MELUHA INTERNATIONAL SCHOOL

HYDERABAD

SR MPC | **JEE MAINS MODEL** | **Date: 13-04-2020**

Time: 3 Hrs | **Max. Marks: 300**

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

MATHS

SYLLABUS : PERMUTATION & COMBINATIONS, PROBABILITY, INDEFINITE INTEGRALS, DIFFERENTIAL EQUATIONS

1. The sum of digits in the units place of all the 4 digits numbers formed by using the digits 3,4,5,6,7 is

1)500 2)600 3) 400 4) 300

2. Number of ways of permuting the letters of the word "ENGINEERING" so that the order of the vowels is not changed is

1) ${}^{11}C_5$ 2) $\frac{11!}{5!}$ 3) $\frac{11!}{2!5!}$ 4) $\frac{{}^{11}P_5}{2}$

3. A student is allowed to select at most 'n' books from a collection of (2n+1) books. If the total number of ways in which he can select at least one book is 63 then n=

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

4. The number of ways that 30 mangoes can be distributed among 5 boys is

1) ${}^{34}C_4$ 2) ${}^{35}C_4$ 3) ${}^{36}C_4$ 4) ${}^{33}C_4$

5. The number of permutations of the letters of the word 'PROPORTATION' taken 4 at a time so that 3 are alike and one is different is

1)15 2) 20 3) 25 4) 120

6. If two numbers a and b are chosen from the set of integers 1 to 39 , then the probability that those numbers satisfy the equation 7a-9b=0 is

1) $\frac{1}{742}$ 2) $\frac{4}{743}$ 3) $\frac{4}{741}$ 4) $\frac{5}{741}$

7. An integer is chosen from $\{2k / -9 \le k \le 10\}$. The probability that it is divisible by both 4 and 6 is

1) $\frac{1}{10}$ 2) $\frac{1}{20}$ 3) $\frac{1}{4}$ 4) $\frac{3}{20}$

8. Three faces of a fair die are yellow, two faces are red and one face is blue . If the die is tossed 3 times , then the probability that the colours yellow ,red and blue appear is (need not be in that order)

1) $\frac{1}{36}$ 2) $\frac{1}{6}$ 3) $\frac{5}{6}$ 4) $\frac{1}{2}$

9. If 10 persons are to sit around table , the odds against two specified persons siting together is

1) 1 to9 2) 2 to 9 3) 7 to 2 4) 2 to 7

10. **For k=1,2,3 the box B_k contains k red balls and (k+1) white balls . let $P(B_1)=\frac{1}{2}, P(B_2)=\frac{1}{3}$ and $P(B_3)=\frac{1}{6}$. A box is selected at random and a ball is drawn from it. If a red balls is drawn , then the probability that it has come from box B_2 is**

1) $\frac{35}{78}$ 2) $\frac{14}{37}$ 3) $\frac{10}{13}$ 4) $\frac{12}{13}$

11. **If** $\int \frac{\sin^2\alpha-\sin^2 x}{\cos x-\cos\alpha}dx = f(x)+Ax+B$ and $B\in R$ then

1) $f(x)=2\sin x, A=\cos\alpha$ 2) $f(x)=2\sin x, A=2\cos\alpha$

3) $f(x)=\sin x, A=\cos\alpha$ 4) $f(x)=\sin x, A=2\cos\alpha$

12. **If** $\int \frac{1+x}{1+\sqrt[3]{x}}dx = lx+mx^{\frac{4}{3}}+nx^{\frac{5}{3}}+c$ then $l+m+n=$

1) $\frac{17}{20}$ 2) $-\frac{17}{20}$ 3) $\frac{19}{20}$ 4) $\frac{13}{20}$

13. **If** $\int(\sin 2x-\cos 2x)dx=\frac{1}{\sqrt{2}}\sin(2x-a)+b$ then

1) $a=\frac{\pi}{4}, b\in R$ 2) $a=-\frac{\pi}{4}, b\in R$ 3) $a=\frac{5\pi}{4}, b\in R$ 4) $a=-\frac{5\pi}{4}, b\in R$

14. **The displacement function s(t) of a particle moving with velocity $v(t)=u+at$ along a straight line, assuming that $s(0)=0$ is**

1) $ut+\frac{1}{2}at^2$ 2) $ut+\frac{1}{2}at^2+c$ 3) constant 4) $ut-\frac{1}{2}at^2$

15. **If** $f_n(x)=\log\log\log....\log x$ (log is repeated n – times), then $\int\left(xf_1(x)\,f_{\,2}(x)\right)^{-1}dx=$

1) $f_{n+1}+c$ 2) $\frac{f_{n+1}(x)}{n+1}+c$ 3) $nf_1(x)+c$ 4) $\frac{f_n(x)}{n}+c$

16. **The integral** $\int x\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)dx\,(x>0)$, is equal to

1) $-x+(1+x^2)\tan^{-1}x+c$ 2) $x-(1+x^2)\cot^{-1}x+c$

3) $-x+(1+x^2)\cot^{-1}x+c$ 4) $x-(1+x^2)\cot^{-1}x+c$

17. **The integral** $\int\left[1+x-\frac{1}{x}\right]e^{x+\frac{1}{x}}dx$ is equal to

1) $(x+1)e^{x+\frac{1}{x}}+c$ 2) $-xe^{x+\frac{1}{x}}+c$ 3) $(x-1)e^{x+\frac{1}{x}}+c$ 4) $x.e^{x+\frac{1}{x}}+c$

18. **If** $\int f(x)dx=\psi(x)$, then $\int x^5 f(x^3)dx$ is equal to

1) $\frac{1}{3}x^3\psi(x^3)-3\int x^3\psi(x^2)dx+C$ 2) $\frac{1}{3}x^3\psi(x^3)-\int x^2\psi(x^3)dx+C$

3) $\frac{1}{3}\left[x^3\psi(x^3)-\int x^3\psi(x^3)dx\right]+C$ 4) $\frac{1}{3}\left[x^3\psi(x^3)-\int x^2\psi(x^3)dx\right]+C$

19. $f(x)=\int\frac{dx}{\sin^6 x}$ is polynomial of degree

1) 3 in cot x 2) 5 in cot x 3) 3 in tan x 4) 5 in tan x

20. $\int\left(\sqrt{\tan x}+\sqrt{\cot x}\right)dx=$

1) $\sqrt{2}\sin^{-1}\left(\sin x+\cos x\right)+c$ 2) $\sqrt{2}\cos^{-1}\left(\sin x+\cos x\right)+c$

3) $\sqrt{2}\cos^{-1}\left(\sin x-\cos x\right)+c$ 4) $\sqrt{2}\sin^{-1}\left(\sin x-\cos x\right)+c$

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers.

Marking scheme: +4 for correct answer, 0 in all other cases.

21. All the numbers that can be formed using all the digits 1,2,3,4 are arranged in the increasing order of magnitude. The rank of the number 3241 is

22. The maximum number of points into which 4 circle and 4 straight lines intersect , is

23. The number of triangles whose vertices are at the vertices of an octagon, but none of whose sides happen to come from the sides of the octagon is

24. If $\int\frac{1-x}{1-\sqrt[4]{x}}dx=x+ax^{\frac{3}{2}}+bx^{\frac{5}{4}}+cx^{\frac{7}{4}}+k$ **then** $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=$ _____

25. For x > 0, if $\int\left(\log x\right)^5dx=x\left[A\left(\log x\right)^5+B\left(\log x\right)^4+C\left(\log x\right)^3+D\left(\log x\right)^2+E\left(\log x\right)+F\right]+$ **constant, then** $A+B+C+D+E+F=$ ____

PHYSICS
SECTION – I
(SINGLE CORRECT ANSWER TYPE)

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Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

SYLLABUS : ELECTROMAGNETIC WAVES, RAY OPTICS, WAVE OPTICS

26. The voltage between the plates of a parallel plate condenser of capacity $2.0\mu F$ **is charging at a rate of** $10Vs^{-1}$**. The displacement current is**

1) 2 mA 2) $2\mu A$ 3) $20\mu A$ 4) 2A

27. A condenser has two conducting plates of radius 10cm separated by a distance of 5mm. It is charged with a constant current of 1.5A. The magnetic field at a point 2cm from the axis in the gap is

1) $6\times10^{-8}T$ 2) $3\times10^{-8}T$ 3) $6\times10^{-6}T$ 4) $3\times10^{-6}T$

28. Light with energy flux of $18\ Wcm^{-2}$ **falls on a non reflecting surface of area** $20cm^2$ **at normal incidence the momemtum delivered in 30 minutes is**

1) $1.2\times10^{-6}kgms^{-1}$ 2) $2.16\times10^{-3}kgms^{-1}$ 3) $1.8\times10^{-3}kgms^{-1}$ 4) $3.2\times10^{-3}kgms^{-1}$

29. A condenser is charged using a constant current. The ratio of the magnetic fields at a distance of $\frac{R}{2}$ **and R from the axis is (R is the radius of plate)**

1) 1 : 1 2) 2 : 1 3) 1 : 2 4) 1 : 4

30. The intensity of electromagnetic wave at a distance of 1km from a source of power 12.56 KW is

1) $10^{-3}Wm^{-2}$ 2) $4\times10^{-3}Wm^{-2}$ 3) $12.56\times10^{-3}Wm^{-2}$ 4) $1.256\times10^{-3}Wm^{-2}$

31. A plane electromagnetic wave of wave length λ has an intensity I. It is propagating along the positive Y-direction. The allowed expressions for the electric and magnetic fields are given by

1) $\vec{E}=\sqrt{\frac{2I}{\epsilon_0 C}}\cos\left(\frac{2\pi}{\lambda}(Y-Ct)\right)\hat{k},\ \vec{B}=\frac{1}{C}E\hat{i}$ 2) $\vec{E}=\sqrt{\frac{I}{\epsilon_0 C}}\cos\left(\frac{2\pi}{\lambda}(Y-Ct)\right)\hat{k},\ \vec{B}=\frac{1}{C}E\hat{i}$

3) $\vec{E}=\sqrt{\frac{2I}{\epsilon_0 C}}\cos\left(\frac{2\pi}{\lambda}(Y-Ct)\right)\hat{k},\ \vec{B}=\frac{1}{C}E\hat{k}$ 4) $\vec{E}=\sqrt{\frac{I}{\epsilon_0 C}}\cos\left(\frac{2\pi}{\lambda}(Y-Ct)\right)\hat{k},\ \vec{B}=\frac{1}{C}E\hat{k}$

32. A light wave incident normally on a glass slab of refractive index 1.5. If 4% of light gets reflected and the amplitude of the electric field of the incident light is $30\ Vm^{-1}$ then the amplitude of the electric field for the wave propagating in the glass medium will be

1) $10\ Vm^{-1}$ 2) $6\ Vm^{-1}$ 3) $24\ Vm^{-1}$ 4) $30\ Vm^{-1}$

33. An electromagnetic wave of frequency $1\times10^{14}\ hertZ$ is propagating along Z-axis, the amplitude of electric field is $4\ Vm^{-1}$. If $\epsilon_0=8.8\times10^{-12}C^2N^{-1}m^{-2}$, then average energy density of electric field will be

1) $35.2\times10^{-10}\ Jm^{-3}$ 2) $35.2\times10^{-11}\ Jm^{-3}$ 3) $35.2\times10^{-12}\ Jm^{-3}$ 4) $35.2\times10^{-13}\ Jm^{-3}$

34. A metal sample carrying a current along X-axis with density J_x is subjected to a magnetic field B_z (along Z-axis). The electric field E_y developed along Y-axis is directly proportional to J_z as well as B_z. The constant of proportionality has SI unit

1) $\frac{m^2}{A}$ 2) $\frac{m^3}{AS}$ 3) $\frac{m^2}{AS}$ 4) $\frac{AS}{m^3}$

35. Select the correct statement from the following :

1) electromagnetic waves cannot travel in vacuum
2) electromagnetic waves are longitudinal waves
3) electromagnetic waves are produced by charge moving with uniform velocity
4) electromagnetic waves carry both energy and momentum as they propagate through space

36. A flying bird is stationary in the air vertically above a stationary fish in the water. If the fish appears to be at a distance x_1 to the bird and the bird appears to be at a distance x_2 to the fish then the correct choice is

1) $x_1=x_2$ 2) $x_1>x_2$ 3) $x_1<x_2$ 4) $4x_2<3x_1$

37. At what distance from a biconvex lens of the focal length F must be placed an object for the distance between the object and its real image to be minimal

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

38. The surfaces of a concave lens made of refractive index 1.5 have the same radii of curvature R. It is now immersed in a medium of refractive index 1.75 then the lens

1) becomes a convergent lens of focal length 3.5 R
2) becomes a convergent lens of focal length 3.0 R
3) changes as a divergent lens of focal length 5 R
4) changes as a divergent lens of focal length 3 R

39. A person can see clearly objects lying between 25 cm and 2 m from his eyes. His vision can be corrected by using spectacles of power

1) $+0.25D$ 2) $+0.5D$ 3) $-0.25D$ 4) $-0.5D$

40. For a prism, the angle of prism is 60^0 and the refractive index is $\sqrt{\frac{7}{3}}$. The minimum possible angle of incidence so that the light ray is refracted from the second surface is

1) 15^0 2) 25^0 3) 30^0 4) 35^0

41. A monochromatic light is incident at certain angle on an equilateral triangular prism and suffers minimum deviation. If the refractive index of the material of the prism is $\sqrt{3}$ then the angle of incidence is

1) 90^0 2) 30^0 3) 45^0 4) 60^0

42. A convergent doublet of separated lens corrected for spherical aberration has resultant focal length of 10 cm. The separation between the two lenses is 2 cm. The focal lengths of the component lenses are

1) 18 cm, 20 cm 2) 12 cm, 14 cm 3) 16 cm, 18 cm 4) 10 cm, 12 cm

43. The focal length of the objective and the eyepiece of a telescope are 50 cm and 5 cm respectively. If the telescope is focused for distinct vision on a scale distant 2m from its objective then its magnifying power will be

1) -12 2) -4 3) +8 4) -8

44. A beaker contains water up to a height h_1 and kerosene of height h_2 above water so that the total height of (water + kerosene) is (h_1+h_2). Refractive index of water is μ_1 and that of kerosene is μ_2. The apparent shift in the position of the bottom of the beaker when viewed from above is

1) $\left(1+\frac{1}{\mu_1}\right)h_2+\left(1-\frac{1}{\mu_2}\right)h_1$ 2) $\left(1+\frac{1}{\mu_1}\right)h_1+\left(1+\frac{1}{\mu_2}\right)h_2$

3) $\left(1-\frac{1}{\mu_1}\right)h_1+\left(1-\frac{1}{\mu_2}\right)h_2$ 4) $\left(1+\frac{1}{\mu_1}\right)h_2+\left(1+\frac{1}{\mu_2}\right)h_1$

45. Two beams of light having intensities I and 4I interfere to produce a fringe pattern on a screen. The phase difference between the beams is $\frac{\pi}{2}$ at point A and π at point B. The difference between the respective intensities at A and B is

1) 2I 2) 4I 3) 5I 4) 7I

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers.

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46. A parallel plate condenser has two circular metal plates of radius 10 cm separated by certain distance. The condenser is being charged with a variable electric field at the rate of $5\times10^{13}Vm^{-1}s^{-1}$. The displacement current is (in A) ____

47. The intensity of solar radiation at the earth's surface is $1\ KWm^{-2}$. The power entering the pupil of an eye of diameter 0.5 cm is (in mW) ____

48. The refractive index of the material of a slab is 1.414. The polarizing angle is (in degree and in minutes) __

49. The eye can be regarded as a single retracting surface. The radius of curvature of this surface is equal to that of cornea (7.8 mm). This surface separates two media of refractive indices 1 and 1.34. The distance from the refracting surface at which a parallel beam of light will come to force (in cm) ____

50. A ray of light is incident at an angle of 60^0 on one face of a prism of angle 30^0. The emergent ray of light makes an angle of 30^0 with incident ray. The angle made by the emergent ray with second face of prism will be _____

CHEMISTRY

SECTION – I

(SINGLE CORRECT ANSWER TYPE)

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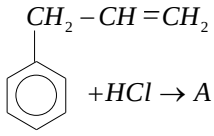
SYLLABUS : HALO ALKANES AND HALO ARENES, ALCOHOLS, PHENOLS, ETHERS, POLYMERS, BIOMOLECULES

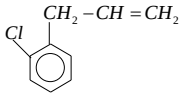
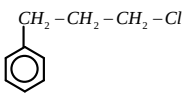
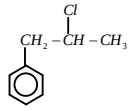
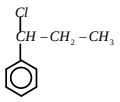
51. Which reagent will you use for the following reaction?

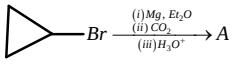
$$CH_3-CH_2-CH_2-CH_3 \rightarrow CH_3-CH_2-CH_2-CH_2Cl + CH_3-CH_2-\overset{Cl}{\overset{|}{C}}H-CH_3$$

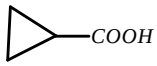
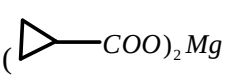
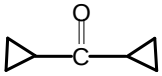
1) Cl_2/uv light 2) $NaCl + H_2SO_4$ 3) Cl_2 gas in dark 4) Cl_2 gas in presence of Iron

52. What is 'A' in the following reaction?



1)  2)  3)  4) 

53. For the following reaction  **, then what is A?**

1)  2)  3)  4)

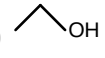
54. Reaction of t-butyl bromide with sodium methoxide produces

1) Isobutane 2) Isobutylene 3) Sodium-t-butoxide 4) t-butyl methyl ether

55. $2CHCl_3 + O_2 \xrightarrow{X} 2COCl_2 + 2HCl$ **. In the above reaction, X stands for**

1) An oxidant 2) A reductant 3) light and air 4) Both 1 & 2

56. In the reaction Ethanol $\xrightarrow{PCl_5} X \xrightarrow{alc.KOH} Y \xrightarrow[H_2O,\Delta]{H_2SO_4} Z$. **The product 'Z' is**

1) C_2H_4 2) $CH_3CH_2-O-CH_2CH_3$ 3)  4) $CH_3CH_2OSO_3H$

57. 23g of Na will react with methyl alcohol to give

1) one mole of oxygen 2) one mole of H_2 3) 8g of H_2 4) $\frac{1}{2}$ mole of H_2

58. The best reagent to convert pent-3-en-2-ol into pent-3-en-2-one is

1) acidic permanganate 2) Acidic dichromate
3) PCC 4) chromic anhydride in glacial CH_3COOH

59. Which of the following alcohols gives the best yield of dialkyl ether on being heated with a trace of H_2SO_4 **?**

1) pentan-1-ol 2) 2-methyl-1-butanol 3) cyclopentanol 4) propan-2-ol

60. Which of the following can reduce ester to alcohol?

1) $NaBH_4$ 2) $Na/alcohol$ 3) H_2/Ni 4) BH_3

61. Phenol when it first reacts with $conc.H_2SO_4$ **and then with** $conc.HNO_3$ **gives**

1) Nitro benzene 2) 2,4,6-Trinitrophenol 3) o-nitrophenol 4) p-nitrophenol

62. Isopropyl benzene on air oxidation in presence of dil.acid gives

1) C_6H_5COOH 2) $C_6H_5COCH_3$ 3) C_6H_5CHO 4) C_6H_5OH

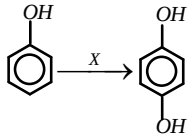
63. Glycerol does not contain ____ alcoholic group

1) 1^o 2) 2^o 3) 3^o 4) 1^o & 2^o

64. The compound that does not liberate CO_2 ,on treatment with aqueous sodium bicarbonate solution is

1) Benzoic acid 2) Benzenesulphonic acid
3) Salicylic acid 4) carbolic acid

65. What is X in the below given reaction



1) Air 2) $KMnO_4 / H_2SO_4$ 3) $K_2S_2O_8$ 4) K_2SO_5

66. The reaction of which among the following ethers with HI in cold leads to formation of methyl alcohol?

1) Ethyl methyl ether 2) Methyl propyl ether
3) Isopropyl methyl ether 4) Tert-butyl methyl ether

67. Methyl phenyl ether can be obtained by reacting

1) Phenolate ions and methyl iodide 2) Methoxide ions & bromo benzene
3) methanol & phenol 4) Bromobenzene & methyl bromide

68. Anisole is the product obtained from phenol by the reaction known as

1) Coupling 2) etherification 3) Oxidation 4) esterification

69. An ether is more volatile than an alcohol having the same molecular formula. This is due to

1) dipolar character of ethers 2) Alcohols having resonance structures
3) Intermolecular H-bonding in ethers 4) Intermolecular H-bonding in alcohols

70. Which of the following compounds when heated with CO at 150^{o}C and 500 atm pressure in the presence of BF_3, forms ethyl propionate?

1) C_2H_5OH 2) CH_3-O-CH_3 3) $C_2H_5-O-C_2H_5$ 4) $CH_3-O-C_2H_5$

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers.

Marking scheme: +4 for correct answer, 0 in all other cases.

71. How many isomers of $C_5H_{11}OH$ will be primary alcohols ____

72. How many chiral compounds are possible on monochlorination of 2-methyl butane?____

73. A nanopeptide contains ____ peptide linkages

74. Synthesis of each molecule of glucose in photosynthesis involves ____ molecules of ATP

75. The no. of π -bonds present in the monomer of polyacrylonitrile is ____

KEY SHEET

MATHS

1) **2**	2) **4**	3) **1**	4) **1**	5) **2**	6) **3**	7) **4**	8) **2**	9) **3**	10) **2**
11) **3**	12) **1**	13) **4**	14) **1**	15) **1**	16) **1**	17) **4**	18) **2**	19) **2**	20) **4**
21) **16**	22) **50**	23) **16**	24) **4.5**	25) **-44**					

PHYSICS

26) **3**	27) **1**	28) **2**	29) **3**	30) **1**	31) **1**	32) **3**	33) **3**	34) **2**	35) **4**
36) **3**	37) **4**	38) **1**	39) **4**	40) **3**	41) **4**	42) **1**	43) **1**	44) **3**	45) **2**
46) **0.139**	47) **19.6**	48) **5431**	49) **3.1**	50) **0**					

CHEMISTRY

51) **1**	52) **3**	53) **1**	54) **2**	55) **3**	56) **3**	57) **4**	58) **3**	59) **1**	60) **2**
61) **2**	62) **4**	63) **3**	64) **4**	65) **3**	66) **4**	67) **1**	68) **2**	69) **4**	70) **3**
71) **4**	72) **4**	73) **8**	74) **18**	75) **3**					

Hints & Solutions

MATHS

1. ${}^4P_3.1(3+4+5+6+7)=600$
2. NNNGGRIEEE $\frac{{}^{11}P_6}{3!2!}=\frac{{}^{11}P_5}{2!}$
3. By verification, if n=2, 2n+1=7
   ${}^7C_1+{}^7C_2+{}^7C_3=63$
4. $M_1+M_2+M_3+M_4+M_5=30$
   ${}^{n+r-1}C_{r-1}={}^{30+5-1}C_{5-1}$
5. ${}^5C_1.1.\frac{4!}{3!}$
6. $n(s)={}^{39}C_2,\ E=\{(9,7),(18,14),(27,21),(36,28)\}$
   $P(E)=\frac{4}{{}^{39}C_2}=\frac{4}{741}$
7. $n(s)={}^{20}C_1, n(E)=3$
   $P(E)=\frac{3}{20}$
8. $3!\left[\frac{3}{6}.\frac{2}{6}.\frac{1}{6}\right]=\frac{1}{6}$
9. Odds against E are $P(\overline{E}):P(E)$

10. $P\left(\frac{B_2}{R}\right)=\frac{P(B_2)P\left(\frac{R}{B_2}\right)}{\sum_{i=1}^{3}P(B_i)P\left(\frac{R}{B_i}\right)}=\frac{\frac{1}{3}.\frac{2}{5}}{\frac{1}{2}.\frac{1}{3}+\frac{1}{3}.\frac{2}{5}+\frac{1}{6}.\frac{3}{7}}=\frac{14}{37}$

11. $\sin^2\alpha-\sin^2 x=\cos^2 x-\cos^2\alpha$

12. $1+x=\left(1+\sqrt[3]{x}\right)\left(1-x^{1/3}+x^{2/3}\right)$

13. $-\sqrt{2}\int\cos\left(2x+\frac{\pi}{4}\right)dx=\frac{-1}{\sqrt{2}}\sin\left(2x+\frac{\pi}{4}\right)+cons\tan t$

$=\frac{1}{\sqrt{2}}\sin\left(2x+\frac{5\pi}{4}\right)$

14. $\frac{ds}{dt}=u+at$

$\int ds=\int(u+at)\,dt$

$s=ut+\frac{at^2}{2}+c$

15. $\int\frac{f^1(x)}{f(x)}dx=\log\left(f(x)\right)+c$

16. $\int xCos^{-1}\left(\frac{1-x^2}{1+x^2}\right)dx=\int x\ 2Tan^{-1}(x)\,dx$ then use By parts

17. $\int e^{x+\frac{1}{x}}dx+\int xe^{x+\frac{1}{x}}\left(1-\frac{1}{x^2}\right)dx$ and use By parts

18. put $x=t^3$ and use By parts

19. Use Reduction formula

20. Put $\tan x=t^2$

21. No. of single digit numbers = ${}^4P_1$

No. of 2- digit numbers = ${}^4P_2$

No. of 3- digit numbers = ${}^4P_3$

Rank of 3241 is 16

22. ${}^4C_2\times 2+{}^4C_2\times 1+\left({}^4C_1+{}^4C_1+2\right)=50$

23. Required no. of triangles = Total no. of triangles – No. of triangles having two sides common – No. of triangles having one side common.

${}^8C_3-8-(8\times 4)$

16.

24. $1-x=\left(1-x^{1/4}\right)\left(1+x^{1/4}\right)\left(1+x^{1/2}\right)$

25. Use Reduction formula

PHYSICS

26. $i_d=\left(\frac{\varepsilon_0 A}{d}\right)\left(\frac{v}{t}\right)$

$=2\times 10^6\times 10$

$i_d=20\mu A\rightarrow(3)$

27. $B=\frac{\mu_0 ir}{2\pi R^2}\quad(r<R)\ (i=1.5A)$

$$B = \frac{4\pi^2 \times 10^{-7} \times 1.5 \times 2 \times 10^{-2}}{2\pi \times 100 \times 10^{-4} 10^{-2}}$$
$$= 6 \times 10^{-7}\ T$$

28. $$P = \frac{IAt}{c} = \frac{18 \times 25 \times 30^{10}}{3 \times 10^8} = 60 \times 10^5 \times 216$$
$$= 2.16 \times 10^{-3}$$

29. $$B = \frac{\mu_0 ir}{2\pi R^2}(rcR)$$
$$\frac{B_1}{B_2} = \frac{\mu_0 iR}{2\pi 2 \times R^2} \quad | \quad \frac{\mu_0 i}{2\pi R} = \frac{1}{2}$$

30. $$I = \frac{P}{4\pi R^2} = \frac{Power}{Area} = 10^{-3} w / m^2$$

31. *Conceptual*

32. 3

33. $$\frac{U}{v} = \frac{1}{4}\varepsilon_0 E^2 = \frac{1}{4} \times 8.8 \times 10^{-12} \times 16$$
$$= 35.2 \times 10^{-12}$$

34. *Conceptual*

35. *Conceptual*

36. $$x_1 < x_2$$
$$x_2 = actual\ depth\ of\ \ fish + (\mu) actual\ height\ of\ bird$$
$$x_1 = actual\ height\ of\ bird + \frac{actual\ depth\ of\ \ fish}{\mu}$$

37. $$\frac{1}{F} = \frac{1}{v} = \frac{1}{u}$$

38. $$\frac{1}{F} = (\mu_l - 1)\left(\frac{-2}{R}\right)$$
$$\frac{1}{F} = \left(\frac{0.25}{1.75}\right)\frac{2}{R}$$
F = 3.5 R convergent

39. $$P = \frac{100}{F}\ (4) short\ systeum$$

40. $\sin(i_m) = \mu(\sin(60 - c))$

$\sin c = \sqrt{\frac{3}{7}}$

$i_m = 30^0$

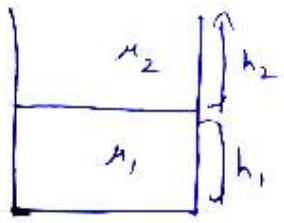
41. $\mu = \frac{\sin i}{\sin(A/2)}$

$i = 60^0$

42. $\frac{1}{f_4} = \frac{1}{f_1} - \frac{1}{f_2} - \frac{d}{f_1 f_2}$

43. $M = \frac{f_0}{f_e}\left(1 + \frac{Fe}{\Delta}\right)$

44.



$d = h_1\left(1 - \frac{1}{\mu_1}\right) + h_2\left(1 - \frac{1}{\mu_2}\right)$

45. $I_R = I_1 + I_2 + 2\sqrt{I_1 I_2}\cos\phi$

Integer type

46. $i_d = \varepsilon_0 A.\frac{dE}{dt}$

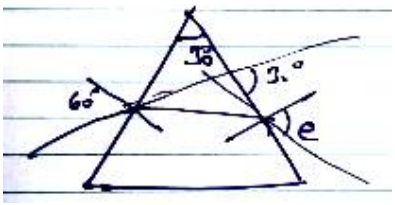
47. $I = \frac{P}{4\pi R^2}$

$P = I\left(4\pi R^2\right)$

48. Polarising angle is equal to tan inverse of refractive index.

49. $\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

50.



$f = 30^0 \; i = 60^0$

$A = 30^0$

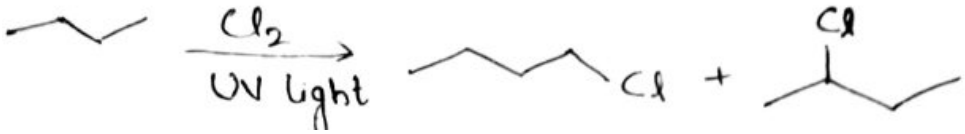
$i + e = A + f$

$e = 30 + 30 - 60$

$= 0$

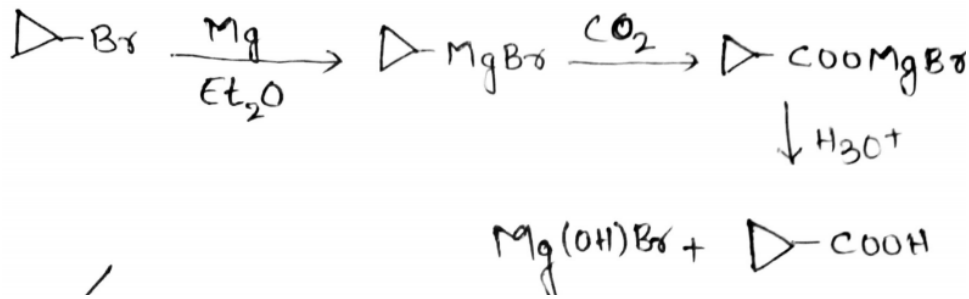
MATHS

51.

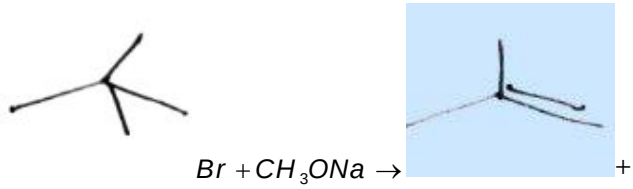


52. $ph - CH_2 - CH = CH_2 \rightarrow ph - CH_2 - CH(Cl) - CH_3$

53.



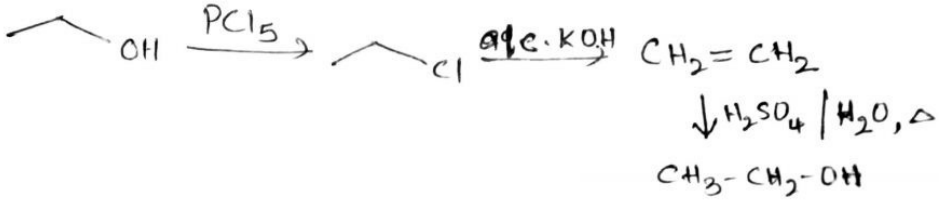
54.



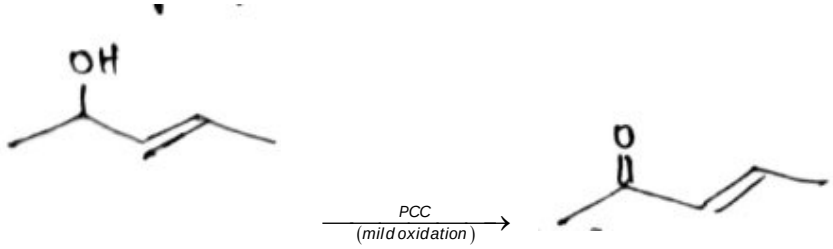
$Br + CH_3ONa \rightarrow$ + HBr

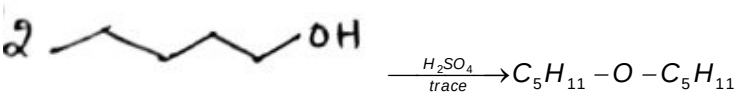
55 $2CHCl_3 + O_2 \xrightarrow[air]{Light} 2COCl_2 + 2HCl$

56.



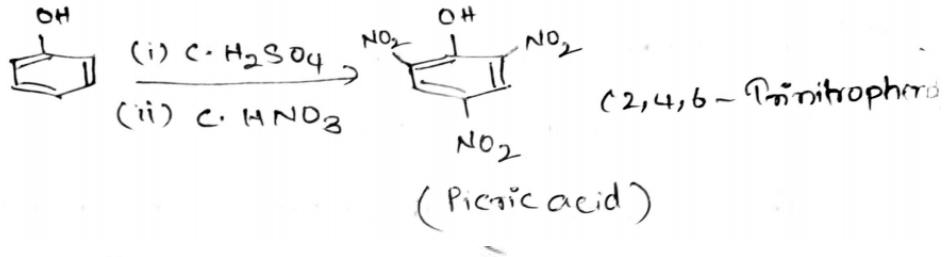
57. $CH_3OH + Na \rightarrow CH_3ONa + \frac{1}{2}H_2, \; 23gr \; of \; Na \rightarrow \frac{1}{2} mol \; of \; H_2$

58. 

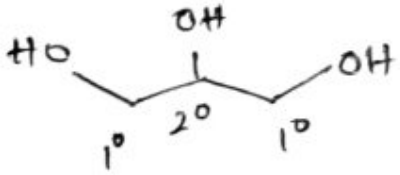
59. 

60. $R-COOR^1 \xrightarrow[alcohol]{Na} R^1-OH+RCOOH$

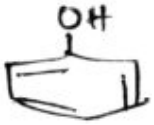
(Bouveault – Blanc reduction)

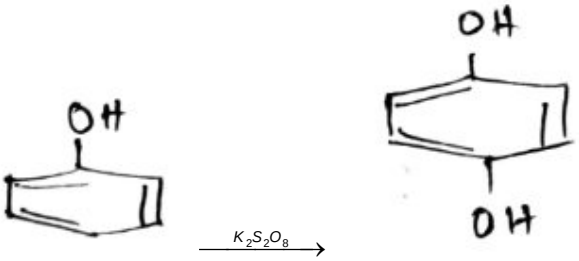
61. 

62. 

63. 

Glycerol

64. Only – COOH functional group liberates CO_2, On treatment with aqueous sodium Carbonate solution acid  (doesn't contain – COOH group)

65. 

Elb's persulfate Oxidation

66. $(CH_3)_3-C-O-CH_3 \xrightarrow[SN'reaction]{Cold\ HI} (CH_3)_3-C-I+CH_3-OH$

67. $ph-O^{\Theta}+CH_3-I \rightarrow ph-o-CH_3$ phenolation

68. $ph-OH+NaOH \rightarrow Ph-0Na+H_20$

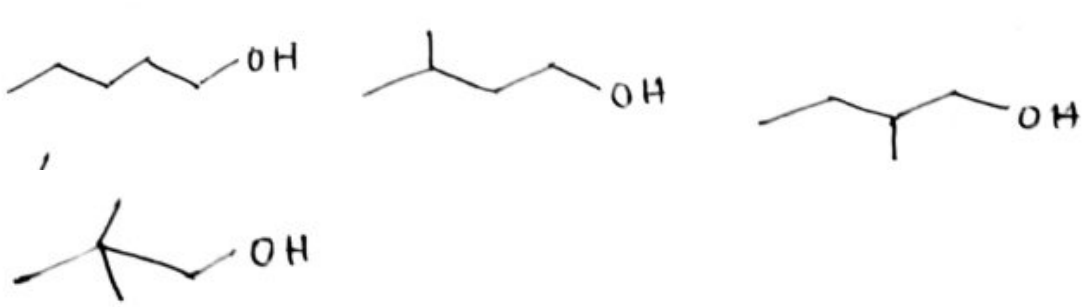
$ph-ONa+CH_3Cl \xrightarrow{\Delta} Ph-OCH_3+NaCl$

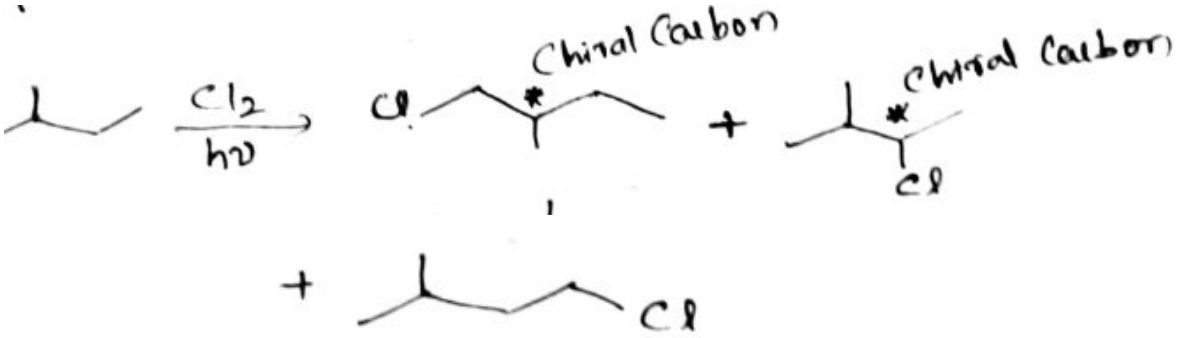
Above reaction is etherification of phenol

69. Due to absence of Intermolecular H – bonding in ethers

70. $C_2H_5-O-C_2H_5+CO \xrightarrow[150^0C,\ 500atm]{BF_3} C_2H_5-COO-C_2H_5$

diethyl ether

71. 

72. 

4 chiral compounds

73. n – 1, n = No. of amino acids

$\Rightarrow$ peptide linkage Compound Contains 9 amino acids and 8 peptide linkages

74. $6CO_2+12NADP.2H+18ATP \rightarrow C_6H_{12}O_6+18P+12NADP+18ADP$

75. $CH_2=CH-C\equiv N$

3 Pi bonds are present in the monomer