CUET Physics Mock Test - Part 3 (Most Expected)

Q51. Which electromagnetic waves are used in radar systems for aircraft navigation? A) X-rays B) Ultraviolet rays C) Microwaves D) Infrared rays

> **Correct Answer:** C) Microwaves **Explanation:** Microwaves have short wavelengths (a few millimeters to a few centimeters), which makes them suitable for radar systems as they can be transmitted as a beam in a particular direction without much diffraction.

Q52. The critical angle (C) for a medium with refractive index (μ) is given by the relation: A) sin C = μ B) cos C = 1/μ C) tan C = μ D) sin C = 1/μ

> **Correct Answer:** D) sin C = 1/μ **Explanation:** According to Snell's law, when light travels from a denser medium to a rarer medium and the angle of refraction is 90 degrees, the angle of incidence is the critical angle. Therefore, μ = 1/sin C, or sin C = 1/μ.

Q53. If two thin lenses of power P1 and P2 are kept in contact, the equivalent power of the combination is: A) P1 × P2 B) P1 / P2 C) P1 + P2 D) P1 - P2

> **Correct Answer:** C) P1 + P2 **Explanation:** For thin lenses in contact, their powers add up algebraically. If one is convex and the other concave, their signs (+ and - respectively) must be taken into account.

Q54. Huygens' principle of secondary wavelets can be used to deduce: A) Only the law of reflection B) Only the law of refraction C) Both the laws of reflection and refraction D) The photoelectric effect

> **Correct Answer:** C) Both the laws of reflection and refraction **Explanation:** Huygens' wave theory successfully explains both reflection and refraction by showing how a wavefront propagates and changes direction upon hitting a surface or changing medium.

Q55. The resolving power of an astronomical telescope can be increased by: A) Increasing the focal length of the objective lens B) Decreasing the focal length of the eyepiece C) Increasing the diameter (aperture) of the objective lens D) Increasing the wavelength of light used

> **Correct Answer:** C) Increasing the diameter (aperture) of the objective lens **Explanation:** Resolving power of a telescope = D / (1.22 × λ), where D is the diameter of the objective lens. A larger diameter gathers more light and provides better resolution.

Q56. Einstein's photoelectric equation is based on the principle of conservation of: A) Momentum B) Mass C) Charge D) Energy

> **Correct Answer:** D) Energy **Explanation:** The equation E = W + K_max (Incident Energy = Work Function + Maximum Kinetic Energy) is a direct application of the law of conservation of energy at the quantum level.

Q57. In the photoelectric effect, the stopping potential becomes zero when the frequency of incident light is: A) Infinity B) Equal to the threshold frequency C) Less than the threshold frequency D) Double the threshold frequency

> **Correct Answer:** B) Equal to the threshold frequency **Explanation:** At the threshold frequency, the incident photon has just enough energy to overcome the work function, so the emitted electron has zero kinetic energy. Hence, zero stopping potential is required to stop it.

Q58. In Rutherford's alpha-particle scattering experiment, the impact parameter for a head-on collision is: A) Maximum B) Minimum but not zero C) Zero D) Infinity

> **Correct Answer:** C) Zero **Explanation:** The impact parameter is the perpendicular distance of the initial velocity vector of the alpha particle from the center of the nucleus. For a head-on collision (scattering angle of 180 degrees), this distance is zero.

Q59. What is the approximate ratio of the volume of a nucleus to the volume of an atom? A) 10^-5 B) 10^-10 C) 10^-15 D) 10^-20

> **Correct Answer:** C) 10^-15 **Explanation:** The radius of a nucleus is roughly 10^-15 m, while the radius of an atom is roughly 10^-10 m. Since volume is proportional to the cube of the radius, the ratio is (10^-15 / 10^-10)^3 = (10^-5)^3 = 10^-15.

Q60. An alpha particle is essentially equivalent to: A) A hydrogen nucleus B) A helium nucleus C) A fast-moving electron D) A high-energy photon

> **Correct Answer:** B) A helium nucleus **Explanation:** An alpha particle consists of 2 protons and 2 neutrons, which is exactly the nucleus of a Helium-4 atom (doubly ionized helium, He2+).

Q61. The phenomenon of natural radioactivity was discovered by: A) Marie Curie B) Ernest Rutherford C) Henri Becquerel D) J.J. Thomson

> **Correct Answer:** C) Henri Becquerel **Explanation:** Henri Becquerel accidentally discovered radioactivity in 1896 when he found that uranium salts emitted mysterious rays that could fog photographic plates even in the dark.

Q62. In a p-type semiconductor, the majority charge carriers are: A) Electrons B) Holes C) Protons D) Neutrons

> **Correct Answer:** B) Holes **Explanation:** A p-type semiconductor is created by doping an intrinsic semiconductor with trivalent impurities (like Boron or Aluminum), which creates a deficiency of electrons, known as holes.

Q63. When a p-n junction diode is forward biased, the width of the depletion region: A) Increases B) Decreases C) Remains the same D) Becomes zero immediately

> **Correct Answer:** B) Decreases **Explanation:** In forward bias, the applied voltage opposes the built-in potential barrier, pushing majority carriers toward the junction. This reduces the width of the depletion layer and allows current to flow.

Q64. A full-wave rectifier circuit fundamentally requires a minimum of how many diodes? A) 1 B) 2 C) 3 D) 4

> **Correct Answer:** B) 2 **Explanation:** A basic center-tapped full-wave rectifier uses 2 diodes to rectify both halves of the AC cycle. A bridge rectifier (another type of full-wave rectifier) uses 4 diodes.

Q65. The SI unit of electric flux is: A) N m^2 C^-1 B) V m^-1 C) N C^-1 D) V m^2

> **Correct Answer:** A) N m^2 C^-1 **Explanation:** Electric flux is Electric Field × Area. The unit of Electric field is N/C (Newtons per Coulomb), and Area is m^2. So, the unit is N m^2 / C. (It can also be written as Volt-meter, V m).

Q66. A potentiometer is considered superior to a voltmeter for measuring electromotive force (EMF) because: A) It is highly sensitive B) It draws no current from the cell at the null point C) It is cheaper D) It is more compact

> **Correct Answer:** B) It draws no current from the cell at the null point **Explanation:** A voltmeter always draws a small amount of current to deflect its pointer, which causes a voltage drop across the cell's internal resistance. A potentiometer measures at the null point (zero current), giving the true EMF.

Q67. Two parallel wires carrying current in the same direction will: A) Repel each other B) Attract each other C) Have no effect on each other D) Rotate perpendicular to each other

> **Correct Answer:** B) Attract each other **Explanation:** According to Fleming's Left-Hand Rule and the magnetic field created by the wires, parallel currents attract each other, while anti-parallel currents repel.

Q68. The SI unit of magnetic flux is: A) Tesla B) Gauss C) Weber D) Henry

Correct Answer: C) Weber **Explanation:** Magnetic flux is the total magnetic field passing through a given area. Its SI unit is the Weber (Wb). Tesla is the unit of magnetic field strength (B), and Henry is the unit of inductance.

Q69. In a step-up transformer, which of the following quantities decreases? A) Voltage B) Current C) Power D) Frequency

Correct Answer: B) Current **Explanation:** A step-up transformer increases voltage. Since ideal power (V × I) remains constant, an increase in voltage must result in a proportional decrease in current.

Q70. Displacement current is produced by: A) Moving charges B) A static magnetic field C) A time-varying electric field D) A steady electric current

Correct Answer: C) A time-varying electric field **Explanation:** James Clerk Maxwell introduced the concept of displacement current to explain how magnetic fields can be generated by a changing electric field, even in a vacuum (like between the plates of a charging capacitor).

Q71. The dispersion of white light into its constituent colors by a glass prism is due to: A) Total internal reflection B) Interference of light C) The dependence of refractive index on wavelength D) Diffraction of light

Correct Answer: C) The dependence of refractive index on wavelength **Explanation:** Different colors have different wavelengths. Glass has a different refractive index for each wavelength (Cauchy's equation), causing each color to bend (refract) at a slightly different angle.

Q72. The beautiful colors seen in soap bubbles or thin oil films on water are due to: A) Dispersion B) Scattering C) Diffraction D) Interference

Correct Answer: D) Interference **Explanation:** Light reflecting off the top and bottom surfaces of the thin film interferes with itself. Constructive and destructive interference of different wavelengths creates the iridescent colors.

Q73. The rest mass of a photon is: A) Infinity B) Equal to the mass of an electron C) Zero D) Dependent on its frequency

Correct Answer: C) Zero **Explanation:** Photons are quanta of light. According to the theory of relativity, they always travel at the speed of light and have no rest mass.

Q74. In the hydrogen emission spectrum, transitions from higher energy levels (n = 3, 4, 5...) down to the n = 2 level form the: A) Lyman series B) Balmer series C) Paschen series D) Pfund series

Correct Answer: B) Balmer series **Explanation:** The Balmer series consists of spectral lines originating from transitions to the n=2 level. It is the only series in the hydrogen spectrum that falls entirely in the visible light region.

Q75. Isotopes of an element have the same: A) Mass number but different atomic number B) Number of neutrons but different number of protons C) Atomic number but different mass number D) Number of nucleons

Correct Answer: C) Atomic number but different mass number **Explanation:** Isotopes are atoms of the same element, meaning they have the same number of protons (atomic number, Z) but a different number of neutrons, which leads to a different mass number (A).

Q76. According to Bohr's model of the hydrogen atom, the radius of the n^{th} orbit is directly proportional to:

A) n

B) n^2

C) $1/n$

D) $1/n^2$

Correct Answer: B) n^2

Explanation: The radius of an electron's orbit in Bohr's model is given by $r \propto n^2/Z$. Therefore, it is directly proportional to the square of the principal quantum number (n^2).

Q77. The energy band gap is maximum in:

A) Metals

B) Semiconductors

C) Insulators

D) Superconductors

Correct Answer: C) Insulators

Explanation: Insulators have a very large forbidden energy gap (often greater than 3 eV) between the valence band and the conduction band, which is why electrons cannot easily jump across it to conduct electricity.

Q78. In a pure (intrinsic) semiconductor at absolute zero temperature (0 K), it behaves exactly like:

A) A perfect conductor

B) A perfect insulator

C) A superconductor

D) A partial conductor

Correct Answer: B) A perfect insulator

Explanation: At absolute zero, all electrons are tightly bound in covalent bonds in the valence band. Since there is no thermal energy to break these bonds, there are no free charge carriers in the conduction band, making it a perfect insulator.

Q79. Which of the following radioactive decays does NOT change the mass number of the parent nucleus?

A) Alpha decay

B) Beta decay

C) Gamma decay

D) Both Beta and Gamma decay

Correct Answer: D) Both Beta and Gamma decay

Explanation: Alpha decay reduces the mass number by 4. Beta decay changes a neutron to a proton (or vice versa), changing the atomic number but keeping the mass number constant. Gamma decay is just an emission of energy (photon) and changes neither mass nor atomic number.

Q80. The material commonly used as a moderator in a nuclear reactor is:

A) Cadmium

B) Uranium

C) Graphite

D) Boron

Correct Answer: C) Graphite

Explanation: A moderator is used to slow down fast-moving neutrons so they can efficiently cause further fission. Graphite and heavy water are the most common moderators. (Cadmium and Boron are used for control rods to absorb neutrons).

Q81. A photodiode is always operated in:

A) Forward bias

B) Reverse bias

C) Zero bias

D) Alternating current only

Correct Answer: B) Reverse bias

Explanation: A photodiode is operated in reverse bias because the fractional change in the minority carrier current (due to incident light) is much more noticeable and easier to measure than the fractional change in the majority carrier forward current.

Q82. The Boolean expression for a NOR gate is:

A) $Y = A \cdot B$

B) $Y = A + B$

C) $Y = \overline{A \cdot B}$

D) $Y = \overline{A + B}$

Correct Answer: D) $Y = \overline{A + B}$

Explanation: A NOR gate is an OR gate followed by a NOT gate. The OR operation is $A + B$, and the NOT operation inverts it, giving $\overline{A + B}$.

Q83. The de Broglie wavelength associated with an electron accelerated through a potential difference of V volts is approximately:

A) $12.27 / \sqrt{V}$ nm

B) $1.227 / \sqrt{V}$ nm

C) $12.27 / V$ nm

D) $1.227 / V$ nm

Correct Answer: B) $1.227 / \sqrt{V}$ nm

Explanation: The formula for the de Broglie wavelength of an electron is $\lambda = \frac{12.27}{\sqrt{V}}$ Angstroms ($\text{\AA}$). Since 1 $\text{\AA}$ = 0.1 nm, the formula in nanometers is $\frac{1.227}{\sqrt{V}}$ nm.

Q84. What happens to the focal length of a convex lens when it is cut horizontally (along the principal axis) into two equal halves?

A) It doubles

B) It halves

C) It remains the same

D) It becomes infinite

Correct Answer: C) It remains the same

Explanation: Cutting the lens horizontally does not change its radii of curvature. Therefore, the focal length remains exactly the same. However, the intensity of the image formed will be halved because only half the amount of light passes through.

Q85. For constructive interference to take place, the path difference between two interacting light waves must be an integral multiple of:

A) $\lambda / 2$

B) λ

C) 2λ

D) $\lambda / 4$

Correct Answer: B) λ

Explanation: Constructive interference occurs when the crests of two waves align. This happens when their path difference is $n\lambda$ (where $n = 0, 1, 2...$). For destructive interference, it is an odd multiple of $\lambda/2$.

Q86. In a step-down transformer, the number of turns in the primary coil (N_p) and secondary coil (N_s) are related as:

A) $N_p > N_s$

B) $N_p < N_s$

C) $N_p = N_s$

D) $N_p = 0$

Correct Answer: A) $N_p > N_s$

Explanation: A step-down transformer decreases the voltage. Since voltage is directly proportional to the number of turns ($V_p / V_s = N_p / N_s$), the primary coil must have more turns than the secondary coil.

Q87. To convert a galvanometer into an ammeter, one must connect:

A) A high resistance in series

B) A low resistance in series

C) A high resistance in parallel

D) A low resistance in parallel

Correct Answer: D) A low resistance in parallel

Explanation: An ammeter is connected in series in a circuit and should have very low resistance so it doesn't affect the main current. To achieve this, a very low resistance (called a shunt) is connected in parallel with the galvanometer.

Q88. The conventional direction of an electric dipole moment is:

A) From positive to negative charge

B) From negative to positive charge

C) Perpendicular to the line joining the charges

D) Radially outwards from the center

Correct Answer: B) From negative to positive charge

Explanation: By convention in physics, the electric dipole moment vector points from the negative charge ($-q$) to the positive charge ($+q$). (Note: This is opposite to the direction of electric field lines).

Q89. Two point charges $+q$ and $-q$ are placed at a distance r apart. The electric potential exactly at the midpoint between them is:

A) Zero

B) kq/r

C) $2kq/r$

D) Infinity

Correct Answer: A) Zero

Explanation: Electric potential is a scalar quantity. The potential at the midpoint due to the positive charge is $+kq/(r/2)$ and due to the negative charge is $-kq/(r/2)$. Adding them together gives exactly zero.

Q90. A moving electric charge produces:

A) Only an electric field

B) Only a magnetic field

C) Both electric and magnetic fields

D) Neither electric nor magnetic fields

Correct Answer: C) Both electric and magnetic fields

Explanation: A stationary charge produces only an electric field. A charge moving with a constant velocity produces both an electric field and a magnetic field. (An accelerating charge also radiates electromagnetic waves).

Q91. The magnetic force on a completely stationary charge placed in a uniform magnetic field is:

A) Maximum

B) Minimum but not zero

C) Zero

D) Infinite

Correct Answer: C) Zero

Explanation: The magnetic force is given by $F = qvB \sin(\theta)$. Since the charge is stationary, its velocity $v = 0$. Therefore, the magnetic force is zero. Magnetic fields only exert force on moving charges.

Q92. The SI unit of magnetic dipole moment is:

A) Ampere meter (A m)

B) Ampere meter squared (A m^2)

C) Tesla meter (T m)

D) Weber per meter squared (Wb/m^2)

Correct Answer: B) Ampere meter squared (A m^2)

Explanation: Magnetic dipole moment for a current-carrying loop is given by $M = I \times A$, where I is current (in Amperes) and A is area (in square meters). Hence, the unit is A m^2.

Q93. The phase difference between current and voltage in a purely capacitive AC circuit is:

A) 0

B) $\pi/4$

C) $\pi/2$

D) π

Correct Answer: C) $\pi/2$

Explanation: In a purely capacitive circuit, the current leads the applied voltage by a phase angle of 90° or $\pi/2$ radians.

Q94. The condition for resonance in an LCR series AC circuit is:

A) $X_L > X_C$

B) $X_L < X_C$

C) $X_L = X_C$

D) $R = 0$

Correct Answer: C) $X_L = X_C$

Explanation: Resonance occurs when the inductive reactance (X_L) perfectly equals the capacitive reactance (X_C). They cancel each other out, leaving the circuit purely resistive with maximum current flow.

Q95. Which of the following electromagnetic waves has the highest frequency?

A) Radio waves

B) X-rays

C) Gamma rays

D) Microwaves

Correct Answer: C) Gamma rays

Explanation: In the EM spectrum, frequency increases in this order: Radio $\rightarrow$ Microwave $\rightarrow$ Infrared $\rightarrow$ Visible $\rightarrow$ Ultraviolet $\rightarrow$ X-ray $\rightarrow$ Gamma ray.

Q96. The color of the sky is blue primarily due to the phenomenon of:

A) Dispersion of light

B) Scattering of light

C) Interference of light

D) Polarization of light

Correct Answer: B) Scattering of light

Explanation: According to Rayleigh scattering, shorter wavelengths (like blue and violet) scatter much more than longer wavelengths (like red) when sunlight interacts with gas molecules in the Earth's atmosphere.

Q97. The minimum angular separation between two close objects that can just be resolved by an optical instrument is called its:

A) Magnifying power

B) Resolving power

C) Limit of resolution

D) Critical angle

Correct Answer: C) Limit of resolution

Explanation: The limit of resolution is the smallest angle or distance between two points that allows them to be seen as distinct. Resolving power is the reciprocal of the limit of resolution.

Q98. In a hydrogen atom, the transition of an electron from $n=3$ to $n=1$ emits a photon that belongs to the:

A) Lyman series

B) Balmer series

C) Paschen series

D) Brackett series

Correct Answer: A) Lyman series

Explanation: Any transition that ends at the ground state ($n=1$) belongs to the Lyman series, regardless of where it started from.

Q99. The energy equivalent of 1 atomic mass unit (1 amu or 1 u) is approximately:

A) 931 MeV

B) 9.31 MeV

C) 93.1 MeV

D) 1 eV

Correct Answer: A) 931 MeV

Explanation: Using Einstein's mass-energy equivalence ($E=mc^2$), the mass of 1 amu converted entirely into energy yields approximately 931.5 Mega electron-Volts (MeV).

Q100. The reverse bias current in a p-n junction diode is mainly due to:

A) Majority charge carriers

B) Minority charge carriers

C) Both majority and minority carriers equally

D) Protons

Correct Answer: B) Minority charge carriers

Explanation: In reverse bias, the potential barrier prevents majority carriers from crossing. The tiny current that does flow (drift current) is due to the thermally generated minority carriers swept across the junction by the electric field.