MHT CET 2024 Solution
(April 22 - Shift 2)

Ques 1. In a family, a man with hemophilia, a genetic disorder where blood doesn't clot properly, marries a woman who is a carrier of the gene but does not express the disorder. What is the probability that their son will have hemophilia ?
A 0%
B 25%
C 50%
D 75%

Ans: C
Solu. There is a 50% chance their son will have hemophilia.
Here's the breakdown:
- The woman is a carrier, meaning she has one X chromosome with the hemophilia gene and one without.
- The man with hemophilia has one X chromosome with the hemophilia gene and a Y chromosome (XY).
- Since males inherit their X chromosome from their mother, there are two possibilities for the son's X chromosome:
  - He inherits the X chromosome with the hemophilia gene from his mother (50% chance). In this case, he will have hemophilia.
  - He inherits the X chromosome without the hemophilia gene from his mother (50% chance). In this case, he will not have hemophilia.

Therefore, the probability of their son having hemophilia is 50%.

Ques 2. Which of the following is a characteristic symptom of Down syndrome?

A Abnormal growth of hair
B Heart murmurs
C Skin rash
D Eye color changes

Ans. B
Solu. Option B, Heart murmurs, is indeed a characteristic symptom of Down syndrome.
Here's a breakdown of why the other options are not characteristic symptoms:

- A. Abnormal hair growth - Not a typical symptom. Hair texture and growth can vary in people with Down syndrome, but it's not a defining characteristic.
- C. Skin rash - Rashes can occur due to various reasons and are not specific to Down syndrome.
- D. Eye color changes - Eye color is determined by genetics and doesn't change due to Down syndrome.

Ques 3. During puberty, how many primary follicles are typically present in the ovaries of a female ?
A 2 million
B 1 million
C Thousands
D None

Ans: C
Solu. Choice C, Thousands, is the typical number of primary follicles present in each ovary during puberty.
A much larger number, around 1-2 million, are present at birth, but a significant portion degenerate throughout childhood. By puberty, there are only around 60,000-80,000 remaining in each ovary. These primary follicles then continue to mature and develop throughout a woman's reproductive years.

Ques 4. The causative agent of malaria is
A Plasmodium falciparum
B Anopheles mosquito
C Trypanosoma brucei
D Entamoeba histolytica

Ans: A
Solu. The causative agent of malaria is indeed Plasmodium falciparum (choice A).
While Anopheles mosquitoes (choice B) transmit the parasite, Plasmodium falciparum is the single-celled organism that infects humans and causes the disease.
Trypanosoma brucei (choice C) causes sleeping sickness, and Entamoeba histolytica (choice D) causes amoebic dysentery. These are both different diseases with different causative agents.

Ques 5. Which virus is responsible for causing AIDS ?
A Hepatitis B virus
B Human papillomavirus (HPV)
C Human immunodeficiency virus (HIV)
D Influenza virus

Ans: C
Solu. The virus responsible for causing AIDS is C. Human immunodeficiency virus (HIV).
- Hepatitis B virus can cause liver disease.
- Human papillomavirus (HPV) can cause various warts and some cancers.
- Influenza virus causes the flu.

Ques 6. Which disease is primarily spread by female Anopheles mosquitoes?

A Dengue fever
B Malaria
C Zika virus
D Chikungunya

Ans: B
Solu. The disease primarily spread by female Anopheles mosquitoes is B. Malaria.
While other mosquito-borne diseases exist (like dengue fever and Zika virus), Anopheles mosquitoes are the main culprits for transmitting malaria.

Ques 7. What is genomics?
A The study of genes within an organism
B The study of heredity and variation in organisms
C The study of the structure and function of the genome
D The study of the interactions between genes and the environn

Ans: A
Solu. The closest definition among your choices is:
- C. The study of the structure and function of the genome

Genomics is a field of molecular biology that goes beyond just genes. It encompasses the entire genetic makeup of an organism, including all the DNA and its interactions. Genetics, on the other hand, focuses more on how traits are inherited through genes.
Here's a breakdown of the other choices:
- A. The study of genes within an organism - This is partially true, but genomics also considers the non-coding regions of DNA and how they influence genes.
- B. The study of heredity and variation in organisms - This is the domain of genetics, which is a subfield within genomics.
- D. The study of the interactions between genes and the environment - This is a related field called epigenetics, which explores how environmental factors can influence gene expression without altering the DNA sequence itself.

Ques 8. Molecular scissor of genetic engineering?
A DNA Ligase
B Ligase
C Restriction endonuclease
D RNA Polymerase

Ans: C
Solu. The molecular scissor of genetic engineering is C. Restriction endonuclease.
Here's why:
- DNA Ligase and Ligase (more general term) act like molecular glue, sealing the cut ends of DNA strands.
- RNA Polymerase is an enzyme involved in creating RNA copies of DNA.
- Restriction endonuclease, on the other hand, functions like precise molecular scissors. It recognizes and cuts DNA at specific nucleotide sequences, allowing scientists to manipulate DNA for various genetic engineering applications.

Ques 9. _____ is also called terror of Bengal.
A Pistia
B Eichhornia
C Water hyacinth
D Both (b) and (C)

Ans: D
Solu. Both B. Eichhornia (scientific name) and C. Water hyacinthare nicknames for the same plant.
This fast-growing aquatic plant is known as the "terror of Bengal" because it can rapidly take over waterways, disrupting ecosystems and causing problems for navigation, fishing, and irrigation.

Ques 10. Which amino acids are histones rich in, facilitating their interaction with DNA ?
A Glycine and proline
B Lysine and arginine
C Alanine and serine
D Aspartic acid and glutamic acid

Ans: B
Solu. Histones are rich in B. Lysine and arginine.
These amino acids are classified as basic amino acids due to their side chains containing positively charged groups. This positive charge allows histones to interact with the negatively charged phosphate groups of DNA. This electrostatic attraction is a key factor in how DNA tightly coils around histone proteins to form structures like nucleosomes, which are the fundamental units of chromosome packaging.

Ques 11. Leaf cutting is done successfully in which of. The following plant _____ .
A rose
B blackberry
C sansvieria
D Bougainvillea

Ans: C
Solu. Out of the choices you provided, leaf cuttings can be done successfully in:
  ● C. Sansvieria
Sansvieria, also known as snake plant or mother-in-law's tongue, is a popular succulent houseplant known for its ease of care. It propagates easily through leaf cuttings.
Leaf cuttings are not the preferred method for propagating roses (A), blackberries (B), or bougainvillea (D). These plants are typically propagated through stem cuttings or other methods.

Ques 12. How many ATP molecules are needed as an initial investment in the glycolytic cycle (normal glycolysis)?
A 1
B 2
C 3
D 4

Ans: B
Solu. B. 2 ATP molecules are needed as an initial investment in the glycolytic cycle (normal glycolysis).
During the first phase of glycolysis, called the phosphorylation phase, two ATP molecules are used to phosphorylate glucose into glucose-6-phosphate. This "investment" of ATP is necessary to activate the glucose molecule and prepare it for further breakdown in the later stages of glycolysis, which ultimately yields a net gain of ATP.

Ques 13. Total genetic content of an organism is called
A Gene pool
B Genetic drift
C Gene frequency
D Gene mutation

Ans: A
Solu. The total genetic content of an organism is called A. Gene pool.
Here's why the other choices are not quite what we're looking for:
- B. Genetic drift is a random change in the allele frequencies of a population over time.
- C. Gene frequency refers to the proportion of a particular allele within a population.
- D. Gene mutation is a permanent alteration in the DNA sequence of a gene.

Gene pool encompasses all the genetic information carried by the members of a population, including all the genes, alleles, and variations present. It represents the total hereditary potential of that population.

Ques 14. Theca interna releases which hormone
A Progesterone
B Estrogen
C LH
D FSH

Ans: B
Solu. Theca interna cells release B. Estrogen (indirectly).
Here's the breakdown:
- Theca interna cells in the ovaries are specialized for androgen production. Androgens, such as androstenedione, are not directly estrogen but act as precursors.
- Neighboring granulosa cells within the follicle contain the enzyme aromatase, which converts the androgens from theca interna into estradiol, the major form of estrogen.

Therefore, theca interna contributes to estrogen production indirectly by supplying the necessary building blocks.

Ques 15. Which of the following is an example of an outbreeding device in plants?
A Cleistogamy
B Autogamy
C Xenogamy
D Geitonogamy

Ans: C
Solu. C. Xenogamy is an example of an outbreeding device in plants.
Here's why:

- Cleistogamy (A) is the self-pollination of flowers that never open, so it discourages cross-pollination.
- Autogamy (B) refers to self-pollination within the same flower, again not promoting outbreeding.
- Geitonogamy (D) is pollination between flowers of the same plant but different individuals, so it's not true outbreeding but reduces the chances of self-pollination compared to autogamy.
- Xenogamy (C) specifically refers to the transfer of pollen between flowers of different plants, which is the key feature of an outbreeding device. Plants have evolved various mechanisms to encourage xenogamy, such as producing separate male and female flowers, having different flowering times, or relying on wind or animals for pollination.

Ques 16. Which of the following techniques is commonly used to introduce herbicide resistance into plants ?
A RNA interference
B CRISPR-Cas9 gene editing
C Polymerase chain reaction (PCR)
D Agrobacterium-mediated gene transfer

Ans: D
Solu. The technique commonly used to introduce herbicide resistance into plants is D. Agrobacterium-mediated gene transfer.
Here's why:
- RNA interference (A): While RNAi has potential applications in plant biotechnology, it's not typically used for introducing herbicide resistance.
- CRISPR-Cas9 gene editing (B): This is a powerful and versatile gene editing tool, but it's a relatively new technology and not yet as widely used for commercial applications like herbicide resistance compared to Agrobacterium.
- Polymerase chain reaction (PCR) (C): PCR is a technique for amplifying DNA, not for introducing genes into plants.

Ques 17. Which microorganism is use in yoghurt production
A streptococcus thermophilus
B ststreptococcus penicillium
C penicillium roqueforti
D aspergillus niger

Ans: A
Solu. A. Streptococcus thermophilus is one of the microorganisms used in yogurt production.
Yogurt is fermented by a combination of bacteria, and Streptococcus thermophilus is a key player. It works alongside other bacteria, typically Lactobacillus bulgaricus, to convert milk sugar (lactose) into lactic acid.
This lactic acid production is what causes milk to curdle and gives yogurt its characteristic tangy flavor and thick texture.

Ques 18. If p is the magnitude of linear momentum of a particle executing a uniform circular motion then the ratio of centripetal force acting on the particle to its linear momentum is given by

Ans: v/r
Solu. Here's the relationship between centripetal force, linear momentum, and a particle in uniform circular motion:
Centripetal force (F_c) is the inward force acting on the particle that causes it to follow a curved path. It's directed towards the center of the circle.
Linear momentum (p) of the particle is the product of its mass (m) and its velocity (v).
The ratio of centripetal force to linear momentum can be expressed as:
$F_c / p = v / r$
Here's the explanation:
1. Centripetal Force (F_c): $F_c = mv^2/r$ (where m is the mass, v is the velocity, and r is the radius of the circular path).
2. Linear Momentum (p): $p = mv$
Deriving the Ratio:
Divide F_c by p:

F_c / p = (mv²/r) / (mv)
Cancel out common factors (m and v):
F_c / p = v / r
Therefore, the ratio of centripetal force to linear momentum is indeed v / r.
This ratio tells us how much force is needed to keep the particle moving in a circle at a specific speed (v) and radius (r).

Ques 19. An e.m.f of 5 volt is produced by a self inductance when the current changes at a steady rate from 3A to 2A in 1 millisecond the value of self inductance is

Answer: L = 5 * 10 ^ - 3
Solu. You can calculate the self-inductance (L) using the following formula:
EMF (ε) = -L * ΔI / Δt
where:
- ε (emf) is the electromotive force induced in volts (V)
- L is the self-inductance in henrys (H)
- ΔI (delta I) is the change in current in amperes (A)
- Δt (delta t) is the change in time in seconds (s)

We are given the following values:
- ε (emf) = 5 V
- ΔI (delta I) = 3 A - 2 A = 1 A
- Δt (delta t) = 1 millisecond = 1 * 10^-3 seconds

Now you can solve for L:
L = - ε * Δt / ΔI L = - (5 V) * (1 * 10^-3 s) / (1 A)
L = 5 * 10^-3 H
Therefore, the self-inductance (L) is 5 millihenries (mH).

Ques 20. Two monkeys off mass 10 kg and 8 kg are moving along a vertical light rope the former climbing up with an acceleration of 2 m/second square while the latter coming down with a uniform velocity of 2 m/sec square find the tension in the rope at the fixed support

Ans: 180.4 N
Solu. For the monkey climbing up:
T - (10 kg * 9.8 m/s^2) = (10 kg) * (2 m/s^2)
T - 98 N = 20 N
T = 118 N

For the monkey coming down:
T - (8 kg * 9.8 m/s^2) = (8 kg) * (-2 m/s^2)
T - 78.4 N = -16 N
T = 62.4 N

Total tension:
T_total = T_up + T_down = 118 N + 62.4 N = 180.4 N

Ques 21. "Water is flowing through a horizontal pipe in stream line flow at the narrowest part of the pipe?
A velocity is maximum and pressure is minimum
B pressure is maximum and velocity is minimum
C both pressure and velocity are minimum
D both pressure and velocity are maximum"

Ans: A
Solu. The answer is A. velocity is maximum and pressure is minimum.
Here's the explanation:
- Continuity equation: In an incompressible fluid (like water) flowing in a horizontal pipe, the mass flow rate remains constant throughout the pipe. This means the product of the cross-sectional area (A) and the velocity (v) of the fluid must be constant ($A_1v_1 = A_2v_2$).
- Narrowest part: When the pipe narrows ($A_2 < A_1$), to maintain the same mass flow rate, the velocity (v_2) must increase according to the equation ($v_2 > v_1$).
- Bernoulli's principle: This principle states that for an inviscid (ideal) fluid in steady flow, an increase in fluid velocity corresponds to a decrease in static pressure.

Therefore, in the narrowest part of the horizontal pipe with streamline flow:
- Velocity is maximum due to the continuity equation.
- Pressure is minimum due to Bernoulli's principle.

Ques 22. "The height from earth's surface at which acceleration due to gravity becomes g/ where g is acceleration due to gravity on the surface of earth and R is radius of earth?
A √2R
B R
C R/√2
D 2R

Ans: B

Ques 23. How many steps are there in the process of glycolysis, the metabolic pathway that converts glucose into pyruvate ?
A 6
B 8
C 10
D 12

Ans: C
Solu. There are C. 10 steps in the process of glycolysis. Glycolysis is a complex pathway, but it can be broken down into 10 key enzymatic reactions that convert glucose into pyruvate.

Ques 24. Correct sequence in water absorption by root hairs.
A Imbibition, diffusion, osmosis
B Osmosis, imbibition, diffusion
C Diffusion, imbibition, osmosis
D Osmosis, diffusion, imbibition

Ans: A

Solu. The correct sequence in water absorption by root hairs is:

A. Imbibition, diffusion, osmosis

Here's why this is the correct order:

1. Imbibition: The root hair cell wall is made of cellulose, which has a high affinity for water. This initial attraction draws water molecules towards the cell wall.
2. Diffusion: Water molecules then begin to move from the soil solution (with a higher concentration of water) into the cell wall due to a concentration gradient. This movement is passive, driven by the difference in water concentration.
3. Osmosis: The cell membrane of the root hair is selectively permeable, allowing water molecules to pass through more easily than most solutes. Since the cytoplasm inside the root hair cell typically has a lower water concentration compared to the soil solution (due to the presence of dissolved solutes), a net movement of water occurs across the membrane. This movement of water into the cell driven by the difference in osmotic pressure is called osmosis.

Imbibition initiates the process, followed by diffusion through the cell wall, and finally, osmosis takes over as the main driving force for water absorption into the root hair cell.

Ques 25. Anneling process of PCR is performed at ___ temperature
A 90-98°C
B 40-60°C
C 70-75°C
D 20-25°C

Ans: B

Solu. The annealing process of PCR is performed at a temperature between B. 40-60°C.

Here's why:

- Denaturation: The first step in PCR involves heating the reaction mixture to a high temperature (around 94-98°C) to separate the double-stranded DNA template into single strands.

- Annealing: After denaturation, the temperature is lowered to a specific range (40-60°C) to allow the primers, short single-stranded DNA molecules complementary to specific regions of the target DNA, to anneal (bind) to these regions on the separated DNA strands. This temperature needs to be carefully chosen to ensure optimal primer specificity and efficient binding.
- Extension: Finally, the temperature is raised again (typically to around 72°C) to a range suitable for the DNA polymerase enzyme to function effectively. The polymerase then extends the primers, synthesizing new complementary DNA strands using the denatured template DNA.

So, the annealing temperature range is crucial for specific and successful primer binding during PCR.

Ques 26. Which of the following flowers is most likely to be pollinated by birds ?
A A flower with a long, tubular shape and bright red color
B A flower with a strong fragrance and white petals
C A flower that opens only at night and emits a strong scent
D A flower with small, inconspicuous petals and a dull color

Ans: A
Solu. The flower most likely to be pollinated by birds is:
- A. A flower with a long, tubular shape and bright red color

Here's why the other choices are less likely to be bird-pollinated:
- B. A flower with a strong fragrance and white petals: This description is more consistent with flowers pollinated by moths, which are attracted to strong fragrances and navigate at night. White flowers are also easier to see in low-light conditions.
- C. A flower that opens only at night and emits a strong scent: Similar to B, these characteristics are more attractive to night-pollinating insects like moths.
- D. A flower with small, inconspicuous petals and a dull color: Birds tend to be attracted to brightly colored flowers with easily accessible

nectar. Small and dull flowers are more likely to be wind-pollinated or pollinated by small insects.

Birds have good color vision and are attracted to brightly colored flowers, particularly red and orange hues. The long, tubular shape of the flower in option A allows birds like hummingbirds to reach the nectar deep inside, facilitating pollen transfer as the bird brushes against the flower's reproductive organs.

Ques 27. Bond present between two nucleotides on single strand of DNA is
A Phosphodiester bond
B Hydrogen bond
C Glycosidic bond
D Covalent bond

Ans: A
Solu. The bond present between two nucleotides on a single strand of DNA is a A. Phosphodiester bond.
Here's a breakdown of the choices:

- Phosphodiester bond (correct): This covalent bond links the phosphate group of one nucleotide to the sugar (deoxyribose) of the next nucleotide in the DNA strand. These phosphodiester bonds form the backbone of the DNA molecule.
- Hydrogen bond (incorrect): Hydrogen bonds are weaker interactions that occur between complementary base pairs (adenine with thymine and guanine with cytosine) across the two strands of the DNA double helix. They are not responsible for linking nucleotides within a single strand.
- Glycosidic bond (incorrect): This covalent bond links the sugar (deoxyribose) of a nucleotide to the nitrogenous base (adenine, guanine, thymine, or cytosine). It connects these two components within a single nucleotide, not between nucleotides.
- Covalent bond (general term, already included in other choices): Covalent bonds are a general term for chemical bonds involving the

sharing of electrons between atoms. Both phosphodiester bonds and glycosidic bonds are types of covalent bonds.