KEAM Physics

Sample Paper – 1

Duration: 150 Minutes **Maximum Marks: 480**

Instructions

- This paper contains **120 Multiple Choice Questions** (Single Correct Answer), modelled on **Paper I (Physics)** of the **KEAM** (Kerala Engineering Architecture Medical) entrance examination.
- Each question has **five options** (A, B, C, D, E); only **one** option is correct.
- Each correct answer carries $+4$ **marks**. Each incorrect answer carries -0.5 **marks**. Unattempted questions carry **0 marks**.
- If more than one option is marked, the response is treated as incorrect and attracts -0.5 marks.
- Personal calculators, log tables, mobile phones, and other electronic gadgets are **strictly prohibited**. Rough work must be done only in the space provided in the question booklet.
- Syllabus: **Class XI & XII Physics** (Kerala State Board / NCERT) — Mechanics, Thermodynamics, Waves, Electrostatics, Current Electricity, Magnetism, Optics, Modern Physics, Semiconductors.

Q1. The dimensional formula for velocity gradient (rate of change of velocity with distance) is:

(A) $[M^0L^0T^{-1}]$

(B) $[MLT^{-1}]$

(C) $[M^0L^0T^{-2}]$

(D) $[LT^{-2}]$

(E) $[M^0L^1T^{-1}]$

Q2. The number of significant figures in the measurement 4.0800×10^3 m is:

(A) 3

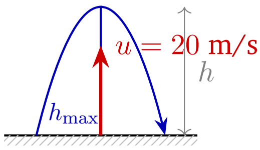
(B) 5

(C) 4

(D) 6

(E) 2

Q3. A ball is thrown vertically upward with an initial speed of 20 m/s. Using the relation $v^2 = u^2 - 2gh$ (take $g = 10$ m/s^2), the maximum height reached by the ball is:



(A) 15 m

(B) 25 m

(C) 20 m

(D) 10 m

(E) 40 m

Q4. Two trains are moving in the **same** direction on parallel tracks. Train A has a speed of 60 km/h and train B has a speed of 90 km/h. The speed of train B relative to train A is:

(A) 150 km/h

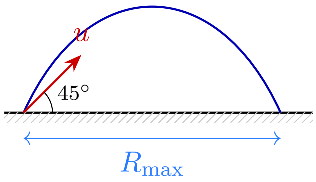
(B) 90 km/h

(C) 60 km/h

(D) 30 km/h

(E) 45 km/h

Q5. A projectile is launched from the ground. The range R of a projectile is given by $R = \dfrac{u^2 \sin 2\theta}{g}$. For an initial speed $u = 20$ m/s and $g = 10$ m/s^2, the maximum possible range (at $\theta = 45°$) is:



(A) 10 m

(B) 20 m

(C) 30 m

(D) 35 m

(E) 40 m

Q6. The time of flight of a projectile is $T = \dfrac{2u \sin\theta}{g}$. For a projectile launched at $\theta = 30°$ with $u = 40$ m/s and $g = 10$ m/s^2, the time of flight is:

(A) 4 s

(B) 2 s

(C) 8 s

(D) 6 s

(E) 3 s

Q7. A stone is swung in a horizontal circle of radius $r = 2$ m at a constant speed of $v = 4$ m/s. The centripetal acceleration of the stone is:

(A) 4 m/s^2

(B) 8 m/s^2

(C) 16 m/s^2

(D) 2 m/s^2

(E) 32 m/s^2

Q8. Which of the following statements about projectile motion is **correct**, assuming no air resistance?

(A) The vertical velocity remains constant throughout the flight

(B) The horizontal acceleration equals g

(C) The horizontal velocity remains constant throughout the flight

(D) The trajectory of the projectile is always a circle

(E) The maximum height depends only on the horizontal component of initial velocity

Q9. A boat can move at a speed of 4 m/s relative to still water. A river is 120 m wide and flows at 3 m/s. The **minimum time** taken for the boat to cross the river (not necessarily straight across) is:

(A) 25 s

(B) 40 s

(C) 50 s

(D) 30 s

(E) 20 s

Q10. A body covers equal distances at speeds $v_1 = 20$ m/s and $v_2 = 30$ m/s. The average speed of the body over the entire journey is:

(A) 25 m/s

(B) 22 m/s

(C) 26 m/s

(D) 20 m/s

(E) 24 m/s

Q11. A body of mass 8 kg is accelerated at 3.5 m/s^2. The net force acting on the body is:

(A) 28 N

(B) 11.5 N

(C) 4.4 N

(D) 22 N

(E) 56 N

Q12. A block of mass 5 kg rests on a flat horizontal surface. The coefficient of static friction between the block and the surface is $\mu_s = 0.4$ (take $g = 10$ m/s^2). The **maximum** static friction force that can act on the block before it slides is:

(A) 10 N

(B) 20 N

(C) 40 N

(D) 0.4 N

(E) 5 N

Q13. In an Atwood machine, two masses $m_1 = 6$ kg and $m_2 = 4$ kg are connected by a light string over a frictionless pulley. Using $g = 10$ m/s^2, the acceleration of the system is:

(A) 1 m/s^2

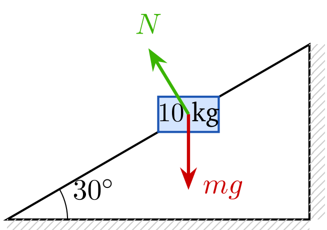
(B) 3 m/s^2

(C) 2 m/s^2

(D) 4 m/s^2

(E) 5 m/s^2

Q14. A block of mass 10 kg rests on a smooth inclined plane of angle 30°. Taking $g = 10$ m/s^2, the normal force exerted by the incline on the block is:



(A) 100 N

(B) 50 N

(C) $100/\sqrt{3}$ N

(D) $50\sqrt{3}$ N

(E) $25\sqrt{3}$ N

Q15. A force of 200 N acts on a body for 0.05 s. The change in linear momentum (impulse) of the body is:

(A) 200 N·s

(B) 4000 N·s

(C) 0.25 N·s

(D) 5 N·s

(E) 10 N·s

Q16. A bus brakes suddenly and decelerates at 5 m/s^2. A passenger of mass 60 kg seated in the bus experiences a pseudo force. The magnitude and direction of this pseudo force (in the ground frame analysis of the passenger's non-inertial experience) is:

(A) 300 N in the forward direction (direction of bus motion)

(B) 300 N opposite to the direction of bus motion

(C) Zero; pseudo forces do not exist

(D) 150 N in the forward direction

(E) 600 N opposite to the direction of bus motion

Q17. A block of mass 4 kg slides on a horizontal surface. If the coefficient of kinetic friction is $\mu_k = 0.3$ (take $g = 10$ m/s^2), the kinetic friction force acting on the block is:

(A) 3 N

(B) 12 N

(C) 1.2 N

(D) 40 N

(E) 4 N

Q18. A constant horizontal force $F = 10$ N is applied to a block on a frictionless surface. The block is displaced $s = 5$ m in the direction of the force. Using $W = F\,s$, the work done by the force on the block is:

(A) 2 J

(B) 10 J

(C) 50 J

(D) 200 J

(E) 25 J

Q19. An engine pulls a car of mass 2000 kg at a constant speed of 20 m/s on a level road. If the coefficient of kinetic friction between the tyres and road is $\mu = 0.1$ (take $g = 10$ m/s^2), the power delivered by the engine is:

(A) 200 W

(B) 4 kW

(C) 400 kW

(D) 40 kW

(E) 4000 W

Q20. In a perfectly elastic collision between two bodies of **equal mass**, one of which is initially at rest, which of the following correctly describes the outcome?

(A) Both masses continue moving with the same speed as the initially moving mass

(B) The first mass stops; the second mass moves at half the initial speed

(C) Both masses move together after collision (perfectly inelastic)

(D) The first mass bounces back with the same speed; the second remains at rest

(E) The first mass stops; the second mass moves with the original speed of the first mass

Q21. A body of mass 5 kg is lifted from the ground to a height of 10 m (take $g = 10$ m/s^2). The increase in gravitational potential energy is:

(A) 500 J

(B) 50 J

(C) 5000 J

(D) 250 J

(E) 100 J

Q22. A force of 25 N acts on a body of mass 5 kg initially at rest and displaces it through 6 m in the direction of the force on a frictionless surface. Using the work-energy theorem, the kinetic energy gained by the body is:

(A) 90 J

(B) 150 J

(C) 30 J

(D) 200 J

(E) 75 J

Q23. The kinetic energy of a body is related to its momentum p by KE $= \frac{p^2}{2m}$. If the momentum of the body is **doubled** while its mass remains unchanged, its kinetic energy becomes:

(A) 2 times the original

(B) $\sqrt{2}$ times the original

(C) 4 times the original

(D) 8 times the original

(E) Unchanged

Q24. The moment of inertia of a solid cylinder about its own axis (axis of symmetry) is $I = \frac{1}{2}MR^2$. For a solid cylinder of mass $M = 4$ kg and radius $R = 0.2$ m, the moment of inertia is:

(A) $0.16\ \text{kg m}^2$

(B) $0.04\ \text{kg m}^2$

(C) $0.4\ \text{kg m}^2$

(D) $0.08\ \text{kg m}^2$

(E) $0.02\ \text{kg m}^2$

Q25. A spinning skater has arms extended to a radius of $R = 1$ m and rotates with angular velocity ω. When she pulls her arms to a radius of $r = 0.5$ m (treating her arms as point masses m each), her new angular velocity is:

(A) $\omega/4$

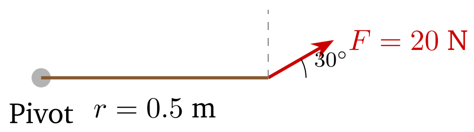
(B) $\omega/2$

(C) ω (unchanged)

(D) 2ω

(E) 4ω

Q26. A force of $F = 20$ N is applied at a perpendicular distance of $r = 0.5$ m from the pivot, at an angle of $\theta = 30^\circ$ to the moment arm. The torque produced about the pivot is $\tau = rF\sin\theta$:



(A) $5\ \text{N m}$

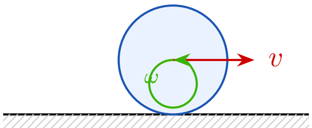
(B) $10\ \text{N m}$

(C) $3.5\ \text{N m}$

(D) 20 N m

(E) 2.5 N m

Q27. A solid sphere (moment of inertia $I = \frac{2}{5}mr^2$) rolls without slipping on a flat surface with speed v. Its total kinetic energy is $\frac{7}{10}mv^2$. The ratio of its **rotational** kinetic energy to its **translational** kinetic energy is:



Rolling sphere

(A) $1/2$

(B) $2/5$

(C) $2/7$

(D) $5/7$

(E) $1/5$

Q28. The moment of inertia of a uniform rod (mass M, length L) about its centre is $\frac{ML^2}{12}$. Using the parallel axis theorem, its moment of inertia about one end is:

(A) $\frac{ML^2}{6}$

(B) $\frac{ML^2}{4}$

(C) $\frac{ML^2}{3}$

(D) $\frac{ML^2}{2}$

(E) $\frac{2ML^2}{3}$

Q29. The moment of inertia of a solid sphere about a diameter is $I = \frac{2}{5}MR^2$. The radius of gyration k (defined by $I = Mk^2$) of the solid sphere about the same axis is:

(A) $\dfrac{R}{\sqrt{2}}$

(B) $R\sqrt{\dfrac{3}{5}}$

(C) $\dfrac{R}{2}$

(D) $R\sqrt{\dfrac{2}{5}}$

(E) $R\sqrt{\dfrac{3}{2}}$

Q30. A wheel of radius $R = 0.3$ m rotates at an angular speed of $\omega = 10$ rad/s. The linear (tangential) speed of a point on the rim of the wheel is:

(A) 30 m/s

(B) 0.03 m/s

(C) $10/3$ m/s

(D) 100 m/s

(E) 3 m/s

Q31. Newton's law of gravitation states $F = \dfrac{Gm_1m_2}{r^2}$. If the distance between two point masses is **tripled** while their masses remain unchanged, the gravitational force between them becomes:

(A) $1/9$ times the original force

(B) $1/3$ times the original force

(C) 3 times the original force

(D) 9 times the original force

(E) $1/6$ times the original force

Q32. The escape velocity from Earth's surface is given by $v_e = \sqrt{2gR}$, where $g = 9.8$ m/s^2 and $R = 6.4 \times 10^6$ m. The numerical value of the escape velocity from Earth is approximately:

(A) 7.9 km/s

(B) 11.2 km/s

(C) 9.8 km/s

(D) 3.0 km/s

(E) 8.0 km/s

Q33. A satellite orbits Earth just above its surface. Using $g = 9.8$ m/s^2 and $R = 6.4 \times 10^6$ m, the orbital velocity is $v_o = \sqrt{gR}$. The numerical value of v_o is approximately:

(A) 11.2 km/s

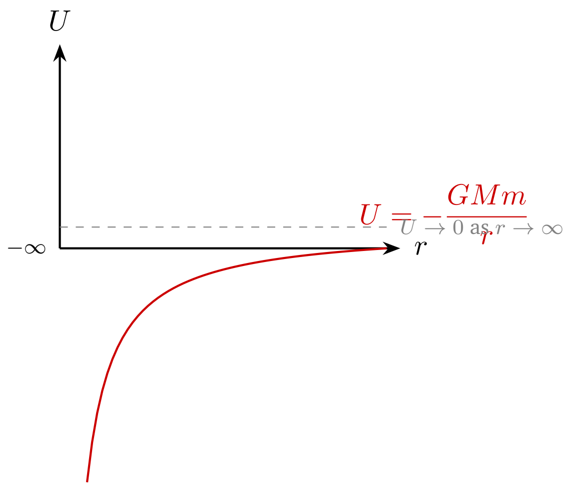
(B) 9.8 km/s

(C) 7.9 km/s

(D) 5.6 km/s

(E) 3.2 km/s

Q34. The gravitational potential energy of a two-mass system is $U = -\dfrac{GMm}{r}$. The **correct reason** why this potential energy is **negative** is:



(A) Gravity is a repulsive force at large distances

(B) The two masses carry negative electric charges

(C) The reference point for zero potential energy is chosen at $r = 0$

(D) The bound system requires external energy input to separate the masses to infinity (zero reference)

(E) Gravitational force always acts downward

Q35. A metallic wire (Young's modulus $Y = 2 \times 10^{11}$ N/m^2) of length $L = 2$ m and cross-sectional area $A = 2 \times 10^{-6}$ m^2 is stretched by a force $F = 200$ N. The extension ΔL produced in the wire is:

(A) 2 mm

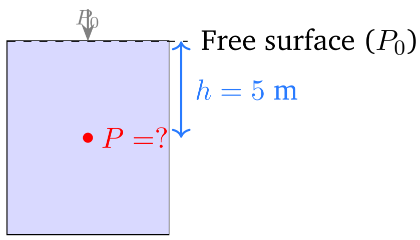
(B) 0.5 mm

(C) 4 mm

(D) 0.1 mm

(E) 1 mm

Q36. A point lies at a depth of $h = 5$ m below the free surface of water (density $\rho = 1000$ kg/m^3). Taking atmospheric pressure $P_0 = 1.013 \times 10^5$ Pa and $g = 10$ m/s^2, the absolute pressure at that point is:



(A) 1.513×10^5 Pa

(B) 5×10^4 Pa

(C) 1.013×10^5 Pa

(D) 2.013×10^5 Pa

(E) 0.5×10^5 Pa

Q37. An object of mass 800 g and density 4000 kg/m^3 is fully submerged in water (density 1000 kg/m^3). Taking $g = 10$ m/s^2, its apparent weight in water is:

(A) 8 N

(B) 6 N

(C) 2 N

(D) 4 N

(E) 7.2 N

Q38. Water ($\rho = 1000$ kg/m^3, surface tension $T = 0.073$ N/m, contact angle $\theta = 0°$) rises in a capillary tube of radius $r = 0.5$ mm. Using $h = \dfrac{2T\cos\theta}{\rho r g}$ and $g = 10$ m/s^2, the height of rise is approximately:

(A) 5.8 cm

(B) 1.5 cm

(C) 2.9 cm

(D) 7.3 cm

(E) 0.73 cm

Q39. According to Poiseuille's law, the volume flow rate through a cylindrical tube is proportional to r^4 (where r is the tube radius), keeping the pressure gradient and viscosity constant. If the radius of the tube is **halved**, the flow rate becomes:

(A) $1/2$ of the original

(B) $1/4$ of the original

(C) $1/8$ of the original

(D) $1/16$ of the original

(E) $1/32$ of the original

Q40. In a hydraulic press, a small piston of area $A_1 = 5$ cm^2 and a large piston of area $A_2 = 100$ cm^2 are connected. A force of $F_1 = 50$ N is applied on the small piston. By Pascal's law, the force F_2 exerted on the large piston is:

(A) 50 N

(B) 100 N

(C) 500 N

(D) 250 N

(E) 1000 N

Q41. System A is in thermal equilibrium with system C, and system B is also in thermal equilibrium with system C. According to the **Zeroth Law of Thermodynamics**, which of the following must be true?

(A) Systems A and B are in thermal equilibrium with each other

(B) Systems A, B, and C all have the same volume

(C) No conclusion about A and B can be drawn without direct contact between them

(D) System A is at a higher temperature than system B

(E) System B is at a higher temperature than system C

Q42. A gas absorbs 500 J of heat and performs 200 J of work on the surroundings. Using the first law of thermodynamics $\Delta U = Q - W$, the change in internal energy of the gas is:

(A) 700 J

(B) 300 J

(C) 500 J

(D) 100 J

(E) 200 J

Q43. One mole of an ideal gas undergoes isothermal expansion at $T = 300$ K from volume V_1 to $V_2 = 2V_1$. The work done by the gas is $W = nRT\ln(V_2/V_1)$ (take $R = 8.314$ J/(mol K), $\ln 2 = 0.693$). The work done is approximately:

(A) 1000 J

(B) 2494 J

(C) 1730 J

(D) 865 J

(E) 500 J

Q44. A Carnot engine operates between a hot reservoir at $T_H = 600$ K and a cold reservoir at $T_C = 300$ K. The efficiency of the engine $\eta = 1 - T_C/T_H$ is:

(A) 100%

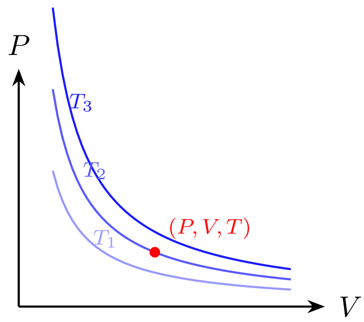
(B) 25%

(C) 33%

(D) 50%

(E) 75%

Q45. An ideal gas is maintained at $T = 300$ K in a container. The pressure is $P = 2 \times 10^5$ Pa and the volume is $V = 5 \times 10^{-3}$ m^3. Using $PV = nRT$ with $R = 8.314$ J/(mol K), the number of moles n of the gas is approximately:



(A) 0.1 mol

(B) 2 mol

(C) 1 mol

(D) 0.2 mol

(E) 0.4 mol

Q46. The root-mean-square speed of oxygen (O_2, molar mass $M = 0.032$ kg/mol) molecules at $T = 300$ K is given by $v_{\text{rms}} = \sqrt{3RT/M}$. Taking $R = 8.314$ J/(mol K), the value of v_{rms} is approximately:

(A) 483 m/s

(B) 273 m/s

(C) 650 m/s

(D) 394 m/s

(E) 340 m/s

Q47. For an ideal **diatomic** gas, the ratio of specific heats $\gamma = C_P/C_V = 7/5$, while for a **monoatomic** ideal gas $\gamma = 5/3$. The correct explanation for the lower γ of the diatomic gas is:

(A) Diatomic molecules have only 3 translational degrees of freedom, same as monoatomic

(B) Diatomic molecules have 5 degrees of freedom (3 translational + 2 rotational), so C_V is larger, making γ smaller

(C) $\gamma = 1$ for all ideal gases at high temperatures

(D) γ increases with temperature for diatomic gases

(E) All ideal gases have the same γ regardless of molecular structure

Q48. Which of the following statements correctly describes entropy and the Second Law of Thermodynamics?

(A) The entropy of any system always increases with time

(B) Entropy remains constant in all real (irreversible) processes

(C) In any irreversible process, the total entropy of the universe (system + surroundings) always increases

(D) Entropy can decrease in an adiabatic process

(E) Entropy is defined only for reversible processes and has no meaning in irreversible processes

Q49. One mole of a monoatomic ideal gas ($\gamma = 5/3$) undergoes adiabatic expansion. Given: $P_1 = 4 \times 10^5$ Pa, $V_1 = 2 \times 10^{-3}$ m^3, $P_2 = 1 \times 10^5$ Pa, $V_2 = 6 \times 10^{-3}$ m^3. The work done by the gas, using $W = \dfrac{P_1V_1 - P_2V_2}{\gamma - 1}$, is:

(A) 200 J

(B) 600 J

(C) 450 J

(D) 300 J

(E) 100 J

Q50. How many degrees of freedom does a diatomic molecule (like N_2 or O_2) have at room temperature, according to the kinetic theory of gases?

(A) 3 (translational only)

(B) 2 (rotational only)

(C) 6 (3 translational + 3 rotational)

(D) 7 (including vibrational modes)

(E) 5 (3 translational + 2 rotational)

Q51. A particle undergoes simple harmonic motion described by the equation $x = 3\sin\left(2\pi t + \dfrac{\pi}{6}\right)$ cm. The amplitude of the SHM is:

(A) 3 cm

(B) 2π cm

(C) $\pi/6$ cm

(D) 6 cm

(E) 1 cm

Q52. A block of mass $m = 4$ kg is attached to a spring of force constant $k = 100$ N/m on a frictionless surface. The time period of simple harmonic oscillation, given by $T = 2\pi\sqrt{m/k}$, is:

(A) 2π s

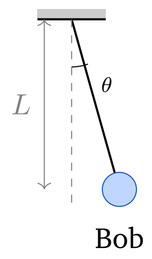
(B) 1.26 s

(C) 0.63 s

(D) 2.5 s

(E) 5 s

Q53. A simple pendulum has a time period of $T = 2$ s (a "seconds pendulum"). Using $T = 2\pi\sqrt{L/g}$ and $g = 10$ m/s^2 ($\pi^2 \approx 10$), the length of the pendulum is:



(A) 2.0 m

(B) 0.5 m

(C) 1.0 m

(D) 4.0 m

(E) 0.25 m

Q54. A spring of force constant $k = 200$ N/m has a block attached to it oscillating with amplitude $A = 5$ cm $= 0.05$ m. The total mechanical energy of the spring-block system is $E = \frac{1}{2}kA^2$:

(A) 50 J

(B) 2.5 J

(C) 5 J

(D) 0.25 J

(E) 0.025 J

Q55. In a forced oscillation, the phenomenon of **resonance** occurs when:

(A) The driving frequency is exactly twice the natural frequency of the system

(B) The applied driving force is at its maximum amplitude

(C) The driving frequency is exactly half the natural frequency of the system

(D) The damping coefficient is at its maximum value

(E) The driving frequency equals the natural (resonant) frequency of the system

Q56. A sound wave travels in air at a speed of $v = 340$ m/s. If the wavelength of the wave is $\lambda = 0.5$ m, the frequency of the wave is:

(A) 680 Hz

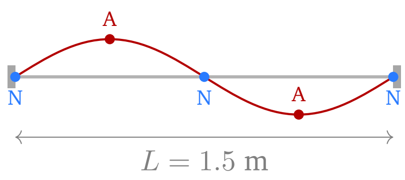
(B) 170 Hz

(C) 340 Hz

(D) 1360 Hz

(E) 170 kHz

Q57. A wire of length $L = 1.5$ m is fixed at both ends. The speed of transverse waves in the wire is $v = 300$ m/s. The frequency of the **second harmonic** (first overtone) is:



(A) 100 Hz

(B) 200 Hz

(C) 300 Hz

(D) 400 Hz

(E) 150 Hz

Q58. Two tuning forks have frequencies of 256 Hz and 260 Hz respectively. When sounded together, the number of beats heard per second is:

(A) 516 Hz

(B) 258 Hz

(C) 4 Hz

(D) 2 Hz

(E) 8 Hz

Q59. A source of sound emitting at $f_0 = 500$ Hz moves **towards** a stationary observer at a speed of $v_s = 20$ m/s. Taking the speed of sound $v = 340$ m/s, the apparent frequency heard by the observer ($f' = f_0 \cdot \frac{v}{v - v_s}$) is:

(A) 529 Hz

(B) 500 Hz

(C) 470 Hz

(D) 531 Hz

(E) 540 Hz

Q60. Which of the following statements correctly classifies sound waves in air and light waves?

(A) Sound in air is transverse and light is longitudinal

(B) Both sound and light are transverse waves

(C) Both sound and light are longitudinal waves

(D) Sound is an electromagnetic wave; light is a mechanical wave

(E) Sound in air is longitudinal and light is transverse

Q61. Two point charges $q_1 = 4\ \mu$C and $q_2 = 6\ \mu$C are placed $r = 0.3$ m apart in vacuum. The electrostatic force between them ($k = 9 \times 10^9$ N m^2/C^2) is:

(A) 2.4 N

(B) 24 N

(C) 0.24 N

(D) 0.024 N

(E) 4.8 N

Q62. The electric field due to a point charge $q = 8$ nC $= 8 \times 10^{-9}$ C at a distance $r = 0.2$ m is $E = \dfrac{kq}{r^2}$ (with $k = 9 \times 10^9\ \mathrm{N\,m^2/C^2}$). The magnitude of E is:

(A) 900 N/C

(B) 1800 N/C

(C) 3600 N/C

(D) 450 N/C

(E) 720 N/C

Q63. An electric dipole has dipole moment $p = 4 \times 10^{-30}$ C m. The electric field on the axis of the dipole at a distance $r = 10$ nm $= 10^{-8}$ m is $E = \dfrac{2kp}{r^3}$. The magnitude of the field is:

(A) 3.6×10^4 N/C

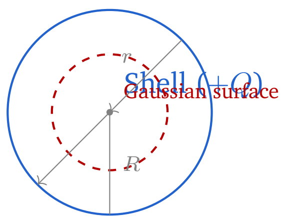
(B) 1.8×10^4 N/C

(C) 7.2×10^4 N/C

(D) 1.44×10^5 N/C

(E) 9.0×10^3 N/C

Q64. A uniform positive charge $+Q$ is distributed over the surface of a thin spherical shell of radius R. A Gaussian surface of radius $r < R$ is drawn concentrically inside the shell. Applying Gauss's law, the electric field **inside** the shell at any point $r < R$ is:



$Q_{\text{enc}} = 0 \Rightarrow E = ?$

(A) $E = \dfrac{kQ}{R^2}$ (same as on the surface)

(B) $E = \dfrac{kQ}{r^2}$ (varies with r)

(C) $E = \dfrac{Q}{4\pi\varepsilon_0 R^2}$ (non-zero constant)

(D) $E = 0$ everywhere inside the shell

(E) E depends on the thickness of the shell

Q65. The electric potential due to a point charge $q = 9$ nC at a distance $r = 0.3$ m is $V = \dfrac{kq}{r}$ (with $k = 9 \times 10^9\ \mathrm{N\,m^2/C^2}$). The potential is:

(A) 810 V

(B) 90 V

(C) 540 V

(D) 27 V

(E) 270 V

Q66. A parallel plate capacitor has plate area $A = 0.02\ \mathrm{m}^2$ and plate separation $d = 2$ mm $= 2 \times 10^{-3}$ m. Using $C = \dfrac{\varepsilon_0 A}{d}$ with $\varepsilon_0 = 8.85 \times 10^{-12}$ F/m, the capacitance is:

(A) 88.5 pF

(B) 177 pF

(C) 44.25 pF

(D) 17.7 pF

(E) 8.85 pF

Q67. A parallel plate capacitor of capacitance C has air between its plates. A dielectric slab of dielectric constant $K = 3$ is inserted to completely fill the space between the plates. The new capacitance is:

(A) C (unchanged)

(B) $3C$

(C) $C/3$

(D) $9C$

(E) $2C$

Q68. A charge of $q = 2\ \mu$C is moved between two points having a potential difference of $\Delta V = 100$ V. The work done in moving the charge is $W = q\Delta V$:

(A) 200 mJ

(B) 0.02 mJ

(C) 0.2 mJ

(D) 2 mJ

(E) 20 mJ

Q69. Which of the following statements about **equipotential surfaces** is **incorrect**?

(A) No work is done in moving a charge along an equipotential surface

(B) Equipotential surfaces are always perpendicular to the electric field lines

(C) Two equipotential surfaces can never intersect each other

(D) Electric field lines and equipotential surfaces are **parallel** to each other

(E) The electric potential has the same value at every point on an equipotential surface

Q70. Which of the following correctly describes the electric field between two large parallel plate conductors (one positive, one negative), far from the edges?

(A) The field is stronger near the positive plate and weaker near the negative plate

(B) The field points from the negative plate to the positive plate

(C) The field is zero in the middle region between the plates

(D) The field increases in magnitude with distance from the plates

(E) The field is uniform and directed from the positive plate to the negative plate

Q71. A resistor of $R = 2\ \Omega$ is connected to a battery of $V = 6$ V (negligible internal resistance). The current flowing through the resistor, by Ohm's law $V = IR$, is:

(A) 3 A

(B) 12 A

(C) 0.33 A

(D) 4 A

(E) 6 A

Q72. A copper wire has resistivity $\rho = 1.7 \times 10^{-8}\ \Omega\,\text{m}$, length $L = 2$ m, and cross-sectional area $A = 1\ \text{mm}^2 = 10^{-6}\ \text{m}^2$. Using $R = \rho L/A$, the resistance of the wire is:

(A) $0.17\ \Omega$

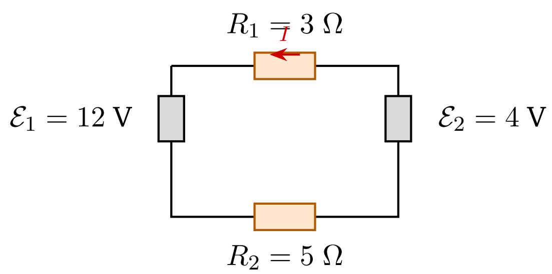
(B) $0.034\ \Omega$

(C) $0.34\ \Omega$

(D) $0.017\ \Omega$

(E) $3.4\ \Omega$

Q73. In the circuit shown below, two batteries $\mathcal{E}_1 = 12$ V and $\mathcal{E}_2 = 4$ V are connected in a single loop (opposing each other) with resistors $R_1 = 3\ \Omega$ and $R_2 = 5\ \Omega$. Applying Kirchhoff's Voltage Law, the current in the circuit is:



(A) 2 A

(B) 0.5 A

(C) 1 A

(D) 4 A

(E) 3 A

Q74. In a Wheatstone bridge, the arms have resistances $P = 4\ \Omega$, $Q = 8\ \Omega$, and $R = 6\ \Omega$. For the bridge to be balanced ($P/Q = R/S$), the value of S must be:

(A) $3\ \Omega$

(B) $6\ \Omega$

(C) $8\ \Omega$

(D) $12\ \Omega$

(E) $24\ \Omega$

Q75. A cell has EMF $= 12$ V and internal resistance $r = 0.5\ \Omega$. When delivering a current of $I = 4$ A, the terminal voltage across the cell is $V_t = \mathcal{E} - Ir$:

(A) 14 V

(B) 12 V

(C) 8 V

(D) 6 V

(E) 10 V

Q76. A current of $I = 3$ A flows through a resistor of $R = 8\ \Omega$. The power dissipated in the resistor, using $P = I^2R$, is:

(A) 72 W

(B) 24 W

(C) 36 W

(D) 144 W

(E) 3 W

Q77. Two resistors of $6\ \Omega$ and $4\ \Omega$ are connected in **series**. The equivalent resistance of the combination is:

(A) $2.4\ \Omega$

(B) $10\ \Omega$

(C) $6\ \Omega$

(D) $4\ \Omega$

(E) $24\ \Omega$

Q78. A battery of EMF $= 10$ V and internal resistance $r = 1\ \Omega$ is connected to an external resistance $R = 9\ \Omega$. The terminal voltage of the battery under this load is:

(A) 10 V

(B) 1 V

(C) 9 V

(D) 5 V

(E) 11 V

Q79. A copper wire carries a current of $I = 2$ A. The number density of free electrons is $n = 8.5 \times 10^{28}$ m^{-3}, cross-sectional area $A = 1$ mm^2 $=$ 10^{-6} m^2, and charge of electron $e = 1.6 \times 10^{-19}$ C. The drift velocity $v_d = I/(nAe)$ of electrons is approximately:

(A) 1.47×10^{-2} m/s

(B) 1.47×10^{-3} m/s

(C) 1.47×10^{-6} m/s

(D) 1.47×10^{-4} m/s

(E) 1.47 m/s

Q80. A resistor has resistance $R_0 = 100\ \Omega$ at temperature $T_0 = 27\ ^\circ$C and temperature coefficient $\alpha = 0.004\ ^\circ\text{C}^{-1}$. Using $R_T = R_0(1 + \alpha\Delta T)$, the resistance at $T = 127\ ^\circ$C is:

(A) $104\ \Omega$

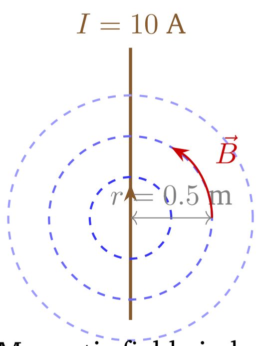
(B) $100\ \Omega$

(C) $400\ \Omega$

(D) $110\ \Omega$

(E) $140\ \Omega$

Q81. An infinitely long straight wire carries a current of $I = 10$ A. Using the Biot-Savart law, the magnetic field at a perpendicular distance of $r = 0.5$ m from the wire is $B = \dfrac{\mu_0 I}{2\pi r}$ (with $\mu_0 = 4\pi \times 10^{-7}$ T m/A):



Magnetic field circles

(A) $4\ \mu$T

(B) $2\ \mu$T

(C) $8\ \mu$T

(D) $40\ \mu$T

(E) $0.4\ \mu$T

Q82. A charge of $q = 2\ \mu$C moves with velocity $v = 10^5$ m/s perpendicular to a magnetic field $B = 0.3$ T. The magnetic (Lorentz) force on the charge is $F = qvB$:

(A) 0.006 N

(B) 0.06 N

(C) 0.6 N

(D) 6 N

(E) 60 N

Q83. Two long parallel wires, each carrying a current of $I = 10$ A in the **same direction**, are separated by a distance $d = 0.1$ m. The force per unit length between them is $\frac{F}{L} = \frac{\mu_0 I_1 I_2}{2\pi d}$ (with $\mu_0 = 4\pi \times 10^{-7}$ T m/A). This force is:

(A) 4×10^{-4} N/m, repulsive

(B) 1×10^{-4} N/m, attractive

(C) 2×10^{-4} N/m, attractive

(D) 8×10^{-4} N/m, repulsive

(E) 10^{-3} N/m, attractive

Q84. A solenoid has $n = 1000$ turns/m and carries a current of $I = 2$ A. The magnetic field inside the solenoid is $B = \mu_0 n I$ (with $\mu_0 = 4\pi \times 10^{-7}$ T m/A). The field is approximately:

(A) 8π mT

(B) 4π mT

(C) π mT

(D) 2.51 mT

(E) 4 mT

Q85. A toroid (doughnut-shaped solenoid) consists of N turns of wire wound on a circular core. Which of the following statements about the magnetic field of a toroid, derived using Ampere's law, is **correct**?

(A) The magnetic field is uniform everywhere inside and outside the toroid

(B) The magnetic field outside the toroid is $\mu_0 NI/(2\pi R)$

(C) Ampere's law gives $B = \mu_0 I$ for the toroid without involving N or R

(D) The magnetic field is zero everywhere inside the toroid

(E) The magnetic field is confined inside the toroid and is essentially zero outside

Q86. A rectangular coil has $N = 100$ turns, area $A = 4$ cm^2 $= 4 \times 10^{-4}$ m^2, and carries a current $I = 0.5$ A. It is placed in a uniform magnetic field $B = 0.2$ T with the plane of the coil perpendicular to the field ($\theta = 90°$). The torque on the coil is $\tau = NIAB\sin\theta$:

(A) 4×10^{-3} N m

(B) 2×10^{-3} N m

(C) 8×10^{-3} N m

(D) 10^{-2} N m

(E) 10^{-4} N m

Q87. A circular coil has $N = 200$ turns, carries a current $I = 1$ A, and has a radius $r = 5$ cm $= 0.05$ m. The magnetic dipole moment of the coil is $m = NIA$, where $A = \pi r^2$. The magnitude of the magnetic moment is approximately (take $\pi = 3.14$):

(A) 0.785 A m^2

(B) 1.57 A m^2

(C) 3.14 A m^2

(D) 0.314 A m^2

(E) 6.28 A m^2

Q88. In a moving-coil galvanometer, the **current sensitivity** is defined as:

(A) The total charge that flows when the needle deflects by one division

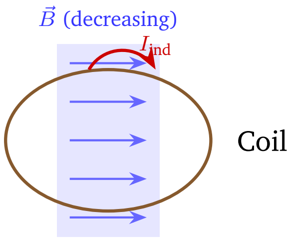
(B) The voltage required to produce unit deflection of the needle

(C) The deflection (in divisions or radians) produced per unit current through the galvanometer

(D) The power dissipated per unit deflection of the needle

(E) The resistance change per unit current in the galvanometer

Q89. The magnetic flux through a coil changes from $\Phi_1 = 0.4$ Wb to $\Phi_2 = 0.1$ Wb in a time of $\Delta t = 0.1$ s. The magnitude of the induced EMF, using Faraday's law $\varepsilon = -\dfrac{\Delta\Phi}{\Delta t}$, is:



(A) 0.3 V

(B) 0.5 V

(C) 4 V

(D) 3 V

(E) 1.5 V

Q90. Lenz's law in electromagnetic induction states that:

(A) The induced current flows in the same direction as the increasing magnetic flux

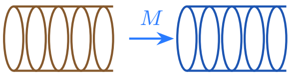
(B) The induced EMF is proportional to the total flux linkage, not its rate of change

(C) The induced current always flows in the clockwise direction when viewed from above

(D) The magnitude of induced EMF depends only on the number of turns in the coil

(E) The induced current flows in a direction such that it opposes the change in magnetic flux that produced it

Q91. Two coils have a mutual inductance $M = 2$ H. The current in the primary coil changes at a rate of $\frac{dI_1}{dt} = 5$ A/s. The EMF induced in the secondary coil, given by $\varepsilon_2 = M\frac{dI_1}{dt}$, is:



(A) 10 V

(B) 2.5 V

(C) 5 V

(D) 20 V

(E) 0.4 V

Q92. A coil of $N = 500$ turns has a self-inductance $L = 0.25$ H. When a current $I = 4$ A flows through it, the energy stored in the magnetic field of the inductor is $U = \frac{1}{2}LI^2$:

(A) 8 J

(B) 2 J

(C) 1 J

(D) 4 J

(E) 0.5 J

Q93. An AC generator coil has $N = 100$ turns, area $A = 0.2$ m^2, and rotates in a uniform magnetic field $B = 0.5$ T at an angular velocity $\omega = 100$ rad/s. The peak EMF generated ($\varepsilon_0 = NBA\omega$) is:

(A) 500 V

(B) 2000 V

(C) 1000 V

(D) 100 V

(E) $50\,\mathrm{V}$

Q94. An AC supply has a peak voltage of $V_0 = 220\sqrt{2}\,\mathrm{V}$. The RMS (root-mean-square) voltage, given by $V_{\text{rms}} = V_0/\sqrt{2}$, is:

(A) $440\,\mathrm{V}$

(B) $311\,\mathrm{V}$

(C) $155\,\mathrm{V}$

(D) $220\,\mathrm{V}$

(E) $110\,\mathrm{V}$

Q95. A step-down transformer has a primary voltage of $V_P = 240\,\mathrm{V}$ and a turns ratio of $N_P : N_S = 10 : 1$. The secondary voltage (using $V_S/V_P = N_S/N_P$) is:

(A) $2400\,\mathrm{V}$

(B) $240\,\mathrm{V}$

(C) $48\,\mathrm{V}$

(D) $12\,\mathrm{V}$

(E) $24\,\mathrm{V}$

Q96. In a purely **resistive** AC circuit, the power factor ($\cos\phi$, where ϕ is the phase difference between voltage and current) is:

(A) 1; all electrical power supplied is dissipated as heat in the resistor

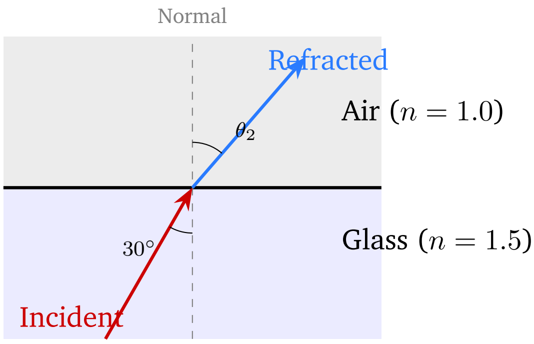
(B) 0; no power is consumed by the circuit

(C) 0.5; only half the power is consumed

(D) $\sqrt{2}$; power factor can exceed unity in resistive circuits

(E) $1/\sqrt{2}$; partial power is consumed

Q97. A ray of light travels from glass (refractive index $n_1 = 1.5$) to air ($n_2 = 1.0$). The angle of incidence in glass is 30° (measured from the normal). Applying Snell's law $n_1 \sin\theta_1 = n_2 \sin\theta_2$, the angle of refraction in air is:



(A) 30°

(B) 48.6°

(C) 60°

(D) 19.5°

(E) 90°

Q98. The critical angle for total internal reflection at a glass-to-air interface is defined by $\sin\theta_c = n_{\text{air}}/n_{\text{glass}}$. For glass with $n_{\text{glass}} = 1.5$ and $n_{\text{air}} = 1.0$, the critical angle θ_c is approximately:

(A) 30°

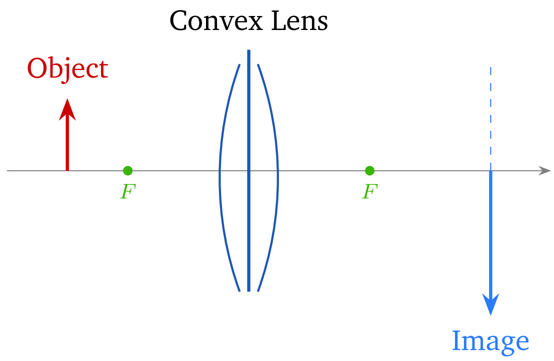
(B) 60°

(C) 41.8°

(D) 48.6°

(E) 90°

Q99. An object is placed at a distance of $u = -30$ cm (sign convention: distances measured from optical centre) from a convex lens of focal length $f = +20$ cm. Using the thin-lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$, the image distance v is:



(A) 30 cm

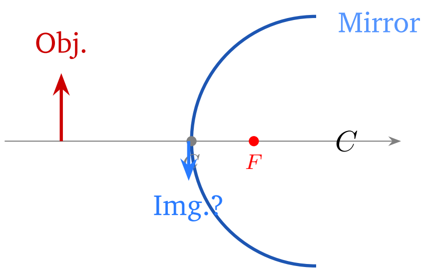
(B) 12 cm

(C) -60 cm

(D) 60 cm

(E) 20 cm

Q100. An object is placed at a distance of $|u| = 45$ cm in front of a concave mirror of focal length $|f| = 15$ cm (using sign convention: $u = -45$ cm, $f = -15$ cm). Applying the mirror formula $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$, the image distance v is:



(A) -15 cm

(B) -30 cm

(C) $+22.5$ cm

(D) -45 cm

(E) -22.5 cm

Q101. For the convex lens situation in Q99 (object at $u = -30$ cm, image at $v = +60$ cm), the linear magnification $m = v/u$ of the image is:

(A) -2 (inverted, magnified twice)

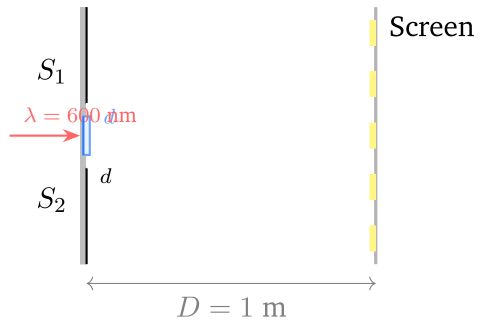
(B) $+2$ (erect, magnified twice)

(C) -1 (inverted, same size)

(D) $+0.5$ (erect, diminished)

(E) -0.5 (inverted, diminished)

Q102. In Young's double-slit experiment, the slit separation is $d = 0.3$ mm, the screen is at distance $D = 1$ m, and the wavelength of light is $\lambda = 600$ nm. The fringe width $\beta = \dfrac{\lambda D}{d}$ is:



(A) 0.2 mm

(B) 2 mm

(C) 20 mm

(D) 0.6 mm

(E) 5 mm

Q103. In an interference experiment using light of wavelength $\lambda = 500$ nm, constructive interference (bright fringe) occurs when the path difference Δ satisfies $\Delta = n\lambda$. For the **second-order** bright fringe ($n = 2$), the path difference is:

(A) 500 nm

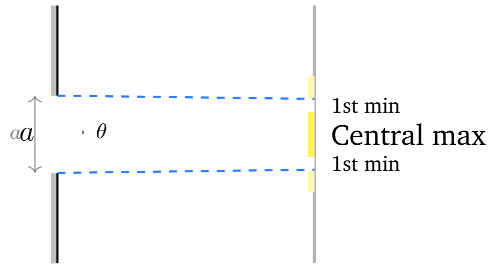
(B) 250 nm

(C) 1000 nm

(D) 750 nm

(E) 2000 nm

Q104. In single-slit diffraction, the condition for the **first dark fringe** (first minimum of intensity) is:



(A) $a\sin\theta = \lambda/2$

(B) $a\sin\theta = 2\lambda$

(C) $a\cos\theta = \lambda$

(D) $a\sin\theta = \lambda$

(E) $a\tan\theta = \lambda$

Q105. Unpolarised light of intensity I_0 passes through a polariser and then through a second polaroid (analyser) that is oriented at $\theta = 60^\circ$ to the polariser. Using Malus's law $I = I_0\cos^2\theta$ (where I_0 here is the intensity after the first polariser), the intensity of light emerging from the analyser is:

(A) $I_0/2$

(B) $I_0\sqrt{3}/2$

(C) $I_0/\sqrt{2}$

(D) $I_0/3$

(E) $I_0/4$

Q106. The work function of a metal is $\phi = 4$ eV $= 4 \times 1.6 \times 10^{-19}$ J. The threshold (minimum) frequency ν_0 of light needed to eject electrons from the metal surface, using $\phi = h\nu_0$ (Planck's constant $h = 6.626 \times 10^{-34}$ J s), is approximately:

(A) 9.66×10^{14} Hz

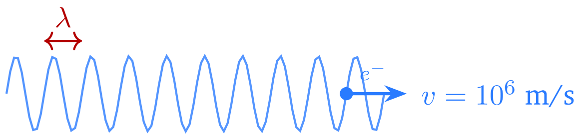
(B) 4.83×10^{14} Hz

(C) 1.93×10^{15} Hz

(D) 6.63×10^{14} Hz

(E) 3.0×10^{15} Hz

Q107. An electron (mass $m_e = 9.11 \times 10^{-31}$ kg) moves with a speed of $v = 10^6$ m/s. The de Broglie wavelength $\lambda = h/(m_e v)$ (with $h = 6.626 \times 10^{-34}$ J s) is approximately:



de Broglie wave of electron

(A) 0.364 nm

(B) 0.727 nm

(C) 1.45 nm

(D) 2.43 nm

(E) 0.1 nm

Q108. Light of frequency $\nu = 1.2 \times 10^{15}$ Hz falls on a metal surface with work function $\phi = 4$ eV. The stopping potential V_0 required to stop the fastest photoelectrons is given by $eV_0 = h\nu - \phi$ (with $h = 6.626 \times 10^{-34}$ J s, 1 eV $= 1.6 \times 10^{-19}$ J). The stopping potential is approximately:

(A) 4.97 V

(B) 4.0 V

(C) 0.97 V

(D) 2.0 V

(E) 0.5 V

Q109. The wave nature of electrons was experimentally confirmed by observing the **diffraction** of electrons from a crystal lattice. This landmark experiment was performed by:

(A) Millikan and Fletcher (oil drop experiment)

(B) Compton (X-ray scattering)

(C) Rutherford (alpha-particle scattering)

(D) Davisson and Germer (electron diffraction from nickel crystal)

(E) de Broglie (theoretical conjecture only, no experiment)

Q110. In Bohr's model of the hydrogen atom, the energy of the nth level is $E_n = -\dfrac{13.6}{n^2}$ eV. The energy of the electron in the $n = 3$ state is:

(A) -13.6 eV

(B) -3.4 eV

(C) -0.85 eV

(D) -0.38 eV

(E) -1.51 eV

Q111. The Balmer series of hydrogen spectral lines consists of transitions that end at the $n = 2$ energy level. Which of the following correctly describes the Hα line of the Balmer series?

(A) Hα corresponds to the $n = 3 \to n = 2$ transition at $\lambda \approx 656$ nm, lying in the visible (red) region

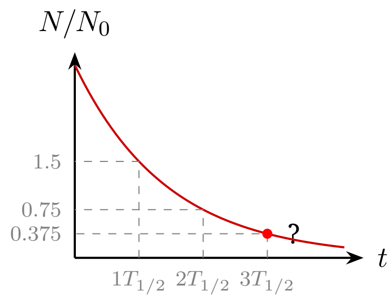
(B) Hα corresponds to $n = 4 \to n = 2$ at $\lambda \approx 486$ nm, lying in the ultraviolet

(C) All Balmer series lines lie in the infrared region of the spectrum

(D) The Balmer series extends only up to the transition from $n = 4$ to $n = 2$

(E) The shortest wavelength in the Balmer series is 364 nm, which lies in the infrared

Q112. A radioactive sample has a half-life of $T_{1/2} = 5730$ years (carbon-14). After **three half-lives**, the fraction of the original number of atoms that remains is:



(A) $1/4$

(B) $1/8$

(C) $1/16$

(D) $1/2$

(E) $1/32$

Q113. The mass defect of the helium-4 nucleus ($^4_2$He) is $\Delta m = 0.030378$ u, where 1 u $= 931.5$ MeV$/c^2$. The total binding energy of the $^4_2$He nucleus is approximately:

(A) 7.07 MeV

(B) 14.1 MeV

(C) 28.3 MeV

(D) 56.6 MeV

(E) 0.030 MeV

Q114. When a p-n junction diode is connected in **forward bias** (positive terminal to p-side, negative to n-side), which of the following correctly describes what happens?

(A) The depletion region widens and barrier potential increases, blocking current

(B) Forward bias has no effect on the width of the depletion region

(C) Forward bias causes only minority carriers to flow across the junction

(D) The depletion region narrows and barrier potential decreases, allowing majority carrier current to flow

(E) Forward bias causes the p-n junction to behave as a perfect insulator

Q115. A Zener diode is distinct from a regular p-n junction diode because:

(A) It is used in forward-bias mode as a signal amplifier

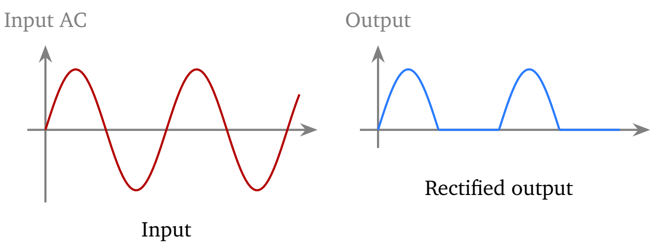
(B) It is used to convert AC to DC (rectification)

(C) It operates at approximately zero bias voltage

(D) It is used in forward-bias mode for voltage regulation

(E) It operates in the reverse-bias breakdown region and maintains a nearly constant voltage, making it ideal for voltage regulation

Q116. In a **half-wave rectifier** circuit (using a single diode), the frequency of the output (rectified) signal compared to the input AC signal frequency is:



(A) Equal to the input AC frequency

(B) Twice the input AC frequency

(C) Half the input AC frequency

(D) Zero (pure DC output)

(E) Four times the input AC frequency

Q117. In **Amplitude Modulation** (AM), the information (message signal) is encoded by:

(A) Varying the frequency of the carrier wave in proportion to the message signal amplitude

(B) Varying the amplitude of the carrier wave in proportion to the instantaneous amplitude of the message signal

(C) Varying both amplitude and frequency of the carrier simultaneously

(D) Varying the phase of the carrier wave according to the message signal

(E) Encoding the message signal using digital binary pulses on the carrier

Q118. The bandwidth of an AM (amplitude-modulated) signal, where f_m is the highest message signal frequency, is:

(A) f_m

(B) f_c (the carrier frequency)

(C) $2f_m$

(D) $f_c + f_m$

(E) $f_c - f_m$

Q119. Ground wave propagation of radio signals is characterised by which of the following?

(A) Ground waves are used for satellite-to-satellite communication

(B) Ground waves require a clear line-of-sight between transmitter and receiver

(C) Ground waves are used for frequencies above 30 MHz (VHF and above)

(D) Ground waves hug the Earth's surface and are suitable for communication at frequencies below about 2 MHz

(E) Ground waves are always reflected by the ionosphere back to the Earth's surface

Q120. Satellite communication is preferred for long-distance communication because:

(A) Satellites operate at very low altitudes (below 1 km) for better signal strength

(B) Satellite communication is limited to audio signals only and cannot carry video

(C) Satellites are used exclusively for weather monitoring and GPS, not for general communication

(D) Satellite communication works only for radio frequencies below 2 MHz (ground wave range)

(E) Satellites serve as relay stations high above Earth, enabling line-of-sight microwave communication over distances that overcome the curvature of the Earth

Detailed Solutions

Q1. Answer: (A)

Q2. Answer: (B)

Q3. Answer: (C)

Q4. Answer: (D)

Q5. Answer: (E)

Q6. Answer: (A)

Q7. Answer: (B)

Q8. Answer: (C)

Q9. Answer: (D)

Q10. Answer: (E)

Q11. Answer: (A)

Q12. Answer: (B)

Q13. Answer: (C)

Q14. Answer: (D)

Q15. Answer: (E)

Q16. Answer: (A)

Q17. Answer: (B)

Q18. Answer: (C)

Q19. Answer: (D)

Q20. Answer: (E)

Q21. Answer: (A)

Q22. Answer: (B)

Q23. Answer: (C)

Q24. Answer: (D)

Q25. Answer: (E)

Q26. Answer: (A)

Q27. Answer: (B)

Q28. Answer: (C)

Q29. Answer: (D)

Q30. Answer: (E)

Q31. Answer: (A)

Q32. $\boxed{\text{Answer: (B)}}$

Q33. $\boxed{\text{Answer: (C)}}$

Q34. $\boxed{\text{Answer: (D)}}$

Q35. $\boxed{\text{Answer: (E)}}$

Q36. $\boxed{\text{Answer: (A)}}$

Q37. $\boxed{\text{Answer: (B)}}$

Q38. $\boxed{\text{Answer: (C)}}$

Q39. $\boxed{\text{Answer: (D)}}$

Q40. $\boxed{\text{Answer: (E)}}$

Q41. $\boxed{\text{Answer: (A)}}$

Q42. $\boxed{\text{Answer: (B)}}$

Q43. $\boxed{\text{Answer: (C)}}$

Q44. $\boxed{\text{Answer: (D)}}$

Q45. $\boxed{\text{Answer: (E)}}$

Q46. $\boxed{\text{Answer: (A)}}$

Q47. $\boxed{\text{Answer: (B)}}$

Q48. $\boxed{\text{Answer: (C)}}$

Q49. $\boxed{\text{Answer: (D)}}$

Q50. $\boxed{\text{Answer: (E)}}$

Q51. $\boxed{\text{Answer: (A)}}$

Q52. $\boxed{\text{Answer: (B)}}$

Q53. $\boxed{\text{Answer: (C)}}$

Q54. $\boxed{\text{Answer: (D)}}$

Q55. $\boxed{\text{Answer: (E)}}$

Q56. $\boxed{\text{Answer: (A)}}$

Q57. $\boxed{\text{Answer: (B)}}$

Q58. $\boxed{\text{Answer: (C)}}$

Q59. $\boxed{\text{Answer: (D)}}$

Q60. $\boxed{\text{Answer: (E)}}$

Q61. $\boxed{\text{Answer: (A)}}$

Q62. $\boxed{\text{Answer: (B)}}$

Q63. $\boxed{\text{Answer: (C)}}$

Q64. Answer: (D)

Q65. Answer: (E)

Q66. Answer: (A)

Q67. Answer: (B)

Q68. Answer: (C)

Q69. Answer: (D)

Q70. Answer: (E)

Q71. Answer: (A)

Q72. Answer: (B)

Q73. Answer: (C)

Q74. Answer: (D)

Q75. Answer: (E)

Q76. Answer: (A)

Q77. Answer: (B)

Q78. Answer: (C)

Q79. Answer: (D)

Q80. $\boxed{\text{Answer: (E)}}$

Q81. $\boxed{\text{Answer: (A)}}$

Q82. $\boxed{\text{Answer: (B)}}$

Q83. $\boxed{\text{Answer: (C)}}$

Q84. $\boxed{\text{Answer: (D)}}$

Q85. $\boxed{\text{Answer: (E)}}$

Q86. $\boxed{\text{Answer: (A)}}$

Q87. $\boxed{\text{Answer: (B)}}$

Q88. $\boxed{\text{Answer: (C)}}$

Q89. $\boxed{\text{Answer: (D)}}$

Q90. $\boxed{\text{Answer: (E)}}$

Q91. $\boxed{\text{Answer: (A)}}$

Q92. $\boxed{\text{Answer: (B)}}$

Q93. $\boxed{\text{Answer: (C)}}$

Q94. $\boxed{\text{Answer: (D)}}$

Q95. $\boxed{\text{Answer: (E)}}$

Q96. $\boxed{\text{Answer: (A)}}$

Q97. $\boxed{\text{Answer: (B)}}$

Q98. $\boxed{\text{Answer: (C)}}$

Q99. $\boxed{\text{Answer: (D)}}$

Q100. $\boxed{\text{Answer: (E)}}$

Q101. $\boxed{\text{Answer: (A)}}$

Q102. $\boxed{\text{Answer: (B)}}$

Q103. $\boxed{\text{Answer: (C)}}$

Q104. $\boxed{\text{Answer: (D)}}$

Q105. $\boxed{\text{Answer: (E)}}$

Q106. $\boxed{\text{Answer: (A)}}$

Q107. $\boxed{\text{Answer: (B)}}$

Q108. $\boxed{\text{Answer: (C)}}$

Q109. $\boxed{\text{Answer: (D)}}$

Q110. $\boxed{\text{Answer: (E)}}$

Q111. $\boxed{\text{Answer: (A)}}$

Q112. $\boxed{\text{Answer: (B)}}$

Q113. $\boxed{\text{Answer: (C)}}$

Q114. $\boxed{\text{Answer: (D)}}$

Q115. $\boxed{\text{Answer: (E)}}$

Q116. $\boxed{\text{Answer: (A)}}$

Q117. $\boxed{\text{Answer: (B)}}$

Q118. $\boxed{\text{Answer: (C)}}$

Q119. $\boxed{\text{Answer: (D)}}$

Q120. $\boxed{\text{Answer: (E)}}$

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	B	3	C	4	D	5	E
6	A	7	B	8	C	9	D	10	E
11	A	12	B	13	C	14	D	15	E
16	A	17	B	18	C	19	D	20	E
21	A	22	B	23	C	24	D	25	E
26	A	27	B	28	C	29	D	30	E
31	A	32	B	33	C	34	D	35	E
36	A	37	B	38	C	39	D	40	E
41	A	42	B	43	C	44	D	45	E
46	A	47	B	48	C	49	D	50	E
51	A	52	B	53	C	54	D	55	E
56	A	57	B	58	C	59	D	60	E
61	A	62	B	63	C	64	D	65	E
66	A	67	B	68	C	69	D	70	E
71	A	72	B	73	C	74	D	75	E
76	A	77	B	78	C	79	D	80	E
81	A	82	B	83	C	84	D	85	E
86	A	87	B	88	C	89	D	90	E
91	A	92	B	93	C	94	D	95	E
96	A	97	B	98	C	99	D	100	E
101	A	102	B	103	C	104	D	105	E
106	A	107	B	108	C	109	D	110	E
111	A	112	B	113	C	114	D	115	E
116	A	117	B	118	C	119	D	120	E