



# PHYSICS

## BOOKS - GURUKUL BOOKS & PACKAGING PHYSICS (HINGLISH)

JULY 2017

### Section I

1. If the angular speed of the Earth is  $7.26 \times 10^{-5}$  rad/s and radius of the Earth is

6,400 km, calculate the change in weight of 1 kg of mass taken from equator to pole.



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2. A small body of mass 0.3 kg oscillates in vertical plane with the help of a string 0.5 m long with a constant speed of 2 m/s. It makes an angle of  $60^\circ$  with the vertical. Calculate tension in the string  $\left(g = 9.8 \frac{m}{s^2}\right)$ .



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3. Two soap bubbles have radii in the ratio of 4:3 . What is the ratio of work done to blow these bubbles ?



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4. At what temperature will average kinetic energy of gas be exactly half of its value at N.T.P. ?



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5. Explain Surface Tension and surface energy.



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6. Prove that  $g_h = g \left( 1 - \frac{2h}{R} \right)$ , where  $g_h$  is the acceleration due to gravity at altitude  $h$  and  $h \ll R$  ( $R$  is the radius of the Earth).



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7. Explain the physical significance of moment of inertia and radius of gyration.



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8. Draw neat, labelled diagram showing different forces acting on a vehicle moving along a banked road.



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9. Prove Kirchhoff's law of radiation theoretically.



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10. A wire fixed at the upper end stretches by length  $l$  by applying a force  $F$ . The work done in stretching is



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**11.** A set of 31 tuning forks is arranged in series of decreasing frequency. Each fork gives 6 beats/sec. with the preceding one. The first fork is the octave of the last. The frequency of the last tuning fork is



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**12.** A uniform solid sphere has radius 0.2 m and density  $8 \times 10^3 \text{ kg/m}^2$ . Find the moment

of inertia about the tangent to its surface.

$$(\pi = 3.142)$$



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## Others

1. Define linear simple harmonic motion.

Assuming the expression for displacement of a particle starting from extreme position, explain graphically the variation of velocity and acceleration w.r.t. time.



A clock regulated by seconds pendulum, keeps correct time. During summer, length of pendulum increases to 1.005 m. How much will the clock gain or lose in one day ( $g = 9.8 \text{ m/s}^2$  and  $\pi = 3.142$ ).



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2. Discuss different modes of vibrations in an air column of a pipe open at both the ends. State the cause of end correction. Find the end correction for the pipe open at both the

ends in fundamental mode.

What should be tension applied to a wire of length 1m and mass 10 g, if it has to vibrate with fundamental frequency of 50 Hz?



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3. A body of mass 'm' performs uniform circular motion along a circular path of radius 'r' with velocity 'v'. If its angular momentum is L, then the centripetal force acting on it is \_\_\_\_\_

A.  $\frac{mL^2}{r^3}$

B.  $\frac{L^2}{mr}$

C.  $\frac{L^2}{mr^2}$

D.  $\frac{L^2}{mr^3}$

**Answer: B::C**



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4. If the Earth losses its gravity, then for a body

A. both mass and weight become zero

B. neither mass nor weight become zero

C. weight become zero but not the mass

D. mass becomes zero but not the weight

**Answer: A::B::C**



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5. If a rigid body of radius 'R' starts from rest and rolls down an inclined plane of inclination  $\theta$  then linear acceleration of body rolling down the plane is \_\_\_\_\_

A.  $\frac{g \sin \theta}{1 + \frac{K}{R}}$

B.  $g \sin \theta \left( 1 + \frac{K}{R} \right)$

C.  $\frac{g \sin \theta}{1 + \frac{K}{R^2}}$

D.  $g \sin \theta \left( 1 + \frac{K^2}{R^2} \right)$

**Answer: A::B**



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6. 1000 tiny mercury droplets coalesce to form a bigger drop .In this process , the

temperature of the drop

A. increases

B. may increase or decrease

C. decreases

D. does not change

**Answer: A::C**



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7. Doppler effect is not applicable

A. source and observer are at rest

B. there is a relative motion between  
source and observer

C. both are moving in opposite directions

D. both are moving same direction with  
different velocities

**Answer: A::B::C::D**



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8. If the total kinetic energy per unit volume of gas enclosed in a container is  $E$ , the pressure exerted by the gas is \_\_\_\_.

A.  $E$

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

C.  $\sqrt{3}E$

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

**Answer: B::C**



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9. A and B are two wire. The radius of A is twice that of B. If they are stretched by the same load, then the stress on B is

A. equal to that of A

B. half that of A

C. two times that of A

D. four times that of A

**Answer: D**



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10.  ${}_{90}\text{Th}^{232} \rightarrow {}_{82}\text{Pb}^{208}$ . The number of  $\alpha$  and  $\beta$  - particles emitted during the above reaction is



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11. If the work function of a metal is 3 eV, calculate the threshold wavelength of that metal.

(Velocity of light =  $3 \times 10^8 \text{ m/s}$  Planck's

constant=

$$6.63 \times 10^{-34} \text{ J} \cdot \text{s}, 1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$$



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**12.** Three capacitors of capacities  $8\mu\text{F}$ ,  $8\mu\text{F}$  and  $4\mu\text{F}$  are connected in a series and a potential difference of 120 volt is maintained across the combination. Calculate the charge on capacitor of capacity  $4\mu\text{F}$ .



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**13.** If the total energy of radiation of frequency  $10^{14} \text{ Hz}$  is  $6.63 \text{ J}$ , calculate the number of photons in the radiation.

(Planck's constant =  $6.63 \times 10^{-34} \text{ J} \cdot \text{s}$ ).



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**14.** Distinguish between diamagnetic and paramagnetic substances.



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**15.** Draw a neat, labelled diagram showing different layers of the Earth's atmosphere.



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**16.** Plane wavefront can be obtained from



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**17.** The expression for electric field intensity at a points outside uniformly charged thin plane

sheet is (where,  $d$  is the distance of point from plane sheet)



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**18.** Draw the circuit diagram for studying the characteristics of a transistor in common emitter configuration. Explain briefly and show how input and output characteristics are drawn.



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**19.** Obtain an expression for magnetic induction along the axis of toroid on the basis of Ampere's circuital law.



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**20.** When a resistance of 12 ohm is connected across a cell, its terminal potential difference is balanced by 120 cm length of potentiometer wire. When the resistance of 18 ohm is connected across the same cell, the balancing length is 150 cm. Find the balancing length

when the cell is in open circuit. Also calculate the internal resistance of the cell.



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**21.** Find the ratio of longest wavelength in Paschen series to shortest wavelength in Balmer series.



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22. State the principle of working of transformer. Explain the construction and working of a transformer. Derive an expression for e.m.f. and current in terms of ratio. Find the magnetization of a bar magnet of length 10 cm and cross-sectional area  $4\text{cm}^2$ , if the magnetic moment is  $2\text{Am}^2$ .



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**23.** Obtain an expression for path difference and fringe width of interference pattern in Young's double slit experiment. Show that the fringe width is same for consecutive bright and dark bands.

The refractive indices of glass and water w.r.t. air are  $\frac{3}{2}$  and  $\frac{4}{3}$  respectively. Determine the refractive index of glass w.r.t. water.



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24. The logic gate which produces LOW output when any one of the input is LOW and produces HIGH output only when all of its inputs are HIGH is called\_\_\_\_\_

A. AND gate

B. OR gate

C. NOR gate

D. NAND gate

**Answer: A**



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25. For efficient transmission, transmitting antenna has length comparable to

- A.  $\lambda$  of frequency used
- B.  $\frac{\lambda}{2}$  of frequency used
- C.  $\frac{\lambda}{3}$  of frequency used
- D.  $\frac{\lambda}{4}$  of frequency used

**Answer: A::C::D**



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26. Cyclotron can not accelerate \_\_\_\_\_.

A. protons

B. neutrons

C.  $\alpha$ -particles

D. deuterons

**Answer:**



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27. In series LCR circuit, the phase angle between supply voltage and current is

A.  $\pi rad$

B.  $\frac{\pi}{2} rad$

C.  $\frac{\pi}{4} rad$

D. zero rad

**Answer: A::D**



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**28.** The small error in Meter Bridge experiment due to end resistance will be eliminated by \_\_\_\_\_

A. by connecting both the resistance only in one gap.

B. by interchanging the positions of known and unknown resistances.

C. by using uniform wire

D. by obtaining the null point near the ends of the

**Answer: A::B::C::D**



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**29.** The ratio of kinetic energy of an electron in Bohr's orbit to its total energy in the same orbit is \_\_\_\_\_

A.  $-1$

B.  $2$

C.  $\frac{1}{2}$

D.  $-0.5$



**Answer: A**



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**30.** Using monochromatic light of wavelength  $\lambda$  in Young's double slit experiment, the eleventh dark fringe is obtained on the screen for a phase difference of \_\_\_\_\_.

A.  $\frac{11}{2}\pi rad$

B.  $\frac{21}{2}\pi rad$

C.  $13\pi rad$

D.  $21\pi rad$

**Answer: A::B::D**



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