

MHT CET 2020 Mathematics Answer Key PDF

Question 1 Option (A) – $1 : \sqrt{2}$

Explanation: Using Einstein's photoelectric equation, the maximum kinetic energies for the two cases are calculated as $2W$ and $4W$ respectively. Since the velocity of emitted photoelectrons is directly proportional to the square root of their kinetic energy, the ratio of their velocities is $\sqrt{2W} : \sqrt{4W} = 1 : \sqrt{2}$.

Question 2 Option (B) – Using blue light instead of green light.

Explanation: The fringe width in Young's double-slit experiment is directly proportional to the wavelength of the incident light. Since the wavelength of blue light is shorter than that of green light, using blue light will decrease the fringe width, causing the observed fringes to be more closely spaced.

Question 3 Option (C) – 0.4425×10^{-10}

Explanation: The dielectric constant of the medium is found by dividing the capacitance with the dielectric by the capacitance with air, yielding $K = 5$. The permittivity of the medium is then calculated using the relation $\epsilon = K\epsilon_0$, which equals 0.4425×10^{-10} SI units.

Question 4 Option (C) – 0.75 V

Explanation: The potential gradient of the potentiometer wire is calculated by dividing the total potential difference by the total length, which yields 0.75 V/m. Thus, the e.m.f. of the cell balancing against a length of 100 cm (1 m) is exactly 0.75 V.

Question 5 Option (A) – $9R/10$

Explanation: Equating the gravitational force exerted by the Earth and the Moon on a test mass provides the position of zero net force. Solving this equation with the Earth's mass being 81 times the Moon's mass gives a distance of $9R/10$ from the center of the Earth.

Question 6 Option (B) – 6 : 1

Explanation: From the balanced meter bridge condition, the resistance ratio is $R_A/R_B = 40/60 = 2/3$. Since resistance is directly proportional to specific resistance and inversely proportional to the square of diameter, substituting the given values yields a specific resistance ratio of 6 : 1.

Question 7 Option (D) – $\sqrt{3}R$

Explanation: The radius of a charged particle's circular path in a uniform magnetic field is directly proportional to the square root of its kinetic energy. When the energy of the particle is tripled, the radius of the circular path increases by a factor of $\sqrt{3}$, becoming $\sqrt{3}R$.

Question 8 Option (D) – Chlorination of alkanes in presence of sunlight

Explanation: Direct chlorination of alkanes via a free-radical mechanism is highly non-selective and yields a complex mixture of mono, di, and poly-chlorinated hydrocarbons. Because separating these components is extremely difficult, this method is not suitable for preparing pure alkyl chlorides.

Question 9 Option (B) – 2-Methylbut-3-en-2-ol

Explanation: An allylic alcohol is characterized by having its hydroxyl ($-\text{OH}$) group bonded to an sp^3 hybridized carbon atom that is directly adjacent to a carbon-carbon double bond. In 2-methylbut-3-en-2-ol, the structure contains this specific allylic arrangement.

Question 10 Option (B) – 5.783 Å

Explanation: For a face-centered cubic (fcc) structure, the number of atoms per unit cell is $z = 4$. Substituting the given density, molar mass, and Avogadro's number into the density formula $\rho = \frac{zM}{N_A a^3}$ allows us to calculate the unit cell edge length as 5.783 Å.

Question 11 Option (B) – ○○

Explanation: According to Dalton's atomic theory, atoms of different elements are represented

by distinct circular symbols, and molecules are represented by joining these circles. A water molecule, considered a binary compound of hydrogen and oxygen, is represented by two adjacent joined circles.

Question 12 Option (B) – 205.6 kJ

Explanation: The reaction of 6.0 g of O_2 corresponds to 0.1875 moles of oxygen gas. Since 38.55 kJ of heat is absorbed for this quantity, the standard enthalpy change per mole of O_2 reacted is calculated as $38.55/0.1875 = 205.6$ kJ.

Question 13 Option (B) – an identity function

Explanation: The composite function $f(f(x))$ is determined by substituting the expression for $f(x)$ into itself. Simplifying the resulting algebraic fraction yields $f(f(x)) = x$, which by definition represents an identity function.

Question 14 Option (B) – 2

Explanation: By expressing the vectors in terms of position vectors from the origin, the sum $\vec{AD} + \vec{BC}$ simplifies to $\vec{d} - \vec{a} + \vec{c} - \vec{b}$. Comparing this to the midpoint vector relation $\vec{MN} = \frac{\vec{c} + \vec{d}}{2} - \frac{\vec{a} + \vec{b}}{2}$ shows that $\vec{AD} + \vec{BC} = 2\vec{MN}$.

Question 15 Option (D) – $-5/2$

Explanation: For two lines to be parallel, their direction ratios must be proportional to one another. Setting up the proportionality relation $\frac{2\lambda}{\lambda} = \frac{-5}{\lambda} = \frac{2}{1}$ and solving for the variable yields $\lambda = -5/2$.

Question 16 Option (B) – $(1/2)\log(8/3)$

Explanation: This definite integral is evaluated by applying the substitution method with $u = x^2 - 1$, which simplifies the expression to $\int \frac{1}{2u} du$. Integrating this over the changed boundary limits from 3 to 8 yields $(1/2)\log(8/3)$.

Question 17 Option (C) – $1/4$

Explanation: The word 'LOGARITHM' contains 9 distinct letters, consisting of 3 vowels and 6 consonants. The probability of an arrangement starting with a vowel and ending with a consonant is calculated as the favorable permutations divided by the total permutations: $\frac{3 \times 6 \times 7!}{9!} = \frac{18}{72} = 1/4$.