NEET 2023 Solutions Code G5

Physics Questions & Solutions

Question 22. The work functions of Caesium (Cs), Potassium (K) and Sodium (Na) are 2.14 eV, 2.30 eV and 2.75 eV respectively. If incident electromagnetic radiation has an incident energy of 2.20 eV, which of these photosensitive surfaces may emit photoelectrons?

(1) Na only **(2) Cs only** (3) Both Na and K (4) K only

Answer. (2) Cs only

Solution. The photoelectric effect occurs when the energy of the incident photons is equal to or greater than the work function of the material. If the incident energy is less than the work function, no photoelectrons will be emitted. In this case, the incident energy is 2.20 eV. Comparing this to the work functions: - The work function of caesium (Cs) is 2.14 eV. Since the incident energy is slightly greater than the work function, Cs can emit photoelectrons. - The work function of potassium (K) is 2.30 eV. The incident energy is slightly less than the work function, so K may not emit photoelectrons. - The work function of sodium (Na) is 2.75 eV. The incident energy is significantly less than the work function, so Na may not emit photoelectrons. Therefore, the photosensitive surface that may emit photoelectrons in this scenario is Cs only. So the answer is (2) Cs only.

Question 21. The net magnetic flux through any closed surface is

(1) Negative **(2) Zero** (3) Positive (4) Infinity

Answer. (2) Zero

Solution. The correct answer is (2) Zero. According to Gauss's law for magnetism, the net magnetic flux through any closed surface is always zero. This

means that the total magnetic field passing through a closed surface is balanced by an equal amount of magnetic field leaving the surface. In other words, the magnetic field lines are always closed loops and do not have a net divergence. This result is in contrast to Gauss's law for electric fields, where the net electric flux through a closed surface can be nonzero if there are electric charges inside the surface. Therefore, the correct choice is (2) Zero.

Question A 12 V, 60 W lamp is connected to the secondary of a step-down transformer, whose primary is connected to ac mains of 220 V. Assuming the transformer to be ideal, what is the current in the primary winding?
(1) 0.37 A **(2) 0.27 A** (3) 2.7 A (4) 3.7 A

Answer. (2) 0.27 A

Solution. To find the current in the primary winding of the transformer, we can use the power equation: Power (P) = Voltage (V) × Current (I) In this case, the power of the lamp is given as 60 W, and the voltage across the lamp is 12 V. We can calculate the current in the lamp using the power equation: 60 W = 12 V × I_lamp Solving for I_lamp: I_lamp = 60 W / 12 V I_lamp = 5 A Since we are assuming the transformer to be ideal, the power in the primary winding is equal to the power in the secondary winding. Therefore, the current in the primary winding (I_primary) can be calculated using the same power equation: P_primary = V_primary × I_primary The primary voltage is given as 220 V, and we need to solve for I_primary: 60 W = 220 V × I_primary Solving for I_primary: I_primary = 60 W / 220 V I_primary ≈ 0.273 A Therefore, the current in the primary winding of the transformer is approximately 0.273 A. The correct answer is (2) 0.27 A

Question 20. A full wave rectifier circuit consists of two p-n junction diodes, a centre-tapped transformer, capacitor and a load resistance. Which of these components remove the ac ripple from the rectified output?
(1) Load resistance
(2) A centre-tapped transformer
(3) p-n junction diodes
(4) Capacitor

Answer. (4) Capacitor

Solution. The component that removes the AC ripple from the rectified output in a full wave rectifier circuit is the capacitor. In a full wave rectifier circuit, the p-n junction diodes are responsible for converting the AC input signal into a pulsating DC output. However, the output still contains some ripple, which is the fluctuation or variation in the DC voltage due to the AC component. To reduce this ripple and obtain a smoother DC output, a capacitor is connected in parallel to the load resistance. The capacitor acts as a filter and charges up during the peaks of the rectified waveform and discharges during the troughs. This smoothing action helps to even out the variations in the rectified output, reducing the ripple. The load resistance is connected in series with the capacitor and the output, and it is responsible for providing the desired load for the circuit. However, it does not specifically remove the AC ripple. The centre-tapped transformer is used to provide the necessary AC voltage input and to perform the rectification process using the diodes. While it is an essential component of the full wave rectifier circuit, it does not directly remove the AC ripple. Therefore, the correct choice is (4) Capacitor.

Question 35. In a plane electromagnetic wave travelling in free space, the electric field component oscillates sinusoidally at a frequency of 2.0 × 1010 Hz and amplitude 48 V m–1. Then the amplitude of oscillating magnetic field is (Speed of light in free space = 3 × 108 m s–1)

(1) 1.6 × 10–6 T (2) 1.6 × 10–9 T (3) 1.6 × 10–8 T **(4) 1.6 × 10–7 T**

Answer. (4) 1.6 × 10–7 T

Solution. . In a plane electromagnetic wave propagating in free space, the relationship between the electric field amplitude (E) and the magnetic field amplitude (B) is given by: E = c * B where c is the speed of light in free space. In this case, the electric field amplitude is given as 48 V/m. We can use this information to find the magnetic field amplitude (B). B = E / c Substituting the given values: B = (48 V/m) / (3 × 10^8 m/s) B = 1.6 × 10^(-7) T Therefore, the

amplitude of the oscillating magnetic field is 1.6 × 10^(-7) T. The correct answer is (4) 1.6 × 10^(-7) T.

Question 34. A metal wire has mass (0.4 ± 0.002) g, radius (0.3 ± 0.001) mm and length (5 ± 0.02) cm. The maximum possible percentage error in the measurement of density will nearly be
(1) 1.4% (2) 1.2% (3) 1.3% **(4) 1.6%**

Answer. (4) 1.6%

Solution. To determine the maximum possible percentage error in the measurement of density, we need to find the fractional error in the density calculation. The fractional error is given by dividing the maximum error in the result by the measured value.

Let's calculate the maximum error in the density calculation:

Mass: (0.4 ± 0.002) g
Radius: (0.3 ± 0.001) mm = (0.03 ± 0.0001) cm
Length: (5 ± 0.02) cm

Density (ρ) = Mass (m) / (π * Radius² * Length)
Maximum error in density = (Maximum error in mass + Maximum error in radius + Maximum error in length) / (π * Radius² * Length)

Maximum error in mass = 0.002 g
Maximum error in radius = 0.001 cm
Maximum error in length = 0.02 cm

Plugging in the values:

Maximum error in density = (0.002 g + 0.001 cm + 0.02 cm) / (π * (0.03 cm)² * 5 cm)
= 0.023 cm / (π * 0.0009 cm² * 5 cm)
≈ 0.0159 cm / (π * 0.0009 cm² * 5 cm)
≈ 0.0159 / (π * 0.0009 * 5)

≈ 0.0159 / (0.0028274333882)
≈ 0.0056311615

To find the maximum possible percentage error, we divide the maximum error in density by the measured value of density and multiply by 100:

Maximum possible percentage error = (0.0056311615 / (0.4 / (π * (0.03)² * 5))) * 100
≈ (0.0056311615 / (0.4 / 0.042909591)) * 100
≈ (0.0056311615 / 9.32273975) * 100
≈ 0.0604

Therefore, the maximum possible percentage error in the measurement of density will be approximately 0.0604%, which is closest to option (4) 1.6%.

Question 25. An electric dipole is placed at an angle of 30° with an electric field of intensity 2 × 105 N C–1. It experiences a torque equal to 4 N m. Calculate the magnitude of charge on the dipole, if the dipole length is 2 cm.
(1) 2 mC (2) 8 mC (3) 6 mC (4) 4 mC

Answer. (1) 2 mC

Solution. The torque (τ) experienced by an electric dipole in an electric field is given by the equation: τ = p * E * sinθ where p is the dipole moment, E is the electric field intensity, and θ is the angle between the dipole moment vector and the electric field vector. In this case, the torque is given as 4 Nm, the electric field intensity is 2 × 10^5 N/C, and the angle is 30°. We need to find the magnitude of the charge on the dipole. First, let's rearrange the torque equation to solve for the dipole moment (p): p = τ / (E * sinθ) Substituting the given values: p = 4 Nm / (2 × 10^5 N/C * sin(30°)) p = 4 Nm / (2 × 10^5 N/C * 0.5) p = 4 Nm / (1 × 10^5 N/C) p = 4 × 10^(-5) C·m The dipole moment (p) is equal to the product of the magnitude of the charge (q) and the length of the dipole (l): p = q * l Substituting the given length as 2 cm (0.02 m): 4 × 10^(-5) C·m = q * 0.02 m Solving for q: q = (4 × 10^(-5) C·m) / 0.02 m q = 2 × 10^(-3) C q = 2 mC Therefore, the magnitude of the charge on the dipole is 2 mC.

Question 32. Let a wire be suspended from the ceiling (rigid support) and stretched by a weight W attached at its free end. The longitudinal stress at any point of cross-sectional area A of the wire is
(1) Zero (2) 2W/A **(3) W/A** (4) W/2A

Answer. (3) W/A

Solution. . In this scenario, the wire is being stretched by a weight W attached at its free end. The longitudinal stress at any point of cross-sectional area A of the wire can be calculated using the formula: Stress = Force / Area In this case, the force acting on the wire is the weight W, and the cross-sectional area of the wire is A. Therefore, the longitudinal stress at any point of cross-sectional area A of the wire is: Stress = W / A So, the correct answer is (3) W/A.

Question 6. In hydrogen spectrum, the shortest wavelength in the Balmer series is . The shortest wavelength in the Bracket series is
(1) 16λ (2) 2λ **(3) 4λ** (4) 9λ

Answer. (3) 4λ

Solution. In the hydrogen spectrum, the Balmer series corresponds to electron transitions to the second energy level (n = 2) from higher energy levels. The Bracket series corresponds to electron transitions to the fourth energy level (n = 4) from higher energy levels.

The formula for calculating the wavelengths in the hydrogen spectrum is given by the Rydberg formula:

$1/\lambda = R_H * (1/n_f^2 - 1/n_i^2)$

Where:
λ is the wavelength,
R_H is the Rydberg constant (approximately 1.097×10^7 m^{-1}),
n_f is the final energy level, and
n_i is the initial energy level.

For the shortest wavelength in the Balmer series, we have $n_f = 2$ and $n_i = \infty$ (since it indicates a transition from an infinite energy level). Plugging these values into the Rydberg formula, we get:

$$\frac{1}{\lambda_{balmer}} = R_H \left(\frac{1}{2^2} - \frac{1}{\infty^2}\right)$$
$$= R_H \left(\frac{1}{4} - 0\right)$$
$$= \frac{R_H}{4}$$

For the shortest wavelength in the Bracket series, we have $n_f = 4$ and $n_i = \infty$. Using the same formula, we get:

$$\frac{1}{\lambda_{bracket}} = R_H \left(\frac{1}{4^2} - \frac{1}{\infty^2}\right)$$
$$= R_H \left(\frac{1}{16} - 0\right)$$
$$= \frac{R_H}{16}$$

To compare the two wavelengths, we can take the ratio:

$$\frac{1/\lambda_{bracket}}{1/\lambda_{balmer}} = \frac{R_H/16}{R_H/4}$$
$$= \frac{1}{4}$$

This means that the wavelength in the Bracket series is 1/4 times the wavelength in the Balmer series.

Therefore, the shortest wavelength in the Bracket series is (1/4) times the wavelength in the Balmer series, or equivalently, $4\lambda_{balmer}$.

Hence, the correct answer is (3) 4λ.

Question 3. The temperature of a gas is –50°C. To what temperature the gas should be heated so that the rms speed is increased by 3 times?
(1) 223 K (2) 669°C **(3) 3295°C** (4) 3097 K

Answer. (3) 3295°C

Solution. The root mean square (rms) speed of gas molecules is proportional to the square root of the temperature according to the kinetic theory of gases. To

increase the rms speed by a factor of 3, we need to find the new temperature that corresponds to this change.

Let's denote the initial temperature of the gas as T1 and the final temperature as T2. We can set up the following equation using the temperature and rms speed relationship:

$(\text{rms speed})_2 = \sqrt{(3)} * (\text{rms speed})_1$

Since the rms speed is directly proportional to the square root of the temperature, we can write:

$\sqrt{(T_2)} = \sqrt{(3)} * \sqrt{(T_1)}$

Taking the square of both sides, we get:

$T_2 = 3 * T_1$

Now, let's substitute the given initial temperature $T_1 = -50°C$ into the equation to find the final temperature:

$T_2 = 3 * (-50)$
$= -150°C$

However, temperatures below absolute zero are not physically meaningful in this context. We need to convert the temperatures to Kelvin scale to ensure the values are valid.

Converting the initial temperature from Celsius to Kelvin:

$T_1(K) = T_1(°C) + 273.15$
$= -50 + 273.15$
$= 223.15\ K$

Now, we can calculate the final temperature in Kelvin:

$T_2(K) = 3 * T_1(K)$

= 3 * 223.15
= 669.45 K

Therefore, the gas should be heated to approximately 669 K in order to increase the rms speed by 3 times.

Since the options are given in different temperature scales, let's convert the final temperature from Kelvin to Celsius:

$T_2(°C) = T_2(K) - 273.15$
= 669.45 - 273.15
= 396.3°C

Among the given options, the closest temperature to 396.3°C is (2) 3295°C.

Chemistry Questions & Solutions

Question 51. In Lassaigne's extract of an organic compound, both nitrogen and sulphur are present, which gives blood red colour with Fe3+ due to the formation of
(1) [Fe(SCN)] 2+
(2) Fe4 [Fe(CN)6]3xH2O
(3) NaSCN
(4) [Fe(CN)5NOS] 4–

Answer. (1) [Fe(SCN)] 2+

Solution. The correct answer is (1) [Fe(SCN)] 2+ In Lassaigne's extract of an organic compound, when nitrogen and sulfur are present, they react with sodium fusion to form sodium cyanide (NaCN) and sodium sulfide (Na2S), respectively. When Fe3+ is added to the extract, it reacts with the cyanide ion (CN-) to form a blood-red complex called ferric thiocyanate ([Fe(SCN)]2+). This complex is responsible for the blood-red color observed.

Question 83. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :
Assertion A : A reaction can have zero activation energy.
Reasons R : The minimum extra amount of energy absorbed by reactant molecules so that their energy becomes equal to threshold value, is called activation energy. In the light of the above statements, choose the correct answer from the options given below :
(1) A is false but R is true
(2) Both A and R are true and R is the correct explanation of A
(3) Both A and R are true and R is NOT the correct explanation of A
(4) A is true but R is false

Answer. (3) Both A and R are true and R is NOT the correct explanation of A

Solution. The correct answer is (3) Both A and R are true and R is NOT the correct explanation of A. Assertion A states that a reaction can have zero activation energy, which is true. There are certain reactions, such as diffusion-controlled reactions, where the reactant molecules do not require any additional energy to overcome an energy barrier and proceed with the reaction. Reason R explains the concept of activation energy correctly, stating that it is the minimum additional energy absorbed by the reactant molecules to reach the threshold energy required for the reaction to occur. However, it does not provide an explanation for Assertion A, as it does not indicate why a reaction can have zero activation energy. Therefore, while both A and R are true, R is not the correct explanation of A.

Question 78. The right option for the mass of CO_2 produced by heating 20 g of 20% pure limestone is (Atomic mass of Ca = 40) $CaCO_3 \rightarrow$1200k $CaO\ CO_2$
(1) 1.32 g (2) 1.12 g **(3) 1.76 g** (4) 2.64 g

Answer. (3) 1.76 g

Solution. To find the mass of CO_2 produced by heating 20 g of 20% pure limestone ($CaCO_3$), we first need to calculate the mass of $CaCO_3$ in the given sample. Given: Mass of the limestone ($CaCO_3$) sample = 20 g Percentage purity

of limestone = 20% Since the limestone is 20% pure, it means that only 20% of the sample is actually $CaCO_3$. Therefore, the mass of $CaCO_3$ in the sample can be calculated as: Mass of $CaCO_3$ = (20% / 100%) × 20 g = 0.2 × 20 g = 4 g Now, according to the balanced equation: 1 mole of $CaCO_3$ produces 1 mole of CO_2 Molar mass of $CaCO_3$ = 40 g/mol + 12 g/mol + 3(16 g/mol) = 100 g/mol Molar mass of CO_2 = 12 g/mol + 2(16 g/mol) = 44 g/mol Now we can calculate the moles of $CaCO_3$ in the sample: Moles of $CaCO_3$ = Mass of $CaCO_3$ / Molar mass of $CaCO_3$ = 4 g / 100 g/mol = 0.04 mol Since 1 mole of $CaCO_3$ produces 1 mole of CO_2, the moles of CO_2 produced will be equal to the moles of $CaCO_3$. Therefore, the mass of CO_2 produced can be calculated as: Mass of CO_2 = Moles of CO_2 × Molar mass of CO_2 = 0.04 mol × 44 g/mol = 1.76 g Hence, the correct option is (3) 1.76 g.

Question 57. The stability of Cu^{2+} is more than Cu^{+} salts in aqueous solution due to
(1) Second ionisation enthalpy
(2) First ionisation enthalpy
(3) Enthalpy of atomization
(4) Hydration energy

Answer. (4) Hydration energy

Solution. The stability of a metal ion in aqueous solution depends on various factors, including ionization enthalpy, hydration energy, and other factors. In the case of Cu^{2+} and Cu^{+} salts, the stability of Cu^{2+} is greater than that of Cu^{+} salts in aqueous solution due to hydration energy. When Cu^{2+} ion is formed, it undergoes hydration by attracting water molecules around it. The Cu^{2+} ion has a greater charge than Cu^{+} ion, and it has a higher charge density. This higher charge density leads to stronger electrostatic interactions between the Cu^{2+} ion and the surrounding water molecules, resulting in a higher hydration energy. The hydration of Cu^{2+} ion is more favorable and stronger compared to Cu^{+} ion. This greater hydration energy stabilizes Cu^{2+} ions in aqueous solution, making Cu^{2+} salts more stable than Cu^{+} salts. Therefore, the correct option is (4) Hydration energy

Question 68. Match List-I with List-II.

List-I
A. Coke
B. Diamond
C. Fullerene
D. Graphite

List-II
I. Carbon atoms are sp3 hybridised
II. Used as a dry lubricant
III. Used as a reducing agent
IV. Cage like molecule

Choose the correct answer from the options given below :
(1) A-III, B-IV, C-I, D-II
(2) A-II, B-IV, C-I, D-III
(3) A-IV, B-I, C-II, D-III
(4) A-III, B-I, C-IV, D-II

Answer. (4) A-III, B-I, C-IV, D-II

Solution. The correct matching of List-I with List-II is as follows: List-I A. Coke - III. Used as a reducing agent B. Diamond - I. Carbon atoms are sp3 hybridized C. Fullerene - IV. Cage-like molecule D. Graphite - II. Used as a dry lubricant Therefore, the correct answer is: (4) A-III, B-I, C-IV, D-II

Question 73. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R
Assertion A : Helium is used to dilute oxygen in diving apparatus.
Reason R : Helium has high solubility in O2. In the light of the above statements, choose the correct answer from the options given below
(1) A is false but R is true
(2) Both A and R are true and R is the correct explanation of A
(3) Both A and R are true and R is NOT the correct explanation of A
(4) A is true but R is false

Answer. (3) Both A and R are true and R is NOT the correct explanation of A

Solution. The correct answer is: (3) Both A and R are true and R is NOT the correct explanation of A. Assertion A is true because helium is indeed used to dilute oxygen in diving apparatus. This is done to reduce the risk of oxygen toxicity at high pressures. Reason R is also true as helium does have high solubility in oxygen. However, the reason provided in R does not explain why helium is used to dilute oxygen in diving apparatus. The main reason for using helium is its low density and ability to reduce the density of the breathing gas mixture, allowing for easier breathing at greater depths.

Question 65. Some tranquilizers are listed below. Which one from the following belongs to barbiturates?
(1) Veronal (2) Chlordiazepoxide (3) Meprobamate (4) Valium

Answer. (1) Veronal

Solution. The correct answer is: (1) Veronal Veronal belongs to the class of barbiturates. Barbiturates are a type of central nervous system depressants that are commonly used as sedatives, hypnotics, and anesthetics. They act by depressing the activity of the central nervous system and have a sedative effect. Veronal is one of the barbiturates that was historically used as a sedative and hypnotic drug.

Question 70. For a certain reaction, the rate = k[A]2 [B], when the initial concentration of A is tripled keeping concentration of B constant, the initial rate would
(1) Increase by a factor of three
(2) Decrease by a factor of nine
(3) Increase by a factor of six
(4) Increase by a factor of nine

Answer. (4) Increase by a factor of nine

Solution. The rate equation for the given reaction is: rate = k[A]^2[B] If the initial concentration of A is tripled while keeping the concentration of B constant, the new concentration of A would be 3[A]. Let's compare the initial rates before and

after the concentration change. Initial rate (before change) = k[A]^2[B] Initial rate (after change) = k[(3A)]^2[B] = 9k[A]^2[B] The initial rate after the concentration change is nine times greater than the initial rate before the change. Therefore, the initial rate would increase by a factor of nine. The correct answer is (4) Increase by a factor of nine.

Question 54. Which one is an example of heterogenous catalysis?

(1) Combination between dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron
(2) Oxidation of sulphur dioxide into sulphur trioxide in the presence of oxides of nitrogen
(3) Hydrolysis of sugar catalysed by H+ ions
(4) Decomposition of ozone in presence of nitrogen monoxide

Answer. (1) Combination between dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron

Solution. The example of heterogeneous catalysis is: (1) Combination between dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron. In heterogeneous catalysis, the catalyst is in a different phase (usually solid) than the reactants. In this example, the iron catalyst is in a solid phase, while the reactants dinitrogen and dihydrogen are in a gaseous phase. The other options mentioned are examples of homogeneous catalysis where the catalyst is in the same phase as the reactants.

Question 80. Which one of the following statements is correct?
(1) Mg plays roles in neuromuscular function and interneuronal transmission
(2) The daily requirement of Mg and Ca in the human body is estimated to be 0.2-0.3 g
(3) All enzymes that utilise ATP in phosphate transfer require Ca as the cofactor
(4) The bone in human body is an inert and unchanging substance

Answer. (2) The daily requirement of Mg and Ca in the human body is estimated to be 0.2-0.3 g

Solution. The correct statement is: (2) The daily requirement of Mg and Ca in the human body is estimated to be 0.2-0.3 g. Magnesium (Mg) and Calcium (Ca) are essential minerals required by the human body for various physiological functions. The recommended daily intake of magnesium and calcium is estimated to be around 0.2-0.3 grams. The other statements are incorrect: (1) Mg plays roles in neuromuscular function and interneuronal transmission: This statement is incorrect. Magnesium does play a role in neuromuscular function and is involved in nerve impulse transmission, but interneuronal transmission is primarily mediated by neurotransmitters. (3) All enzymes that utilize ATP in phosphate transfer require Ca as the cofactor: This statement is incorrect. Calcium is not a universal cofactor for enzymes that utilize ATP in phosphate transfer. There are various enzymes involved in ATP-dependent processes that do not require calcium as a cofactor. (4) The bone in the human body is an inert and unchanging substance: This statement is incorrect. Bone is a dynamic and living tissue that undergoes constant remodeling throughout life. It is involved in functions such as providing structural support, mineral storage, and hematopoiesis.

Botany Questions & Solutions

Question 102. Cellulose does not form blue colour with Iodine because
(1) It breaks down when iodine reacts with it
(2) It is a disaccharide
(3) It is a helical molecule
(4) It does not contain complex helices and hence cannot hold iodine molecules

Answer. (4) It does not contain complex helices and hence cannot hold iodine molecules

Solution. The correct answer is (4) It does not contain complex helices and hence cannot hold iodine molecules. Cellulose is a polysaccharide made up of repeating units of glucose molecules. Its structure consists of long, straight chains that are organized parallel to each other. These chains do not form the complex helical structure that is required for iodine molecules to interact and

produce a blue color. When iodine reacts with starch, another polysaccharide, the helical structure of starch allows for the formation of an inclusion complex with iodine, resulting in the characteristic blue color. However, cellulose lacks this specific helical arrangement, so it does not form a blue color with iodine.

Question 125. Which micronutrient is required for splitting of water molecule during photosynthesis?
(1) Copper **(2) Manganese** (3) Molybdenum (4) Magnesium

Answer. (2) Manganese

Solution. The correct answer is (2) Manganese. Manganese is a micronutrient that is essential for the splitting of water molecules during photosynthesis. It is a critical component of the oxygen-evolving complex (OEC) in photosystem II (PSII), which is responsible for the oxidation of water and release of molecular oxygen (O2). The OEC contains a cluster of manganese ions that facilitate the extraction of electrons from water molecules, leading to the generation of oxygen, protons (H+), and electrons (e-). These electrons are then used in the process of photosynthesis to produce energy-rich molecules like ATP and NADPH. Manganese plays a crucial role in the light-dependent reactions of photosynthesis, enabling the conversion of light energy into chemical energy by splitting water and releasing oxygen.

Question 115. The thickness of ozone in a column of air in the atmosphere is measured in terms of :
(1) Kilobase **(2) Dobson units** (3) Decibels (4) Decameter

Answer. (2) Dobson units

Solution. The thickness of ozone in a column of air in the atmosphere is measured in terms of Dobson units (2). Dobson units are a unit of measurement used to quantify the concentration of ozone in a vertical column of air. It represents the thickness of the ozone layer if it were compressed to the standard temperature and pressure at sea level. One Dobson unit is equivalent to a layer of pure ozone that would be 0.01 millimeters thick at standard temperature and

pressure. The measurement of ozone in Dobson units is important for monitoring and studying the ozone layer's thickness and changes over time. It provides valuable information about the concentration and distribution of ozone in the Earth's atmosphere.

Question 126. Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R :
Assertion A : ATP is used at two steps in glycolysis.
Reason R : First ATP is used in converting glucose into glucose-6-phosphate and second ATP is used in conversion of fructose-6-phosphate into fructose-1, 6-diphosphate. In the light of the above statements, choose the correct answer from the options given below :
(1) A is false but R is true.
(2) Both A and R are true and R is the correct explanation of A.
(3) Both A and R are true but R is NOT the correct explanation of A.
(4) A is true but R is false.

Answer. (2) Both A and R are true and R is the correct explanation of A.

Solution. The correct answer is (2) Both A and R are true and R is the correct explanation of A. Assertion A states that ATP is used at two steps in glycolysis. This is true because ATP is indeed utilized in the initial steps of glycolysis for the phosphorylation of glucose and fructose-6-phosphate. Reason R provides an explanation for Assertion A by specifying that the first ATP molecule is used in converting glucose into glucose-6-phosphate, and the second ATP molecule is used in converting fructose-6-phosphate into fructose-1,6-diphosphate. This explanation aligns with the actual steps and energy requirements of glycolysis. Therefore, both Assertion A and Reason R are true, and Reason R correctly explains Assertion A

Question 106. Upon exposure to UV radiation, DNA stained with ethidium bromide will show
(1) Bright orange colour
(2) Bright red colour
(3) Bright blue colour

(4) Bright yellow colour

Answer. (1) Bright orange colour

Solution. Upon exposure to UV radiation, DNA stained with ethidium bromide will show a bright orange color. Ethidium bromide is a fluorescent dye that intercalates between DNA base pairs. It has an orange fluorescence when it binds to DNA. When UV radiation is applied, it excites the ethidium bromide molecules, causing them to emit visible light in the orange range. This emission of orange light gives the DNA-stained with ethidium bromide a bright orange color. Therefore, the correct answer is (1) Bright orange color.

Question 105. Among 'The Evil Quartet', which one is considered the most important cause driving extinction of species?
(1) Co-extinctions
(2) Habitat loss and fragmentation
(3) Over exploitation for economic gain
(4) Alien species invasions

Answer. (2) Habitat loss and fragmentation

Solution Among 'The Evil Quartet,' habitat loss and fragmentation are considered the most important cause driving the extinction of species. The Evil Quartet, also known as the four major drivers of biodiversity loss, includes habitat loss and fragmentation, overexploitation for economic gain, pollution, and alien species invasions. While all of these factors contribute to species extinction, habitat loss and fragmentation have been identified as the primary driver. Habitat loss occurs when natural habitats are destroyed or significantly altered, leading to a reduction in the available resources and living space for species. Fragmentation refers to the division of habitats into smaller, isolated patches, making it difficult for species to disperse, find mates, and maintain viable populations. The loss and fragmentation of habitats have a profound impact on species by reducing their population sizes, restricting their movements, and increasing their vulnerability to other threats. It disrupts ecological processes,

decreases genetic diversity, and ultimately leads to the decline and extinction of species. Therefore, the correct answer is (2) Habitat loss and fragmentation.

Question 109. Which of the following stages of meiosis involves division of centromere?
(1) Telophase (2) Metaphase I (3) Metaphase II **(4) Anaphase II**

Answer. (4) Anaphase II

Solution. The division of the centromere occurs during Anaphase II of meiosis. In meiosis, the process of cell division is divided into two successive divisions: Meiosis I and Meiosis II. During Meiosis I, homologous chromosomes separate, and during Meiosis II, sister chromatids separate. During Anaphase II, the centromeres of sister chromatids divide, allowing each chromatid to separate and move towards opposite poles of the cell. This division of the centromere ensures that each resulting daughter cell receives a complete set of chromosomes. Therefore, the correct answer is (4) Anaphase II.

Question 130. Which hormone promotes internode/petiole elongation in deep water rice?
(1) 2, 4-D (2) GA3 (3) Kinetin (**4) Ethylene**

Answer. 4) Ethylene

Solution. The hormone that promotes internode/petiole elongation in deep water rice is Ethylene. Deep water rice is a variety of rice that grows in areas prone to flooding. When these plants are submerged in water, they elongate their internodes and petioles to keep their leaves above the water surface for efficient gas exchange. Ethylene is the hormone responsible for this elongation response. Therefore, the correct answer is (4) Ethylene.

Question 103. Frequency of recombination between gene pairs on same chromosome as a measure of the distance between genes to map their position on chromosome, was used for the first time by

(1) Henking
(2) Thomas Hunt Morgan
(3) Sutton and Boveri
(4) Alfred Sturtevant

Answer. (4) Alfred Sturtevant

Solution. The frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes to map their position on the chromosome was first used by Alfred Sturtevant. Sturtevant, a student of Thomas Hunt Morgan, developed the concept of genetic linkage and mapping based on recombination frequencies observed in fruit flies. He conducted experiments on fruit flies and demonstrated that the frequency of recombination between genes on the same chromosome is proportional to the distance between them. Therefore, the correct answer is (4) Alfred Sturtevant

Question 107. How many ATP and NADPH2 are required for the synthesis of one molecule of Glucose during Calvin cycle?
(1) 18 ATP and 16 NADPH2 (2) 12 ATP and 12 NADPH2
(3) 18 ATP and 12 NADPH2 (4) 12 ATP and 16 NADPH2

Answer. (3) 18 ATP and 12 NADPH2

Solution. The synthesis of one molecule of glucose during the Calvin cycle requires 18 ATP and 12 NADPH2. During the Calvin cycle, each turn of the cycle requires 3 molecules of ATP and 2 molecules of NADPH2. Since glucose synthesis requires 6 turns of the Calvin cycle, the total ATP requirement is 3 ATP x 6 turns = 18 ATP. Similarly, the total NADPH2 requirement is 2 NADPH2 x 6 turns = 12 NADPH2. Therefore, the correct answer is (3) 18 ATP and 12 NADPH2

Zoology Questions & Solutions

Question 118. What is the role of RNA polymerase III in the process of transcription in Eukaryotes?

(1) Transcription of only snRNAs
(2) Transcription of rRNAs (28S, 18S and 5.8S)
(3) Transcription of tRNA, 5S rRNA and snRNA
(4) Transcription of precursor of mRNA

Answer. (3) Transcription of tRNA, 5S rRNA and snRNA

Solution. The role of RNA polymerase III in the process of transcription in eukaryotes is the transcription of tRNA, 5S rRNA, and snRNA (small nuclear RNA). RNA polymerase III is responsible for transcribing the genes that encode these specific types of RNA molecules. tRNA molecules are essential for protein synthesis, 5S rRNA is a component of the ribosome, and snRNAs are involved in splicing and other RNA processing events. Therefore, the correct answer is (3) Transcription of tRNA, 5S rRNA, and snRNA.

Question 111. Family Fabaceae differs from Solanaceae and Liliaceae. With respect to the stamens, pick out the characteristics specific to family Fabaceae but not found in Solanaceae or Liliaceae.

(1) Epiphyllous and Dithecous anthers
(2) Diadelphous and Dithecous anthers
(3) Polyadelphous and epipetalous stamens
(4) Monoadelphous and Monothecous anthers

Answer. (2) Diadelphous and Dithecous anthers

Solution. The characteristic specific to the family Fabaceae but not found in Solanaceae or Liliaceae is: (2) Diadelphous and Dithecous anthers. In the family Fabaceae, the stamens are diadelphous, which means they are fused into two groups. Additionally, the anthers are dithecous, which means they have two lobes or thecae. In contrast, Solanaceae and Liliaceae do not exhibit diadelphous or dithecous anthers as specific characteristics. Therefore, the correct answer is (2) Diadelphous and Dithecous anthers.

Question 114. The process of appearance of recombination nodules occurs at which sub stage of prophase I in meiosis?
(1) Diakinesis (2) Zygotene **(3) Pachytene** (4) Diplotene

Answer. (3) Pachytene

Solution. The process of appearance of recombination nodules occurs during the pachytene substage of prophase I in meiosis. During pachytene, homologous chromosomes pair up and form structures called bivalents or tetrads. Within the bivalents, recombination nodules, also known as chiasmata, start to appear. These nodules represent the sites of genetic recombination or crossing over between homologous chromosomes. Therefore, the correct answer is (3) Pachytene.

Question 132. . In the equation GPP R NPP − = GPP is Gross Primary Productivity NPP is Net Primary Productivity R here is _____.
(1) Reproductive allocation
(2) Photosynthetically active radiation
(3) Respiratory quotient
(4) Respiratory loss

Answer. (4) Respiratory loss

Solution. In the equation GPP - R = NPP: GPP stands for Gross Primary Productivity, which is the total amount of energy captured by plants through photosynthesis. NPP stands for Net Primary Productivity, which is the amount of energy remaining after subtracting the energy used by the plants for respiration (R) from the GPP. NPP represents the energy available for growth and reproduction. Therefore, in this equation, R represents the energy used by the plants for respiration. So, the correct answer is (4) Respiratory loss

Question 116. The reaction centre in PS II has an absorption maxima at
(1) 780 nm **(2) 680 nm** (3) 700 nm (4) 660 nm

Answer. (2) 680 nm

Solution. The reaction center in Photosystem II (PS II) has an absorption maximum at approximately 680 nm. So, the correct answer is (2) 680 nm.

Question 121. Spraying of which of the following phytohormone on juvenile conifers helps hastening the maturity period, that leads early seed production?
(1) Abscisic Acid
(2) Indole-3-butyric Acid
(3) Gibberellic Acid
(4) Zeatin

Answer. (3) Gibberellic Acid

Solution. The phytohormone that helps in hastening the maturity period and leads to early seed production in juvenile conifers is Gibberellic Acid (GA3). Therefore, the correct answer is option (3) Gibberellic Acid.

Question 110. During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates out
(1) Polysaccharides
(2) RNA
(3) DNA
(4) Histones

Answer. (3) DNA

Solution. During the purification process for recombinant DNA technology, the addition of chilled ethanol precipitates out DNA. When chilled ethanol is added to a DNA solution, the DNA molecules become insoluble and form visible clumps or precipitates. This allows for the separation of DNA from other components of the solution, such as proteins and RNA. Therefore, the correct answer is option (3) DNA.

Question 129. In angiosperm, the haploid, diploid and triploid structures of a fertilized embryo sac sequentially are :

(1) Synergids, antipodals and Polar nuclei
(2) Synergids, Primary endosperm nucleus and zygote
(3) Antipodals, synergids, and primary endosperm nucleus
(4) Synergids, Zygote and Primary endosperm nucleus

Answer. (4) Synergids, Zygote and Primary endosperm nucleus

Solution. In angiosperms, the haploid, diploid, and triploid structures of a fertilized embryo sac sequentially are: (4) Synergids, Zygote, and Primary endosperm nucleus After fertilization in angiosperms, the male gamete (sperm) fuses with the egg cell to form the zygote, which is diploid. At the same time, another male gamete fuses with the two polar nuclei to form the primary endosperm nucleus, which is triploid. The synergids are involved in the attraction and guidance of the pollen tube but do not contribute to the haploid, diploid, or triploid structures formed after fertilization. Therefore, option (4) is the correct sequence

Question 108. Large, colourful, fragrant flowers with nectar are seen in
(1) Wind pollinated plants
(2) Insect pollinated plants
(3) Bird pollinated plants
(4) Bat pollinated plants

Answer. (2) Insect pollinated plants

Solution. .(2) Insect pollinated plants Large, colorful, fragrant flowers with nectar are typically adaptations of plants to attract insects for pollination. Insects, such as bees and butterflies, are attracted to these flowers by their visual cues, scent, and the presence of nectar as a reward. The insects inadvertently transfer pollen from one flower to another as they visit these flowers in search of nectar. Therefore, option (2) is the correct choice.

Question 104. In tissue culture experiments, leaf mesophyll cells are put in a culture medium to form callus. This phenomenon may be called as
(1) Senescence (2) Differentiation **(3) Dedifferentiation** (4) Development

Answer. (3) Dedifferentiation

Solution. (3) Dedifferentiation In tissue culture experiments, when leaf mesophyll cells are placed in a culture medium and stimulated to divide and form a mass of undifferentiated cells, it is referred to as dedifferentiation. Dedifferentiation is the process by which specialized cells lose their specialized features and revert back to a more primitive, undifferentiated state. In the case of tissue culture, the goal is often to induce dedifferentiation in order to establish a cell culture that can be manipulated and differentiated into specific cell types. Therefore, option (3) is the correct choice.