

## MHT CET 2022 Biology Answer Key PDF

## Answer Key

**Question 1** -Option- (D) metastatic

Explanation: Plant movements include thigmotactic, chemotactic, and phototropic movements. Metastasis is the spread of cancerous cells in animals.

**Question 2** -Option- (B) innermost, delicate and vascular membrane

Explanation: The cranial meninges surrounding the central nervous system consist of the outer Dura mater, middle Arachnoid mater, and the innermost, highly vascular, and delicate Pia mater.

**Question 3** -Option- (D)  $Mg^{++}$

Explanation: During the initiation of translation, the association of the larger and smaller ribosomal subunits requires a critical concentration of magnesium ( $Mg^{++}$ ) ions.

**Question 4** -Option- (D) 19

Explanation: Aerobic respiration yields a net of 38 ATP molecules per glucose molecule, whereas anaerobic respiration yields only 2 ATP. Therefore, aerobic respiration is 19 times more efficient.

**Question 5** -Option- (B) *Anasa tristis*

Explanation: Hermann Henking first discovered the 'X-chromosome' (referred to as the 'X body') while studying spermatogenesis in the squash bug, *Anasa tristis*, in 1891.

**Question 6** -Option- (C) 50%

Explanation: In the  $F_2$  generation of a monohybrid cross ( $TT \times tt$ ), the genotypic ratio is  $1 TT : 2 Tt : 1 tt$ . The homozygous parental genotypes ( $TT$  and  $tt$ ) constitute 50% of the progeny.

**Question 7** -Option- (A) A and E are true

Explanation: Upon germination, the pollen grain produces non-motile male gametes and the tube nucleus remains positioned at the advancing tip of the growing pollen tube.

**Question 8** -Option- (D) larynx

Explanation: The larynx (commonly called the voice box) contains the vocal cords, which vibrate to produce sound as air passes through them.

**Question 9** -Option- (C) Jellies

Explanation: Vaults, diaphragms, and cervical caps are mechanical/physical barrier methods of contraception, whereas spermicidal jellies are chemical methods.

**Question 10** -Option- (A)  $2n + 2$

Explanation: Hyperploidy is a type of aneuploidy involving the addition of one or more chromosomes to the diploid set, represented by tetrasomy ( $2n + 2$ ).

**Question 11** -Option- (C) Both statement-I and Statement-II are correct.

Explanation: Transcription and translation are heterocatalytic functions of DNA (synthesizing other molecules). Semiconservative replication is fundamentally driven by the complementary base-pairing nature of the two DNA strands.

**Question 12** -Option- (A) BamH I

Explanation: *BamH I* is a type II restriction endonuclease isolated from *Bacillus amyloliquefaciens*, whereas pUC, M13, and pBR322 are cloning vectors.

**Question 13** -Option- (D) All are correct

Explanation: Water is the ideal transport medium in plants because it remains liquid at physiological temperatures, acts as a universal solvent, maintains a neutral pH, and is chemically active.

**Question 14** -Option- (D) Closely located linked genes are always separated during crossing over.

Explanation: Closely linked genes are physically near each other on a chromosome and are rarely separated by crossing over, showing a high frequency of parental inheritance.

**Question 15** -Option- (D) reticular activating system

Explanation: The reticular activating system (RAS) is a complex network of neurons running through the brainstem that connects and coordinates different regions of the brain.

**Question 16** -Option- (B) natural selection

Explanation: Industrial melanism in the peppered moth (*Biston betularia*) is a classic observed example of natural selection resulting from environmental changes.

**Question 17** -Option- (A) inner membrane of mitochondria

Explanation: The electron transport system (ETS) enzymes and coenzymes are embedded within the inner mitochondrial membrane (cristae).

**Question 18** -Option- (A) cellulose

Explanation: Cattle dung contains large quantities of undigested plant cell walls, making it rich in cellulose, which serves as the primary substrate for methanogenic biogas production.

**Question 19** -Option- (C) migrate

Explanation: Migration is a behavioral adaptation where organisms temporarily move from a stressful, cold habitat (like winter) to a more hospitable geographic region.

**Question 20** -Option- (D) Western Ghats

Explanation: The Western Ghats of India exhibit immense biodiversity, hosting a significantly higher amphibian species diversity and endemism compared to the Eastern Ghats.

**Question 21** -Option- (C) brings about paralysis of midgut of pest insect

Explanation: The crystal protein ( $\delta$ -endotoxin) produced by *Bacillus thuringiensis* solubilizes in the alkaline insect gut, binding to epithelial cells and causing pore formation, midgut paralysis, and death.

**Question 22** -Option- (A) diploid embryo and triploid endosperm

Explanation: Syngamy (fusion of egg and male gamete) produces a diploid zygote/embryo ( $2n$ ), and triple fusion (fusion of secondary nucleus and male gamete) produces a triploid endosperm ( $3n$ ).

**Question 23** -Option- (B) b, c, e

Explanation: Among the cranial nerves, Trigeminal (V), Facial (VII), and Glossopharyngeal (IX) are mixed nerves containing both sensory and motor fibers.

**Question 24** -Option- (C) Tomato

Explanation: Rice, wheat, and mango flowers contain a single ovary with a single ovule (producing a single-seeded fruit), whereas tomatoes contain multiple ovules in a multilocular ovary.

**Question 25** -Option- (C) arteriosclerosis

Explanation: Arteriosclerosis is a general term describing the loss of elasticity, thickening, and hardening of arterial walls, whereas atherosclerosis specifically involves fatty plaque deposition.

**Question 26** -Option- (C) 7.4

Explanation: Human arterial blood is slightly basic, tightly maintained within a narrow homeostatic pH range of 7.35 to 7.45 (average 7.4).

**Question 27** -Option- (C) diploid megaspore mother cell

Explanation: In *Taraxacum* (dandelions), apomictic development (diplospory) occurs where an unreduced diploid embryo sac develops directly from the diploid megaspore mother cell.

**Question 28** -Option- (A) inhibitor

Explanation: In the lac operon, the regulatory gene '*i*' stands for 'inhibitor' because its protein product (repressor) inhibits the transcription of structural genes.

**Question 29** -Option- (C) cornua

Explanation: The uterine horns or cornua are the distal, narrow portions of the fallopian tubes (oviducts) where they enter and open into the fundus of the uterus.

**Question 30** -Option- (D) C and D only

Explanation: Acute renal failure (ARF) is medically characterized by a sudden, rapid decline in renal function (C) and a corresponding elevation of nitrogenous waste like creatinine in the serum (D).

**Question 31** -Option- (C) 2

Explanation: The acetyl group of acetyl-Coenzyme A consists of a methyl group single-bonded to a carbonyl group ( $-COCH_3$ ), containing exactly two carbon atoms.

**Question 32** -Option- (D) i – c, ii – d, iii – b, iv – a

Explanation: Match: Ornithophily is by birds (i-c), Entomophily is by insects (ii-d), Anemophily is by wind (iii-b), and Chiropterophily is by bats (iv-a).

**Question 33** -Option- (B) i – c, ii – d, iii – a, iv – b

Explanation: Match: Jaundice is marked by yellow conjunctiva (i-c), Diarrhoea by loose stools/blood in stool (ii-d), Vomiting by nausea (iii-a), and Constipation by difficult defecation (iv-b).

**Question 34** -Option- (A) primary spermatocytes

Explanation: During the growth phase of spermatogenesis, diploid spermatogonia accumulate nutrients and enlarge to form diploid primary spermatocytes.

**Question 35** -Option- (D) 150

Explanation: Anatomical dead space in the human respiratory system refers to the volume of conducting airways where no gas exchange occurs, which is typically about 150 mL.

**Question 36** -Option- (A) Statement-I is correct but Statement-II is incorrect.

Explanation: The oxygen-hemoglobin saturation curve is sigmoid. Statement-II is incorrect because a decrease in  $pCO_2$  and temperature shifts the curve to the left, not the right.

**Question 37** -Option- (B) Newly formed pond or reservoir.

Explanation: Primary succession occurs in newly formed, barren areas devoid of any pre-existing soil or organic matter, such as a newly formed pond, reservoir, or bare rock.

**Question 38** -Option- (D) always more than

Explanation: Absolute (maximum) natality is the theoretical maximum birth rate under ideal, unlimited environmental conditions, which is always greater than realized (ecological) natality.

**Question 39** -Option- (C) i – c, ii – d, iii – a, iv – b

Explanation: Match: Coconut has nuclear endosperm (i-c), Balsam has cellular (ii-d), Asphodelus has helobial (iii-a), and Black pepper has perisperm (iv-b).

**Question 40** -Option- (A) Statement-I is correct but Statement-II is incorrect.

Explanation: T-lymphocytes differentiate into helper, killer, memory, and suppressor subtypes. Statement-II is incorrect because B-lymphocytes mature in the bone marrow, not the thymus.

**Question 41** -Option- (D) Human settlement

Explanation: Volcanic eruptions, forest fires, and earthquakes are natural disturbances, whereas human settlement is an anthropogenic (man-made) cause of biodiversity loss.

**Question 42** -Option- (D) i – c, ii – a, iii – d, iv – b

Explanation: Match: *Alu I* is from *Arthrobacter luteus* (i-c), *Bam HI* from *B. amyloliquefaciens* (ii-a), *Eco RI* from *E. coli* (iii-d), and *Hind II* from *H. influenzae* (iv-b).

**Question 43** -Option- (D) Progesterone level depletes and foetus is aborted.

Explanation: In early pregnancy (first trimester), the corpus luteum is the primary source of progesterone required to maintain the endometrium. Its regression in the third week leads to abortion.

**Question 44** -Option- (C) iii and iv

Explanation: Statement iii is incorrect because the glomerular filtrate is alkaline/neutral (similar to blood plasma pH). Statement iv is incorrect because the PCT actively reabsorbs high-threshold substances.

**Question 45** -Option- (A) AV Node

Explanation: The sinoatrial (SA) node acts as the primary pacemaker of the heart, while the atrioventricular (AV) node acts as the pacesetter, regulating the delay and conduction of impulses.

**Question 46** -Option- (D) Basophils

Explanation: Basophils are the least abundant of all white blood cells (leukocytes) in healthy humans, accounting for only 0.5

**Question 47** -Option- (B) genetic disorder

Explanation: Cystinuria is an autosomal recessive genetic disorder characterized by impaired renal tubular reabsorption of dibasic amino acids, leading to cystine stone formation.

**Question 48** -Option- (D) plants

Explanation: The tumor-inducing (Ti) plasmid from *Agrobacterium tumefaciens* is widely used as a vector to genetically transform plant cells.

**Question 49** -Option- (B) Statement-I is incorrect but Statement-II is correct.

Explanation: Statement-I is incorrect because the prostate is a single, unpaired gland, not a paired gland. Statement-II is correct; it secretes a slightly acidic, milky fluid.

**Question 50** -Option- (B) lenticels

Explanation: Lenticels are specialized, porous tissue regions in the bark of woody stems and roots that facilitate the exchange of gases between the internal tissues and the atmosphere.

**Question 51** -Option- (D) nematode

Explanation: *Caenorhabditis elegans* is a small, free-living, soil-dwelling transparent nematode (roundworm) widely used as a model organism in developmental genetics.

**Question 52** -Option- (C) with entry of sperm into ooplasm

Explanation: In human females, the secondary oocyte is arrested in metaphase II of meiosis. Meiosis II is completed only when a sperm penetrates the ooplasm during fertilization.

**Question 53** -Option- (C) Starling

Explanation: The term 'hormone' was first coined and introduced into physiology by the English physiologist Ernest Henry Starling in 1905.

**Question 54** -Option- (B) During parturition

Explanation: Recombinant relaxin is used clinically to facilitate labor and delivery (parturition) by relaxing the pelvic ligaments and softening the uterine cervix.

**Question 55** -Option- (D) Statement-I is incorrect but Statement-II is correct.

Explanation: Statement-I is incorrect because amniogenic cells form the amnion, not the chorion. Statement-II is correct; the chorion participates in placental and embryonic development.

**Question 56** -Option- (A) Statement-I is correct but Statement-II is incorrect.

Explanation: The outer layer of the root hair cell wall consists of hydrophilic pectin, while the inner layer consists of cellulose, not chitin.

**Question 57** -Option- (C) passenger

Explanation: In recombinant DNA technology, the foreign, cleaved DNA fragment containing the desired gene being carried is referred to as passenger DNA.

**Question 58** -Option- (C) Ornithine cycle

Explanation: In the liver, the toxic ammonia produced from amino acid deamination is converted into non-toxic urea via the Ornithine cycle (or Urea cycle).

**Question 59** -Option- (C) Statement-I is correct but Statement-II is incorrect.

Explanation: The oxygen-dissociation curve is sigmoid. Statement-II is incorrect because a decrease in  $pCO_2$  and temperature shifts the curve to the left, not the right.

**Question 60** -Option- (B) Acute bronchitis – Shortness of breath and yellow mucus

Explanation: Acute bronchitis is characterized by inflammation of the bronchial tubes, presenting with cough, yellow-green sputum/mucus, and shortness of breath.

**Question 61** -Option- (A) Acetaldehyde

Explanation: In anaerobic alcohol fermentation, acetaldehyde acts as the terminal hydrogen acceptor, being reduced to ethanol by  $NADH + H^+$ .

**Question 62** -Option- (C) Four

Explanation: Out of the 16 possible outcomes in the  $F_2$  generation of a dihybrid cross, exactly four genotypes are completely homozygous for both traits ( $RRYY$ ,  $RrYy$ ,  $rrYY$ ,  $rryy$ ).

**Question 63** -Option- (D) pioneer species

Explanation: Ecological succession on barren land or water bodies is initiated by the establishment of the pioneer species (the pioneer community).

**Question 64** -Option- (A) Citrus

Explanation: In *Citrus* species, adventive polyembryony occurs where multiple embryos develop directly from diploid maternal nucellar or integumentary cells.

**Question 65** -Option- (B) ssDNA

Explanation: The bacteriophage  $\phi X174$  is uniquely characterized by having a single-stranded, circular DNA genome (ssDNA).

**Question 66** -Option- (A) stomach

Explanation: Pepsinogen is secreted by the peptic (chief) cells of the gastric glands located in the mucosal lining of the stomach.

**Question 67** -Option- (B) Thirty four

Explanation: During the complete aerobic oxidation of one glucose molecule, out of the 38 total ATP molecules generated, 34 ATP are produced via oxidative phosphorylation in the ETS.

**Question 68** -Option- (C) DNA polymerase DNA polymerase-I DNA polymerase-  $\alpha$

Explanation: *RNA primers are removed by DNA polymerase. The gaps are filled by DNA polymerase – I in prokaryotes, and by DNA polymerase –  $\alpha$  (along with primase) in eukaryotes.*

**Question 69** -Option- (C) Ascariasis

Explanation: Mebendazole is an anthelmintic medication primarily used to treat nematode infections, such as ascariasis caused by *Ascaris lumbricoides*.

**Question 70** -Option- (D) Apes and human

Explanation: Humans and other primates (apes) are continuous breeders that can reproduce throughout the year, unlike seasonal breeders (sheep, goats, donkeys).

**Question 71** -Option- (A) Both Statement-I and Statement-II are incorrect.

Explanation: Statement-I is incorrect because the sediment in secondary settling tanks is called activated sludge (floc refers to microbial aggregates). Statement-II is incorrect because screening precedes the grit chamber.

**Question 72** -Option- (C) Crick

Explanation: Francis Crick, along with Brenner and colleagues, provided the first genetic evidence for a triplet genetic code in 1961 using bacteriophage T4 rII mutants.

**Question 73** -Option- (B) 7

Explanation: Gregor Mendel selected and studied 7 distinct pairs of contrasting, true-breeding characters/traits in the garden pea plant, *Pisum sativum*.

**Question 74** -Option- (B) blood group systems

Explanation: Duffy, Kidd, and Lewis represent minor, clinically significant human red blood cell surface antigen blood group systems.

**Question 75** -Option- (A) Urethra

Explanation: In human males, the urethra serves a dual function of carrying both urine from the bladder and semen from the reproductive tract, acting as a urinogenital canal.

**Question 76** -Option- (B) i – c, ii – a, iii – d, iv – b

Explanation: Match: Extinct is when the last individual dies (i-c), Endangered is a 50-70

**Question 77** -Option- (C) Land snails - Ureotelic

Explanation: Land snails are highly adapted for water conservation and are uricotelic (excreting uric acid), not ureotelic.

**Question 78** -Option- (C) It increases the rate of reaction within a limited range only.

Explanation: Increasing substrate concentration increases enzymatic reaction rate until all active sites of the enzyme molecules are fully saturated (reaching  $V_{\max}$ ).

**Question 79** -Option- (D) Sucrose

Explanation: Sucrose, a disaccharide of glucose and fructose obtained primarily from sugarcane, is commonly known as cane sugar.

**Question 80** -Option- (A) Both Statement-I and Statement-II are correct.

Explanation: Degeneration of dopaminergic neurons in the substantia nigra causes Parkinson's disease. Cocaine increases synaptic dopamine levels by blocking its reuptake transporter.

**Question 81** -Option- (D)  $6\text{ NADH}_2 + 2\text{ FADH}_2 + 2\text{ GTP}$

Explanation: Each turn of the Krebs cycle (per acetyl CoA) yields 3  $\text{NADH}$ , 1  $\text{FADH}_2$ , and 1  $\text{GTP}$ . Therefore, two molecules of acetyl CoA yield double these amounts.

**Question 82** -Option- (C) Gap between adjacent neurons is 20-30 nm.

Explanation: In electrical synapses, the membranes of pre- and post-synaptic neurons are extremely close, separated by a gap of only about 2 nm (not 20-30 nm, which is typical for chemical synapses).

**Question 83** -Option- (B) i – c, ii – d, iii – b, iv – a

Explanation: Match: Protandry is seen in sunflower (i-c), Prepotency in apple (ii-d), Self sterility in tobacco (iii-b), and Herkogamy in *Calotropis* (iv-a).

**Question 84** -Option- (C) Biopiracy

Explanation: Biopiracy refers to the unauthorized commercial exploitation or replication of biological resources and traditional knowledge of another country or person.

**Question 85** -Option- (D) Zona glomerulosa

Explanation: The adrenal cortex is divided into three zones; the outermost zone, the Zona glomerulosa, is responsible for secreting mineralocorticoid hormones like aldosterone.

**Question 86** -Option- (B) regulator protein

Explanation: The regulator gene (*i*) of the lac operon synthesizes a repressor protein (regulator protein) that binds to the operator gene to turn transcription off.

**Question 87** -Option- (B) A: Renal artery, B: Renal column, C: Cortex

Explanation: These represent the major structural anatomical landmarks visible in a longitudinal section (L.S.) of the human kidney.

**Question 88** -Option- (B) Vit. D

Explanation: Vitamin D3 (cholecalciferol) is synthesized endogenously in the human skin upon exposure to solar ultraviolet B (UVB) radiation.

**Question 89** -Option- (C) vasopressin

Explanation: Vasopressin (antidiuretic hormone or ADH) stimulates water reabsorption in the collecting ducts, which reduces urine volume and increases blood volume and pressure.

**Question 90** -Option- (C) *Saccharomyces cerevisiae*

Explanation: Brewer's yeast, *Saccharomyces cerevisiae*, is widely used to ferment sugars in malted cereals to produce ethanol and carbon dioxide.

**Question 91** -Option- (D) Gibberellins

Explanation: During germination of cereal seeds, gibberellin released from the embryo stimulates the synthesis of hydrolytic enzymes like  $\alpha$ -amylase in the aleurone layer.

**Question 92** -Option- (C) Father –  $X^cY$  and mother –  $X^C X^c$

Explanation: For a colorblind daughter ( $X^c X^c$ ), she must inherit an  $X^c$  from a colorblind father ( $X^c Y$ ) and an  $X^c$  from a carrier mother ( $X^C X^c$ ). This parental cross can also produce a colorblind son ( $X^c Y$ ).

**Question 93** -Option- (A) Statement-I is correct but Statement-II is incorrect.

Explanation: Random elimination of alleles due to natural disasters is genetic drift (bottleneck effect). Statement-II is incorrect because mutations are permanent (not temporary) heritable changes.

**Question 94** -Option- (C) Avery, McCarty and MacLeod

Explanation: While Griffith discovered transformation, Oswald Avery, Colin MacLeod, and Maclyn McCarty first proved biochemically that DNA is the transforming principle in 1944.

**Question 95** -Option- (D) malaria

Explanation: The sporozoan protozoan parasite *Plasmodium vivax* is one of the causative pathogens of malaria in humans.

**Question 96** -Option- (A) medullary part of collecting duct

Explanation: The medullary collecting duct is highly permeable to urea, allowing it to diffuse out into the medullary interstitium to maintain high osmolarity.

**Question 97** -Option- (A) i – d, ii – c, iii – b, iv – a

Explanation: Match: Organism is the basic unit (i-d), Population is organisms of the same kind (ii-c), Community is populations of different species (iii-b), and Biome is a major climatic zone (iv-a).

**Question 98** -Option- (A) Lemurs and Tarsiers

Explanation: The primate sub-order Prosimii (lower primates) includes lemurs, tarsiers, lorises, and bushbabies.

**Question 99** -Option- (B) congenital diseases

Explanation: Congenital diseases are anatomical, physiological, or genetic disorders that are present in an individual from birth.

**Question 100** -Option- (A) gut of female Anopheles mosquito

Explanation: In the life cycle of *Plasmodium*, the sexual phase involving the fusion of male and female gametocytes (fertilization) occurs inside the gut of the female *Anopheles* mosquito.

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