CAREER POINT

JEE Main

RTS

Part TEST-1

Physics, Chemistry & Mathematics

Hints & Solutions

RTS/26/PT-1/PCM

PHYSICS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	3	3	3	1	2	3	1	1	3	4	3	3	4	2	3
Ques.	16	17	18	19	20	21	22	23	24	25					
Ans.	2	1	4	3	2	2.00	2.00	8.00	5.00	4.00					

CHEMISTRY

Ques.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	3	1	2	2	2	4	2	2	4	3	4	2	4	2	3
Ques.	41	42	43	44	45	46	47	48	49	50					
Ans.	1	4	1	4	4	8.00	5.00	2.00	7.00	5.00					

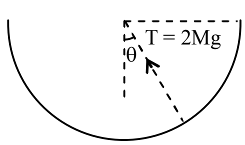
MATHEMATICS

Ques.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
Ans.	3	3	3	3	2	1	4	3	3	3	4	3	4	2	3
Ques.	66	67	68	69	70	71	72	73	74	75					
Ans.	2	2	3	2	3	9.00	142.00	3360.00	0.50	10.00					

PHYSICS

Section-I

1.[3]



$$T - Mg\cos\theta = \frac{Mv^2}{r}$$

where $T = 2Mg$ and $\frac{1}{2}Mv^2 = Mg\,(r\cos\theta)$

2. [3] $P = mK^2r^2t$

$$\left(\frac{mdV}{dt}\right) V = mK^2r^2t$$

$$\int VdV = \int K^2r^2tdt$$

$V = Krt$

So centripetal acceleration

$$= \frac{V^2}{r} = K^2rt^2$$

3.[3] $E_K = \frac{P^2}{2m}$

$$\frac{\sqrt{E_k}}{P} = \frac{1}{\sqrt{2m}} = \text{const.}$$

4.[1] $Mg = Kx \Rightarrow x = \frac{Mg}{K}$ … (1)

$\frac{1}{2}Kx^2 = mgx \Rightarrow x = 2mg/K$

From relation $m = M/2$

5.[2] Center of mass resides always near to heavier mass.

6.[3] $F = \frac{2mv\cos\theta}{t}$

7.[1] $X_{cm} = \frac{m_1x_1 + m_2x_2}{m_1 + m_2}$, $y_{cm} = \frac{m_1x_1 + m_2x_2}{m_1 + m_2}$

8.[1]

9.[3] $I = \frac{7}{5}MR^2 = MK^2$

$K = \sqrt{\frac{7}{5}}.R$

10.[4] $I = I_{cm} + Md^2$

11.[3]

12.[3] Zero

13.[4] $a = \frac{m_1g - m_2g}{m_1 + m_2}$; $T = \frac{2m_1m_2g}{m_1 + m_2}$

14.[2] $H_A = 2H_B$

$\Rightarrow (u\sin\theta)_A = \sqrt{2}\ (u\sin\theta)_B$

& $T_A = \sqrt{2}T_B$

$R_e = \frac{24 \times u_y}{g}$ so $R_1 = R_2$ if

$u_{xB} = \sqrt{2}\ u_{xA}$

15.[3] $E\sin^2\theta = \frac{E}{2} \Rightarrow \theta = 45°$

$R = \frac{u^2}{g} = \frac{2(mu^2)}{2gm} = \frac{2E}{(mg)}$

16. [2] $\vec{v}_1 = 5\hat{i}$ m/s $\vec{v}_2 = 5\hat{j}$ m/s

$\Delta\vec{v} = \vec{v}_2 - \vec{v}_1$

$= 5\hat{j} - 5\hat{i} = 5(\hat{j} - \hat{i})$ m/s

17.[1] $s_{5th} = \frac{1}{2}a(2n - 1)$

$= \frac{1}{2} \times 8(2 \times 5 - 1)$

$= 4 \times 9 = 36$ m

18.[4] $d = \frac{m}{V} = \frac{m}{\pi r^2 \ell}$

By Solving % Error in d

$= (1\%) + 2 \times (\pm 1\%) + 1\%$

$=- 4\%$

19.[3] Use $C = \sqrt{A^2 + B^2 + 2AB\cos\theta}$

20.[2] $K = \frac{[M]}{[W]} = \frac{[M]}{[M^1L^2T^{-2}]} = [L^{-2}T^2]$

Section-II

21. **[2.00]**

For maximum compression, velocity of each block is same.

By momentum conservation.

$1 \times 2 = 1 \times v + 1 \times v$

$v = 1$ m/s

By energy conservation.

$\frac{1}{2} \times 1 \times 2^2 = \frac{1}{2} \times 1 \times (1)^2 + \frac{1}{2} \times 1 \times (1)^2 + \frac{1}{2}kx^2$

$\Rightarrow x = 0.2$ m

$= 2/10$ m

$X = 2$m

22. **[2.00]**

$L = 4 \times (1/2) \times 5 + 3 \times (1/2) \times 5$

$= \frac{35}{2}$

23. **[8.00]**

$a = \frac{2 \times 10}{2 + \frac{1}{3} + 1} = 6$ m/s^2, $2 \times g - T = 2 \times 6$

$\Rightarrow T = 8N$

24. **[5.00]**

$v_x = \frac{dx}{dt}$ and $v_y = \frac{dy}{dt}$

$(V_x)_{t=0} = \frac{3nR}{r}$

25. **[4.00]**

$x = u_xt + \frac{1}{2}a_xt^2$

$\Rightarrow 84 = 5t + \frac{1}{2} \times 3t^2 \Rightarrow t = 6$ sec

$\therefore y = u_yt + \frac{1}{2}a_yt^2$

Hence, $y = \frac{1}{2} \times 2 \times 36 = 36$ m $= 9 \times n$

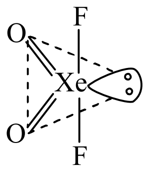
$n = 4$

CHEMISTRY

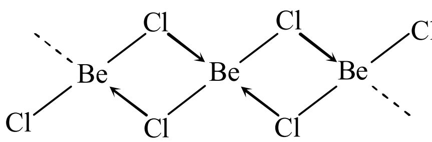
Section-I

26.[3] Smaller is the size of cation greater will be covalent character.

27. [1]



28.[2] $BeCl_2(s)$ is polymer.



29.[2] Correct order of catenations :

S > Se > O > Te

30.[2] S belongs to 3rd period while O belongs to 2nd period

31.[4] $\left.\begin{array}{l} N > O \\ P > S \end{array}\right\downarrow IP\downarrow$

$\therefore$ Correct order of IP is N > O > P > S

32.[2] Order of IE_1

Group (16) < (15) < (17) < (18)

33.[2]

34.[4]

35.[3] No change because at. mass is double

36.[4] mass of one molecule of $H_2O = \dfrac{18}{6.023 \times 10^{23}}$

$\approx 3 \times 10^{-23}$ g

$= 3 \times 10^{-23}$ cm^3

$\therefore$ d = 1 gm/cm^3

37.[2] $\because$ 8g sulphur is present in 100 g of substance

$\therefore$ 32 g sulphur will present $= \dfrac{100}{8} \times 32$

= 400 g

38.[4]

39.[2] $mvr = \dfrac{nh}{2\pi}$

$mv.\ 9x = \dfrac{3h}{2\pi}$

$\dfrac{h}{mv} = 6\pi x$

$\lambda = 6\pi x$

40.[3] $KE = hc\left[\dfrac{\lambda_0 - \lambda}{\lambda_0\lambda}\right]$

$\upsilon^2 = \dfrac{2hc}{m}\left[\dfrac{\lambda_0 - \lambda}{\lambda_0\lambda}\right]$

$\upsilon = \left[\dfrac{2hc}{m}\left(\dfrac{\lambda_0 - \lambda}{\lambda_0\lambda}\right)\right]^{1/2}$

41.[1] $\Delta x\ .\ m\Delta v = \dfrac{h}{4\pi}$

$\dfrac{\Delta x_A}{\Delta x_B} = \dfrac{(m.\Delta V)_B}{(m\Delta V)_A} = \dfrac{2}{1}$

42.[4]

	3S		3P		
	A	B	X	Y	Z
n :	3	3	3	3	3
l :	0	0	1	1	1
m :	0	0	+1	0	–1
s :	$-\frac{1}{2}$	$+\frac{1}{2}$	$+\frac{1}{2}$	$+\frac{1}{2}$	$+\frac{1}{2}$

43.[1] (1) $v \propto \dfrac{z}{n}$ (2) $r \propto \dfrac{n^2}{z}$

(3) P.E. $\propto \dfrac{-z^2}{n^2}$ (4) K.E. $\propto \dfrac{z^2}{n^2}$

44.[4] $K_p = \dfrac{P_{PCl_3}.P_{Cl_2}}{P_{PCl_5}}$

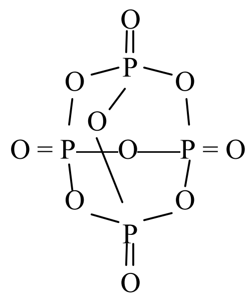
$= \dfrac{a^2p^2}{(1+a)(1-a)p}$

$= \dfrac{a^2p}{1-a^2}$

45.[4] O.N. of each species remains same.

Section-II

46. **[8.00]**



Total σ-bonds = 16

$x = 16$

$\frac{x}{2} = 8$

47. **[5.00]**

Compounds II – VI all have pπ-dπ bonds.

48. **[2.00]**

$IE_3 >> IE_2$

49. **[7.00]**

	$2SO_2$	+ O_2	$\rightarrow$ $2SO_3$
total	4	4	0
at eq^m	4 – 2	4–4×0.2	2
	= 2	= 3	2

Total moles 2+ 3 + 2 = 7

50. **[5.00]**

	$AB_{2(g)}$ $\rightleftharpoons$	$AB_{(g)}$ +	$B_{(g)}$
Initial	100	0	0
At equ.	100 – x	x	x

At eq. $P = 120$

$120 = 100 - x + x + x$

$= 100 + x = 120$

$x = 20$

$$Kp = \frac{x \times x}{100 - x} = \frac{20 \times 20}{100 - 20} = 5$$

MATHEMATICS

Section-I

51.[3] $\frac{x^2 - 3x + 4}{x^2 + 3x + 4} = y$

$x^2 - 3x + 4 = x^2y + 3xy + 4y$

$x^2(1 - y) - 3x(1 + y) + 4(1 - y) = 0$

For 'x' to be real $D \geq 0$

$9(1 + y)^2 - 4^2 (1 - y)^2 \geq 0$

$9 + 9y^2 + 18y - 16 - 16y^2 + 32y \geq 0$

$-7y^2 + 50y - 7 \geq 0$

$7y^2 - 50 y + 7 \leq 0$

$y^2 - 49y - y + 7 \leq 0$

$7y (y - 7) - 1(y - 7) \leq 0$

$\frac{1}{7} \leq y \leq 7$

52. [3] Let α and β are the roots of the equation

$x^2 = 5x - 3$

$x^2 - 5x + 3 = 0$

$x^2 - \left(\frac{\alpha}{\beta} + \frac{\beta}{\alpha}\right)x + 1 = 0$

$x^2 - \left(\frac{\alpha^2 + \beta^2}{\alpha\beta}\right)x + 1 = 0$

Put the value and get the equation

$3x^2 - 19x + 3 = 0$

53.[3] $2x^3 + 6x^2 + x + 2 = 0$ has roots α, β, γ

so, $\alpha + \beta + \gamma = -3$

$\alpha\beta + \beta\gamma + \gamma\alpha = \frac{1}{2}$, $\alpha\beta\gamma = -1$

then, $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma} = \frac{\alpha\beta + \beta\gamma + \gamma\alpha}{\alpha\beta\gamma}$

$= \frac{1/2}{-1} = -\frac{1}{2}$

54.[3] $\because$ $U = \{x : x^5 - 6x^4 + 11x^3 - 6x^2 = 0\}$

$= \{0, 1, 2, 3\}$

$A = \{x : x^2 - 5x + 6 = 0\} = \{2, 3\}$

and $B = \{x : x^2 - 3x + 2 = 0\} = \{1, 2\}$

$\therefore$ $A \cap B = \{2\}$

Hence, $(A \cap B)' = U - (A \cap B)$

$= \{0, 1, 2, 3\} - \{2\} = \{0, 1, 3\}$

55.[2] n(A) = 40% of 10000 = 4000, n(B) = 2000, n(C) = 1000, $n(A \cap B) = 500$ $n(B \cap C) = 300$, $n(C \cap A) = 400$, $n(A \cap B \cap C) = 200$

$\therefore$ $n(A \cap \overline{B} \cap \overline{C}) = n(A \cap (B \cup C)')$

$= n(A) - n(A \cap (B \cup C))$

$= n(A) - n(A \cap B) - n(A \cap C) + n(A \cap B \cap C)$

$= 4000 - 500 - 400 + 200 = 3300$

56.[1]

$\boxed{A \quad\quad\quad\quad\quad}$ $!6$

$\boxed{D \quad\quad\quad\quad\quad}$ $\frac{!6}{!2}$

$\boxed{H \quad\quad\quad\quad\quad}$ $\frac{!6}{!2}$

$\boxed{I \quad\quad\quad\quad\quad}$ $\frac{!6}{!2}$

$\boxed{K \quad\quad\quad\quad\quad}$ $\frac{!6}{!2}$

$\boxed{R|A|A \quad\quad\quad}$ $!4$

$\boxed{R|A|D|A \quad\quad}$ $!3$

$\boxed{R|A|D|H|A \quad}$ $!2$

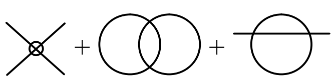
$\boxed{R|A|D|H|I|A}$ 1

So number of words before "RADHIKA" will be

$= !6 + 4 \times \frac{!6}{!2} + !4 + !3 + !2 + 1$

$= 720 + 1440 + 24 + 6 + 2 + 1$

$= 2193$

57.[4] 

$8L + 4C$

$= {}^8C_2.1 + {}^4C_2.2 + {}^8C_1.{}^4C_1.2$

$= 28 + 12 + 64 = 104$

58.[3] ${}^8C_3 = \frac{8 \times 7 \times 6}{3.2.1} = 56$

59.[3]

$$\begin{array}{ccccc} & & & & 1^2 \\ & & 2 & 3 & 2^2 \\ 5 & 6 & 7 & 8 & 3^2 \end{array}$$

10^{th} row $\rightarrow 9^2 + 1, 9^2 + 2, \ldots. 10^2$

11^{th} row $\rightarrow 10^2 + 1, \ldots..$

60.[3] Number of factors is 50.

Therefore, the Coeff. of x^{49} is

$(-1 - 3 - 5 \ldots\ldots\ldots.. - 99) = \frac{-50}{2}(1 + 99)$

$= -2500$

61.[4] Given that x, 2x + 2, 3x + 3 are in G.P.

Therefore, $(2x + 2)^2 = x(3x + 3)$

$\Rightarrow x^2 + 5x + 4 = 0$

$\Rightarrow (x + 4)(x + 1) = 0$

$\Rightarrow x = -1, -4$

Now first term a = x, second term ar = 2 (x + 1)

$\Rightarrow r = \frac{2(x+1)}{x}$,

then 4^{th} term $= ar^3 = x\left[\frac{2(x+1)}{x}\right]^3$

$= \frac{8}{x^2}(x+1)^3$

Putting x = – 4, we get

$T_4 = \frac{8}{16}(-3)^3 = -\frac{27}{2} = -13.5$

62.[3] Let $\log_{\cos x}\sin x = t$, the given equation is

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

$\Rightarrow (t - 1)^2 = 0$

$\Rightarrow t = 1$

$\Rightarrow \log_{\cos x}\sin x = 1$ or $\sin x = \cos x$

$\Rightarrow \tan x = 1$

$\Rightarrow x = \frac{\pi}{4}$

63.[4] $\sin 5^o \sin(60^o - 5^o)\sin(60^o + 5^o)$

$= \frac{1}{4}\sin 15^o = \frac{1}{4}\cdot\frac{\sqrt{3}-1}{2\sqrt{2}} = \frac{\sqrt{3}-1}{8\sqrt{2}}$

64.[2] $\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2(1+\cos 16\theta)}}}}$

$= \sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2\times 2\cos^2 8\theta}}}}$

$= \sqrt{2+\sqrt{2+\sqrt{2(1+\cos 8\theta)}}}$

$= \sqrt{2+\sqrt{2+2\cos 4\theta}} = \sqrt{2+2\cos 2\theta} = 2\cos\theta$

65.[3] cosec 70° + $\sqrt{3}$ sec 110°

$= \sec 20° - \sqrt{3}\ \text{cosec } 20°$

$= 2\left[\frac{1}{2}.\frac{1}{\cos 20°} - \frac{\sqrt{3}}{2}.\frac{1}{\sin 20°}\right]$

$= 2\left[\frac{\sin 30° \sin 20° - \cos 30°.\cos 20°}{\sin 20° \cos 20°}\right]$

$= 2\left(\frac{-\cos 50°}{\frac{1}{2}\sin 40°}\right) = -4$

66.[2] G.M. of $(3.3^2.3^3.....3^n) = (3.3^2.3^3....3^n)^{1/n}$

$= (3)^{\frac{1+2+3+....+n}{n}} = 3^{\frac{n(n+1)}{2n}} = 3^{\frac{n+1}{2}}$

67.[2] $6^n - 3^n = 189$

$3^n(2^n - 1) = 3^3(7)$

$n = 3$

$n^4 = 3^4 = 81$

68.[3] Average speed $= \frac{120+120+120}{\frac{120}{30}+\frac{120}{25}+\frac{120}{50}}$ km/hr

$= \frac{3}{\frac{1}{30}+\frac{1}{25}+\frac{1}{50}}$ km/hr

69.[2] $\sigma = \sqrt{\frac{1}{n}\Sigma x_i^2 - \left(\frac{1}{n}\Sigma x_i\right)^2}$

$= \frac{400}{n} - \left(\frac{80}{n}\right)^2 > 0$

$\because$ n > 16

So, n = 18

70.[3] $\bar{x} = \frac{2+3+5+6+9}{5} = 5$

M.D. $= \frac{|2-5|+|3-5|+|5-5|+|6-5|+|9-5|}{5}$

M.D.$= \frac{3+2+0+1+4}{5}$

M.D. = 2

Section-II

71. **[9.00]**

$\therefore\ x^2 + x - 2 = (x+2)(x-1)$

At $x = 1$ $a + b - 1 + 2 + 3 = 7$

$a + b = 3$ .....(1)

At $x = -2$

$16a - 8b - 5 = -5$

$16a - 8b = 0$

$b = 2a$ .....(2)

Solve (1) & (2)

$a = 1, b = 2$

$\therefore\ a + 4b = 9$

72. **[142.00]**

$\therefore\ N = 2^3.\ 3^1.\ 5^2.\ 7^2 \times 13^1$

No. of proper division = (3 + 1) (1 + 1) (2 + 1) (2 + 1) (1 + 1) – 2 = 142

73. **[3360.00]**

Fixing two 'S' s one in the beginning and the other in the end, we are left with eight letters of which T is repeated thrice, I is repeated twice. Hence, the required number of ways

$= \frac{8!}{3!\,2!} = \frac{8\times7\times6\times5\times4\times3\times2}{12} = 3360.$

74. **[0.50]**

$\frac{a}{1-r} = 1$ .... (1)

$a = ar + ar^2 + ar^3 + ...$

$a = \frac{ar}{1-r}$

$\Rightarrow 1 - r = r$

$\Rightarrow r = \frac{1}{2}$

75. **[10.00]**

$f(x) = 3 + \frac{3\sin 2x}{2} + 2(1 + \cos 2x)$

$= 5 + 2\cos 2x + \frac{3\sin 2x}{2}$

$f(x)_{max} = 5 + \sqrt{4+\frac{9}{4}} = 5 + \frac{5}{2} = b$

$f(x)_{min} = 5 - \frac{5}{2} = a$

$\therefore\ a + b = 10$