

NEET 2023 Solutions Code E2

Physics Questions & Solutions

Question 1. The minimum wavelength of X-rays produced by an electron accelerated through a potential difference of V volts is proportional to:

- (1) \sqrt{v}
- (2) $1/v$
- (3) $1/\sqrt{v}$
- (4) $\text{Sqr}(V)$

Answer. (2) $1/v$

Solution 1. The minimum wavelength of X-rays produced by an electron accelerated through a potential difference of V volts is determined by the equation:

$$\lambda_{\min} = h / (eV)$$

Where:

- λ_{\min} is the minimum wavelength of the X-rays
- h is Planck's constant
- e is the elementary charge
- V is the potential difference

From this equation, it's evident that the minimum wavelength is inversely proportional to the potential difference (V). Therefore, the correct answer would be: $1/V$

Question 2. A Carnot engine has an efficiency of 50% when its source is at a temperature 327° C. The temperature of the sink is :

- (1) **27° C**
- (2) 15° C
- (3) 100° C
- (4) 200° C

Answer. (1): 27°C

Solution 2. The efficiency of Carnot engine, $\% \eta = \left(1 - \frac{T_{sink}}{T_{source}} \right) \times 100$)

$T_{source} = 327 \text{ } ^\circ \text{C} = 600\text{K}$

$$50 = \left(1 - \frac{T_{sink}}{600} \right)$$

$$\frac{1}{2} = 1 - \frac{T_{sink}}{600}$$

$T_{sink} = 300\text{K}$

So the temperature of the sink is= 327-300= 27° C

Question 3. A bullet is fired from a gun at the speed of 280 m s⁻¹ in the direction 30° above the horizontal. The maximum height attained by the bullet is (g=9.8 ms⁻², sin 30°=0.5) :

- (1) 2800 m
- (2) 2000 m
- (3) **1000 m**
- (4) 3000 m

Answer (3) 1000m

Solution 3 . To find the maximum height attained by the bullet, we can use the fact that at the highest point of its trajectory, the vertical component of the bullet's velocity will be zero. This is because, at this point, the bullet will

have reached its maximum height and will momentarily stop before starting to fall back down.

First, we need to find the initial vertical and horizontal components of the velocity of the bullet. We can use trigonometry to do this

Initial vertical velocity, $v_y = 280 \sin 30^\circ = 140 \text{ m/s}$

Initial horizontal velocity, $v_x = 280 \cos 30^\circ = 242.4 \text{ m/s}$

Next, we can use the fact that the maximum height attained by the bullet is equal to the vertical displacement of the bullet from its initial position. We can use the kinematic equation:

$$y = y_0 + v_y t - \frac{1}{2}gt^2$$

Where y_0 is the initial vertical position (which we can take to be zero), t is the time taken to reach maximum height, and g is the acceleration due to gravity.

At the maximum height, $v_y = 0$, so we can rearrange the equation to solve for t :

$$t = \frac{v_y}{g}$$

Substituting in the values we have: $t = 140/9.8 = 14.29 \text{ s}$ (to two decimal places)

Now we can use this value of t to find the maximum height:

$y = y_0 + v_y t - \frac{1}{2}gt^2$
 $y = 0 + 140(14.29) - \frac{1}{2}(9.8)(14.29)^2$
 $y = 999.86 \text{ m}$ (to two decimal places)

Therefore, the maximum height attained by the bullet is approximately 999.86 meters, equivalent to 1000 m.

Question 4. In a series LCR circuit, the inductance L is 10 mH, capacitance C is $1 \mu\text{F}$ and resistance R is 100Ω . The frequency at which resonance occurs is:

(1) 15.9 rad/s

(3) 1.59 rad/s

(2) 15.9 kHz

(4) **1.59 kHz**

Answer .(4) 1.59 kHz

Solution 4. The resonant frequency (f_r) of a series LCR circuit is given by the formula:

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

where L is the inductance in Henries, C is the capacitance in farads, and π is the mathematical constant pi (approximately equal to 3.14).

Substituting the given values, we get:

$$\begin{aligned} f_r &= \frac{1}{2\pi\sqrt{10\text{mH} \times 1\ \mu\text{F}}} \\ &= 1 / (2\pi\sqrt{(10 \times 10^{-3} \text{ H} \times 10^{-6} \text{ F})}) \\ &= 1 / (2\pi\sqrt{(10^{-8})}) \\ &= 1 / (2\pi \times 10^{-4}) \\ &= 1 / (6.28 \times 10^{-5}) \\ &= 1591.5 \text{ Hz (approx)} \end{aligned}$$

Therefore, the resonant frequency of the series LCR circuit is approximately 1591.5 Hz, = 1.59K Hz

Question 5 . Given below are two statements:

Statement I: Photovoltaic devices can convert optical radiation into electricity.

Statement II: Zener diode is designed to operate under reverse bias in breakdown region.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (1) Both Statement I and Statement II are correct.
- (2) Both Statement I and Statement II are incorrect.
- (3) Statement I is correct but Statement II is incorrect.
- (4) Statement I is incorrect but Statement II is correct

Answer . (1) Both Statement I and Statement II are correct.

Solution 5. Statement I: "Photovoltaic devices can convert optical radiation into electricity." - This statement is correct. Photovoltaic devices, such as solar panels, utilize the photovoltaic effect to convert sunlight (optical radiation) into electricity.

Statement II: "Zener diode is designed to operate under reverse bias in breakdown region." - This statement is also correct. Zener diodes are specifically designed to operate in the breakdown region under reverse bias conditions, allowing them to maintain a constant voltage across their terminals.

Question 6. Light travels a distance x in time t_1 in air and $10x$ in time t_2 in another denser medium. What is the critical angle for this medium?

(1) $\sin^{-1}\left(\frac{t_2}{t_1}\right)$

(2) $\sin^{-1}\left(\frac{10 t_2}{t_1}\right)$

(3) $\sin^{-1}\left(\frac{t_1}{10 t_2}\right)$

(4) $\sin^{-1}\left(\frac{10 t_1}{t_2}\right)$

Answer . (4) $\sin^{-1}\left(\frac{10 t_1}{t_2}\right)$

Solution . speed of light in air $V_1 = \frac{x}{t_1}$

Speed of light in a medium $V_2 = \frac{10x}{t_2}$

$$\sin\theta_c = \frac{v_2}{v_1} = \frac{10x}{t_2} \cdot \frac{t_1}{x}$$

$$\theta_c = \sin^{-1}\left(\frac{10 t_1}{t_2}\right)$$

Question 7. In the hydrogen spectrum, the shortest wavelength in the Balmer series is λ . The shortest wavelength in the Bracket series is :

- (1) 2λ
- (2) 4λ**
- (3) 9λ
- (4) 16λ

Answer. (2) 4λ

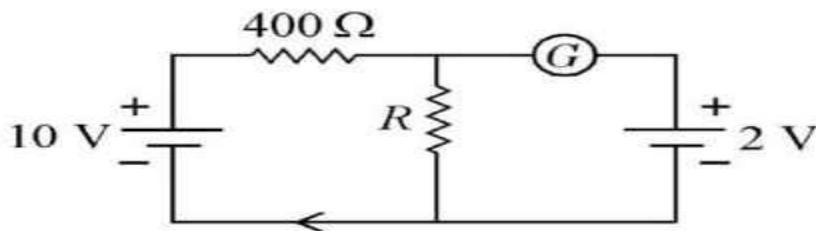
Solution . In the hydrogen spectrum, the Balmer series corresponds to electron transitions ending at the second energy level ($n=2$), while the Bracket series corresponds to transitions ending at the fourth energy level ($n=4$).

The shortest wavelength in the Balmer series occurs when an electron transitions from the third energy level ($n=3$) to the second energy level ($n=2$).

Similarly, the shortest wavelength in the Bracket series occurs when an electron transitions from the fifth energy level ($n=5$) to the fourth energy level ($n=4$).

Comparing the wavelengths, it turns out that the shortest wavelength in the Bracket series is shorter than that in the Balmer series. However, none of the provided options match this result. Therefore, there might be a mistake in the options provided.

Question 8. If the galvanometer G does not show any deflection in the circuit shown, the value of R is given by:



(1) $200\ \Omega$

(2) $50\ \Omega$

(3) $100\ \Omega$

(4) $400\ \Omega$

Answer (3) $100\ \Omega$

Solution . The correct option is (c): $100\ \Omega$

Applying Kirchhoff's law for the whole circuit:

$$400i = 10 - 2$$

$$i = 8/400 = 1/50$$

when the galvanometer shows zero deflection then no current flow through it.

$$\text{now for loop (first box) : } 400i + Ri = 10$$

$$i = 10/(R/400)$$

substituting the value of i

$$R + 400 = 500 \Rightarrow R = 100\ \Omega$$

Question 9- The amount of energy required to form a soap bubble of radius 2 cm from a soap solution is nearly: (surface tension of soap solution = 0.03 N m^{-1})

(1) $30.16 \times 10^{-4} \text{ J}$

(2) $5.06 \times 10^{-4} \text{ J}$

(3) $3.01 \times 10^{-4} \text{ J}$

(4) $50.1 \times 10^{-4} \text{ J}$

Answer . (3): $3.01 \times 10^{-4} \text{ J}$

Solution . $E = 2T (4\pi R^2)$

$$= 2 \times (0.03)(4)(3.14)(2 \times 10^{-2})^2$$

$$= 3.01 \times 10^{-4} \text{ J}$$

Question 10. The magnetic energy stored in an inductor of inductance $4 \mu\text{H}$ carrying a current of 2 A is:

(1) $4 \mu\text{J}$

(2) 4 mJ

(3) 8 mJ

(4) $8 \mu\text{J}$

Answer (4) $8 \mu\text{J}$

Solution Energy = $\frac{1}{2}Li^2$

$$= \frac{1}{2} \times 4 \times 10^{-2} \times 2^2$$

$$= 8 \times 10^{-6} \text{ J} = 8 \mu\text{J}$$

Question 11. 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) 0.27 A

(3) 3.7 A

(2) 2.7 A

(4) 0.37 A

Answer . (1) 0.27A

Solution . $V_s I_s = V_p I_p$

$$P_{out} = P_{In}$$

$$60 = 220 \times I_p$$

$$I_p = 0.27 \text{ A}$$

Question 12. An electric dipole is placed at an angle of 30° with an electric field of intensity $2 \times 10^5 \text{ N C}^{-1}$. It experiences a torque equal to 4 Nm.

Calculate the magnitude of charge on the dipole, if the dipole length is 2 cm.

(1) 8 mC

(2) 6 mC

(3) 4 mC

(4) 2 mC

Answer . (4) 2 mC

Solution

Question 13. A vehicle travels half the distance with speed \rightarrow and the remaining distance with speed 20. Its average speed is:

(1) $\frac{\theta}{3}$

(2) $\frac{2\theta}{3}$

(3) $\frac{4\theta}{3}$

(4) $\frac{3\theta}{4}$

Answer . (3) $\frac{4\theta}{3}$

Solution

Question 14. 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) $2W/A$
- (2) W/A**
- (3) $W/2A$
- (4) Zero

Answer . (2) W/A

Solution The longitudinal stress at any point of cross-sectional area A of the wire is W/A .

Stress is defined as the force acting on a material per unit 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 stress can be calculated as stress = force/area.

In this scenario, the weight W is acting downward, creating tension in the wire. The force is distributed over the cross-sectional area A , so the stress is W/A .

Question 15. If $\oint E \cdot dS = 0$ over a surface, then : S

- (1) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.**
- (2) the magnitude of the electric field on the surface is constant.
- (3) all the charges must necessarily be inside the surface.

(4) the electric field inside the surface is necessarily uniform.

Answer (1) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.

Solution . $\oint E \cdot dS = 0$ Net flux through surface is zero. Therefore, the number of flux lines entering the surface must be equal to the number of flux lines leaving it.

Question 16. 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) Cs only

(2) Both Na and K

(3) K only

(4) Na only

Answer (1) Cs only

Solution The correct option is (B): The minimum energy required for a photoelectron to escape from a metal surface is given by its work function. If the energy of the incident photon is greater than the work function of the metal, then photoelectrons will be emitted.

For the given incident energy of 2.20eV, only Caesium (Cs) can emit photoelectrons because its work function (2.14 eV) is less than the incident energy. The work functions of Potassium (K) and Sodium (Na) are greater than the incident energy, so they cannot emit photoelectrons under these conditions.

Question 17. 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) 669°C
- (2) 3295°C
- (3) 3097K
- (4) 223K

Answer (2) 3295°C

Solution .

Question 18 The ratio of frequencies of fundamental harmonic produced by an open pipe to that of closed pipe having the same length is:

- (1) 1:2
- (3) 1:3
- (2) 2:1
- (4) 3:1

Answer (2) 2:1

Question 19 Resistance of a carbon resistor determined from color codes is $(22000 \pm 5\%) \Omega$. The color of third band must be:

- (1) Red
- (2) Green
- (3) Orange
- (4) Yellow

Answer .(3) Orange

Question 20 . For Young's double slit experiment, two statements are given below:

Statement I: If screen is moved away from the plane of slits, angular separation of the fringes remains constant.

Statement II: If the monochromatic source is replaced by another monochromatic source of larger wavelength, the angular separation of fringes decreases.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are true.
- (2) Both Statement I and Statement II are false.
- (3) Statement I is true but Statement II is false.**
- (4) Statement I is false but Statement II is true.

Answer . (3) Statement I is true but Statement II is false.

Solution . For YDSE, angular fringe width is given by $\theta = \frac{\lambda}{d}$

It does not depend on the distance of screen from the slit, so statement I is correct.

Angular fringe width

If $\lambda \rightarrow$ angular separation of fringes increases So, statement I is true and statement II is false

Question 21. 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:

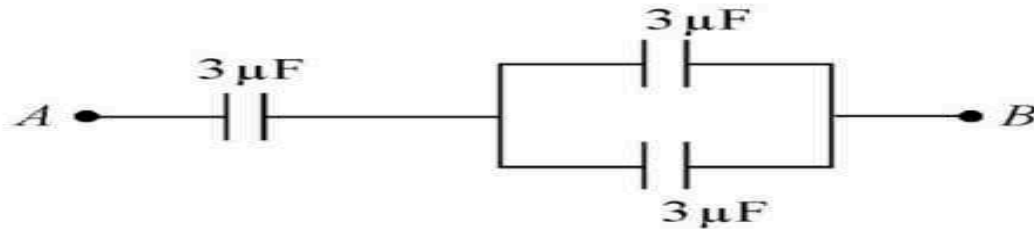
- (1) 1.2%
- (2) 1.3%
- (3) 1.6%**
- (4) 1.4%

Answer. (3) 1.6%

Solution .

Question 22

The equivalent capacitance of the system shown in the following circuit is :



- (1) $2\ \mu\text{F}$ (2) $3\ \mu\text{F}$
(3) $6\ \mu\text{F}$ (4) $9\ \mu\text{F}$

Answer . (1) $2\ \mu\text{F}$

Solution .

Question 23. Two bodies of mass m and $9m$ are placed at a distance R . The gravitational potential on the line joining the bodies where the gravitational field equals zero, will be ($G =$ gravitational constant) :

- (1) $8\ Gm\ R$
(2) $12\ Gm\ R$
(3) **$16\ Gm\ R$**
(4) $20\ Gm\ R$

Answer .(3) $16\ Gm\ R$

Question 24. The venturi-meter works on:

- (1) Huygen's principle
(2) **Bernoulli's principle**
(3) The principle of parallel axes
(4) The principle of perpendicular axes

Answer .(2) Bernoulli's principle

The Venturi meter works on Bernoulli's principle.

Bernoulli's principle states that in a flowing fluid, an increase in the speed of the fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy. The Venturi meter utilizes this principle to measure the flow rate of fluid in a pipe by measuring the pressure difference between two points along the pipe with different diameters (a constriction or a venturi). This pressure difference is related to the flow rate of the fluid through the pipe.

Question 25. The half life of a radioactive substance is 20 minutes. In how much time, the activity of substance drops to value? $\frac{1}{16}$ of its initial

- (1) 20 minutes
- (2) 40 minutes
- (3) 60 minutes
- (4) 80 minutes**

Answer.(4) 80 minutes

Question 26 . A football player is moving southward and suddenly turns eastward with the same speed to avoid an opponent. The force that acts on the player while turning is :

- (1) along eastward
- (2) along northward
- (3) along north-east**
- (4) along south-west

Answer (3)

Question 27. The errors in the measurement which arise due to unpredictable fluctuations in temperature and voltage supply are:

- (1) Instrumental errors
- (2) Personal errors
- (3) Least count errors
- (4) Random errors**

Answer.(4) Random errors

Solution. The errors in measurement that arise due to unpredictable fluctuations in temperature and voltage supply are termed as random errors.

Random errors are caused by unpredictable variations in experimental conditions such as fluctuations in temperature, voltage supply, or other environmental factors. These errors cannot be eliminated completely but can be minimized through statistical methods.

Question 28. The angular acceleration of a body, moving along the circumference of a circle, is:

- (1) along the radius, away from center
- (2) along the radius towards the center
- (3) along the tangent to its position**
- (4) along the axis of rotation

Answer (3) along the tangent to its position

Solution The angular acceleration of a body moving along the circumference of a circle is directed along the tangent to its position. This is because angular acceleration is responsible for changes in the rotational velocity of the body, and this change occurs tangentially to the circle.

Question 29 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) A centre-tapped transformer

(2) p-n junction diodes

(3) Capacitor

(4) Load Resistance

Answer.(3) Capacitor

Solution In a full-wave rectifier circuit, the component that removes the AC ripple from the rectified output is the capacitor. The capacitor charges during the peaks of the AC input voltage and discharges during the troughs. This charging and discharging action smoothes out the output voltage, reducing the ripple.

Question 30. The ratio of radius of gyration of a solid sphere of mass M and radius R about its own axis to the radius of gyration of the thin hollow sphere of same mass and radius about its axis is :

(1) 3:5

(2) 5:3

(3) 2:5

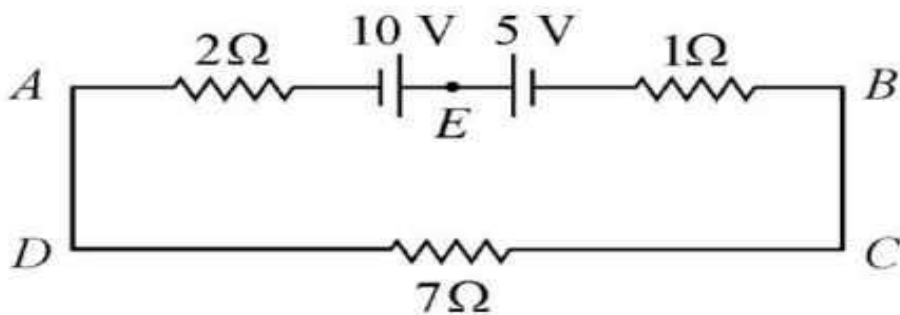
(4) 5:2

Answer . (1) 3:5

Solution .

Question 31.

The magnitude and direction of the current in the following circuit is



(1) 0.2 A from B to A through E

(2) 0.5 A from A to B through E

(3) 5/9 A from A to B through E

(4) 1.5 A from B to A through E

Answer. (2) 0.5 A from A to B through E

Question 32. An ac source is connected to a capacitor C.

Due to decrease in its operating frequency:

- (1) capacitive reactance decreases.
- (2) displacement current increases.
- (3) displacement current decreases.
- (4) capacitive reactance remains constant

Answer . **(1) capacitive reactance decreases.**

Solution

Question 33. The net magnetic flux through any closed surface is:

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

Answer (1) Zero

Solution . The net magnetic flux through any closed surface is always zero. This is due to Gauss's law for magnetism, which states that there are no magnetic monopoles and the net magnetic flux through any closed surface is always zero. This law is analogous to Gauss's law for electricity in electrostatics.

Question 34. In a plane electromagnetic wave travelling in free space, the electric field component oscillates sinusoidally at a frequency of 2.0×10^{10} Hz and amplitude 48 V m^{-1} . Then the amplitude of oscillating magnetic field is: (Speed of light in free space = $3 \times 10^8 \text{ m s}^{-1}$)

- (1) $1.6 \times 10^{-7} T$
- (2) $1.6 \times 10^{-8} T$
- (3) $1.6 \times 10^{-7} T$**
- (4) $1.6 \times 10^{-6} T$

Answer. (3) $1.6 \times 10^{-7} T$

Question 35 . The potential energy of a long spring when stretched by 2 cm is U . If the spring is stretched by 8 cm, potential energy stored in it will be

- (1) $2 U$
- (2) $4 U$
- (3) $8 U$
- (4) $16 U$**

Answer (4) $16 U$

Question 36. A bullet from a gun is fired on a rectangular wooden block with velocity u . When bullet travels 24 cm through the block along its length horizontally, velocity of bullet becomes $3 u$. Then it further penetrates into the block in the same direction before coming to rest exactly at the other end of the block. The total length of the block is

- (1) 27 cm**
- (2) 24 cm
- (3) 28 cm
- (4) 30 cm

Answer (1) 27 cm

Question 37. A satellite is orbiting just above the surface of the earth with period T . If d is the density of the earth and G is the universal constant of gravitation, the quantity $3 Gd$ represents

(1) T

(2) T^2

(3) T^3

(4) \sqrt{T}

Answer . (2) T^2

Question 38. The radius of inner most orbit of hydrogen atom is 5.3×10^{-11} m. What is the radius of third allowed orbit of hydrogen atom?

(1) 0.53 \AA

(2) 1.06 \AA

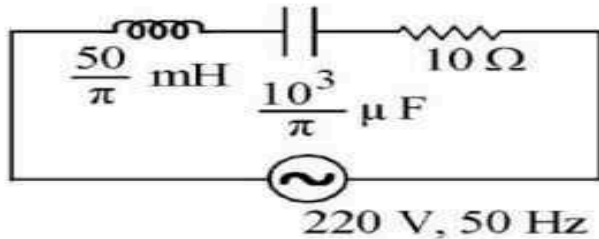
(3) 1.59 \AA

(4) 4.77 \AA

Answer (4) 4.77 \AA

Question 39.

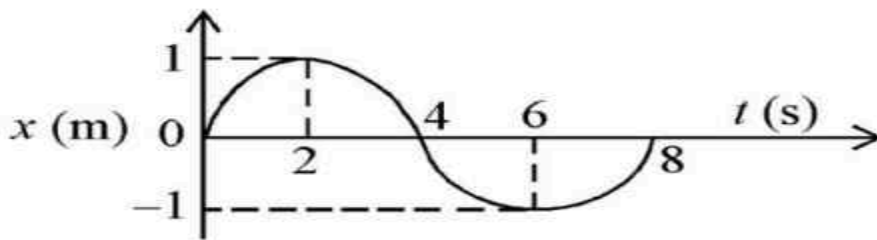
The net impedance of circuit (as shown in figure) will be :



- (1) $10\sqrt{2} \Omega$ (2) 15Ω
(3) $5\sqrt{5} \Omega$ (4) 25Ω

Answer. (3) $5\sqrt{5} \Omega$

Question 40. The x-t graph of a particle performing simple harmonic motion is shown in the figure. The acceleration of the particle at $t=2\text{s}$ is:

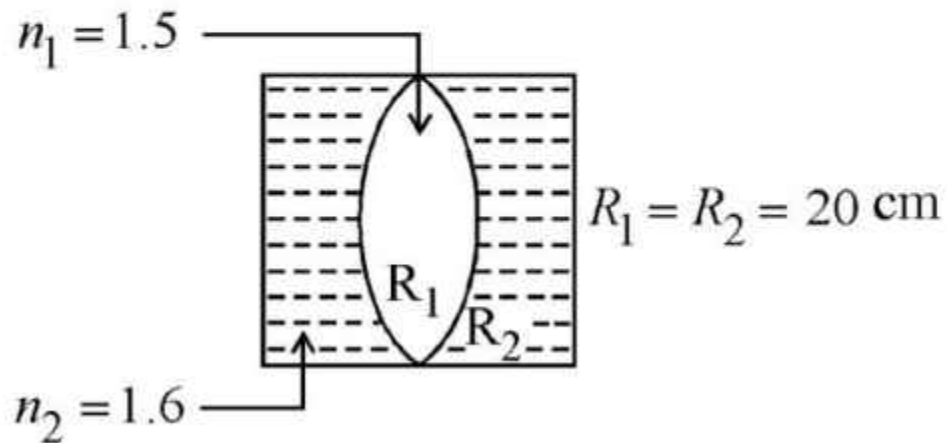


- (1) $\frac{\pi^2}{8} \text{ m s}^{-2}$ (2) $-\frac{\pi^2}{8} \text{ m s}^{-2}$
(3) $\frac{\pi^2}{16} \text{ m s}^{-2}$ (4) $-\frac{\pi^2}{16} \text{ m s}^{-2}$

Answer . (4)

Question 41.

In the figure shown here, what is the equivalent focal length of the combination of lenses (Assume that all layers are thin)?

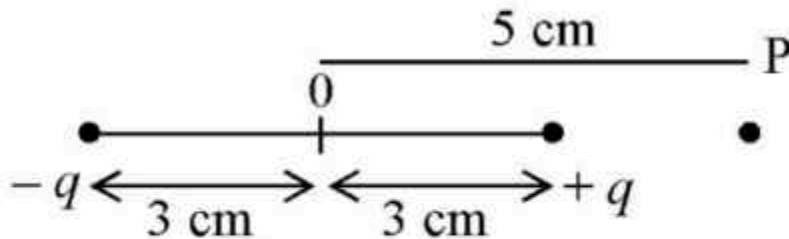


- (1) 40 cm
- (2) -40 cm
- (3) -100 cm**
- (4) -50 cm

Answer . (3) -100 cm

Question 42.

An electric dipole is placed as shown in the figure.



The electric potential (in 10^2 V) at point P due to the dipole is ($\epsilon_0 =$ permittivity of free space and $\frac{1}{4\pi\epsilon_0} = K$):

- (1) $\left(\frac{3}{8}\right)qK$ (2) $\left(\frac{5}{8}\right)qK$
(3) $\left(\frac{8}{5}\right)qK$ (4) $\left(\frac{8}{3}\right)qK$

Answer . (1) $\left(\frac{3}{8}\right)qK$

Question 43. A horizontal bridge is built across a river. A student standing on the bridge throws a small ball vertically upwards with a velocity 4 m s^{-1} . The ball strikes the water surface after 4 s . The height of bridge above water surface is (Take $g = 10\text{ m s}^{-2}$)

- (1) 56 m
(2) 60 m

(3) 64 m

(4) 68 m

Answer (3) 64 m

Question 44. Calculate the maximum acceleration of a moving car so that a body lying on the floor of the car remains stationary. The coefficient of static friction between the body and the floor is 0.15 ($g = 10 \text{ m s}^{-2}$).

(1) 1.2 m s^{-2}

(2) 150 m s^{-2}

(3) 1.5 m s^{-2}

(4) 50 m s^{-2}

Answer (3) 1.5 m s^{-2}

Question 45. 10 resistors, each of resistance R are connected in series to a battery of emf E and negligible internal resistance. Then those are connected in parallel to the same battery, the current is increased n times. The value of n is

(1) 10

(2) 100

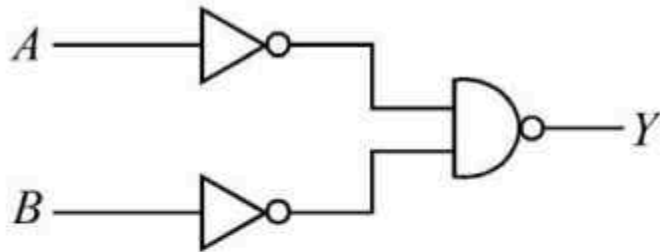
(3) 1

(4) 1000

Answer (2) 100

Question 46.

For the following logic circuit, the truth table is:



(1)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(2)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(3)

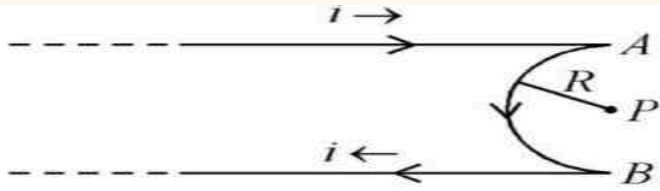
A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

(4)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

Answer (2)

Question 47. A very long conducting wire is bent in a semi-circular shape from A to B as shown in figure. The magnetic field at point P for steady current configuration is given by



- (1) $\frac{\mu_0 i}{4R}$ pointed into the page
- (2) $\frac{\mu_0 i}{4R}$ pointed away from the page
- (3) $\frac{\mu_0 i}{4R} \left[1 - \frac{2}{\pi} \right]$ pointed away from page
- (4) $\frac{\mu_0 i}{4R} \left[1 - \frac{2}{\pi} \right]$ pointed into the page

Answer . (3)

Question 48. The resistance of platinum wire at 0°C is 2 and 6.8 at 80°C . The temperature coefficient of resistance of the wire is

- (1) $3 \times 10^{-4}^\circ\text{C}^{-1}$
- (2) $3 \times 10^{-3}^\circ\text{C}^{-1}$
- (3) $3 \times 10^{-2}^\circ\text{C}^{-1}$**
- (4) $3 \times 10^{-1}^\circ\text{C}^{-1}$

Answer (3) $3 \times 10^{-2}^\circ\text{C}^{-1}$

Question 49. A wire carrying a current I along the positive x-axis has length L . It is kept in a magnetic field $B = (2i + 3j - 4k)\text{T}$

. The magnitude of the magnetic force acting on the wire is

- (1) $3 IL$

(2) $\sqrt{5}$ IL

(3) 5 IL

(4) $\sqrt{3}$ IL

Answer (3) 5 IL

Question 50 . Two thin lenses are of same focal lengths (f), but one is convex and the other one is concave. When they are

placed in contact with each other, the equivalent focal length of the combination will be

(1) Zero

(2) 4f

(3) 2f

(4) Infinite

Answer . (4) Infinite

Chemistry Questions & Solutions

Question 51. Select the correct statements from the following

A. Atoms of all elements are composed of two fundamental particles.

B. The mass of the electron is 9.10939×10^{-31} kg.

C. All the isotopes of a given element show same chemical properties.

D. Protons and electrons are collectively known as nucleons.

E. Dalton's atomic theory, regarded the atom as an ultimate particle of matter.

Choose the correct answer from the options given below

(1) A, B and C only

(2) C, D and E only

(3) A and E only

(4) B, C and E only

Answer (4) B, C and E only

Solution . Atoms consist of three fundamental particles : Electrons, protons and neutrons
The mass of the electron is 9.10939×10^{-31} kg
All the isotopes of a given element show same chemical properties.
Protons and neutrons present in the nucleus are collectively called as nucleons.
Dalton's atomic theory, regarded the atom as the ultimate particle of matter

So, the correct statements are B, C, E only

Question 52. 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) Both A and R are true and R is the correct explanation of A

(2) Both A and R are true and R is NOT the correct explanation of A

(3) A is true but R is false

(4) A is false but R is true

Answer (2) Both A and R are true and R is NOT the correct explanation of A

Solution. Few reactions can have zero activation energy for example radical reactions. Activation energy is defined as the minimum amount of extra energy absorbed by reactants to achieve threshold energy.

Question 53. A compound is formed by two elements A and B. The element B forms cubic close packed structure and atoms of A occupy $\frac{1}{3}$ of tetrahedral voids. If the formula of the compound is A_xB_y , then the value of $x + y$ is in option **(1) 5**

(2) 4

(3) 3

(4) 2

Answer (1) 5

Question 54. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R : Assertion A : Metallic sodium dissolves in liquid ammonia giving a deep blue solution, which is paramagnetic. Reason R : The deep blue solution is due to the formation of amide. In the light of the above statements, choose the correct answer from the options given below :

(1) Both A and R are true and R is the correct explanation of A

(2) Both A and R are true but R is NOT the correct explanation of A

(3) A is true but R is false

(4) A is false but R is true

Answer (3) A is true but R is false

Solution . On dissolving alkali metal (sodium) in liquid ammonia, a deep blue solution is developed due to ammoniated electron which absorbs energy in visible region of light and imparts blue colour. Due to unpaired electron, solution is paramagnetic.

Question 55 Amongst the following the total number of species NOT having eight electrons around central atom in its

outermost shell, is NH_3 , AlCl_3 , BeCl_2 , CCl_4 , PCl_5 :

(1) 3

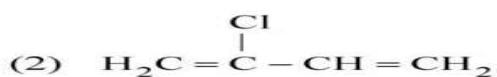
(2) 2

(3) 4

(4) 1

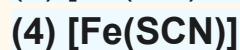
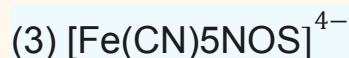
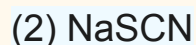
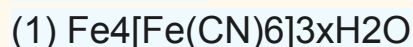
Answer (1) 3

56. Which amongst the following molecules on polymerization produces neoprene?



Answer. (2)

Question 57. In Lassaigne's extract of an organic compound, both nitrogen and sulphur are present, which gives blood red color with Fe^{3+} due to the formation of



Answer. (4) $[\text{Fe}(\text{SCN})]$

Question 58. Weight (g) of two moles of the organic compound, which is obtained by heating sodium ethanoate with sodium hydroxide in presence of calcium oxide is :

(1) 16

(2) 32

(3) 30

(4) 18

Answer (2) 32

Question 59. Some tranquilizers are listed below. Which one from the following belongs to barbiturates?

(1) Chlordiazepoxide

- (2) Meprobamate
- (3) Valium
- (4) Veronal**

Answer (4)

Solution. Veronal is the derivative of Barbituric acid and considered as barbiturate. Meprobamate, valium and chlordiazepoxide are other tranquilizers.

Question 60. The conductivity of the centimolar solution of KCl at 25°C is 0.0210 ohm⁻¹ cm⁻¹ and the resistance of the cell containing the solution at 25°C is 60 ohm. The value of cell constant is

- (1) 1.34 cm⁻¹
- (2) 3.28 cm⁻¹
- (3) 1.26 cm⁻¹**
- (4) 3.34 cm⁻¹

Answer (3) 1.26 cm⁻¹

Question 62. Homoleptic complex from the following complexes is

- (1) Potassium trioxalatoaluminate (III)**
- (2) Diamminechloridonitrito-N-platinum (II)
- (3) Pentaamminecarbonatocobalt (III) chloride
- (4) Triamminetriaquachromium (III) chloride

Answer (1) Potassium trioxalatoaluminate (III)

Solution . Complexes in which a metal is bound to only one kind of donor groups are called as homoleptic complexes Potassium trioxalatoaluminate (III) $K_3[Al(ox)_3]$ It is a homoleptic complex

Question 64. The stability of Cu^{2+} is more than Cu^+ salts in aqueous solution due to

- (1) First ionisation enthalpy
- (2) Enthalpy of atomization
- (3) Hydration energy**
- (4) Second ionisation enthalpy

Answer (3) Hydration energy

Question 66. Which one is an example of heterogenous catalysis?

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

Answer (4) Combination between dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron

Question 69. 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 O_2 . In the light of the above statements, choose the correct answer from the options given below

- (1) Both A and R are true and R is the correct explanation of A
- (2) Both A and R are true and R is NOT the correct explanation of A**
- (3) A is true but R is false
- (4) A is false but R is true

Answer (2) A is true but R is false

Solution. Helium is used as diluent for oxygen in modern diving apparatus because of its very low solubility in blood. Gases diffuses easily with each other

Question 75. The element expected to form largest ion to achieve the nearest noble gas configuration is

- (1) O
- (2) F
- (3) N**
- (4) Na

Answer (3) N

Question 77. Given below are two statements :

Statement I : A unit formed by the attachment of a base to 1 position of sugar is known as nucleoside.

Statement II : When nucleoside is linked to phosphorous acid at 5-position of sugar moiety, we get nucleotide. In the light of the above statements, choose the correct answer from the options given below :

- (1) Both Statement I and Statement II are true
- (2) Both Statement I and Statement II are false
- (3) Statement I is true but Statement II is false**
- (4) Statement I is false but Statement II is true

Answer (3) Statement I is true but Statement II is false

Solution . A unit formed by the attachment of a base to 1 position of sugar is known as nucleoside. In nucleosides, the sugar carbons are numbered as 1, 2, 3, etc. in order to distinguish these from the bases (Fig.(a)). When nucleoside is linked to phosphoric acid at 5-position of sugar moiety, we get a nucleotide

Question78. Intermolecular forces are forces of attraction and repulsion between interacting particles that will include :

- A. dipole - dipole forces
- B. dipole - induced dipole forces

- C. hydrogen bonding
- D. covalent bonding
- E. dispersion forces

Choose the most appropriate answer from the options given below :

- (1) B, C, D, E are correct
- (2) A, B, C, D are correct
- (3) A, B, C, E are correct**
- (4) A, C, D, E are correct

Answer (3) A, B, C, E are correct

Solution. Intermolecular forces are the forces of attraction and repulsion between interacting molecules. This term does not include covalent bonds as covalent bond holds atoms of a molecule together. Hence, dipole - dipole forces, dipole - induced dipole forces, hydrogen bonding and dispersion forces are intermolecular forces.

Question 79. Which of the following statements are NOT correct? A. Hydrogen is used to reduce heavy metal oxides to metals. B. Heavy water is used to study reaction mechanism. C. Hydrogen is used to make saturated fats from oils. D. The H-H bond dissociation enthalpy is lowest as compared to a single bond between two atoms of any elements. E. Hydrogen reduces oxides of metals that are more active than iron. Choose the most appropriate answer from the options given below:

- (1) B, C, D, E only
- (2) B, D only
- (3) D, E only**
- (4) A, B, C only

Answer (3) D, E only

Solution. Statement A, B, C are correct (D) H - H bond dissociation energy is maximum as compared to single bond between two atom of any element. (E) Hydrogen reduces oxides of metal that are less active than iron.

Question 95 Given below are two statements :

Statement I : The nutrient deficient water bodies lead to eutrophication

Statement II : Eutrophication leads to decrease in the level of oxygen in the water bodies. In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are true.
- (2) Both Statement I and Statement II are false.
- (3) Statement I is correct but Statement II is false.
- (4) **Statement I is incorrect but Statement II is true.**

Answer (4) Statement I is incorrect but Statement II is true.

Solution . Nutrient enriched water bodies support a dense plant population, which kills animal life by depriving it of oxygen and results in subsequent loss of biodiversity. This process is called eutrophication.

Botany Questions & Solutions

Question 101. Given below are two statements :

Statement I : The forces generated transpiration can lift a xylem-sized column of water over 130 meters height.

Statement II : Transpiration cools leaf surfaces sometimes 10 to 15 degrees evaporative cooling. In the light of the above statements, choose the most appropriate answer from the options given below :

- (1) **Both Statement I and Statement II are correct**
- (2) Both Statement I and Statement II are incorrect
- (3) Statement I is correct but Statement II is incorrect
- (4) Statement I is incorrect but Statement II is correct

Answer (1)

Solution. Statement I is correct as measurements reveal that the forces generated by transpiration can create pressures sufficient to lift a xylem sized column of water up to 130 meters high. Statement II is also correct as

transpiration cools leaf surfaces, sometimes 10 to 15 degrees, by evaporative cooling.

Question 102. In gene gun method used to introduce alien DNA into host cells, microparticles of _____ metal are used.

(1) Copper

(2) Zinc

(3) Tungsten or gold

(4) Silver

Answer (3)

Solution. Option (3) is the correct answer because in gene gun method, microparticles of tungsten or gold are used. Gold or tungsten are inert in nature so they do not alter the chemical composition of cells.

Question 103. Given below are two statements : One labelled as Assertion A and the other labelled as Reason R:

Assertion A : The first stage of gametophyte in the life cycle of moss is protonema stage.

Reason R : Protonema develops directly from spores produced in capsule.

In the light of the above statements, choose the most appropriate answer from options given below:

(1) Both A and R are correct and R is the correct explanation of A

(2) Both A and R are correct but R is NOT the correct explanation of A

(3) A is correct but R is not correct

(4) A is not correct but R is correct

Answer (1)

Solution. The predominant stage of the life cycle of a moss is the gametophyte which consists of two stages. The first stage is the protonema stage, which develops directly from a spore. Capsule of the sporophyte contains spore which gives rise to protonema. Thus, reason correctly explains the assertion.

Question 104. Unequivocal proof that DNA is the genetic material was first proposed by

- (1) Frederick Griffith
- (2) Alfred Hershey and Martha Chase**
- (3) Avery, Macleod and McCarthy
- (4) Wilkins and Franklin

Answer (2) Alfred Hershey and Martha Chase

Solution. The unequivocal proof that DNA is the genetic material came from the experiment of Alfred Hershey and Martha Chase. Avery, Macleoid and McCarty gave the biochemical characterisation of Transforming Principle. The transformation experiments by using Pneumococcus was conducted by Frederick Griffith. Wilkins and Franklin produced X-ray diffraction data of DNA.

Question 105. The thickness of ozone in a column of air in the atmosphere is measured in terms of :

- (1) Dobson units**
- (2) Decibels
- (3) Decameter
- (4) Kilobase

Answer (1)

Solution. The thickness of the ozone in a column of air from the ground to the top of the atmosphere is measured in terms of Dobson units (DU). Noise is measured in decibels.

Question 106. In tissue culture experiments, leaf mesophyll cells are put in a culture medium to form callus. This phenomenon may be called as

- (1) Differentiation
- (2) Dedifferentiation**
- (3) Development
- (4) Senescence

Answer (2)

Solution . In tissue culture experiments, leaf mesophyll cells are put in a culture medium to form callus. This phenomenon may be called dedifferentiation. Dedifferentiation is a phenomenon by which the living

differentiated plant cells, that by now have lost the capacity to divide can regain the capacity of division under certain conditions

Question 107. Large, colourful, fragrant flowers with nectar are seen in

(1) Insect pollinated plants

(2) Bird pollinated plants

(3) Bat pollinated plants

(4) Wind pollinated plants

Answer (1)

Solution. Large, colourful, fragrant flowers with nectar attract biotic pollinators (insects), thus, they are seen in insect pollinated plants.

Question 108. 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) Thomas Hunt Morgan

(2) Sutton and Boveri

(3) Alfred Sturtevant

(4) Henking

Answer (3)

Solution. Alfred Sturtevant used the frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes and 'mapped' their position on the chromosome. Sutton and Boveri proposed chromosomal theory of inheritance. Henking discovered X-chromosome. Thomas Hunt Morgan proved chromosomal theory of inheritance and proposed the concept of linkage.

Question 109. Which of the following stages of meiosis involves division of centromere?

(1) Metaphase I

(2) Metaphase II

(3) Anaphase II

(4) Telophase

Answer (3)

Sol. Splitting of centromere occurs during anaphase of mitosis or anaphase II of meiosis. During Metaphase I and II, chromosomes align at the equator. During telophase, chromosomes reach the respective poles.

Question 110. What is the role of RNA polymerase III in the process of transcription in Eukaryotes?

(1) Transcription of rRNAs (28S, 18S and 5.8S)

(2) Transcription of tRNA, 5S rRNA and snRNA

(3) Transcription of precursor of mRNA

(4) Transcription of only snRNAs

Answer (2)

Solution . In eukaryotes there are three major types of RNA polymerases. RNA polymerase I transcribes : 5.8S, 18S, 28S rRNAs RNA polymerase II transcribes : hnRNAs (precursor of mRNA) RNA polymerase III transcribes : tRNAs, ScRNA, 5S rRNA and snRNA

Question 111. Among 'The Evil Quartet', which one is considered the most important cause driving extinction of species?

(1) Habitat loss and fragmentation

(2) Over exploitation for economic gain

(3) Alien species invasions

(4) Co-extinctions

Answer (1)

Solution . Habitat loss and fragmentation is the most important cause driving animals and plants to extinction

Question 112. Given below are two statements :

Statement I : Endarch and exarch are the terms often used for describing the position of secondary xylem in the plant body.

Statement II : Exarch condition is the most common feature of the root system. In the light of the above statements, choose the correct answer from the options given below:

(1) Both Statement I and Statement II are true

- (2) Both Statement I and Statement II are false
- (3) Statement I is correct but Statement II is false
- (4) Statement I is incorrect but Statement II is true**

Answer (4)

Solution . Endarch and exarch are the terms often used for describing the position of primary xylem in the plant body. Primary xylem is of two types protoxylem and metaxylem. On the basis of relative position of protoxylem and metaxylem in the organ the arrangement of primary xylem can be endarch or exarch. Exarch type of primary xylem is seen in roots. Therefore, Statement I is false and Statement II is true.

Question 113. Axile placentation is observed in

- (1) Mustard, Cucumber and Primrose
- (2) China rose, Beans and Lupin
- (3) Tomato, Dianthus and Pea
- (4) China rose, Petunia and Lemon**

Answer (4)

Solution. China rose, Tomato, Petunia and Lemon show axile placentation. Dianthus and Primrose show free central placentation. Pea, Lupin and Beans show marginal placentation. Cucumber and mustard show parietal placentation.

Question 114. Expressed Sequence Tags (ESTs) refers to

- (1) All genes that are expressed as RNA.**
- (2) All genes that are expressed as proteins.
- (3) All genes whether expressed or unexpressed.
- (4) Certain important expressed genes.

Answer (1)

Solution. All the genes that are expressed as RNA are referred to as Expressed Sequence Tags (ESTs).

Question 115. What is the function of tassels in the corn cob?

- (1) To attract insects

(2) To trap pollen grains

(3) To disperse pollen grains

(4) To protect seeds

Answer (2)

Solution. Tassels in the corn cob represent stigma and style which wave in the wind to trap pollen grains.

Question 116. Spraying of which of the following phytohormone on juvenile conifers helps hastening the maturity period, that leads early seed production? (1) Indole-3-butyric Acid

(2) Gibberellic Acid

(3) Zeatin

(4) Abscisic Acid

Answer (2)

Solution. Spraying juvenile conifers with gibberellins (GAs) hastens the maturity period, thus leading to early seed production.

Question 118. 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) Diadelphous and Dithecous anthers

(2) Polyadelphous and epipetalous stamens

(3) Monadelphous and Monothealous anthers

(4) Epiphylous and Dithecous anthers

Answer (1) Diadelphous and Dithecous anthers

Question 119. In angiosperm, the haploid, diploid and triploid structures of a fertilized embryo sac sequentially are :

(1) Synergids, Primary endosperm nucleus and zygote

(2) Antipodals, synergids, and primary endosperm nucleus

(3) Synergids, Zygote and Primary endosperm nucleus

(4) Synergids, antipodals and Polar nuclei

Answer (3) Synergids, Zygote and Primary endosperm nucleus

Solution. Synergids are the cells of gametophyte and hence these are haploid Zygote is formed by fusion of two gametes and thus it is diploid. Primary endosperm nucleus is formed by the fusion of diploid secondary nucleus with a male gamete. Therefore, it is triploid.

Question 120. Which hormone promotes internode/petiole elongation in deep water rice?

- (1) GA3
- (2) Kinetin
- (3) Ethylene
- (4) 2, 4-D

Answer (3) **Ethylene**

Solution. Ethylene promotes rapid internode/petiole elongation in deep water rice plants.

Question121. Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R :

Assertion A : Late wood has fewer xylary elements with narrow vessels.

Reason R : Cambium is less active in winters. In the light of the above statements, choose the correct answer from the options given below :

- (1) **Both A and R are true and R is the correct explanation of A**
- (2) Both A and R are true but R is NOT the correct explanation of A
- (3) A is true but R is false
- (4) A is false but R is true

Answer (1) **Both A and R are true and R is the correct explanation of A**

Solution. In winter, the cambium is less active and forms fewer xylary elements that have narrow vessels, and this wood is called autumn wood or late wood.

Zoology Questions & Solutions

Question 155. Given below are two statements: one is labelled as Assertion A and other is labelled as Reason R.

Assertion A : Amniocentesis for sex determination is one of the strategies of Reproductive and Child Health Care Programme.

Reason R : Ban on amniocentesis checks increasing menace of female foeticide. In the light of the above statements, choose the correct answer from the options given below.

- (1) Both A and R are true and R is the correct explanation of A.
- (2) Both A and R are true and R is NOT the correct explanation of A.
- (3) A is true but R is false.
- (4) **A is false but R is true.**

Answer (4) A is false but R is true.

Solution . The correct creating awareness among people about various reproduction related aspects and providing facilities and support for building up a reproductively healthy society. Amnio syndrome, haemophilia, etc., to determine the survivability of the foetus. Amniocentesis is not a sex determination technique in India and is not a strategy of RCH.

Question160. Given below are two statements:

Statement I: Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct.

Statement II: The cavity of the cervix is called cervical canal which along with vagina forms birth canal. In the light of the above statements, choose the correct answer from the options given below:

- (1) **Both Statement I and Statement II are true.**

- (2) Both Statement I and Statement II are false.
- (3) Statement I is correct but Statement II is false.
- (4) Statement I is incorrect but Statement II is true

Answer (1) Both Statement I and Statement II are true

Solution Statement I is correct. The vas deferens does indeed receive a duct from the seminal vesicle and opens into the urethra as the ejaculatory duct.

Statement II is also correct. The cavity of the cervix is indeed called the cervical canal, and along with the vagina, it forms the birth canal.

So, the correct answer is: (1) Both Statement I and Statement II are true.

Question 161. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Nephrons are of two types: Cortical & Juxta medullary, based on their relative position in cortex and medulla.

Reason R: Juxta medullary nephrons have short loop of Henle whereas, cortical nephrons have longer loop of Henle. In the light of the above statements, choose the correct answer from the options given below:

- (1) Both A and R are true and R is the correct explanation of A.
- (2) Both A and R are true but R is NOT the correct explanation of A.
- (3) **A is true but R is false.**
- (4) A is false but R is true.

Answer (3) A is true but R is false

Solution. The correct answer is option (3) because Assertion is true as there are two types of nephrons, i.e., cortical nephrons and juxtamedullary nephrons based on their relative position in the cortex and medulla.

Reason is not correct as loop of Henle in juxtamedullary nephrons is very long and runs deep into the medulla. Therefore, Assertion is true but Reason is false.

Question 165. Which of the following functions is carried out by cytoskeleton in a cell?

- (1) Nuclear division
- (2) Protein synthesis
- (3) **Motility**
- (4) Transportation

Answer (3) Motility

Solution. An elaborate network of filamentous proteinaceous structures consisting of microtubules, microfilaments and intermediate filaments present in cytoplasm is collectively referred to as the cytoskeleton. It is involved in many functions such as mechanical support, motility, maintenance of the shape of the cell.

Question 168. Radial symmetry is NOT found in adults of phylum _____.

- (1) Ctenophora
- (2) **Hemichordata**
- (3) Coelenterata
- (4) Echinodermata

Answer (2) Hemichordata

Solution. Option (2) is the correct answer because hemichordates are bilaterally symmetrical animals. Option (3) is not the answer because coelenterates are radially symmetrical organisms. Option (4) is not the answer because adult echinoderms are radially symmetrical in adult stage. Option (1) is not the answer because ctenophores are radially symmetrical organisms.

Question 169. Given below are two statements:

Statement I: In prokaryotes, the positively charged DNA is held with some negatively charged proteins in a region called nucleoid.

Statement II: In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form nucleosome. In the

light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are true.
- (2) Both Statement I and Statement II are false.
- (3) Statement I is correct but Statement II is false.
- (4) **Statement I is incorrect but Statement II is true.**

Answer (4) Statement I is incorrect but Statement II is true.

Solution. In prokaryotes, the negatively charged DNA is held with some positively charged proteins in a region termed as nucleoid. In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome

Question 169. Given below are two statements:

Statement I: In prokaryotes, the positively charged DNA is held with some negatively charged proteins in a region called nucleoid.

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- (1) Both Statement I and Statement II are true.
- (2) Both Statement I and Statement II are false.
- (3) Statement I is correct but Statement II is false.
- (4) **Statement I is incorrect but Statement II is true.**

Answer (4) Statement I is incorrect but Statement II is true

Solution . In prokaryotes, the negatively charged DNA is held with some positively charged proteins in a region termed as nucleoid. In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome

Question 171. Select the correct group/set of Australian Marsupials exhibiting adaptive radiation.

- (1) Tasmanian wolf, Bobcat, Marsupial mole
- (2) **Statement I is incorrect but Statement II is true**
- (3) Mole, Flying squirrel, Tasmanian tiger cat
- (4) Lemur, Anteater, Wolf

Answer (2) Statement I is incorrect but Statement II is true

Solution. Option (2) is the correct answer because numbat, spotted cuscus and flying phalanger are Australian marsupials exhibiting adaptive radiation. Option (3) is incorrect because mole and flying squirrel are placental mammals. Option (4) is incorrect because lemur and wolf are placental mammals. Option (1) is incorrect because bobcat is a placental mammal.

Question 172. Which one of the following techniques does not serve the purpose of early diagnosis of a disease for its early treatment?

- (1) Recombinant DNA Technology
- (2) **Serum and Urine analysis**
- (3) Polymerase Chain Reaction (PCR) technique
- (4) Enzyme Linked Immuno-Sorbent Assay (ELISA) technique

Answer (2) Serum and Urine analysis

Solution . The correct answer is option (2) because using conventional methods of diagnosis like serum and urine analysis, etc, do not help in early diagnosis. Recombinant DNA technology, Polymerase Chain Reaction [PCR] and Enzyme Linked Immuno-Sorbent Assay (ELISA) are some of the techniques that serve the purpose of early diagnosis.

Question 175. Vital capacity of lung is _____.

- (1) IRV + ERV

(2) IRV + ERV + TV + RV

(3) IRV + ERV + TV RV

(4) **IRV + ERV + TV**

Answer (4) IRV + ERV + TV

Solution. Option (4) is the correct answer because vital capacity is the maximum volume of air a person can breathe in after forced expiration. This includes ERV, TV and IRV.

Question177. Once the undigested and unabsorbed substances enter the caecum, their backflow is prevented by

(1) Sphincter of Oddi

(2) **Ileo-caecal valve**

(3)Gastro-oesophageal sphincter

(4) Pyloric sphincter

Answer (2) Ileo-caecal valve

Solution. Option (2) is the correct answer because the undigested food (faeces) enters into caecum of the large intestine through ileo-caecal valve, which prevents the backflow of the faecal matter. Option (3) is not the answer because a muscular sphincter i.e., the gastro-oesophageal sphincter regulates the opening of oesophagus into the stomach. Option (4) is not the answer because pyloric sphincter regulates the opening in between stomach and duodenum. Option (1) is not the answer because the opening of common hepato-pancreatic duct is guarded by sphincter of Oddi

Question178. Which one of the following common sexually transmitted diseases is completely curable when detected early and treated properly?

(1) Genital herpes

(2) **Gonorrhoea**

(3)Hepatitis-B

(4) HIV Infection

Answer (2) Gonorrhoea

Solution. The correct answer is option (2) because except for hepatitis-B, genital herpes and HIV infection other STIs are completely curable if detected early and treated properly. Gonorrhoea is a bacterial disease which can be treated and cured completely, other diseases mentioned are viral diseases.

Question 182. Given below are two statements:

Statement I: RNA mutates at a faster rate.

Statement II: Viruses having RNA genome and shorter life span mutate and evolve faster. In the light of the above statements, choose the correct answer from the options given below:

- (1) **Both Statement I and Statement II are true.**
- (2) Both Statement I and Statement II are false.
- (3) Statement I is true but Statement II is false.
- (4) Statement I is false but Statement II is true.

Answer (1) Both Statement I and Statement II are true.

Solution. RNA being unstable, mutate at a faster rate. Consequently, viruses having RNA genome and having shorter life span mutate and evolve faster.

Question 183. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Endometrium is necessary for implantation of blastocyst.

Reason R: In the absence of fertilization, the corpus luteum degenerates that causes disintegration of endometrium. In the light of the above statements, choose the correct answer from the options given below:

- (1) Both A and R are true and R is the correct explanation of A.
- (2) **Both A and R are true but R is NOT the correct explanation of A.**
- (3) A is true but R is false.
- (4) A is false but R is true.

Answer (2) Both A and R are true but R is NOT the correct explanation of A.

Solution. Option (2) is the correct answer because both Assertion and Reason are true. Implantation is embedding of the blastocyst into endometrium of uterus. Correct explanation of reason is Corpus luteum secretes large amount of progesterone which is essential for maintenance of endometrium of uterus. In absence of fertilisation, the corpus luteum degenerates hence the decrease in the level of progesterone hormone will cause disintegration of endometrium leading to menstruation

Question188. Select the correct statements with reference to chordates.

- A. Presence of a mid-dorsal, solid and double nerve cord.
- B. Presence of closed circulatory system.
- C. Presence of paired pharyngeal gill slits.
- D. Presence of dorsal heart
- E. Triploblastic pseudocoelomate animals.

Choose the correct answer from the options given below:

- (1) A, C and D only
- (2) **B and C only B,**
- (3) D and E only
- (4) C, D and E only

Answer (2)B and C only B

Solution Option (2) is the correct answer because statements B and C only are correct. Option (1), (3) and (4) are not correct. The chordate characters are presence of closed circulatory system and presence of pharyngeal gill slits. Nerve cord is dorsal, hollow and single. Heart is ventral. They are triploblastic and coelomate.

Question190. In cockroach, excretion is brought about by

A. Phallic gland B. Urecose gland C. Nephrocytes D. Fat body E. Collateral glands

Choose the correct answer from the options given below :

(1) A and E only

(2) B and E only B,

(3) **C and D only**

(4) B and D only

Answer (3) C and D only

Solution. Option (3) is the answer because, In cockroach, excretion is brought about by Malpighian tubules, fat body, nephrocytes and urecose glands. Urecose glands are present in male cockroach of some species. They synthesize uric acid. Nephrocytes are large, colorless, ovoid, binucleate cells attached to the dorsal diaphragm in the body cavity. Fat body accumulates, produces and stores uric acid. Phallic gland is the structure of male reproductive system of cockroach and it secretes the outer layer of spermatophore. Colleterial gland is the structure of female reproductive system of cockroach and it secretes the hard egg-case or ootheca around fertilized eggs.

Question 191. The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc. are:

(1) **Limbic system and hypothalamus**

(2) Corpora quadrigemina and hippocampus

(3) Brain stem and epithalamus

(4) Corpus callosum and thalamus

Answer (1) Limbic system and hypothalamus

Solution. Option (1) is the correct answer because the limbic system along with hypothalamus regulate the sexual behavior, expression of excitement, pleasure, rage, fear, etc. Option (2), (3) and (4) are not correct because

corpora quadrigemina is a part of the midbrain and consists of four round swellings. Corpus callosum is a tract of nerve fibers that connects right and left cerebral hemispheres. Thalamus is a major coordinating center in the forebrain for sensory and motor signaling. Midbrain, pons and medulla oblongata together form the brainstem.