



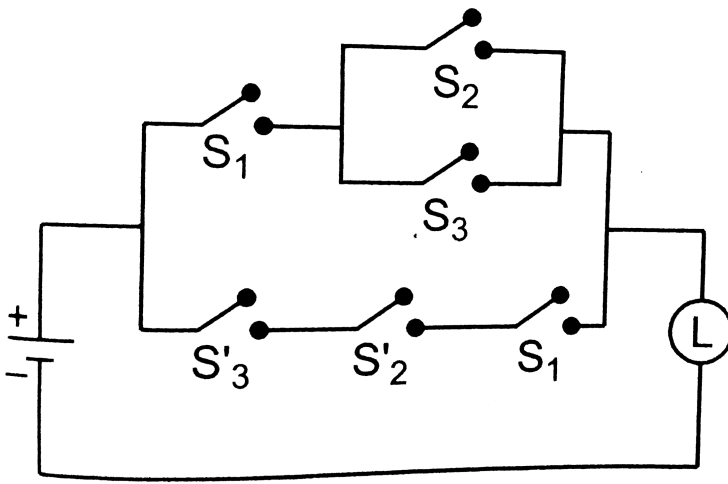
PHYSICS

BOOKS - GURUKUL BOOKS & PACKAGING PHYSICS (HINGLISH)

OCTOBER 2015

Section I

1. Construct the simplified circuit for the following circuit :



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Section 1

1. State an expression for the moment of inertia of a solid uniform disc rotating about an axis passing through its centre,

perpendicular to its plane. Hence derive an expression for the moment of inertia and radius of gyration.

(i) about a tangent in the plane of the disc,
and

(ii) about a tangent perpendicular to the plane of the disc. In a set, 21 tuning forks are arranged in a series of decreasing frequencies. Each tuning fork produces 4 beats per second with the preceding fork. If the first fork is an octave of the last fork, find the frequencies of the first and tenth forks.

2. Discuss the composition of two S.H.M.s along the same path having same period. Find the resultant amplitude and initial phase.

A sonometer wire is in unison with a tuning fork of frequency 125Hz when it is stretched by a weight. When the weight is completely immersed in water, 8 beats are heard per second. Find the sepecific gravity of the material of the weight.



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3. Which of the following substance is ductile ?

A. Glass

B. High carbon steel

C. Steel

D. Copper

Answer:



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4. The angle of contact for pure water and clean glass surface is

A. acute

B. obtuse

C. 90°

D. 0°

Answer:



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5. A seconds pendulum is suspended in an elevator moving with constant speed in downward direction. The periodic time (T) of that pendulum is

- A. less than two seconds
- B. equal to two seconds
- C. greater than two seconds
- D. very much greater than two seconds

Answer:



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6. The equation of a progressive wave is $y = 7 \sin(4t - 0.02x)$, where x and y are in cm time in second. The maximum velocity of a particle is.....

A. $28\text{cm} / \text{s}$

B. $32\text{cm} / \text{s}$

C. $49\text{cm} / \text{s}$

D. $112\text{cm} / \text{s}$

Answer:



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7. Dimensions of emissive power are

A. $[M^1 L^{-2} T^{-3}]$

B. $[M^1 L^2 T^{-3}]$

C. $[M^1 L^0 T^{-3}]$

D. $[M^1 L^0 T^{-2}]$

Answer:



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8. The pressure of an ideal gas is written as

$$p = \frac{2E}{3V}. \text{Here } E \text{ refers to}$$

- A. translational kinetic
- B. rotational kinetic
- C. vibrational kinetic
- D. inversely proportional to pressure

Answer:



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9. The fundamental frequency of transverse vibration of a stretched string of radius r is proportional to

A. r^{-2}

B. r^{-1}

C. $r - \left(\frac{1}{2}\right)$

D. r^2

Answer:



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10. Draw a neat labelled diagram of conical pendulum. State the expression for its periodic time in terms of length.



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11. A raindrop of diameter 4mm is about to fall on the ground. Calculate the pressure inside the raindrop. [Surface tension of water $T = 0.072\text{N/m}$, atmospheric pressure $= 1.013 \times 10^5\text{N/m}^2$]



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12. Discuss the weightlessness experienced by an astronaut in an orbiting satellite.



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13. The periodic time of a linear harmonic oscillator is 2π second, with maximum displacement of 1cm . If the particle starts from extreme position, find the displacement of the particle after $\frac{\pi}{3}$ seconds.



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14. State and prove : Law of conservation of angular momentum.



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15. A pinhole is made in a hollow sphere of radius 5cm whose inner wall is at temperature 727°C . Find the power radiated per unit area.

[Stefan's constant $\sigma = 5.7 \times 10^{-8} \text{J}/\text{m}^2\text{sK}^4$,
emissivity (e) = 0.2]



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16. Draw a neat labelled diagram showing forces acting on the meniscus of water in a capillary tube.



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17. Compute the temperature at which the r.m.s speed of nitrogen molecules is 832m/s .

[Universal gas constant, $R = 8320J/k$ mole
 K , molecular weight of nitrogen = 28.]



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18. Discuss the behaviour of wire under increasing load .



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19. Determine the binding energy of satellite of mass $1000kg$ revolving in a circular orbit

around the Earth when it is close to the surface of Earth. Hence find kinetic energy and potential energy of the satellite.

[Mass of Earth = $6 \times 10^{24} \text{ kg}$, radius of Earth = 6400 km , gravitational constant $G = 6.67 \times 10^{-11} \text{ Nm}^2 / \text{kg}^2$]



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20. Show that all harmonics are present on a stretched string between two rigid supports.



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21. A stone of mass 100 g attached to a string of length 50 cm is whirled in a vertical circle by giving it a velocity of 7 m/s at the lowest point. Find the velocity at the highest point .



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Section 2

1. Obtain an expression for average power dissipated in a purely resistive $A.C.$ circuit.

Define power factor of the circuit and state its value for purely resistive $A.C.$ circuit.

A rectangular coil of a moving coil galvanometer contains 50 turns each having area 12cm^2 . It is suspended in radial magnetic field $0.025\text{Wb}/\text{m}^2$ by a fibre of twist constant $15 \times 10^{-10}\text{N} - \text{m}/\text{degree}$. Calculate the sensitivity of the moving coil galvanometer.



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2. State Bohr's third postulate for hydrogen (H_2 atom. Derive Bohr's formula for the wave number.

Obtain expressions for longest and shortest wavelength of spectral lines in ultraviolet region for hydrogen atom. The photoelectric current in a photoelectric cell can be reduced to zero by a stopping potential of 1.8 volt. Monochromatic light of wavelength 2200\AA is incident on the cathode. Find the maximum kinetic energy of the photoelectrons in joules.

[Charge on electron = $1.6 \times 10^{-19}C$]



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3. Which one of the following particles cannot be accelerated by a cyclotron ?

A. Electrons

B. Protons

C. Deuterons

D. α -particles

Answer:



4. In biprism experiment two interfering waves are produced due to division of

A. amplitude

B. wavefront

C. amplitude and wavefront

D. neither wavefront nor amplitude

Answer:



5. The output of a two input NOR gate is in state 1 when :-

- A. all inputs are high
- B. all inputs are low
- C. only one of its inputs is high
- D. onle one of its inputs is low

Answer:



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6. Light of a certain wavelength has a wave number \bar{v} in vacuum. Its wave number in a medium of refractive index n is

A. $\frac{n}{v}$

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

C. $\frac{\bar{v}}{n}$

D. $n \bar{v}$

Answer:



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7. If the radius of a sphere is doubled without changing the charge on it, then electric flux originating from the sphere is..... .

A. double

B. half

C. same

D. zero

Answer:



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8. The momentum of a photon of de Broglie wavelength 5000\AA is

[Plank's constant = $6.63 \times 10^{-34} J \cdot s$]

A. $1.326 \times 10^{-28} kg - m / s$

B. $7.54 \times 10^{-28} kg - m / s$

C. $1.326 \times 10^{-27} kg - m / s$

D. $7.54 \times 10^{-27} kg - m / s$

Answer:



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9. Ionosphere mainly consists of..... .

A. positive ions and electrons

B. water vapour and smoke

C. ozone layer

D. dust particles

Answer:



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10. State any 'two' possible sources of errors in meter-bridge experiment. How can they be minimised?



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11. A potentiometer wire has resistance of per unit length of $0.1\Omega/m$. A cell of e.m.f. $1.5V$ balances against $300cm$ length of the wire. Find the current in the potentiometer wire.



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12. Give any 'two' points of differences between diamagnetic and ferromagnetic substances.



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13. An iron rod of area of cross-section 0.1m^2 is subjected to a magnetising field of $1000\text{A} / \text{m}$. Calculate the magnetic permeability of the iron rod.

[Magnetic susceptotibility of iron = 59.9,

magnetic permeability of vacuum

$$= 4\pi \times 10^{-7} \text{ S.I. unit]$$



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14. Draw a neat labelled circuit diagram of experimental arrangement for study of photoelectric effect.



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15. A coil of 100 turns, each of area $0.02m^2$ is kept in a uniform field of induction 3.5×10^{-5} T. If the coil rotates with a speed of $6000r.p.m.$ about an axis in the plane of the coil and perpendicular to the magnetic induction, calculate peak value of e.m.f. induced in the coil



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16. Define modulation and transducer.





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17. In a biprism experiment, when a convex lens was placed between the biprism and eyepiece at a distance of 30cm from the slit, the virtual images of the slits are found to be separated by 7mm . If the distance between the slit and biprism is 10cm and between the biprism and eyepiece is 80cm , find the linear magnification of the image.



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18. With the help of a neat circuit diagram, explain the working of a photodiode. State its any'two uses.



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19. A parallel beam of monochromatic light is incident on a glass slab at an angle of incidence 60° . Find the ratio of width of the beam in the glass to that in the air if refractive index of glass is $3/2$.



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20. With the help of neat diagrams, explain how the nonpolar dielectric material is polarised in external electric field of increasing intensity. Define polarisation in dielectrics.



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21. In a single slit diffraction pattern, the distance between first minima on the right and first minima on the left of central

maximum is 4mm . The screen on which the pattern is displaced is 2m from the slit and wavelength of light used is 6000\AA . Calculate width of the slit and width of the central maximum.



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