PHYSICS

BOOKS - GURUKUL BOOKS & PACKAGING PHYSICS (HINGLISH)

MARCH 2015

Section I

1. The period of a conical pendulum in terms of its length (l) , semivertical angle (θ) and

acceleration due to gravity (g) is

A. $\frac{1}{2\pi}\sqrt{\frac{1\cos\theta}{g}}$

B. $\frac{1}{2\pi}\sqrt{\frac{1\sin\theta}{g}}$

C. $\frac{1}{2\pi}\sqrt{\frac{1\cos\theta}{4g}}$

D. $\frac{1}{2\pi}\sqrt{\frac{1\tan\theta}{g}}$

Answer:

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2. The kinetic energy of a rotating body depends upon

A. distribution of mass only

B. ongular speed only

C. destribution of mass and angular speed

D. angular acceleration only

Answer:

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3. If the metal bob of a simple pendulum is replaced by a wooden bob, then its time period will

A. increase

B. remain same

C. decreases

D. afirst increase and then decreases

Answer:

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4. The graph between applied force and change in the length of wire within elastic limit is a

A. straight line with positive slope

B. straight line with negative slope

C. curve with positive slope.

D. curve the negative slope

Answer:

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5. When a longistudinal wave is incident at the bondary of a denser medium, then

A. compression reflects as a compression.

B. compression reflects as a rarefaction.

C. rarefaction reflects as a compression

D. longitudinal wave reflects as transverse wave.

Answer:

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6. The dimensions of universal gravitational constant are :-

A. $\left[L^1 M^0 T^0\right]$

B. $\left[L^2 M^1 T^0\right]$

C. $\left[L^{-1} M^1 T^{-2}\right]$

D. $\left[L^3 M^{-1} T^{-2}\right]$

Answer:

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7. Two copperr spheres of radii 6 cm and 12 cm respectively are suspended in an evacuated enclosure. Each of them are at a temperature $15^{\circ}C$ above the surroundings. The ratio of their rate of loss of heat is

A. $2:1$

B. $1:4$

C. $1:8$

D. $8:1$

Answer:

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8. In circular motion, assuming $\bar{v} = \overline{w} \times \bar{r}$, obtain an expressio for the resultantj acceleration of a particle in terms of tangential and radial component.

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9. Explain why an astronaut in an orbiting satellite has a feeling of weightlessness

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10. State theorem of parallel axes and therom of perpendi cular axes about moment of inertia.

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11. State : (a) Wien's displacement law, and (b) first law of thermodynamics.

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12. A particale in S.H.M. has a perod of 2 seconds and amplitude of 10 cm. Calculate the acceleration when it is at 4 cm from its positive extreme position.

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13. The surface tension of water at $0^{\circ} C$ is 75.5 dyn/cm. Calculate the surface tension of water at $25^{\circ} C$.

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14. The spin dryer of washing machine rotating at 15 rps slows down to 5 rps after making 50 rotations. Find the its angular acceleration.

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15. Calculate the period of revolution of Neptune around the sun, given that diameter of its orbit is 30 times the diameter of earth's orbit around the sun, both orbits being assumed to be circular.

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16. Derive an expression for excess pressure inside a drop of liquid.

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17. Explain Doppler effect.

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18. Calculate the average molecular kinetic energy :

(a) per kilomole,

(b) per kilogram, of oxygen at $27^\circ C$. (R = 8320 J/K mole K, Avogadro's number $= 6 \cdot 03 \times 10^{26}$ molecules/K mole)

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19. A unifrom steel rod of cross section $5mm^2$ is heated from $0^\circ C$ to$25^\circ C$. Find the force

which must be exerted to prevent it from expanding. Also, find the energy stored per unit volume of the rod.

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20. What are forced vibrations and resonance ? Show that only odd harmonics are present in an air column vibrating in a pipe closed at one end. A stretched wire emits a fundamental note of frequency 256 Hz. Keeping the stretching force constant and reducing length

of the wire by 10cm, the frequency becomes 320 Hz. Calculate the original length of wire.

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21. Obtain an expression for potential energy of a particle performing simple harmonic motion. Hence evaluate the potenhtial energy (a) at mean position and (b) extreme position.

A horizontal disc is freely rotating about a transverse axit passing through its centre at the rate of 100 revolutions per minute. A 20

gram blob of wax falls on the disc and sticks to teh disc at a distance of 5 cm form its axis. Moment of inertia of the disc about its axit passing through its centre of mass is 2×10^{-4} kg m^2. Calculate the new frequency of rotation of the disc.

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Section Ii

1. The electric field intensity in free space at a distance 'r' outside a charged conducting sphere of radius 'R' in terms of surface charge density σ is

A. $\frac{\sigma}{\varepsilon_0}\left[\frac{R}{r}\right]^2$

B. $\frac{\varepsilon_0}{\sigma}\left[\frac{R}{r}\right]^2$

C. $\frac{R}{r}\left[\frac{\sigma}{\varepsilon_0}\right]^2$

D. $\frac{R}{\sigma}\left[\frac{r}{\varepsilon_0}\right]^2$

Answer: A

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2. Instrument which can measure terminal potential difference as well as electromotive force (e.m.f.) is

A. Wheatstone's meter bridge

B. Volmeter

C. Potentiometer

D. Galvanometer

Answer: C

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3. The frequency of incident light falling on a photosensitive metal plate is doubled, the K.E of the emitted photo-electrons is

A. same as its initial value

B. two times its initial value

C. more than two times its intial value

D. less than two times its intitial value

Answer: C

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4. Linear momentum of an electron in Bohr obrit of H-atom (principal quantum number n) is proporational to

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

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

C. n

D. n^2

Answer: B

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5. In a semiconductor , acceptor impurity is

A. antimony

B. indium

C. phosphrous

D. arsenic

Answer: B

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6. The power radiated by linear antenna of length 'l' is proportional to (λ=wavelength)

A. $\frac{\lambda}{l}$

B. $\left(\frac{\lambda}{l}\right)^2$

C. $\frac{l}{\lambda}$

D. $\left(\frac{l}{\lambda}\right)^2$

Answer: D

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7. The numerical aperture of objective of a microscope is $1 \cdot 12$. The limit of resolution, when light of wavelength 6000Å is used to view an object is :

A. $0 \cdot 25 \times 10^{-7} m$

B. $2 \cdot 5 \times 10^{-7} m$

C. $25 \times 10^{-7} m$

D. $250 \times 10^{-7} m$

Answer: C

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8. What is a Polaroid ? State its two uses.

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9. Draw a neat and labelled diagram of suspended coid type moving coil galvanometer.

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10. Define : (a) Moganetization and (b) Magnetic intensity.

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11. Draw a block diagram of generalized communications system.

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12. A solenoid $3 \cdot 142$ m long and $5 \cdot 0$ cm in diameter has two layers of windings of 500 turns each and carries a current of 5A. Calculate the magnetic induction at its centre along the axis.

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13. A circular coil of 300 turns and average area $5 \times 10^{-3} m^2$ carries a current of 15 A.

Calculater the magnitude of magnetic moment associated with coil.

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14. The magnetic flux thropugh a loop varies according to the relation $\phi = t^2 + 6t + C$, where 'C' is constant, ϕ is in milliwebe3r and 't' is in sedcond. What is the mognitude of induced e.m.f. in the loop at t = 2 seconds ?

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15. An electron is orbiting is 5th Bohr orbit. Calculate ionisation energy for this atom. If the ground state energy is $-13 \cdot 6$ eV.

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16. Obtain an expression for the radius of Bohr orbit for H atom.

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17. Define α and β parameters of a transistor. What is the relation between them?

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18. Two metal spher4s having charge densities 5 $\mu C/m^2$ and $-2\mu C/m^2$ with radii 2 mm and 1 mm respectivly are kept in a hypothetical closed surface. Calculate total normal electric induction over the closed surface.

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19. The threshold wavelenght of silver is 3800Å . Calculate the maximum kinetic energy in eV of photoelelctrons emitted, when ultraviolet light of wavelegth 2600Å falls on it. (Planck's constant, $h = 6 \cdot 63 \times 10^{-34}\text{Js}$, . Velocity of light in air, $c = 3 \times 10^{8} m / s$)

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20. Obtain an expression for e.m.f. induced in a coil rotating with uniform angular velocity in a

uniform magnetic field. Show graphically the variation of e.m.f. with time (t).

Rewsistance of a potentiometer witre is $0 \cdot 1 \quad \Omega / cm.$ A cell of e.m.f. $1 \cdot 5$ V is balanced at 300 cm on this potentiometer wire, Calculate teh current and balancing length for another cell of e.m.f. $1 \cdot 4$ V on the same potentiometer wire.

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21. Describe biprism exper4iment to calcularte the wavelength of a monocharomatic light. Draw the necessary ray diagram.

If the critical angle of a medium is $\sin^{-1}\left(\frac{3}{5}\right)$, find the po0larising angle.

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