FIITJEE MONTHLY ASSESSMENT TEST

PHYSICS, CHEMISTRY & MATHEMATICS

CM – TEST-68-BATCH **CODE: 105981**

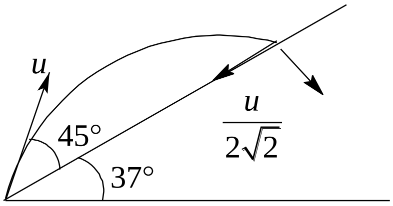
ANSWERS

PHYSICS [PART-I]			CHEMISTRY [PART-II]			MATHEMAICS [PART-III]		
Q. NO.	ANSWER	CONCEPT CODE	Q. NO	ANSWER	CONCEPT CODE	Q. NO	ANSWER	CONCEPT CODE
1	[A]	P111213	1	[D]	C111902	1	[A]	
2	[B]	P110607	2	[D]	C112807	2	[A]	M110708
3	[B]	P110409	3	[D]	C111903	3	[B]	M110518
4	[A]	P111902	4	[B]	C113613	4	[D]	
5	[A]	P111005	5	[A]	C112615	5	[D]	
6	[B]	P111113	6	[C]	C114505	6	[B]	M111001
7	[C]	P112715	7	[B]	C111804	7	[B]	M110414
8	[B]	P111222	8	[D]	C090501	8	[C]	M111005
9	[AD]	P110604	9	[ABD]	C113002	9	[ABCD]	
10	[ACD]	P110410	10	[BC]	C114717	10	[BD]	M110832
11	[AC]	P110502	11	[AD]	C114504	11	[ABC]	M100506
12	[CD]	P111307	12	[ABC]	C113208	12	[AB]	M110402
1	(A)→(PQRS) (B)→(PQRS) (C)→(PQRS) (D)→(R)	P111311	1	(A)→(ST) (B)→(QT) (C)→(R) (D)→(PST)	C120102	1	(A)→(P) (B)→(QS) (C)→(PQS) (D)→(R)	M111214
2	(A)→(R) (B)→(P) (C)→(S) (D)→(Q)	P112223	2	(A)→(RT) (B)→(Q) (C)→(PT) (D)→(S)	C111707	2	(A)→(QR) (B)→(Q) (C)→(QS) (D)→(PQR)	M111415
1	[5]	P110502	1	[5]	C110502	1	[2]	M110402
2	[3]	P110609	2	[4]	C124514	2	[7]	M111506
3	[1]	P111816	3	[8]	C090806	3	[4]	M110112
4	[7]	P111816	4	[7]	C100110	4	[3]	M110517
5	[2]	P111105	5	[3]	C111608	5	[1]	M111512
6	[8]	P110420	6	[5]	C112001	6	[2]	M111130

[Hint & Solutions]

PHYSICS

1. A
2. B



$$t = u/4\sqrt{2} ----(1)$$

$$R = \frac{u}{\sqrt{2}}\left(\frac{u}{4\sqrt{2}}\right) - \frac{1}{2}\times 10\frac{3}{5}\left(\frac{u^2}{32}\right)$$

$$R = \frac{u^2}{32} ----(2)$$

$$V_x = \frac{u}{\sqrt{2}} - 10\left(\frac{3}{5}\right)\frac{u}{4\sqrt{2}} = \frac{-u}{2\sqrt{2}} ----(3)$$

$$V_y = \frac{u}{\sqrt{2}} - 10\left(\frac{4}{5}\right)\frac{u}{4\sqrt{2}} = \frac{-u}{\sqrt{2}} ----(4)$$

$$0 = e\frac{u}{\sqrt{2}}t' - \frac{1}{2}10\left(\frac{4}{5}\right)t'^2$$

$$t' = \frac{eu}{4\sqrt{2}} -----(5)$$

$$\frac{u^2}{32} = \frac{u}{2\sqrt{2}}\left(\frac{eu}{4\sqrt{2}}\right) + \frac{1}{2}10\left(\frac{3}{5}\right)\left(\frac{e^2u^2}{32}\right)$$

$$3e^2 + 2e - 1 = 0$$

$$e = \frac{1}{3}$$

3. B
4. A
5. A

Density of the system increases so upper level will fall.

6. B
7. C
8. B
9. AD

COME:

$$2V_2^2 + 3V_3^2 = 350 -----(1)$$

$$V_{cm} = 8 = \frac{2V_2 + 3V_3}{5} ----(2)$$

Solving (1) and (2)

$V_2 = 5$ and $11\,m/s$

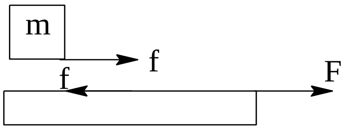
$V_3 = 10$ and $6\,m/s$

10. ACD
11. AC
12. CD

1. (A) – PQRS; (B) – PQRS; (C) – PQRS; (D) – R
2. (A) – R; (B) – P; (C) – S; (D) – Q

1. [5]

$W = Fd -----(1)$



$0 = u - \frac{f}{m}t \Rightarrow t = \frac{mu}{f} -----(2)$

$d = ut = \frac{mu^2}{f} -----(3)$

$F = f ----(4)$

$W = mu^2 \Rightarrow u = \frac{11.25}{1.5} \Rightarrow m = \frac{11.25}{2.25} = 5kg$

2. [3]

Kinetic energy from centre of mass frame

K. E $= \frac{1}{2}(m_1 + m_2)V_{cm}{}^2 + \frac{1}{2}\frac{m_1 m_2}{(m_1 + m_2)}V_{rel}^2$

ΔK.E. =3 Joule

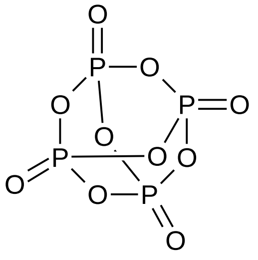
3. [1]
4. [7]
5. [2]
6. [8]

$k_1 x + k_2 x = 5$ when $k_1 = \frac{5}{4}k$ and $k_2 = 5k$

$x = 8mm$

[Hint & Solutions]
CHEMISTRY

1. D
2. D
3. D
4. B



5. A
6. C

Elimination reactions of quaternary ammonium salts for alkene formation

7. B

12 more attack at activating ring

8. D

$\frac{T}{P^{2/5}}$ = constant and $PV = nRT$

For this polytropic process $pV^{5/3} =$ constant

$\therefore \; as \; c = \frac{C_r}{\gamma - 1} + \frac{R}{1-n}$

$\therefore, \; c = 0$

9. ABD

$CaO + H_2O \longrightarrow Ca(OH)_2$

10. BC
11. AD
12. ABC

CaC_2 gives ethyne

Be_2C and Al_4C_3 give methane

1. (A) $\rightarrow$ (s,t)
(B) $\rightarrow$ (q,t)
(C) $\rightarrow$ (r)
(D) $\rightarrow$ (p,s,t)
2. (A) $\rightarrow$ (r,t)
(B) $\rightarrow$ (q)
(C) $\rightarrow$ (p,t)
(D) $\rightarrow$ (s)

[Integer Type Questions]

1. [5]
2. [4]
3. [8]
4. [7]
5. [3]
6. [5]

$Z = \frac{V_m}{V_m^o}$, where V_m^o = the molar volume of a perfect gas

From the given equation

$V_m = b + \frac{RT}{P} = b + V_m^o$

$\therefore V_m = 5b \Rightarrow V_m^o = 4b$

$so\ z = \frac{5}{4} = 1.25$

[Hint & Solutions]
MATHEMATICS
[Answer & Solutions]

1. A

The number of ways when no student failed in any examination $= (2^3 - 1)^4$

The number of ways when out of above cases atleast one subject was not cleared by any students $= 3C_1(3)^4$

The number of ways when out of above cases atleast any two subjects were not cleared by any student $= 3C_2(1)^4$. So required cases $= (2^3 - 1)^4 - 3C_1 3^4 + 3C_2$ = 2161

2. A
3. B

To exhaust all single digit numbers he must have written $\sum_{i=1}^{g} i^2 = 285$ digits, to exhaust 10 he must write 2×10^2 more digits i.e. 485 digits. So 500th digit will occur when he is writing 11.

4. D
5. D

If given equation have rational roots

$\Rightarrow$ $x^2 - ax + b = 0,\ x^2 - bx + a = 0$ have integral roots say α_1, β_1 and α_2, β_2

Let $\frac{1}{\alpha_1} + \frac{1}{\beta_1} = \frac{a}{b}$, $\frac{1}{\alpha_2} + \frac{1}{\beta_2} = \frac{b}{a}$

Suppose $\frac{a}{b} \geq 1$

Case I, $\frac{a}{b} = 1 \quad \Rightarrow \quad \alpha_1 + \beta_1 = \alpha_1\beta_1$

$\Rightarrow \quad (\alpha_1 - 1)(\beta_1 - 1) = 1 \quad \Rightarrow \quad \alpha_1 = 2, \beta_1 = 2$

$\Rightarrow \quad a = b = 4$ and $a + b = 8$

Case II, $\quad \frac{a}{b} > 1 \quad \frac{1}{\alpha_1} + \frac{1}{\beta_1} > 1 \quad \Rightarrow \quad \alpha_1, \beta_1 \ngeq 2$

$\Rightarrow \quad \alpha_1 = 1 \quad \Rightarrow \quad 1 + \beta_1 = a$ and $\beta_1 = b$

$\Rightarrow \quad a - b = 1 \quad \Rightarrow \quad \alpha_2\beta_2 - (\alpha_2 + \beta_1) = 1$

$(\alpha_2 - 1)(\beta_2 - 1) = 2 \quad \Rightarrow \quad \alpha_2 = 2,\ \alpha_3 = 3$

$\Rightarrow \quad b = 5$ and $a = 6 \quad \Rightarrow \quad a + b = 11$

6. B

Option (B) is correct because in this case $a > 0, b < 0$ (let $b = -c$)

$$\Rightarrow \quad -cx^2 + ay^2 = -ac \quad \Rightarrow \quad \frac{x^2}{a} - \frac{y^2}{c} = 1$$

7. B

$$(x^2 + 2x + 4)^n = \sum_{r=0}^{2n} a_r x^r$$

Let $\quad x = 2t \quad \Rightarrow \quad 4^n(1 + t + t^2)^n = \sum_{r=0}^{2n} 2^r a_r t^r$

Let $\quad x = \frac{2}{t} \quad \Rightarrow \quad 4^n(1 + t + t^2)^n = \sum_{r=0}^{2n} 2^r a_r t^{2n-r}$

$\Rightarrow \quad 2^r a_r = 2^{2n-r} a_{2n-r}$

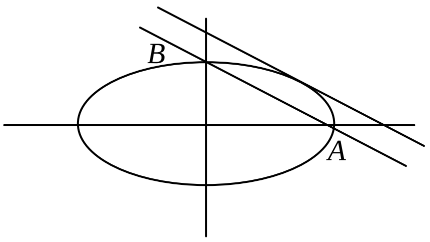
$$\Rightarrow \quad \sum_{r=n}^{24} \frac{a_{2n-r}}{a_r} = \sum_{r=n}^{2n} \frac{1}{4^{n-r}}$$

$$= \frac{4^{n+1} - 1}{3}$$

8. C

Let perpendicular distance of *P* from the line be *h*

$\frac{1}{2} \times h \times 5 = 6(\sqrt{2} - 1) \qquad$ (as $\Delta PAB = 6(\sqrt{2} - 1)$)



$$\Rightarrow h = \frac{12(\sqrt{2} - 1)}{5}$$

Now distance of tangent parallel to *AB* i.e. $4y + 3x = 12\sqrt{2}$, from line *AB* is $\frac{12(\sqrt{2} - 1)}{5}$.

There are just three such points.

9. ABCD

10. BD

11. ABC

If a, b, c are odd integer then D can not be perfect square,

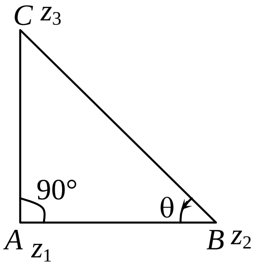
$\Rightarrow \quad |f(\lambda)| > 0$ where $\lambda \in Q$

$\Rightarrow \quad |a p^2 + b pq + c q^2| \geq 1 \Rightarrow \quad \left| f\left(\frac{p}{q}\right) \right| \geq \frac{1}{q^2}$

If $\quad a.c = 1 \quad \Rightarrow \quad a = c = 1$ and $b \geq 3$ as

$c.(a - b + c) < 0 \quad \Rightarrow \quad \alpha \in (-1, 0)$

12. AB



$$\frac{W_2}{|W_2|} = \frac{W_1}{|W_1|}e^{-i\theta}$$

$$\Rightarrow \quad \frac{W_2}{W_1} = \frac{|W_2|}{|W_1|}e^{-i\theta} = 1 - i\tan\theta$$

$$W_1\overline{W}_2 = \frac{W_1}{W_2}|W_2|^2 = |W_1||W_2|e^{-i\theta} = \left(|W_1|^2 - i|W_1||W_2|\sin\theta\right)$$

1. **(A) P; (B) QS; (C) PQS; (D) R**

If $N = 2^{K_0} p_1^{K_1} p_2^{K_2} p_3^{K_3} ....p_n^{K_4}$

Total number of devises are = $(K_0+1)(K_1+1)(K_2+1).....(K_n+1)$

Total number of even devises = $K_0(K_1+1)(K_2+1)...(K_n+1)$

Total number of odd devises = $(K_1+1)(K_2+1)...(K_n+1)$

(A) $f(\alpha) = 4 \Rightarrow \quad (K_0-1)(K_1+1)(K_2+1).......(K_n+1) = 4$

Case 1 $\quad K_0 = 5 \Rightarrow N = 2^5$

Case 2 $\quad K_0 = 3 \quad N = 2^3 3, 2^3 5, 2^3 7$

Case 3 $\quad K_0 = 2 \Rightarrow$ Not possible

(B) $f(\alpha) = 0 \Rightarrow K_0 = 1$

(C) for $f(\alpha) < 0 \quad K_0 = 0$

(D) $f(\alpha) = -(2K+1)$, then $K_0 = 0$ and $K_1, K_2......$ must be even

2. A-QR; B-Q; C-QS; D-PQR

(A) $$S_n = \sum_{r=1}^{n}\cos^4\left(\frac{\theta + 2(r-1)\pi}{n}\right) = \frac{1}{2}\sum_{r=1}^{n}\left(1+\cos^2\left(2\theta + \frac{4(r-1)\pi}{n}\right)\right)$$

$$= \frac{1}{2}\left(1 + \frac{1}{2}\left(1+\cos\left(4\theta + \frac{8(r-1)\pi}{n}\right)\right)\right) = \sum_{r-1}^{n}\left(\frac{3}{4} + \frac{1}{4}\cos\left(4\theta + \frac{8(r-1)\pi}{n}\right)\right) = \frac{3n}{4}$$

$$+\frac{\cos\left(4\theta + \frac{4(n-1)\pi}{n}\right)\sin 4\pi}{\sin\frac{4\pi}{n}} = \frac{3n}{4}$$

(B) $$\sqrt{3}\tan^2\frac{\theta}{2} - \sqrt{3}\lambda\tan\frac{\theta}{2} + (\sqrt{3}-\lambda) = 0$$

$$\cot\frac{c}{2} = \frac{\tan\frac{A}{2} + \tan\frac{B}{2}}{1 - \tan\frac{A}{2}\tan\frac{B}{2}} = \frac{\lambda}{1 - \left(1 - \frac{\lambda}{\sqrt{3}}\right)} = \sqrt{3} \qquad \Rightarrow C = \frac{\pi}{3}$$

(C) $\cos^n x = 1 + \sin^n x$ for n even $n = m\pi$ for n odd $n = 2m\pi$ or $x = \left(2p\pi + \frac{3\pi}{2}\right)$

(As $\cos^n x + \sin^n x \le \sin^2 x + \cos^2 x = 1$ if $n > 2$)

(D) $\sin = \frac{6}{5m - m^2}$ or $\frac{4}{5m-m^2}$, but for exactly three roots $\sin = \pm 1$

$$\Rightarrow \quad \frac{6}{5m-m^2} = \pm 1 \quad \Rightarrow \quad m = 2, 3, -1, 6$$

1. [2]
2. [7]
3. [4]
4. [3]

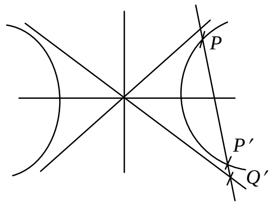
5. [1]

Let $\angle CAD = 2\alpha,$ then $RS = 5 - 2 \times \cot\alpha$

$\tan 2\alpha = \frac{4}{3} \Rightarrow \tan\alpha = \frac{1}{2} \quad \Rightarrow \quad RS = 1$

6. [2]

6. For any line in case of hyperbola we know that $PQ = P'Q'$



$\frac{PQ}{P'Q'} + \frac{PQ'}{P'Q} = 1 + \frac{PP' + P'Q'}{PP' + PQ} = 2$