# JEE (MAIN + ADVANCED) : NURTURE COURSE
## PHASE : TNG & TNF

Test Type : MINOR TEST **PAPER – 2** Test Pattern : JEE-Advanced

**TEST DATE : 08 - 09 - 2019**

## PART-1 : PHYSICS SOLUTION

### SECTION–I(i)

**1. (B,C,D)**

**Sol.** $\vec{A}+\vec{B}=-\vec{C}$

$\vec{A}+\vec{B}+\vec{C}=0$

$\vec{C}+\vec{A}=-\vec{B}$

$|\vec{C}+\vec{A}|=|\vec{B}|$

**2. (B,C)**

**Sol.** Since both reach same maximum height they have to have same vertical component of velocity hence same time of flight. Since (2) reaches further than (1) it must have higher horizontal velocity.

Alternative : $H_{max}=\frac{v_y^2}{2g}T=\frac{2u_y}{g}$

Since $H_1 = H_2$ $T_1 = T_2$

Also, $R=\frac{2u_x y_2}{g}$ $R_2 > R_1$

$\Rightarrow u_{2x} > u_{1x}$

$\therefore u_2 > u_1$

**3. (A,C,D)**

**Sol.** $T = m_1a$

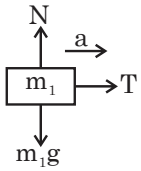
$m_1g - T = m_2a$

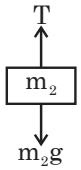
$\rightarrow$ option 'a', force is $< m_2g \Rightarrow a < g$

no acceleration of $m_1$ in vertical direction,

therefore $N - m_1g = 0$

$\Rightarrow N = mg$



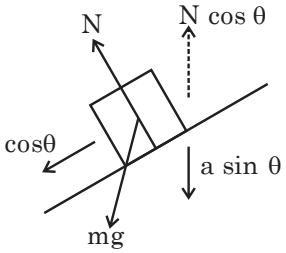




a of $m_2$ is dependent on T and T depends on $m_1$

Blocks have acceleration of same magnitude but different direction.

**4. (B,D)**

**Sol.**




$mg - N\cos\theta = ma\sin\theta$

**5. Ans. (D)**

**Sol.** $v_{max} = 4 + \frac{1}{2}\times 2\times 2 + (6-2)\times 2 + \frac{1}{2}(8 - 6)\times(4-2) + 2(8-6) + \frac{1}{2}\times(10-8)\times 4$

$= 24$ m/s.

**6. (B,C,D)**

**Sol.** AC = d

$v_c^2 = v_A^2 + 2ad$

$ad = \perp 20$

$v_B^2 = v_A^2 + 2\frac{ad}{2}$

$\Rightarrow v_B = 13$ m/sec.

$v_{Avg.}$ for A to B $= \frac{v_A + v_B}{2} = 10$ m/s.

$t_1 = \frac{v_B - v_A}{a} = \frac{6}{a}$, $t_2 = \frac{v_C - v_B}{a} = \frac{4}{a}$

$t_1 : t_2 = 3 : 2$

$v_{avg.}$ for B to C $= \frac{v_B + v_C}{2} = 15$ m/s

**7. (C)**

**Sol.** $v = \frac{dx}{dt} = u + 2a(t - 1)$

$a = \frac{dv}{dt} = 2a$

**8. (C)**

**Sol.** $T = \frac{2u\sin\theta}{g}$

$8 = 2 \times 50 \times \frac{\sin\theta}{10}$

$\Rightarrow \theta = 53°$

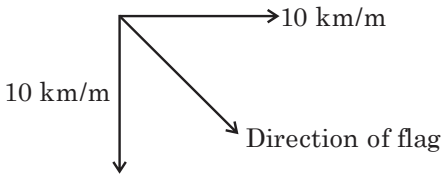
**9. (B)**

**Sol.** $\frac{2u\sin\theta}{g} \times v = 4.5$ m

$v = 1.25$ m/s

**10. (C)**

**Sol.**




## SECTION–III :

**1. Ans.(6)**

**Sol.** By using dimensional analysis

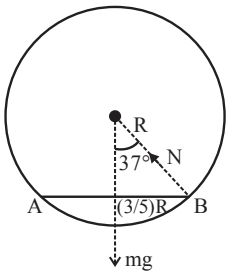
$ML^2T^{-2} = M^x(T^{-1})^y(L)^z = M^xL^zT^{-y}$

$\Rightarrow x = 1, z = 2, y = 2$

$\Rightarrow 2x + y + z = 2 \times 1 + 2 + 2 = 6$

**2. Ans.(9)**

**Sol.**

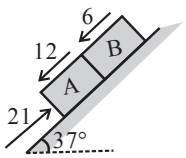



$2N\cos 37° = mg$

$\Rightarrow N = \frac{1.44 \times 10}{2 \times 0.8} = 9$ Newton

**3. Ans.(7)**

**Sol.**



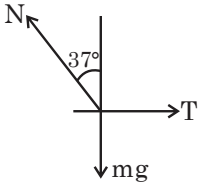

$N = \frac{21 - 12 - 6}{2 + 1} = 1$ m/s²

For block B : $N - 6 = 1 \Rightarrow N = 7N$

**4. Ans.(2)**

**Sol.** $N\cos 37° = mg$

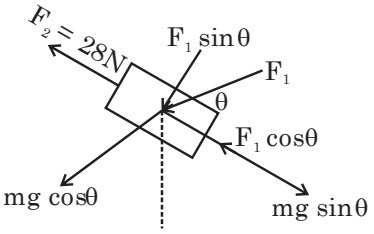
$N = \frac{0.16 \times 10}{4} \times 5$




$N = 2N$

**5. Ans.(8)**

**Sol.**




$28 + F_1 \cos\theta = mg \sin\theta$

$28 + F_1 \times \frac{4}{5} = 100 \times \frac{3}{5}$

$\frac{F_1 \times 4}{5} = 60 - 28$

$\frac{F_1}{5} = \frac{32}{5} = 8N$

**6. Ans.(4)**

**Sol.** $v_{avg.} = \frac{\sqrt{2}R}{t}$

$t = \frac{3\pi R}{2v}$

$= \frac{\sqrt{2}R}{3\pi R} \times 2 \times 3\pi\sqrt{2} = 4$ m/sec.

**7. Ans.(6)**

**Sol.** $u\cos\theta = 3\sqrt{2}$

$u\sin\theta = 3\sqrt{2}$

u = 6 m/sec.

**8. Ans.(5)**

**Sol.** $H = \frac{R}{2} = 25$ m

$\frac{H}{5} = 5$

**9. Ans.(8)**

**Sol.** $\tan\theta = \sqrt{3}$, $\theta = 60°$

$\frac{2\theta}{15} = 8$

**10. Ans.(5)**

**Sol.** $\frac{u\sin\theta}{g} = 4$

$\Rightarrow u\sin\theta = 40$ m/sec.

After 2 sec.

$v_x = v_y = 20$ m/sec.

so, $u_x = 20$

$u_y = 40$

$u = \sqrt{2000} = 20\sqrt{5}$ m/sec.

x = 5

## PART–2 : CHEMISTRY — SOLUTION

### SECTION–I(i)

**1. (A,B,C,D)**

**Sol.** $n_{BaCl_2} = \frac{20.8}{100} \times \frac{50}{208} = \frac{1}{20} = 0.05$ ;

$n_{H_2SO_4} = \frac{9.8}{100} \times \frac{100}{98} = 0.1$

| | | | | |
|---|---|---|---|---|
| Moles | 0.05 | 0.01 | | |
| After reaction | 0 | 0.05 | 0.05 | 0.01 |

$\Rightarrow$ $n_{SO_4^{2-}}$ remaining = 0.05

$\Rightarrow [SO_4^{2-}] = \frac{0.05}{150} \times 1000 = \frac{1}{3} = 0.33$ ;

$[H^+] = \frac{0.2}{0.15} = 1.33$ M; $[Cl^-]$

$= \frac{0.1}{0.15} = 0.66$M $[Ba^{2+}] = 0$

**2. (B)**

**Sol.** $MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$

$n_{O_2} = \frac{1.12}{22.4} = \frac{1}{20}$

$\Rightarrow$ $n_{HCl} = 4 \times \frac{1}{20} = \frac{1}{5}$

$\Rightarrow$ $m_{HCl} = \frac{1}{5} \times 36.5 = V \times 1.2 \times \frac{3.65}{100}$

$\Rightarrow$ V = 166.7 ml

**3. (A,B)**

**Sol.** Conceptual

**4. (B)**

**Sol.** $288 \times \frac{33.33}{100} = 96$

$\Rightarrow$ 3'S' atoms per molecule

**5. (C,D)**

**Sol.** $Al_2O_3$, $SnO_2$

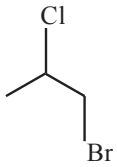
**6. (C,D)**

**Sol.** $d_{z^2}$-orbital & $p_x$-orbital

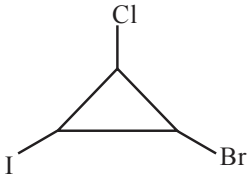
**7. (A,B,C)**

**Sol.** Fact

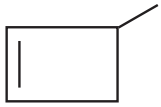
**8. (A,B,D)**

**Sol.** 


1-bromo-2-chloropropane




1-bromo-2-chloro-3-iodo cyclopropane



3-methyl cyclobut-1-ene

2,2-dimethylpropane

**9. (A)**

**Sol.** Fact

**10. (A,B,C)**

**Sol.** Fact

## SECTION–III

**1. Ans. (6)**

**Sol.** Molar mass of methanol ($CH_3OH$) = 32 g $mol^{-1}$ = 0.032 kg $mol^{-1}$

Molarity of the given solution = $\frac{0.793 kg L^{-1}}{0.032 kg\, mol^{-1}}$ = 24.78 mol $L^{-1}$

Applying

$M_1 \times V_1 = M_2V_2$

(Given solution) (solution to be prepared)

$24.78 \times V1 = 0.22 \times 2.7$ L

or $V_1$ = 00.024 L = 24.0 mL

**2. Ans. (1)**

**Sol.** Conceptual

**3. Ans. (6)**

**Sol.** no of moles =126/63=2

no of O-atom = $2 \times 3 = 6$

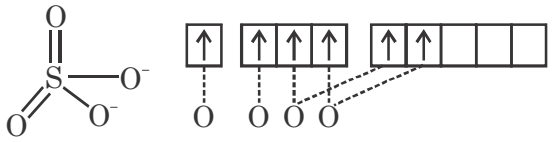
**4. Ans. (2)**

**Sol.** Number of valence electron = 2

**5. Ans. (3)**

**Sol.** $BrF_3$, $XeF_2$, $CH_3^+$

**6. Ans. (2)**

**Sol.** 


**7. Ans. (6)**

**Sol.**

**8. Ans. (5)**

**Sol.** Fact

**9. Ans. (5)**

**Sol.**

**10. Ans. (6)**

**Sol.** Functional group : Amide, Ketone, Ester, 2° amine, Alkene, Carboxylic acid.

## PART–3 : MATHEMATICS SOLUTION

### SECTION–I(i)

**1. (B,D)**

**Sol.** $x - y = \frac{\pi}{6}, \frac{5\pi}{6}$

$x + y = \frac{\pi}{3}, \frac{5\pi}{3}$

$x = \frac{\pi}{4}, y = \frac{\pi}{12}$

$x = \frac{11\pi}{12}, y = \frac{3\pi}{4}$

**2. (A,B,C,D)**

**Sol.** $\tan 22\frac{1}{2}^{\circ} = \sqrt{2} - 1$

$\sin 22\frac{1}{2}^{\circ} = \frac{\sqrt{2-\sqrt{2}}}{2}$

[class facts]

**3. (A,B,C,D)**

**Sol.** $\cos2\theta \cdot \cos\theta - \sin4\theta \cdot \sin\theta = \frac{1}{2}(\cos3\theta + \cos\theta) - \frac{1}{2}(\cos3\theta - \cos5\theta)$

$= \frac{1}{2}(\cos5\theta + \cos\theta)$

$= \cos3\theta \cdot \cos2\theta$

$\cos20° + \cos100° + \cos140° = \cos20° + 2\cos120° \cdot \cos20°$

$= \cos20° - \cos20°$

$= 0$

$\sin5\theta + \sin2\theta - \sin\theta = (\sin5\theta - \sin\theta) + \sin2\theta$

$= 2\cos3\theta \cdot \sin2\theta + \sin2\theta + \sin2\theta$

$= \sin2\theta(2\cos3\theta + 1)$

$\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta} = \frac{(\cos\theta + \sin\theta)^2}{\cos^2\theta - \sin^2\theta} = \frac{\sin2\theta + 1}{\cos2\theta}$

$\tan2\theta + \sec2\theta$

**4. (B,C)**

**Sol.** $(\log_{10}2x)(\log_{10}x) = (1 - \log_{10}2)$

$\log_{10}x = t \qquad \log_{10}2 = k$

$t(t + k) = 1 - k$

$t^2 + kt + k - 1 = 0$

$t^2 + (k - 1)t + t + k - 1 = 0$

$t = -1, 1 - k$

$\log_{10}x = -1 \qquad \log_{10}x = \log_{10}5$

$x = 0 \cdot 1 \qquad x = 5$

**5. (A,C)**

**Sol.** $\alpha \times \frac{1}{\alpha} = \frac{c}{a} \Rightarrow c = a$

$\alpha + \frac{1}{\alpha} = \frac{b}{a} \geq 2 \Rightarrow b \geq 2a$

**6. (A,B,C,D)**

**Sol.** $4x^2 - 11x + 2k = 0$

$4x^2 - 12x - 4k = 0$

$x + 6k = 0$

$x = -6k$

$x^2 - 3x - k = 0$

put $x = -6k$

$36k^2 + 18k - k = 0$

$k(36k + 17) = 0$

$k = -\frac{17}{36}, 0$

$x = \frac{17}{6}, 0$

**7. (C,D)**

**Sol.** $N = \frac{1 + 2\log_3 2}{(1 + \log_3 2)^2} + \frac{(\log_3 2)^2}{(1 + \log_3 2)^2}$

$N = 1$

**8. (A,B,D)**

**Sol.** $\sin15° = \frac{\sqrt{3}-1}{2\sqrt{2}} \qquad \cos15° = \frac{\sqrt{3}+1}{2\sqrt{2}}$

$\sin^2 15° = \left(\frac{\sqrt{3}-1}{2\sqrt{2}}\right)^2$

$\sin15° \cos15° = \frac{1}{2}\cos30° = \frac{1}{4}$

**9. (A,D)**

**Sol.** $y = \frac{1}{4}\sin 3x$

$y_{max} = \frac{1}{4}$

$y_{min} = -\frac{1}{4}$

**10. (A,B,D)**

**Sol.** $1 + \sin x - \sin 2x = \cos x + \cos 2x - \cos 3x$

$1 + \sin x(1 - 2\cos x) = 2\sin 2x \cdot \sin x + 1 - 2\sin^2 x$

$\sin x(1 - 2\cos x) = -2\sin^2 x(1 - 2\cos x)$

$\sin x(1 - 2\cos x)(1 + 2\sin x) = 0$

$\sin x = 0$

$\cos x = \frac{1}{2}$

$\sin x = -\frac{1}{2}$

$x = n\pi$

$x = 2n\pi \pm \frac{\pi}{3}$

$x = n\pi + (-1)^{n+1}\left(\frac{\pi}{6}\right)$

## SECTION–III

**1. Ans. (3)**

**Sol.** $\tan 3x = -1$

$3x = n\pi - \frac{\pi}{4}$

$x = \frac{n\pi}{3} - \frac{\pi}{12}$

$x = \frac{\pi}{4}, \frac{7\pi}{12}, \frac{11\pi}{12}$

**2. Ans. (6)**

**Sol.** $(1 - \cos 2x)(\sin 2x) = \frac{\sqrt{3}}{2}(1 - \cos 2x)$

$\cos 2x = 1$ $\qquad$ $\sin 2x = \frac{\sqrt{3}}{2}$

$x = n\pi$ $\qquad$ $2x = n\pi + (-1)^n\frac{\pi}{3}$

$x = -\pi, 0,$ $\qquad$ $x = -\frac{5\pi}{6}, -\frac{2\pi}{3}, \frac{\pi}{6}, \frac{\pi}{3}$

**3. Ans. (3)**

**Sol.** $\sin\left(\frac{A+C}{2}\right)\cdot\sin\left(\frac{A-C}{2}\right) + \sin^2\frac{B}{2}$

$1 + \cos\frac{B}{2}\cdot\sin\left(\frac{A-C}{2}\right) - \cos^2\frac{B}{2}$

$1 + \cos\frac{B}{2}\left(\sin\left(\frac{A-C}{2}\right) - \sin\left(\frac{A+C}{2}\right)\right)$

$1 + 2\cos\frac{B}{2}\cdot\cos\frac{A}{2}\cdot\sin\left(\frac{-C}{2}\right)$

$1 - 2\cos\frac{A}{2}\cos\frac{B}{2}\sin\frac{C}{2}$

**4. Ans. (8)**

**Sol.** $\tan\theta - \cot\theta = -2\cot 2\theta$

$2\tan 2\theta - 2\cot 2\theta = -4\cot 4\theta$

$4\tan 4\theta - 4\cot 4\theta = -8\cot 8\theta$

**5. Ans. (3)**

**Sol.** $D < 0$

$4(4k - 1)^2 - 4(15k^2 - 2k - 7) < 0$

$k^2 - 6k + 8 < 0$

$(k - 4)(k - 2) < 0$

$k \in (2, 4)$

**6. Ans. (1)**

**Sol.** $x^2 - 3x + 2 > 0$

$(x - 2)(x - 1) > 0$

$x \in (-\infty, 1) \cup (2, \infty)$

$x^2 - 5x + 4 < 0$

$(x - 1)(x - 4) < 0$

$x \in (1, 4)$ taking intersection

$x \in (2, 4)$

**7. Ans. (3)**

**Sol.** $x^4 = t$

$\frac{t^{10} + 2}{t + 1} \rightarrow$ remainder is 3

**8. Ans. (5)**

**Sol.** $\cos\left(\frac{\pi}{2}-2\sin x\right) = \cos(2\cos x)$

$2\cos x = 2n\pi \pm \left(\frac{\pi}{2}-2\sin x\right)$

$2\cos x + 2\sin x = 2n\pi + \frac{\pi}{2}$

$\cos x + \sin x = \frac{\pi}{4}$

$1 + \sin 2x = \frac{\pi^2}{16}$

$\sin 2x = \frac{\pi^2-16}{16}$

$\Rightarrow (\sin x \cos x)^{-1} = \frac{32}{\pi^2-16}$

$2\cos x - 2\sin x = 2n\pi - \frac{\pi}{2}$

$\cos x - \sin x = -\frac{\pi}{4}$

**9. Ans. (2)**

**Sol.** Use sine rule $C = 180° - 120° = 60°$

$(b + c\sqrt{2}) = k(\sin 45° + \sqrt{2}\sin 60°)$

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

$= 2k \sin 75° = 2k \sin A = 2a$

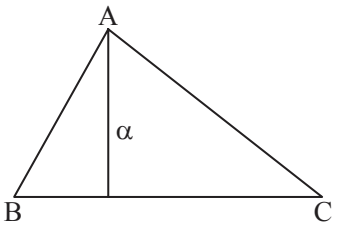
**10. Ans. (9)**

**Sol.** Here $a = 4k$, $b = 5k$, $c = 6k$

$\therefore s = \frac{15k}{2}$

$\therefore \Delta = \sqrt{\frac{15k}{2}\left(\frac{15k}{2}-4k\right)\left(\frac{15k}{2}-5k\right)\left(\frac{15k}{2}-6k\right)}$

$= \frac{15\sqrt{7}}{4}k^2$




But $R = \frac{abc}{4\Delta} = \frac{4k.5k.6k}{15\sqrt{7}k^2} = \frac{8}{\sqrt{7}}k$

and $r = \frac{\Delta}{s} = \frac{15\sqrt{7}}{4}k^2 \cdot \frac{2}{15k} = \frac{\sqrt{7}}{2}k$

$\therefore \frac{R}{r} = \frac{\frac{8k}{\sqrt{7}}}{\frac{\sqrt{7}k}{2}} = 16 : 7$