SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR MPC
Time: 3 Hours

EAMCET DPP-30

Date: 18-05-2020

MATHEMATICS-IIA

Syllabus: Complex Numbers

1. **If** $\left[\frac{1-i}{1+i}\right]^{50} = p+iq\left(i=\sqrt{-1}\right)$ **then**

1) $p=-1,q=0$ 2) $p=1,q=0$ 3) $p=0,q=1$ 4) $p=0,q=-1$

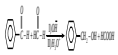
2. **If** $1,\omega,\omega^2$ **are the cube roots of unity, then the value of** $\frac{a\omega^2+b+c\omega+d\omega^2}{a+b\omega+c\omega^2+d}\left(a,b,c,d\in R\right)$ **is**

1) $\frac{1}{\omega}$ 2) $\frac{1}{\omega^2}$ 3) ω^2 4) 1

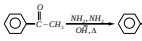
3. **The argument of the complex number** $\frac{2+3i}{\left(3+i\right)+\left(1+2i\right)^2}$ **is**

1) $\tan^{-1}\left(\frac{-2}{3}\right)$ 2) $\tan^{-1}\left(2\right)$ 3) 0 4) $\frac{\pi}{6}$

4. **For all complex numbers** z_1,z_2 **satisfying**  **and** $\left|z_2-3-4i\right|=5,$ **the minimum value of**



1) 0 2) 2 3) 7 4) 17

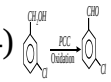
5. **The complex numbers**  **and** **are conjugate complexes for**

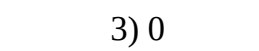
1) 2) $x=\left(n+\frac{1}{2}\right)^{\pi}$ 3) $x=0$ 4) no value

6. **If** $\left|z+\frac{6}{z}\right|=5,$ **then greatest value of** $\left|z\right|$ **is**

1) 6 2) 5 3) 1 4) 3

7. **If** $8iz^3+12z^2-18z+27i=0$ **then**

1) $\left|z\right|=\frac{3}{2}$ 2) $\left|z\right|=\frac{2}{3}$ 3)  4) 

8. **Sum of common roots of the equations**  **and** $z^{1985}+z^{100}+1=0$ **is**

1) -1 2) 1 3) 0 4) 1

9. **If w is the complex cube root of unity and** $\left(1+w^2\right)^5=a+bw,$ **then the value of** a,b **are respectively**

1) $0,0$ 2) $1,-1$ 3) $-1,1$ 4) $1,1$

10. **If** $-3+ix^2y$ **and** x^2+y+4i **be conjugate of each other, then the value of** x **and** y **is**

1) $\pm1,-4$ 2) $-1,4$ 3) $\pm1,\pm4$ 4) None of these

11. **If z and w are two non-zero complex numbers such that** $\left|z\ w\right|=1$ **and** $\arg z-\arg w=\frac{\pi}{2},$ **then** $\bar{z}w=$

1) 1 2) -1 3) i 4) –i

12. **Let** a,b,c **be three points lying on the circle** $|z|=1$ **and suppose** $\alpha\in\left(0,\frac{\pi}{2}\right)$ **such that** $a+b\cos\alpha+c\sin\alpha=0,$ **then**

1) $b=\pm ic$ 2) $2a^2+b^2+c^2=0$ 3) $a^2+b^2+c^2=0$ 4) None of these

13. **For any Z, the value of** $\left|\frac{1+z}{1+\bar{z}}\right|^n+\left|\frac{1+\bar{z}}{1+\bar{z}}\right|^n$ **is**

1) 2 2) $\frac{1}{2}$ 3) 1 4) 4

14. **If** $z=re^{i\theta}$ **then** $\arg\left(e^{iz}\right)$ **is**

1) $r\cos\theta$ 2) $e^{-r\sin\theta}$ 3) 0 4) $e^{i\theta}$

15. **If** $z=(\lambda+3)-i\sqrt{5-\lambda^2},$ **then the locus of z is**

1) ellipse 2) semi circle 3) parabola 4) straight line

16. **If** $|z^2-3|=3|z|$ **then the maximum value of** $|z|$ **is**

1) 1 2) $\frac{3+\sqrt{21}}{2}$ 3) $\frac{\sqrt{21}-3}{2}$ 4) None of these

17. **The complex numbers satisfying** $\arg(z+1)=\frac{\pi}{4}$ **and** $\arg(2z+3-2i)=\frac{3\pi}{4}$ **simultaneously is**

1) $\frac{3}{4}-\frac{1}{4}i$ 2) $\frac{1}{4}+\frac{3}{4}i$ 3) $-\frac{1}{4}-\frac{3}{4}i$ 4) None of these

18. **If** $|z_1|=1,|z_2|=2,|z_3|=3$ **and** $|9z_1z_2+4z_1z_3+z_2z_3|=12$**. Find the value of** $|z_1+z_2+z_3|$

1) 2 2) 3 3) 0 4) –2

19. **The value of** $\sum_{n=1}^{13}\left(i^n+i^{n+1}\right),$ **where** $i=\sqrt{-1}$

1) i 2) $i-1$ 3) $-i$ 4) 0

20. **If** $z=x-iy$ **and** $z^{1/3}=p+iz,$ **then** $\frac{\left(\frac{x}{p}+\frac{y}{q}\right)}{p^2+q^2}$ **is**

1) 1 2) -1 3) 2 4) -2

MATHEMATICS-IIB

Syllabus: Areas

21. **The area bounded by** $y=x^3-4x$ **and** $x-$**axis is**

1) 5 2) 9 3) 8 4) 12

22. **The area bounded by the curve** $y=x^3,$ **the** $x-$**axis and the ordinate at** $x=-2$ **and** $x=1$ **is**

1) $\frac{9}{2}$ 2) $\frac{15}{2}$ 3) $\frac{15}{4}$ 4) $\frac{17}{4}$

23. **The area bounded by parabola** $y^2=x,$ **straight line** $y=4$ **and** $y-$**axis is**

1) $\frac{16}{3}$ 2) $\frac{64}{3}$ 3) $7\sqrt{2}$ 4) $-7\sqrt{2}$

24. **The area of the region bounded by** $x^2=y-3,y=4,y=6$ **and** $y-$**axis in the first quadrant is**

1) $\frac{2\left(2\sqrt{3}-1\right)}{3}$ 2) $\frac{4\left(2\sqrt{3}-1\right)}{3}$ 3) $\frac{\left(3\sqrt{3}-1\right)}{3}$ 4) $\frac{2\left(3\sqrt{3}-1\right)}{3}$

25. **The area bounded by the lines** $x=0,y=1,y=2$ **and the hyperbola** $xy=1$

1) $\log 2$ 2) $\log 3$ 3) $\log 4$ 4) $\log 5$

26. **The area of the region bounded by the curves** $y=x^2+3, y=x, x=0$ **and** $x=2$ **is**

1) 7 2) $\frac{20}{3}$ 3) $\frac{19}{3}$ 4) $\frac{22}{3}$

27. **The area bounded by the curves** $y=e^x, y=2x-x^2$ **and the lines** $x=0, x=2$ **is** $k-7/3$ **where** $k=$

1) e^2 2) e 3) $\frac{e^2}{2}$ 4) $-e^2$

28. **The area between the parabola** $y=x^2$ **and the line** $y=x$ **is**

1) $\frac{1}{6}$ 2) $\frac{1}{3}$ 3) $\frac{1}{2}$ 4) $\frac{1}{8}$

29. **The area bounded by** $y=x^2$ **and the line** $x+y-2=0$ **is**

1) 6 2) $\frac{14}{3}$ 3) 20 4) $\frac{9}{2}$

30. **The area bounded by the curves** $y=\sqrt{x}, 2y+3=x$ **and** $x-$**axis in the 1st quadrant is**

1) 9 2) $\frac{27}{4}$ 3) 36 4) 18

31. **The area enclosed by the parabolas** $y=x^2-1$ **and** $y=1-x^2$ **is**

1) $\frac{1}{3}$ 2) $\frac{2}{3}$ 3) $\frac{4}{3}$ 4) $\frac{8}{3}$

32. **Area bounded by the curve** $x^2=4y$ **and the straight line** $x=4y-2$ **is**

1) $\frac{8}{9}$ 2) $\frac{9}{8}$ 3) $\frac{4}{3}$ 4) None

33. **The are bounded by the curve** $y=2x-x^2$ **and the straight line** $y=-x$ **is given by**

1) $\frac{9}{2}$ 2) $\frac{43}{6}$ 3) $\frac{35}{6}$ 4) $\frac{1}{3}$

34. **The area bounded by** $y=2-x^2$ **and** $x+y=0$ **is**

1) $\frac{7}{2}$ 2) $\frac{9}{2}$ 3) 9 4) None of these

35. **The area of the plane regain bounded by the curves** $x+2y^2=0$ **and** $x+3y^2=1$ **is**

1) $\frac{2}{3}$ 2) $\frac{4}{3}$ 3) $\frac{5}{3}$ 4) $\frac{1}{3}$

36. **The area enclosed between the curves** $y=ax^2$ **and** $x=ay^2\,(a>0)$ **is 1 sq. unit. Then the value of a is**

1) $\frac{1}{\sqrt{3}}$ 2) $\frac{1}{2}$ 3) 1 4) $\frac{1}{3}$

37. **Area bounded by the curves** $y=\sin^{-1}x, y-$**axis and** $y=\cos^{-1}x$ **is**

1) $2+\sqrt{2}$ 2) $2-\sqrt{2}$ 3) $1+\sqrt{2}$ 4) $\sqrt{2}-1$

38. **Area bounded by** $y=\tan^{-1}x, y=\cot^{-1}x$ **and** $y-$**axis is**

1) $\ln\sqrt{2}$ 2) $\ln 4$ 3) $\ln 8$ 4) $\ln 2$

39. **Area bounded by the curves** $|y|=1-x^2$ **and** $|x|+|y|=1$ **is**

1) $\frac{8}{3}$ 2) $\frac{2}{3}$ 3) 2 4) -2

40. **The area bounded by the curves** $y=xe^x, y=xe^{-x}$ **and the lines** $x=1$ **is**

1) $\frac{2}{e}$ 2) $1-\frac{2}{e}$ 3) $\frac{1}{e}$ 4) $1-\frac{1}{e}$

PHYSICS

Syllabus: Ray Optics, Optical Instruments

41. A car is fitted with a convex side-view mirror of focal length 20 cm. A second car 2.8 m behind the first car is overtaking the first car at a relative speed of 15 m/s. The speed (in m/s) of the image of the second car as seen in the mirror of the first one is.

1) $\frac{1}{15}$m/s 2) 10m/s 3) 15m/s 4) $\frac{1}{10}$m/s

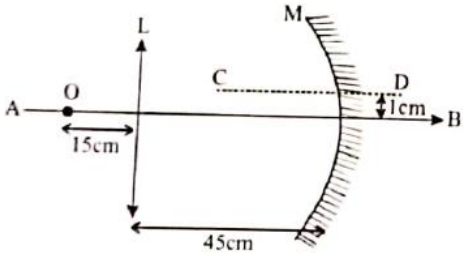
42. If the refractive index of the material of a prism is cot $\frac{A}{2}$ and the angle of prism is A, then angle of minimum deviation is

1) $\pi - 2A$ 2) $\pi - A$ 3) $\frac{\pi}{2} - 2A$ 4) $\frac{\pi}{2} - A$

43. A telescope has an objective of focal length 100 cm and an eyepiece of focal length 5 cm. What is the magnifying power of the telescope when the final image is formed at the least distance of distinct vision ?

1) 20 2) 24 3) 28 4) 32

44. In the figure shown, L is a converging lens of focal length 10 cm and M is a concave mirror of radius of curvature 20cm. A point object O is placed in front of the lens at a distance 15 cm. AB and CD are optical axes of the lens and mirror respectively. The distance of the final image formed by this system from the optical centre of the lens is $x\sqrt{26}$ cm. Find the value of x in cm. [The distance between CD and AB is 1 cm]

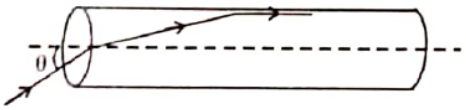


1) 2 2) 3 3) 6 4) 4

45. An object at 2.4 m in front of a lens forms a sharp image on a film 12 cm behind the lens. A glass plate 1 cm thick, of refractive index 1.50 is interposed between lens and film with its plane faces parallel to film. At what distance (from lens) should object shifted to be in sharp focus of film?

1) 7.2m 2) 2.4 3) 3.2m 4) 5.6m

46. A transparent solid cylindrical rod has a refractive index of $\frac{2}{\sqrt{3}}$. It is surrounded by air. A light ray is incident at the mid-point of one end of the rod as shown in the figure.



The incident angle θ for which the light ray grazes along the wall of the rod is :

1) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$ 2) $\sin^{-1}\left(\frac{2}{\sqrt{3}}\right)$ 3) $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$ 4) $\sin^{-1}\left(\frac{1}{2}\right)$

47. A ray of light passes through an equilateral prism such that the angle of incidence is equal to the angle of emergence and the latter is equal to $\frac{3}{4}$ th of angle of prism. The angle of deviation is

1) 25^0 2) 30^0 3) 45^0 4) 35^0

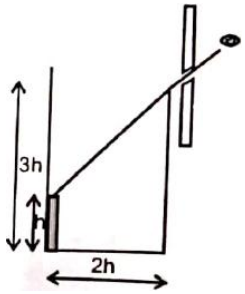
48. A light ray falls on a rectangular glass slab as shown. The index of refraction of the glass, if total internal reflection is to occur at the vertical face, is

1) $\sqrt{\frac{3}{2}}$ 2) $\frac{\left(\sqrt{3}+1\right)}{2}$ 3) $\frac{\left(\sqrt{2}+1\right)}{2}$ 4) $\sqrt{5}/2$

49. A person can see clearly only upto a distance of 30 cm. He wants to read a book placed at a distance of 50 cm from his eyes. What is the power of the lens of his spectacles?

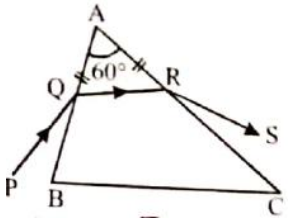
1) -1.0D 2) -1.33D 3) -1.67D 4) -2.0D

50. An observer can see through a pin-hole the top end of a thin rod of height h, placed as shown in the figure. The beaker height is 3h and its radius h. When the beaker is filled with a liquid up to a height 2h, he can see the lower end of the rod. Then the refractive index of the liquid is



1) $\frac{5}{2}$ 2) $\sqrt{\frac{5}{2}}$ 3) $\sqrt{\frac{3}{2}}$ 4) $\frac{3}{2}$

51. A ray PQ incident on the refracting face BA is refracted in the prism BAC as shown in the figure and emerges from the other refracting face AC as RS such that AQ = AR. If the angle of prism A=60^0 and the refractive index of the material of prism is $\sqrt{3}$, then the angle of deviation of the ray is



1) 60^0 2) 45^0 3) 30^0 4) None of these

52. A rectangular glass slab ABCD of refractive index n_1 is immersed in eater of refractive index $n_2\left(n_1 > n_2\right)$. A ray of light is incident at the surface AB of the slab as shown. The maximum value of the angle of incidence α_{max} such that the ray comes out only from the other surface CD is given by

1) $\sin^{-1}\left[\frac{n_1}{n_2}\left(\sin^{-1}\left(\frac{n_1}{n_2}\right)\right)\right]$ 2) $\sin^{-1}\left[n_1\cos\left(\sin^{-1}\left(\frac{n_1}{n_2}\right)\right)\right]$

3) $\sin^{-1}\left(\frac{n_1}{n_2}\right)$ 4) $\sin^{-1}\left(\frac{n_2}{n_1}\right)$

53. A microscope is focussed on a mark on a piece of paper and then ass slab of glass of thickness 3 cm and refractive index 1.5 is placed over the mark. How should the microscope he moved to get the mark in focus again ?

1) 4.5 cm downward 2) 1 cm downward 3) 2 cm upward 4) 1 cm upward

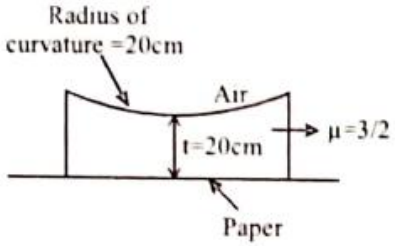
54. The focal lengths of the objective and the eye piece of .1 compound microscope are 2.0 cm and 3.0 cm, respectively. The distance between the objective and the eye piece is 15.0 cm. The final image formed by the eye piece is at infinity. The two lenses are thin. The distance in cm of the object and the image produced by the objective, measured from the objective lens, are respectively

1) 2.4 and 12.0 2) 2.4 and 15.0 3) 2.0 and 12.0 4) 2.0 and 3.0

55. A rectangular block of glass is placed on a mark made on the surface of the table and it is viewed from the vertical position of eye. If refractive index of glass be p and its thickness d, then the mark will appear to be raised up by

1) $\frac{(\mu+1)d}{\mu}$ 2) $\frac{(\mu-1)d}{\mu}$ 3) $\frac{(\mu+1)}{\mu d}$ 4) $\frac{(\mu-1)\mu}{d}$

56. A planoconcave lens is placed on a paper on which a flower is drawn. How far above its actual position does the flower appear to be?



1) 10 cm 2) 15 cm 3) 50 cm 4) None of these

57. A thin prism of angle 15^0 made of glass of refractive index μ_1 = 1.5 is combined with another prism of glass of refractive index μ_2 = 1.75. The combination of the prism produces dispersion without deviation. The angle of the second prism should be

1) 7^0 2) 10^0 3) 12^0 4) 5^0

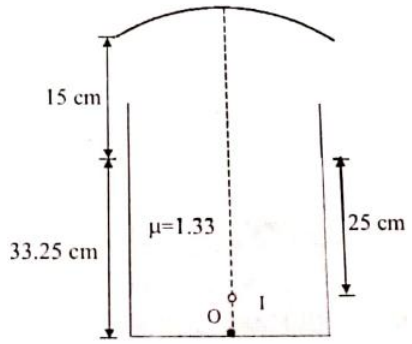
58. A telescope consists of two thin lenses of focal lengths, 0.3 in and 3 cm respectively. It is focused on moon which subtends an angle of 0.5^0 at the objective. Then the angle subtended at the eye by the final image will be

1) 5^0 2) 0.25^0 3) 0.5^0 4) 0.35^0

59. A bi-convex lens made of glass (refractive index 1.5) is put in a liquid of refractive index 1.7. Its local length will

1) decrease and change sign 2) increase and change sign
3) decrease and remain of the same sign 4) increase and remain of the same sign

60. A container is filled with water $(\mu = 1.33)$ upto a height of 33.25 cm. A concave mirror is placed 15 cm above the water level and the image of an object placed at the bottom is 25 cm below the water level. Focal length of the mirror is



1) 15 cm 2) 20 cm 3) -18.31 cm 4) 10 cm

61. An convex mirror of radius of curvature 1.6 m has an object placed at a distance of 1 m from it. The image is formed at a distance of

1) 8/13 m in front of the mirror 2) 8/13 m behind the mirror
3) 4/9 m in front of the mirror 4) 4/9 m behind the mirror

62. A short linear object of length b lies along the axis of a concave mirror. The size of the image is equal to

1) $b\left(\frac{u-f}{f}\right)^{1/2}$ 2) $b\left(\frac{f}{u-f}\right)^{1/2}$ 3) $b\left(\frac{u-f}{f}\right)$ 4) $b\left(\frac{f}{f-u}\right)$

63. Two plane mirrors are inclined to each other at an angle θ. A ray of light is reflected first at one mirror and then at the other. The total deviation of the ray is

1) 2θ 2) $240^0-2\theta$ 3) $360^0-2\theta$ 4) $180^0-\theta$

64. A plane mirror is approaching you at 10 cms^{-1}. Your image shall approach you with a speed of

1) $+10\,cms^{-1}$ 2) $-10\,cms^{-1}$ 3) $+20\,cms^{-1}$ 4) $-20\,cms^{-1}$

65. A candle is placed before a thick plane mirror. When looked obliquely in the mirror, a number of images are seen from the surfaces of the plane mirror. Then

1) first image is brightest
2) second image is brightest
3) third image is brightest
4) all images beyond second are brighter

CHEMISTRY

Syllabus: Aldehydes & Ketones

66. $2CH_3CHO \xrightarrow{\text{Aq NaOH}} CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_2-CHO$ **represents.**

1) Cannizaro reaction
2) Benzoin's condensation
3) Aldol condensation
4) Perkin's reaction

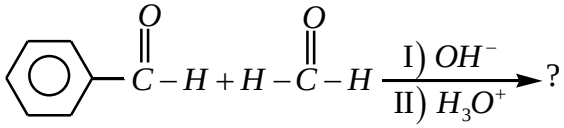
67. $C_6H_5-\overset{\displaystyle O}{\overset{\|}{C}}-H+CH_3-\overset{\displaystyle O}{\overset{\|}{C}}-OC_2H_5 \xrightarrow{\text{dil } NaOH} ?$

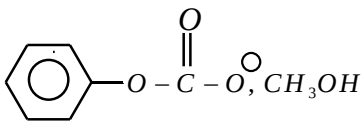
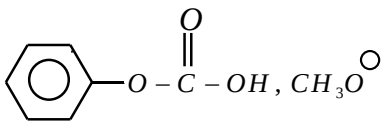
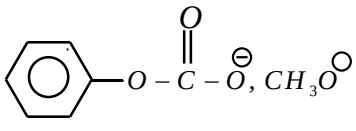
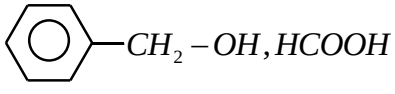
1) $C_6H_5-\overset{\displaystyle O}{\overset{\|}{C}}-CH_2-\overset{\displaystyle O}{\overset{\|}{C}}-OC_2H_5$
2) $C_6H_5-CH=CH-\overset{\displaystyle O}{\overset{\|}{C}}-OC_2H_5$
3) $C_6H_5-\overset{\displaystyle O}{\overset{\|}{C}}=CH_2-\overset{\displaystyle O}{\overset{\|}{C}}-OC_2H_5$
4) $C_6H_5-\underset{\displaystyle OH}{\underset{|}{CH}}=CH_2-\underset{\displaystyle OH}{\underset{|}{C}}-OC_2H_5$

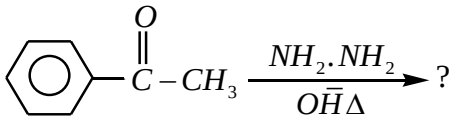
68. $A \xrightarrow{Cl_2} CCl_3CHO \xrightarrow{NaOH} B.$ **In this reaction A and B are**

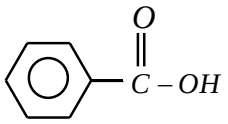
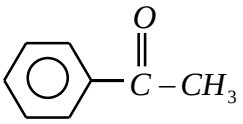
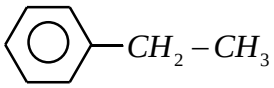
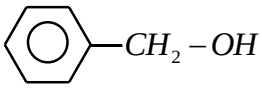
1) CH_3-CHO and $CHCl_3$
2) CH_3CHO and C_2H_5Cl
3) CH_3-CH_2-OH and CH_3Cl
4) CH_3-O-CH_3 and $CHCl_3$

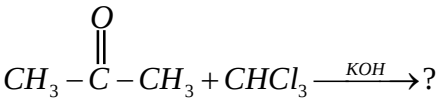
69. What are the products of the following crossed cannizaro reaction

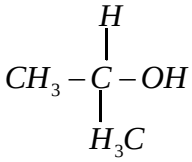
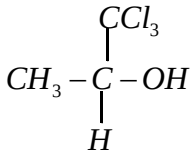
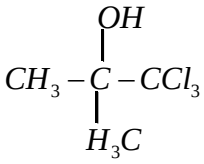
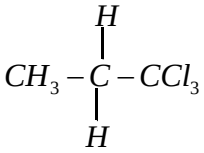


1) 
2) 
3) 
4) 

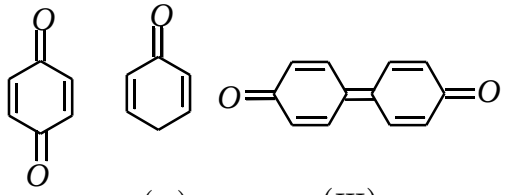
70. 

1)  2)  3)  4) 

71. 

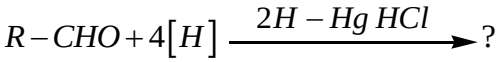
1)  2)  3)  4) 

72. The correct stability order of the following three quinones is

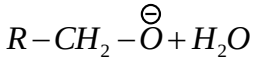


(I) (II) (III)

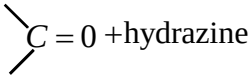
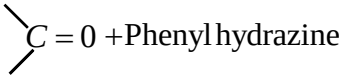
1) I>III>II 2) I=III>II 3) I=II>III 4) III>I>II

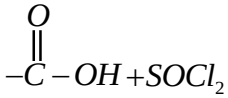
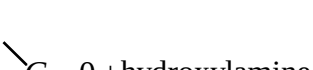
73. 

1) $R-CH_3+H_2O$ 2) $R-CH_2-OH+H_2O$

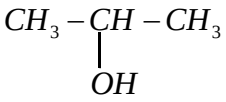
3)  4) $R-COOH+H_2$

74. Oxime is the product of the following

1)  2) 

3)  4) 

75. Haloform reaction is not given by

1) CH_3COCH_3 2) $CH_3COC_2H_5$ 3) $C_6H_5COC_2H_5$ 4) 

76. A new C-C bond formation is possible in

1) Cannizaro reaction 2) Rosenmund's reaction

3) Clemmenson's reduction 4) Reimerr-Tiemann reaction

77. Which of the following does not undergo aldol condensation

1) $ClCH_2CHO$ 2) CCl_3CHO 3) $C_6H_5CH_2CHO$ 4) CH_3CHO

78. Which of the following undergoes cannizaro reaction.

A) HCHO B) C_6H_5CHO C) Cl_3C-CHO D) $(CH_3)_3-C-CHO$

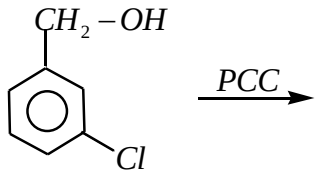
1) Only A & B 2) Only B & C 3) Only C & D 4) Only A,B & D

79. Formaldehyde reacts with ammonia to give urotropine the formula for urotrpine is

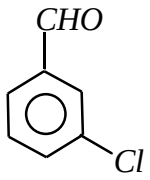
1) $(CH_2)_6N_6$ 2) $(CH_2)_4N_3$ 3) $(CH_2)_6N_4$ 4) $(CH_2)_3N_3$

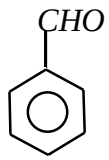
80. Ketones react with Mg/Hg over water gives

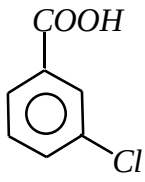
1) Pinacolone 2) Alcohols 3) Pinacols 4) None of these

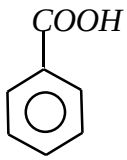
81. 

Product is

1) 

2) 

3) 

4) 

82. $4-\text{Heptanone} \xrightarrow{KMnO_4/H^+,\Delta} A+B$ **Identify A and B**

1) Ethanoic acid & Pentanoic acid 2) Ethanol and butanoe

3) Butanoic acid and propanoic acid 4) Acetic acid and Pentanoic acid

83. Which of the following has the most acidic hydrogens

1) 3-Hexanone 2) 2,4-Hexanedione

3) 2,5-Hexanediane 4) 2,3-Hexanedione

84. Which of the following compounds does not react with sodium bisulphate

1) Benaldehyde 2) Acetone 3) Acetophenone 4) Acetaldehyde

85. The reaction in which X=0 group changes to xH_2

A) Clemmenson's reduction

B) Wolf-Kishner reduction

C) Aldol condensation

D) Rosenmund reduction

1) A & B only 2) B and C only 3) A and D only 4) A,B,C and D

KEY SHEET

MATHS-IIA

1) **1**	2) **3**	3) **1**	4) **2**	5) **4**	6) **1**	7) **1**	8) **1**	9) **4**	10) **1**
11) **4**	12) **1**	13) **1**	14) **1**	15) **2**	16) **2**	17) **4**	18) **1**	19) **2**	20) **4**

MATHS-IIB

21) **3**	22) **4**	23) **2**	24) **4**	25) **1**	26) **2**	27) **1**	28) **1**	29) **4**	30) **1**
31) **4**	32) **2**	33) **1**	34) **2**	35) **2**	36) **1**	37) **2**	38) **4**	39) **2**	40) **1**

PHYSICS

41) **1**	42) **1**	43) **2**	44) **3**	45) **4**	46) **3**	47) **2**	48) **1**	49) **2**	50) **2**
51) **1**	52) **1**	53) **4**	54) **1**	55) **2**	56) **1**	57) **2**	58) **1**	59) **2**	60) **3**
61) **4**	62) **4**	63) **3**	64) **3**	65) **2**					

CHEMISTRY

66) **3**	67) **2**	68) **1**	69) **4**	70) **3**	71) **3**	72) **3**	73) **1**	74) **4**	75) **3**
76) **4**	77) **2**	78) **1**	79) **3**	80) **3**	81) **1**	82) **3**	83) **2**	84) **3**	85) **1**

HINTS & SOLUTOINS

MATHS-IIA

1. $\left[\left[\frac{1-i}{1+i}\right]^2\right]^{25} = -1+0i$

2. $\frac{\omega^2\left(a\omega^2+b+c\omega+d\omega^2\right)}{\left(a\omega^2+b\omega^3+c\omega^4+d\omega^2\right)}$

3. $\frac{2+3i}{5i} = \frac{3}{5}-\frac{2i}{5}$

   $\arg(z) = \tan^{-1}\left(\frac{-2}{3}\right)$

4. The points z_1 and z_2 describe circles of radii 12,5 centres '0' and $(3,4)$. The nearest distance between the circles is $12-10=2$

5. $\sin x = \cos x$ and $\cos 2x = \sin 2x$

6. $\left|\left|z\right|-\frac{6}{\left|z\right|}\right| \le \left|z+\frac{6}{z}\right| = 5$

   $\Rightarrow \left|z\right|-\frac{6}{\left|z\right|} \le 5$

$|z|^2 - 5|z| - 6 \le 0 \Rightarrow -1 \le |z| \le 6$

7. $(2z-3i)\left(4iz^2-9\right)=0$

$\Rightarrow z = \frac{3i}{2}$ and $z^2 = \frac{9}{4i}$

$|z| = \frac{3}{2}$

8. $z^3+2z^2+2z+1=0$

$\Rightarrow \left(z^3+1\right)+2z(z+1)=0$

$\Rightarrow (z+1)+\left(z^2+z+1\right)=0$

$\Rightarrow z = -1, w, w^2$

9. $\left(1+w^2\right)^5 = a+bw$

$1+w = a+bw$

$a=1,\ b=1$

10. $-3-ix^2y = x^2+y+4i$

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

$x^2 = 1$ and $y=-4$

11. $|zw|=1 \Rightarrow |z||w|=1$

$\arg\left(\frac{z}{w}\right) = ki = \frac{\pi}{2} \Rightarrow \frac{z}{w} = ki$

$z = wki \Rightarrow |z| = 1$

Let $z = re^{i\theta}\ -\pi \le \theta < \pi$

$\Rightarrow w\bar{z} = -i$

12. $1 = |-a|^2 = |b\cos\alpha + c\sin\alpha|^2$

$1 = |b^2|\cos^2\alpha + |c|^2\sin^2\alpha + \left(b\bar{c}+\bar{b}c\right)\cos\alpha\sin\alpha \qquad 1 = 1+\left(\frac{b}{c}+\frac{c}{b}\right)\cos\alpha\ \sin\alpha$

$2CH_3CHO \xrightarrow{\text{Aq NaOH}} CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_2-CHO$

$C_6H_5-\overset{O}{\overset{\|}{C}}-H + CH_3-\overset{O}{\overset{\|}{C}}-OC_2H_5 \xrightarrow{\text{dil NaOH}}$?

13. $C_6H_5-\overset{O}{\overset{\|}{C}}-H + CH_3-\overset{O}{\overset{\|}{C}}-OC_2H_5$ and $C_6H_5-CH=CH-\overset{O}{\overset{\|}{C}}-OC_2H_5$ are conjugates of each other,

$C_6H_5-\overset{O}{\overset{\|}{C}}=CH_2-\overset{O}{\overset{\|}{C}}-OC_2H_5$

Hence $C_6H_5-\underset{\displaystyle OH}{\underset{|}{CH}}=CH_2-\underset{\displaystyle OH}{\underset{|}{C}}-OC_2H_5$

14. $A \xrightarrow{Cl_2} CCl_3CHO \xrightarrow{NaOH} B.$

$\arg\left(e^z\right) = r\cos\theta$

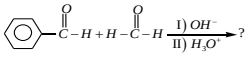
15. Let $z = x+iy$ then $x = \lambda+3$ and $y = -\sqrt{5-\lambda^2}$

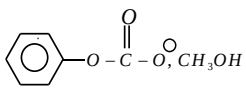
$(x-3)^2 = (5-y)^2 \Rightarrow (x-3)^2 + y^2 = 5$

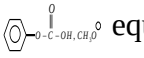
Obviously is a semi circle as $y<0$.

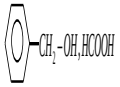
16. $\left|z^3-3\right| \ge \left|z^2\right|-3$

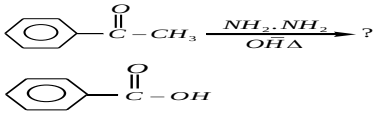
$\Rightarrow 3|z| \geq |z|^2 - 3$

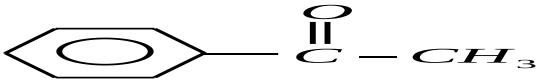


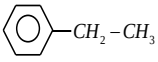


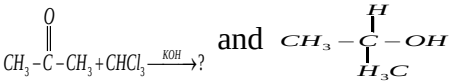
17. Equation (1) is a ray with slope 1 and starting through  equation (2) is a ray with slope 

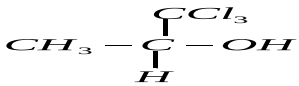
and starting through 

18. 

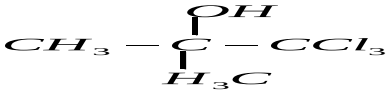
19. 

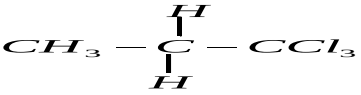
20. 

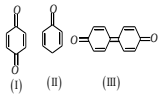
 and



MATHS-IIB

21. 

22. 

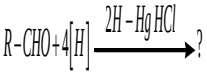
23. 

24. $\int_1^6 \sqrt{y-3}\, dy =$

25. $\int_1^2 x dy = \int_1^2 \frac{1}{y} dy = \log 2$

26. $= \int_0^2 \left(x^2 + 3 - x\right) dx = \frac{20}{3}$

27. $\int_0^2 e^x - x^2 + \frac{x^3}{3} dx = e^4 - 4 + \frac{8}{3} - 1 = e^2 - \frac{7}{3}$

28. 

29. $\int_{-2}^1 \left(2 - x - x^2\right) dx = \frac{9}{2}$

30. $\int_0^9 \sqrt{x} dx - \int_3^9 \left(\frac{x-3}{2}\right) dx$

$R-CH_2-\overset{\ominus}{O}+H_2O$

31. $y=x^2-1,\ y=1-x^2$

$2\int_0^1\left(1-x^2\right)-\left(x^2-1\right)dx=\frac{8}{3}$

32. $\frac{1}{4}\int_{-1}^{2}(x+2)dx-\int_1^2\frac{x^2}{4}dx=\frac{9}{8}$

33. $-\overset{\overset{O}{\|}}{C}-OH+SeCl_2$

34. $\int_{-1}^{2}\left(2-x^2\right)dx+\int_{-1}^{2}x\,dx=3+\frac{3}{2}=\frac{9}{2}$

35. $\left|\int_{-1}^{1}\left(1-3y^2\right)dy-\int_{-1}^{1}\left(-2y^2\right)dy\right|=\frac{4}{3}$

36. $\int_0^{\frac{1}{a}}\left(\sqrt{\frac{x}{a}}-ax^2\right)dx=1\Rightarrow a^2=\frac{1}{3}\Rightarrow a=\frac{1}{\sqrt{3}}$

37. $\int_0^{\pi/4}\sin ydx+\int_{\pi/4}^{\pi/2}\cos 4dy=2-\sqrt{2}$

38. $CH_3-\underset{\underset{O}{\|}}{CH}-CH_3$

39. $2\int_{-1}^{1}\left(1-x^2\right)-4x\frac{1}{2}=\frac{8}{3}-2=\frac{2}{3}$

40. $\int_0^1\left(xe^x-xe^{-x}\right)dx=e^x\left(x-1\right)\Big]_0^1+e^{-x}\left(r+1\right)\Big]_0^1=\frac{2}{e}$

PHYSICS

41. From mirror formula

$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$ so, $\frac{dv}{dt}=-\frac{v^2}{u^2}\left(\frac{du}{dt}\right)$

$\Rightarrow\frac{dv}{dt}=-\left(\frac{f}{u-f}\right)^2\frac{du}{dt}$

$\Rightarrow\frac{dv}{dt}=\frac{1}{15}m/s$

42. We have,

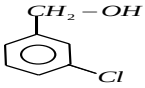
$\mu=\frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

$\Rightarrow\cot\frac{A}{2}=\frac{\sin\left(A+\frac{\delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

or $\sin\frac{A}{2}.\cot\frac{A}{2}=\sin\left(\frac{A+\delta_m}{2}\right)$

or $\sin\frac{A}{2}.\frac{\cot\frac{A}{2}}{\sin\frac{A}{2}}=\sin\left(\frac{A+\delta_m}{2}\right)$

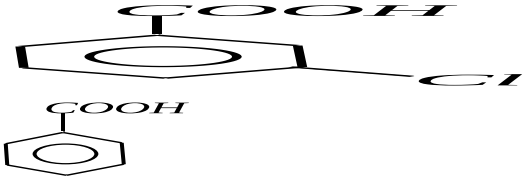
or $\cos\frac{A}{2}=\cos\left[\frac{\pi}{2}-\left(\frac{A+\delta_m}{2}\right)\right]$



or 

43. 

When final image is formed at least distance of distinct vision (d), then



44. I_1 is the image of object O formed by the lens

$\frac{1}{v_1}-\frac{1}{u_1}=\frac{1}{f};=-15,\ f_1=10$

Solving we get, $v_1=30cm$

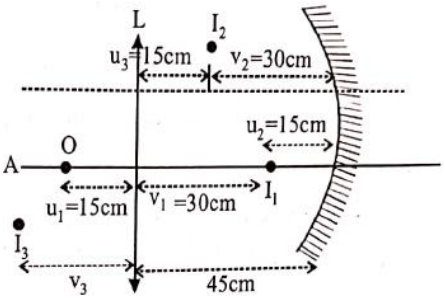
I_1 acts as source for mirror

$\therefore u_2=-(45-v_1)=-15cm.$

I_2 is the image formed by the mirror

$\therefore\frac{1}{v_1}=\frac{1}{f_m}-\frac{1}{u_2}=-\frac{1}{10}+\frac{1}{15}$

$\therefore v_2=-30cm$



The height of I_2 above principal axis of lens is $=\frac{v_2}{u_2}\times1+1=3cm.$

I_2 acts as a source for lens, $u_3=-(45-v_2)=-15cm.$

Hence, the lens forms an image I_3 at a distance $v_3=30cm$ to the left of lens.

The height of I_3 below the principal axis of lens $=\frac{v_3}{u_3}\times3=6cm.$

45. The focal length of the lens

$\frac{1}{f}=\frac{1}{v}-\frac{1}{u}=\frac{1}{12}+\frac{1}{240}=\frac{20+1}{240}=\frac{21}{240}$

$f = \frac{240}{21} cm$

Shift $\propto t\left(1-\frac{1}{u}\right)$

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

Now $v' = 12-\frac{1}{3}=\frac{35}{3}cm$

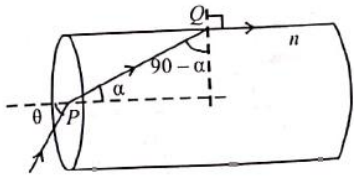
Now the object be distance u'.

$\frac{1}{u'}=\frac{3}{35}-\frac{21}{240}=\frac{1}{5}\left[\frac{3}{7}-\frac{21}{48}\right]$

$\frac{1}{u'}=\frac{1}{5}\left[\frac{48-49}{7\times16}\right]$

$u' = -7\times16\times5 = -560cm = -5.6m$

46. Applying Snell's law at Q



Applying Snell's law at Q

$n=\frac{\sin 90^0}{\sin\left(90^0-\alpha\right)}=\frac{1}{\cos\alpha}$

$\therefore \cos\alpha=\frac{1}{n}$

$\therefore \sin\alpha=\sqrt{1-\cos^2\alpha}=\sqrt{1-\frac{1}{n^2}}=\sqrt{\frac{n^2-1}{n}}...(1)$

Applying Snell's Law at P

$n=\frac{\sin\theta}{\sin\alpha}\Rightarrow\sin\theta=n\times\sin\alpha=\sqrt{n^2-1};$

from (1)

$\therefore \sin\theta=\sqrt{\left(\frac{2}{\sqrt{3}}\right)^2-1}=\sqrt{\frac{4}{3}-1}=\frac{1}{\sqrt{3}}$

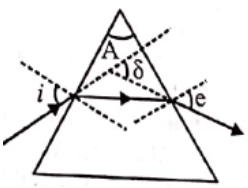
or $\theta=\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

47. From the fig.

Angle of deviation,

$\delta = i+e-A$

Here, $e=i$ and $e=\frac{3}{4}A$



$\therefore \delta = \frac{3}{4}A + \frac{3}{4}A - A = \frac{A}{2}$

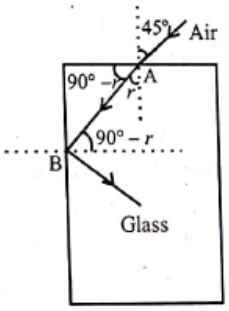
For equilateral prism, $A = 60^0$

$\therefore \delta = \frac{60^0}{2} = 30^0$

48. For point A, ${}_a\mu_g = \frac{\sin 45^0}{\sin r} \Rightarrow \sin r = \frac{1}{\sqrt{2}_a\mu_g}$

For point B, $\sin\left(90^0 - r\right) = {}_g\mu_a$ where,

$\left(90^0 - r\right)$ is critical angle.



$\therefore \cos r = {}_g u_a = \frac{1}{{}_a u_g}$

$\Rightarrow {}_a u_g = \frac{1}{\cos r}$

$= \frac{1}{\sqrt{1-\sin^2 r}} = \frac{1}{\sqrt{1-\frac{1}{2_a\mu_g^2}}}$

$= {}_a\mu_g^2 = \frac{1}{1-\frac{1}{2_a\mu_g^2}} = \frac{2_a\mu_g^2}{2_a\mu_g^2 - 1}$

$= 2_a\mu_g^2 - 1 = 2 \Rightarrow {}_a\mu_g = \sqrt{\frac{3}{2}}$

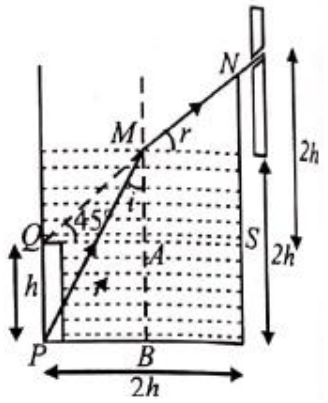
49. $u = -50cm = -0.5m$

$v = -30cm = -0.3m$

$P = \frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{-1}{0.3} + \frac{1}{0.5} = \frac{-0.2}{0.15} = -1.33D$ 50. For the image of point P to be seen by the observer, it should be formed at point Q.

In ΔQNS,

$NS = QS = 2h$



$\therefore \angle NQS = 45^0$

$\therefore r = 45^0$

At point M

$$\frac{1}{2}\mu = \frac{\sin r}{\sin i} = \frac{\sin 45^0}{\sin i} = \frac{1}{\sqrt{2}.\sin i} \quad ...(i)$$

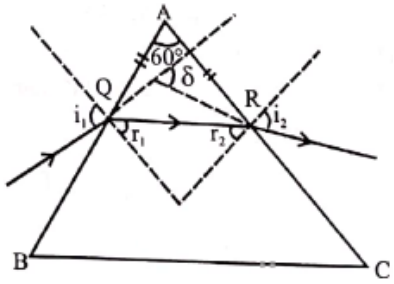
In ΔPMB,

$PM^2 = 4h^2 + h^2 = 5h^2$

$$\therefore \sin i = \frac{h}{\sqrt{5}h} \qquad ...(ii)$$

From (i) and (ii) ${}_1^2\mu = \sqrt{\frac{5}{2}}$

51. Given $AQ = AR$ and $\angle A = 60^0$



$\therefore \angle AQR = \angle ARQ = 60^0$

$\therefore r_1 = r_2 = 30^0$

Applying Snell's law on face AB.

$\sin i_1 = \mu \sin r_1$

$$\Rightarrow \sin i_1 = \sqrt{3}\sin 30^0 = \sqrt{3} \times \frac{1}{2} = \frac{\sqrt{3}}{2}$$

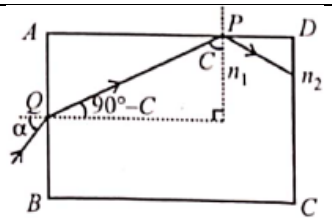
$\therefore i_1 = 60^0$

Similarly, $i_2 = 60^0$

In a prism, deviation

$\delta = i_1 + i_2 - A = 60^0 + 60^0 - 60^0 = 60^0$

52. The ray will come out from CD if it suffers total internal reflection at surface AD, i.e., it strikes the surface AD at critical angle C (the limiting case).



Applying Snell's law at P

$n_1 \sin C = n_2$ or $n \sin C = \frac{n_2}{n_1}$

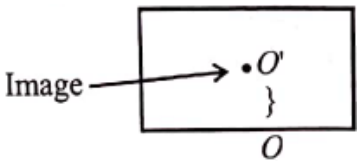
Applying Snell's law at Q

$n_2 \sin\alpha = n_1 \cos C$

$\Rightarrow \sin\alpha = \frac{n_1}{n_2}\cos\left\{\sin^{-1}\left(\frac{n_2}{n_1}\right)\right\}$

or, $\alpha = \sin^{-1}\left[\frac{n_1}{n_2}\cos\left\{\sin^{-1}\left(\frac{n_2}{n_1}\right)\right\}\right]$

53. In the later case microscope will be focused for O'. So, it is required to be lifted by distance OO'.
$OO' =$ real depth of $O -$ apparent depth of O.



$= 3 - \frac{3}{1.5}\left[\mu = \frac{\text{real depth}}{\text{apprent depth}}\right]$

$= 3\left[\frac{1.5-1}{1.5}\right] = \frac{3\times 5}{1.5} = 1cm$

54. Here $f_0 = 2$ cm and $f_e = 3$ cm.

Using lens formula for eye piece

$\Rightarrow \frac{-1}{u_e} + \frac{1}{\infty} = \frac{1}{3} \Rightarrow u_e = -3$ cm

But the distance between objective and eye piece is 15 cm (given)

$\therefore$ Distance of image formed by the objective

$= v = 15 - 3 = 12$ cm.

Let u be the object distance from objective, then for objective lens

$-\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ or $\frac{-1}{u} + \frac{1}{12} = \frac{1}{2}$

$\Rightarrow \frac{-1}{u} = \frac{1}{2} = \frac{1}{12} = \frac{5}{12}, u = -\frac{12}{5} = -2.4cm$

55. Since $\frac{\text{Apparent depth}}{\text{Real depth}} = \frac{1}{\mu}$

$=$Apparent depth$= d/\mu$

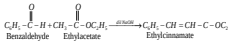
So mark raised up

= Real depth – Apparent depth

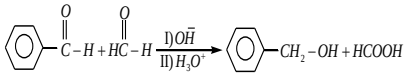
$$= d - \frac{d}{\mu} = d\left(1 - \frac{1}{\mu}\right) = \left(\frac{\mu - 1}{\mu}\right)d$$

56. Considering refraction at the curved surface.

$u = -20, \mu_2 = 1$

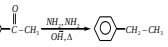


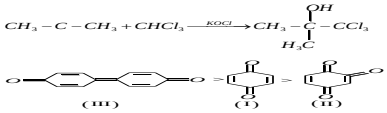
Applying $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$



i.e., 10 cm below the curved surface or 10 cm above the actual position of flower.

57. Deviation = zero

So, 



$$\Rightarrow A_2 = -\frac{0.5}{0.75} \times 15^0 \text{ or } A_2 = -10^0.$$

Negative sign shows that the second prism is inverted with respect to the first.

58. Magnification

$$\Rightarrow \frac{0.3m}{3cm} = \frac{\beta}{0.5^0} \Rightarrow \frac{30cm}{3cm} = \frac{\beta}{0.5^0}$$

$\Rightarrow \beta = 5^0$

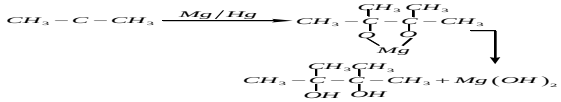
59. From lens formula

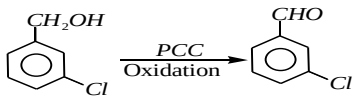
$$\frac{1}{f_0} = \left({}_a\mu_g - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$\frac{1}{f_a} = (1.5 - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right) \quad ...(i)$$

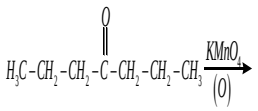
When lens is immersed in liquid, then

$$\frac{1}{f_1} = \left({}_l\mu_g - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$





Dividing eq. (i) by (ii), we get



or $f_l = -4.25\, f_a$

Hence, focal length will increase and will change in sign.

60. The image I' for first refraction (i.e., when the ray comes out of liquid) is at a depth of

$$= \frac{33.25}{1.33} = 25cm \left[\because \text{Apparent depth} = \frac{\text{Real depth}}{\mu}\right]$$

Now, reflection will occur at concave mirror. For this I' behaves as an object.

$\therefore \mu = -(15+25) = -40$ cm and $v = -\left[15+\frac{25}{1.33}\right]$

Where $\frac{25}{1.33}$ is the real depth of the image.

Using mirror formula we get

$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$, $f = -18.31$ cm

61. Here, $f = \frac{1.6}{2} m = 0.8m, u = -1m$

We have, $\frac{1}{v} = \frac{1}{0.8} - \frac{1}{-1} = \frac{10}{8} + 1 = \frac{18}{8} = \frac{9}{4}$

or $v = \frac{4}{9} m$

(Positive sign indicates that the distance is behind the mirror)

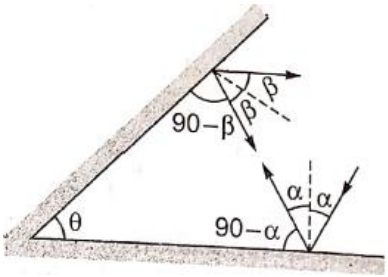
62. Length of image $= \left(\frac{f}{f-u}\right) b$

63. Total deviation $= (180^0 - 2\alpha) + (180^0 - 2\beta)$

$= 360^0 - 2(\alpha + \beta)$

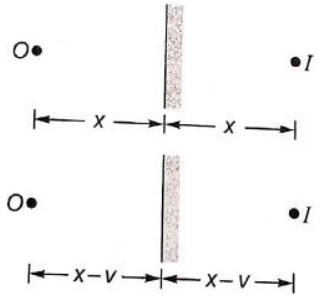
But, $90^0 - \alpha + 90^0 - \beta + \theta = 180^0$

or $\theta = \alpha + \beta$



$\therefore$ Total deviation $= 360^0 - 2\theta$

64. It is clear from figure, the new distance is
2x-2v. the distance of image from object is reduced by an amount 2v in one second.
Thus, the required speed is $2 \times 10 = 20 cms^{-1}$ in direction your down speed i.e., positive.



65. The first images is due to reflection from the front surface i.e., in unpolished surface of the mirror. So, only a small fraction is the incident light energy is reflected. The second image is due to reflection from polished surface. So, a major portion of light is reflected. Thus, the second image is the brightest.

CHEMISTRY

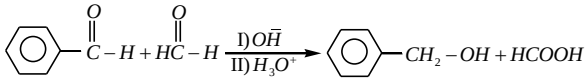
66. $2CH_3CHO \xrightarrow{aq\ NaOH} CH_3-\underset{OH}{\underset{|}{CH}}-CH_2-CHO$

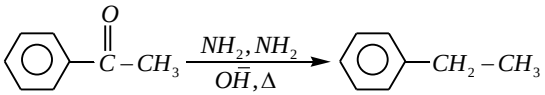
Aldehyde β – Hydroxyaldehyde

67. $C_6H_5-\overset{O}{\overset{\|}{C}}-H + CH_3-\overset{O}{\overset{\|}{C}}-OC_2H_5 \xrightarrow{dil\ NaOH} C_6H_5-CH=CH-C-OC_2$

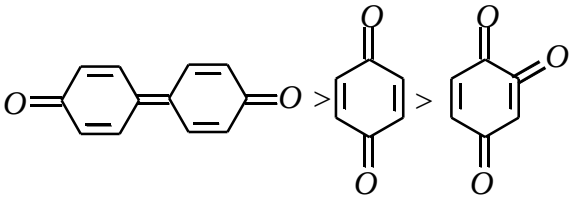
Benzaldehyde Ethylacetate Ethylcinnamate

68. $CH_3-CHO \xrightarrow{Cl_2} CCl_3CHO \xrightarrow{NaOH} CHCl_3$

69. 

70. 

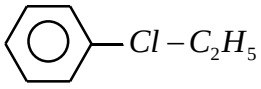
71. $CH_3-C-CH_3 + CHCl_3 \xrightarrow{KOCl} CH_3-\underset{H_3C}{\underset{|}{\overset{OH}{\overset{|}{C}}}}-CCl_3$

72. 

(III) (I) (II)

73. $R-CHO+(H) \xrightarrow{Zn-Hg,HCl} R-CHS+H_2O.$

74. $C=O+NH_2OH \rightarrow Oxime.$

75. The compound  cannot Hyde go holoform reaction.

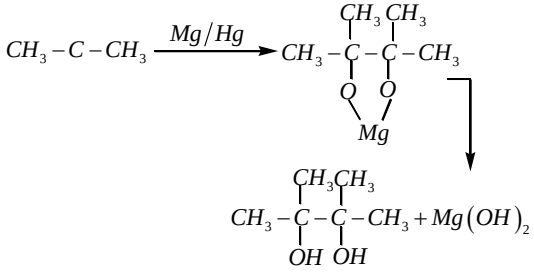
76. In Reimer-Tieman reaction a new C-C bond formation is possible

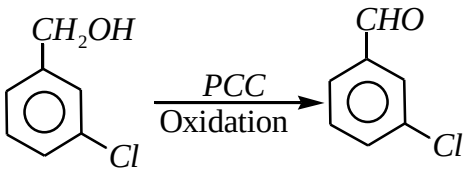
77. No α – Hydrogen atoms

78. Aldehydes containing no α – hydrogen undergo reaction except CCl_3CHO and $(ClH_5)_3-CHO.$

79. $6HCHO+4NH_3 \rightarrow (CH_2)_6N_4+6H_2O$

Urotropine

80. 

81. 

82. $H_3C-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-CH_3 \xrightarrow[(O)]{KMnO_4} CH_3-CH_2-COOH + CH_3-CH_2-CH_2-COOH$

83. Conceptual

84. Only acetophenone des not focus adduct due to steric effect.

85. Conceptual