ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)
path to success
BENGALURU, KARNATAKA

MOCK TEST

EXAM DATE : 26.11.2017

CODE A

CAREER utsav '17
careers after +2
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Q.No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans	3	1	3	3	1	2	1	1	1	4	2	1	1	2	3
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Q.No	111	112	113	114	115	116	117	118	119	120					
Ans	1	3	4	2	2	2	1	2	1	3					

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MOCK TEST

PAPER CODE **A**

EXAM DATE : 26.11.2017

TIME
1.30 Hours (PCM)
1.30 Hours (PCB)

FORM NUMBER :

MAXIMUM MARKS
PCM - 80 MARKS
PCB - 90 MARKS

ANSWER KEY & SOLUTION

1. A body when projected vertically up, covers a total distance D, during the time of its flight t. If there were no gravity, the distance covered by it during the same time is equal to

(1) 0 (2) D (3) 2D (4) 4D

Ans : 3

Sol. The displacement of the body during the time t as it attains the point of projection

$\Rightarrow S = 0$

$\Rightarrow v_0 t - \frac{1}{2}gt^2 = 0$

$\Rightarrow t = \frac{2v_0}{g}$

During the same time t, the body moves in absence of gravity through a distance

$D' = v_0 t$, because in absence of gravity g = 0

$\Rightarrow D' = v_0\left(\frac{2v_0}{g}\right) = \frac{2v_0^2}{g}$ ...(i)

In presence of gravity the total distance covered is

$= D = 2H = 2\frac{v_0^2}{2g} = \frac{v_0^2}{g}$ ...(ii)

(i) ÷ (ii) $\Rightarrow D' = 2D$

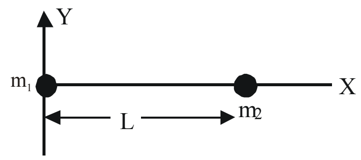
2. The position of centre of mass of a system consisting of two particles of masses m_1 and m_2 separated by a distance L apart from m_1 is

(1) $\frac{m_2 L}{m_1 + m_2}$ (2) $\frac{m_1 L}{m_1 + m_2}$

(3) $\frac{m_2 L}{m_1 - m_2}$ (4) $\frac{m_1 L}{m_1 - m_2}$

Ans. 1

Sol. Let centre of first body be origin and line joining them is taken as x-axis



$r_{cm} = \frac{m_1 r_1 + m_2 r_2}{m_1 + m_2} = \frac{m.0 + m_2 L}{m_1 + m_2}$

$= \frac{m_2 L}{m_1 + m_2}$

3. An artificial satellite moving in a circular orbit around the earth has a total (K.E. + P.E.) = E_0. Its potential energy is

(1) $-E_0$ (2) $1.5\ E_0$

(3) $2\ E_0$ (4) E_0.

Ans. 3

Sol. Total energy = kinetic energy + Potential energy

$E_0 = \frac{1}{2}mv^2 - \frac{GMm}{r}$ ...(i)

Further, $\frac{mv^2}{r} = \frac{GMm}{r^2}$

or $\frac{1}{2}mv^2 = \frac{GMm}{2r}$ ...(ii)

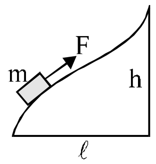
Substiuting the value of $\frac{1}{2}mv^2$ in equation (i)

from equation (ii), we get

$E_0 = \frac{GMm}{2r} - \frac{GMm}{r} = -\frac{GMm}{2r}$

Therefore, $P.E. = -\frac{GMm}{r} = 2E_0$

4. A body of mass m is slowly pulled up the hill by a force F which at each point was directed along the tangent of the trajectory as shown in figure. All surfaces are smooth. Find the work performed by this force



(1) mgl (2) $-mgl$
(3) mgh (4) Zero

Ans : 3

Sol. $\sum W_{net} = \Delta K$

as particle is moving slowly, this means $\Delta K = 0$

$\Rightarrow W_N + W_F + W_{mg} = \Delta K$

but $W_N = 0$, as $\vec{N} \perp d\vec{r}$

$\Rightarrow O + W_f - mgh = 0$

$\Rightarrow W_F = mgh$

5. A block slides down an inclined rough plane of inclination θ with constant velocity. It is then projected up the inclined plane with an initial speed u. How far up the incline will it move before coming to rest?

(1) $u^2/4g \sin\theta$ (2) $u^2/g \sin\theta$
(3) $u^2/2g \sin\theta$ (4) u^2/g

Ans : 1

Sol. As acceleration is zero on the inclined plane this means $f = mg \sin\theta$

For upward motion net downward force is

$f + mg \sin\theta = 2mg \sin\theta$

$\Rightarrow a = 2g \sin\theta$

$\Rightarrow$ using $v^2 = u^2 + 2as$

$0 = u^2 - 4g \sin\theta\, s$

$$\Rightarrow \frac{u^2}{4g\sin\theta} = s$$

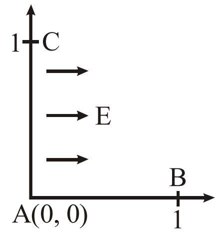
6. A uniform electric field pointing in positive x-direction exists in a region. Let A be the origin, B be the point on the x-axis at x = +1 cm and C be point on the

y-axis at y = + 1 cm. Then the potentials at the points A, B and C satisfy :

(1) $V_A < V_B$ (2) $V_A > V_B$
(3) $V_A < V_C$ (4) $V_A > V_C$

Ans. 2

Sol.

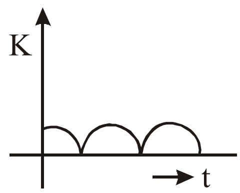


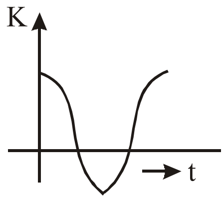
Direction of electric field is in the direction of potential drop

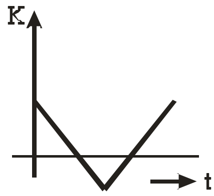
$\Rightarrow V_A > V_B$

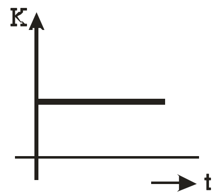
$V_A = V_C$

7. A body performs S.H.M. Its kinetic energy, K, varies with time t, as indicated in the graph :

(1)


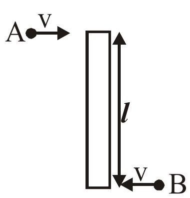
(2)


(3)


(4)


Ans : 1

8. Two particles A and B of mass m each and moving with velocity v, hit the ends of a rigid bar of the same mass m and length l simultaneously and stick to the bar as shown in the figure. The bar is kept on a smooth horizontal plane. The linear and angular speed of the system (bar + particle) after the collision are



(1) $v_{cm} = 0, \omega = \frac{12}{7}\frac{v}{\ell}$ (2) $v_{cm} = 0, \omega = \frac{4v}{\ell}$

(3) $v_{cm} = 0, \omega = \frac{5v}{\ell}$ (4) $v_{cm} = 0, \omega = \frac{v}{5\ell}$

Ans : 1

Sol. From COLM,

$mv - mv + 0 = 3\ m\ v_{cm}$

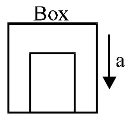
$\Rightarrow\ v_{cm} = 0$

From COAM

$$2mv \times \frac{\ell}{2} = \left(\frac{m\ell^2}{12} + \frac{2m\ell^2}{4}\right)\omega$$

$$\Rightarrow \frac{12v}{7\ell}$$

9. With what acceleration 'a' should the box in the figure descend so that a body of mass M placed in it exerts a force $\frac{Mg}{4}$ on the base of the box ?



(1) $\frac{3g}{4}$ (2) $\frac{g}{4}$

(3) $\frac{g}{2}$ (4) $\frac{g}{8}$

Ans : 1

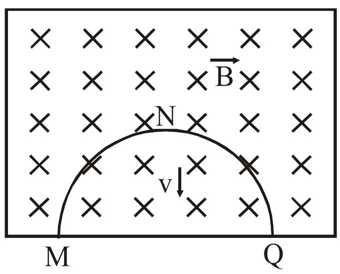
Sol. If the box is accelerated downwards, from the frame outside the elevator, equation of motion can be written as

$Mg - N = Ma$

Here, $N = \frac{Mg}{4}$

$\Rightarrow\ a = \frac{3g}{4}$

10. A thin semi-circular conducting ring of radius R is falling with its plane vertical in a horizontal magnetic induction $\vec{B}$ (see figure). At the position MNQ the speed of the ring is v and the potential difference developed across the ring is



(1) zero (2) $Bv\pi R^2/2$

(3) πRBv (4) 2RBv

Ans. 4

Sol. The induced emf as given by Faraday's law of induction is

$E = -Blv$

$l = 2R$

= projection of ring perpendicular to the direction of v

$= -B \times 2R \times v$

$= -2BvR.$

11. The magnetic flux through each turn of a 100 turn coil is $(t^3 - 2t) \times 10^{-3}$ Wb, where t is in second. The induced emf at t = 2 s is

(1) -4V (2) -1V

(3) +1V (4) +4V

Ans. 2

Sol. $\phi = (t^3 - 2t) \times 10^{-3}$

$$\frac{d\phi}{dt} = (3t^2 - 2) \times 10^{-3}$$

$$\left.\frac{d\phi}{dt}\right|_{t=2} = (3\times4-2) \times 10^{-3}\ .\ Wb/s$$

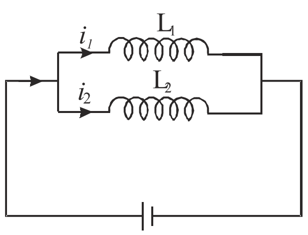
$$= 10^{-2}\ Wb/s$$

$$e = -N\frac{d\phi}{dt}$$

$$= -100 \times 10^{-2}\ V$$

$= -1$ V.

12. Two inductances L_1 and L_2 are placed far apart and in parallel. Their combined inductance is



(1) $\frac{L_1L_2}{L_1+L_2}$ (2) (L_1+L_2)

(3) $(L_1+L_2)\frac{L_1}{L_2}$ (4) $(L_1+L_2)\frac{L_2}{L_1}$

Ans. 1

Sol. $E = L_e \frac{di}{dt}$

$$E = L_1 \frac{di_1}{dt} = L_2 \frac{di_2}{dt}$$

$$i = i_1 + i_2$$

$$\frac{di}{dt} = \frac{di_1}{dt} + \frac{di_2}{dt}$$

$$\frac{E}{L_e} = \frac{E}{L_1} + \frac{E}{L_2}$$

$$\frac{1}{L_e} = \frac{1}{L_1} + \frac{1}{L_2}$$

$$L_e = \frac{L_1 L_2}{L_1 + L_2}$$

13. Resonance frequency of a circuit is f. If the capacitance is made 4 times the initial value, then the resonance frequency will become :

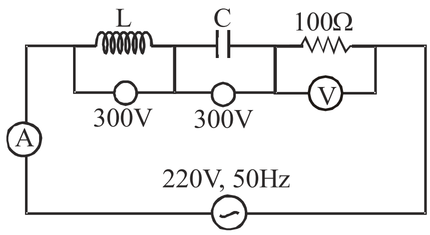
(1) f/2 (2) 2f

(3) f (4) f/4

Ans. 1

Sol. $f = \frac{1}{2\pi\sqrt{LC}}$ i.e. $f \propto \frac{1}{\sqrt{C}} \rightarrow \frac{1}{\sqrt{4}} = \frac{1}{2}$ time

14. In the circuit shown in figure, what will be the readings of voltmeter and ammeter ?



(1) 800 V, 2 A (2) 220 V, 2.2 A

(3) 300 V, 2 A (4) 100 V, 2 A.

Ans. 2

Sol. As $V_L = V_C = 300\,V$,

and $V = \sqrt{V_R^2 + (V_L - V_C)^2}$

$\therefore \quad V_R = V = 220\,V$

Also $I = \frac{V}{R} = \frac{220}{100} = 2.2\,A$

15. Two particles X and Y having equal charges, after being accelerated through the same potential difference, enter a region of uniform magnetic field and describe circular paths of radii R_1 and R_2, respectivley. The ratio of the mass of X to that of Y is

(1) $(R_1/R_2)^{1/2}$ (2) R_2/R_1

(3) $(R_1/R_2)^2$ (4) R_1/R_2

Ans. 3

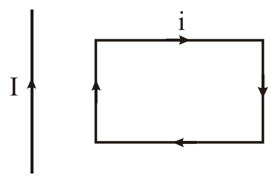
Sol. Let the masses be m_1 and m_2 respectively of X and Y. If E is energy gained by charged particle in electric field.

$$Bqv = \frac{mv^2}{r} \quad \Rightarrow \quad Bqr = \sqrt{2mE}$$

$$R_1 = \frac{\sqrt{2m_1E}}{Bq};\ R_2 = \frac{\sqrt{2m_2E}}{Bq}$$

$$\frac{R_1}{R_2} = \sqrt{\frac{m_1}{m_2}} \quad \Rightarrow \quad \frac{m_1}{m_2} = \left(\frac{R_1}{R_2}\right)^2$$

16. A regular loop carrying a current i is situated near a long striaght wire such that the wire is parallel to one of the sides of the loop and is in the plane of the loop. If a steady current I established in the wire as shown in the figure, the loop will :



(1) Rotate about an axis parallel to the wire

(2) Move away from the wire

(3) Move towards the wire

(4) Remain stationary.

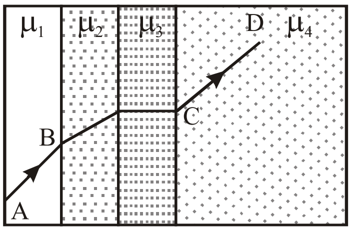
Ans. 3

Sol: $F = \frac{\mu_0 iI}{2\pi r}$

$F_{attraction} > F_{repulsion}$

Hence the loop will move towards the wire.

17. A ray of light passes through four transparent media with refractive indices μ_1, μ_2, μ_3 and μ_4 as shown in the figure, the surfaces of all media are parallel. If the emergent ray CD is parallel to the incident ray AB, we must have



(1) $\mu_1 = \mu_2$ (2) $\mu_2 = \mu_3$

(3) $\mu_3 = \mu_4$ (4) $\mu_4 = \mu_1$

Ans. 4

Sol. According to Snell's Law,

$\mu \sin\theta$ = constant

which gives

$\mu_1 = \mu_4$.

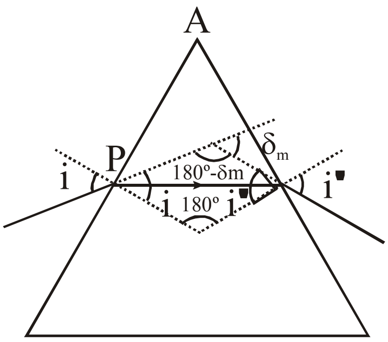
18. A ray of light passes through an equilateral prism such that the angle of incidence and the angle of emergence are both equal to 3/4th of the angle of prism. The angle of minimum deviation is

(1) 15º (2) 30º

(3) 45º (4) 60º

Ans. 2

Sol:



Givne A = 60º

$$i = i' = \frac{3}{4}A = 45^\circ \quad \because \quad i + i' = A + \delta$$

or $90^\circ = 60^\circ + \delta$

$\therefore \quad \delta = 30^\circ$

Note that $i = i'$ is the condition for minimum deviation.

Hence $\delta = 30^\circ = \delta_{min}$

19. When a beam of light with wavelength, $\lambda = 6000\,Å$, traveling in air, enters a glass medium whose refractive index is 1.5 then

(1) Frequency of light remains constant

(2) Velocity of light increases by 1.5 times

(3) Frequency of light increases by 1.5 times

(4) Wavelength (λ) remains constant

Ans. 1

Sol. (i) When a beam of light enters from one medium to other, its frequency remains unchanged.

(ii) $V = n\lambda$ and $\mu = \frac{c}{v}$

$$\therefore \quad 1.5 = \frac{n\lambda_1}{n\lambda_2}$$

$$\text{or} \quad 1.5 = \frac{\lambda_1}{\lambda_2} \quad \text{or} \quad \lambda_2 = \frac{\lambda_1}{1.5}$$

Hence wavelength decreases by 1.5 times.

20. An ammeter and a voltmeter are joined in series to a cell. Their readings are A and V respectively. If a resistance is now joined in parallel with the voltmeter.

(1) Both A and V will increase

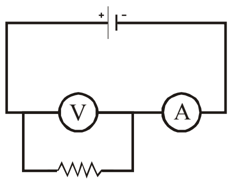
(2) Both A and V will decrease

(3) A will decrease, V will increase

(4) A will increase, V will decrease.

Ans. 4

Sol.



When a resistance is joined in parallel with the voltemeter, the total resistance of the circuit decreases. Current will increase and ammeter reading will increase. Potential difference across the ammeter increases thus potential difference across voltmeter decreases.

21. A uniform wire has electric resistance R. The wire is cut into n equal parts. All wires are put parallel to each other and joined at the ends. The resistance of the combination is

(1) R/n (2) R/n^2

(3) R (4) None of these.

Ans. 2

Sol. $\therefore\ R = \rho \frac{l}{A}$

$\therefore\ R \propto l$

Hence, resistance of each wire is $\frac{R}{n}$

For the resistance of the combination,

$\frac{1}{R'} = \frac{n}{R} + \frac{n}{R} + \frac{n}{R} + \ldots\ldots n$ times

$= \frac{n}{R} \times n$

$R' = \frac{R}{n^2}$.

22. In the circuit shown in figure the heat produced in the 5 ohm resistor due to the current flowing through it is 10 calories per second. The heat generated in the 4 ohms resistor is

(1) 1 calorie/sec (2) 2 calories/sec
(3) 3 calories/sec (4) 4 calories/sec

Ans. 2

Sol. Let I_1 be the current flowing in 5Ω resistance and $(I - I_1)$ in 4Ω and 6Ω resistance.

The heat generated in 5Ω resistor is

10 cal/s = 4.2 × 10 J/s

$\therefore\ 4.2 \times 10 = I_1^2 R$

$\therefore\ I_1 = \sqrt{\frac{4.2 \times 10}{5}} = \sqrt{8.4} = 2.9\,\text{amp}$ ...(i)

Since AB and CD are in parallel.

$\therefore$ The potential difference remains the same between C and D; and between A and B.

$\therefore\ (I - I_1)(4 + 6) = I_1 \times 5$ on solving using I_1 from (i) we get

$(I - 2.9)\ 10 = 2.9 \times 5$

$\therefore\ I - 2.9 = 1.45$

$\therefore\ I = 4.35$

Heat released/sec in 4 W resistance will be

$= (4.35 - 2.9)^2 \times 4$

$= 8.4$ J/s

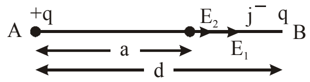
$= 2$ cal/s

23. There are points on a straight line joining two fixed opposite charges. There is :

(1) No point where potential is zero
(2) Only one point where potential is zero
(3) No point where electric field is zero
(4) Only one point where electric field is zero.

Ans. 2

Sol. Let two opposite charges +q and –q be situated at points A and B respectively.



$$E_1 = \frac{1}{4\pi\varepsilon_0}\frac{q}{a^2}$$

$$E_2 = \frac{1}{4\pi\varepsilon_0}\frac{q}{(d-a)^2}$$

$E = E_1 + E_2$

$$= \frac{q}{4\pi\varepsilon_0}\left[\frac{1}{a^2} + \frac{1}{(d-a)^2}\right]$$

$$= \frac{q}{4\pi\varepsilon_0}\frac{\left[d^2 - 2ad + a^2 + a^2\right]}{a^2(d-a)^2}$$

Hence, there can be more that one point where electric field is zero.

$$V_1 = \frac{1}{4\pi\varepsilon_0}\frac{q}{a};\ V_2 = \frac{1}{4\pi\varepsilon_0}\frac{(-q)}{(d-a)}$$

$V = V_1 + V_2$

$$= \frac{q}{4\pi\varepsilon_0}\left[\frac{1}{a} - \frac{1}{d-a}\right] = \frac{q(d-2a)}{4\pi\varepsilon_0 a(d-a)}$$

$\therefore$ Potential is zero only at d = 2a or a = d/2

24. A certain charge Q is divided into two parts q and (Q-q). For the maximum coulomb force between them, the ratio (q/Q) is :

(1) 1/16 (2) 1/8
(3) 1/4 (4) 1/2

Ans. 4

Sol. $F = \frac{1}{4\pi\varepsilon_0}\frac{q(Q-q)}{r^2}$

for F to be maximum, $\frac{dF}{dq} = 0$

$$\frac{1}{4\pi\varepsilon_0}\cdot\frac{1}{r^2}\left[Q - q + q(-1)\right] = 0$$

$Q - 2q = 0$

$$\frac{q}{Q} = \frac{1}{2}$$

25. A 6×10^{-9} F parallel plate capacitor is connected to a 500 V battery. When air is replaced by another dielectric material. 7.5×10^{-6} C charge flows into the capacitor. The dielectric constant of the material is :

(1) 1.0 (2) 3.5 (3) 2.0 (4) 4.5

Ans. 2

Sol. $Q = CV$

$Q_1 = 6 \times 10^{-9} \times 500$

$= 3 \times 10^{-6}$ C

After insertion of dielectric

$Q'_1 = (3+7.5) \times 10^{-6}$ C

$= 10.5 \times 10^{-6}$ C

$Q'_1 = CVK$

$10.5 \times 10^{-6} = 6 \times 10^{-9} \times 500\ K$

K= 3.5

26. Arrange Cl^-, Br^-, I^- in the order of decreasing reducing power –

(1) $Cl^- > Br^- > I^-$ (2) $I^- > Br^- > Cl^-$

(3) $Br^- > Cl^- > I^-$ (4) $I^- > Cl^- > Br^-$

Ans . 2

27. When O_2 is converted into O_2^+; ....

(1) Both paramagnetic character and bond order increase

(2) Bond order decreases

(3) Paramagnetic character increases

(4) Paramagnetic character decreases and the bond order increases

Ans . 4

28. In which of the following complex ion, the central metal ion is in a state of sp^3d^2 hybridisation ?

(1) $[CoF_6]^{3-}$ (2) $[Co(NH_3)_6]^{3+}$

(3) $[Fe(CN)_6]^{3-}$ (4) $[Cr(NH_3)_6]^{3+}$

Ans . 1

29. The oxidation state of Fe in the brown ring complex : $[Fe(H_2O)_5NO]\ SO_4$ is :-

(1) +2 (2) +1 (3) +3 (4) 0

Ans . 2

30. The correct order of O–O bond length in O_2, H_2O_2 and O_3 is

(1) $O_2 > O_3 > H_2O_2$ (2) $O_3 > H_2O_2 > O_2$

(3) $O_2 > H_2O > O_3$ (4) $H_2O_2 > O_3 > O_2$

Ans . 4

31. Which one of the following statement is FALSE ?

(1) Raoult's law states that the vapour pressure of a components over a solution is proportional to its mole fraction

(2) The osmotic pressure (π) of a solution is given by the equation π = MRT, where M is the molarity of the solution

(3) The correct order of osmotic pressure for 0.01 M aqueous solution of each compound is $BaCl_2 > KCl > CH_3COOH$ > sucrose

(4) Two sucrose solutions of same molality prepared in different solvents will have the same freezing point depression.

Ans . 4

32. The reaction quotient (Q) for the reaction

$N_2\ (g) + 3H_2\ (g) \rightleftharpoons 2NH_3\ (g)$

is given by $Q = \dfrac{[NH_3]^2}{[N_2][H_2]^3}$. The reaction will proceed form right to left if

(1) $Q < K_c$ (2) $Q > K_c$

(3) $Q = 0$ (4) $Q = K_c$

Ans . 2

33. Let the solubility of AgCl in water, in 0.01 M $CaCl_2$, in 0.01 M NaCl and in 0.05 M $AgNO_3$ be s_1,s_2,s_3 and s_4 respectively. Which of the following relations between these quantities is correct

(1) $s_1 > s_2 > s_3 > s_4$ (2) $s_1 > s_2 = s_3 > s_4$

(3) $s_4 > s_2 > s_3 > s_1$ (4) $s_1 > s_3 > s_2 > s_4$

Ans . 4

34. The standard electrode potential for the half cell reactions are :

$Zn^{++} + 2e^- \rightarrow Zn\ E° = -0.76$ V

$Fe^{++} + 2e^- \rightarrow Fe\ E° = -0.44$ V

The E.M.F. of the cell reaction :

$Fe^{++} + Zn \rightarrow Zn^{++} + Fe$ is

(1) +1.20 V (2) +0.32 V

(3) –0.32 V (4) –1.20 V

Ans . 2

35. Given that

$2\,C\,(s) + 2\,O_2\,(g) \rightarrow 2\,CO_2\,(g);\ \Delta H = -787\text{ kJ}$

$H_2\,(g) + 1/2\,O_2\,(g) \rightarrow H_2O\,(l):\ \Delta H = -286\text{ kJ}$

$C_2H_2\,(g) + 2\frac{1}{2}O_2 \rightarrow 2\,CO_2\,(g) + H_2O\,(l)$

$\Delta H = -1301\text{ kJ}$

Heat of formation of acetylene is

(1) –1802 kJ (2) +1802 kJ
(3) –800 kJ (4) +228 kJ

Ans . 4

36. The wavelength of the third line of the Balmer series for a hydrogen atom is :

(1) $\frac{21}{100R_H}$ (2) $\frac{100}{21R_H}$

(3) $\frac{21R_H}{100}$ (4) $\frac{100R_H}{21}$

Ans . 2

37. If a is the length of unit cell, then which one is correct relationship -

(1) For simple cubic lattice, Radius of metal atom $= \frac{a}{2}$

(2) For bcc lattice, Radius of metal atom $= \frac{\sqrt{3}a}{4}$

(3) For fcc lattice, Radius of metal atom $= \frac{a}{2\sqrt{2}}$

(4) All of these

Ans . 4

38. Radioactivity of a sample (z = 22) decreases 90% after 10 years. What will be the half-life of the sample?

(1) 5 years
(2) 2 years
(3) 3 years
(4) 10 years

Ans . 3

39. 'a' and 'b' are van der Waals' constants for gases. Chlorine is more easily liquefied than ethane because

(1) a for Cl_2 > a for C_2H_6 but b for Cl_2 < b for C_2H_6
(2) a for Cl_2 < a for C_2H_6 but b for Cl_2 > b for C_2H_6
(3) a and b for Cl_2 > a and b for C_2H_6
(4) a and b for Cl_2 < a and b for C_2H_6

Ans . 1

40. According to Bohr's theory , the angular momentum of an electron in 5th orbit is

(1) $25\frac{h}{\pi}$
(2) $1.0\frac{h}{\pi}$
(3) $10\frac{h}{\pi}$
(4) $2.5\frac{h}{\pi}$

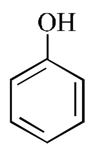
Ans . 4

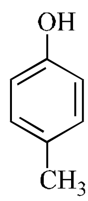
41. Gold numbers of protective colloids A , B , C and D are 0.50 , 0.01 , 0.10 and 0.005 , respectively . The correct order of their protective powers is

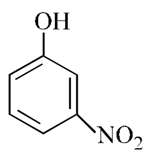
(1) D < A < C < B
(2) C < B < D < A
(3) A < C < B < D
(4) B < D < A < C

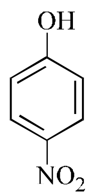
Ans . 3

42. In the following compounds:


(I)


(II)


(III)

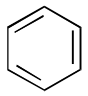

(IV)

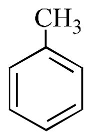
The order of acidity is:

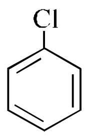
(1) III > IV > I > II
(2) I > IV > III > II
(3) II > I > III > IV
(4) IV > III > I > II

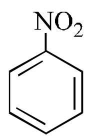
Ans . 4

43. Identify the correct order of reactivity in electrophilic substitution reaction of the following compounds:


(I)


(II)


(III)


(IV)

(1) I > II > III > IV (2) IV > III > II > I
(3) II > I > III > IV (4) II > III > I > IV

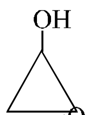
Ans . 3

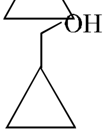
44. Anti–Markownikoff's addition of HBr is not observed in –

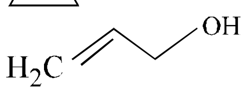
(1) Propene
(2) But–2–ene
(3) Butene
(4) Pent–2–ene

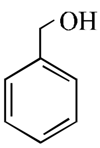
Ans . 2

45. Which of the following alcohol shows fastest reaction with HI ?

(1) 

(2) 

(3) 

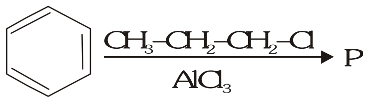
(4) 

Ans . 2

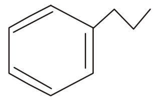
46. The reaction of $CH_3OC_2H_5$ with HI gives

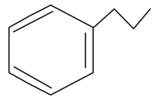
(1) CH_3I
(2) C_2H_5OH
(3) $CH_3I + C_2H_5OH$
(4) $C_2H_5I + CH_3OH$

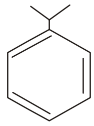
Ans . 3

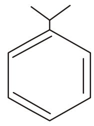
47. 

$$P \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } O_2/\Delta} Q + \text{phenol},$$ **P & Q are -**

(1)  and $CH_3-CH_2-\overset{O}{\overset{\|}{C}}-H$

(2)  and $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

(3)  and $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

(4)  and $CH_3-CH_2-\overset{O}{\overset{\|}{C}}-H$

Ans . 3

48. **In Cannizzaro reaction given below :-**

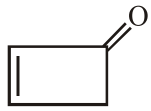
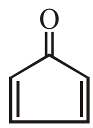
$$2PhCHO \xrightarrow{:\overset{\ominus}{O}H} PhCH_2OH + PhCO_2^{\ominus}$$

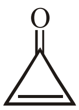
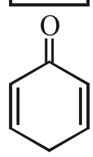
the slowest step is :-

(1) The abstraction of proton from the carboxylic group
(2) The deprotonation of $PhCH_2OH$
(3) The attack of $:\overset{\ominus}{O}H$ at the carboxyl group
(4) The transfer of hydride to the carbonyl group

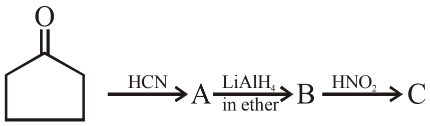
Ans . 4

49. The most reactive compound towards CH_3–MgCl is :

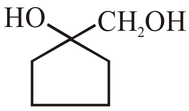
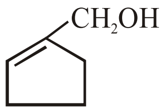
(1)  (2) 

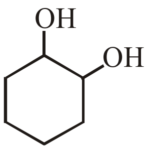
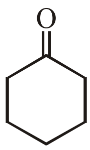
(3)  (4) 

Ans . 2

50. 

In above reaction major product (C) is :

(1)  (2) 

(3)  (4) 

Ans . 4

51. If the sum to infinity of the series

$1+4x+7x^2+10x^3+......+\infty$ is $\frac{35}{16}$ then x equals

(1) $\frac{1}{5}$ (2) $\frac{19}{7}$

(3) $\frac{4}{5}$ (4) $\frac{2}{3}$

Ans. 1

S o l

$$\begin{array}{rcl} s_\infty &=& 1 + 4x + 7x^2 + 10x^3 + ... \infty \\ xs_\infty &=& \quad\; x + 4x^2 + 7x^3 + ... \infty \\ \hline (1-x)s_\infty &=& 1 + 3x + 3x^2 + 3x^3 + ... \infty \end{array}$$

$\Rightarrow (1-x)\frac{35}{16}=1+\frac{3x}{1-x}$

$\Rightarrow 35x^2 - 102x + 19 = 0$

$\Rightarrow (7x-19)(5x-1) = 0$

$\Rightarrow x=\frac{19}{7} \quad x=\frac{1}{5}$

$\because |x|<1 \; ; \quad x=\frac{1}{5}$

52. The number of real solution(s) of the equation

$7\sqrt{x}+8\sqrt{-x}+\frac{15}{x^3}=98$ is/are

(1) 0 (2) 1

(3) 2 (4) Infinite

Ans. 1

Sol. $\sqrt{x}\,;\ x\ge 0 \quad \sqrt{-x} \quad -x\ge 0$

$x \le 0$

But x = 0 is also not possible

$\therefore \frac{15}{x^3}$ is indefined

53. If $a=\cos\frac{2\pi}{7}+i\sin\frac{2\pi}{7}$, then the quadratic equation whose roots are $\alpha=a+a^2+a^4$ and $\beta=a^3+a^5+a^6$ is

(1) $x^2 - x + 2 = 0$ (2) $x^2 + x - 2 = 0$

(3) $x^2 - x - 2 = 0$ (4) $x^2 + x + 2 = 0$

Ans. 4

Sol . $a=\cos\frac{2\pi}{7}+i\sin\frac{2\pi}{7}$

$a^7 = 1$

$s=\alpha+\beta=a+a^2+a^4+a^3+a^5+a^6$

$s=a\frac{(1-a^6)}{1-a}=-1$

$p=\alpha\beta=(a+a^2+a^4)(a^3+a^5+a^6)$

$=a^4+a^6+1+a^5+1+a+1+a^2+a^3$

$= 3 - 1 = 2$

Reqd eqn $= x^2 - sx + p = 0$

$x^2 + x + 2 = 0$

54. If $\cos\alpha+\cos\beta+\cos\gamma=\sin\alpha+\sin\beta+\sin\gamma=0$ then $\cos 3\alpha+\cos 3\beta+\cos 3\gamma=$

(1) 0 (2) $\cos(\alpha+\beta+\gamma)$

(3) $3\cos(\alpha+\beta+\gamma)$ (4) $3\sin(\alpha+\beta+\gamma)$

Ans. 3

Sol. $\cos\alpha+\cos\beta+\cos\gamma=0$

$\sin\alpha+\sin\beta+\sin\gamma=0$

let $a=\cos\alpha+i\sin\alpha$

$b=\cos\beta+i\sin\beta$

$c=\cos\gamma+i\sin\gamma$

$\therefore a + b + c = 0$

$a^3 + b^3 + c^3 - 3abc = 0$

$\Rightarrow(\cos 3\alpha+i\sin 3\alpha)(\cos 3\beta+i\sin 3\beta)+(\cos 3\gamma+i\sin 3\gamma)$

$= 3[\cos(\alpha+\beta+\gamma)+i\sin(\alpha+\beta+\gamma)]$

$\Rightarrow \cos 3\alpha+\cos 3\beta+\cos 3\gamma=3\cos(\alpha+\beta+\gamma)$

55. N be the set of natural numbers. The relation R defined on $N \times N$ as follows

(a, b) R (c, d) $\Leftrightarrow$ a + d = b + c is

(1) Not reflexive (2) Not symmetric

(3) Transitive (4) None of these

Ans. 3

Sol. 1 .(a, b) R (a, b) $\Leftrightarrow$ a + b= b + a is

$\therefore$ R is reflexive

2. (a, b) R (c, d)

$\Rightarrow$ a + d = b + c

= c + b = d + a

= (c, d) R (a, b)

3. (a, b) R (c, d) & (c, d) R (e, f)

$\Rightarrow$ (a + d) = (b + c) & c + f = d + e

$\Rightarrow$ a + d + c + f = b + c + d + e

$\Rightarrow$ a + f = b + e

$\Rightarrow$ (a, b) R (e, f)

$\therefore$ R is transitive

56. If $A = 1000^{1000}$; $B = 1001^{999}$, then

(1) A > B (2) A = B

(3) A < B (4) None of these

Ans. 1

Sol. Since, $\left(1+\frac{1}{n}\right)^n < 3 \quad \forall n \in N$

Now, $\frac{(1001)^{999}}{(1000)^{1000}} = \frac{1}{1001}\left(\frac{1001}{1000}\right)^{1000}$

$= \frac{1}{1001}\left(1+\frac{1}{1000}\right)^{1000}$

$< \frac{1}{1001}.3 < 1$

$\Rightarrow 1001^{999} < 1000^{1000}$

B < A

57. If the eccentricity of the two ellipse $\frac{x^2}{169}+\frac{y^2}{25}=1$ and $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ are equal, then the value of $\frac{a}{b} =$

(1) $\frac{5}{13}$ (2) $\frac{6}{13}$

(3) $\frac{13}{5}$ (4) $\frac{13}{6}$

Ans. 3

Sol. $\frac{x^2}{169}+\frac{y^2}{5^2}=1$

$e = \frac{12}{3}$; $e' = \sqrt{1-\frac{b^2}{a^2}}$

$\Rightarrow \frac{b}{a} = \frac{5}{13} \Rightarrow \frac{a}{b} = \frac{13}{5}$

58. The number of common tangents to the circles $x^2 + y^2 - 2x - 4y + 1 = 0$ and $x^2 + y^2 - 12x - 16y + 91 = 0$ is

(1) 1 (2) 2

(3) 3 (4) 4

Ans. 4

Sol. $C_1 = (1, 2)$ $r_1 = 2$

$C_2 = (6, 8)$ $r_1 = 3$

$C_1C_2 = \sqrt{61}$ $r_1 + r_2 = 5$

So $C_1C_2 > r_1 + r_2$

59. Two perpendicular tangents to the circle $x^2 + y^2 = a^2$ meet at P. Then, the locus of P has the equation

(1) $x^2 + y^2 = 2a^2$ (2) $x^2 + y^2 = 3a^2$

(3) $x^2 + y^2 = 4a^2$ (4) None of these

Ans. 1

Sol. Director circle's equation

$x^2 + y^2 = 2a^2$

60. If the tangents at P and Q on the parabola meet in T, then SP, ST and SQ are in

(1) AP (2) GP

(3) HP (4) None of these

Ans. 2

Sol. Since , tangent at P & Q on the parabola meet in T

$P\left(at_1^2, 2at_1\right)$, $Q\left(at_2^2, 2at_2\right)$

$T = \left(at_1t_2, a\left(t_1+t_2\right)\right)$

$SP = a\left(1+t_1^2\right)$

$SQ = a\left(1+t_2^2\right)$

$ST^2 = a^2\left(1-t_1t_2\right)^2 + a^2\left(t_1+t_2\right)^2$

$= a\left(1+t_2^2\right) \times a\left(1+t_2^2\right)$ = SP.SQ

$\therefore$ SP, ST, SQ are in G.P

61. Let $f(x)=\begin{cases} x^p \sin\frac{1}{x} & ; \ x \neq 0 \\ 0 & ; \ x = 0 \end{cases}$, then f(x) is continuous but not differentiable at x = 0 if

(1) $0<p\le 1$ (2) $1\le p<\infty$

(3) $-\infty<p\le 0$ (4) $p=0$

Ans. 1

Sol. $\lim_{x\to 0} x^p \sin\frac{1}{x}=0;\ 0<p<\infty$

RHD = $\lim_{h\to 0}\frac{h^p\sin\frac{1}{h}-0}{h}$

LED = $\lim_{h\to 0}\frac{(-h^p)\sin\left(-\frac{1}{h}\right)-0}{-h}$

$\therefore$ f is not differentaible at x > 0

$\therefore\ p\le 1$

So $p\in(0,1]$

62. $\lim_{x\to 0}(\operatorname{cosec} x)^{\frac{1}{\log_e x}}$ is equal to

(1) 0 (2) 1

(3) 1/e (4) None of these

Ans. 3

Sol. $\ln y=\lim_{x\to 0}\frac{\ln\operatorname{cosec} x}{\ln x}$

$=\lim_{x\to 0}\frac{-\cot x}{1/x}=-1$

$y=e^{-1}$

63. Let $f: R\to R$ be a differentiable function having f(2) = 6, $f'(2)=\frac{1}{48}$ then, $\lim_{x\to 2}\int_6^{f(x)}\frac{4t^3}{x-2}dt=$

(1) 18 (2) 12

(3) 24 (4) 36

Ans. 1

Sol. $\lim_{x\to 2}\int_6^{f(x)}\frac{4t^3}{x-2}dt$

$=4(f(x))^3\times f'(x)=4\times 6^3\times\frac{1}{48}=18$

64. If $f''(x)=-f(x)$ where f(x) is a continuous double differentiable function and $g(x)=f'(x)$. If $F(x)=\left(f\left(\frac{x}{2}\right)\right)^2+\left(g\left(\frac{x}{2}\right)\right)^2$ and F(5) = 5, then F(10) =

(1) 0 (2) 5

(3) 10 (4) 25

Ans. 2

Sol. $f''(x)=-f(x)$

$\Rightarrow g'(x)=-f(x)$

Also $F(x)=\left(f\left(\frac{x}{2}\right)\right)^2+\left(g\left(\frac{x}{2}\right)\right)^2$

$F'(x)=2f\left(\frac{x}{2}\right)\times f'\left(\frac{x}{2}\right)\times\frac{1}{2}+2g\left(\frac{x}{2}\right)\times g'\left(\frac{x}{2}\right)\times\frac{1}{2}$

$F'(x)=0\ \Rightarrow\ F(x)=C$

F(5) = 5

65. The maximum value of $f(x)=\frac{x}{4+x+x^2}$ on [-1, 1] is

(1) $\frac{-1}{4}$ (2) $\frac{-1}{3}$

(3) $\frac{1}{6}$ (4) $\frac{1}{5}$

Ans. 3

Sol. $f'(x)=\frac{4-x^2}{(4+x+x^2)}=0\ \Rightarrow\ x=\pm 2$

Both values are not in [-1, 1] so

$f(-1)=\frac{-1}{4}\quad f(1)=\frac{1}{6}$ maximum

66. Co- ordinates of a point on the curve y = xlogx at which the normal is parallel to the line 2x - 2y = 3 are

(1) (0, 0) (2) (e, e)

(3) $(e^2, 2e^2)$ (4) $(e^{-2}, -2e^{-2})$

Ans. 4

Sol. Given $y = x\ln x$

$\frac{dy}{dx}=1+\ln x$

Slope of normal $= \frac{-1}{1+\ln x}$

So $\frac{-1}{1+\ln x} = 1 \Rightarrow x = e^{-2}$

$\Rightarrow y = -2e^{-2}$

So co-ordinate of pt in $(e^{-2}, -2e^{-2})$

67. The point of the curve $y = x^2$ which is closest to $\left(4, -\frac{1}{2}\right)$ is

(1) (1, 1) (2) (2, 4)

(3) $\left(\frac{2}{3}, \frac{4}{9}\right)$ (4) $\left(\frac{4}{3}, \frac{16}{9}\right)$

Ans. 1

Sol. $L = \sqrt{(x-4)^2 + \left(y + \frac{1}{2}\right)^2}$

$L = (x-4)^2 + \left(y + \frac{1}{2}\right)^2$

$L' = x^4 + 2x^2 - 8x$

$L' = 4x^3 + 4x - 8 = 0$

$\Rightarrow x = 1$

$L'' = 12x^2 + 4$

$L'' = 16 > 0$

So D is minimum at x = 1i.e at (1, 1)

68. The value of $\int \frac{(x+1)}{x(1+xe^x)^2} dx$ is

(1) $\frac{1}{1+xe^x} + c$ (2) $\ln\left|\left(\frac{x+e^x}{1+xe^x}\right)\right| + c$

(3) $\ln\left|\frac{x+1}{1+xe^x}\right| + c$ (4) None of these

Ans. 4

Sol. Let $1 + xe^x = t$

$(x+1)e^x dx = dt$

$I = \int \frac{dt}{(t-1)t^2} = \int -\frac{1}{t^2} - \frac{1}{t} + \frac{1}{t-1} dt$

$= \frac{1}{t} - \log|t| + \log|t-1| + C$

$= \frac{1}{1+xe^x} + \log\left|\frac{xe^x}{1+xe^x}\right| + C$

69. The value of $\int \frac{(x^2-1)dx}{x^3\sqrt{2x^4 - 2x^2 + 1}}$ is

(1) $2\sqrt{2 - \frac{2}{x^2} + \frac{1}{x^4}} + C$

(2) $2\sqrt{2 + \frac{2}{x^2} + \frac{1}{x^4}} + C$

(3) $\frac{1}{2}\sqrt{2 - \frac{2}{x^2} + \frac{1}{x^4}} + C$

(4) None of these

Ans. 3

Sol. $I = \int \frac{\left(\frac{1}{x^3} - \frac{1}{x^5}\right)dx}{\sqrt{2 - \frac{2}{x^2} + \frac{1}{x^4}}}$

$2 - \frac{2}{x^2} + \frac{1}{x^2} = t$

$\left(\frac{4}{x^3} - \frac{4}{x^5}\right)dx = dt$

$I = \frac{1}{4}\int \frac{dt}{\sqrt{t}} = \frac{1}{2}\sqrt{2 - \frac{2}{x^2} + \frac{1}{x^4}} + C$

70. If $f(x) = \min\{x+2, 1, 2-x\}$, then $\int_{-2}^{2} f(x)dx$ equals

(1) 1 (2) 2

(3) 3 (4) 0

Ans. 3

Sol. $\int_{-2}^{-1}(x+2)dx + \int_{-1}^{1}dx + \int_{1}^{2}(2-x)dx$

$= \frac{1}{2} + 2 + \frac{1}{2} = 3$

71. If $f(x) = \frac{e^x}{1+e^x}$

$I_1 = \int_{f(-a)}^{f(a)} xg(x(1-x))dx$ and

$I_2 = \int_{f(-a)}^{f(a)} g(x(1-x))dx$ then the value of $I_2 : I_1 =$

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

Ans. 1

Sol. $f(a)+f(-a)=\frac{e^a}{1+e^a}+\frac{1}{e^a+1}=1$

$\Rightarrow f(a)=1-f(-a)$

Let $f(-a)=t$

$\Rightarrow f(a)=1-t$

$I_1=\int_t^{1-t} xg(x(1-x))dx$

$I_1=\int_t^{1-t}(1-x)g(x(1-x))dx$

$2I_1=\int_t^{1-t}g(x(1-x))(x+1-x)dx=I_2$

$\Rightarrow 2I_1=I_2$

$\frac{I_2}{I_1}=2$

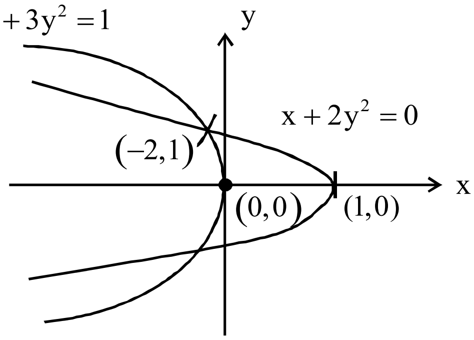
72. The area of the plane region bounded by the curve $x+2y^2=0$ and $x+3y^2=1$ is equal to

(1) $\frac{4}{3}$ (2) $\frac{5}{3}$

(3) $\frac{1}{3}$ (4) $\frac{2}{3}$

Ans. 1

Sol.



$x+3y^2=1$

$x+2y^2=0$

Solving $y=\pm1; x=-2$

Required area $\left|\int_{-1}^{1}(x_1-x_2)dy\right|$

$=\left|\int_{-1}^{1}(1-y^2)dy\right|$

$=\frac{4}{3}$ sq.units

73. The solutions of the differential equation

$\frac{dy}{dx}+\frac{2x}{1+x^2}y=\frac{1}{(1+x^2)^2}$ is

(1) $y(1-x^2)=\tan^{-1}x+c$

(2) $y(1+x^2)=\tan^{-1}x+c$

(3) $y(1+x^2)^2=\tan^{-1}x+c$

(4) $y(1-x^2)^2=\tan^{-1}x+c$

Ans. 2

Sol. $\frac{dy}{dx}+\frac{2x}{1+x^2}y=\frac{1}{(1+x^2)^2}$

$P=\frac{2x}{1+x^2}$ $Q=\frac{1}{(1+x^2)^2}$

$I.F=e^{\int pdx}=1+x^2$

$y(1+x^2)=\int(1+x^2)\frac{1}{(1+x^2)^2}dx+c$

$y(1+x^2)=\tan^{-1}x+c$

74. The general solutions of $y^2dx+(x^2-xy+y^2)dy=0$ is

(1) $\tan^{-1}\frac{x}{y}+\log_e|y|+c=0$

(2) $2\tan^{-1}\frac{x}{y}+\ln|x|+c=0$

(3) $\ln|y|+\sqrt{x^2+y^2}+\ln y+c=0$

(4) None of these

Ans. 1

Sol. $dx+\left(\frac{x^2-xy+y^2}{y^2}\right)dy=0$

$\frac{dx}{dy}+\left(\frac{x}{y}\right)^2-\left(\frac{x}{y}\right)+1=0$

$\frac{x}{y} = \upsilon$

$\frac{dx}{dy} = \upsilon + y\frac{d\upsilon}{dy}$

$y\frac{d\upsilon}{dy} = -(\upsilon+1)$

$\Rightarrow \tan^{-1}\upsilon + \log|y| + c = 0$

$\Rightarrow \tan^{-1}\frac{x}{y} + \ln|y| + c = 0$

75. If $\vec{a},\vec{b},\vec{c}$ are unit coplanar vectors,then $\left[2\vec{a}-\vec{b} \quad 2\vec{b}-\vec{c} \quad 2\vec{c}-\vec{a}\right]$ is equal to

(1) 1 (2) 0

(3) $-\sqrt{3}$ (4) $\sqrt{3}$

Ans. 2

Sol. $\therefore\ 2\vec{a}-\vec{b},\ 2\vec{b}-\vec{c},\ 2\vec{c}-\vec{a}$

are also coplaner, thus

$\left[2\vec{a}-\vec{b}\ 2\vec{b}-\vec{c}\ 2\vec{c}-\vec{a}\right] = 0$

76. If $\left(\vec{a}\times\vec{b}\right)^2 + \left(\vec{a}\cdot\vec{b}\right)^2 = 676$ and $|\vec{b}| = 2$, then $|\vec{a}|$ is equal to

(1) 13 (2) 26

(3) 39 (4) None of these

Ans. 1

Sol. $\left(|\vec{a}||\vec{b}|\sin\theta\,\hat{n}\right)^2 + \left(|\vec{a}||\vec{b}|\cos\theta\right)^2 = 676$

$|\vec{a}|^2|\vec{b}|^2 = 676$

$|\vec{a}| = 13$

77. The lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-k}$ and $\frac{x-1}{k} = \frac{y-4}{2} = \frac{z-5}{1}$ are co-planar if (where $k \neq -3$)

(1) $k = 0$ (2) $k = 1$

(3) $k = 3$ (4) $k = 4$

Ans. 1

Sol. $\begin{vmatrix} -1 & 1 & 1 \\ 1 & 1 & -k \\ k & 2 & 1 \end{vmatrix} = 0$

$\Rightarrow -1(1+2k) - 1(1+k^2) + 1(2-k) = 0$

$\Rightarrow -k^2 - 3k^2 = 0$

$\Rightarrow k = 0$ or $k = -3$

78. If $D_k = \begin{vmatrix} 1 & n & n \\ 2k & n^2+n+1 & n^2+n \\ 2k-1 & n^2 & n^2+n+1 \end{vmatrix}$ and $\sum_{k=1}^{n} D_k = 56$ then n equals

(1) 4 (2) 6

(3) 8 (4) None of these

Ans. 4

Sol. $\sum_{k=1}^{n} D_k = \begin{vmatrix} \sum_{k=1}^{n} 1 & n & n \\ 2\sum_{k=1}^{n} k & n^2+n+1 & n^2+n \\ 2\sum_{k=1}^{n} k - \sum_{k=1}^{n} 1 & n^2 & n^2+n+1 \end{vmatrix}$

$\Rightarrow \begin{vmatrix} n & 0 & 0 \\ n^2+n & 1 & 0 \\ n & 0 & n+1 \end{vmatrix} = 56$

$\Rightarrow n(n+1) = 56$

$\Rightarrow n = 7$

79. The number of distinct values of a 2×2 determinant whose entries are from the set $\{-1,0,1\}$ is

(1) 3 (2) 4

(3) 5 (4) 6

Ans. 3

Sol. Possible values are $-2,-1,0,1,2$

$\begin{vmatrix} 1 & 0 \\ -1 & 1 \end{vmatrix} = 1$ $\quad \begin{vmatrix} 1 & -1 \\ 0 & 0 \end{vmatrix} = 0$

$\begin{vmatrix} 0 & 1 \\ 1 & -1 \end{vmatrix} = -1$ $\quad \begin{vmatrix} 1 & -1 \\ 1 & 1 \end{vmatrix} = 2$

$\begin{vmatrix} -1 & 1 \\ 1 & 1 \end{vmatrix} = -2$

80. The mirror image of the parabola $y^2 = 4x$ in the tangent to the parabola at the point (1,2) is

(1) $(x-1)^2 = 4(y+1)$ (2) $(x+1)^2 = 4(y+1)$

(3) $(x+1)^2 = 4(y-1)$ (4) $(x-1)^2 = 4(y-1)$

Ans. 3

Sol. Any point on given parabola is $(t^2, 2t)$. The equation of tangent at (1,2) is x - y + 1 = 0 image of (h,k) of the point $(t^2, 2t)$ in x - y + 1 = 0

$$\frac{h-t^2}{1} = \frac{k-2t}{-1} = \frac{-2(t^2-2t+1)}{1+1}$$

$h = 2t - 1$

$k = t^2 + 1$

elimintary $(h+1)^2 = 4(k-1)$

81. In Mendelian dihybrid cross, when heterozygous round / yellow are self crossed, round / green offsprings are represented by the genotype

(1) RrYy, RrYY, RRYy (2) Rryy, RRyy, rryy

(3) rrYy, RrYY (4) Rryy, RRyy

Ans : 4

82. Endosperm is formed during the double fertilisation by the fusion of

(1) Two polar nuclei and one male gamete

(2) One polar nucleus and one male gamete

(3) Ovum and male gamete

(4) Two polar nuclei and two male gametes

Ans : 1

83. In a pond, *Daphnia* is preyed upon by Prawn. Here, prawn and *Daphnia* are respectively

(1) Tertiary consumer and secondary consumer

(2) Primary consumer and primary producer

(3) Secondary consumer and primary consumer

(4) Primary consumer and secondary consumer.

Ans : 3

84. An gymnosperm plant has 24 chromosomes in 'microspore mother cell'. The number of chromosomes in its endosperm will be

(1) 12 (2) 36

(3) 24 (4) 48

Ans : 1

85. The coding strand of DNA has the following sequence:

5'–ACGTAC–3'

What will be the sequence of mRNA?

(1) UGCAUG (2) ACGUAC

(3) ACGTAC (4) TGCATG

Ans : 2

86. The steps in DNA fingerprinting are given below. arrange them in the correct sequence

(i) Transfer of separated DNA fragments to nitrocellulose membrane

(ii) Isolation of DNA

(iii) Hybridisation using labelled VNTR probe

(iv) Separation of DNA fragments by electrophoresis

(v) Detection of hybridised DNA fragments by autoradiography

(vi) Digestion of DNA by restriction endonucleases

(1) (i),(iii),(ii),(v),(vi),(iv)

(2) (ii),(vi),(iv),(i),(iii),(v)

(3) (iii),(ii),(v),(i),(iv),(vi)

(4) (iv). (iii). (ii). (v), (i). (vi)

Ans : 2

87. Verhulst-Pearl logistic growth is described by the equation

(1) $dN/dt = rN\left(\frac{K-N}{N}\right)$

(2) $dN/dt = rN\left(\frac{N-K}{N}\right)$

(3) $dN/dt = rN\left(\frac{K-N}{K}\right)$

(4) $dN/dt = rN\left(\frac{N-K}{K}\right)$

Ans : 3

88. The stalk which joins ovule to placenta is called

(1) Hilum (2) Funicle

(3) Micropyle (4) Chalaza

Ans : 2

89. The relative contribution of CH_4, CFCs and N_2O to total global warming is respectively

(1) 6%, 14% and 20% (2) 25%, 6% and 10%

(3) 30%, 24% and 2% (4) 20%, 14% and 6%.

Ans : 4

90. Initiation codon of protein synthesis (in eukaryotes) is

(1) GUA (2) GCA

(3) CCA (4) AUG.

Ans : 4

91. Cattle and goats do not eat *Calotropis* because

(1) It is tasteful to its predator

(2) It produces highly poisonous glycosides

(3) It possesses thorns

(4) It is hard to chew.

Ans : 2

92. In a grassland ecosystem, the largest population in a pyramid of number is that of

(1) Producers

(2) Primary consumers

(3) Secondary consumers

(4) Tertiary consumers

Ans : 1

93. Which of the following is not used in catalytic converters?

(1) Rhodium (2) Palladium

(3) Lead (4) Platinum

Ans : 3

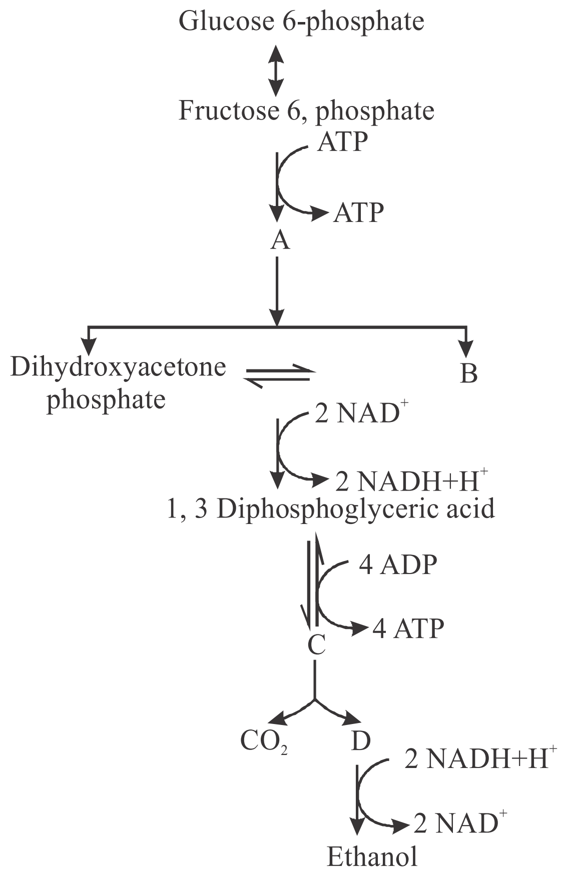
94. Which of the following plants is not pollinated by water?

(1) *Vallisneria* (2) Water lily

(3) *Hydrilla* (4) *Zostera*

Ans : 2

95. Observe the given flow chart showing steps of anaerobic respiration and identify the compounds A, B, C and D.



	A	B	C	D
(1)	Citrate	Pyruvic acid	Succinate	Glyceraldehyde 3-phosphate
(2)	Succinate	Citrate	Pyruvic acid	Acetaldehyde
(3)	Fructose 1, 6- Bisphosphate	Glyceral-dehyde 3-phosphate	Pyruvic acid	Acetaldehyde
(4)	Glyceral dehyde 3-phosphate	Fructose 1,6- bisphosphate	Citric acid	Oxaloacetate

Ans : 3

96. The reserve food in euglenoids and diatoms respectively is

(1) Cyanophycean starch, chitin

(2) Paramylon, leucosin

(3) Lipid globules, volutin globules

(4) Leucosin, glycogen

Ans : 2

97. Match the column I with column II and III and select the correct option.

Column I	Column II	Column III
(P) Auxin	(i) Zeatin	(A) Barley Endosperm assay
(Q) Gibberellin	(ii) Dormin	(B) Avena curvature assay
(R) Cytokinin	(iii) Tryptophan	(C) Stomatal closure
(S) Abscisic acid	(iv) Mevalonic acid	(D) Tobacco pith culture

(1) P-(iii)-B, Q-(iv)-A, R-(i)-D, S-(ii)-C
(2) P-(iv)-C, Q-(ii)-B, R-(iii)-A, S-(i)-D
(3) P-(i)-A, Q-(ii)-D, R-(iv)-C, S-(iii)-B
(4) P-(ii)-D, Q-(iv)-A, R-(iii)-C, S-(i)-B

Ans : 1

98. The flower showing floral formula belongs to Family

$\oplus$ ⚥ $K_{(5)}\ \widehat{C_{(5)}\ A_5}\ \underline{G}_{(2)}$

(1) Liliaceae (2) Solanaceae
(3) Poaceae (4) Ranunculaceae.

Ans : 2

99. The elements essential for the translocation of organic substances in the phloem are
(1) Manganese and copper
(2) Boron and potassium
(3) Molybdenum and zinc
(4) Sulphur and potassium

Ans : 2

100. Identify the correct from given statements.
(I) Dicot leaves are dorsiventral whereas monocot leaves are isobilateral.
(II) Cellular slime moulds have multinucleate protoplasmic body called Plasmodium.
(III) During nitrification, ammonium ions are oxidised to nitrites with the help of nitrobacter and nitrites are changed to nitrates by Nitrosomonas bacteria.
(IV) The substrate for photorespiration are glucose and organic acids.
(V) Pepsin and renin enzymes are absent in invertebrates.
(1) (I), (III) and (II)
(2) (I) only
(3) (III) and (IV) only
(4) (I), (III) and (IV) only

Ans : 2

101. How many of the following characters are present in animals ?
(a) Bilateral Symmetry
(b) Cellular grade of organization
(c) Binary fission
(d) Amoeboid movement
(e) Anaerobic respiration
(f) Metagenesis
(1) 2 (2) 4
(3) 5 (4) 6

Ans. 4

102. Haversian systems are found in the bones of
(1) Scoliodon
(2) Scoliodon and Psittacula
(3) Rabbit and man
(4) Panther, Python and Man

Ans. 3

103. How many of the following structures are found in female cockroach only?
(a) Spermatheca (b) Anal style
(c) Anal cerci (d) Common oviduct
(1) 0 (2) 1
(3) 2 (4) 3

Ans. 3

104. Which of the followings are not the components of DNA?
(a) Uracil
(b) Thiamine B_1
(c) Pentose sugar
(d) Double hydrogen bonds
(e) Glycosidic bonds
(1) a (2) a & b
(3) a, d & e (4) a, c & e

Ans. 2

105. Which of the following dental formula, represent(s) human milk set ?

(a) $\frac{2123}{2123}$ (b) $\frac{2102}{2102}$

(c) $\frac{212}{212}$ (d) $\frac{0012}{0012}$

(1) a (2) b
(3) b & c (4) a & d

Ans. 3

106. What would be the consequence of SA node fails to initiate an impulse ?
(1) Ventricles stop contracting
(2) Ventricles continue contraction at slower rate.
(3) Heart rate would be normal
(4) Immediate cardiac arrest leading to death.
Ans. 2

107. Which of the following blood vessel contains heighest amount of urea ?
(1) Hepatic portal vein (2) Hepatic vein
(3) Renal vein (4) Renal artery
Ans. 2

108. Find the incorrect statements
(a) Drones (male honey bees) have grandfathers but no fathers.
(b) Maximum life span is species characteristics
(c) In parthenogenesis genetic variations are absent
(d) Menstrual cycle is absent in Gorilla
(e) Oviparity always need water medium for fertilization
(f) Life span has absolutely no relation with the size of an organism.
(1) a, b, c & d (2) c, d & e
(3) a, e & f (4) b, c & e
Ans. 2

109. What will be the day of ovulation of the duration of reproductive cycle in female is 20 days?
(1) 10th day (2) 6th day
(3) 14th day (4) 20th day
Ans. 2

110. For the birth of 100 babies minimum how many meiotic divisions required ?
(1) 100 (2) 125 (3) 200 (4) 250
Ans. 2

111. Find the incorrect statements
(a) Mother's milk is rich in iron and IgA.
(b) Foetal ejection reflex results in release of oxytocin from foetal pituitary.
(c) Major contributor of seminal plasma is seminal vesicle
(d) Primary oocyte & WBC contain same number of chromosomes.
(e) Removal of ovaries during 5th month of pregnancy may lead to abortion
(1) a, b & e (2) b & d
(3) b, d & e (4) a, b & c
Ans. 1

112. IVF technique includes
(1) GIFT (2) AI
(3) IUT (4) All of these
Ans. 3

113. Amniocentesis helps in
(1) Determination of genetic disorder
(2) Determination of sex of foetus
(3) Determination of metabolic disorder
(4) All of these
Ans. 4

114. Which of the following is not a part of human evolution?
(1) Bipedal locomotion
(2) Loss of tail
(3) Reduction of jaw bone
(4) All are the parts of human evolution
Ans. 2

115. How lamarck would explain the reason for increased antibiotic resistance in bacteria - " the experiment conducted by Lederberg"?
(1) The antibiotic resistance property was present in bacteria from begining. They got selected by nature when antibiotic was applied to the culture medium.
(2) Few bacteria develope antibiotic resistance when antibiotic was applied and would survived
(3) Application of antibiotic in medium caused sudden change in the genetic system of bacteria, thus they developed antibiotic resistance.
(4) Application of antibiotic would creat a new species of bacteria that continued to live while pre existing bacteria perished from culture plate.
Ans. 2

116. What is the similiarity between Darwin & Mendel?
(1) Both believed in genes controlling a character
(2) Both believed in transmission of characters from parents to offspring
(3) Both worked on natural selection
(4) Both believed on continuous variation.
Ans. 2

117. Which of the following conditions leads to infertility or sterility exclusively in male?
(a) Klinefelter syndrome
(b) Down's syndrome
(c) Turner's syndrome
(d) Haemophilia
(1) a (2) a, b
(3) a, b & c (4) a, b, c & d
Ans. 1

118. Which of the following disease never affect genital/ reproductive structures?
(1) Mumps (2) AIDS
(3) Gonorrhoea (4) Syphilis

Ans. 2

119. Which of the following is an example of artificial passive immunity?
(1) Administration of Anti Tetanus Serum (ATS) after inury
(2) Administration of polio vaccine
(3) Transmission of antibodies via placenta from mother to foetus
(4) Administration of antibodies to infant via breast feeding.

Ans. 1

120. The confirmatory test for HIV before appearance of symptoms of AIDS
(1) ELISA (2) Western blot
(3) PCR (4) Both 2 & 3

Ans. 3