PHYSICS

BOOKS - NAVBODH PHYSICS (HINGLISH)

MULTIPLE CHOICE QUESTIONS

Circular Motion

1. Find the angular speed of the minute hand of a clock.

A. $\frac{\pi}{60}$ rad

B. $\frac{\pi}{30}$ rad

C. $\frac{\pi}{360}$ rad

D. 2π rad

Answer: B

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2. Two cars, A and B, take the same time to go round around two concentric circular tracks of radii r_1 and r_2, respectively. If $r_2 = 4r_1$, the ratio of the angular speed of car A to that of car B is

A. 4

B. 2

C. 1

D. $\frac{1}{4}$

Answer: C

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3. A particle moves in a circle of radius R. In half the period of revolution its displacement is ..... and distance covered is ..... .

A. πr

B. $2r$

C. π

D. r

Answer: B

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4. The length of a seconds hand in watch is $1cm$. The change in velocity of its tip in $15s$ is

A. $\frac{\pi}{15} cm / s$

B. $\frac{\pi}{15\sqrt{2}} cm/s$

C. $\frac{\pi}{\sqrt{15}} cm/s$

D. $\frac{\pi}{\sqrt{2}} cm/s$

Answer: B

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5. The centripetal force acting on a particle in UCM is proportional to

A. T^2

B. T^{-2}

C. f^{-2}

D. ω

Answer: B

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6. For a conical pendulum of string length L, its angular speed is proportional to

A. $\sqrt{L}$

B. L

C. $\frac{1}{\sqrt{L}}$

D. $\frac{1}{L}$

Answer: C

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7. A body is mass m is rotating in a vertical circle of radius 'r' with critical speed. The difference in its $K.E$ at the top and at the bottom is

A. $\frac{9}{2}$ mgr

B. 6 mgr

C. 4 mgr

D. 2 mgr

Answer: D

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Gravitation

1. The dimensions of universal gravitational constant are :-

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

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

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

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

Answer: C

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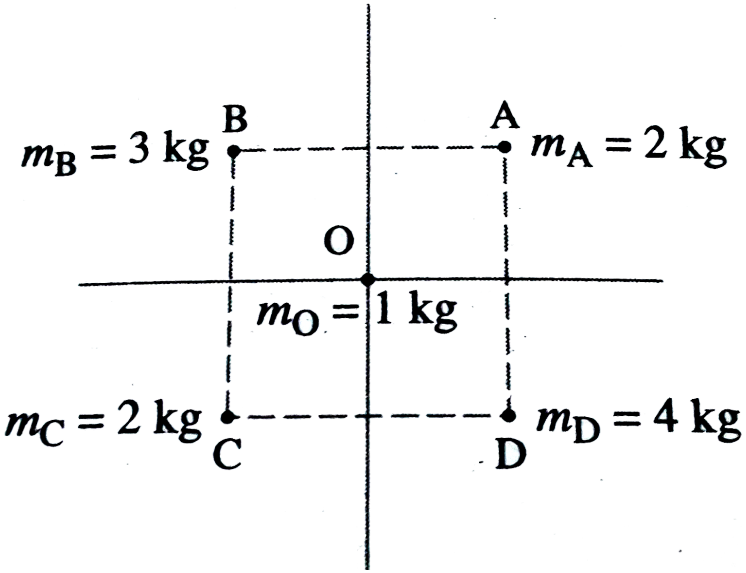
2. Four particles of masses 2 kg, 3 kg, 2 kg and 4 kg are at the corners of a square of diagonal 4 m, as shown. The net gravitational force on a particle of mass 1 kg at the centre of the square is [

Take $G = \frac{20}{3} \times 10^{-11}$ SI units, pN $\equiv$ piconewton



A. $\frac{5}{3} pN$

B. $\frac{5}{6} pN$

C. $\frac{50}{6} pN$

D. $\frac{50}{3}$ pN.

Answer: D

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3. The period of revolution of a satellite in a low-altitude circular orbit around a spherical planet of uniform density ρ is

A. $\sqrt{\frac{3\pi}{\rho G}}$

B. $\sqrt{\frac{\rho G}{3\pi}}$

C. $\sqrt{\frac{\pi G}{3\rho}}$

D. $\sqrt{\frac{3G}{\rho\pi}}$

Answer: A

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4. Kepler's law of periods is also known as

A. the law of elliptical orbit

B. the law of orbit

C. the harmonic law

D. the law of isochronism

Answer: C

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5. The acceleration due to gravity on the Earth's surface is about 6 times that on the Moon. The radius of the Moon is nearly $\frac{4}{18}$ times that of the Earth. The ratio of the binding energy of a body at rest on the Earth's surface to that on the Moon's surface is about

A. $\frac{5}{3}$

B. `(108)/(4)

C. $\frac{5}{108}$

D. $\frac{3}{5}$

Answer: B

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6. The acceleration due to gravity is g at a point distant r from the centre of earth of radius R. If $r < R$, then

A. $1/r$

B. $1/r^2$

C. r

D. r^2

Answer: C

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7. The total energy of a satellite of mass m orbiting with a critical orbital speed v is

A. $-mv^2$

B. $-\frac{1}{2}mv^2$

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

D. mv^2

Answer: B

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8. The escape speed of a body from the surface of the Earth is

A. $2R\sqrt{\frac{2\pi\rho G}{3}}$

B. $2R\sqrt{\frac{\pi\rho G}{3}}$

C. $R\sqrt{\frac{2\pi\rho G}{3}}$

D. $\sqrt{\frac{GM}{R}}$

Answer: A

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Rotational Motion

1. For a body rotating with constant angular velcoity, its kinetic energy is directly proportional to the square of its

A. frequency of rotation

B. rotational period

C. radius of gyration

D. both (a) and (c)

Answer: D

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2. A rigid body of radius R and radius of gyration k rolls without slipping along a horizontal plane. Then, the ratio of its rotational energy to total energy is

A. $\frac{k^2}{R^2}$

B. $\frac{k^2}{k^2+R^2}$

C. $\frac{R^2}{k^2}$

D. $\frac{R^2}{k^2+R^2}$

Answer: B

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3. A block slides down a plane. Inclined at 30° to the horizontal, with an acceleration a. A disc rolling without slipping down the same inclined plane would have an acceleration

A. $\frac{1}{3}$ a

B. $\frac{1}{2}$ a

C. $\frac{2}{3}$ a

D. $\frac{5}{7}$ a

Answer: C

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4. A plane srface is inclined at an angle θ. A cube slides down the plane and a solid sphere rolls down the plane without slipping. The ratio of the acceleration of the cube to that of the sphere is

A. 1

B. $\frac{5}{2}$

C. $\frac{7}{2}$

D. $\frac{2}{7}$

Answer: C

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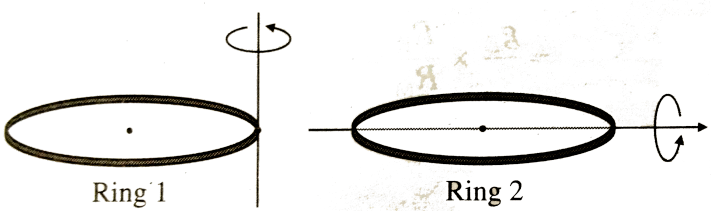
5. Two identical rings, 1 and 2 are rotated about a transverse tangent and a diameter as shown by applying torques τ_1 and τ_2, respectively. If they have the same (in magnitude) angular accelerations.



A. $\tau_1 = 4\tau_2$

B. $\tau_1 = 2\tau_2$

C. $\tau_1 = \tau_2$

D. $4\tau_1 = \tau_2$

Answer: A

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6. A ring of radius R rotates about its diameter while a disc of the same radius rotates about the transeverse axis through its centre. The respective radii of gyrations are

A. in the ratio of their masses

B. in the inverse ratio of their masses

C. both equal to $\sqrt{2}R$

D. both equal to $\frac{R}{\sqrt{2}}$

Answer: D

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7. A torque of $160N \cdot m$ is applid to a flywheel initially at rest. If the flywheel acquires kinetic energy of 8 kJ in 5 s, its angular momentum at the end of 5 s is

A. 10 SI units

B. 32 SI units

C. 50 SI units

D. 800 SI units

Answer: D

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Oscillations

1. If the maximum speed of a SHO is πms^{-1}. Its average speed during one oscillations is

A. $\frac{\pi}{2} m/s$

B. $\frac{\pi}{4} m/s$

C. $2m/s$

D. zero

Answer: C

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2. The potential energy of a particle of mass m free to move along the x-axis is given by $U = (1/2)kx^2$ for $x < 0$ and $U = 0$ for $x \geq 0$ (x denotes the x-coordinate of the particle and k is a positive constant). If the total mechanical energy of the particle is E, then its speed at $x = -\sqrt{2E/k}$ is

A. $\sqrt{\frac{2E}{k}}$

B. $\sqrt{\frac{k}{m}}$

C. $\sqrt{\frac{2E}{m}}$

D. $\sqrt{\frac{2kE}{m}}$

Answer: A

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3. A body of mass 2 g performs linear SHM. If the restoring force acting on it is 3 N when it 0.06 m from the mean position, the period of the SHM is

A. 0.2 s

B. $0.4\pi s$

C. 5 s

D. $5\pi s$

Answer: B

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4. A uniform solid bar of wood floats vertically in water with 10 cm of its height immersed in the water. When it is slightly depressed and released, it oscillates with a frequency of

A. $\frac{\pi}{7} Hz$

B. $\frac{\sqrt{2\pi}}{7} Hz$

C. $\frac{7}{\pi} Hz$

D. $\frac{7}{\sqrt{2\pi}} Hz$

Answer: D

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5. The ratio of the kinetic to potential energy of a particle in SHM, when its displacement is one-half the amplitude, is

A. $\frac{1}{3}$

B. $\frac{1}{4}$

C. 3

D. 4

Answer: C

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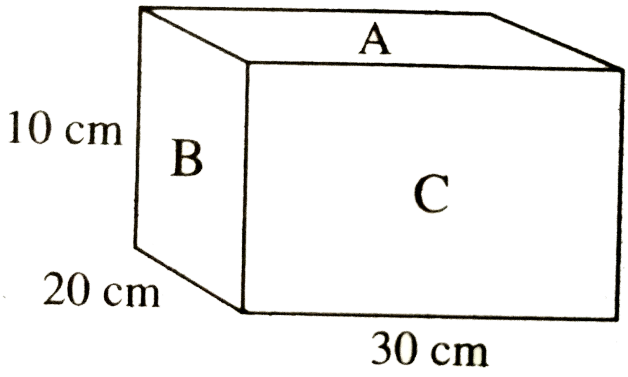
Elasticity

1. A block, resting on the ground, has the dimensions as shown in the diagram. The face which experiences the smallest stress, when the block

rests on that face is



A. face C

B. face A

C. face B

D. all the faces experience the same stress.

Answer: B

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2. For a constant hydraulic stress on an object, the fractional change in the object's volume $\left(\frac{\triangle V}{V}\right)$ and its bulk modulus (b) are related as

A. $\frac{\Delta V}{V} \propto \frac{1}{K}$

B. $\frac{\Delta V}{V} \propto K$

C. $\frac{\Delta V}{V} \propto K^2$

D. $\frac{\Delta V}{V} \propto \frac{1}{K^2}$

Answer: A

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3. A decrease in temperature of $40^{\circ} C$ produces a 0.1 % strain in a wire stretched between two fixed supports. If the area of cross section of the wire is πmm^2 and Young's modulus of its material is 160 GPa, the thermal stress in the wire is

A. 16 Gpa

B. 160 Mpa

C. $160\pi kPa$

D. $160\pi Pa$

Answer: B

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4. The sag δ of a centrally loaded rectangular beam supported at its ends depends on the applied load, the material of the beam and its dimensions (length l, breadth band height h). If Y is Young's modulus of the material of the beam, which of the following is INCORRECT?

A. $\delta \propto \frac{1}{Y}$

B. $\delta \propto b$

C. $\delta \propto \frac{1}{h^3}$

D. $\delta \propto l^3$

Answer: B

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5. The area of cross section of a steel rope used for lifting should be greater than or equal to

A. $\frac{\text{factor of safety} \times \text{maximum load}}{\text{Young's modulus of steel}}$

B. $\frac{\text{factor of safety} \times \text{maximum load}}{\text{elastic limit of steel}}$

C. $\frac{\text{maximum load}}{\text{elastic limit of steel}}$

D. $\frac{\text{maximum load}}{\text{Young's modulus of steel}}$

Answer: B

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Surface Tension

1. If for a liquid in a vessel, the force of cohesion is more than the force of adhesion,

A. the liquid does not wet the solid

B. the liquid wets the solid

C. the surface of the liquid is plane

D. the angle of contact is zero

Answer: A

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2. A drop of water of radius 4 mm splits into droplets such that the mcrease in surface area is $\frac{300}{\pi}$ times the surface area of the original drop. The increase in surface energy is

[Surface tension of water = 0.07 N/m]

A. $1.344\mu J$

B. $336\mu J$

C. $1.344mJ$

D. $336mJ$

Answer: C

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3. Angle of contact of a liquid with a solid depends on

A. It is independent of the gas above the free surface of the liquid.

B. It is independent of the inclination of the solid to the liquid surface.

C. It depends upon the nature of the liquid and solid in contact.

D. It depends upon the temperature and purity of the liquid.

Answer: A

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4. A small air bubble of radius r in water is at a depth h $(r << h)$. If P_o is the atmospheric pressure, ρ is the density of water and T is the

surface tension of water, the excess pressure inside the bubble over the pressure outside it is

A. $\rho gh + \frac{4T}{r}$

B. $\frac{4T}{r}$

C. $\frac{2T}{r}$

D. $\rho gh + \frac{2T}{r}$

Answer: C

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5. An air bubble just inside a soap solution and a soap bubble blown using the same solution have the same radii. The ratio of the excess pressure inside the air bubble to that inside the soap bubble is

A. $1:4$

B. $1:2$

C. $2:1$

D. $4:1$

Answer: B

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6. The force due to surface tension in a capillary tube supports a liquid column of weight $48\pi\mu N$. If the surface tension of the liquid. is 0.04 N/m and the angle of contact is 0°, the diameter of the capillary tube is

A. 0.6 mm

B. 1.2 mm

C. 6 mm

D. 12 mm

Answer: B

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Wave Motion

1. Two particles in the path of a wave of frequency 2000 Hz are 6 cm apart and differ in phase by 120°. The velocity of the wave is

A. $90m/s$

B. $360m/s$

C. $360\pi m/s$

D. $160m/s$

Answer: B

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2. When a longitudinal wave is reflected from a rarer medium, the phase change produced is

A. zero rad

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

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

D. π rad

Answer: A

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3. Quincke's tube is used

A. to demonstrate Doppler effect

B. to determine the wavelength of a sound wave

C. to demonstrate the interference of two sound waves

D. for both (a) and (c).

Answer: D

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4. Beats are the result of

A. the beat frequency

B. the average frequency

C. half the beat frequency

D. double the beat frequency.

Answer: C

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5. Two sound waves having wave numbers $0.98m^{-1}$ and $1m^{-1}$ when superposed produce 7

beats per second. The speed of sound in air is

A. $330m/s$

B. $350m/s$

C. $357m/s$

D. $500m/s$

Answer: B

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6. The speed of sound in air is v. The velocity of a source of sound whose frequency appears to be

doubled to a stationary observer is

A. $\frac{v}{4}$, towards the observer

B. $\frac{v}{2}$, towards the observer

C. $\frac{v}{4}$, away from the observer

D. $\frac{v}{2}$, away from the observer

Answer: B

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Stationary Waves

1. The displacement of a particle of a medium when a sound wave propagates is represented by y = A cos (ax+ bt). Given that A, a and b are positive constants, the wave speed is

A. b

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

C. $\frac{2\pi}{a}$

D. $\frac{b}{a}$

Answer: D

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2. If Yand ρ are Young's modulus and mass density of the material of a wire, the fundamental frequency of the stretched wire is proportional to

A. $\sqrt{\frac{\rho}{Y}}$

B. $\sqrt{\frac{Y}{\rho}}$

C. $\sqrt{Y\rho}$

D. $\frac{Y}{\sqrt{\rho}}$

Answer: B

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3. The frequency of the second overtone in a pipe open at both ends is n_1. The frequency of the second overtone in a pipe of the same dimensions but closed at one end is n_2. Then,

A. $n_1 = \frac{6}{5}n^2$

B. $n_2 = \frac{6}{5}n_1$

C. $n_1 = \frac{4}{5}n_2$

D. $n_2 = \frac{4}{5}n_1$

Answer: A

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4. A sound wave of frequency 1020 Hz and travelling at $340 m/s$ is reflected from the closed end of a tube. The node adjacent to the closed end is at ..... from the closed end.

A. $\frac{1}{3}m$

B. $\frac{1}{4}m$

C. $\frac{1}{6}m$

D. $\frac{1}{12}m$

Answer: C

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5. Two tuning forks resonate with air columns of lengths 16 cm and 25 cm, respectively. If the lower frequency is 320 Hz then, ignoring end corrections, the frequency of the other fork is

A. 204.8 Hz

B. 256 Hz

C. 400 Hz

D. 500 Hz

Answer: D

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6. Stethoscope was invented by

A. the diaphragm

B. the cymbal

C. the bellow

D. the bell

Answer: D

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Kinetic Theory Of Gases And Radiation

1. If n moles of a gas of molar mass M contains Nmolecules each of mass m_0 and N_A is the Avogadro constant, then N and M are respectively equal to

A. nN_A, m_0N_A

B. $\frac{N_A}{n}, \frac{N_A}{m_0}$

C. $\frac{M}{m_0}, m_0N$

D. $\frac{n}{N_A}, m_0N_A.$

Answer: A

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2. Given that the atomic mass of argon is 10 times that of helium, at what temperature is the rms speed of a helium atom equal to that of an argon atom at $1247^\circ C$?

A. $124.7^\circ C$

B. $-121^\circ C$

C. $-152^\circ C$

D. $-124.7^\circ C$

Answer: B

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3. The temperature at which the energy of an ideal gas will be three times that at $27^\circ C$ is

A. $81^\circ C$

B. $627^\circ C$

C. 627 K

D. $900^\circ C$

Answer: B

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4. The molar heat capacity of a gas at constant pressure is equal to [R $\equiv$ the universal molar gas constant, $\gamma \equiv$ the adiabatic constant]

A. γR

B. $(\gamma - 1)R$

C. $\frac{\gamma}{\gamma - 1}R$

D. $\frac{\gamma - 1}{\gamma}R$

Answer: C

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5. The speed corresponding to the peak of Maxwell-Boltzmann molecular distribution curve is

A. the root-mean-square speed of the gas molecules

B. the speed possessed by the largest number of gas molecules

C. the maximum speed possessed by the gas molecules

D. the average speed of the gas molecules.

Answer: B

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6. In a given process on an ideal gas, $dW = 0$ and $dQ < 0$. Then for the gas

A. the temperature decreases

B. the volume decreases

C. the pressure increases

D. the pressure remains constant.

Answer: A

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7. In one cycle, the working substance in a heat engine absorbs 3000 J from the hot reservoir. If 2250 J are wasted per cycle, the efficiency of the engine is

A. $75\ \%$

B. $50\ \%$

C. $7.5\ \%$

D. $25\ \%$.

Answer: D

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8. In a refrigerator, the external work done on the working substance in one cycle is 20% of the energy extracted from the cold reservoir. The coefficient of performance of the refrigerator is

A. 20

B. 4

C. 2

D. 5

Answer: D

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9. Which of the following materials is diathermanous?

A. Dry air

B. Iron

C. Water vapour

D. Wood

Answer: A

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10. A body cools from $80^\circ C$ to $70^\circ C$ in 5 minutes and to $62^\circ C$ in the next 5 minutes. The ratio of the rates of fall of temperature during the two intervals is

A. $\frac{6}{5}$

B. $\frac{5}{4}$

C. $\frac{25}{6}$

D. $\frac{5}{6}$

Answer: B

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Wave Theory Of Light

1. Huygen's wave theory of light could not explain

A. reflection

B. refraction

C. interference

D. photoelectric effect.

Answer: D

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2. Light of a certain colour has 3000 waves to the millimetre in air. What is its frequency in water?

$$\left[n_{\text{ water }} = \frac{4}{3}, C = 3 \times 10^8 m/s\right]$$

A. $9 \times 10^{11} Hz$

B. $6.75 \times 10^{14} Hz$

C. $9 \times 10^{14} Hz$

D. $12 \times 10^{14} Hz$

Answer: C

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3. The refractive index of glass with respect to water is $\frac{9}{8}$. while that of turpentine with respect to water is $\frac{10}{9}$. The refractive index of glass with respect to turpentine is

A. $\frac{5}{4}$

B. $\frac{81}{80}$

C. $\frac{4}{5}$

D. $\frac{9}{4\sqrt{5}}$

Answer: B

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4. A ray of light passes from vaccume into a medium of refractive index n. if the angle of incidence is twice the angle of refraction, then the angle of incidence is

A. $\cos^{-1} 0.8$

B. $\sin^{-1} 0.8$

C. $2\cos^{-1} 0.8$

D. $2\sin^{-1} 0.8$

Answer: C

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5. .....is used to measure Doppler line broadening.

A. Polaroid

B. Diffraction grating

C. Plasma

D. Herapathite

Answer: B

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Interference And Diffraction

1. In terms of the ratio r of the amplitudes of two coherent waves producing an interference pattern, the ratio of the intensity maximum to intensity minimum in the pattern is

A. $\frac{r+1}{r-1}$

B. $\frac{r-1}{r+1}$

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

D. $\left(\frac{r-1}{r+1}\right)^2$

Answer: C

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2. If the width ratio of the two slits in Young's double slit experiment is 4:1, then the ratio of intensity at the maxima and minima in the interference patternn will be

A. $\frac{221}{21}$

B. $\left(\frac{221}{21}\right)^2$

C. 441

D. 121

Answer: C

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3. In Young's double-slit experiment, a point in the fringe pattern is one-third of the fringe width fr9m the central bright fringe. The phase difference between the interfering waves at the point is

A. $\frac{\pi}{6}$ rad

B. $\frac{\pi}{3}$ rad

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

D. $\frac{2\pi}{3}$ rad

Answer: D

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4. In a biprism experiment, the screen is 1 m away from the two virtual sources which are 1 mm apart. If the source of light having wavelength 6000 Å is replaced by one having wavelength 5500 Å, the fringe width

A. decreases by $50\mu m$

B. increases by $50\mu m$

C. decreases by 0.5 mm

D. increases by 0.5 mm.

Answer: A

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5. In Young's double-slit experiment, if both the slits are covered by a thin transparent sheet of thickness t and refractive index n, the optical path difference between the two interfering waves

A. increases by (n -1) t

B. decrease by (n -1) t

C. changes by $\frac{D}{d}$ (n-1) t

D. is not affected.

Answer: D

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6. The central maximum in the diffraction pattern of a circular aperture is known as

A. the Abbe disc

B. the Airy disc

C. the Poisson spot

D. the Rayleigh spot

Answer: B

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7. When a monochromatic light passes through a slit 0.2 mm wide and falls on a screen 3.5 m away, the first minimum of the diffraction pattern is 9.1 mm from the centre of the central maximum. The wavelength of the light is

A. 2600Å

B. 4000Å

C. 4300Å

D. 5200Å

Answer: D

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8. A monochromatic light of wavelength λ falls on a single slit. The first secondary maximum occurs at 30° if the width of the slit is equal to

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

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

C. λ

D. 2λ.

Answer: B

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9. The formula, $\theta_{\min} = 1.22\lambda / D$ (in the usual notation), for the limit of resolution of a telescope is due to

A. Abbe

B. Airy

C. Fraunhoffer

D. Fresnel

Answer: B

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Electrostatics

1. The electric intensity at a point 1 metre from the centre of a charged spherical conductor of radius 20 cm is $10^5 N/C$. If the conductor is in a medium of permittivity $35.4pF/m$, the surface density of charge on the conductor is

A. $88.5\mu C/m^2$

B. $22.125\mu C/m^2$

C. $14.16\mu C/m^2$

D. $177\mu C/m^2$

Answer: A

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2. A cube of marble, of volume $1cm^3$ and permittivity 75 pF/m, is in an electric field of intensity 200 V/m. The electrostatic energy in the cube is

A. $1.5 \times 10^{-12} J$

B. $1.3275 \times 10^{-11} J$

C. $1.5 \times 10^{-6} J$

D. $1.3275 \times 10^{-5} J$

Answer: A

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3. .....is a polar molecule.

A. N_2

B. H_2

C. NH_3

D. CO_2

Answer: C

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4. The dimensions of electric susceptibility are the same as those of

A. electric polarisation

B. magnetic susceptibility

C. permittivity

D. refractive index.

Answer: C

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5. One farad is equivalent to

A. $1C^2/J$

B. $1J/C$

C. $1J/C^2$

D. $1V/C$

Answer: A

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Current Electricity

1. A resistance of 50Ω is to be prepared using a wire of cross-sectional area $10^{-8}m^2$ and conductivity 2.2×10^6 siemens/metre. The length of the wire required is

A. 22.5 m

B. 11 m

C. 1.1 m

D. 2.2 m.

Answer: C

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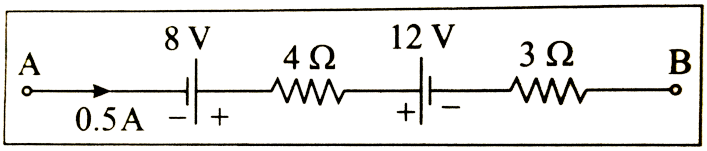
2. The figure shows part of an electric circuit. The potential difference $V_A - V_B$ is



A. 9.0 V

B. 7.5 V

C. 6.0 V

D. 4.5 V.

Answer: B

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3. Two resistors R_1 and R_2 are connected in the left gap and the right gap of a metre bridge, and the null point is obtained at 20 cm from the left. On interchanging the resistors in the two gaps, the null point shifts by

A. 20 cm

B. 40 cm

C. 60 cm

D. 80 cm

Answer: C

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4. Two resistors, X and R, are connected in the left gap and the right gap of a metre bridge, and the null point in obtained at 20 cm from the left end. With $X + 24\Omega$ in the left gap and the same resistance R in the right gap, the null point is at the centre of the wire. Then, X is equal to

A. 4.8Ω

B. 6Ω

C. 8Ω

D. 12Ω

Answer: C

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5. Equal lengths of manganin wire and constantan wire, of equal cross-sectional areas, are connected respectively in the left gap and right gap of a Wheatstone bridge which has a wire 90 cm long. If the null point is obtained at 44 cm from the left end, the ratio of the conductivity of manganin to that of constantan is

A. $\frac{11}{14}$

B. $\frac{14}{11}$

C. $\frac{22}{23}$

D. $\frac{23}{22}$

Answer: D

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6. A Leclanche cell of emf 1.46 V balances against 292 cm of a potentio meter wire. If the current through the wire is 400 mA, the resistance per unit length of the potentiometer wire is

A. $2\Omega / m$

B. $2\Omega / cm$

C. $12.5\Omega / m$

D. $12.5\Omega / cm$

Answer: C

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Magnetic Effect Of Electric Current

1. Ampere's circuital law is the integral form of

A. Lenz's law

B. Faraday's law

C. Biot-Savart's law

D. Coulomb's law.

Answer: C

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2. Magnetic field at a distance r from an infinitely long straight conductor carrying steady varies as

A. $\frac{\mu_0}{4\pi}\frac{2I}{r}$

B. $\frac{\mu_0}{4\pi}\frac{I}{r}$

C. $\frac{\mu_0 I}{\pi r}$

D. $\frac{2\mu_0 I}{\pi r}$

Answer: A

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3. A moving coil galvanometer of resistance G gives full scale deflection for a certain current. The shunt resistance required to convert it to measure a current n times the initial current is about

A. $(n-1)G$

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

C. $\frac{n-1}{G}$

D. nG

Answer: B

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4. Which of the following is the ultimate source of energy

A. the strength of the magnetic field

B. the electric potential difference between the dees

C. the radius R at which the ions leave the cyclotron

D. the mass of the ions.

Answer: B

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Magnetism

1. The gyromagnetic ratio of electron is

A. magnetic moment per unit volume

B. $\frac{\text{magnetic permeability}}{\text{angular momentum}}$

C. specific charge

D. $\frac{\text{magnetization}}{\text{angular momentum}}$

Answer: C

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2. The magnetic moment of a magnet of volume $16cm^3$ is $3.2A \cdot m^2$ The intensity of

magnetization is

A. $2 \times 10^5 A/m$

B. $2 \times 10^5 m/A$

C. $51.2 A/m$

D. $51.2 \times 10^{-6} A/m$

Answer: A

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3. The dimensions of magnetic intensity are

A. [LI]

B. $\left[L^2 I\right]$

C. $\left[L^{-1} I\right]$

D. $\left[L^{-2} I\right]$

Answer: C

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4. MAGNETIC SUSCEPTIBILITY

A. silver

B. platinum

C. mercury

D. sodium chloride.

Answer: B

5. The phenomenon of perfect diamagnetism in superconductors is called

A. the gyromagnetic effect

B. the Meissner effect

C. the Weiss effect

D. saturation magnetization

Answer: B

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Electromagnetic Induction

1. A circular conducting loop of area $100cm^2$ and resistance 3Ω is placed in a magnetic field with its plane perpendicular to the field. If the field is spatially uniform but varies with time t (in second) as $B(t) = 1.5\cos\omega t$ tesla, the peak value of the current in the loop is

A. 3 mA

B. $5\omega mA$

C. $300\omega mA$

D. 500 mA

Answer: B

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2. A step down transformer works on 220 volts a.c. mains. It is used to light a 100 w, 20 V bulb. The main current is 0.5 A. What is the efficiency of the transformer?

A. 99.1%

B. 90.91%

C. 100%

D. 9.091%

Answer: B

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3. An aeroplane, with wingspan 60 m, is flying horizonally due north at 900 km/h at a location where the vertical component of the Earth's

magnetic field is $20\mu T$. The potential difference developed between its wing-tips is

A. 0.03 V

B. 0.052 V

C. 0.3 V

D. 0.52 V.

Answer: C

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4. When the electric flux Φ_e in a region of space, of relative permittivity (dielectric constant) $k = \frac{\varepsilon}{\varepsilon_0}$, varies with time it gives rise to a displacement current given by

A. $\varepsilon \frac{d\Phi_e}{dt}$

B. $\frac{1}{\varepsilon} \frac{d\Phi_e}{dt}$

C. $k \frac{d\Phi_e}{dt}$

D. $\frac{1}{k} \frac{d\Phi_e}{dt}$

Answer: A

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5. A choke coil is preferred to a resistance for reducing current in an ac circuit because .

A. it is cheaper than a resistor

B. it lasts longer than a resistor

C. the resistor may overheat · and melt

D. it brings about a voltage drop with negligible power consumption.

Answer: D

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6. When the magnitude of the current in a pure LC circuit is maximum, the energy is stored in

A. the electric field of the capacitor

B. the electric field of the inductor

C. the magnetic field of the inductor

D. the magnetic field of the capacitor

Answer: C

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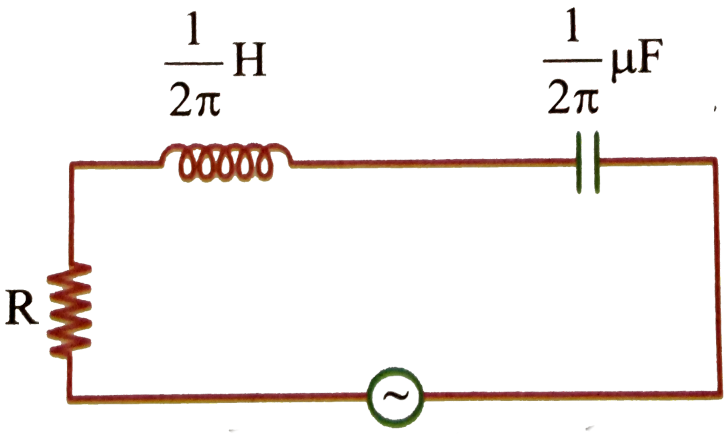
7. In a series LCR circuit



A. the current leads on the emf by $\pi/2$ rad

B. the current lags on the emf by $\pi/2$ rad

C. the current leads on the emf only if the circuit behaves inductively

D. the current leads on the emf only if the circuit behaves capacitively.

Answer: D

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8. In an LC circuit, which of the following has the dimensions of frequency?

A. ZC

B. LC

C. $\frac{L}{Z}$

D. $\frac{Z}{L}$

Answer: D

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9. An acceptor circuit is

A. at the input stage of a radio receiver

B. at the output stage of a radio wave transmitter

C. for parallel resonance

D. to pass direct current.

Answer: A

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Electrons And Photons

1. In photoelectric effect, the electrons are ejected from metals if the incident light has a certain minimum.

A. wavelength

B. frequency

C. amplitude

D. number of photons

Answer: B

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2. Radiation of energy 6.5 eV is incident on a metal surface whose work function is 4.2 eV. What is the potential difference that should be applied to stop the fastest photoelectrons emitted by the metal surface ?

A. 0.15 eV

B. ranging from 0 to 0.15 eV

C. ranging from 0 to 2.25 eV

D. ranging from 2.25 eV to 2.40 eV.

Answer: B

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3. UV radiation of energy 4 eV falls on caesium surface whose photoelectric work function is 1.95 eV. The kinetic energy of the fastest photoelectrons is

A. $3.28 \times 10^{-19} J$

B. $4.88 \times 10^{-19} J$

C. $3.12 \times 10^{-19} J$

D. $6.4 \times 10^{-19} J$

Answer: A

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4. Electrons are ejected from a metallic surface when light with a wavelength of 6250Å is used. If light of wavelength 5250Å is used instead,

A. there will not be any photoemission

B. the photoelectric current will increase

C. the stopping potential will increase

D. the stopping potential will decrease.

Answer: C

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5. In a photoelectric cell, the product of the stopping potential and electronic charge is equal to

A. the momentum of every emitted electron

B. the kinetic energy of every emitted electron

C. the photoelectric work function of the emitter material

D. the maximum kinetic energy that an emitted electron can have.

Answer: D

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6. In the usual notation, the momentum of a photon is

A. hvc

B. $\frac{hv}{c}$

C. $\frac{h\lambda}{c}$

D. $h\lambda c$

Answer: B

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Atoms Molecules And Nuclei

1. Which of the following lines of Balmer series has longest wavelength?

A. H_{δ}

B. H_{γ}

C. H_{β}

D. $H_{\propto}$

Answer: D

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2. The wavelength of the series limit of the Brackett series in the hydrogen spectrum is

[R $\equiv$ the Rydberg constant]

A. $\frac{9}{R}$

B. $\frac{16}{R}$

C. $\frac{25}{R}$

D. $\frac{36}{5R}$

Answer: B

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3. When an X-ray tube is operated with an accelerating potential difference V, the cutoff wavelength is proportional to

A. $\frac{1}{V}$

B. $\sqrt{V}$

C. V

D. V^2

Answer: A

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4. The nuclear radius of $^{179}_{79}$ Au is nearly

A. $1.2\sqrt[3]{79}fm$

B. $1.2\sqrt[3]{118}fm$

C. $1.2\sqrt[3]{197}fm$

D. $2.3\sqrt[3]{79}fm$

Answer: C

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5. The nuclear radius of the sodium nuclide $^{23}_{11}\mathrm{Na}$ is half that of the tungsten nuclide $_{74}\mathrm{W}$. The neutron number of the tungsten nuclide is

A. 82

B. 100

C. 110

D. 184

Answer: C

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6. The half-life of radium is 1600 y. How much of $1\mu g$ of radium will remain undistintegrated after 8000 y?

A. $\frac{1}{28}\mu g$

B. $\frac{1}{16}\mu g$

C. $\frac{1}{32}\mu g$

D. $\frac{1}{64}\mu g$

Answer: C

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7. The de Broglie wavelength of the electron in the hydrogen atom is proportional to [n is the principal quantum number]

A. n

B. n^2

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

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

Answer: A

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Semiconductors

1. In a semiconductor, free electron desnity is about

A. $10^6 / m^3$

B. $10^{17} / m^3$

C. $10^{27} / m^3$

D. $10^{23} / m^3$

Answer: A

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2. When a pn-junction is formed,

A. the electrons combine with the positively charged donor ions

B. the donor and acceptor ions in the depletion region combine with each other.

C. The holes combine with the negatively charged acceptor ions

D. the depletion region is free of mobile charge carriers.

Answer: D

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3. An electronic circuit which converts an alternating voltage into a unidirectional pulsating voltage is called

A. a transistor

B. a rectifier

C. an oscillator

D. a modulator

Answer: B

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4. A photodiode is operated

A. in reverse bias mode

B. in forward bias mode

C. as an unbiased pn-junction

D. with an alternating bias

Answer: A

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5. When a junction transistor is used as an amplifier, its emitter-base junction is

A. unbiased

B. always reverse-biased

C. always forward-biased

D. either forward-biased or reverse-biased.

Answer: C

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6. When used as a switch, a transistor is operated in

A. the cut-off region and active region

B. the cut-off region and saturation region

C. the saturation region and active region

D. the breakdown region and saturation region.

Answer: B

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7. When the load resistance across a solar cell is zero, the current in the external circuit passed by the solar cell is called

A. the open-circuit current

B. the reverse saturation current

C. the short-circuit current

D. the photocurrent.

Answer: C

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Communication Systems

1. The physical medium connecting a transmiter and receiver is called

A. antenna

B. transducer

C. ionosphere

D. channel.

Answer: D

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2. A TV signal, which contains both voice and picture information, is allocated a bandwidth of

A. 4.2 MHz

B. 6 MHz

C. 11 GHz

D. 14 GHz.

Answer: B

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3. Bandwidth of optical fibre communication is

A. ~$20kHz$

B. ~$750MHz$

C. $> 100GHz$

D. $> 1THz.$

Answer: C

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4. The modulation index for an amplitude modulated wave, for which the maximum amplitude is A and the minimum amplitude is B, is

A. $\frac{A}{B}$

B. $\frac{B}{A}$

C. $\frac{A-B}{A+B}$

D. $\frac{A+B}{A-B}$

Answer: C

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5. A demodulator is a part of

A. a transmitter

B. a transducer

C. a receiver

D. a communication channel.

Answer: C

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6. If f c is the critical frequency of radio waves for reflection by the ionosphere and N max is the density of free electrons in the ionosphere

A. $f_c \propto N_{\max}$

B. $f_c \propto \frac{1}{N_{\max}}$

C. $f_c \propto \frac{1}{\sqrt{N_{\max}}}$

D. $f_c \propto \sqrt{N_{\max}}$

Answer: D