

MHT CET 2024 Biology Answer Key PDF

Answer Key

Question 1 Correct Answer – (B) 10-15 micrometers.

Explanation: Lymphocytes are a type of white blood cell whose diameter typically ranges between 10 to 15 micrometers in their resting, mature forms[1][2].

Question 2 Correct Answer – (C) Antidiuretic hormone (ADH).

Explanation: ADH (vasopressin) is secreted by the posterior pituitary and acts on the collecting ducts of the kidney, promoting water reabsorption to maintain osmotic balance.

Question 3 Correct Answer – (C) Proximal convoluted tubule.

Explanation: The proximal convoluted tubule (PCT) is primarily responsible for the reabsorption of nearly all essential nutrients, solutes (like glucose and amino acids), and the majority of water and ions.

Question 4 Correct Answer – (B) 1:2:1.

Explanation: In a monohybrid cross between two heterozygotes ($Aa \times Aa$), the resulting genotypes are 1 AA : 2 Aa : 1 aa , giving a genotypic ratio of 1:2:1.

Question 5 Correct Answer – (B) Sympathetic stimulation causes vasoconstriction of the afferent arteriole, decreasing glomerular filtration rate (GFR).

Explanation: Activation of the sympathetic nervous system triggers vasoconstriction of the afferent arteriole to redirect blood flow, which consequently lowers the glomerular filtration rate.

Question 6 Correct Answer – (B) Hypothalamus.

Explanation: The hypothalamus synthesizes hormones like ADH (stored and released by the posterior pituitary) that directly regulate water balance and glomerular filtrate volume.

Question 7 Correct Answer – (D) Euploidy.

Explanation: Euploidy refers to the state of having a normal, balanced chromosome complement that is an exact multiple of the haploid number.

Question 8 Correct Answer – (A) Polymerase Chain Reaction (PCR).

Explanation: PCR is a molecular biology technique used to make millions of copies (amplify) of a specific DNA segment, which is crucial when analyzing limited DNA samples in fingerprinting.

Question 9 Correct Answer – (C) 20%.

Explanation: According to Chargaff's rule, Adenine = Thymine = 30%, so $A + T = 60\%$. The remaining 40% is split equally between Guanine and Cytosine, making Guanine = 20%.

Question 10 Correct Answer – (C) 2.4%.

Explanation: Geographically, India occupies approximately 2.4% of the total land area of the world.

Question 11 Correct Answer – (D) Vanaspati Ghee.

Explanation: Hydrogenation of liquid vegetable oils in the presence of a metal catalyst like nickel yields solid or semi-solid Vanaspati Ghee.

Question 12 Correct Answer – (B) 27 : 9 : 9 : 9 : 3 : 3 : 3 : 1

Explanation: While $(1 : 2 : 1)^3$ represents the true genotypic ratio, the official keys and options commonly cite the phenotypic ratio 27 : 9 : 9 : 9 : 3 : 3 : 3 : 1 for a trihybrid cross.

Question 13 Correct Answer – (B) UUU.

Explanation: The codon UUU (as well as UUC) specifically codes for the hydrophobic amino acid phenylalanine.

Question 14 Correct Answer – (A) *cys E*, *cys M*.

Explanation: The bacterial genes *cys E* and *cys M* encode enzymes involved in the biosynthetic pathway of the sulfur-containing amino acid cysteine, which improves wool quality.

Question 15 Correct Answer – (A) AUG

Explanation: The codon AUG has a dual function because it acts as the initiation (start) codon for translation and also codes for the amino acid methionine.

Question 16 Correct Answer – (B) Liver

Explanation: Angiotensinogen, an essential α -2-globulin precursor in the renin-angiotensin system, is synthesized and continuously released into the circulation by the liver.

Question 17 Correct Answer – (B) Columnae carnea

Explanation: The inner muscular walls of the ventricles of the heart exhibit irregular muscular ridges and columns known as columnae carnea (or trabeculae carnea).

Question 18 Correct Answer – (C) Leaves

Explanation: In plants, photoperiodic signals are perceived by photoreceptors (such as phytochromes) located in the leaves, which then transmit the flowering signal (florigen) to the shoot apex.

Question 19 Correct Answer – (C) Transpiration cohesion theory

Explanation: The cohesion-tension-transpiration pull theory, proposed by Dixon and Jolly, is the most widely accepted mechanism explaining the vertical ascent of water in tall trees.

Question 20 Correct Answer – (B) Kangaroo rat

Explanation: The kangaroo rat is highly adapted to arid environments, conserving water by producing extremely concentrated urine and dry feces, and utilizing metabolic water.

Question 21 Correct Answer – (B) Gibberellin

Explanation: Gibberellins (specifically GA_3) are commercially applied to grapes to promote fruit elongation, increase pedicel length, and reduce cluster compactness.

Question 22 Correct Answer – (A) Leydig cells for testosterone production

Explanation: Interstitial Cell Stimulating Hormone (ICSH), also known as luteinizing hormone (LH), acts on the interstitial Leydig cells of the testes to stimulate testosterone synthesis.

Question 23 Correct Answer – (D) All of the above

Explanation: Key integrative themes in human physiology include hemodynamic circulation, neural signalling networks, and endocrine/hormonal regulation working in concert.

Question 24 Correct Answer – (D) All of the above

Explanation: Cellular replication and genetic reproduction processes require mitosis (for somatic growth), meiosis (for gametogenesis), and DNA replication.

Question 25 Correct Answer – (D) Depends on the species

Explanation: Excretory products differ across the animal kingdom depending on habitat and water availability (ammoniotelic, ureotelic, or uricotelic pathways).

Question 26 Correct Answer – (D) All of the above

Explanation: Plant growth is highly regulated by a combination of major phytohormones, including auxins, gibberellins, and cytokinins.

Question 27 Correct Answer – (D) 2-Methylprop-1-ene

Explanation: Reductive ozonolysis of 2-methylprop-1-ene yields propanone and formaldehyde. In the exam's typo where "ethanal" or "methanol" was substituted as "ethanol", this is the closest matching option.

Question 28 Correct Answer – (A) 5.0×10^{-16}

Explanation: A pH of 9 implies $\text{pOH} = 5$, hence $[\text{OH}^-] = 10^{-5} \text{ M}$. Stoichiometrically, $[\text{Ca}^{2+}] = 0.5 \times 10^{-5} \text{ M}$. Thus, $K_{sp} = [\text{Ca}^{2+}][\text{OH}^-]^2 = 5.0 \times 10^{-16}$.

Question 29 Correct Answer – (C) 100.80°C

Explanation: Since $\Delta T_b = K_b \cdot m$, an elevation of 0.16°C for a 0.1 m solution means $K_b = 1.6$. For 0.5 m, the elevation is $1.6 \times 0.5 = 0.80^\circ\text{C}$, yielding a boiling point of 100.80°C .

Question 30 Correct Answer – (A) $[\text{Ar}]3d^{10}4s^1$

Explanation: Copper (atomic number 29) exhibits an anomalous electronic configuration where an electron is promoted from 4s to 3d to obtain a stable, fully-filled d-subshell.

Question 31 Correct Answer – (A) Velocity is maximum and pressure is minimum.

Explanation: According to the equation of continuity, velocity is highest at the narrowest section. By Bernoulli's principle, higher fluid velocity corresponds to a lower pressure zone.

Question 32 Correct Answer – (A) $20/7\lambda$

Explanation: Using $1/\lambda = R(1/n_1^2 - 1/n_2^2)$, we get $1/\lambda_1 = R(5/36)$ and $1/\lambda_2 = R(7/144)$. Dividing the wavelengths yields $\lambda_2 = \frac{20}{7}\lambda_1$.

Question 33 Correct Answer – (B) R

Explanation: The acceleration due to gravity varies as $g' = g \frac{R^2}{(R+h)^2}$. Setting $g' = g/4$ gives $1/2 = \frac{R}{R+h}$, which simplifies to $h = R$.