PHYSICS

BOOKS - D MUKHERJEE PHYSICS (HINGLISH)

PRACTICE WORKSHEET 3

Straight Objective Type

1. A flat coil of area A and n turns is placed at the centre of a ring fo radius $r\left(r^2 > > A\right)$ and resistance R. The coil and the ring are coplaner. When the current in the coil increases from zero to i , the total charge circulating in the ring is

A. $\frac{\mu_0 nAi}{2rR}$

B. $\frac{\mu_0 nAi}{r^2 R}$

C. $\frac{\mu_0 nAi}{2\pi R}$

D. $\frac{\mu_0 n^2 i}{4\pi r R}$

Answer: A

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2. A satellite is in a circular orbit very close to the surface of a planet. At some point it is given an impulse along its direction of motion, causing its velocity to increase n times . It now goes into an elliptical orbit. The maximum possible value of n for this to occur is

A. 2

B. $\sqrt{2}$

C. $\sqrt{2}+1$

D. $\frac{1}{\sqrt{2}-1}$

Answer: B

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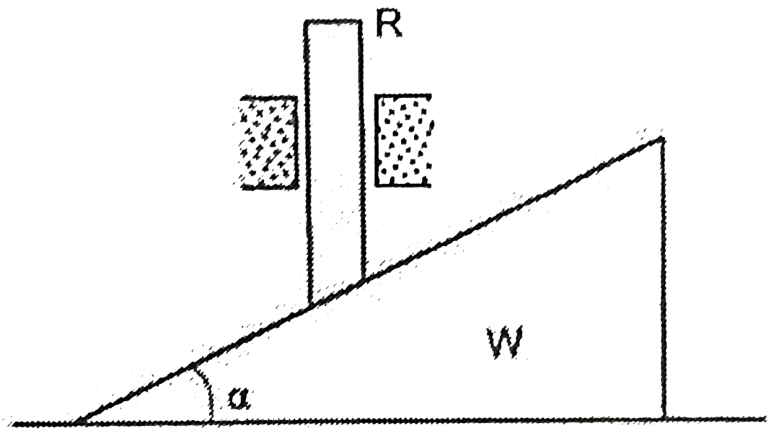
3.



In the arrangement shown above, all surfaces are frictionless. The rod R is constrained to move vertically. The vertically acceleration of R is a_1 and the horizontal accelration of the wedge W is a_2. The ratio a_1 / a_2 is equal to

A. $\tan \alpha$

B. $\cot \alpha$

C. $\sin \alpha$

D. $\cos \alpha$

Answer: A

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4. Three infinitely long thin conductors are joined at the origin of coordinates and lie along the x-y- and z-axes. A current i flowing along the conductor lying along the x-axis divides equally into the othere two at the origin. The magnetic field at the point (0,-a,0) has magnitude

A. $\frac{\mu_0 i}{4\pi a}$

B. $\frac{3\mu_0 i}{4\sqrt{2}\pi a}$

C. $\frac{\sqrt{5}\mu_0 i}{8\pi a}$

D. $\frac{\sqrt{3}\mu_0 i}{2\pi a}$

Answer: C

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5. An engine whistling at a constant frequency n_0 and moving with a constant velocity goes past a stationery observer. As the engine crosses him, the frequency of the sound heard by him changes by a factor f. The

actual difference in the frequencies of the sound heard by him before and after the engine crosses him is

A. $\frac{1}{2}n_0(1-f^2)$

B. $\frac{1}{2}n_0\left(\frac{1-f^2}{f}\right)$

C. $n_0\left(\frac{1-f}{1+f}\right)$

D. $\frac{1}{2}n_0\left(\frac{1-f}{1+f}\right)$

Answer: B

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6. Which of the following units does not have the same dimensions as the henry?

A. joule $(\text{ampere})^2$

B. $telsa(\text{meter})^2(\text{ampere})^{-2}$

C. ohm second

D. $(\text{farad})^{-1}(\text{second})^{-1}$

Answer: D

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7. Assume that helium obeys the Bohr theory exactly. Which of the following transition in helium will not give rise to a spectral line which has the same wavelength as some spectral line in the hydrogen spectrum?

A. From n=4 to n=2

B. From n=6 to n=2

C. From n=8 to n=4

D. From n=6 to n=3

Answer: D

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8. A ball of density ρ_0 falls from rest from a point P onto the surface of a liquid of density ρ in the time T. It enters the liquid, stops, moves up, and returns to P in a total time 3 T. neglect viscosity, surface tension and splashing find the ratio of $\frac{\rho}{\rho_0}$

A. 1.5

B. 2

C. 3

D. 4

Answer: C

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9. When an object is placed in front of a concave mirror of focal length f, a virtual image is produced with a magnification of 2. To obtain a real image with a magnification of 2, the object has to be moved by a distance equal to

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

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

C. f

D. $\frac{3f}{2}$

Answer: C

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10. A charged particle of specific charge s moves undeflected through a region of space containing mutually perpendicular and uniform electric and magnetic fields, E and B. When the field E is switched off, the particle will move in a circular path of radius

A. $\frac{E}{Bs}$

B. $\frac{Es}{B}$

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

D. $\frac{E}{B^2 s}$

Answer: D

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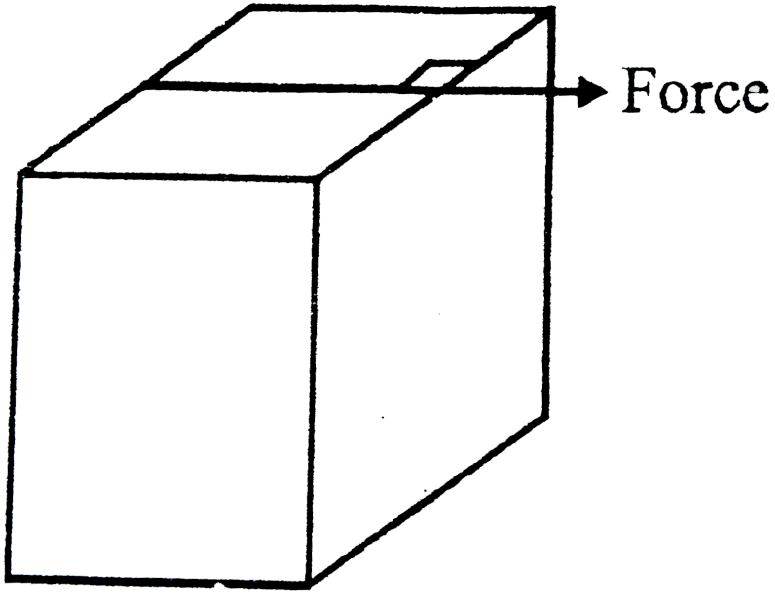
11. In the figure, a solid uniform cube is placed on a horizontal surface. The co-efficient of friction between them is μ where $\mu < \frac{1}{2}$. A variable horizontal force perpendicular to one edge and passing through the midnight of that applied on the cube's upper face. The maximum acceleration with which it can move without toppling is



A. μg

B. $2\mu g$

C. $g(1-2\mu)$

D. $\left(\mu+\frac{1}{2}\right)g$

Answer: C

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12. A radioactive sample with half-life=T emits α-particles. Its total activity is A_i at some time and (A_f) at a later time. The number of α-particle emitted by the sample between these two points in time is

A. $A_i - A_f$

B. $\frac{T}{In2}(A_i - A_f)$

C. $\frac{In2}{T}(A_i - A_f)$

D. $\frac{T}{In2}\left(\frac{1}{A_f}-\frac{1}{A_i}\right)$

Answer: B

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13. A uniform rod of mass m, hinged at its upper end, is released from rest from a horizontal position. When it passes through the vertical position, the force on the hinge is

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

B. $2mg$

C. $\frac{5}{2}mg$

D. 3mg

Answer: C

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14. In solar radiation, the intensity of radiation is maximum around the wavelength λ_m. If R is the radius of the sun and c is the velocity of light, the mass lost by the sum per unit time is proportional to

A. $\frac{R^2}{\lambda^4 c^2}$

B. $\frac{R^2}{\lambda^2 c^2}$

C. $\frac{R^3}{\lambda^4 c^3}$

D. $\frac{R^3}{\lambda^4 c^2}$

Answer: A

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15. In an isolted, charged, parllel-plate air capacitor, the charge per unit area on each plate has a magnitude of σ. A dielectric slab having the dielectric constant K is now introduced between the plates. The induced charge per unit area on the surface of the dielectric will have magnitude.

A. $\frac{\sigma}{K}$

B. $\sigma(K-1)$

C. $\sigma\left(1-\frac{1}{K}\right)$

D. $\frac{\sigma}{K+1}$

Answer: C

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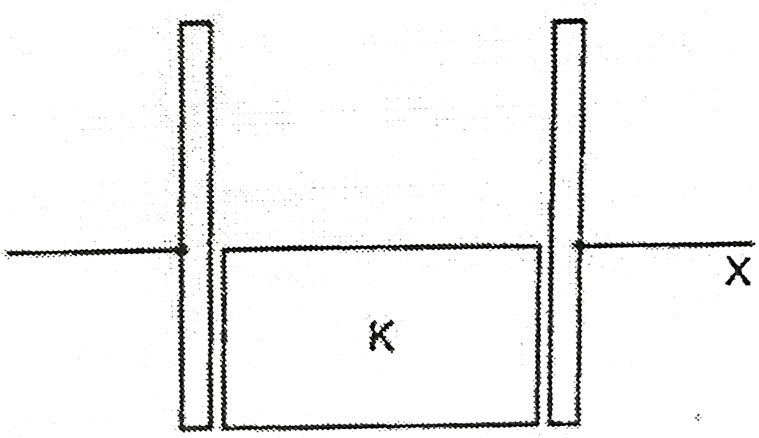

16.

A parallel- plate capacitor is charged from a cell and then isolated from it. A dielectric slab of dielectric constant K is now introduced in the region between the plated, filling half of it. The electric intensity in the diaelectric is E_1 and that in air is E_2.

A. $E_1 = E_2$

B. $E_1 = \frac{E_2}{K}$

C. $E_1 = \left(1 - \frac{1}{K}\right) E_2$

D. $E_1 = \frac{E_2}{K-1}$

Answer: A

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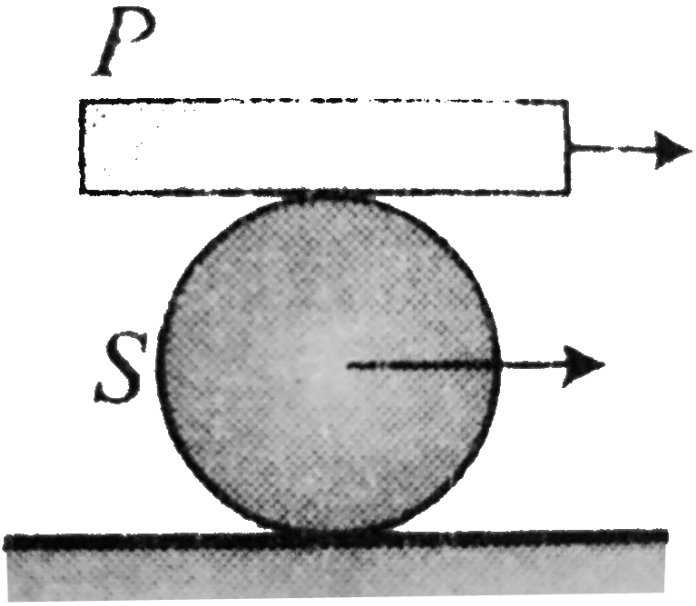
17. A plank P is placed on a solid cylinder S, which rolls on a horizontal surface. The two are of equal mass. There is no slipping at any of the surfaces in contact. The ratio of kinetic energy of P to the kinetic energy of S is:



A. $1:1$

B. $2:1$

C. $8:3$

D. $11:8$

Answer: C

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Assertion Reason Type

1. STATEMENT-1: In characteristic X-rays, K_α X-rays are of smaller wavelength than K_β X-rays for the same element.

STATEMENT-2: Characteristics X-rays are produced by transitions of orbital electrons in the target atom.

A. Statement-1 is True , Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True , Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True , Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: D

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2. STATEMENT-1: In radioactivity, the nature of a smaple can be understood by its half life or average life but not by its total life.

STATEMENT-2: The total life of any radioactive sample is infinite.

A. Statement-1 is True , Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True , Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True , Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: A

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3. STATEMENT-2: In a gas , any rapid change must be adiabatic, whereas a slow change may be adiabatic.

STATEMENT-2: In a p-V diagram, the magnitude of the slope is greater for an adiabatic process than for an isothermal process.

A. Statement-1 is True , Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True , Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True , Statement-2 is False.

D. Statement-1 is False , Statement-2 is True.

Answer: B

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Linked Comprehension Type

1. When we hear a sound, we understand it mainly on the basis of three parameters, called intensity, pitch and tone. These quatities, in turn, depend on cetain measurable quantities associated with the sound.

Which of the following statements regarding the intensity and loudness of a sound is not correct?

A. The unit of intensity is W/m^2

B. The unit of loudness is the decibel.

C. The loudness of a sound is directly proportional to its intensity

D. The intensity depends on the frequency, amplitude, density of the medium and the velocity of sound in the medium.

Answer: C

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2. When we hear a sound, we understand it mainly on the basis of three parameters, called intensity, pitch and tone. These quatities, in turn, depend on cetain measurable quantities associated with the sound.

Which of the following statements regarding the pitch of a sound is not correct?

A. The pitch of a sound depends only on tis frequency.

B. The difference between the frequencies of two sounds is called their ' interval'.

C. If two sounds differ by N octaves, the ratio of their frequencies is 2^N

D. Different notes on a musical scale differ only in pitch.

Answer: B

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3. When we hear a sound, we understand it mainly on the basis of three parameters, called intensity, pitch and tone. These quatities, in turn, depend on cetain measurable quantities associated with the sound.

Which of the following statements regarding the tone of a sound in not correct?

A. The tone of a sound depends on its waveform.

B. We indentify the source of a sound by its tone.

C. The tone of a sound improves if most of its harmonics are present along with the fundamental.

D. The second harmonic of a sound can also be called its second overtone.

Answer: D

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Matrix Matching Type

1. In the experimental setup for a photocell, the wavelength of the light incident on the cathod is initially 0.6 times the threshold wavelength for the material of the cathode. Certain change in the experimental setup are given in column A and their possibel effects are given in column B.

Column A

(i) The intensity of the incident light is doubled but the frequency remains

(ii) Both the intensity and wavelength of the incident light are doubled

(iii) The intensity of the incident light is doubled and its wavelength is ma

(iv) The intensity of the incident light ramains the same and the wavelengt

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