PHYSICS

BOOKS - GURUKUL BOOKS & PACKAGING PHYSICS (HINGLISH)

SEPTEMBER 2014

Section 1

1. Draw a diagram showing all components of forces acting on a vehicle moving on a curved

banked road. Write the necessary equation for maximum safety, speed and state the significance of each term involved in it.

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2. Explain Maxwell distribution of molecular speed with necessary graph.

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3. Find the total energy and binding energy of an artifical satellite of mass orbiting at height of above the surface of the earth.

[$G = 6.67 \times 10^{-11} S.I$ units, Radius of earth : $R = 6400km$, Mass of earth : $M = 6 \times 10^{24} kg$]

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4. Wavelengths of two notes in the air are $\left(\frac{70}{153}\right)m$ and $\left(\frac{70}{157}\right)m$. Each of these notes

produces 8 beats per second with a tuning fork of fixed frequency . Find the velocity of sound in the air and frequency . Find the velocity of sound in the air and frequency of the tuning fork.

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5. Draw a diagram showing different stages of projection for artifical satellite.

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6. State the law of conservation of angular momentum and explain with a suitable example.

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7. Define the angle of contact and state its any two characteristics.

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8. PERFECTLY BLACK BODY

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9. A stone of mass 5kg, tied to one end of a rope of length $0.8m$, is whirled in vertical circle. Find the minimum velocity at the highest point and at the midway point $[g = 9.8m/s^2]$

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10. The maximum speed of a particle performing a linear S.H.M. is 0.16 m/s and the maximum acceleration is 0.64 m/s^2. The period of S.H.M. is

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11. Water rises to a height 3.2 cm in a glass capillary tube. Find the height to which the same water will rise in another glass capillary having half area of cross-section.

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12. A $36cm$ long sonometer wire vibrates with frequency of $280Hz$ in fundamental mode, when it is under tension of $24.5N$. Calculate linear density of the material of wire.

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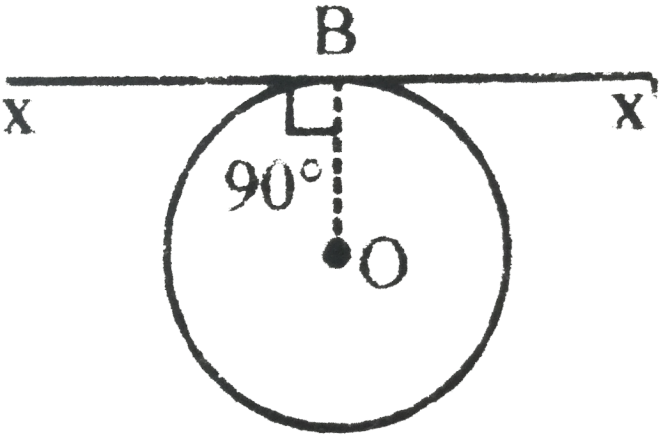
13. A thin wire of length L and uniform linear mass density ρ is bent into a circular loop with centre at O as shown. The moment of inertia

of the loop about the axis XX' is :



A. $\frac{3\rho L^2}{8\pi^2}$

B. $\frac{8\pi^2}{3\rho L^3}$

C. $\frac{3\rho L^3}{8\pi^2}$

D. $\frac{8\pi^2}{3\rho L^2}$

Answer:

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14. The average displacement over a period of S.H.M. is (A = amplitude of S.H.M)

A. 0

B. A

C. $2A$

D. $4A$

Answer:

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15. In which of the following substances , surface tension increases with increase in temperature ?

A. Copper

B. Molten copper

C. Iron

D. Molten iron

Answer:

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16. The ratio of diameters of two wires of the same material and same length is n : 1. If the same load is applied to both the wires then the increase in the length of the thin wire is $(n > 1)$

A. $n^{\frac{1}{4}}$ times

B. $n^{\frac{1}{2}}$ times

C. n times

D. n^2 times

Answer:

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17. The coefficient of reflection of an opaque body is 0.16. Its coefficient of emission is

A. 0.94

B. 0.84

C. 0.74

D. 0.64

Answer:

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18. Let velocity of a sound wave be 'v' and $'\omega'$ be angular velocity. The propagation constant of the wave is

A. $\sqrt{\frac{\omega}{v}}$

B. $\sqrt{\frac{v}{\omega}}$

C. $\frac{\omega}{v}$

D. $\frac{v}{\omega}$

Answer:

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19. The value of end correction for an open organ pipe of radius r is _____ .

A. $0.3r$

B. $0.6r$

C. $0.9r$

D. $1.2r$

Answer:

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20. Distinguish between forced vibrations and resonance. Draw neat, labelled diagrams for the modes of vibration of a streched string in second harmonic and third harmonic.

The area of the upper face of a rectangular block is $0.5m \times 0.5m$ and the lower face is fixed. The height of the block is $1cm$. A shearing force applied at the top face

produces a displacement of $0.015mm$. Find the strain and shearing force.

(Modulus of rigidity : $\eta = 4.5 \times 10^{10} N/m^2$)

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21. Define phase of S.H.M. Show variation of displacement, velocity and acceleration with phase for a particle perfoming linear S.H.M. graphically, when it starts from extreme position.

A body starts rotating from rest. Due to a

couple of $20Nm$ it completes 60 revolutions in one minute. Find the moment of inertia of the body.

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Section 2

1. In a biprism experiment, a slit is illuminated by a light of wavelength 4800. The distance between the slit and biprism is and the distance between the biprism is $15cm$ and the

distance between the biprism and eyepiece is $85cm$. If the distance between virtual sources is $3mm$, determine the distance between $4th$ bright band on one side and $4th$ dark band on the other side of the central bright band.

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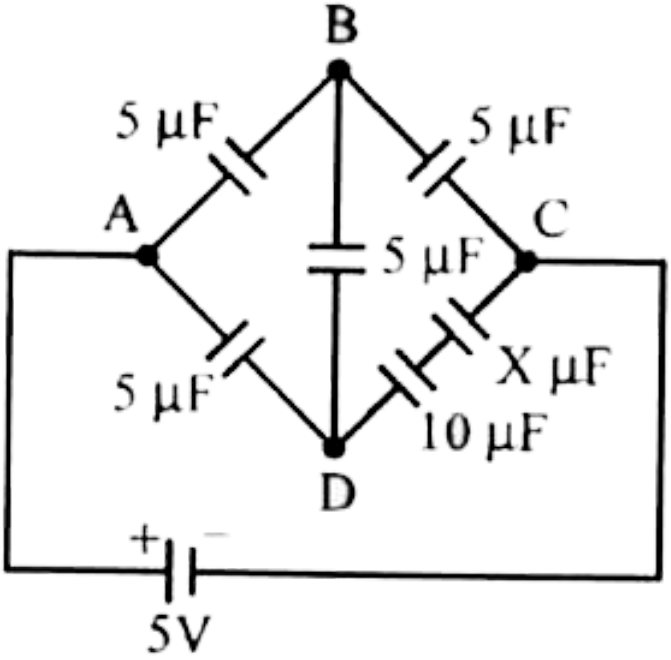
2. Six capacitors of capacities $5\mu F, 5\mu F, 5\mu F, 5\mu F, 10\mu F$ and X μF are connected in a network as shown in the figure. What is the value of X if the network is

balanced?



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3. Show that the current flowing through a moving coil galvanometer is directly

proportional to the angle of deflection of coil.

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4. Explain the formation of energy band diagram in case of conductor and semiconductor.

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5. Draw a neat labelled diagram showing the plane of vibration and plane of polarisation

for polarised light.

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6. State the conditions to get steady interference pattern.

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7. In a hydrogen atom, an electron carrying charge $'e'$ revolves in an orbit of radius $'r'$ with speed $'v'$. Obtain an expression for the

magnitude of magnetic moment of a revolving electron.

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8. Sketch a block diagram of a generalised communication system.

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9. Red light of wavelength 6400 Å in air has a wavelength of 4000 Å in glass. If the

wavelength of violet light in air is 4400 Å, then the wavelength in glass is

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10. The magnetic moment of a magnet of dimensions $4cm * 2cm * 1.25cm$ is $3Am^2$ what is the intensity of magnetisation ?

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11. An A.C. circuit consists of inductor of inductance $125mH$ connected in parallel with a capacitor of capacity $50\mu F$. Determine the resonant frequency.

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12. Calculate the de Broglie wavelength of an electron moving with $1/3rd$ of the speed of light in vacuum.

(Neglect relativistic effect)

(Planck's constant : $h = 6.63 \times 10^{-34} Js$, Mass of electron : $m = 9.11 \times 10^{-28} g$)

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13. If numerical aperture of a microscope is increased, then its

A. resolving power decreases

B. limit of resolution decreases

C. resolving power remains constant

D. limit of resolution increases

Answer:

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14. A solenoid of 2.5 m length and 2.0 cm diameter possesses 10 turns per cm. A current of 0.5 A is flowing through it . The magnetic induction at axis inside the solenoid is

A. $\pi \times 10^{-5} T$

B. $2\pi \times 10^{-5} T$

C. $3\pi \times 10^{-5} T$

D. $4\pi \times 10^{-5}T$

Answer:

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15. Kirchhoffs voltage law and current law are respectively in accordance with the conservation of

A. charge and momentum

B. charge and energy

C. energy and charge

D. energy and momentum

Answer:

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16. When radiations of wavelength λ_1 and λ_2 are incident on certain photosensitive material, the energies of electron ejected ar E_1 and E_2 respectively, such that $E_1 > E_2$,

Then Planck's constant 'h' is (C = velocity of light)

A. $\frac{(E_1 - E_2)(\lambda_1 - \lambda_2)}{c(\lambda_1 \cdot \lambda_2)}$

B. $\frac{(E_1 - E_2)\lambda_1 c}{(\lambda_1 - \lambda_2)\lambda_2}$

C. $\frac{(E_1 - E_2)\lambda_1 \lambda_2}{c(\lambda_2 - \lambda_1)}$

D. $\frac{(\lambda_2 - \lambda_1)c}{(E_1 - E_2)\lambda_1 \cdot \lambda_2}$

Answer:

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17. Colour of light emitted by LED depends upon

A. its forward bias

B. its reverse bias

C. the band gap of the material of semicondutor

D. its size

Answer:

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18. Line of sight propagation is also called _____propagation

A. sky wave

B. ground wave

C. sound wave

D. space wave

Answer:

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19. Two parallel plates separated by distance d are kept at potential difference V volt. A charge q of mass m enters in parallel plates with some velocity. The acceleration of the charge particle will be

A. $\frac{qV}{dm}$

B. $\frac{dm}{qV}$

C. $\frac{qm}{dV}$

D. $\frac{dV}{qm}$

Answer:

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20. Explain the phenomenon of self induction and mutual induction. Define coefficient of self induction and mutual induction. Write the SI unit and dimensions of coefficient of self induction.

A potentiometer wire has a length of $4m$ and a resistance of 5Ω. What resistance should be connected in series with a potentiomete-wire and a cell of e.m.f. $2V$ having internal

resistance 1Ω to get a potential gradient of $10^{-3}V/cm$?

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21. Derive an expression for the total energy of electron in n^{th} Bohr orbit. Hence show that energy of the electron is inversely proportional to the square of principal quantum number. Also define binding energy. The photoelectric threshold wavelength of a metal is is $230nm$. Determine the maximum

kinetic energy in joule and in eV of the ejected electron for the metal surface when it is exposed to a radiation of wavelength $180nm$.

[Plank's constant: $h = 6.63 \times 10^{-34} Js$, Velocity of light: $c = 3 \times 10^{8} m/s$]

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