

MHT CET 2019 Biology Answer Key PDF

Question 1 Option: (B) – $\frac{2\nu}{3}$

Explanation: Using Einstein's photoelectric equation, $eV_s = h(\nu - \nu_0)$. Setting up the ratio of stopping potentials for the two given frequencies and solving for the threshold frequency yields $\nu_0 = \frac{2\nu}{3}$.

Question 2 Option: (B) – A real, inverted and same size image can be obtained by using convex mirror

Explanation: Convex mirrors always form virtual, erect, and diminished images of real objects. Therefore, obtaining a real, inverted, and same-size image using a convex mirror is physically impossible.

Question 3 Option: (C) – $1000\ \Omega$

Explanation: Since the deflection θ is inversely proportional to the total resistance R_{total} , reducing the deflection from 30 to 20 divisions requires increasing the resistance by 50%. This corresponds to an additional series resistance of $1000\ \Omega$.

Question 4 Option: (A) – $1.22\ \text{V}$

Explanation: The velocity of a transverse wave on a string is $V = \sqrt{T/\mu}$. By Hooke's law, the tension T is proportional to the extension x , so increasing the extension by 50% increases the velocity to $\sqrt{1.5}V \approx 1.22V$.

Question 5 Option: (B) – $2.25 \times 10^8\ \text{m/s}$

Explanation: Using the relation $\mu_g v_g = \mu_w v_w$, we can substitute the given refractive indices and the speed of light in glass to calculate the speed of light in water as $v_w = 2.25 \times 10^8\ \text{m/s}$.

Question 6 Option: (D) – 10%

Explanation: The density of a cube is $\rho = m/a^3$. The maximum permissible error is calculated by summing the relative errors as $\Delta\rho/\rho = \Delta m/m + 3(\Delta a/a) = 4\% + 3(2\%) = 10\%$.

Question 7 Option: (B) – $\geq \left[\frac{10gh}{7}\right]^{1/2}$

Explanation: By conservation of mechanical energy, the initial total kinetic energy of the rolling solid sphere ($\frac{7}{10}MV^2$) must be greater than or equal to the potential energy at height h (Mgh), which yields $V \geq \sqrt{10gh/7}$.

Question 8 Option: (A) – $2mnu$

Explanation: Each elastic collision with the wall results in a momentum change of $2mu$ per ball. Since n balls strike the wall per second, the average force exerted is the rate of change of momentum, which is $2mnu$.

Question 9 Option: (B) – PQ

Explanation: The magnitude of the vector product of two perpendicular vectors is given by $|\vec{P} \times \vec{Q}| = PQ \sin(90^\circ)$. Since $\sin(90^\circ) = 1$, the magnitude is simply PQ.

Question 10 Option: (C) – 320 m

Explanation: The transmission range is given by $d = \sqrt{2Rh}$. Rearranging this formula and substituting the values $d = 64\ \text{km}$ and $R = 6400\ \text{km}$ yields a required tower height of $h = 320\ \text{m}$.

Question 11 Option: (A) – 0.125

Explanation: Since the excess pressure is $\Delta P = 4T/R \propto 1/R$, doubling the pressure means the radius of the first bubble is half that of the second. Thus, the volume ratio is $n = (1/2)^3 = 0.125$.

Question 12 Option: (C) – $\frac{gR^2}{(R+h)^2}$

Explanation: The acceleration due to gravity at a height h above the Earth's surface is given by the inverse-square law relation $g_h = gR^2/(R+h)^2$, where R is the radius of the Earth.

Question 13 Option: (A) – leads the current by phase $(\pi/2)^c$

Explanation: In a purely inductive AC circuit, the alternating voltage (or induced e.m.f.

opposing the change) across the inductor leads the alternating current by a phase angle of 90° or $\pi/2$ radians.

Question 14 Option: (C) – 21%

Explanation: The rotational kinetic energy is $E_k = L^2/2I$. Increasing the angular momentum L by 10% increases the kinetic energy by a factor of $(1.1)^2 = 1.21$, which represents a 21% increase.

Question 15 Option: (A) – r_a/μ

Explanation: The radius of the spherical wavefront is proportional to the speed of light in that medium. Since the speed of light in a medium is reduced by a factor of μ , the radius of the wavefront also decreases to r_a/μ .

Question 16 Option: (B) – velocity of the particle.

Explanation: The time taken to traverse a semicircle in a cyclotron is $t = \pi m/qB$. This time depends only on the mass, charge, and magnetic field strength, making it completely independent of the particle's velocity.

Question 17 Option: (B) – $x = L\theta \cos \sqrt{\frac{g}{L}}t$

Explanation: For a simple pendulum executing SHM, the angular displacement is $\theta(t) = \theta \cos(\omega t)$ where $\omega = \sqrt{g/L}$. The linear displacement is therefore $x(t) = L\theta(t) = L\theta \cos \sqrt{g/L}t$.

Question 18 Option: (D) – resistance of the coil.

Explanation: According to Faraday's law, the induced e.m.f. is $e = -Nd\phi/dt$, which depends on the magnetic properties and speed of movement. The electrical resistance of the coil affects the induced current but not the magnitude of the induced e.m.f.

Question 19 Option: (C) – $2\sqrt{G(M_e + M_m)/D}$

Explanation: At the midpoint, the distance to both centers is $D/2$. Equating the kinetic energy required for escape to the magnitude of the gravitational potential energy yields $v = 2\sqrt{G(M_e + M_m)/D}$.

Question 20 Option: (C) – $1.2^\circ\text{C}/\text{min}$

Explanation: According to Newton's law of cooling, the rate of cooling is directly proportional to the temperature difference. Therefore, the new rate is $2 \times (30/50) = 1.2^\circ\text{C}/\text{min}$.

Question 21 Option: (B) – remain same

Explanation: By Gauss's law, the net outward electric flux through any closed surface depends only on the total enclosed charge q and is independent of the size or radius of the Gaussian surface.

Question 22 Option: (D) – Cl_2

Explanation: In the given reaction, chlorine (Cl_2) gains electrons and undergoes reduction (its oxidation state decreases from 0 to -1). Since it gets reduced, it acts as the oxidizing agent.

Question 23 Option: (B) – N_2O

Explanation: Nitrous oxide (N_2O) is a neutral non-metal oxide that does not react with acids or bases to form salts, unlike the acidic oxide SO_2 and basic oxide Na_2O .

Question 24 Option: (B) – SO_2

Explanation: Easily liquefiable gases with higher critical temperatures are more readily adsorbed by activated charcoal. Among the choices, SO_2 is a polar gas with a high critical temperature and is adsorbed most easily.

Question 25 Option: (B) – Ionization isomers

Explanation: These two coordination compounds yield different ions in an aqueous solution (NO_2^- versus SO_4^{2-}), making them ionization isomers of each other.

Question 26 Option: (A) – $\text{Rate} \propto [\text{OH}^-][\text{CH}_3\text{Br}]$

Explanation: The alkaline hydrolysis of methyl bromide proceeds via an $\text{S}_\text{N}2$ mechanism,

which is a second-order reaction whose rate depends on the concentrations of both the nucleophile and the substrate.

Question 27 Option: (C) – -455.8 J

Explanation: The work done during irreversible expansion against constant pressure is $W = -P_{\text{ext}}\Delta V = -1 \text{ atm} \times 4.5 \text{ L} = -4.5 \text{ L} \cdot \text{atm}$. Converting this to Joules gives $-4.5 \times 101.3 \text{ J} = -455.8 \text{ J}$.

Question 28 Option: (D) – non availability of vacant d-atomic orbitals

Explanation: Nitrogen is in the second period of the periodic table and lacks vacant d-orbitals in its valence shell, preventing it from expanding its octet to form five covalent bonds as phosphorus does.

Question 29 Option: (D) – Buna-S

Explanation: The copolymerization of styrene and 1,3-butadiene monomers in a 1:3 ratio under suitable conditions forms the synthetic elastomer known as Buna-S.

Question 30 Option: (B) – m-RNA

Explanation: A codon is a sequence of three nucleotides on a messenger RNA (m-RNA) molecule that codes for a specific amino acid during translation.

Question 31 Option: (A) – Chiropterophily

Explanation: The transfer of pollen grains from the anther to the stigma mediated by bats as the pollinating agents is botanically termed chiropterophily.

Question 32 Option: (C) – The mesophyll cells of C_4 plants

Explanation: In C_4 plants, the initial fixation of carbon dioxide occurs in the cytoplasm of the mesophyll cells, where the enzyme PEPCase catalyzes the carboxylation of phosphoenolpyruvate.

Question 33 Option: (C) – Poppy

Explanation: Opioids are a class of drugs naturally extracted from the latex of the unripe seed pods of the opium poppy plant, *Papaver somniferum*.

Question 34 Option: (B) – Visceral muscles

Explanation: Peristalsis consists of involuntary, wave-like muscle contractions that propagate food through the digestive tract, carried out by smooth (visceral) muscles.

Question 35 Option: (D) – Taq Polymerase

Explanation: Taq polymerase is a thermostable DNA polymerase isolated from *Thermus aquaticus*. It is used in PCR because it remains active at the high temperatures required for DNA denaturation.