SOLUTIONS

PROGRESS TEST-2

RB-1815

RBS-1803-1804

JEE ADVANCED PATTERN

Test Date: 15-10-2017

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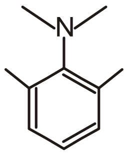
CHEMISTRY

1. (C)



Due to steric hinderence molecule become non planar. So no resonance possible.

2. (C)

$$\underset{7}{CH_3}-\underset{6}{CH_2}-\underset{5}{C}\equiv\underset{4}{C}-\underset{3}{\overset{\overset{O}{||}}{C}}-\underset{2}{CH_2}-\underset{1}{CH_3}$$

3. (D)

Larger number of bond and minimum charge separation make structure most stable.

4. (B)

Let x mole NH_3 is evolved

Now, total g eq. of acid = total g eq. of base

$1 \times 1 \times 1 = x \times 1 + 1 \times \frac{1}{7} N$

or, $x = \frac{6}{7}$

Also, mole of N = $\frac{6}{7} \times 1 = \frac{6}{7}$

mass of N = $\frac{6}{7} \times 14 = 12$ g

% of N in the compound = $\frac{12}{50} \times 100 = 24$

5. (D)

$H_2SO_4 \longrightarrow Na_3H(SO_4)_2$

$\text{n.f.} = \left[2 - \frac{1}{2}\right] = \frac{3}{2}$

Equivalent mass = $\frac{98}{3/2} = \frac{2}{3} \times 98 = 65.33$

6. (B)

200 gm (109%) New oleum

$$\boxed{H_2SO_4 + SO_3} + \boxed{H_2O} \longrightarrow \boxed{H_2SO_4 + SO_3}$$

↓ ↓ ↓ ↓ ↓

120 gm 80 gm 9 gm 169 gm 40 gm

New oleum

$\because$ 209 gm new oleum can give maximum of 218 gm H_2SO_4.

$\therefore$ 100 gm new oleum can give maximum of $\frac{218}{209} \times 100 = 104.30$

$\therefore$ % labelling of new oleum = 104.3%

7. (A)

8. (A)

9. (A,B,D)

(A) Ph–$\ddot{N}$H–C(=O)–CH_3 +R

(B) Ph–$\ddot{O}$–CH_3 +R

(C) Ph–$C(CH_3)_3$ +I

(D) Ph–O^- +R

10. (A,C)

m.g.eq of I^- = 10; m.g. eq of $IO_3^- = 50$

So, I^- is limiting

n-factor of I_2 = 5/3

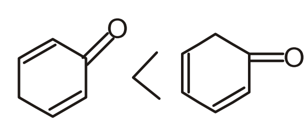
So, m.mole of $I_2 = \frac{10}{\frac{5}{3}} = 6$

m.mole of $MnO_4^- = \frac{6 \times 14}{5} = 16.8$

m.mole of Mn^{+2} = 16.8

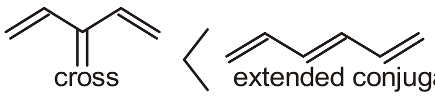
11. (B,C,D)

so, Ph—CH_2—Ph > Ph–CH=CH_2



Cross conjugation external conjugation

$CH_2 = CH - OH < \underset{\text{more resonance}}{CH_2 = CH - CH = CH - OH}$



cross conjugation < extended conjugation

12. (B,C,D)

13. (A, B, C)

$$M_{mix} = \frac{M_1V_1 + M_2V_2 + M_3V_3}{V_1 + V_2 + V_3}$$

$$\text{For } 1:1:5 \Rightarrow M_{mix} = \frac{12+6+10}{7} = \frac{28}{7} = 4\text{ M}$$

$$\text{For } 1:2:6 \Rightarrow M_{mix} = \frac{12+12+12}{9} = \frac{36}{9} = 4\text{ M}$$

$$\text{For } 1:3:7 \Rightarrow M_{mix} = \frac{12+18+14}{11} = \frac{44}{11} = 4\text{ M}$$

$$\text{For } 1:2:5 \Rightarrow M_{mix} = \frac{12+12+10}{8} = \frac{34}{8} \neq 4\text{ M}$$

14. (A)

15. (B)

16. (A)

17. (D)

18. (C)

19. (4)

$\frac{100}{29}$ (M) NaOH (aq.) solution, means,

$\frac{100}{29}$ moles of NaOH is present in 1000g solution.

$$\text{So, mass of solvent } = \left(1000 - \frac{100}{29} \times 40\right)\text{g} = \frac{25000}{29}\text{g} = \frac{25}{29}\text{kg}$$

$$\text{So, molality} = \frac{100}{29 \times \frac{25}{29}} = 4\text{ m}$$

20. (5)

Let x moles of Cl_2 is liberated from bleaching powder then,

gram equivalent of Cl_2 = gram equivalent of I_2 = gram equivalent of $Na_2S_2O_3$.

or, $x \times 2 = 2 \times \frac{1}{10} \times 1$

or, $x = 0.1$

i.e., mass of Cl_2 liberated = 0.1 × 71 g

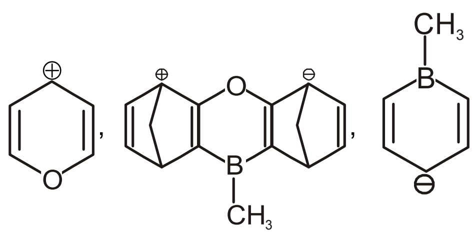
So, % of available chlorine = $\frac{7.1}{142} \times 100 = 5\%$

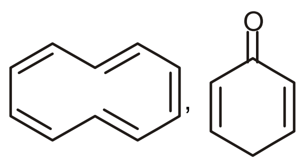
21. (8)

$$4Zn + 10HNO_3 \longrightarrow 4Zn(NO_3)_2 + 3H_2O + NH_4NO_3$$

$a = 4;\ b = 3;\ c = 1 \Rightarrow a + b + c = 4 + 3 + 1 = 8$

22. (5)

Aromatic : 

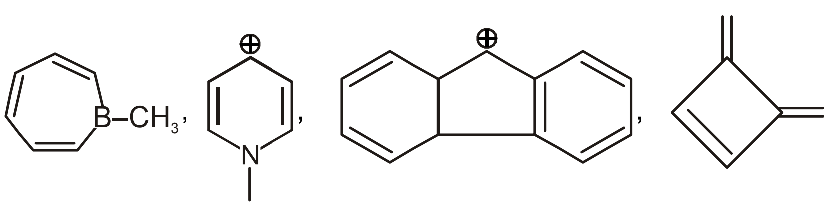
Non-aromatic : 

Remaining four structures are anti-aromatic.

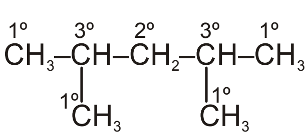
23. (6)

24. (4)

Six electrons delocalised structures are :



25. (4)



26. **(5)**

27. **(6)**

28. **(2)**

$$Ba(\overset{+7}{Mn}O_4)_2 + \overset{+2}{Fe}\overset{+3}{C_2}O_4 \xrightarrow{H^+} Mn^{2+} + Fe^{3+} + \overset{+4}{C}O_2$$

n.f. = 10 n.f. = (1 + 2 = 3)

$$\text{g eq. } Ba(MnO_4)_2 = \text{g.eq. } FeC_2O_4$$

$$\Rightarrow (1)\left(\frac{1}{10}\times 10\right) = \left(\frac{1}{6}\right)(x\times 3) = \frac{x}{2} \Rightarrow x = 2$$

MATHEMATICS

29. **(D)**

$$\frac{a}{\sqrt{cb}} - 2 = \sqrt{\frac{b}{c}} + \sqrt{\frac{c}{b}} \Rightarrow a = b + c + 2\sqrt{bc} \Rightarrow a = \left(\sqrt{b}+\sqrt{c}\right)^2$$

$\Rightarrow (\sqrt{a}-\sqrt{b}-\sqrt{c})(\sqrt{a}+\sqrt{b}+\sqrt{c}) = 0 \Rightarrow \sqrt{a}+\sqrt{b}+\sqrt{c} = 0$ (not valid)

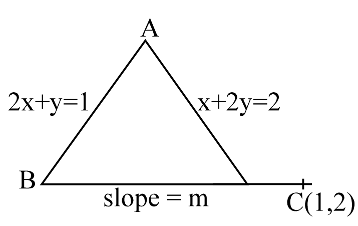
$-\sqrt{a}+\sqrt{b}+\sqrt{c} = 0$

hence x = – 1, y = 1

30. **(B)**

Slope of AB = – 2 ; slope of AC = $\frac{-1}{2}$; slope of BC = m

$$\frac{m+2}{1-2m} = \frac{-\frac{1}{2}-m}{1-\frac{1}{2}m} \Rightarrow 4 - m^2 = -(1-4m^2) = 4m^2 - 1$$



$5m^2 = 5 \Rightarrow m = \pm 1$

(y – 2) = 1(x – 1) or (y – 2) = – 1(x – 1)

x-intercept x = – 1 x = 3 **Ans.**

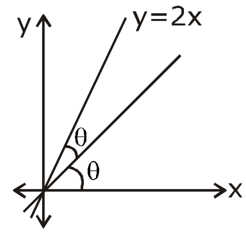
31. (B)

$\tan 2\theta = 2$

$\therefore \dfrac{2\tan\theta}{1-\tan^2\theta} = 2$

$\Rightarrow \tan^2\theta + \tan\theta - 1 = 0$

$\therefore \tan\theta = \dfrac{\sqrt{5}-1}{2}$ Ans.



32. (A)

Circumcentre O $\equiv \left(-\frac{1}{3},\frac{2}{3}\right)$ and orthocentre H $\equiv \left(\frac{11}{3},\frac{4}{3}\right)$

$\therefore$ coordinate of G are $\left(1,\frac{8}{9}\right)$

A(1, 10), G $\left(1,\frac{8}{9}\right)$

AG : GD = 2 : 1

$\therefore$ D = $\left(1,-\frac{11}{3}\right)$

$\therefore$ coordinate of the mid point of BC are $\left(1,-\frac{11}{3}\right)$

33. (B)

$\dfrac{2-x-x^2}{1+x^2} \ge 1$

$\Rightarrow 2x^2+x-1 \le 0 \Rightarrow (2x-1)(x+1) \le 0$

$\Rightarrow x \in \left[-1,\frac{1}{2}\right]$

34. (C)

35. (D)

$$t_1 = \frac{1}{\sin\theta\cdot\sin 3\theta} = \frac{\sin 2\theta}{\sin\theta\cdot\sin 2\theta\cdot\sin 3\theta} = \frac{\sin(3\theta-\theta)}{\sin\theta\cdot\sin 2\theta\cdot\sin 3\theta}$$

$$= \frac{1}{\sin 2\theta}\cdot\left[\frac{\sin 3\theta\cdot\cos\theta - \cos 3\theta\cdot\sin\theta}{\sin\theta\cdot\sin 3\theta}\right] = \frac{1}{\sin 2\theta}\left[\cot\theta - \cot 3\theta\right]$$

$$t_2 = \frac{1}{\sin 2\theta}\left[\cot 3\theta - \cot 5\theta\right]$$

$$t_3 = \frac{1}{\sin 2\theta}\left[\cot 5\theta - \cot 7\theta\right]$$

$$\vdots$$

$$t_{20} = \frac{1}{\sin 2\theta}\left[\cot 39\theta - \cot 41\theta\right]$$

Summing, we get

$$\therefore \quad S_{20} = \frac{1}{\sin 2\theta}[\cot\theta - \cot 41\theta]$$

36. (C)

$$y = \frac{\{\sin x\}}{1+\{\sin x\}}$$

$$\{\sin x\} = \frac{1}{1-y} - 1 \qquad \because 0 \le \{\sin x\} < 1$$

$$\therefore 0 \le \frac{1}{1-y} - 1 < 1 \quad \Rightarrow y \in [0, 1/2)$$

37. (A,C,D)

38. (A, C, D)

$$P(x) = \frac{1-x^{18}}{1+x}$$

$$= \frac{1-(y-1)^{18}}{y} = \frac{1-(1-y)^{18}}{y}$$

cofficient of y^2 in $\left\{\frac{1-(1-y)^{18}}{y}\right\}$ is cofficient of y^3 in $(1-y)^{18} = {}^{18}C_3 = 816$

39. (A, B)

$f(g(x))$ is even, periodic, unbounded & positive $\forall x$ in domain.

40. (A, C)

$4^x - 2^{x+2} + 5 + ||b-1|-3| = |\sin y|$

$= 4^x - 2^x \cdot 4 + 4 + 1 + ||b-1|-3| = |\sin y|$

$\Rightarrow (2^x - 2)^2 + 1 + ||b-1|-3| = |\sin y|$

Now, LHS $\geq$ 1 and RHS $\leq$ 1 , equality is possible only when LHS = RHS = 1.

$\therefore ||b-1|-3| = 0$

$\Rightarrow |b-1| = 3 \Rightarrow b-1 = \pm 3$

$\therefore b = 4, -2$

41. (B, D)

Dividing by $\cos(2012°)$, we get

$\tan\theta = \dfrac{1+\tan 2012°}{1-\tan 2012°}$

$\Rightarrow \tan\theta = \tan(2012° + 45°) = \tan 2057°$

$\Rightarrow$ Hence $\theta = k(180^0) + 2057^0$

Put k = –10

$\theta = 2057^o - 1800^o = 257^o$

If k = –11 $\Rightarrow \theta = 77^o$

42. (A)

$A = -\ell og_2\left(\dfrac{1}{2} - x\right) + \ell og_2\sqrt{(2x-1)^2}$

$A = \ell og_2 \dfrac{|2x-1|}{\left(\dfrac{1-2x}{2}\right)} = \ell og_2 2 = 1$

$B^2 = 10 - 1 \Rightarrow B = \pm 3$

43. (C)

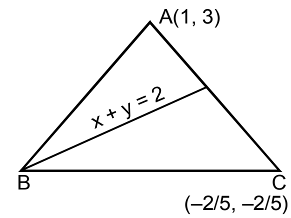
$\log_3(c^3 - 18) = 2 \Rightarrow c = 3$

44. (A)

45. (B)

Image of A(1, 3) in line x + y = 2 is

$$\left(1-\frac{2(2)}{2}, 3-\frac{2(2)}{2}\right) = (-1, 1)$$



So line BC passes through (–1, 1) and $\left(-\frac{2}{5}, -\frac{2}{5}\right)$.

Equation of line BC is $y - 1 = \frac{-2/5-1}{-2/5+1}(x + 1)$

$\Rightarrow y - 1 = \frac{-7}{3}(x + 1) \Rightarrow 3y - 3 = -7x - 7$

$\Rightarrow 7x + 3y + 4 = 0$

46. (C)

Vertex B is point of intersection of

7x + 3y + 4 = 0 and x + y = 2

47. (4)

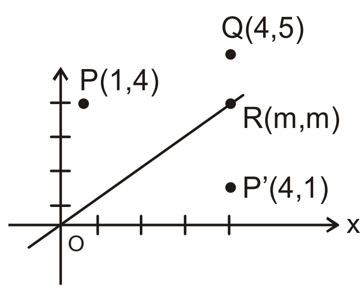


Image of (1, 4) about the line y = x is (4, 1) $\Rightarrow P'(4,1)\,Q(4,5)$ and R(m, m) are collinear.

$\Rightarrow m = 4$

48. (0)

minimum value of R.H.S. = 2, at x=1 and maximum value of L.H.S. is 2 at $x = 2n\pi, n \in I$

Thus no. of real solution = 0.

49. (5)

Differentiate w.r.t. θ and put $\theta = \frac{\pi}{2}$.

50. (0)

$\sin x = \cos^2 x$

Also $\cos^{12}x+3\cos^{10}x+3\cos^{8}x + \cos^{6}x-1 = (\cos^4 x + \cos^2 x)^3 - 1$

$= (\sin^2 x + \sin x)^3 - 1 = 0$

51. **(1)**

$a = \log_{12}18$ & $b = \log_{24} 54$

$$a=\frac{\log_2 18}{\log_2 12}=\left(\frac{2\log_2 3+1}{\log_2 3+2}\right),\ b=\frac{\log_2 54}{\log_2 24}=\left(\frac{3\log_2 3+1}{\log_2 3+3}\right)$$

Let $\log_2 3 = x \Rightarrow a = \left(\frac{2x+1}{x+2}\right)$ $b = \left(\frac{3x+1}{x+3}\right)$

$$ab+5(a-b) = \frac{(2x+1)(3x+1)}{(x+2)(x+3)} + 5\left(\frac{2x+1}{x+2}-\frac{3x+1}{x+3}\right)$$

$$= \frac{6x^2+5x+1+5(2x^2+7x+3-3x^2-7x-2)}{(x+2)(x+3)}$$

$$= \frac{x^2+5x+6}{(x+2)(x+3)} = \frac{(x+2)(x+3)}{(x+2)(x+3)} = 1$$

52. **(5)**

$3x-7 \le x^2-3x+2 < 3x-7+1$ & $3x \in Z$

$\Rightarrow 0 \le x^2-6x+9 < 1$ & $3x \in Z$

$\Rightarrow 2 < x < 4$ & $3x = n$ for some $n \in Z$

$\Rightarrow 2 < \frac{n}{3} < 4$ & $x = \frac{n}{3}, n \in Z$ $\Rightarrow 6 < n < 12$ & $x = \frac{n}{3}, n \in Z$

$\Rightarrow n \in \{7,8,9,10,11\}$ & $x = \frac{n}{3}, n \in Z$ $\Rightarrow x \in \left\{\frac{7}{3},\frac{8}{3},3,\frac{10}{3},\frac{11}{3}\right\}$

53. **(4)**

The period of the function is 8

$$\therefore \sum_{r=0}^{\infty}\left(f(1+8r)\right)^r = 5$$

$$\Rightarrow 1+f(1)+\left(f(1)\right)^2+....\infty \text{ terms} = 5$$

$$\frac{1}{1-f(1)}=5$$

$$5f(1)=4$$

54. **(2)**

$\left[\cot^{-1}x\right]+2\left[\tan^{-1}x\right]=0,$ will be satisfied only when

$\left[\cot^{-1}x\right]=0$ & $\left[\tan^{-1}x\right]=0$

or $\left[\cot^{-1}x\right]=2$ & $\left[\tan^{-1}x\right]=-1$

Case–I $\left[\cot^{-1}x\right]=0\Rightarrow x\in(\cot 1,\infty)$

$\&\left[\tan^{-1}x\right]=0\Rightarrow x\in[0,\tan 1)$

$\therefore x\in(\cot 1,\tan 1)$

Case–II $\left[\cot^{-1}x\right]=2\Rightarrow x\in(\cot 3,\cot 2]$

$\&\left[\tan^{-1}x\right]=-1\Rightarrow x\in[-\tan 1,0)$

$\therefore x\in[-\tan 1,\cot 2]$

Thus the solution set for the given equation is

$[-\tan 1,\cot 2]\cup(\cot 1,\tan 1)\ \Rightarrow x=1,-1$

55. **(7)**

Let x = I + f $\qquad 0\le f<1$

$73\,I+\left[f+\frac{1}{19}\right]+\left[f+\frac{1}{20}\right]+\ldots+\left[f+\frac{1}{91}\right]=546$

Now 546 = 7 × 73 + 35

$\Rightarrow I=7$

56. **(5)**

Put $\theta=0$, then $2^7=1+a+b+c+d$

$\Rightarrow a+b+c+d=127$

$\therefore (a+b+c+d-2)^{\frac{1}{3}}=(125)^{\frac{1}{3}}=5$

PHYSICS

57. (A)

Force is parallel to a line $y = \frac{3}{2}x + c$

The equation of given line can be written as

$y = -\frac{k}{3}x + \frac{5}{3}$

Work done will be zero, when force is perpendicular to the displacement i.e., the above two lines are perpendicular or

$m_1m_2 = -1$

or $\left(\frac{3}{2}\right)\left(-\frac{k}{3}\right) = -1$

or k = 2

58. (C)

$= r(\sqrt{2} + 1)$

59. (B)

$f = \mu(m_1 + m_2 + m_3)g = 0.4(3 + 2 + 1) \times 10 = 24$ N

To move the blocks $F \geq f$, $3t \geq 24$, $t \geq 8$s

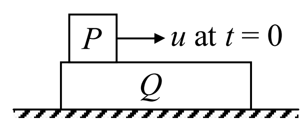
60. (C)

Friction between *P* and *Q* will retard *P* (and accelerate *Q*) till slipping is stopped

Masses of the blocks are same so

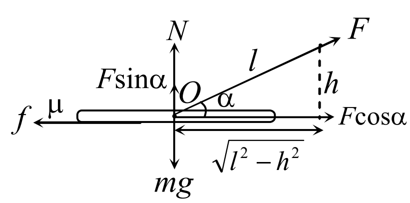
$\therefore$ Retardation of *P* = acceleration of $Q = \mu g$

Thus $v_p = u - \mu gt$ and $v_q = \mu gt$



Once slipping is stopped both blocks will move with same velocity $\left(\text{i.e.} \frac{u}{2}\right)$. Graph (C) depicts this treatment.

61. (A)



$N = mg - F\sin\alpha$

$F\cos\alpha = f = \mu N$

$F\cos\alpha = \mu(mg - F\sin\alpha)$

$$\mu = \frac{F\cos\alpha}{mg - F\sin\alpha} = \frac{F \times \frac{\sqrt{l^2 - h^2}}{l}}{mg - F \times \frac{h}{l}}$$

$$\mu = \frac{F\sqrt{l^2 - h^2}}{mgl - Fh}$$

62. **(C)**

$$-\frac{1}{nu}-\frac{1}{u}=\frac{-1}{f}, \qquad u=\left(\frac{n+1}{n}\right)f$$

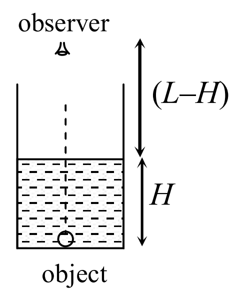
63. **(C)**

The maximum velocity of the insect is $A\sqrt{\frac{k}{M}}$.

Its component perpendicular to the mirror is $A\sqrt{\frac{k}{M}}$ sin 60^0.

Thus maximum relative speed $=\sqrt{3}A\sqrt{\frac{k}{M}}$.

64. **(A)**



$$X_{app}=L-H+\frac{H}{\mu}$$

$$\frac{dX_{app}}{dt}=\frac{dH}{dt}\left(\frac{1-\mu}{\mu}\right)$$

$$\pi r^2H=V$$

$$\therefore\ \frac{dH}{dt}=-\frac{2H}{r}\frac{dr}{dt}=\frac{2KH}{r}$$

$$\therefore\ \frac{dX_{app}}{dt}=\frac{2KV}{\pi r^3}\left(\frac{(1-\mu)}{\mu}\right)$$

65. **(A) (B) and (C)**

Here $10-T_2=10a$ … (i)

$T_2-T_1-0.3\times 2g=3a$ … (ii)

$T_1-0.3\times 2g=2a$

Summing up $10g-0.3\times 4\times g=15a$

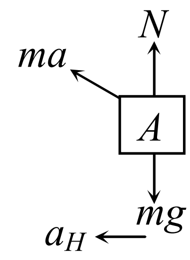
i.e. $a=5.86$ ms^{-2}

$T_2=10\times 9.8-10\times 5.86\,\text{ms}^{-2}$ = 41.4 N

$T_1=2\times 5.86+0.6\times 9.8=17.7$ N

66. (B) and (D)

From FBD of *A* with respect to *B*



$a_v = 0$

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

$$\Rightarrow \quad N = mg - ma\sin\theta$$

$$ma\cos\theta = ma_H \ \Rightarrow a_H = a\cos\theta$$

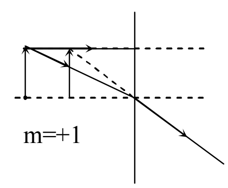
If block *B* is having friction then, for $a_H = 0$

$$ma\cos\theta \le \mu N = \mu(mg - ma\sin\theta)$$

$$\mu \ge \frac{a\cos\theta}{g - a\sin\theta}$$

67. (A), (C)

Apparent position of the object wrt lens.



$$u = \left(\frac{10}{1} + \frac{10}{2}\right) = 15\,\text{cm}$$

$$\frac{1}{15} + \frac{1}{v} = \frac{2(1.5) - 1}{R}$$

$v = 7.5$ cm

Image size = $\frac{7.5}{15} \times 1$ = 0.5 cm

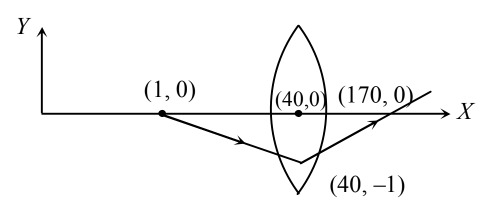
68. (A) (B) and (C)

$$\frac{1}{f} = (1.5 - 1)\left(\frac{1}{10} - \frac{1}{50}\right),\ f = 25 \text{ cm}$$

$$-\frac{1}{F} = \frac{2}{f} + \frac{1}{f_m} = \frac{2}{25} + \frac{1}{-25},\ F = -25$$

69. (B) and (C)

The ray is intersecting $y = 0$ line at $x = 1$ and $x = 40$ line at $y = -1$.



$\therefore \quad u = 39$ cm

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \qquad \Rightarrow \qquad v = 130 \text{ cm}$$

$\therefore$ Equation of refracted ray is

$130\,y = x - 170$

If space on the right of the lens is filled with liquid of $\mu = 4/3$, then

$$\frac{1.5}{v_1}+\frac{1}{39}=\frac{0.5}{30}$$

$$\frac{4}{3v}-\frac{1.5}{v_1}=\frac{\left(\frac{4}{3}-1.5\right)}{-30}$$

v = –390 cm

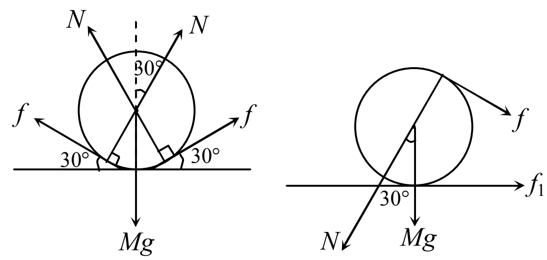
$\therefore$ Equation of refracted ray is $390y+x+330=0$

70. (D)

71. (A)

72. (C)

$f_1=f$ for no rotation of bottom cylinder ...(i)



FBD of top cylinder :

$2N\cos 30+2f\sin 30=Mg$ ...(ii)

FBD of bottom cylinder (left one)

$N\sin 30=f_1+f\cos 30$ ...(iii)

Solving (i), (ii) and (iii)

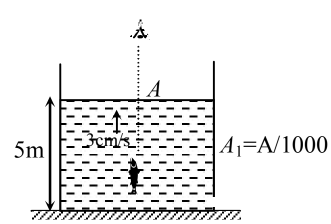
$N=\frac{Mg}{2}$ $\quad f=\frac{Mg}{2(2+\sqrt{3})}$

73. (A)

Velocity of efflux $v=\sqrt{2g\times 5}=10$ m/s

Velocity of surface $=\frac{10\times A/1000}{A}$ = 1 cm/s

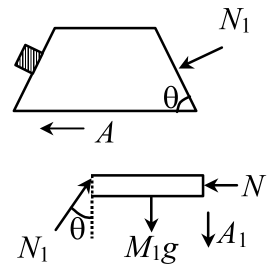
74. (A)



Velocity of fish w.r.t surface in air $=\frac{3+1}{\mu}=3$ cm/s

Velocity as viewed directly by the observer $=3-1=$ 2 cm/s

75. (3)



Let M_1 be the mass of the rod.

$M_1 g - N_1 \cos\theta = M_1 A_1$ … (i)

$N_1 \sin\theta = (M + M)A$ … (ii)

$A = g\tan\theta$ … (iii)

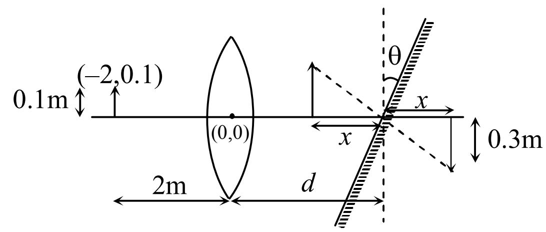
relation between A_1 and A

$A_1 = A\tan\theta$

So by solving these equations $\boldsymbol{M_1 = 3M}$

76. (7) 77. (3) 78. (5) 79. (4) 80. (7)

81. (5)



$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} - \frac{1}{-2} = \frac{1}{1.5}; \quad v = 6\text{m}$$

$$m = \frac{v}{u} = -3$$

$$x = 6 - d\,; \qquad \tan\theta = \frac{0.3}{x}$$

$\Rightarrow$ d = 5m.

82. (4)

Let the curved surface form the image of the object at a distance v_1, which acts as an object for second surface and final image is formed at a distance v from lens,

$$\therefore \quad \frac{\mu_2}{v_1} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R} \quad \ldots (1)$$

$$\frac{\mu_3}{v} - \frac{\mu_2}{v_1} = \frac{\mu_3 - \mu_2}{\infty} = 0 \quad \ldots (2)$$

Adding (1) & (2) $\frac{\mu_3}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R} = \frac{1}{2R}$

$u = -3R$, $v = 8R$

$$\therefore \quad \frac{\mu_3}{8R} + \frac{1}{3R} = \frac{1}{2R}$$

$\therefore$ μ_3 = **4/3**

83. (2)

$$\vec{V}_{\text{obj, mirror}} = 4\hat{i} + 9\hat{j}$$

$$\frac{dx}{dt} = 4, \frac{dy}{dt} = 9$$

$$u = -x$$

$$-\frac{1}{10} = \frac{1}{V} + \frac{1}{-x}$$

$$V = \frac{-10x}{x-10}$$

$$V_{1x} = \frac{dV}{dt} = \left(\frac{10}{x-10}\right)^2 \left(\frac{dx}{dt}\right)$$

$$V_{1x} = -16$$

$$m = -\frac{V}{-x} = \frac{-10}{x-10} = \frac{y_1^0}{y}$$

$$V_{1y} = -\left(\frac{10}{x-10}\right)\frac{dy}{dt}$$

$$V_{1y} = -18$$

$$\vec{V}_{\text{image,mirror}} = -16\hat{i} - 18\hat{j}$$

$$\vec{V}_{\text{image}} = -12\hat{i} - 16\hat{j}$$

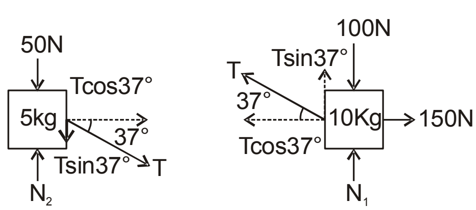
$$|V| = 20 \text{ cm/s}$$

∴ z = 10 cm/s

84. (2)

$a = 10ms^{-2}$

150 – Tcos37° = 10a



∴ $T = \frac{125}{2}N$