1. 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) 2:5   (2) 5:2   (3) 3:5   (4) 5:3

   Ans: No Options

   Solid sphere $I_s = MK_s^2$

   $$\frac{2}{5}MR^2 = MK_s^2$$

   $$K_s = \sqrt{\frac{2}{5}R^2}$$

   Hollow sphere $I_H = MK^2$

   $$\frac{2}{3}MR^2 = MK_H^2$$

   $$K_H = \sqrt{\frac{2}{3}R^2}$$

   $$\frac{K_s}{K_H} = \sqrt{\frac{2}{5}R^2 \cdot \frac{3}{2R^2}} = \sqrt{\frac{3}{5}}$$

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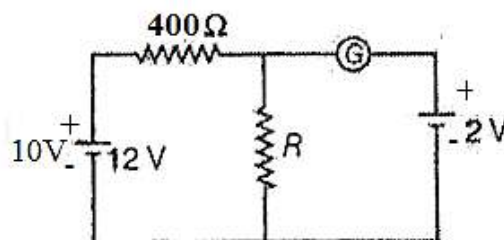   (1) 3.7A   (2) 0.37A   (3) 0.27A   (4) 2.7A

   Ans: 3

   For Ideal transformer

   $P_{output} = P_{input}$

   $60 = V_p I_p$

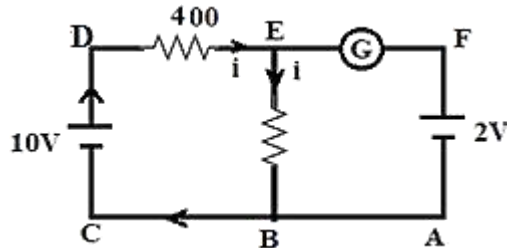 $I_p = \frac{60}{220} = 0.27A$

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

   (1) 100 Ω   (2) 400 Ω   (3)200 Ω   (4)50 Ω

Ans: (1)

Applying Kirchhoff's loop rule ABCDEFA

$+10 - i(400) - 2 = 0$

$8 = i \times 400$

$i = \dfrac{1}{50}$ A

Again loop BCDEB

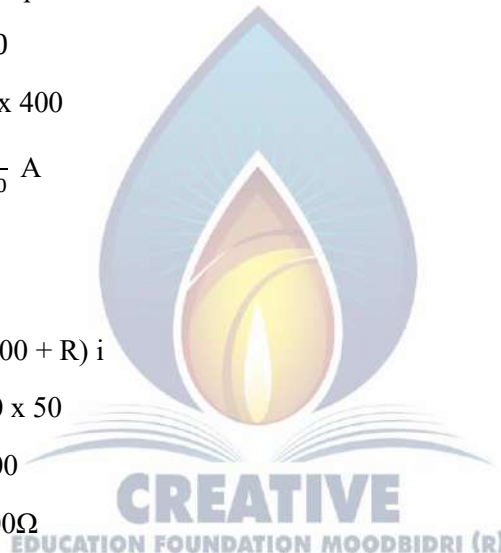$+10 - 400i - R \times i = 0$

$10 = (400 + R) i$

$400 + R = 10 \times 50$

$400 + R = 500$

$R = 100\Omega$

4. 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) Capacitor   (2) Load resistance
   (3) A centre- tapped transformer   (4) p-n junction diodes

Ans: (1)

Capacitor removes the A.C ripple from rectified outputs.

5. The work functions of Caesium (Cs). Potassium (K) and Sodium (Na) are 2.14eV, 2.30eV and 275eV respectively. If incident electromagnetic radiation has an incident energy of 2.20eV, which of these photosensitive surfaces may emit photoelectrons?
   (1) K only   (2) Na only
   (3) Cs only   (4) Both Na and K

Ans: (3)

For Photo electrons

Energy of Photon > Work function

So, $E > \varphi_{cs}$

Emits Photoelectrons

$E < \varphi_K$

$E < \varphi_{Na}$

Does not emit photoelectrons

6. The radius of frequencies of fundamental harmonic produced by an open pipe to that of closed pipe having the same length is:
   (1) 1:3   (2) 3:1   (3) 1:2   (4) 2:1

   Ans: (4)

   $$f = \frac{1}{2l}v$$
   $$f_{closed} = \frac{1}{4l}v$$
   $$\frac{f_{open}}{f_{closed}} = \frac{v}{2l}\frac{4l}{v} = \frac{2}{1}$$

7. 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) 3.01×10^{-4}J   (2) 50.1×10^{-4} j   (3) 30.16×10^{-4}J   (4) 5.06×10^{-4}J

   Ans: (1)

   $$W = 8\pi R^2 T = 8 \times 3.14 \times (2 \times 10^{-2})^2 \times 0.03 = 3.01 \times 10^{-4} J$$

8. 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) $W/2A$ (2) Zero   (3) $2W/A$ (4) W/A

   Ans: (4)

   Longitudinal stress $= \frac{Weight}{A} = \frac{w}{A}$

9. A vehicle travels half the distance with speed v and the remaining distance with speed $2v$. Its average speed is:
   (1) $\dfrac{4v}{3}$ (2) $\dfrac{3v}{4}$ (3) $\dfrac{v}{3}$ (4) $\dfrac{2v}{3}$

   Ans: (1)

   Average speed $= \dfrac{2V_1 V_2}{(V_1 + V_2)} = \dfrac{2 \times 2V \times V}{(V + 2V)} = \dfrac{4V^2}{3V} = \dfrac{4V}{3}$

10. 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) Statement I is a true but statement II is false
(2) Statement I is false but statement II is true
(3) Both statement I and statement II are true.
(4) Both statement I and statement II are false

Ans: (1)

Angular separation of the fringes is independent of the distance between the screen and the slit.

Angular separation of fringes is directly proportional to wavelength.

11. Light travels 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) $\sin^{-1}\left(\dfrac{t_1}{10t_2}\right)$

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

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

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

Ans: (2)

Critical angle $i_c = \sin^{-1}\dfrac{1}{\mu}$

$$\mu = \frac{c}{v}$$

$$\Rightarrow c = \frac{x}{t_1} \text{ and } v = \frac{10x}{t_2}$$

$$\mu = \frac{\dfrac{x}{t_1}}{\dfrac{10x}{t_2}} = \frac{t_2}{10t_1}$$
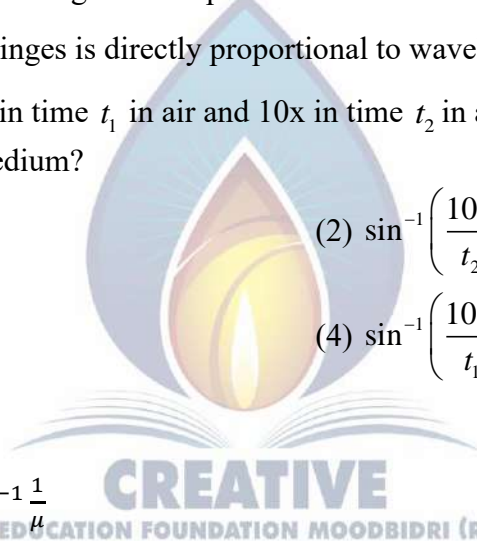
$$i_c = \sin^{-1}\left(\frac{1}{\frac{t_2}{10t_1}}\right)$$

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

12. An ac source is connected to a capacitor C. Due to decrease in its operating frequency:
    (1) Displacement current decreases
    (2) capacitive reactance remains constant
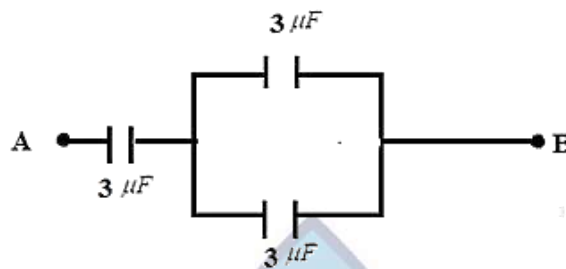   (3) Capacitive reactance decreases
    (4) displacement current increases

Ans: (1)

$$i_c = i_d = \frac{\varepsilon}{X_c} = \frac{\varepsilon}{\frac{1}{\omega c}} \qquad i = \varepsilon \omega c$$

If frequency decreases, i_d decreases

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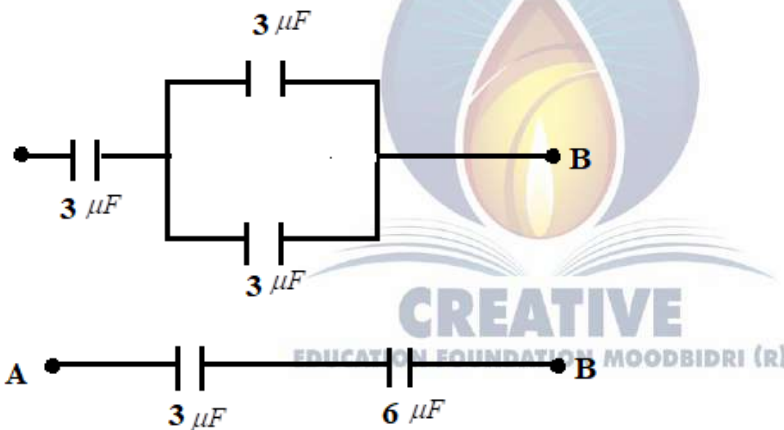

(1) $6\,\mu F$ (2) $9\,\mu F$ (3) $2\,\mu F$ (4) $3\,\mu F$

Ans: (3)

$$c_{eq} = \frac{(3)(6)}{3+6} = \frac{18}{9} = 2\mu F$$

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

(1) $1.6 \times 10^{-7}T$ (2) $1.6 \times 10^{-6}T$ (3) $1.6 \times 10^{-9}T$ (4) $1.6 \times 10^{-8}T$

Ans: (1)

$$f = 2 \times 10^{10}\,Hz$$
$$E_0 = 48Vm^{-1}$$
$$B_0 = \frac{E_0}{C} = \frac{8}{3 \times 10^8} = 16 \times 10^{-8}T = 1.6 \times 10^{-7}T$$

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

(1) 9λ (2) 16λ (3) 2λ (4) 4λ

Ans: (4)

$$\frac{1}{\lambda} = RZ^2\left(\frac{1}{2^2}\right) \qquad\qquad \frac{1}{\lambda^1} = RZ^2\left(\frac{1}{4^2}\right)$$

$$\frac{1}{\lambda} = \frac{RZ^2}{4} \qquad\qquad \frac{1}{\lambda^1} = \frac{RZ^2}{16} = \frac{1}{4}\left(\frac{RZ^2}{4}\right)$$

$$= \frac{1}{4\lambda}$$

$$\lambda^1 = 4\lambda$$

16. A metal wire has mass $(+0.4 \pm 0.002)$ 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) 1.6%   (2) 1.4%   (3) 1.2%   (4) 1.3%

Ans: (1)

$$m = (0.4 \pm 0.002)g, R = (0.3 \pm 0.001)mm$$

$$l = (5 \pm 0.02)cm$$

$$\rho = \frac{m}{v} = \frac{m}{A.l} \Rightarrow \rho = \frac{m}{A.l}$$

$$\rho = \frac{m}{\pi R^2 l}$$

$$\frac{\Delta\rho}{\rho} \times 100 = \frac{\Delta m}{m} \times 100 + \frac{2\Delta R}{R} \times 100 + \frac{\Delta l}{l} \times 100$$

$$= \frac{0.002}{0.4} \times 100 + 2\left(\frac{0.001}{0.3} \times 100\right) + \frac{0.02}{5} \times 100$$

$$= 0.5 + 0.67 + 0.4 = 1.57\% \approx 1.6\%$$

17. 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 north-east   (2) along south-west

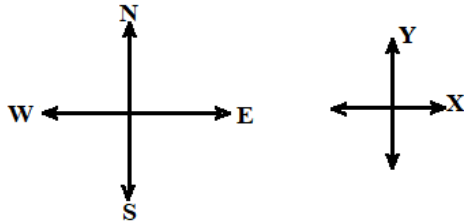(3) Along eastward   (4) along northward

Ans: (1)

Initially

$$\vec{V_i} = -u\,j$$

$$\vec{V_f} = u\hat{i}$$

Force will act along the direction of change in momentum

$$\overrightarrow{\Delta p} = m\overrightarrow{v_f} - m\overrightarrow{v_i}$$

$$= m(u\hat{i} + u\,j) \text{ i.e., along North East.}$$

18. 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) 3097 K   (2) 223 K   (3) 669°C   (4) 3295°C

Ans: (4)

$$T_0 = -50 + 273 = 223K$$

$$V_{rms} \propto \sqrt{T}$$

$$\frac{V}{4V} = \frac{\sqrt{223}}{\sqrt{T}}$$

$$T = 223 \times 16 = 3568K = 3295^0C$$

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

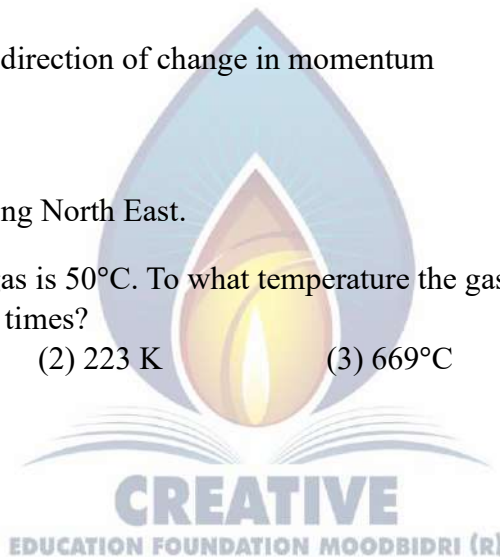   (1) Orange   (2) Yellow   (3) Red   (4) Green

Ans: (1)

$$R = (22000 \pm 5\%)\Omega$$

$$= (22 \times 10^3 \pm 5\%)\Omega$$

Colour code: Red Red Orange Gold.

Third band is orange

20. A bullet is fired from a gum at the speed of 280 ms^{-1} in the direction 30° above the horizontal. The maximum height attained by the bullet is $\left(g = 9.8ms^{-2}, \sin 30^o = 0.5\right)$:

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

    Ans: (1)

    $$H_{max} = \frac{u^2 \sin^2 \theta}{2g}$$

    $$= \frac{(280)^2 \sin^2 30^0}{2 \times 9.8}$$

    $$= 1000 \text{ m}$$

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

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

    Ans: (3)

    $$\eta = \frac{50}{100} = \frac{1}{2}$$

    $$T_{source} = 327^0 c = 327 + 273 = 600K$$

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

    $$T_{sink} = 300k = 27^0 C$$

22. In a series LCR circuit, the inductance L is 10 mH, capacitance C is 1 μF and resistance R is 100 Ω. The frequency at which resonance occurs is:

    (1) $1.59 rad/s$　　　　(2) $1.59 kHz$　　　　(3) $15.9 rad/s$　　　　(4) $15.9 kHz$

    Ans: (2)
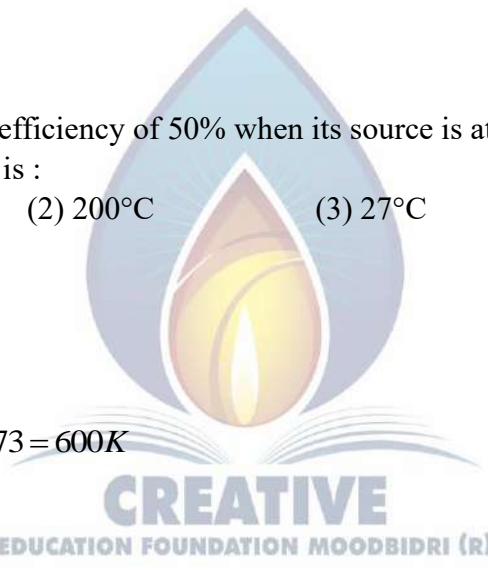
    L = 10 mH

    $$C = 1\mu F$$

    $$R = 100\Omega$$

    $$\omega = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{10 \times 10^{-3} \times 10^{-6}}} = \frac{1}{\sqrt{10^{-8}}}$$

    $$= \frac{1}{10^{-4}} = 10^4 \, rad/s$$

$$f = \frac{\omega}{2\pi} = \frac{10^4}{2 \times 3.14} = 1.59 kHz$$

23. If $\oiint_s \vec{E}.\overrightarrow{dS} = 0$ over a surface, then:

(1) All the changes must necessarily be inside the surface.

(2) The electric field inside the surface is necessarily uniform

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

(4) The magnitude of electric field on the surface is constant
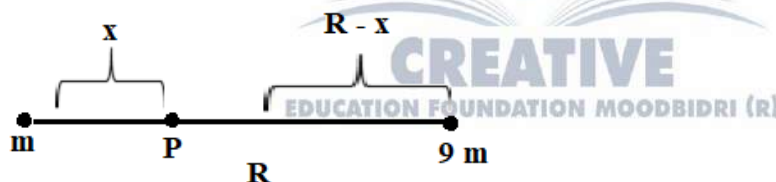
Ans: (3)

If number of flux lines entering the surface is equal to number of flux lines leaving the surface.

Then $\oiint \vec{E}.\vec{ds} = 0$

24. 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) $-\frac{16Gm}{R}$ (2) $-\frac{20Gm}{R}$ (3) $-\frac{8Gm}{R}$ (4) $-\frac{12Gm}{R}$

Ans: (1)

Let field be zero at a distance x from 'm' at point 'p' then

$$\frac{Gm}{x^2} = \frac{G(9m)}{(R-x)^2}$$

$$\frac{1}{x^2} = \frac{9}{(R-x)^2}$$

$$\frac{1}{x} = \frac{3}{R-x}$$

$$x = \frac{R}{4}$$

$$V_P = \frac{-Gm}{\left(\frac{R}{4}\right)} - \frac{G(9m)}{\left(\frac{3R}{4}\right)} = \frac{16Gm}{R}$$
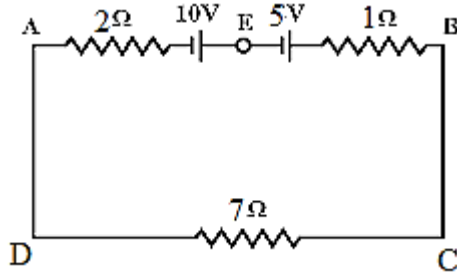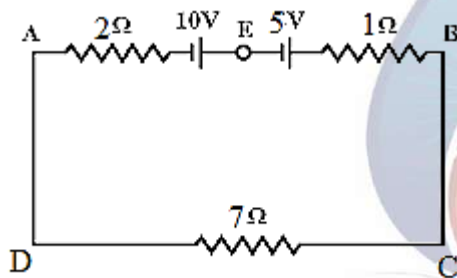
25. The magnitude and direction of the current in the following circuit is

(1) $\frac{5}{9}$ A from A to B through E

(2) 1.5 A from B to A through E

(3) 0.2 A from B to A through E

(4) 0.5 A from A to B through E

Ans: (4)

Equivalent emf = 10-5 = 5 volt

$$R_{eq} = 2+1+7 = 10\Omega$$

$$i = \frac{\varepsilon_{eq}}{R_{eq}} = \frac{5}{10} = 0.5A$$

Current is 0.5 A from 'A' to 'B' through 'E'

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

(1) $\frac{1}{\sqrt{V}}$　　　　　　(2) V^2　　　　　　(3) $\sqrt{V}$　　　　　　(4) $\frac{1}{V}$

Ans: (4)

$$eV = \frac{nC}{\lambda \min}$$

$$\lambda_{\min} = \frac{hc}{eV}$$

$$\lambda_{\min} \propto \frac{1}{V}$$

27. The angular acceleration of a body, moving along the circumference of a circle, is:
    (1) Along the tangent to its position
    (2) along the axis of rotation
    (3) Along the radius, away from centre
    (4) along the radius towards the centre

    Ans: (2)

    Angular velocity acceleration of a body is along the axis of the rotation.

28. The magnetic energy stored in an inductor of inductance $4\,\mu F$ carrying a current of 2A is :
    (1) 8mJ   (2) $8\,\mu J$ (3) $4\,\mu J$ (4) 4mJ

    Ans: (2)

    Energy stored $= \dfrac{1}{2}Li^2$

    $$= \dfrac{1}{2}(4\times10^{-6})(2^2)$$
    $$= 4\times10^{-6}\times2 = 8\mu J$$

29. The half-life of a radioactive substance is 20 minutes. In how much time, the activity of substance drops to $\left(\dfrac{1}{16}\right)^{th}$ of its initial value?

    (1) 60 minutes   (2) 80 minutes   (3) 20 minutes   (4) 40 minutes
    Ans: (2)
    $t_{1/2} = 20\min utes$

    Activity after n half lives $= \dfrac{A_0}{2^n}$

    A_0 is initial activity

    $$\dfrac{A_0}{2^n} = \dfrac{A_0}{2^4}$$
    $$n = 4$$

    Time taken $= 4\times20 = 80\min utes$

30. 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) 8U   (2) 16U   (3) 2U   (4) 4U
    Ans: (2)
    $U = \dfrac{1}{2}kx^2$

$$U = U_i = \frac{1}{2}k(2^2) = 2k$$

$$U_f = \frac{1}{2}k(8)^2$$
$$= \frac{1}{2}k(64) = 32k$$
$$= 16(2k) = 16U$$

31. The venturi-meter works on:
    (1) The principle of parallel axes
    (2) The principle of perpendicular axes
    (3) Huygen's principle
    (4) Bernoulli's principle
    Ans: (4)
    Venturi meter works on the principle of Bernoulli's principle

32. The net magnetic flux through any closed surface is :
    (1) Infinity   (2) Negative   (3) Zero   (4) Positive
    Ans: (3)
    Since Magnetic field lines form closed loops. Net magnetic flux through a closed surface is "zero"

33. 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) **Statement I** is correct but Statement II is incorrect
    (2) **Statement I** is incorrect but Statement II is correct
    (3) Both **Statement I** and **Statement II** are correct
    (4) Both **statement I** and **statement II** are incorrect

    Ans: (3)

    Both statement are correct.

34. The errors in the measurement which arise due to unpredictable fluctuations in temperature and voltage supply are:
    (1) Least count errors   (2) Random errors
    (3) Instrumental errors   (4) personal errors

    Ans: (2)

    Fluctuations in temperature and voltage supply correspond to Random errors

35. An electric dipole is placed at an angle of 30° with an electric field of intensity $2 \times 10^5 \, NC^{-1}$. It experiences a torque equal to 4 Nm. Calculate the magnitude of charge on the dipole, if the length is 2 cm.
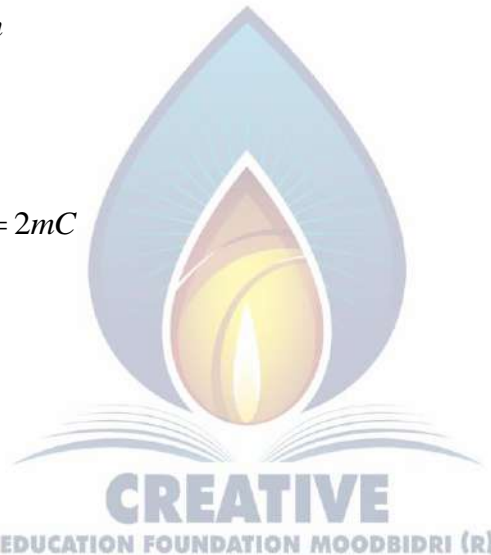
(1) 4mC (2) 2mC (3) 8mC (4) 6mC

Ans: (2)

$\tau = \rho E \sin\theta$

$4 = (2 \times 10^5) p \sin 30^0$

$p = \dfrac{4 \times 2}{2 \times 10^5} = 4 \times 10^{-5} C.m$

$P = Qd \quad \rightarrow Q = \dfrac{\rho}{d}$

$= \dfrac{4 \times 10^{-5}}{2 \times 10^{-2}} = 2 \times 10^{-3} C = 2mC$

36. The $x-t$ graph of a particle performing simple harmonic motion is shown in the figure. The acceleration of the particle at $t = 2\,$s is:
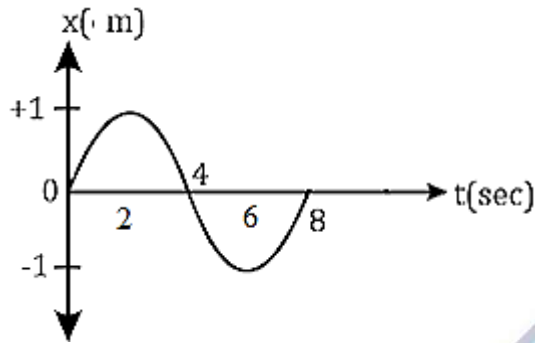
(1) $\dfrac{\pi^2}{16} ms^{-2}$ (2) $-\dfrac{\pi^2}{16} ms^{-2}$ (3) $\dfrac{\pi^2}{8} ms^{-2}$ (4) $-\dfrac{\pi^2}{8} ms^{-2}$

Ans: (2)

T= 8 sec

A=1m

$\omega = \dfrac{2\pi}{T} = \dfrac{2\pi}{8} = \dfrac{\pi}{4}$ rad/s

x = A sinωt

   $= 1.\sin\left(\dfrac{\pi}{4}\,t\right)$

   $= \sin\left(\dfrac{\pi}{4}\,t\right)$

V= $\dfrac{dx}{dt}$

   $= \dfrac{\pi}{4}\cos\left(\dfrac{\pi}{4}\,t\right)$

a $= \dfrac{dV}{dt}$

   $= -\dfrac{\pi^2}{16}\sin\left(\dfrac{\pi}{4}\,t\right)$
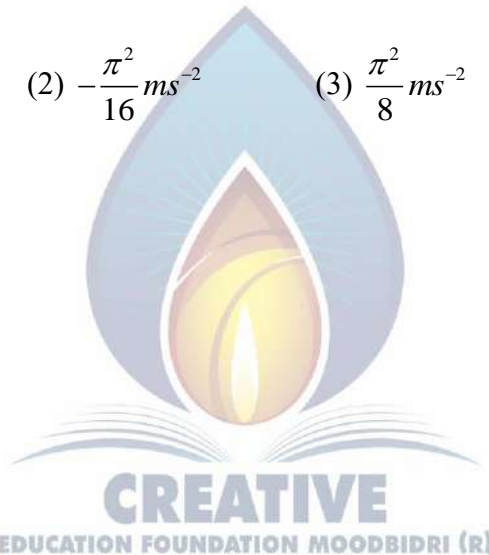
(t = 2 sec)

a $= -\dfrac{\pi^2}{16}\sin\left(\dfrac{\pi \times 2}{4}\right)$

   $= -\dfrac{\pi^2}{16}\sin\dfrac{\pi}{2}$

   $= -\dfrac{\pi^2}{16}\times 1$

   $= -\dfrac{\pi^2}{16}$ m/s^{-2}

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

(1) 64 m   (2) 68 m   (3) 56 m   (4) 60 m

Ans: (1)

u= 4 m/s

t= 4 sec

g= -10 m/s^2

$s = ut + \frac{1}{2}\ at^2$

$\quad = +4(4) + \frac{1}{2}\ (-10)\ (4^2)$

$\quad = -16 + 80$

$\quad = -64$ m

38. A wire carrying a current I along the positive x-axis has length L. It is kept in a magnetic field $\vec{B} = (2\hat{i} + 3j - 4k)T$. The magnitude of the magnetic force acting on the wire is:

(1) 5 IL (2) $\sqrt{3}\ IL$ (3) 3 IL (4) $\sqrt{5}\ IL$

Ans: (1)

$\vec{L} = L\hat{i}$

$\vec{B} = (\ 2\hat{i} + 3\hat{j} - 4\hat{k})$ T

$\vec{F} = I(\ \vec{L} \times \vec{B})$

$\quad = I[\ L\hat{i} \times (\ 2\hat{i} + 3\hat{j} - 4\hat{k})] = IL\ (3\hat{k} + 4\hat{j})$
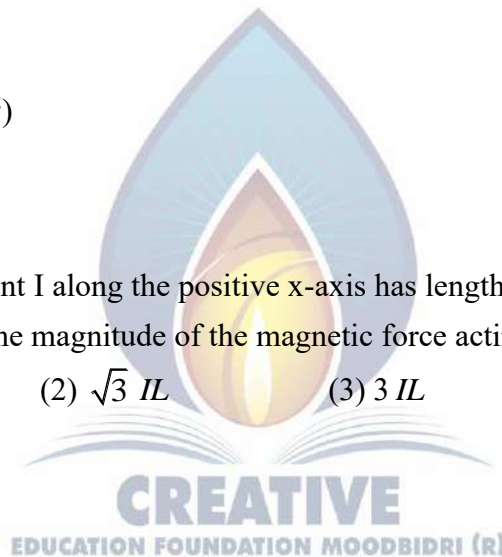
$F = IL\ \sqrt{3^2 + 4^2}$

$\quad = 5IL$

39. The resistance of platinum wire at 0°C is 2Ω at 80°C. The temperature coefficient of resistance of the wire is:

(1) $3\times10^{-2\ o}C^{-1}$ (2) $3\times10^{-1\ o}C^{-1}$ (3) $3\times10^{-4}\ \ ^{o}C^{-1}$ (4) $3\times10^{-3\ o}C^{-1}$

Ans: (1)

R$_0$ = 2Ω

R$_{80}$ = 6.8 Ω

$R_{80} = R_0(1 + \alpha t)$

$6.8 = 2(1 + \alpha \times 80)$

$6.8 = 2 + 160\,\alpha$

$6.8 - 2 = 160\,\alpha$

$4.8 = 160\,\alpha$

$\alpha = \dfrac{48}{1600}$

$\alpha = 3 \times 10^{-2}\ {}^{0}C^{-1}$

40. 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) $1.59\,\overset{0}{A}$ (2) $4.77\,\overset{0}{A}$ (3) $0.53\,\overset{0}{A}$ (4) $1.06\,\overset{0}{A}$

Ans: (2)

$r_0 = 5.3 \times 10^{-11}$ m

$r_n = n^2 r_0$

$r_3 = (3)^2 \times 5.3 \times 10^{-11}$

$\quad = 47.7 \times 10^{-11}$ m

$\quad = 4.77 \times 10^{-10}$ m

$\quad = 4.77 Å$
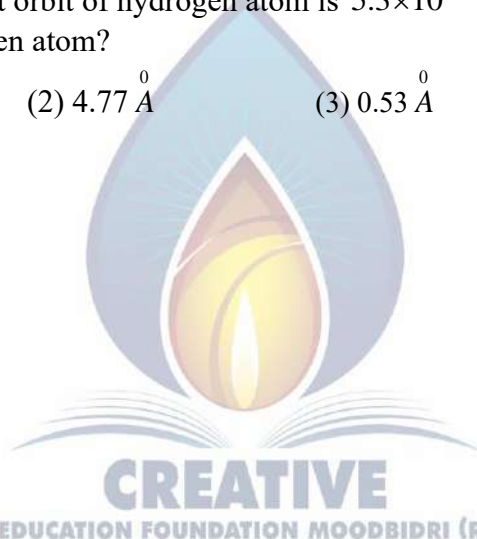
41. 10 resistors, each of resistance R are connected in series to a battery of emf E and negligible internal resistance. Then those are connected in parallel to the same battery, the current is increased n times. The value of n is:

(1) 1   (2) 1000   (3) 10   (4) 100

Ans: (4)

$R_1 = 10R$ (in series)

$R_2 = \dfrac{R}{10}$ (In parallel)

$I_2 = nI_1$

$E = I_1 R_1 = I_2 R_2$

$I_1 \times 10 R = n\, I_1 \times \dfrac{R}{10}$

$\quad\quad n = 100$

42. A satellite is orbiting just above the surface of the earth with period T. If d is the density of the earth with period T. If d is the density of the earth and G is the universal constant of gravitation, the quantity $\dfrac{3\pi}{Gd}$ represents:

(1) T^3 (2) $\sqrt{T}$ (3) T   (4) T^2

Ans: (4)

$M = \dfrac{4}{3}\pi R^3 d$

$T = 2\pi \sqrt{\dfrac{R^3}{GM}}$

$\quad = 2\pi \sqrt{\dfrac{R^3}{G \times \frac{4}{3}\pi R^3 d}}$

$T = \sqrt{\dfrac{3\pi}{Gd}}$

$\dfrac{3\pi}{Gd} = T^2$

43. Two thin lenses are of same focal lengths (f), but one is convex and the other one is concave. When they are place in contact with each other, the equivalent focal length of the combination will be:

(1) $f/2$ (2) Infinite   (3) Zero   (4) $f/4$

Ans: (2)

$f_1 = f$

$f_2 = -f$

$\dfrac{1}{F} = \dfrac{1}{f_1} + \dfrac{1}{f_2}$

$\dfrac{1}{F} = \dfrac{1}{f} - \dfrac{1}{f}$

$\dfrac{1}{F} = 0$

$F = \infty$

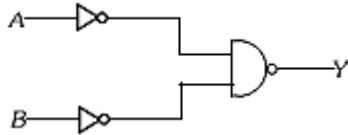44. For the following logic circuit, the truth table is :

	A	B	Y
	0	0	1
(1)	0	1	0
	1	0	1
	1	1	0

	A	B	Y
	0	0	0
(2)	0	1	0
	1	0	0
	1	1	1

	A	B	Y
	0	0	1
(3)	0	1	1
	1	0	1
	1	1	0

	A	B	Y
	0	0	0
(4)	0	1	1
	1	0	1
	1	1	1

Ans: (4)

A	B	$\overline{A}$	$\overline{B}$	$\overline{A}.\overline{B}$	$\overline{\overline{A}.\overline{B}}$
0	0	1	1	1	0
0	1	1	0	0	1
1	0	0	1	0	1
1	1	0	0	0	1

45. A bullet from 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 $\frac{u}{3}$. 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) 28 cm   (2) 30 cm   (3) 27 cm   (4) 24 cm

Ans: (3)
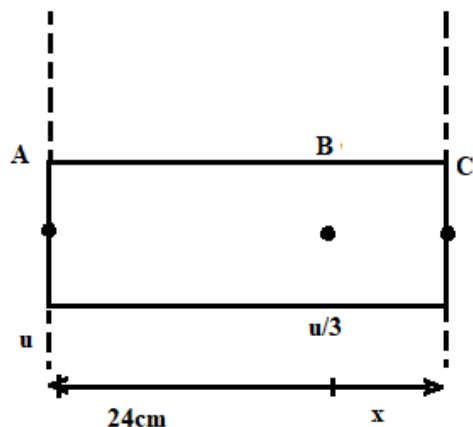
Case 1: A to B
$v^2 - u^2 = 2as$

$$\frac{u^2}{9} - u^2 = 2 \times a \times 24$$

$$\frac{-8}{9} u^2 = 48a$$

$$a = -\frac{u^2}{54}$$

Case 2: B to C

$$v^2 - u^2 = 2ax$$
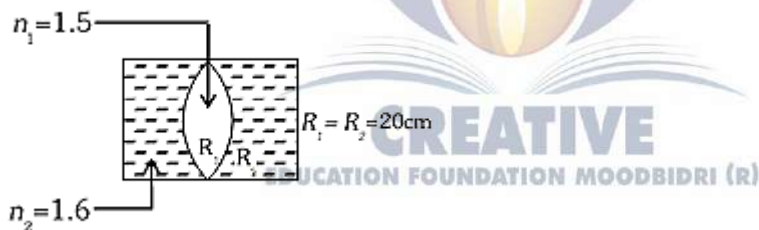
$$0 - \frac{u^2}{3} = 2 \times \left(\frac{-u^2}{54}\right) \times x$$

$$\frac{u^2}{9} = 2 \times \frac{u^2}{54} \times x$$

x = 3cm

Total length = 24 + 3 = 27cm

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

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

Ans: (1)

By Len's maker's formula

$$\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\frac{1}{f_1} = (1.6 - 1)\left(\frac{1}{\infty} - \frac{1}{20}\right)$$

$$\frac{1}{f_1} = \frac{6}{10} \times \frac{-1}{20} = \frac{-3}{100} cm \qquad .... (1)$$

$$\frac{1}{f_2} = (1.5 - 1)\left(\frac{1}{20} + \frac{1}{20}\right)$$

$$\frac{1}{f_2} = \frac{1}{2} \times \frac{2}{20} = \frac{1}{20} cm \qquad ....(2)$$

$$\frac{1}{f_3} = (1.6-1)\left(\frac{-1}{20} - \frac{1}{\infty}\right)$$

$$\frac{1}{f_3} = \frac{6}{10} \times \frac{-1}{20} = \frac{-3}{100} \, cm \qquad \text{........(3)}$$
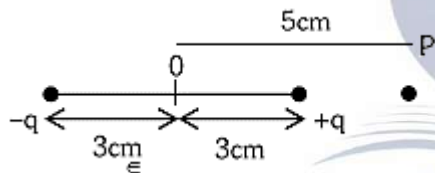
$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3}$$

$$\frac{1}{f} = \frac{-3}{100} + \frac{1}{20} - \frac{3}{100}$$

$$\frac{1}{f} = \frac{-3+5-3}{100} = \frac{-1}{100}$$

f = -100 cm

47. 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 ($\in_0$ = permittivity of free space and $= \dfrac{1}{4\pi \in_0} = K$):

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

Ans: (3)
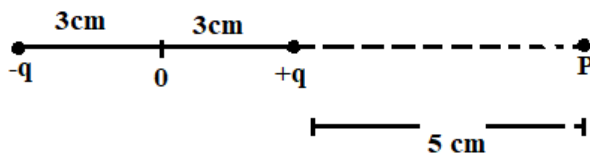
$$V_P = V_{+q} + V_{-q}$$

$$= \frac{kq}{(2\times10^{-2})} + \frac{k(-q)}{(8\times10^{-2})} \quad = \frac{3}{8}kq\times10^2 = \frac{3}{8}kq$$

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

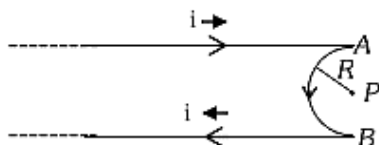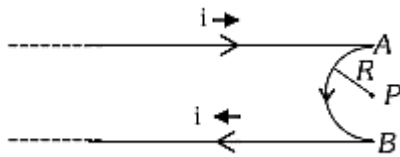(1) $\dfrac{\mu_0 i}{4R}\left[1-\dfrac{2}{\pi}\right]$ pointed away from page

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

(3) $\dfrac{\mu_0 i}{4R}$ pointed into the page

(4) $\dfrac{\mu_0 i}{4R}$ pointed away from the page

Ans: (1)

$$\vec{B}_{net} = \vec{B_1} + \vec{B_2} + \vec{B_3}$$

$$= \dfrac{-\mu_0 i}{4\pi R} - \dfrac{\mu_0 i}{4\pi R} + \dfrac{\mu_0 i}{4\pi R}$$

(Outwards perpendicular to the plane of paper field positive and inwards negative)

$$= \dfrac{-\mu_0 i}{2\pi R} + \dfrac{\mu_0 i}{4R}$$

$$= \dfrac{\mu_0 i}{4R}\left(1-\dfrac{2}{\pi}\right)$$

Directed away from the page.

49. 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 $0.15\left(g = 10ms^{-2}\right)$.

(1) $1.5ms^{-2}$
(2) $50\,ms^{-2}$
(3) $1.2\,ms^{-2}$
(4) $150\,ms^{-2}$

Ans: (1)
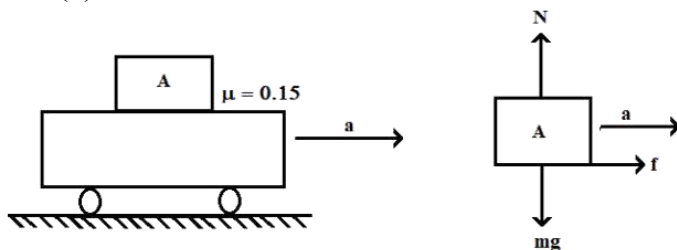
According to Newton's 2nd law

$F_{net} = ma$

$f = ma$

$ma \le \mu N$

$ma \le \mu mg$

$a \le 0.15 \times 10$

$a \le 1.5 m/s^2$

$a_{max} = 1.5 m/s^2$

50. The net impedance of circuit (as show in figure) will be:

220 V, 50 Hz
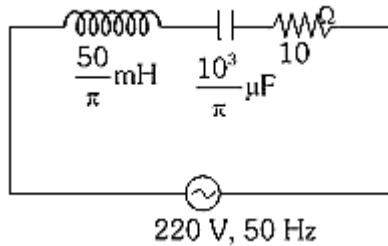
(1) $5\sqrt{5}\,\Omega$ (2) $25\,\Omega$ (3) $10\sqrt{2}\,\Omega$ (4) $15\,\Omega$

Ans: (1)

$Z = \sqrt{R^2 + (X_L - X_C)^2}$

$R = 10\,\Omega$

$X_L = L\omega = \dfrac{50}{\pi} \times 10^{-3} \times 2 \times \pi \times 50 = 5000 \times 10^{-3} = 5\,\Omega$

$X_C = \dfrac{1}{C\omega} = \dfrac{1}{\dfrac{10^3}{\pi} \times 10^{-6} \times 2\pi \times 50} = 10\,\Omega$

$z = \sqrt{100 + (5-10)^2} = \sqrt{100 + 25} = \sqrt{125} = 5\sqrt{5}\,\Omega$

SECTION – A

51. Amongst the following, the total number of species NOT having eight electrons around central atom in its outer most shell, is NH_3, $AlCl_3$, $BeCl_2$, CCl_4, PCl_5 :
    (1) 4   (2) 1   (3) 3   4) 2
    Ans : (3)
    $AlCl_3$, $BeCl_2$, PCl_5.

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

53. 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.
    Reason 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 true but **R** is false.
    (2) **A** is false but **R** is true.
    (3) Both **A** and **R** are true and **R** is the correct explanation of **A**
    (4) Both **A** and **R** are true and **R** is **NOT** the correct explanation of **A**
    Ans **:** (2)

54. The given compound
    HC=CH-CH-CH₂CH₃
                 |
                 X
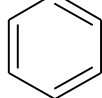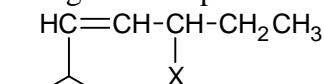
    is an example of
    (1) allylic halide   (2) vinylic halide   (3) benzylic halide   (4) aryl halide
    Ans: (1)

55. The number of σ bonds, π bonds and lone pair of electrons in pyridine, respectively are:
    (1) 11, 3, 1   (2) 12, 2, 1   (3) 11, 2, 0   (3) 12, 3, 0
    Ans : (1)
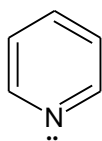
56. The right option for the mass of CO_2 produced by heating 20g of 20 % pure limestone is (Atomic mass of Ca = 40)

$$\left[CaCO_3 \xrightarrow{1200K} CaO + CO_2 \right]$$

(1) 2.64 g   (2) 1.32 g   (3) 1.12 g   (4) 1.76 g

Ans : (4)

$CaCO_3 \xrightarrow{1200K} CaO + CO_2$ 20% of 20g $CaCO_3$ = 4g

100g   44g

4g   1.76g

57. Which one is an example of heterogenous catalysis?

(1) Decomposition of ozone in presence of nitrogen monoxide.

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

(3) Oxidation of sulphur dioxide into sulphur trioxide in the presence of oxides of nitrogen.

(4) Hydrolysis of sugar catalyzed by H^+ ions.

Ans : (2)

$N_2(g) + 3H_2(g) \xrightarrow{Fe} 2NH_3(g)$

58. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**:
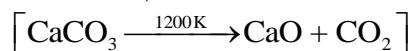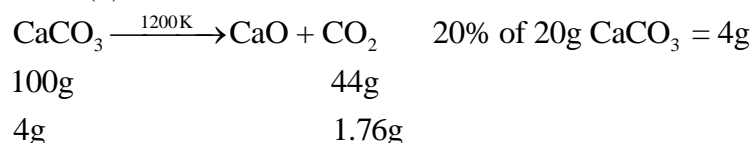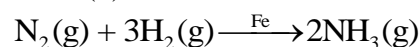
Assertion A: Metallic sodium dissolves in liquid ammonia giving a deep blue solution, which is paramagnetic.

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) **A** is true but **R** is false.

(2) **A** is false but **R** is true.

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

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

Ans : (1)

Deep blue colour of the solution is due to the formation of ammoniated electron

59. Which one of the following statements is correct?

(1) The bone in human body is an inert and unchanging substance.

(2) Mg plays roles in neuromuscular function and interneuronal transmission.

(3) The daily requirement of Mg ad Ca in the human body is estimated to be 0.2 – 0.3 g.

(4) All enzymes that utilise ATP in phosphate transfer require Ca as the cofactor.

Ans : (3)

60. Identify the product in the following reaction :

i) Cu_2Br_2/HBr
ii) Mg/dry ether
iii) H_2O
→ Product

(1)   (2)   (3)   (4)

Ans : (4)

Cu_2Br_2/HBr
Sandmeyer reaction
Mg/dry ether
H_2O
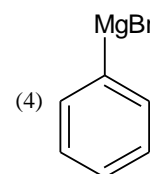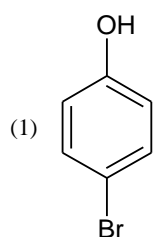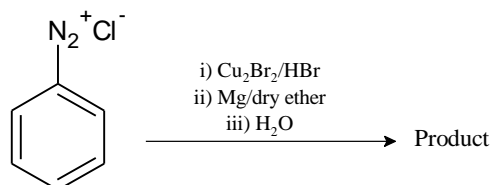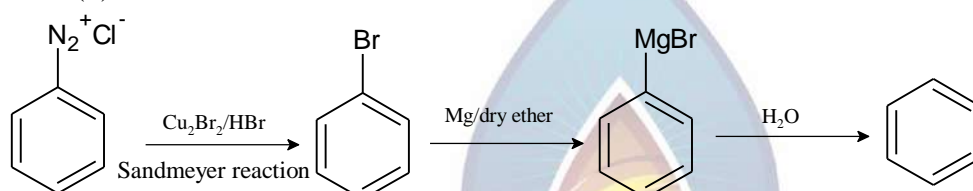
61. For a certain reaction, the rate = $k[A]^2[B]$, when the initial concentration of A is tripled keeping concentration of B constant, the initial rate would
(1) increase by a factor of nine.
(2) increase by a factor of three.
(3) decrease by a factor of nine.
(4) increase by a factor of six.
Ans : (1)

62. 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 atoms of any element.
E. Hydrogen reduces oxides of metals that are more active than iron.
Choose the most appropriate answer from the options given below:
(1) D, E only　　(2) A, B, C only　　(3) B, C, D, E only　　(4) B, D only
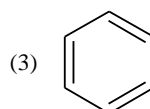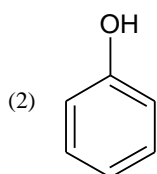Ans : (1)

63. Homoleptic complex from the following complexes is :
(1) Pentamminecarbonatocobalt (III) chloride
(2) Triamminetriaquachromium (III) chloride
(3) Potassium trioxalatoaluminate (III)
(4) Diamminechloridonitrito–N–platinum (II)
Ans : (3)
$K_3[Al(C_2O_4)_3]$ Contains only one type of ligands

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

(1) $[Fe(CN)_5 NOS]^{4-}$　　(2) $[Fe(SCN)]^{2+}$　　　　　　　　(3) $Fe_4[Fe(CN)_6]_3 \cdot xH_2O$　　(4) NaSCN

Ans : (2)

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

Assertion A : In equation $\Delta_r G = -nFE_{cell}$, value of $\Delta_r G$ depends on n.

Reasons R : E_{cell} is an intensive property and $\Delta_r G$ is an extensive property.

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

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

Ans **:** **(4)**

66. Identify product (A) in the following reaction :
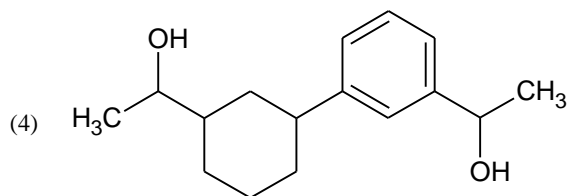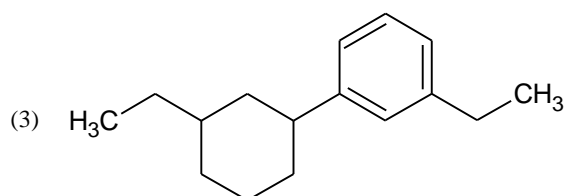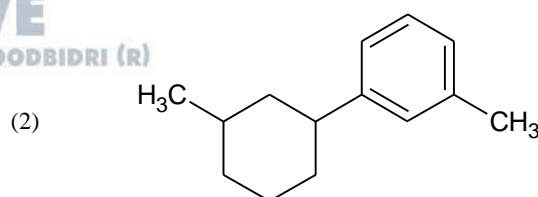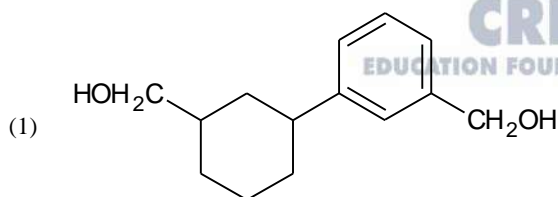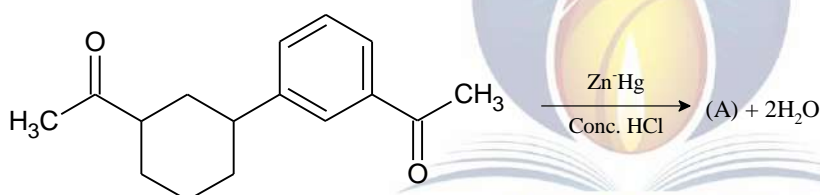
Ans : (3)
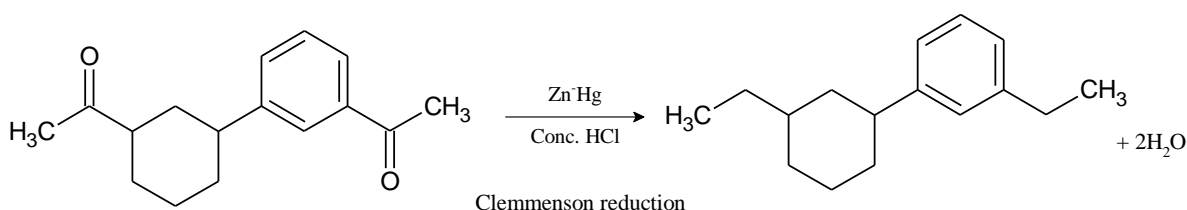
67. The relation between n_m, (n_m = the number of permissible values of magnetic quantum number (m)) for a given value of azimuthal quantum number (l), is

(1) $n_m = 2l^2 + 1$　　　(2) $n_m = l + 2$　　　(3) $l = \dfrac{n_m - 1}{2}$　　　(4) $l = 2n_m + 1$

Ans : (3)

$n_m = 2l + 1$　　$2l = n_m - 1$　　$l = \dfrac{n_m - 1}{2}$

68. The stability of Cu^{2+} is more than Cu^+ salts in aqueous solution due to –
(1) hydration energy.
(2) second ionisation enthalpy.
(3) first ionisation enthalpy.
(4) enthalpy of atomization.
Ans : (1)

69. Match List-I with List-II

	List-I		List-II
A.	Coke	I.	Carbon atoms are sp^3 hybridised
B.	Diamond	II.	Used as a dry lubricant
C.	Fullerene	III.	Used as a reducing agent
D.	Graphite	IV.	Cage like molecules

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

70. 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) 30　　　　(2) 18　　　　(3) 16　　　　(4) 32
Ans: (4)
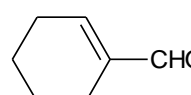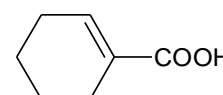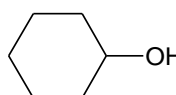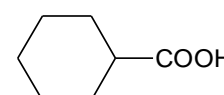
$$CH_3COONa + NaOH \xrightarrow[\text{Decarboxylation}]{\text{CaO, }\Delta} \underset{16\,\text{gmol}^{-1}}{CH_4}$$
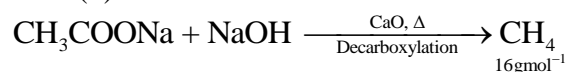
71. Complete the following reaction

[C] is

Ans: (2)

(A)   (A)
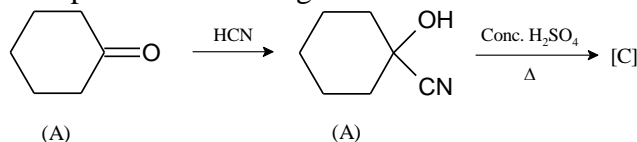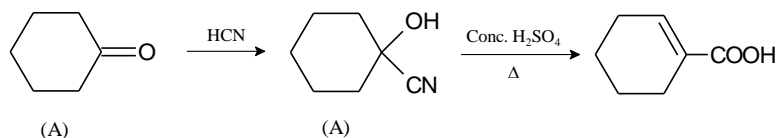
72. Given below are two statements :

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

    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) Statement I is true but Statement II is false.

    (2) Statement I is false but Statement II is true.

    (3) Both Statement I and Statement II are true

    (4) Both Statement I and Statement II are false.

    Ans **:** (3)

73. Which amongst the following options is correct graphical representation of Boyle's Law?
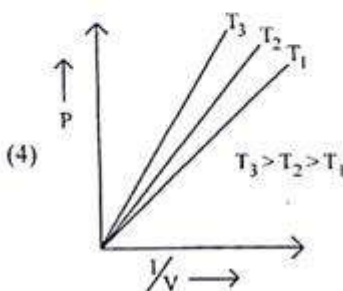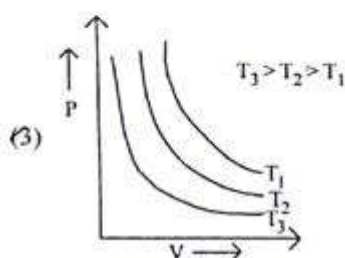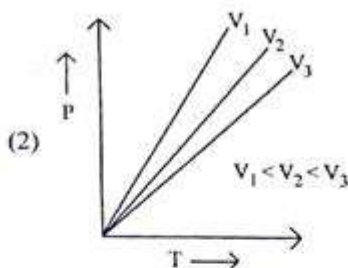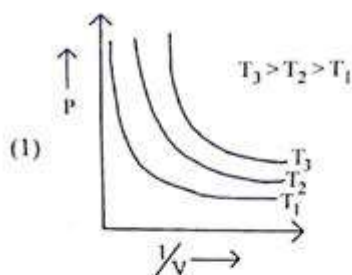
    Ans : (4)

74. A compound is formed by two elements A and B. The element B forms cubic close packed structure and atoms of A occupy 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) 3   (2) 2   (3) 5   (4) 4

    Ans: (3)

No. of B atoms = y   No. of T.V = 2y

$$\text{No. of A atoms} = 2y \times \frac{1}{3}$$

$$A_{2y \times \frac{1}{3}} B_y \Rightarrow A_2 B_3 \Rightarrow x + y = 5$$

75. 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) A, B, C, E are correct   (2) A, C, D, E are correct
    (3) B, C, D, E are correct   (4) A, B, C, D are correct
    Ans : (1)

76. The correct order of energies of molecular orbitals of N_2 molecule, is :
    (1) $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < \sigma^* 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y)$
    (2) $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma 2p_z < \sigma^* 2p_z$
    (3) $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < \sigma 2p_z < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$
    (4) $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$
    Ans : (3)

77. Taking stability as the factor, which one of the following represents correct relationship?
    (1) $AlCl > AlCl_3$ (2) $TlI > TlI_3$ (3) $TlCl_3 > TlCl$ (4) $InI_3 > InI$
    Ans : (2)
    Inert pair effect

78. The conductivity of centimolar solution of KCl at 25^0C is 0.0210 ohm^{-1} cm^{-1} and the resistance of the cell containing the solution at 25^0C is 60 ohm. The value of cell constant is
    (1) 1.26 cm^{-1} (2) 3.34 cm^{-1} (3) 1.34 cm^{-1} (4) 3.28 cm^{-1}
    Ans : (1)
    Cell constant = $\kappa \times R = 0.0210 \times 60 = 1.26$ cm^{-1}

79. Which of the following reactions will NOT give primary amine as the product?
    (1) $CH_3NC \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) LiAlH}_4} Product$ (2) $CH_3CONH_2 \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) LiAlH}_4} Product$
    (3) $CH_3CONH_2 \xrightarrow{Br_2/KOH} Product$ (4) $CH_3CN \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) LiAlH}_4} Product$
    Ans : (1)

$$CH_3NC \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } LiAlH_4} CH_3\underset{2^0\text{-amine}}{NHCH_3}$$
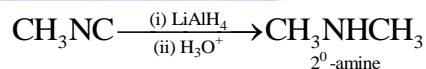
80. The element expected to form largest ion to achieve the nearest noble gas configuration is :
    (1) N   (2) Na   (3) O   (4) F

    Ans: (1)

    Size : $N^{3-} > O^{2-} > F^- > Na^+$

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

    (1) $H_2C=CH-C\equiv CH$

    (2) $H_2C=\underset{\underset{CH_3}{|}}{C}-CH=CH_2$

    (3) $H_2C=CH-CH=CH_2$

    (4) $H_2C=\underset{\underset{Cl}{|}}{C}-CH=CH_2$

    Ans: (4)

    Polymerization of chloroprene gives neoprene polymer.

82. Consider the following reaction and identify the product (P).

    $$H_3C-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{OH}{|}}{CH}-CH_3 \xrightarrow{HBr} \text{Product (P)}$$

    3-methylbutan-2-ol
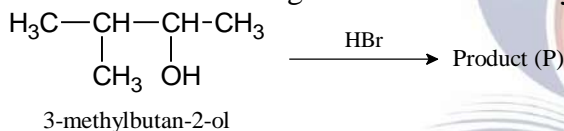
    (1) $H_3C-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{Br}{|}}{CH}-CH_3$

    (2) $H_3C-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2Br$

    (3) $H_3C-\underset{\underset{CH_3}{|}}{\overset{\overset{Br}{|}}{C}}-CH_2CH_3$

    (4) $H_3C-CH=CH-CH_3$

    Ans: (3)

    $$H_3C-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{OH}{|}}{CH}-CH_3 \xrightarrow[-H_2O]{H^+} H_3C-\underset{\underset{CH_3}{|}}{CH}-\overset{+}{CH}CH_3 \xrightarrow{\text{1, 2 - Hydride shift}} H_3C-\underset{\underset{CH_3}{|}}{\overset{+}{C}}-CH_2CH_3$$

    3-methylbutan-2-ol

    $$\downarrow Br^-$$

    $$H_3C-\underset{\underset{CH_3}{|}}{\overset{\overset{Br}{|}}{C}}-CH_2CH_3$$

    2-bromo-2-methylbutane
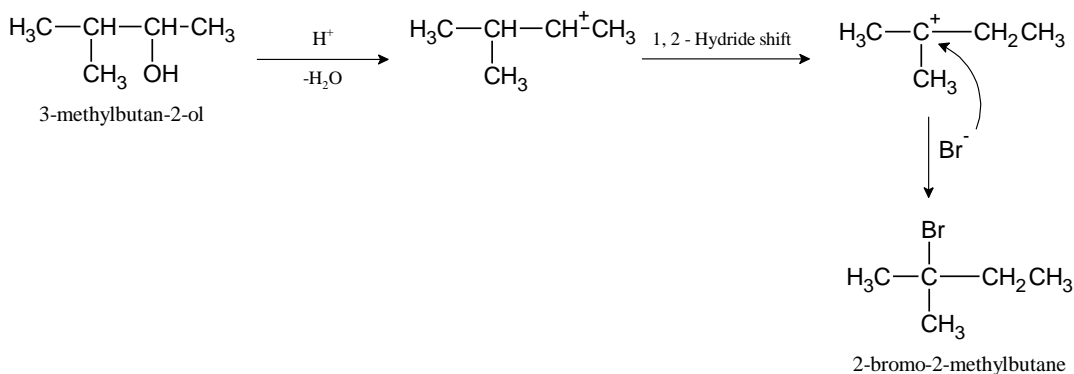
83. Select the correct statement from the following :

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

B. The mass of the electron is $9.10939 \times 10^{-31}\, kg$.

C. All the isotope 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 and E only   (2) B, C and E only   (3) A, B and C only   (4) C, D and E only

Ans : (2)

84. 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) **A** is true but **R** is false.

(2) **A** is false but **R** is true.

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

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

Ans **:** (1)

85. Amongst the given options which of the following ion acts as a Lewis acid?

(1) BF_3 (2) OH^- (3) NH_3 (4) H_2O

Ans: (1)

BF_3 is a electron deficient compound
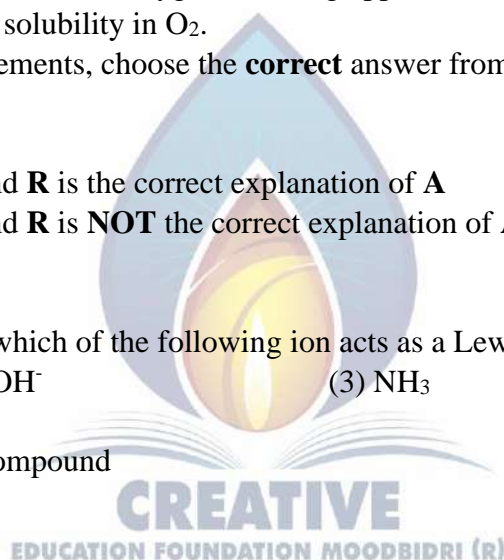
Section – B

86. Match List – I with List – II :

List – I (Oxoacids of Sulphur)   List – II (Bonds)
A. Peroxodisulphuric acid   I. Two S-OH, Four S=O, One S-O-S
B. Sulphuric acid   II. Two S-OH, One S = O
C. Pyrosulphuric acid   III. Two S-OH, Four S = O, One S-O-O-S
D. Sulphurous acid   IV. Two S-OH, Two S = O

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

Ans : (4)

87. Consider the following reaction :

$$\text{Ph-CH}_2\text{-O-Ph} \xrightarrow[\Delta]{HI} A + B$$

Identify product A and B

(1) A = Ph-CH$_2$I and B = Ph-OH   (2) A = Ph-CH$_3$ and B = Ph-I

(3) A = Ph-CH$_3$ and B = Ph-OH   (4) A = Ph-CH$_2$OH and B = Ph-I
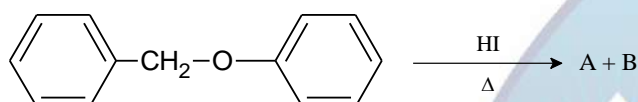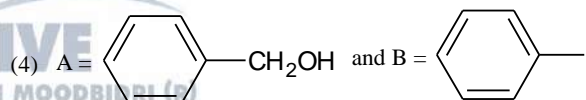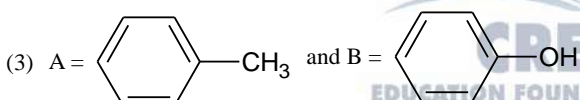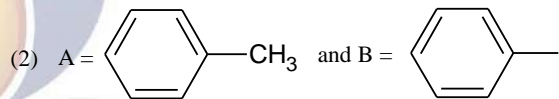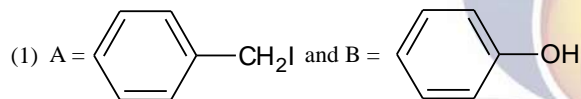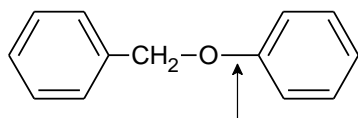
Ans : (1)

partial double bond does not breakes

88. The equilibrium concentrations of the species in the reaction $A + B \rightleftharpoons C + D$ are 2, 3, 10 and 6 mol L^{-1}, respectively at 300 K. ΔG^0 for the reaction is (R = 2 cal / mol K)

(1) – 1381.80 cal   (2) – 13.73 cal   (3) 1372.60 cal   (3) – 137.26 cal

Ans : (1)

$$A + B \rightleftharpoons C + D \quad K = \frac{[C][D]}{[A][B]} = \frac{10 \times 6}{2 \times 3} = 10$$

$$\Delta G^0 = -2.303RT\log K = -2.303 \times 2 \times 300 \times \log 10 = \text{-1381.80 cal}$$

89. Identify the major product obtained in the following reaction
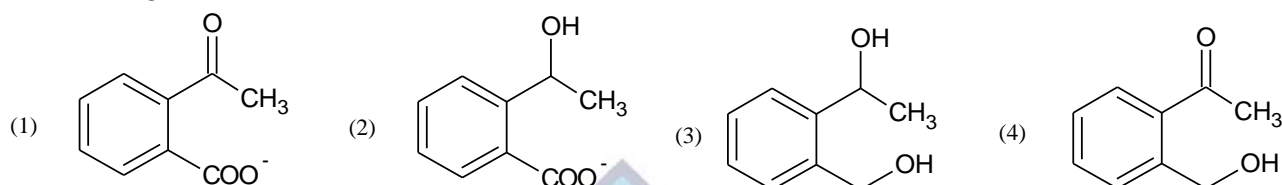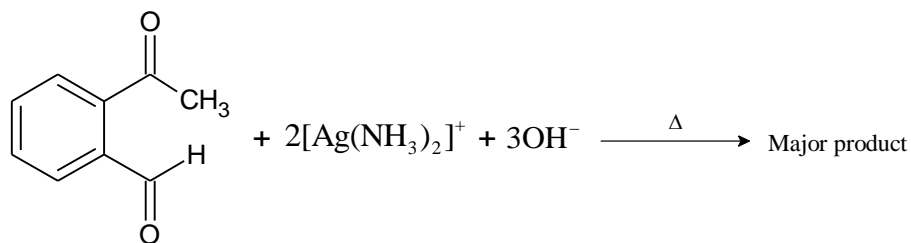
Ans : (1)
Tollens reagent oxidizes aldehyde to carboxylate ion.

90. Pumice stone is an example of –
    (1) solid sol   (2) foam   (3) sol   (4) gel
    Ans : (1)

91. Which amongst the following options is the correct relation between change in enthalpy and change in internal energy?
    (1) $\Delta H - \Delta U = -\Delta nRT$ (2) $\Delta H + \Delta U = \Delta nR$ (3) $\Delta H = \Delta U - \Delta n_g RT$ (4) $\Delta H = \Delta U + \Delta n_g RT$
    Ans : (4)

92. The reaction that does NOT take place in a blast furnace between 900 K and 1500 K temperature range during extraction of iron is :
    (1) $C + CO_2 \rightarrow 2CO$
    (2) $CaO + SiO_2 \rightarrow CaSiO_3$
    (3) $Fe_2O_3 + CO \rightarrow 2FeO + CO_2$
    (4) $FeO + CO \rightarrow Fe + CO_2$
    Ans : (3)

93. Consider the following compounds/species:
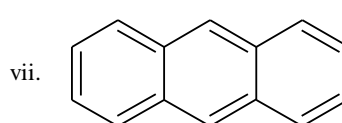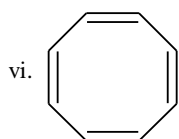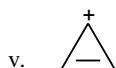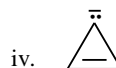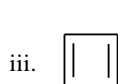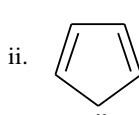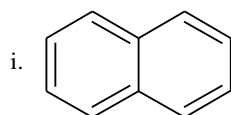
The number of compounds/species which obey Huckle's rule is
    (1) 2   (2) 5   (3) 4   (4) 6

Ans: (3)

94. Which amongst the following will be most readily dehydrated under acidic conditions?

(1) [structure: CH_3-CH(NO_2, H)-CH(OH)-CH_2OH]

(2) [structure: CH_3-CH(NO_2)-CH_2-CH_2-CH(OH)-CH_3]

(3) [structure: CH_3-CH(NO_2)-CH_2-C(OH)(H)-CH_3]

(4) [structure: CH_3-CH(OH,H)-CH_2-CH(OH)-CH_3]
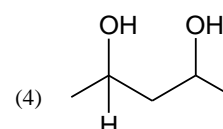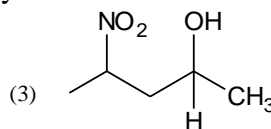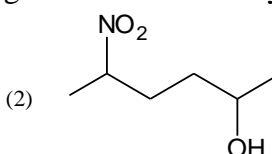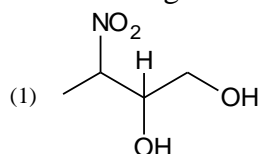
Ans: (4)

95. What fraction of one edge centred octahedral void lies in one unit cell of fcc?

(1) $\dfrac{1}{4}$ (2) $\dfrac{1}{12}$ (3) $\dfrac{1}{2}$ (4) $\dfrac{1}{3}$

Ans : (1)

96. Identify the final product [D] obtained in the following sequence of reactions.

$$H_3C-CHO \xrightarrow[\text{ii) } H_3O^+]{\text{i) LiAlH}_4} [A] \xrightarrow[\Delta]{H_2SO_4} [B] \xrightarrow{HBr} [C] \xrightarrow[\text{Na/dry ether}]{\text{[Br-benzene]}} [D]$$

(1) C_4H_{10} (2) $HC\equiv C^-Na^+$ (3) [ethylbenzene structure]   (4) [biphenyl structure]

Ans: (3)

$$H_3C-CHO \xrightarrow[\text{ii) } H_3O^+]{\text{i) LiAlH}_4} H_3C-CH_2OH \xrightarrow[\Delta]{H_2SO_4} H_2C=CH_2 \xrightarrow{HBr} H_3C-CH_2(Br) \xrightarrow[\text{Na/dry ether}]{\text{[Br-benzene]}} \text{[ethylbenzene]}$$
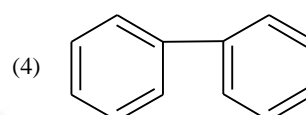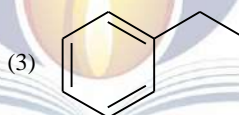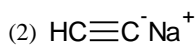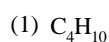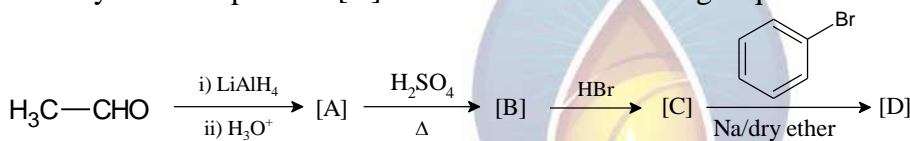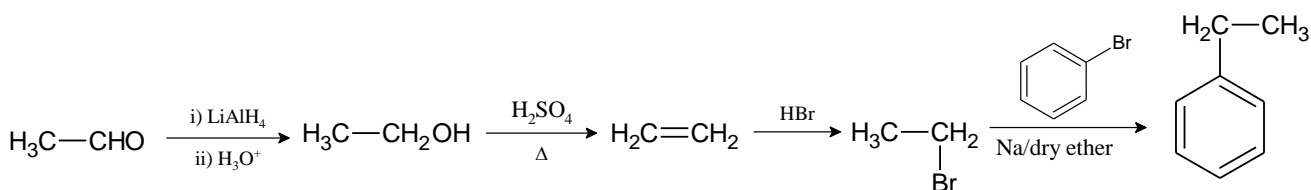
97. Given below are two statements :
     Statement I : The nutrient deficient water bodies lead to eutrophication.
     Statement II : Eutrophication leads to decrease in the level of oxygen in the water bodies.
     In the light of the above statements, choose the **correct** answer from the options given below :
     (1) Statement I is correct but Statement II is false.   (2) Statement I is incorrect but Statement II is true.
     (3) Both statement I and Statement II are true.   (4) Both statement I and Statement II are false.
     Ans : (2)

98. Which of the following statement are INCORRECT ?

A. All the transition metals except scandium from MO oxides which are ionic.

B. The highest oxidation number corresponding to the group number in transition metal oxides is attained in Sc_2O_3 to Mn_2O_7.

C. basic character increases from V_2O_3 to V_2O_4 to V_2O_5.

D. V_2O_4 dissolves in acids to give VO_4^{3-} salts.

E. CrO is basic but Cr_2O_3 is amphoteric.

Choose the correct answer from the options given below.

(1) C and D only   (2) B and C only

(3) A and E only   (3) B and D only

Ans : (1)

99. Which complex compound is most stable?

(1) $\left[CoCl_2(en)_2\right]NO_3$ (2) $\left[Co(NH_3)_6\right]_2(SO_4)_3$

(3) $\left[Co(NH_3)_4(H_2O)Br\right](NO_3)_2$ (4) $\left[Co(NH_3)_3(NO_3)_3\right]$

Ans: (1)

100. On balancing the given redox reaction,

$$a\,Cr_2O_7^{2-} + b\,SO_3^{2-}(aq) + c\,H^+(aq) \longrightarrow 2a\,Cr^{3+}(aq) + b\,SO_4^{2-}(aq) + \frac{c}{2}H_2O(\ell)$$
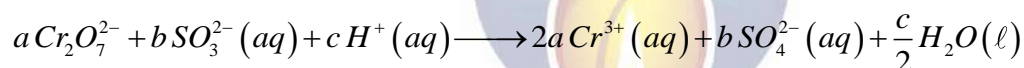
the coefficients a, b, and c are found to be respectively –

(1) 1, 8, 3   (2) 8, 1, 3   (3) 1, 3, 8   (4) 3, 8, 1

Ans : (3)

SECTION- A

101. What is the role of RNA polymerase III in the process of transcription in Eukaryotes?
    1) Transcription of precursor of mRNA
    2) Transcription of only snRNAs
    3) Transcription of rRNAs (28S, 18S and 5.8S)
    4) Transcription of tRNA, 5 srRNA and snRNA

    Ans: (4) Pg - II PU-111

102. Family Fabaceae differs from Solanaceae or Liliaceae.
    1) Monoadelphous and Monothecous anthers
    2) Epiphyllous and Dithecous anthers
    3) Diadelphous and Dithecous anthers
    4) Polyadelphous and epipetalous stamens

    Ans: (3) Pg - I PU-81/79

103. In the equation

    GPP -R = NPP

    GPP is Gross Primary Productivity

    NPP is Net Primary Productivity

    R here is _____.

    1) Respiratory loss
    2) Reproductive allocation
    3) Photosynthetically active radiation
    4) Respiratory quotient

    Ans: (1) Pg - II PU-243

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

    Ans: (4) P.g - I PU-249

105. Axile placentation is observed in
    1) Tomato, Dianthus and Pea
    2) China rose, Petunia and Lemon
    3) Mustard, Cucumber and Primrose
    4) China rose, Beans and Lupin
    Ans: (2) Pg - I PU-75

106. Among eukaryotes, replication of DNA takes place in
     1) G_1 phase   2) G_2 phase   3) M phase   4) S phase

     Ans: (4) Pg - I PU-163

107. How many ATP and $NADPH_2$ are required for the synthesis of one molecule of Glucose during Calvin cycle?
     1) 12 ATP and 16 $NADPH_2$ 2) 18 ATP and 16 $NADPH_2$
     3) 12 ATP and 12 $NADPH_2$ 4) 18 ATP and 12 $NADPH_2$

     Ans: (4) Pg - I PU-218

108. Given below are two statements : One is labelled as Assertion A and the other is 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 the options given below :
     1) A is correct but R is not correct.
     2) A is not correct but R is correct.
     3) Both A an R are correct but R is the correct explanation of A.
     4) Both A and R are correct but R is Not the correct explanation of A.

     Ans: (3) Pg - I PU-36

109. Movement and accumulation of ions across a membrane against their concentration gradient can be explained by
     1) Passive Transport
     2) Active Transport
     3) Osmosis
     4) Facilitated Diffusion

     Ans: (2) Pg - I PU-178

110. Unequivocal proof that DNA is the genetic material was first proposed by
     1) Avery, Macleoid and McCarthy
     2) Wilkins and Franklin
     3) Frederick Griffith
     4) Alfred Hershey and Martha Chase

     Ans: (4) Pg - II PU-101

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

     Ans: (1) Pg - I PU-169

112. 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 – 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 true but R is false
2) A is false but R is true.
3) Both A and R are true and R is the correct explanation of A.
4) Both A and R are true but R is NOT the correct explanation of A.

Ans: (3) Pg - I PU-229

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

Ans: (3) Pg - II PU-30

114. The historic Convention on Biological Diversity. "The Earth Summit' was held in Rio de Janeiro in the year :
1) 1986   2) 2002   3) 1985   4) 1992

Ans: (4) Pg. II PU-267

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

Ans: (3) Pg - II PU-282

116. In tissue culture experiments, leaf mesophyll cells are put in a culture medium to form callus. This phenomenon may be called as :
1) Development   2) Senescene
3) Differentiation   4) Dedifferentiation

Ans: (4) Pg - I PU-245

117. 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.
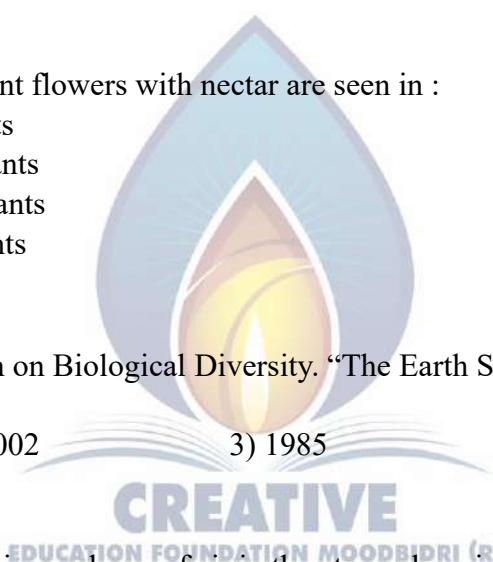
In the light of the above statements, choose the correct answer from the options given below :

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

Ans: (2) Pg - I PU-91

118. What is the function of tassels in the corn cob?
    1) To disperse pollen grains
    2) To protect seeds
    3) To attract insects
    4) To trap pollen grains

    Ans: (4) Pg - II PU-29

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

    Ans: (4) Pg - I PU-168

120. Identify he pair of heterosporous pteridophytes among the following :
    1) *Psilotum* and *Salvinia*
    2) *Equisetum* and *Salvinia*
    3) *Lycopodium* and *Selaginella*
    4) *Selaginella* and *Salvinia*

    Ans: (4) Pg - I PU-38

121. The reaction centre in PS II has an absorption maxima at
    1) 600 nm   2) 780 nm   3) 680 nm   4) 700nm

    Ans: (3) Pg - I PU-211

122. In angiosperm, the haploid, diploid and triploid structures of a fertilized embryo sae sequentially are :
    1) Synergids, Zygote an Primary endosperm nucleus
    2) Synergids, antipodals and Polar nuclei
    3) Synergids, primary endosperm nucleus and zygote.
    4) Antipoldals, synergids, and primary endosperm nucleus.

    Ans: (1) Pg. II PU-27

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123. Given below are two statements : One is labelled as Assertion 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)   A is true but R is false.
   2)   A is false but R is true
   3)   Both A and R are true and R is the correct explanation of A
   4)   Both A and R are true but R is NOT the correct explanation of A.

   Ans: (3) Pg - I PU-96

124. The phenomenon of pleiotropism refers to
   1)   A single gene affecting multiple phenotypic expression.
   2)   More than two genes affecting a single character.
   3)   Presence of several alleles of a single gene controlling a single crossover.
   4)   Presence of two alleles, each of the two genes controlling a single trait.

   Ans: (1) Pg - II PU-85

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

   Ans: (1) Pg - I PU-148

126. 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)   Alfred Sturtevant   2) Henking
   3)   Thomas Hunt Morgan   4) Sutton and Boveri

   Ans: (1) Pn - II PU-83

127. Given below are two statements :

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

   Statement II : Transpiration cools leaf surfaces sometimes 10 to 15 degrees, by evaporative cooling.

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

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

4) Both Statement I and statement II are incorrect.

Ans: (3) Pn - II PU-188/189

128. Upon exposure to UV radiation, DNA stained with ethidium bromide will show
    1) Bright yellow colour　　　　　　2) Bright orange colour
    3) Bright red colour　　　　　　　　4) Bright blue colour

    Ans: (2) Pg - II PU-198

129. Which micronutrient is required for splitting of water molecule during photosynthesis?
    1) Magnesium　　　2) copper　　　　3) manganese　　　4) molybdenum

    Ans: (3) Pg - I PU-198

130. Which hormone promotes internode /petiole elongation in deep water rice?
    1) Ethylene　　　2) 2, 4-D　　　　3) GA_3　　　4) Kinetin

    Ans: (1) Pg - I PU-250

131. Identify the correct statements :
    A) Detrivores perform fragmentation.
    B) The humus is further degraded by some microbes during mineralization.
    C) Water soluble inorganic nutrients go down into the soil and get participated by a process called leaching.
    D) The detritus food chain begins with living organisms.
    E) Earthworms break down detritus into smaller particles by a process called catabolism.
    Choose the correct answer from the options given below:
    1) C, D, E only　　　　　　　2) D, E, A only
    3) A, B, C only　　　　　　　4) B, C, D only

    Ans: (3) Pn - II PU-243

132. In gene gun method used to introduce alien DNA into host cells, microparticles of _____ metal are used.
    1) Tungsten or gold　　　　　2) Silver
    3) Copper　　　　　　　　　　4) Zinc

    Ans: (1) Pg - II PU-201

133. During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates our
    1) Histones　　　2) Polysaccharides　　3) RNA　　　4) DNA

    Ans: (4) Pg - II PU-201

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

    Ans: (3) Pg - II PU-264

135. Expressed Sequence Tags (ESTs) refers to
    1) All genes whether expressed or unexpressed.
    2) Certain important expressed genes.
    3) All genes that are expressed as RNA
    4) All genes that are expressed as proteins.

    Ans: (3) Pn - II PU-119
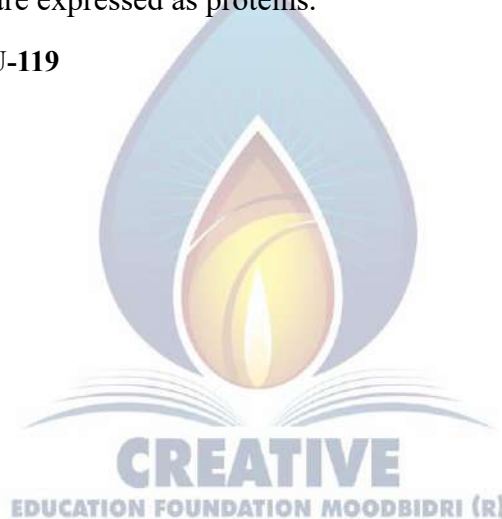
SECTION- B

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

Assertion A : In gymnosperms the pollen grains are released from the microsporangium and carried by air currents.

Reason R : Air currents carry the pollen grains to the mouth of the archegonia where the male gametes are discharged and pollen tube is not formed.

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

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

Ans: (1) Pg - I PU-39

137. Identify the correct statements :

A) Lenticels are the lens-shaped openings permitting the exchange of gases.
B) Bark formed early in the season is called hard bark.
C) Bark is a technical term that refers to all tissues exterior to vascular cambium.
D) Bark refers to periderm and secondary phloem.
E) Phellogen is single – layered in thickness.

Choose the correct answer from the options given below :

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

Ans: (4) Pg - I PU-96/97

138. Match List I with List II :

List I	List II
A) Oxidative Decarboxylation	I. Citrate synthase
B) Glycolysis	II. Pyruvate Dehydrogenase
C) Oxidative Phosphorylation	III. Electron transport system
D) Tricarboxylic Acid cycle	IV. EMP pathway

Choose the correct answer from the options given below :

1) A- III, B-I, C-II, D-IV
2) A-II, B-IV, C-III, D-I
3) A-III, B-IV, C-II, D-I
4) A-II, B-IV, C-I, D-III

Ans: (2) Pg - I PU-228/232

139. How many different proteins does the ribosome consist of ?
    1) 40   2) 20   3) 80   4) 60

    Ans: (3) Pg - II PU-115

140. Given below are two statements :
    Statement I : Gause's 'Competitive Exclusion Principle' states that two closely related species competing for the same resources cannot co-exist indefinitely and competitively inferior one will be eliminated eventually.
    Statement II : In general, carnivores are more adversely affected by competition than herbivores.
    In the light of the above statements, choose the correct answer from the options given below :
    1) Statement I is correct but Statement II is false.
    2) Statement I is incorrect but Statement II is true.
    3) Both Statement I and Statement II are true.
    4) Both Statement I and Statement II are false.

    Ans: (1) Pg - II PU-235

141. Match List I with List II
    List I   List II
    A) Cohesion   I. More attraction in Liquid phase
    B) Adhesion   II Mutual attraction Among water molecules
    C) Surface tension   III Water loss in liquid phase
    D) Guttation   IV Attraction towards polar Surfaces

    Choose the correct answer from the options given below:

    1) A-III, B-I, C-IV, D-II
    2) A-II, B-I, C-IV, D-III
    3) A-II, B-IV, C-I, D-III
    4) A-IV, B-III, C-II, D-I

    Ans: (3) Pg - I PU-188

142. Which one of the following statements is NOT correct ?
    1) Water hyacinth grows abundantly in eutrophic water bodies and leads to an imbalance in the ecosystem dynamics of the water body.
    2) The amount of some toxic substances of industrial waste water increases in the organisms at successive trophic levels.
    3) The micro-organisms involved in biodegradation of organic matter in a sewage polluted water body consume a lot of oxygen causing the death of aquatic organisms.
    4) Algal blooms caused by excess of organic matter in water improve water quality and promote fisheries.

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Ans: (4) Pg - II PU-275-277

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

Assertion A : A flower is defined as modified shoot wherein the shoot apical meristem changes to floral meristem.

Reason R : Internode of the shoot gets condensed to produce different floral appendages laterally at successive nodes instead of leaves.

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

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

Ans: (3) Pg - I PU-71

144. Melonate inhibits the growth of pathogenic bacteria by inhibiting the activity of
1) Lipase   2) Denitrogenase
3) Succinic dehydrogenase   4) Amylase

Ans: (3) Pg - I PU-158

145. Match List I and List II

List I   List II

A) M phase   I. Proteins are Synthesized
B) G_2 Phase   II. Inactive phase
C) Quiescent Stage   III. Interval between mitosis and Initiation of DNA replication
D) G_1 Phase   IV. Equational division

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

Ans: (1) Pg - I PU-163/164

146. Which of the following combinations is required for chemiosmosis?
1) Proton pump, electron gradient, ATP synthase
2) Proton pump, electron gradient, NADP synthase
3) Membrane, proton pump, proton gradient, ATP synthase
4) Membrane, proton pump, proton gradient, NADP synthase

Ans: (3) Pg - I PU-215

147. Main steps in the formation of Recombinant DNA are given below. Arrange these steps in a correct sequence.
    A) Insertion of recombinant DNA into the host cell.
    B) Cutting of DNA at specific location by restriction enzyme.
    C) Isolation of desired DNA fragment.
    D) Amplification of gene of interest using PCR.
       Choose the correct answer from the options given below :
    1) C, B, D, A   2) B, D, A, C
    3) B, C, D, A   4) C, A, B, D

    Ans: (1) Pg - II PU-201/203

148. Which of the following statements are correct about Klinefelter's Syndrome?
    A) This disorder was first described by Langdon Down (1866)
    B) Such an individual has overall masculine development. However, the feminine development is also expressed.
    C) The affected individual is short statured.
    D) Physical, psychomotor and mental development is retarded.
    E) Such individuals are sterile.
       Choose the correct answer from the options given below :
    1) B and E only   2) A and E only
    3) A and B only   4) C and D only

    Ans: (1) Pg - II PU-92

149. Match List I with List II :
List I	List II
A. Iron	I. Synthesis of auxin
B. Zinc	II. Component of nitrate reductase
C. Boron	III. Activator of catalase
D. Molybdenum	IV. Cell elongation and differentiation

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

    Ans: (1) Pg - I PU-197/198

150. Match List I with List II :
List I	List II
(Interaction)	(Species A and B)
A. Mutualism	I. +(A), O(B)
B. Commensalism	II. –(A), O(B)

C. Amensalism   III. +(A), -(B)
D. Parasitism   IV. +(A), +(B)

Choose the correct answer from the options given below :

1) A-IV, B-III, C-I, D-II
2) A-III, B-I, C-IV, D-II
3) A-IV, B-II, C-I, D-III
4) A-IV, B-I, C-II, D-III

Ans: (4) Pg - II PU-232

SECTION-A

151. Once the undigested and unabsorbed substances enter the caecum, their backflow is prevented by-
    (1) Gastro- oesophageal sphincter
    (2) Pyloric sphincter
    (3) Sphincter of Oddi
    (4) Ileo- caecal valve

    Ans: (4) Pg - I PU-264

152. Match List I with List II

List I	List II
A. Heroin	I. Effect on cardiovascular system'
B. Marijuana	II. Slow down body function
C. Cocaine	III. Painkiller
D. Morphine	IV. Interfere with transport of dopamine

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

    Ans: (3) Pg - II PU-158/159

153. Which of the following functions is carried out by cytoskeleton in a cell?
    (1) Motility   (2) Transportation   (3) Nuclear division   (4) Protein synthesis
    Ans: (1) Pg - I PU-136

154. Given below are two statements: one is labelled as Assertion A and the 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) A is true but R is false
    (2) A is false but R is true
    (3) Both A and R are true and R is the correct explanation of A
    (4) Both A and R are true and R is NOT the correct explanation of A

    Ans: (2) Pg - II PU-58

155. 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) Statement I is correct but statement II is false
    (2) Statement I is incorrect but statement II is true

(3) Both statement I and statement II are true

(4) Both statement I and statement II are false

   Ans: (3) Pg - II PU-43

156. Match List I with List II

   List I   List II
   A. P-wave   I. Beginning of systole
   B. Q- wave   II. Repolarisation of ventricles
   C. QRS complex   III Depolarisation of atria
   D. T-wave   IV. Depolarisation of ventricles
      Choose the correct answer from the options given below:
   (1) A-II, B-IV, C-I, D-III   (2) A-I, B-II, C-III, D- II
   (3) A-III, B-I, C-IV, D-II   (3) A-IV, B-III, C-II, D- I

   Ans: (3) Pg - I PU-286

157. Given below are two statements:

   Statement i: A protein is imagined as a line, the left end represented by first amino acid (C-terminal) and the right end represented by last amino acid (N- terminal)

   Statement II: Adult human haemoglobin, consists of 4 subunits (two subunits of α type and two subunit of β type)

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

   (1) Statement I is true but statement II is false

   (2) Statement I is false but statement II is true

   (3) Both statement I and statement II are true

   (4) Both statement I and statement II are false

   Ans: (2) Pg - I PU-150

158. Match the List I with List II

   List I   List II
   A. Ringworm   I. *Haemophilus influenzae*
   B. Filariasis   II. *Trichophyton*
   C. Malaria   III. *Wuchereria bancrofti*
   D. Pneumonia   IV. *Plasmodium vivax*
      Choose the correct answer from the options given below:
   (1) A-III, B-II, C-I, D-IV   (2) A-III, B-II, C- IV, D-I
   (3) A-II, B-III, C-IV, D-I   (4) A-II, B-III, C- IV, D-I

   Ans: (3) Pg - II PU-147/149

159. Vital capacity of lung is ____

   (1) Irv+ERv+TV-RV   (2) IRV+ERV+TV
   (3) IRV+ERV   (4) IRV+ERV+TV+RV

Ans: (2) Pg - I PU-271/272

160. Which of the following statements are correct regarding female reproductive cycle?
    A. In non-primate mammals cyclical changes during reproduction are called oestrus cycle
    B. First menstrual cycle begins at puberty and is called menopause
    C. Lack of menstruation may be indicative of pregnancy
    D. Cyclic menstruation extends between menarche and menopause
    Choose the most appropriate answer from the options given below:
    (1) A, B and C only   (2) A, C and D only\
    (3) A and D only   (4) A and B only

Ans: (2) Pg - II PU-09

161. Match List I with List II
    List I   List II
    (cells)   (Secretion)
    A. Peptic cells   I. Mucus
    B. Goblet cells   II. Bile juice
    C. Oxyntic cells   III. Proenzyme pepsinogen
    D. Hepatic cells   IV. HCl and intrinsic factor for absorption of vitamin B_{12}
    Choose the correct answer from the options given below:
    (1) A-III, B-I, C- IV, D-II   (2) A- II, B-IV, C-I, D-III
    (2) A-IV, B-III, C-II, D- I   (4) A-II, B-I, C-III, D-IV

Ans: (1) Pg -I PU-262

162. Match List I with List II
    List I   List II
    A. Vasectomy   I. Oral method
    B. Coitus interruptus   II. Barrier method'
    C. Cervical caps   III. Surgical method
    D. Saheli   IV. Natural method

    Choose the correct option from the option given below

    (1) A – II, B – III, C – I , D – IV   (2) A – IV, B – II, C – I, D – III
    (3) A – III, B – I, C – IV, D – II   (4) A – III, B – IV, C – II, D – I

Ans: (4) Pg - II PU-61/62

163. Match List I with List II
    List-I   List-II
    A. *Taenia*   I. Nephridia
    B. *Paramecium*   II. Contractile vacuole
    C. *Periplaneta*   III. Flame cells

D. *Pheritima*   IV. Urecose gland

   Choose the correct answer from the options give below:

(1) A-III, B-II, C-IV, D-I   (2) A-II, B-I, C-IV, D-III

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

Ans: (1) Pg - I PU-51/52/53/21

164. Which one of the following symbols represents mating between relatively in human pedigree analysis?
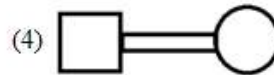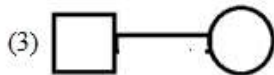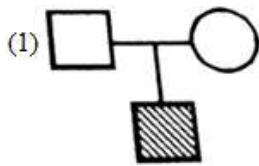
Ans: (4) Pg - II PU-88

165. Which of the following statements is correct?
    (1) Presence of large amount of nutrients in water restricts 'Algal Bloom'
    (2) Algal Bloom decreases fish mortality
    (3) Eutrophication refers to increase in domestic sewage and waste water in lakes
    (4) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.

Ans: (4) Pg - II PU-275/276/277

166. Which of the following are NOT considered as the part of endomembrane system?
    A. Mitochondria   B. Endoplasmic Reticulum
    C. Chloroplasts   D. Golgi complex
    E. Peroxisomes
       Choose the most appropriate answer from the options given below:
    (1) A and D only   (2) A, D and E only
    (3) B and D only   (4) A, C and E only

Ans: (4) Pg - I PU-132/133

167. Select the correct group/ set of Australian Marsupials exhibiting adaptive radiation.
    (1) Mole, Flying squirrel, Tasmanian tiger cat
    (2) Lemur, Anteater, Wolf
    (3) Tasmania wolf, Bobcat, Marsupial mole
    (4) Numbat, spotted cuscus, Flying phalanger

Ans: (4) Pg - II PU-134

168. 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) Statement I is correct but statement II is false

(2) Statement I incorrect but statement II is true

(3) Both statement I and Statement II are true

(4) Both statement I and statement II are false

Ans: (2) Pg - II PU-99

169. Given below are two statements:

Statement I: Electrostatic precipitator is most widely used in thermal power plant.

Statement II: Electrostatic precipitator in thermal power plant removes ionizing radiations

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

(1) Statement I is correct but statement II is incorrect

(2) Statement I is incorrect but statement II is correct

(3) Both statement I and statement II are correct

(4) Both statement I and statement II are incorrect

Ans: (1) Pg - II PU-271

170. Match List I with list II

List I	List II
A. CCK	I. Kidney
B. GIP	II. Heart
C. ANF	III. Gastric gland
D. ADH	IV. Pancreas

Choose the correct answer from the options given below:

(1) A-II, B-IV, C-I, D-III   (2) A-IV, B-II, C-III, D_ I

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

Ans: (3) Pg - I PU-339

171. Given below are 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 form the options given below:

(1) A is true but R is false

(2) A is false but R is true

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

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

Ans: (1) Pg - I PU-293

172. In which blood corpuscles, the HIV undergoes replication and produces progeny viruses?

(1) Basophils　　　　(2) Eosinophils　　　　　　(3) T_H cells　　(4) B-lymphocytes

Ans: (3) Pg - II PU-156

173. 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) A is true but R is false

(2) A is false but R is true

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

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

Ans: (3) Pg - II PU-51

174. Given below are two statements:

Statements 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) Statement I is true but statement II is false

(2) Statement I false but statement II is true

(3) Both statement I are statement II are true

(4) Both statement I and statement II are false

Ans: (3) Pg - II PU-103

175. Match List I with List II with respect to human eye.

List I	List II
A. Fovea	I. Visible coloured portion of eye that regulates diameter of Pupil

B. Iris   II. External layer of eye formed of dense connective tissue.
C. Blind spot   III. Point of greatest visual acuity or resolution
D. Sclera   IV. Point where optic nerve leaves the eyeball and
                    photoreceptor cells are absent
Choose the correct answer from the options given below:
(1) A-I, B-IV, C-III, D- II   (2) A-II, B-I, C-III, D-IV
(2) A-III, B-I, C-IV, D-II   (4) A-IV, B-III, C-II, D- I

Ans: (3) Pg - I PU-324

176. Given below are two statements:
    Statement I: Ligaments are dense irregular tissue
    Statement II: Cartilage is dense regular tissue.
    In the light of the above statements, choose the correct answer from the options given
    below:
    (1) Statement I is true but statement II is false
    (2) Statement I is false but statement II is true
    (3) Both statement I and statement II are true
    (4) Both statement I and statement II are false

    Ans: (4) Pg - I PU-103/104

177. Match list I with List II
    List I   List II
    A. Gene 'a'   I. β - galactosidase
    B. Gene 'y'   II. Transacetylase
    C. Gene 'i'   III. Permease
    D. Gene 'z'   IV. Repressor protein
        Choose the correct answer from the options given below:
    (1) A-III, B-IV, C-I, D-II   (2) A-III, B- I, C- IV, D-II
    (3) A-II, B- I, C- IV, D- III   (4) A-II, B- III, C- IV, D- I

    Ans: (4) Pg - II PU-117

178. Given below are two statements:
    Statement I: Low temperature preserves the enzyme in a temporarily inactive state
    whereas high temperature destroys enzymatic activity because proteins are denatured
    by heat.
    Statement II: when the inhibitor closely resembles the substrate in its molecular
    structure and inhibits the activity of the enzyme, it is known as competitive inhibitor.
    In the light of the above statements, choose the correct answer from the options given
    below:
    (1) statement I is true but statement II is false
    (2) statement I is false but statement II is true
    (3) Both statement I and statement II are true

(4) Both statement I and statement II are false

Ans: (3) Pg - I PU-157/158

179. Match the list I with List II

List I	List II
(Type of Joint)	(Found between)
A. Cartilaginous Joint	I. Between flat skull bones
B. Ball and Socket Joint	II. Between adjacent vertebrae in vertebral column
C. Fibrous Joint	III. Between carpal and metacarpal of thumb
D. Saddle Joint	IV. Between Humerus and Pectoral girdle

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

Ans: (4) Pg - I PU-312

180. Match List I with List II

List I	List II
(Interacting species)	(Name of Interaction)
A. A Leopard and a Lion in a forest/ grassland	I. Competition
B. A Cuckoo laying egg in a Crow's nest	II. Brood parasitism
C. Fungi and root of a higher plant	III. Mutualism
D. A cattle egret and a Cattle in a field	IV. Commensalism in Mycorrhizae

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

Ans: (3) Pg - II PU-234-237

181. Which of the following is not a cloning vector ?
(1) pBR322   (2) Probe   (3) BAC   (4) YAC

Ans: (2) Pg II PU-198/199

182. broad palm with single palm crease is visible in a person suffering from –
(1) Klinefelter's syndrome   (2) Thalassemia
(3) Down's syndrome   (4) Turner's syndrome

Ans: (3) Pg - II PU-92

183. Which one of the following techniques does not serve the purpose of early diagnosis of a disease for its early treatment?
(1) Polymerase Chain Reaction (PCR) technique
(2) Enzyme Linked Immuno-Sorbent Assay (ELISA) technique

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(3) Recombinant DNA Technology
(4) Serum and Urine analysis

Ans: (4) Pg - II PU-212

184. Radial symmetry is NOT found in adults of phylum____
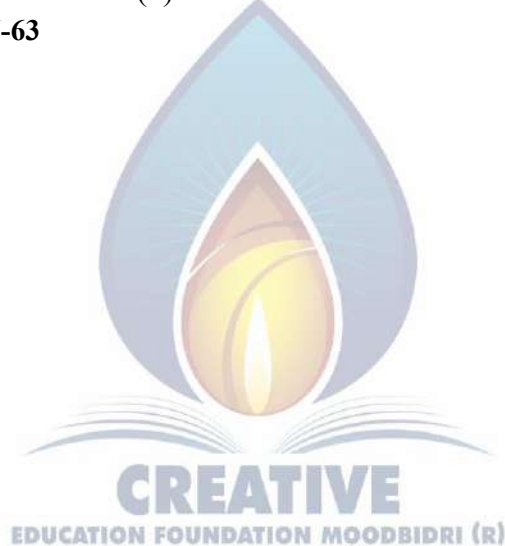   (1) Coelenterata   (2) Enchinodermata   (3) Ctenophora   (4) Hemichordata

   Ans: (4) Pg - I PU-54

185. Which one of the following common sexually transmitted diseases is completely curable when detected early and treated properly?
    (1) Hepatitis-B   (2) HIV Infection
    (3) Genital herpes   (4) Gonorrhoea
   Ans: (4) Pg - II PU-63

186. In cockroach, excretion is brought about by –
   A. Phallic gland   B. Urecose gland   C. Nephrocytes
   D. Fat body   E. Collaterial glands
   Choose the correct answer from the options given below:
   (1) B, C and D only   (2) B and D only
   (3) A and E only   (4) A, B and E only

   Ans : (1) Pg - I PU-114

187. Match **List I** with **List II.**

List I	List II
A. Mast cells	I. Ciliated epithelium
B. Inner surface of bronchiole	II. Areolar connective tissue
C. Blood	III. Cuboidal epithelium
D. Tubular parts of nephron	IV. Specialised connective tissue

   Choose the correct answer from the options given below :
   (1) A-II, B-I, C-IV, D-III   (2) A-III, B-IV, C-II, D-I
   (3) A-I, B-II, C-IV, D-III   (4) A-II, B-III, C-I, D-IV
   Ans : (1) Pg - I PU-101/103

188. Match **List I** with **List II**

List I	List II
A. Logistic growth	I. Unlimited resource availability condition
B. Exponential growth	II. Limited resource availability condition
C. Expanding age pyramid	III. The percent individuals of pre-reproductive age is largest followed by reproductive and post reproductive age groups.
D. Stable age pyramid	IV. The percent individuals of pre-reproductive age groups are Same

   Choose the correct answer from the options given below :
   (1) A-II, B-IV, C-I, D-III   (2) A-II, B-IV, C-III, D-I
   (3) A-II, B-I, C-III, D-IV   (4) A-II, B-III, C-I, D-IV
   Ans : (3) Pg - II PU-230/231

189. Which of the following are NOT under the control of thyroid hormone? \
   A. Maintenance of water an electrolyte balance.
   B. Regulations of basal metabolic rate.
   C. Normal rhythm of sleep wake cycle.
   D. Development of immune system
   E. Support the process of R.B.Cs formation
   Choose the correct answer from the option given below
   1) C and D only   2) D and E only   3) A and D only   4) B and C only
   Ans: (1) Pg - I PU-334/335

190. Which of the following statements are correct regarding skeletal muscles

A. Muscle bundles are held together by collagenous connective tissue layer called fascicle.

B. Sarcoplasmic reticulum of muscle fibre is a store house of calcium ions

C. Striated appearance of skeletal muscle fibre is due to distribution pattern of actin and myosin proteins.

D. M line is considered as functional unit of contraction called sarcomere.

Choose the most appropriate answer from the options given below :

1) A, C and D only
2) C and D only
3) A, B and C only
4) B and C only

Ans: (4) Pg - I PU-304

191. Select the correct statement 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 gillslits.
   D) Presence of dorsal heart
   E) Triploblastic pseudocoelomate animals.

   Choose the correct answer from the options given below:

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

   Ans: (4) Pg - I PU-54/55

192. The unique mammalian characteristics are :

   1) hairs, pinna and indirect development.
   2) pinna, monocondylic skull and mammary glands
   3) hairs, tympanic membrane and mammary glands
   4) hairs, pinna and mammary glands

   Ans: (4) Pg - I PU-60

193. Select the correct statement.

   A) Tetrad formation is seen during Leptotene.
   B) During Anaphase the centromeres split and chromatids separate.
   C) Nucleous, Golgi complex and ER are reformed during Telophase.
   E) Crossing over takes place between sister chromatids of homologous chromosome.

   Choose the correct answer from the options given below:

   1) A, C and E only
   2) B and E only
   3) A and C only

4) B and D only

Ans: (4) Pg - I PU-168

194. Given below are two statements .

Statement I : During G_0 phase of cell cycle, the cell is metabolically inactive.

Statement II : The centrosome undergoes duplication during S phase of interphase.
In the light of the above statements , choose the most appropriate answer from the options given below:
1) Statement I is correct but statement II is incorrect
2) Statement I is incorrect but statement II is correct
3) Both statement I and Statement II are correct
4) Both statement I and Statement II are incorrect

Ans: (2) Pg - I PU-164

195. Which of the following statements are correct?

A) An excessive loss of body fluid from the body switches off osmoreceptors.

B) ADH facilitates water reabsorption to prevent diuresis.

C) ANF causes vasodilation.

D) ADH causes increase in blood pressure.

A) ADH is responsible for decrease in GFR

Choose the correct answer from the options given
1) A, B and E only
2) C, D and E only
3) A and B only
4) B, C and D only

Ans: (4) Pg - I PU-297

196. Which of the following is characteristic feature of cockroach regarding sexual dimorphism?
1) Presence of sclerites
2) Presence of anal cerci
3) Dark brown body colour and anal cerci
4) Presence of anal styles

Ans: (4) Pg - I PU-114

197. The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc are :
1) Brain stem & epithalamus
2) Corpus callosum and thalamus
3) Limbic system & hypothalamus
4) Corpora quadrigemina & hippocampus

Ans: (3) Pg - I PU-321

198. Which one of the following is the sequence on corresponding coding strand, if the sequence on mRNA formed is as follows.
5' AUCGAUCGAUCGAUCGAUCG AUCG AUCG 3' ?
   1) 5' ATCGATCGATCGATCGATCGATCGATCG 3
   2) 3' ATCGATCGATCGATCGARCGATCGATCG 5
   3) 5' UAGCUAGCUAGCUAGCUA GCUAGU
   4) 3'UAGCUAGCUAGCUAGCUAGCUAGCUAGC5

   Ans: (1) Pg - II PU-108

199. Which of the following statements are correct
   A. Basophils are most abundant cells of the total WBCs
   B. Basophils secrete histamine, serotonin and heparin.
   C. Basophils are involved in inflammatory response
   D. Basophils have kidney shaped nucleus
   E. Basophiles are agranulocytes

   Choose the correct answer from the options given below

   1) B and C only   2) A and B only   3) D and E only   4) C and E only

   Ans: (1) Pg - I PU-279

200. Which one of the following is NOT an advantage of inbreeding?
   1) Elimination of less desirable genes and accumulation of superior genes takes place due to it.
   2) It decreases the productivity of inbreed population, after continuous inbreeding.
   3) It decreases homozygosity.
   4) It exposes harmful recessive genes that are eliminated by selection.

   Ans: (2) Pg - II PU-167