

MHT CET 2024 Biology Answer Key PDF

Answer Key

Question 1 Correct Answer – (D) regulator protein

Explanation: In the lac-operon system, the regulatory gene synthesizes a repressor protein (a regulator protein) that binds to the operator to switch it off, or is inactivated by an inducer to switch it on. code Code

Question 2 Correct Answer – (C) Determination of sex

Explanation: Crossing over of homologous chromosomes results in genetic recombination, variations, and provides raw material for natural selection, but it has no direct significance in sex determination.

Question 3 Correct Answer – (C) Malpighian tubules

Explanation: Malpighian tubules are excretory organs in insects used primarily for uricotelic excretion (excreting uric acid), whereas gills and general body surfaces are typical organs for ammonotelic excretion.

Question 4 Correct Answer – (B) Jurassic

Explanation: The Jurassic period of the Mesozoic era is widely known as the peak of the 'Age of Reptiles' due to the widespread dominance and diversification of dinosaurs.

Question 5 Correct Answer – (C) Statement I is correct and statement II is incorrect.

Explanation: Statement I is correct as the peg-and-socket joint between a tooth and the jawbone is indeed a gomphosis. Statement II is incorrect because having different kinds of teeth describes heterodont dentition, not diphyodont (which refers to having two successive sets of teeth).

Question 6 Correct Answer – (B) Sporopollenin

Explanation: Sporopollenin is an extremely durable, non-biodegradable organic polymer composing the exine of pollen grains, protecting them from chemical and physical degradation.

Question 7 Correct Answer – (C) ABA

Explanation: Abscissic Acid (ABA) is a plant hormone synthesized during water stress that alters the permeability of guard cell membranes, preventing the uptake of K^+ and Cl^- ions and triggering stomatal closure.

Question 8 Correct Answer – (C) 4.6

Explanation: The circular double-stranded DNA genome in the nucleoid of *Escherichia coli* contains approximately 4.6 million base pairs.

Question 9 Correct Answer – (D) mesethmoid cartilage

Explanation: The human nasal cavity is divided into right and left nasal chambers by a vertical median nasal septum composed of the mesethmoid cartilage.

Question 10 Correct Answer – (A) i - b ii - c iii - a

Explanation: Citric acid is used in the confectionery industry (i-b), fumaric acid is utilized in resins as a wetting agent (ii-c), and gluconic acid is used in medicine to enhance the solubility of Ca^{2+} (iii-a).

Question 11 Correct Answer – (B) Spinal accessory

Explanation: The spinal accessory nerve (Cranial Nerve XI) is a motor nerve that controls the movement of the pharynx, larynx, and specific shoulder muscles (like trapezius).

Question 12 Correct Answer – (C) Taq polymerase

Explanation: Taq polymerase is a thermostable DNA polymerase isolated from the thermophilic bacterium *Thermus aquaticus*, making it ideal for the high-temperature denaturation steps of PCR.

Question 13 Correct Answer – (C) It increases pressure inside the cranium.

Explanation: Cerebrospinal fluid (CSF) acts as a shock absorber, protects the CNS from physical trauma, and helps exchange nutrients/oxygen; however, it functions to regulate and maintain constant cranial pressure rather than increasing it.

Question 14 Correct Answer – (B) Detection of chromosomal abnormalities

Explanation: Detection of chromosomal abnormalities is the diagnostic purpose of amniocentesis, whereas miscarriage, needle injuries to the fetus, and amniotic fluid leakage are associated physical risks.

Question 15 Correct Answer – (A) 1 – 6

Explanation: Vernalization is the pre-treatment of seeds or seedlings at low temperatures (typically between 1 °C and 6 °C) to induce early flowering in plants.

Question 16 Correct Answer – (A) chiropterophily

Explanation: Bat-pollinated (chiropterophilous) flowers are typically dull-colored or pale, open at night, and emit a strong, musky or fruity fragrance to attract nocturnal bats.

Question 17 Correct Answer – (B) iv → ii → v → i → iii

Explanation: Intra-renal blood flow starts at the renal arteriole (iv), proceeds to the glomerular capillaries (ii), drains via the efferent arteriole (v) into the peritubular capillaries (i), and eventually leaves via the renal veinule (iii).

Question 18 Correct Answer – (A) Both statement I and statement II are correct.

Explanation: During the mitochondrial electron transport chain, the oxidation of NADH and FADH₂ releases protons and electrons, which are transferred across a series of carriers to molecular oxygen (the terminal acceptor).

Question 19 Correct Answer – (D) It increases the rate of reaction within a limited range.

Explanation: Initially, increasing the substrate concentration increases the reaction rate, but this effect is limited to a certain range until all enzyme active sites are saturated (V_{max} is reached).

Question 20 Correct Answer – (A) Both statement I and statement II are correct.

Explanation: Eukaryotic chromosomes reside within the nucleus and exist as diffused chromatin during interphase, condensing into distinct visible structures only during active cell division.

Question 21 Correct Answer – (A) i - d ii - a iii - e iv - b v - c

Explanation: The standard differential leukocyte count ranges are: lymphocytes (25%–30%), eosinophils (1%–3%), basophils (0.5%–1%), neutrophils (about 70%), and monocytes (3%–5%).

Question 22 Correct Answer – (B) AUG

Explanation: The triplet codon AUG is the universal start (initiation) codon in messenger RNA (mRNA) that signals the beginning of protein translation.

Question 23 Correct Answer – (A) cholinesterase

Explanation: Acetylcholinesterase (cholinesterase) is the enzyme present in the synaptic cleft that rapidly hydrolyzes and inactivates the neurotransmitter acetylcholine after signal transmission.

Question 24 Correct Answer – (D) anaerobic bacteria

Explanation: In the secondary treatment of sewage, the settled activated sludge is transferred to anaerobic sludge digesters where anaerobic bacteria digest the organic flocs.

Question 25 Correct Answer – (C) Agrobacterium

Explanation: The tumor-inducing (Ti) plasmid, widely used as a gene transfer vector for plants, is naturally found in the soil bacterium *Agrobacterium tumefaciens*.

Question 26 Correct Answer – (C) co-evolution

Explanation: The tightly linked mutualistic relationship where the evolutionary modifications of a flower and its specific pollinator are interdependent is an example of co-evolution.

Question 27 Correct Answer – (A) Irritability

Explanation: Irritability (or excitability) is the physiological property of a nerve fiber to perceive a stimulus and respond by entering an active state of excitation.

Question 28 Correct Answer – (B) tree plantation, protection and mass awareness.

Explanation: In Maharashtra, the 1926 toll-free helpline named 'Hello Forest' was established by the Forest Department to promote public awareness, forest protection, and tree plantation.

Question 29 Correct Answer – (C) Degree of saturation decreases with increase in partial pressure of O_2 (ppO_2).

Explanation: The degree of oxygen-hemoglobin saturation increases (not decreases) with an increase in the partial pressure of oxygen (ppO_2), following a sigmoid curve.

Question 30 Correct Answer – (B) Cohesion – tension

Explanation: The cohesion-tension-transpiration pull theory proposed by Dixon and Jolly is the most widely accepted scientific explanation for the translocation of water up through the xylem.

Question 31 Correct Answer – (A) Sponge

Explanation: Sponges are simple, aquatic, ammoniotelic organisms that directly excrete metabolic ammonia waste via simple diffusion across their general body surface.

Question 32 Correct Answer – (C) Statement I is correct and statement II is incorrect.

Explanation: Statement I is correct; amniocentesis uses a needle to draw amniotic fluid. Statement II is incorrect because ultrasonography (not harmful X-rays) is used to locate the fetus prior to the procedure.

Question 33 Correct Answer – (B) iii only

Explanation: Polyembryony increases survival chances, is useful in horticulture, and produces identical clones. It does not cause seedless fruit formation (which is caused by parthenocarpy), making statement iii incorrect.

Question 34 Correct Answer – (C) Succinyl CoA $\rightarrow$ Succinate

Explanation: Substrate-level phosphorylation in the citric acid cycle occurs when the high-energy thioester bond of Succinyl CoA is cleaved, coupling with the synthesis of GTP (or ATP) from GDP and P_i .

Question 35 Correct Answer – (D) Statement I is incorrect and statement II is correct.

Explanation: Statement I is incorrect because the exocrine acinar cells of the pancreas secrete digestive enzymes, not insulin (secreted by endocrine β -cells). Statement II is correct as pancreatic δ -cells secrete somatostatin.

Question 36 Correct Answer – (B) active

Explanation: The active site is the specific pocket or cleft on an enzyme's surface where substrate molecules bind and undergo a chemical reaction.

Question 37 Correct Answer – (A) Both statement I and statement II are correct.

Explanation: Ecological succession initiates with primary changes in the pioneering vegetative community (Statement I), which subsequently drives changes in the herbivorous and carnivorous animal populations (Statement II).

Question 38 Correct Answer – (A) i - d ii - c iii - a iv - b

Explanation: Hypertension is persistently high BP (i-d), Angina is chest pain (ii-c), Arteriosclerosis is arterial hardening (iii-a), and Atherosclerosis is cholesterol deposition in arterial walls (iv-b).

Question 39 Correct Answer – (C) fungi and bacteria

Explanation: In a pond ecosystem, zooplankton, aquatic insects, and fish act as consumers (heterotrophs), while fungi and bacteria function as decomposers (saprotrophs).

Question 40 Correct Answer – (C) required in low concentration and act as catalysts.

Explanation: Hormones act as chemical messengers in trace concentrations, but unlike biocatalysts (enzymes), they are completely consumed during the physiological processes they regulate.

Question 41 Correct Answer – (D) i and ii only

Explanation: *Plasmodium vivax* (malaria) and *Wuchereria bancrofti* (filariasis) are digenetic parasites requiring two hosts (human and mosquito vectors) to complete their life cycles.

Question 42 Correct Answer – (C) Statement I is correct and statement II is incorrect.

Explanation: Statement I is correct; DNA replication exemplifies its autocatalytic function. Statement II is incorrect because eukaryotic DNA replication is bidirectional, not unidirectional.

Question 43 Correct Answer – (B) holoblastic

Explanation: Cleavage in placental human zygotes is holoblastic (total or complete), meaning the entire zygote and subsequent blastomeres divide completely.

Question 44 Correct Answer – (C) co-dominance

Explanation: Roan coat color in cattle is a classic example of co-dominance, where alleles for both red and white hair are simultaneously and independently expressed in the heterozygote.

Question 45 Correct Answer – (C) saltation

Explanation: Hugo de Vries defined a single-step, large evolutionary mutation that can result in sudden speciation as saltation.

Question 46 Correct Answer – (C) stomach

Explanation: Unlike most ingested nutrients, a significant portion of consumed alcohol is absorbed directly through the mucosal lining of the stomach due to its lipid solubility.

Question 47 Correct Answer – (B) 2

Explanation: During the preparatory phase of glycolysis, 2 molecules of ATP are consumed (one by hexokinase and one by phosphofructokinase) to phosphorylate glucose.

Question 48 Correct Answer – (B) emphysema

Explanation: Emphysema is a chronic respiratory disorder characterized by the irreversible breakdown of alveolar walls, reducing the respiratory surface area and causing shortness of breath.

Question 49 Correct Answer – (A) tRNA

Explanation: Transfer RNA (tRNA) molecules are the smallest functional RNA species, typically ranging from only 73 to 93 nucleotides in length.

Question 50 Correct Answer – (C) i, ii, iii and v only

Explanation: Cell enlargement occurs exponentially (i), involving turgidity (ii), vacuolation (iii), and dimensional growth (v). Growth rate eventually plateaus, so statement iv is incorrect.

Question 51 Correct Answer – (D) 5' – G – T – C – G – A – C – 3' 3' – C – A – G – C – T – G – 5'

Explanation: The restriction endonuclease HindII recognizes and cleaves the specific symmetric hexanucleotide palindromic sequence 5'–GTCGAC–3'.

Question 52 Correct Answer – (A) Both statement I and statement II are correct.

Explanation: Sacred groves are communal forest tracts set aside and legally or culturally protected in India (Statement I), serving as crucial in-situ refuges for endangered endemic species (Statement II).

Question 53 Correct Answer – (C) *Rhizobium*

Explanation: *Rhizobium* species are soil-living bacteria that form symbiotic root nodules in leguminous plants such as groundnuts to fix atmospheric nitrogen.

Question 54 Correct Answer – (B) back crossing the hybrid with its recessive parent.

Explanation: A test cross is a specific type of backcross where an organism of dominant phenotype (but unknown genotype) is crossed with a homozygous recessive parent.

Question 55 Correct Answer – (C) It secretes prostaglandins which stimulate reverse peristalsis in vagina.

Explanation: Statement C is incorrect because prostaglandins (which facilitate reverse uterine peristalsis to aid sperm transport) are secreted by the seminal vesicles, not the prostate gland.

Question 56 Correct Answer – (C) renal pyramids

Explanation: Inside the human kidney, the renal papilla of each renal pyramid projects into a corresponding minor calyx, making their counts stoichiometrically equal.

Question 57 Correct Answer – (C) Kupffer cells

Explanation: Kupffer cells are specialized, resident macrophages located in the sinusoids of the liver that act as highly active phagocytic cells.

Question 58 Correct Answer – (A) i - b ii - c iii - d iv - a

Explanation: Subcutaneous lipids function as thermal insulators (i-b), adipocyte lipids serve as reserved food (ii-c), perinephric lipids act as shock absorbers (iii-d), and skin waxes provide water resistance (iv-a).

Question 59 Correct Answer – (A) Hydrilla → Lotus → Pistia → Typha → Cyperus

Explanation: Primary hydrosere succession follows: Submerged (Hydrilla) → Rooted Floating (Lotus) → Free Floating (Pistia) → Reed Swamp (Typha) → Sedge Meadow (Cyperus).

Question 60 Correct Answer – (D) yr

Explanation: In a dihybrid cross context, 'y' and 'r' represent the recessive allelic counterparts to 'Y' (yellow) and 'R' (round) respectively.

Question 61 Correct Answer – (D) Diaphragm becomes relaxed and dome shaped during inspiration.

Explanation: Statement D is incorrect because during active inspiration, the diaphragm contracts and flattens (moving downward) to increase thoracic volume. It relaxes during expiration.

Question 62 Correct Answer – (C) artificial acquired active

Explanation: The BCG vaccine introduces a live-attenuated strain of *Mycobacterium bovis* to artificially stimulate the host's immune system to actively produce antibodies.

Question 63 Correct Answer – (C) cry protein

Explanation: *Bacillus thuringiensis* synthesizes crystalline endotoxins (cry proteins) that solubilize and active within the alkaline pH of insect larval midguts, causing cell lysis.

Question 64 Correct Answer – (B) Pars distalis

Explanation: The neurohypophysis consists of the pars nervosa, infundibulum, and median eminence. The pars distalis is the primary lobe of the adenohypophysis.

Question 65 Correct Answer – (D) high moisture content at certain level.

Explanation: Recalcitrant seeds are desiccation-sensitive seeds that must maintain a high internal moisture content (typically > 30%) because drying them kills the embryo.

Question 66 Correct Answer – (A) iii → v → i → iv → ii

Explanation: Impulse conduction: resting potential at -70 mV (iii) → stimulus disturbance (v) → rapid Na^+ influx (i) → extracellular fluid electronegativity (iv) → channel closure and K^+ repolarization (ii).

Question 67 Correct Answer – (C) commensalism

Explanation: The relationship between the sea anemone and clownfish is commensalism; the fish obtains shelter and protection within the stinging tentacles, while the anemone is unaffected.

Question 68 Correct Answer – (D) ii, iii, i

Explanation: Uricotelic land snails (ii) have the highest water conservation capacity, followed by osmoconforming marine sharks (iii), while freshwater bony fish (i) excrete copious dilute urine.

Question 69 Correct Answer – (A) Generative cell

Explanation: In a mature two-celled pollen grain, the smaller, spindle-shaped cell with dense cytoplasm floating in the vegetative cell is the generative cell.

Question 70 Correct Answer – (B) i → iii → ii → iv → v

Explanation: The correct developmental sequence is: Insemination (i) → Fertilization (iii) → Blastulation (ii) → Gastrulation (iv) → Gestation (v).

Question 71 Correct Answer – (B) gene frequency

Explanation: Gene (or allele) frequency is defined as the proportion of a specific allele relative to the total sum of all alleles at that locus within a population's gene pool.

Question 72 Correct Answer – (C) Diabetes insipidus

Explanation: Diabetes insipidus, caused by ADH deficiency, is characterized by polydipsia (thirst) and polyuria (watery urine) with no glucosuria (glucose in urine).

Question 73 Correct Answer – (D) Statement I is incorrect and statement II is correct.

Explanation: Statement I is incorrect because diazotrophs include free-living nitrogen fixers (e.g., *Azotobacter*) alongside symbiotic ones. Statement II is correct as manures are organic fertilizers.

Question 74 Correct Answer – (A) Both statement I and statement II are correct.

Explanation: Fishes possess a two-chambered venous heart that receives and pumps only de-oxygenated blood (Statement I) through a single, non-overlapping circulatory loop (Statement II).

Question 75 Correct Answer – (C) Pigs

Explanation: Pigs are currently the primary species of choice for research in clinical xenotransplantation due to their anatomical compatibility and ease of genetic modification.

Question 76 Correct Answer – (A) *Clarias gariepinus*

Explanation: The illegal introduction of the African catfish (*Clarias gariepinus*) for aquaculture has threatened native Indian catfish species through competition and predation.

Question 77 Correct Answer – (B) marasmus

Explanation: Severe, prolonged Protein-Energy Malnutrition (PEM) in infants under one year of age leads directly to marasmus, characterized by extreme muscle wasting.

Question 78 Correct Answer – (A) 1 - 10 mm

Explanation: Root hairs are unicellular, tubular prolongations of epiblema cells that typically reach an average physical length of 1 to 10 mm.

Question 19 Correct Answer – (B) Capillary

Explanation: Capillary water, which is held in the micro-pores of soil particles by surface tension forces, is the only form of soil water readily available for root absorption.

Question 80 Correct Answer – (A) ultrafiltration

Explanation: The semipermeable cellophane membrane in a hemodialysis machine allows urea and salts to diffuse out of blood, mimicking the ultrafiltration process of the glomerulus.

Question 81 Correct Answer – (C) Oxidation and decarboxylation

Explanation: The transition/link reaction involves the oxidative decarboxylation of pyruvate into acetyl-CoA, releasing CO_2 and reducing NAD^+ to $NADH + H^+$.

Question 82 Correct Answer – (C) *Zostera*

Explanation: Marine angiosperms like *Zostera* have needle-like pollen grains with a specific gravity higher than water, allowing them to sink and perform epi- or hypohydrophyly.

Question 83 Correct Answer – (A) Gibberellins

Explanation: Bolting—the sudden elongation of internodes prior to flowering in rosette plants like cabbage—is physiologically regulated and promoted by gibberellins.

Question 84 Correct Answer – (A) Both statement I and statement II are correct.

Explanation: The cellulosic outer cell wall of root hair cells is completely, freely permeable, whereas the underlying plasma membrane is selectively semipermeable.

Question 85 Correct Answer – (C) crude birth rate

Explanation: The crude birth rate is a standard demographic indicator calculated as the total number of live births per 1,000 individuals in a population per year.

Question 86 Correct Answer – (C) ethological

Explanation: Ethological (behavioral) isolation occurs when specific mating rituals, calls, or behaviors prevent individuals of different species from recognizing each other as mates.

Question 87 Correct Answer – (D) It originates as downward extension of hypothalamus.

Explanation: Statement D is incorrect because the adenohypophysis originates as an upward embryonic outpocketing of the pharyngeal ectoderm (Rathke's pouch), not as a downward hypothalamic extension.

Question 88 Correct Answer – (A) 150 - 400 cm

Explanation: According to standard ecological biome climatographs, tropical rainforests receive a high mean annual precipitation ranging between 150 to 400 cm.

Question 89 Correct Answer – (C) Leucine

Explanation: In the universal genetic code, the triplet codon CUA is one of the six redundant codons that specify the amino acid leucine.

Question 90 Correct Answer – (A) Carbonic anhydrase enzyme is found in RBCs and absent in blood plasma.

Explanation: Carbonic anhydrase is highly concentrated within red blood cells to facilitate rapid CO_2 conversion, while being practically absent in the blood plasma.

Question 91 Correct Answer – (D) antipodals and secondary nucleus

Explanation: The ploidy level is not the same because antipodal cells are haploid (n) structures of the female gametophyte, whereas the secondary nucleus is a diploid ($2n$) fusion product.

Question 92 Correct Answer – (D) Statement I is incorrect and statement II is correct.

Explanation: Statement I is incorrect; GnRH is secreted by the neurosecretory cells of the hypothalamus, not the pituitary. Statement II is correct as GnRH stimulates pituitary gonadotropins.

Question 93 Correct Answer – (B) i > ii > iii > iv

Explanation: Based on the global species diversity pie chart of invertebrates: Insects (i) > Other animal groups (ii) > Molluscs (iii) > Crustaceans (iv).

Question 94 Correct Answer – (A) Fever stimulates production of antibodies and helps in recovery from viral infections.

Explanation: Statement A is incorrect because fever is a non-specific, innate immune response and does not directly stimulate the antigen-specific adaptive production of antibodies.

Question 95 Correct Answer – (B) exchange of genetic material takes place between sister chromatids.

Explanation: Statement B is the exception because crossing over and genetic recombination occur specifically between non-sister chromatids of homologous chromosomes.

Question 96 Correct Answer – (D) ABA

Explanation: Absciscic acid (ABA) is a major phytohormone that acts as a natural plant growth inhibitor, inducing seed dormancy and stomatal closure.

Question 97 Correct Answer – (A) i - b ii - c iii - d iv - a

Explanation: Bioherbicide matches: *Phytophthora palmivora* controls milkweed (i-b), *Alternaria crassa* controls water hyacinth (ii-c), *Cactoblastis cactorum* controls cacti (iii-d), and *Tyrea moth* controls *Senecio jacobaea* (iv-a).

Question 98 Correct Answer – (D) Statement I is incorrect and statement II is correct.

Explanation: Statement I is incorrect because phosphorus has no atmospheric gaseous phase, so its atmospheric deposition is negligible compared to carbon. Statement II is correct.

Question 99 Correct Answer – (C) Cytoplasm and mitochondrial matrix

Explanation: Substrate-level phosphorylation occurs in the cytoplasm during glycolysis (yielding ATP) and in the mitochondrial matrix during the citric acid cycle (yielding GTP).

Question 100 Correct Answer – (B) flagellate Gram - ve

Explanation: *Salmonella typhi*, the causative agent of typhoid fever, is a motile, flagellated, Gram-negative, rod-shaped bacterium.

Prepp
Your Personal Exam Guide