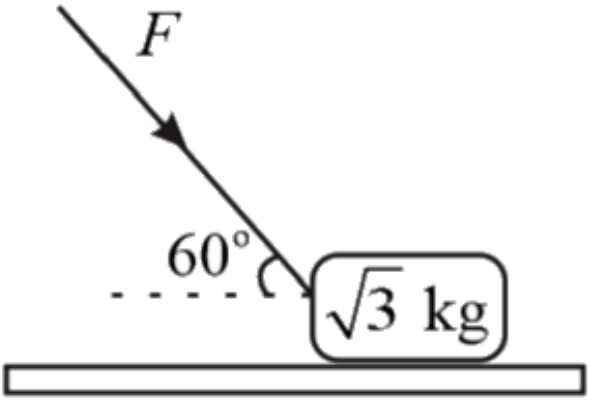
8. A force F is applied on a block of mass $\sqrt{3}kg$ which rests on a horizontal surface with a coefficient of friction $\dfrac{1}{2\sqrt{3}}$. The maximum value of F for which the block doesn't move, is

[Take $g = 10ms^{-2}$]



A. 20 N

B. 10 N

C. 15 N

D. 25 N

Answer: A

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9. Two simple pendulums of length 5 m and 20 m are given small displacements in the same direction at the same time. The minimum number of oscillations, the shorter pendulum has completed, when the phase difference between them become zero again, is

A. 3

B. 4

C. 2

D. 5

Answer: C

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10. The energy of a photon is equal to the kinetic energy of a proton. The energy of the photon is E. Let λ_1 be the de-Broglie wavelength of the proton and λ_2 be the wavelength of the photon. The ratio $\frac{\lambda_1}{\lambda_2}$ is proportional to

A. E^0

B. $E^{1/2}$

C. E^{-1}

D. E^{-2}

Answer: B

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11. An object weights m_1 in a liquid of density d_1 and that in liquid of density d_2 is m_2. The density of the object is

A. $d = \frac{m_2 d_2 - m_1 d_1}{m_2 - m_1}$

B. $d = \frac{m_1 d_1 - m_2 d_2}{m_2 - m_1}$

C. $d = \frac{m_2 d_1 - m_1 d_2}{m_1 - m_2}$

D. $d = \frac{m_1 d_2 - m_2 d_1}{m_1 - m_2}$

Answer: D

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12. The length of a telescope, for which it is known that it has an objective lens of focal

length 144 cm and an eye piece of focal length 6 cm is

A. 1.5m

B. 1.44m

C. 1.38m

D. 1.56 m

Answer: A

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13. The surface tension and vapour pressure of water at 20°C is $7.28 \times 10^{-2} Nm^{-1}$ and 2.33×10^{3} Pa respectively. The radius of the smallest spherical water droplet which can form without evaporating at 25°C is

A. $1.25 \times 10^{-5} m$

B. $6.25 \times 10^{-5} m$

C. $4.3 \times 10^{-5} m$

D. $3.4 \times 10^{-5} m$

Answer: B

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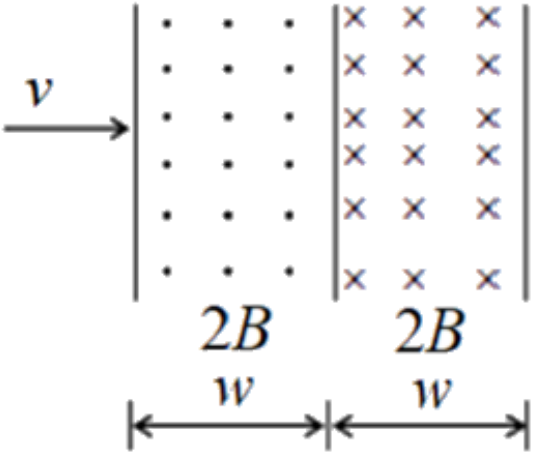
14. The figure shows two regions of uniform magnetic field of strengths 2B and 2B. A charged particle of mass m and charge q enters the region of the magnetic field with a velocity $v = \frac{qBw}{m}$, where w is the width of each region of the magnetic field. The time taken by the particle to come out of the

region of the magnetic field is



A. $\frac{4\pi m}{qB}$

B. $\frac{2\pi m}{qB}$

C. $\frac{\pi m}{2qB}$

D. $\frac{\pi m}{qB}$

Answer: D

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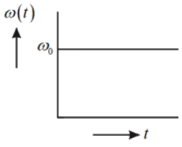
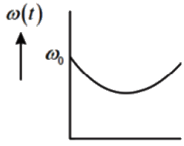
15. A circular platform is free to rotate in a horizontal plane about a vertical axis passing through its centre. A tortoise is sitting at the edge of the platform. Now the platform is given an angular velocity ω_0. When the tortoise move along a chord of the platform with a constant velocity (with respect to the platform),

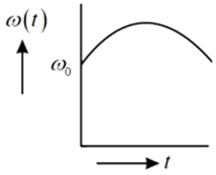
A.



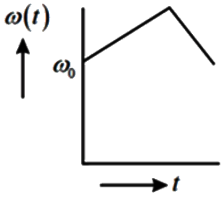
B.



C.



D.



Answer: C

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16. Four identical solid spheres each of mass M and radius R are fixed at four corners of a light square frame of side length $4R$ such that centres of spheres coincides with corners of square, moment of inertia of 4 spheres about an axis passing through any side of square is

A. $\frac{21MR^2}{5}$

B. $\frac{42MR^2}{5}$

C. $\frac{84MR^2}{5}$

D. $\frac{168MR^2}{5}$

Answer: D

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17. If resistivity of pure silicon is $3000\Omega meter$, and the electron and hole mobilities are $0.12m^2V^{-1}s^{-1}$ and $0.045m^2V^{-1}s^{-1}$ respectively, determine the resistivity of a specimen of the material when 10^{19} atoms of phosphorous are added per m^3 are also added. Given charge on electron $= 1.6 \times 10^{-19}C.$

A. 2.21Ω

B. 3.21Ω

C. 4.21Ω

D. 5.21Ω

Answer: D

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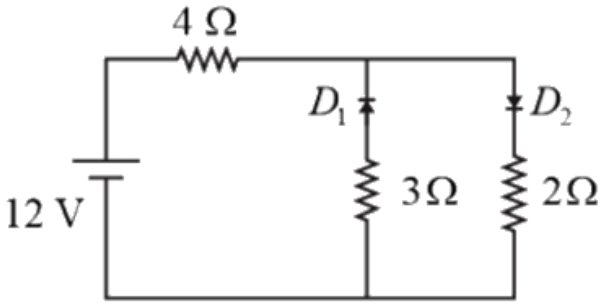
18. The current through the battery shown in the circuit is



A. 1.33A

B. 1.71 A

C. 2.00 A

D. 2.31 A

Answer: C

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19. Two spheres A and B are made of the same material and have the same radius. Sphere A is hollow and sphere B is solid. Both the spheres are heated to the same temperature. Which of the following is correct ?

A. A expands more than B

B. A expands less than B

C. both the spheres expand equally

D. data is insufficient

Answer: C

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20. A real image of an object is formed at a distance of $20cm$ from a lens. On putting another lens in contact with it, the image is shifted $10cm$ towards the combination, Determine the power of the second lens.

A. 5 D

B. 2.5 D

C. 10 D

D. 2 D

Answer: A

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Physics Subjective Numerical

1. Two uniform solid spheres made of copper have radii 15 cm and 20 cm respectively. Both of them are heated to a temperature of $70^{\circ}C$ and then placed in a region of ambient

temperature equal to $45^{\circ}C$. What will be the ratio of the initial rates of cooling of both the spheres?

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2. A physical quantity A is related to four observable a,b,c and d as follows, $A = \frac{a^2b^3}{d\sqrt{c}}$, the percentage errors of measurement is a,b,c and d,are $1\%, 3\%, 2\%$ and 1% respectively. What is the percentage error in the quantity A?

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3. A string $25cm$ long fixed at both ends and having a mass of $2.5g$ is under tension. A pipe closed from one end is $40cm$ long. When the string is set vibrating in its first overtone and the air in the pipe in its fundamental frequency, 8 beats per second are heard. If is observed that decreasing the tension in the string decreases the beat frequency. If the speed of sound in air is $320m/s$. Find tension in the string.

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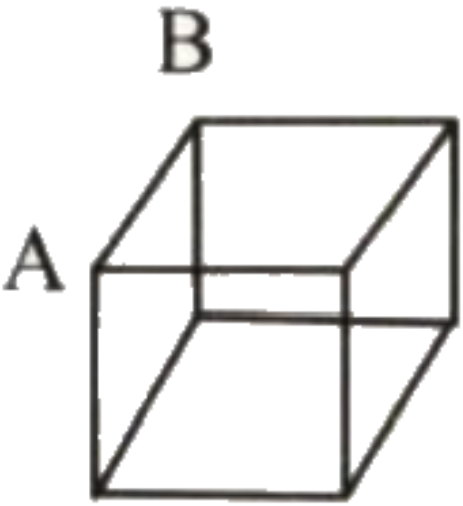
4.



In the above arrangement, each side of the cube has 1Ω resistance and it is known that the effective resistance between A and B is $\frac{5}{9}\Omega$. Now, if the resistor between A and B is removed, then find the new effective

resistance (in Ω) between the same two points.

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5. Two particles are projected vertically upwards from the surface of the earth with velocities $v_1 = \sqrt{\frac{2gR}{3}}$ and $v_2 = \sqrt{\frac{4gR}{3}}$ respectively. If the maximum heights attained by the two particles are h_1 and h_2 respectively, then calculate the ratio $\frac{h_1}{h_2}$.

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