HINTS & SOLUTIONS

PART-I (Physics)

1. The displacement ....
Ans. (A)

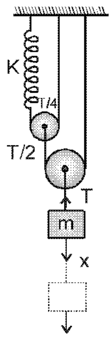
2. Find the natural ....

Sol. (D)
Let mass 'm' falls down by x so spring extends by 4x ;

$\therefore \frac{T}{4} = k(4x)$

$T = (16k)\, x$

Where T is the restoring force on mass m



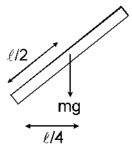
$\therefore f = \frac{1}{2\pi}\sqrt{\frac{16k}{m}}$

$f = \frac{2}{\pi}\sqrt{\frac{k}{m}} = \frac{2}{\pi} \times \sqrt{\frac{25}{1}} = \pi$ Hz

3. A body is performing ....
Ans. (D)

4. A uniform rod of ....
Sol. (D)

At the instant string is cut :



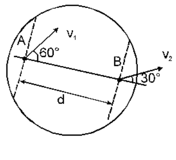
$mg.\frac{\ell}{4} = \frac{m\ell^2}{3}.\alpha \;\Rightarrow\; \alpha = \frac{3g}{4\ell}$

$a_{cm} = \alpha\,\frac{\ell}{2} = \frac{3g}{8} \Rightarrow a_{horizontal}$

$= a_{cm}\sin\theta = \frac{3g}{8} \times \frac{\sqrt{3}}{2} = \frac{3\sqrt{3}g}{16}$ m/s^2

5. Two points A & B ....
Sol. (D)
For rigid body separation between two point remains same.
$v_1 \cos 60° = v_2 \cos 30°$

$\frac{v_1}{2} = \frac{\sqrt{3}\,v_2}{2} \;\Rightarrow\; v_1 = \sqrt{3}\,v_2$



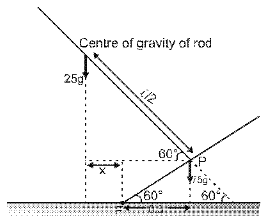
$\omega_{disc} = \left|\frac{v_1 \sin 60° - v_2 \sin 30°}{d}\right| = \left(\frac{\sqrt{3}v_1 - v_2}{2d}\right)$

$= \left|\frac{\sqrt{3}\times\sqrt{3}v_2 - v_2}{2d}\right| = \frac{2v_2}{2d} = \frac{v_2}{d}$

$\Rightarrow \omega_{disc} = \frac{v_2}{d} = \frac{v_1}{\sqrt{3}d}$

all the options are correct

6. A 75 kg man holds ....
Sol. (D)



Consider (man + rod) as system,
Torque on system about F is zero

$\tau = 75g(0.5) - 25g(x) = 0$

$\Rightarrow x = 1.5$

$\Rightarrow \frac{\ell}{2}\cos 60° = x + 0.5 \;\Rightarrow\; \frac{\ell}{4} = 1.5 + 0.5$

$\Rightarrow \ell = 8$m.

7. A rod of mass ....
Sol. (D)

$W_F = KE\uparrow$ where $W_F = \tau\theta = (F\ell)\left(\frac{\pi}{2}\right)$

$(F\ell)\frac{\pi}{2} = \frac{1}{2}\left(\frac{m\ell^2}{3}\right)\omega^2$

$\omega = \sqrt{\frac{3F\pi}{m\ell}}$

$P_F = (\tau)\,(\omega)$

$P_F = (F\ell)\sqrt{\frac{3F\pi}{m\ell}}$

$P_F = \sqrt{\frac{3F^3\pi\ell}{m}} = \sqrt{\frac{3\times(3)^3\times\pi\times 1}{\pi}} = 9$ watt

8. Consider a uniform ....
Sol. (C)
T.K.E. of disc

$= \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$

$$= \frac{1}{2}mv^2 + \frac{1}{2} \times \frac{mr^2}{2} \times \left(\frac{v}{r}\right)^2 = \frac{3}{4}mv^2 = 75 \text{ J}$$

Velocity of particles of upper half is more than that of lower half hence kinetic energy of upper half will be more than $\frac{3}{8}$ mv^2 . = 37.5 J

9. Select correct statement ....
Ans. (D)

10. A standing wave ....
Ans. (A)

Sol. Total mechanical energy of vibration = $\int \frac{1}{2} dm v^2$

$dm = \mu\, dx$, $\mu = 10^3$ kg/m^3 (0.04) m^2
$\mu = 40$ kg/m

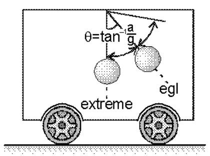
$v(x) = \frac{ds}{dt}$ = 5 mm $\sin \pi x$ (– sin (200 t)

Total mechanical energy = $\frac{1}{2}\mu \int v^2(x)dx$ = 10 joules.

11. A simple pendulum ....
Sol. (BC)
bob will oscillate about equilibrium position

with amplitude $\theta = \tan^{-1}\left(\frac{a}{g}\right)$ for any value of a.

If a < < g, motion will be SHM, and then



time period will be $2\pi\sqrt{\frac{\ell}{\sqrt{a^2+g^2}}}$.

12. Which of the ....
Sol. (ABCD)
Work done by kinetic friction may be positive when it acts along motion of the body.
Friction on rigid body rolling on inclined plane is along upward because tendency of slipping is downwards.

13. A plank with a ....
Ans. (BCD)

14. A steel wire is ....
Sol. (ABC)
The mechanical strain

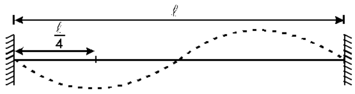
$= \frac{\Delta\ell}{\ell} = \alpha\,\Delta T = 1.21 \times 10^{-5} \times 20 = 2.42 \times 10^{-5}$

The tension in wire

$= T = Y\frac{\Delta\ell}{\ell}A = 2 \times 10^{11} \times 2.42 \times 10^{-5} \times 10^{-6} = 48.4$ N

$\therefore$ speed of wave in wire

$$V = \sqrt{\frac{T}{\mu}} = \sqrt{\frac{48.4}{0.1}} = 22 \text{ m/s}$$



Since the wire is plucked at $\frac{\ell}{4}$ from one end

The wire shall oscillate in 1st overtone (for minimum number of loops)

$\lambda = \ell = 1$m

Now $V = f\lambda$ or $f = \frac{V}{\lambda}$ = 22 Hz.

15. The vibrations ....
Sol. (ABCD)

$y = 4 \sin\left(\pi\frac{x}{15}\right)\cos 96\pi t$

At x = 5 cm, $y = 4\sin\frac{\pi}{3}\cos(96\pi t)$ and

$y_{max} = 2\sqrt{3}$ cm

Positions of nodes is given by equation

$\sin\left(\frac{\pi x}{15}\right) = 0 \Rightarrow \frac{\pi x}{15} = n\pi$

$\Rightarrow x = 15n$

At x = 7.5 cm and t = 0.25 sec.

Velocity of the particle = $\frac{\partial y}{\partial t}$

$= -344\pi \sin\left(\frac{\pi x}{15}\right)\sin(96\pi t) = 0$

16. The equation ....
Sol. (A)
The equation of wave moving in negative x-direction, assuming origin of position at x = 2 and origin of time (i.e. initial time) at t = 1 sec.

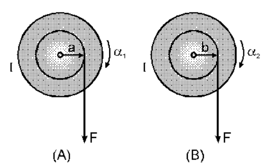
$y = 0.1 \sin(4\pi(t-1) + 8x)$

Shifting the origin of position to left by 2m, that is, to x = 0. Also shifting the origin of time backwards by 1 sec, that is to t = 0 sec.

$y = 0.1 \sin[(4\pi(t-1) + 8(x-2)]$

17. The speed of ....
Sol. (C)
As given the particle at x = 2 is at mean position at t = 1 sec.
$\therefore$ its velocity $v = \omega A = 4\pi \times 0.1 = 0.4\pi$ m/s.

18. A person pulls ....
Sol. (9)
For A $F.a = I\alpha_1$



$\alpha_1 = \frac{Fa}{I}$ $\alpha_2 = \frac{Fb}{I}$

$\omega_f = \omega_0 + \alpha t$ $\omega_{f2} = \frac{Fbt}{I}$ $\omega_{f1} = \frac{Fat}{I}$

$W_1 = \Delta k = \frac{1}{2} I\omega_{f\,1}^2$

$= \frac{1}{2} . I . \frac{F^2a^2t^2}{I^2} = \frac{F^2a^2t^2}{2I}$

$W_2 = \frac{F^2b^2t^2}{2I}$; $\frac{W_2}{W_1} = \frac{b^2}{a^2} = 9.$

19. A rigid structure ....

Sol. (8)

When the structure becomes inverted, there is no decrease in the potential energy of the ring. therefore,

Decrease in PE of the rod = Gain in rotational kinetic energy of the structure

$\Rightarrow M.g.\ 4R = \frac{1}{2} I_{sy}\, \omega^2$

(As COM of the rod comes down by distance 4R)

Now $I_{sy} = \frac{MR^2}{2} + \left[\frac{M.4R^2}{12} + M.4R^2\right]$

$= \frac{MR^2}{2} + \frac{13MR^2}{3} = \frac{29MR^2}{6}$

$\omega = \sqrt{\frac{8M.gR}{\left(\frac{29}{6}\right)MR^2}} = \sqrt{\frac{48g}{29R}} = 8$ rad/s

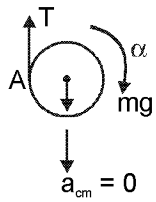
20. In the figure shown ....

Sol. (2)

$a_A = a = \alpha . R$ ...(i)

$T - mg = 0$ ...(ii)

$T.R = \frac{mR^2}{2}.\alpha$ ....(iii)



$\therefore \quad g = \frac{a}{2}$

Ans. 2

21. A non–uniform ....

Sol. (2)

$\mu = Kx = \frac{dM}{dx}$

$\int_O^M dM = \int_O^{\ell} Kx\,dx$ and $K = \frac{2M}{\ell^2}$

$V = \sqrt{\frac{F}{\mu}} = \sqrt{\frac{F}{Kx}} = \frac{dx}{dt} \quad \int_O^{\ell} \sqrt{x}\,dx = \sqrt{\frac{F}{K}} \int_O^t dt$

$\therefore \quad t = \sqrt{\frac{4\ell^3}{9}.\frac{K}{f}} = \sqrt{\frac{4\ell^3}{9F}.\frac{2m}{\ell^2}}$

$= \sqrt{\frac{8M\ell}{9F}} = \sqrt{\frac{8 \times 45 \times 1.5}{9 \times 15}} = 2.$

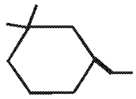
PART-II (Chemistry)

22. IUPAC name of the compound ....

Sol. (B)

23. Which of the following cycloalkanes ....

Sol. (A)



(3-Ethyl-1,1-dimethylcylcohexane)

24. Which is correct about ....

Sol. (C)

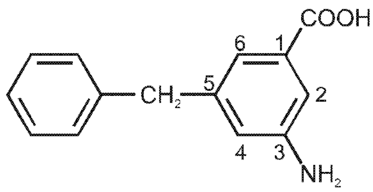
1°, 2° and 3° amines are functional isomers

25. Identify (X) and (Y) respectively ....

Sol. (C)

26. The IUPAC name of the ....

Sol. (B)



27. The correct statement ....

Sol. (D)

28. What is the relation between ....

Sol. (C)

29. What is correct about following ....

Sol. (D)

30. The smallest aldehyde and its ....

Sol. (C)

31. An optically pure compound X ....

Sol. (C)

% optical purity of mixture $= \frac{[\alpha]_{obs}}{[\alpha]_{pure}} \times 100$

$= \frac{10}{20} \times 100 = 50\ \%$

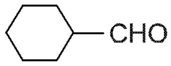
so $d - \ell = 50$

and $d + \ell = 100$

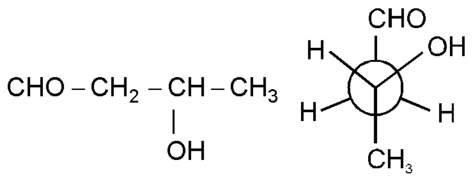
2d = 150

∴ d = 75% and ℓ = 25%

32. Which is / are the correct IUPAC ....
Sol. (ACB)

The correct IUPAC name of  is Cyclohexanecarbaldehyde

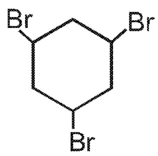
33. Consider the Newmann projection ....
Ans. **(AB)**



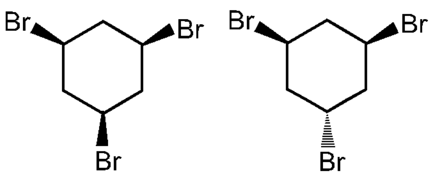
Gauche form

(minimum T.S. and intramolecular H bonding).

34. Which of the following ....
Sol. (ACD)



has 2 geometrical isomers



35. The correct statement(s) ....
Sol. (AD)

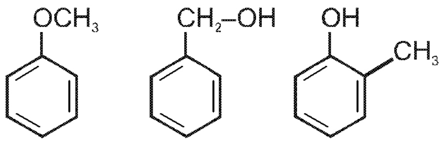
36. Which of the following is/are ....
Sol. (ABCD)

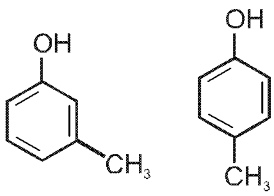
37. The correct names for the ....
Sol. (B)
In naming the above compound, are follow the rules for priority under (E,Z) and (R,S) system. (Read rules in the reading material in case of doubt).

38. The above structure can have ....
Sol. (B)
Other stereoisomers of above (2R,3E) stereoisomer are (2R,3Z), (2S,3E), (2S,3Z) out of this (2S,3E) is enantiomers. Hence number of diastereomers = 2.

39. How many structural isomers ....
Sol. (5)

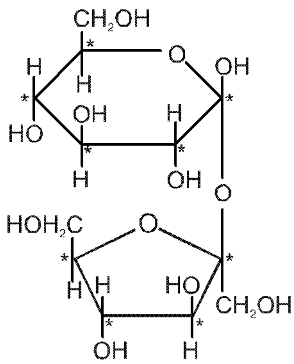
Sol.



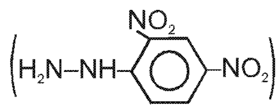


40. The number of chiral centers ....
Ans. 9

Sol.



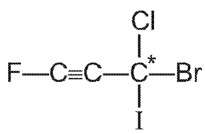
= 9

41. 2,4 DNP 

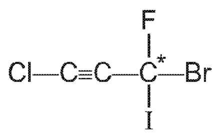
reacts with ....

Ans. **3**
Sol. Benzaldehyde is unsymmetrical and gives 2 product but formaldehyde is symmetrical and gives only one product.

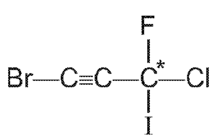
42. Total number of alkynes ....
Sol. (8)



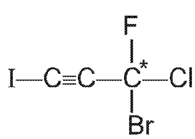
d + ℓ



d + ℓ



d + ℓ



d + ℓ

PART-III (Mathematics)

43. Given that $\vec{a} = \hat{i}+\hat{j}+\hat{k}$, $\vec{c} = \hat{j}-\hat{k}$ ....

Sol. (C)

$\vec{a} \times \vec{b} = \vec{c}$

$\vec{a} \times (\vec{a} \times \vec{b}) = \vec{a} \times \vec{c}$

$(\vec{a}\cdot\vec{b})\,\vec{a} - (\vec{a}\cdot\vec{a})\,\vec{b} = \vec{a} \times \vec{c}$

$$3(\hat{i}+\hat{j}+\hat{k}) - 3\vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 1 & 1 \\ 0 & 1 & -1 \end{vmatrix}$$

$3\vec{b} = 3(\hat{i}+\hat{j}+\hat{k}) - \{\hat{i}(-1-1) - \hat{j}(-1) + \hat{k}(1)\}$

$= 3\hat{i}+3\hat{j}+3\hat{k}+2\hat{i}-\hat{j}-\hat{k}$

$= 5\hat{i}+2\hat{j}+2\hat{k}$

44. If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar vector ....

Sol. (B)

Given $\vec{d} = \lambda\vec{a} + \mu\vec{b} + \nu\vec{c}$

Forming dot product with $\vec{b}\times\vec{c}$

$(\vec{b}\times\vec{c}).\vec{d} = \lambda[\vec{b}\vec{c}\vec{a}] + \mu[\vec{b}\vec{c}\vec{b}] + \nu[\vec{b}\vec{c}\vec{c}]$

$[\vec{b}\vec{c}\vec{d}] = \lambda[\vec{a}\vec{b}\vec{c}] = \lambda[\vec{b}\vec{c}\vec{a}]$

$\Rightarrow \lambda = \dfrac{[\vec{b}\vec{c}\vec{d}]}{[\vec{b}\vec{c}\vec{a}]}$

45. A plane whose equation is $2x - y + 3z + 5 = 0$ ....

Sol. (A)

The new equation is $2x - y + 3z + 5 + \lambda(5x - 4y - 2z + 1) = 0$

or $(2 + 5\lambda)x - (1 + 4\lambda)y + (3 - 2\lambda)z + 5 + \lambda = 0$

It is perpendicular to the plane $2x - y + 3z + 5 = 0$

$\therefore$ $2(2 + 5\lambda) + 1 + 4\lambda + 3(3 - 2\lambda) = 0$

or $7 + 4\lambda = 0$

$\Rightarrow \lambda = -\dfrac{7}{4}$

Substituting for λ we get $27x - 24y - 26z = 13$

46. In a cricket championship there......

Sol. (A)

Let n be the number of teams

$\because$ ${}^nC_2 = 36$

$\Rightarrow \dfrac{n(n-1)}{1.2} = 36$

$\Rightarrow n(n - 1) = 72 = 9 \times 8$

$\Rightarrow n = 9$

47. Three straight lines L_1, L_2, L_3 ....

Sol. (D)

Total number of points on a three lines are $m + n + k$.

$\therefore$ Maximum number of triangles

$= {}^{m+n+k}C_3 - {}^mC_3 - {}^nC_3 - {}^kC_3$

(subtract those triangles in which point on the same line)

48. If $(1 + x + x^2)^n = \sum_{r=0}^{2n} a_r x^r$ then,........

Sol. (A)

We have

$(1 + x + x^2)^n = a_0 + a_1x + a_2x^2 + a_3x^3 + ... + a_{2n}x^{2n}$

On differentiating both sides, we get

$n(1 + x + x^2)^{n-1}(1 + 2x) = a_1 + 2a_2x + 3a_3x^2 + ... + 2na_{2n}x^{2n-1}$

On putting $x = -1$ we get

$\Rightarrow n(1 - 1 + 1)^{n-1}(1 - 2) = a_1 - 2a_2 + 3a_3 - ..... - 2na_{2n}$

$\Rightarrow a_1 - 2a_2 + 3a_3 - .... - 2na_{2n} = -n$

49. If $|x| < 1$, then.......

Sol. (A) $(1 + x + x^2)^{-3} = \left[\dfrac{1}{(1+x+x^2)}\right]^3$

$= \left[\dfrac{1-x}{1-x^3}\right]^3$

$= (1 - x)^3(1 - x^3)^{-3}$

$= (1 - x^3 + 3x^2 - 3x)(1 + 3x^3 + 6x^6 + ...)$

$\therefore$ Coefficient of x^6 in $(1 + x + x^2)^{-3}$

$= 6 - 3 = 3$

50. The digit at the unit.........

Sol. (B)

$(19)^{2005} + (11)^{2005} - (9)^{2005}$

$= (10 + 9)^{2005} + (10 + 1)^{2005} - (9)^{2005}$

$= (9^{2005} + {}^{2005}C_1(9)^{2004} \times 10 + ...) + ({}^{2005}C_0 + {}^{2005}C_1 10 + ...) - (9)^{2005}$

$\therefore$ Unit digit $= 1$

51. If the sum of the coefficients ....

Sol. (D)

$(a^2 - 6a + 11)^{10} = 1024$

$\Rightarrow (a^2 - 6a + 11)^{10} = 2^{10}$

$\Rightarrow a^2 - 6a + 11 = 2$

$\Rightarrow a^2 - 6a + 9 = 0$

$\Rightarrow (a - 3)^2 = 0$

$\Rightarrow a = 3$

52. If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar vectors............

Sol. (C)

Condition for coplanarity

$$\begin{vmatrix} 1 & 2 & 3 \\ 0 & \lambda & 4 \\ 0 & 0 & 2\lambda - 1 \end{vmatrix} = 0$$

$\Rightarrow (2\lambda - 1)(\lambda) = 0 \Rightarrow \lambda = 0, \frac{1}{2}$

53. Kanchan has 10 friend among.......

Sol. (B, D)

The number of ways of inviting, with the couple not included = ${}^{8}C_5$.

The number of ways of inviting, with the couple included = ${}^{8}C_3$.

$\therefore$ The required number of ways

$= {}^{8}C_5 + {}^{8}C_3 = {}^{8}C_3 + {}^{8}C_3 \ (\because {}^{8}C_5 = {}^{8}C_3)$

Also ${}^{10}C_5 - 2 \times {}^{8}C_4 = \frac{10!}{5!5!} - 2 \times \frac{8!}{4!4!}$

$= \frac{10.9.8.7.6}{120} - 2 \times \frac{8.7.6.5}{24}$

$= 9 \times 4 \times 7 - 140 = 112 = 2 \times \frac{8!}{3!5!}$

54. The term independent of x in the expansion ....

Sol. (A,C)

Expression $= (-1)^n . \frac{(1-x^2)^n}{x^n}$

$\therefore$ the term independent of x

= the coefficient of x^n in $(-1)^n.(1 - x^2)^n$

= the coefficient in

$(-1)^n \{{}^{n}C_0 + {}^{n}C_1(-x^2) + {}^{n}C_2(-x^2)^2 + ... + {}^{n}C_n(-x^2)^n\}$

and the expansion contains only even powers of x.

55. Let $R = (8 + 3\sqrt{7})^{20}$ .....

Sol. (B, C)

$R = [R] + g = (8+3\sqrt{7})^{20} = {}^{20}C_0 8^{20} + {}^{20}C_1 8^{19}(3\sqrt{7}) + ...$, where $0 < g < 1$.

$f = (8 - 3\sqrt{7})^{20} = {}^{20}C_0 . 8^{20} - {}^{20}C_1 8^{19}(3\sqrt{7}) + ...$, where $0 < f < 1$.

$\therefore$ $[R] + g + f = 2[{}^{20}C_0.8^{20} + {}^{20}C_2 8^{18}(3\sqrt{7})^2 + ...]$ = an even integer

$\therefore$ g + f = an integer = 1 as $0 < g < 1$, $0 < f < 1$.

$\therefore$ [R] = an even integer – 1 = an odd integer

Also , $R - [R] = g = 1 - f = 1 - (8 - 3\sqrt{7})^{20} = 1 - \frac{1}{(8+3\sqrt{7})^{20}}$

56. If $\vec{a}, \vec{b}, \vec{c}$ are noncoplanar ....

Sol. (A, B, C)

$\vec{b} \times \vec{c} = \vec{a} \Rightarrow [\vec{a}\,\vec{b}\,\vec{c}] = (\vec{a}.\vec{a}) = |\vec{a}|^2$

Similarly $[\vec{a}\,\vec{b}\,\vec{c}] = |\vec{b}|^2 = |\vec{c}|^2$

$\therefore |\vec{a}| = |\vec{b}| = |\vec{c}| = \sqrt{[\vec{a}\,\vec{b}\,\vec{c}]}$

Now , $[\vec{b}\times\vec{c}\ \ \vec{c}\times\vec{a}\ \ \vec{a}\times\vec{b}] = [\vec{a}\,\vec{b}\,\vec{c}]^2$

$\therefore [\vec{a}\,\vec{b}\,\vec{c}] = [\vec{a}\,\vec{b}\,\vec{c}]^2$ (from the question)

But $[\vec{a}\,\vec{b}\,\vec{c}] \neq 0$. So :, $[\vec{a}\,\vec{b}\,\vec{c}] = 1$.

Hence , $|\vec{a}| = |\vec{b}| = |\vec{c}| = 1$.

57. The equation of a ....

Sol. (BC) For A(1, 1, 1), $2x - y - 3z - 5 = 2 - 1 - 3 - 5 < 0$

For B(2, 1, – 3), $2x - y - 3z - 5 = 4 - 1 + 9 - 5 > 0$

For C(1, – 2, – 2), $2x - y - 3z - 5 = 2 + 2 + 6 - 5 > 0$.

For D (– 3, 1, 2), $2x - y - 3z - 5 = -6 - 1 - 6 - 5 < 0$

$\therefore$ A, D are on one side of the plane and B, C are on the other side.

$\therefore$ the line segments AB, AC, BD, CD intersect the plane.

58. If p is a prime.......................

Sol. (B) $(p - 1)\sigma(p^n)$

$= (p - 1)(1 + p + p^2 + ... + p^n)$

$= p^{n+1} - 1$

59. If p, q are two ....

Sol. (B) $\sigma(pq) = 1 + p + q + pq = (1 + p)(1 + q)$

60. In a certain test there are..................

Ans. 6

Sol. Since the number of students giving wrong answers to at least i question (i = 1, 2,......, n) = 2^{n-i}

The number of student answering exactly i $(1 \le i \le n - 1)$ questions wrongly = {the number of students answering at least i questions wrong, i = 1, 2,..... n) } – {the number of students answering at least (i + 1) question wrong $(2 \le i + 1 \le n)$} $= 2^{n-i} - 2^{n-(i+1)} (1 \le i \le n - 1)$.

Now, the number of students answering all the question wrongly $= 2^{n-n} = 2^0$.

Thus the total number of wrong answers

$= 1(2^{n-1} - 2^{n-2}) + 2(2^{n-2} - 2^{n-3}) + 3(2^{n-3} - 2^{n-4}) + ... + (n-1)(2^1 - 2^0) + n(2^0)$

$= 2^{n-1} + 2^{n-2} + 2^{n-3} + ... + 2^0 = 2^n - 1$ [$\because$ its a G.P.]

$\therefore$ As given $2^n - 1 = 2047 \Rightarrow 2^n = 2048 = 2^{11}$

$\Rightarrow n = 11 \Rightarrow n - 5 = 6$

61. If the sum of the ....

Ans. 1

Sol. Accordingly , $(\alpha - 2 + 1)^{35} = (1 - \alpha)^{35}$

$\Rightarrow \quad (\alpha - 1)^{35} = (1 - \alpha)^{35} \Rightarrow \quad \alpha = 1.$

62. If the planes x = cy + bz,..............

Ans. 1

Sol. Let l , m, n direction ratios of the line lying in the three planes, then the line is perpendicular to the normals to these planes, so that we have

$l - cm - bn = 0$

$- cl + m - an = 0$

$- bl - am + n = 0$

Elimination l, m, n from these questions we get

$$\begin{vmatrix} 1 & -c & -b \\ -c & 1 & -a \\ -b & -a & 1 \end{vmatrix} = 0$$

$\Rightarrow \quad 1 - a^2 + c(- c - ab) - b(ac + b) = 0$

$\Rightarrow \quad a^2 + b^2 + c^2 + 2abc = 1$

63. If $[\vec{b}\ \vec{c}\ \vec{d}]$ = 4 and ....

Ans. 8

Sol. We know that (a × b) × c = (a . c) b – (b . c)a. Putting c × d = e,

we get

(a × b) × (c × d) = (a × b) × e = (a . e)b – (b . e)a

= {a . (c × d)}b – {b . ((c × d)}a

= [a c d]b – [b c d]a ...(1)

Similarly ,

(a × c) × (d × b) = [a d b]c – [c d b] a

= [a d b]c – [b c d] a ...(2)

Also

(a × d) × (b × c) = – (b × c) × (a × d)

= (b × c) × (d × a)

= [b d a]c – [c d a]b

= – [a d b]c – [a c d]b ...(3)

from (1), (2) and (3), we get -

a = (a × b) × (c × d) + (a × c) × (d × b) + (a × d) × (b × c)

= [a c d] b – [b c d] a + [a d b]c – [b c d]a – [a d b] c – [a c d] b

= – 2[b c d]a. = – 8 a.