SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR MPC | **DPP TEST - 28** | **Date: 15-05-2020**

Time: 3 Hours | **Max.Marks:80 M**

MATHS-A

SYLLABUS: ***Random variables and Binominal and Poisson distribution***

1. A random variable x has the following distribution

$X = xi$	**1**	**2**	**3**	**4**
$P(X = xi)$	**K**	**2K**	**3K**	**4K**

The value of K and $P(X < 3)$ are equal to

1) $\frac{1}{10}, \frac{3}{5}$ 2) $\frac{1}{10}, \frac{3}{10}$ 3) $\frac{3}{10}, \frac{1}{10}$ 4) $\frac{1}{24}, \frac{5}{12}$

2. A random variable x takes the values 0, 1, 2, 3 and its mean is 1.3. If $P(X=3) = 2P(X=1), P(X=2) = 0.3$ then $P(X=0) =$

1) 0.1 2) 0.2 3) 0.3 4) 0.4

3. Three coins whose faces are marked 1 and 2 are tossed. The expected sum of numbers on their faces is

1) 4 2) 4.5 3) 5 4) 6

4. If the variance of the random variable X is 5, then the variance of the random variable -3X is

1) 15 2) 45 3) -45 4) 60

5. The range of random variable X is $\{1, 2, 3, 4, ...\}$ and the probabilities are

$P(X = K) = \frac{3^{ck}}{K!}; K = 1, 2, 3, 4, ...$ **then the vales of C is**

1) $\log_e^3$ 2) $\log_e^2$ 3) $\log_3^{\left(\log_e^2\right)}$ 4) $\log_2^{\left(\log_e^3\right)}$

6. A discrete random variable X, can take all possible integer values from 1 to k, each with a probability $\frac{1}{k}$. Its variance is

1) $\frac{K^2}{4}$ 2) $\frac{(K+1)^2}{4}$ 3) $\frac{K^2-1}{12}$ 4) $\frac{K^2-1}{6}$

7. Given below is the distribution of a random variable X

$X = x$	**1**	**2**	**3**	**4**
$P(X = x)$	λ	2λ	3λ	4λ

If $\alpha = P(X < 3)$ and $\beta = P(X > 2)$ then $\alpha : \beta =$

1) 2 : 5 2) 3 : 4 3) 4 : 5 4) 3 : 7

8. A random variable X has the probability distribution

X	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
$P(X)$	**0.15**	**0.23**	**0.12**	**0.10**	**0.20**	**0.08**	**0.07**	**0.05**

For the events E = {X is a prime number} and F = { X < 4}, the probability $P(E \cup F)$ is

1) 0.35 2) 0.77 3) 0.87 4) 0.50

9. **If X is a binomial variate with $n=6$ and 9 $P(X=4)$, $P(X=2)$ the parameter P is**

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

10. **The mean and standard deviation of a binominal variate X are 4 and $\sqrt{3}$ respectively. Then $P(X\geq 1)=$**

1) $1-\left(\frac{1}{4}\right)^{16}$ 2) $1-\left(\frac{3}{4}\right)^{16}$ 3) $1-\left(\frac{2}{3}\right)^{16}$ 4) $1-\left(\frac{1}{3}\right)^{16}$

11. **Out of 800 families with 4 children each the expected number of families having at least one boy is**

1) 550 2) 50 3) 750 4) 300

12. **The probability of a man hitting the target is $\frac{1}{3}$. The number of times must one fire so that the probability of hitting the target at least once is more than 90% is**

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

13. **Let a random variable X have a binominal distribution with mean 8 and variance 4. If $P(X\leq 2)=\frac{K}{2^{16}}$, then K is equal to**

1) 137 2) 121 3) 17 4) 1

14. **If the mean and variance of a binomial distribution are 4 and 2 respectively, then the probability of 2 success of that binomial variate X, is**

1) $\frac{1}{2}$ 2) $\frac{219}{256}$ 3) $\frac{37}{256}$ 4) $\frac{7}{64}$

15. **If X is a Poisson variate with $P(X=0)=P(X=1)$, then $P(X=2)=$**

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

16. **A random variable X follows Poisson distribution such that $P(X=K)=P(X=K+1)$ then the parameter of the distribution $\lambda=$**

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

17. **In a big city 5 accidents take place over a period of 100 days. If the number of accidents follows P.D, the probability that there will be 2 accidents in a day is**

1) $\frac{e^{-5}5^2}{2!}$ 2) $\frac{e^{-0.5}5^2}{2!}$ 3) $\frac{e^{-0.05}(0.05)^2}{2!}$ 4) $\frac{e^{-5}5^2}{2!}$

18. **The probability that at most 5 defective fuses will be found in a box of 200 fuses if experience shows that 2% of such fuses are defective is**

1) $\frac{e^{-4}4^2}{5!}$ 2) $\sum_{x=0}^{5}\frac{e^{-4}4^x}{x!}$ 3) $\sum_{x=0}^{\infty}\frac{e^{-4}4^x}{x!}$ 4) $1-\sum_{x=0}^{\infty}\frac{e^{-4}4^x}{x!}$

19. **If the probability of a bad reaction from a vaccination is 0.01, then the probability that exactly two out of 300 people will get bad reaction is**

1) $\frac{7}{2e^2}$ 2) $\frac{9}{2e^3}$ 3) $\frac{7}{e^3}$ 4) $\frac{9}{e^3}$

20. **If X is a Poisson variate with mean 2 , then $P\left(X>\frac{3}{2}\right)=$**

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

MATHS-B

SYLLABUS: Definite Integrals

21. $\int_0^1 \frac{x^3}{1+x^8}dx$

1) $\frac{\pi}{16}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{2}$ 4) $\frac{\pi}{8}$

22. $\int_0^{\frac{\pi}{4}} \left(\tan^4 x + \tan^2 x\right)dx$

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

23. $\int_0^k \frac{1}{2+8x^2}dx = \frac{\pi}{16}$ **then k =**

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

24. $\int_0^{\frac{\pi}{4}} \frac{e^{\tan x}}{\cos^2 x}dx$

1) $e-1$ 2) $e^{-1}-1$ 3) $e^{-1}+1$ 4) $e^{-2}-1$

25. $\int_0^{\frac{\pi}{2}} \frac{1}{\sin x+\cos x}dx =$

1) $\sqrt{2}\log\left(\sqrt{2}+1\right)$ 2) $\sqrt{2}\log\left(\sqrt{2}-1\right)$

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

26. $\int_0^a \frac{x-a}{x+a}dx$

1) $a+2a\log 2$ 2) $a-2a\log 2$ 3) $2a\log a-a$ 4) $2a\log 2$

27. $\int_0^1 \frac{1}{e^x+e^{-x}}dx$

1) 1 2) $\tan^{-1}(e)-\frac{\pi}{4}$ 3) $\tan^{-1}(e)+\frac{\pi}{4}$ 4) $\frac{\pi}{4}$

28. $\int_0^1 \frac{\left(\tan^{-1}x\right)^3}{1+x^2}dx$

1) $\frac{\pi^4}{64}$ 2) $\frac{\pi^4}{256}$ 3) $\frac{\pi^4}{1024}$ 4) $\frac{\pi^4}{512}$

29. $\int_{\frac{1}{\pi}}^{\frac{2}{\pi}} \frac{\cos\left(\frac{1}{x}\right)}{x^2}dx$

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

30. $\int_0^{\frac{\pi}{2}} \frac{a\cos x + b\sin x}{\cos x + \sin x}\,dx$

1) $\pi(a+b)$ 2) $\frac{\pi}{2}(a+b)$ 3) $\frac{\pi}{4}(a+b)$ 4) πab

31. $\int_0^{\frac{\pi}{2}} \frac{f(\sin x)}{f(\sin x)+f(\cos x)}\,dx$

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

32. $\int_0^a x(a-x)^n\,dx$

1) $\frac{a}{n+1}$ 2) $\frac{a}{n+2}$ 3) $\frac{a^{n+1}}{(n+1)(n+2)}$ 4) $\frac{a^{n+2}}{(n+1)(n+2)}$

33. $\int_0^{\frac{\pi}{2}} \frac{200\sin x + 100\cos x}{\sin x + \cos x}\,dx$

1) 50π 2) 25π 3) 75π 4) 150π

34. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \log\left(\frac{2-\sin\theta}{2+\sin\theta}\right)d\theta$

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

35. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \sin|x|\,dx$

1) 0 2) 1 3) 2 4) π

36. **The value of** $\int_0^1 \frac{8\log(1+x)}{1+x^2}\,dx$

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

37. $\int_0^1 x^{\frac{3}{2}}\sqrt{1-x}\,dx$

1) $\frac{\pi}{6}$ 2) $\frac{\pi}{9}$ 3) $\frac{\pi}{12}$ 4) $\frac{\pi}{16}$

38. $\int_0^{\frac{\pi}{2}} \sin^8 x\cos^2 x\,dx$

1) $\frac{\pi}{512}$ 2) $\frac{3\pi}{512}$ 3) $\frac{5\pi}{512}$ 4) $\frac{7\pi}{512}$

39. $\int_0^{\log 5} \frac{e^x\sqrt{e^x-1}}{e^x+3}\,dx$

1) $\pi+2$ 2) $\pi-2$ 3) $4-\pi$ 4) $4+\pi$

40. **If** $\int_0^{\frac{\pi}{2}} \log(\sin x)\,dx = k$ **then** $\int_0^{\frac{\pi}{2}} \log(\cos x)\,dx$

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

PHYSICS

SYLLABUS: Semiconductor Devices

41. Carbon, silicon and germanium have four valence electrons each. These are characterized by valence and conduction bands separated by energy band gap respectively equal to $(E_g)_c$, $(E_g)_{si}$ and $(E_g)_{Ge}$ which of the following statements is true?

1) $(E_g)_{si} < (E_g)_{Ge} < (E_g)_c$ 2) $(E_g)_c < (E_g)_{Ge} < (E_g)_{si}$

3) $(E_g)_c > (E_g)_{si} > (E_g)_{Ge}$ 4) $(E_g)_c < (E_g)_{si} = (E_g)_{Ge}$

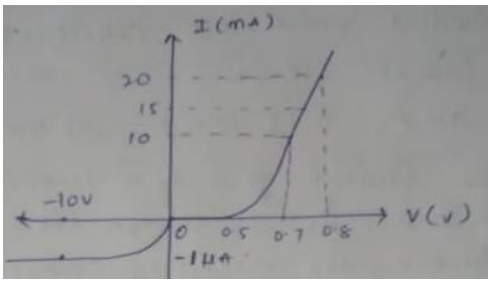
42. A potential barrier of 0.50V exists across a $P-N$ junction. If the depletion region is $5.0\times10^{-7}\,m$ wide, the intensity of the electric field in this region

1) $1.0\times10^{6}V/m$ 2) $1.0\times10^{5}V/m$ 3) $2.0\times10^{5}V/m$ 4) $2.0\times10^{6}V/m$

43. Pure si at 300k has equal electron (n_e) and hole (n_h) concentration of $1.5\times10^{16}m^{-3}$ doping by indium increases in to $4.5\times10^{22}m^{-3}$ calculate n_e in the doped silicon.

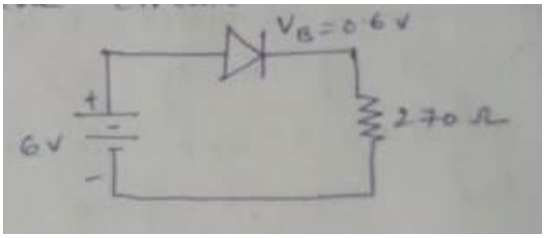
1) $2\times10^{8}m^{-3}$ 2) $5\times10^{9}m^{-3}$ 3) $2\times10^{9}m^{-3}$ 4) $5\times10^{8}m^{-3}$

44. The V – I characteristic of a silicon diode is shown in the figure calculate the resistance of the diode at $I_D = 15mA$



1) 5Ω 2) 10Ω 3) 15Ω 4) 20Ω

45. In the given circuit diagram $V_B = 0.6V$ .Calculate the current 'I' in the circuit



1) 10 mA 2) 20 mA 3) 30 mA 4) 40 mA

46. The current through a P – N junction diode is 55 mA at a forward bias voltage of 3V. If the temperature is 27^0C, find the static resistance of the diode

1) 11.2Ω 2) 15.9Ω 3) 54.5Ω 4) 59.7Ω

47. A zener diode has a breakdown voltage of 9.1 volts with a maximum power dissipation of 364 milli watts. What is the maximum current the diode can handle?

1) 40 mA 2) 60 mA 3) 80 mA 4) 100 mA

48. In an $n-p-n$ transistor circuit, the collector current is 10mA. If 90% of the electrons emitted, reach the collector then, the emitter current will be

1) 9 mA 2) 10 mA 3) 11 mA 4) 12 mA

49. The current gain of a transistor in common emitter mode is 40. To change the collector current by 160mA, the necessary change in the base current is (at constant V_{CE})

1) 0.25 A 2) 4 A 3) 4 mA 4) 40 mA

50. **A common emitter transistor amplifier has a current gain of 50. If the load nesistance is 4000Ω and input resistance is 500Ω, the voltage gain of amplifier is**
1) 100 2) 200 3) 300 4) 400

51. **In $n-p-n$ transistor 10^{10} electrons enter the emitter in 10^{-6} sec. If 4% of the electrons are lost in the base. The current transfer ratio will be**
1) 0.98 2) 0.97 3) 0.96 4) 0.95

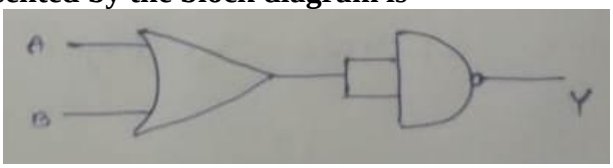
52. **A transistor is used as an amplifier in C B mode with a load resistance of $5K\Omega$ the current gain of amplifier is 0.98 and the input resistance is 70Ω the voltage gain and power gain respectively are**
1) 70, 68.6 2) 80, 75.6 3) 60, 66.6 4) 90, 96.6

53. **In a transistor if $\frac{I_C}{I_E}=\alpha$ and $\frac{I_C}{I_B}=\beta$. If α varies between $\frac{20}{21}$ and $\frac{100}{101}$, then the value of β lies between**
1) 1 – 10 2) 0.95 – 0.99 3) 20 – 100 4) 200 – 300

54. **A half wave rectifier is used to convert 'n' HZ ac in to dc, then the number of pulses per second present in the rectified voltage is**
1) n 2) $\frac{n}{2}$ 3) 2n 4) 4n

55. **The applied ac power to a half wave rectifier is 200W. The dc power output obtained is 50W. The rectification efficiency is**
1) 12.5% 2) 25% 3) 37.5% 4) 50%

56. **Identify the gate represented by the block diagram is**

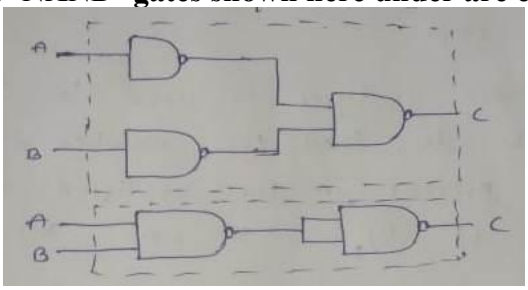


1) AND 2) NOT 3) NAND 4) NOR

57. **In the given Boolean expression $y=A.\overline{B}+B.\overline{A}$, if $A=1, B=1$ then y will be**
1) 0 2) 1 3) 11 4) 10

58. **$AB+\overline{AB}$ is always**
1) 0 2) 1 3) 10 4) 11

59. **The combination of the 'NAND' gates shown here under are equivalent to**



1) an 'OR' gate an 'AND' gate 2) an 'AND' gate and a 'NOT' gate
3) an 'AND' gate and 'OR' gate 4) an 'OR' gate and an 'NOT' gate

60. **The minimum number of gates required to realize this expression $Z=DABC+DA\overline{BC}$ is**
1) One 2) Two 3) Eight 4) Five

CHEMISTRY

SYLLABUS: Phenols, Ethers

61. **Phenol is converted into salicylaldehyde by**
1) Kolbe's reaction 2) Cannizaro reaction
3) Reimer – Tiemann reaction 4) Kolbe Schmidt reaction

62. The correct order of relative acidic strength of phenol, Ethyl alcohol and water is

1) Phenol > water > Ethyl alcohol
2) Ethyl alcohol > water > Phenol
3) Ethyl alcohol > Phenol > water
4) water > Phenol > Ethyl alcohol

63. Identify the product z in the following sequence of reactions

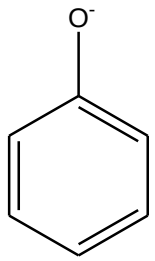
$$phenol \xrightarrow{NaOH} X \xrightarrow[\substack{4-7atm\\410k}]{CO_2} \xrightarrow{H^+} Z$$

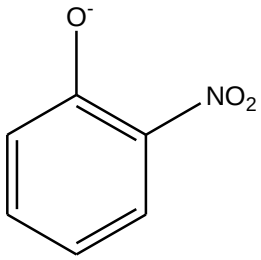
1) Aspirin
2) Salicylaldehyde
3) Benzoic acid
4) Salicilic acid

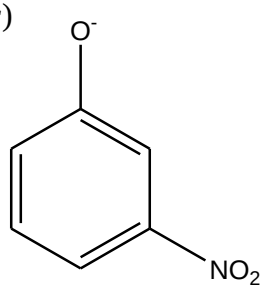
64. Electro philic substitution in phenol takes place at

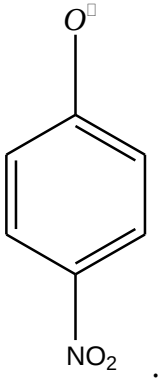
1) Ortho and Para positions
2) Meta position
3) Ortho position
4) Para position

65. The descending order of K_b values of the following compounds is

a) 

b) 

c) 

d) 

1) d > b > c > a
2) a > c > b > d
3) b > d > c > a
4) a > c > d > b

66. m – Di hydroxyl benzene is called as

1) Resorcinol
2) Catechol
3) Quinol
4) Cresol

67. Benzene $\xrightarrow{Dleum} A \xrightarrow{NaOH} B \xrightarrow[-Nacl]{HCl} C$ in correct statement among the following is

1) Aqueous solutions of 'B' is acidic
2) 'A' is Benzene sulphonic acid
3) Aqueous solutions of 'B' is acidic
4) 'C' is more acidic than water

68. Which of the following compounds would not evolve CO_2 when treated with a_q. $NaHCO_3$ solution?

1) Phenol
2) Benzoic acid
3) 2,4 – Di nitro phenol
4) 2, 4, 6 Tri nitro phenol

69. This reaction, $C_6H_5OH \xrightarrow[Phridine]{CH_3COCl} C_6H_5OCOH_3$ is called

1) Reimer – Tiemann reaction
2) Schoten – baumann reaction
3) Acetylation
4) Benzoylation

70. Which of the following is most acidic ?

1) Phenol
2) CH_3CH_2OH
3) picric acid
4) P – Nitro phenol

71. Hybridization of oxygen in diethyl ether is

1) SP
2) SP^2
3) SP^3
4) SP^3d

72. The reaction $R-X+R-ONa \rightarrow R-O-R+NaX$ is called

1) Wurtz reaction
2) William son's synthesis
3) Kolbe's reaction
4) Hoff mann bromamide reaction

73. When vapours of ethyl alcohol are passed over Al_2O_3 at 523K, it forms

1) 1, 2 Ethanediol
2) Ethene
3) Ethoxy ethane
4) Ethanal

74. $C_2H_5-O-C_2H_5+\underset{(hot)}{HI} \xrightarrow{\Delta} x+y$, here 'x' and 'y' are

1) C_2H_5I and C_2H_5OH
2) C_2H_5I and H_2O
3) C_2H_5OH and H_2O
4) C_2H_4 and H_2O

75. $C_2H_5-O-C_2H_5+PCl_5 \rightarrow C_2H_5Cl+X$, here 'X' is

1) PCl_3 2) H_3PO_3 3) CO_3Cl 4) $COCl_3$

76. Which of the following is the strongest Lewis base?

1) H_2O 2) CH_3CH_2OH 3) CH_3OCH_3 4) C_6H_5OH

77. Grignard reagents are prepared in

1) Benzene 2) Chloroform 3) Alcohols 4) Ethers

78. When diethyl ether is heated with dil. H_2SO_4 under pressure it forms

1) Propanoic acid 2) Acetic acid
3) Ethyl alcohol 4) Ethyl hydrogen sulphate

79. Di ethyl ether when treated with acetyl chloride in presence of $AlCl_3$ given

1) $C_2H_5Cl,\ CH_3COOH_3$ 2) $C_2H_5Cl,\ CH_3COOH$
3) $CH_3CHO\ CH_3COCH_3$ 4) $C_2H_5Cl,\ CH_3COOC_2H_5$

80. Alcohols can be distinguished from ether by

1) Sodium metal 2) Ester formation 3) Iodoform test 4) All the above

KEY SHEET

MATHS - A

1) **2** 2) **4** 3) **2** 4) **2** 5) **3** 6) **3** 7) **4** 8) **8** 9) **3** 10) **2**

11) **3** 12) **1** 13) **1** 14) **4** 15) **4** 16) **2** 17) **3** 18) **2** 19) **2** 20) **3**

MATHS – B

21) **1** 22) **3** 23) **3** 24) **1** 25) **1** 26) **2** 27) **2** 28) **3** 29) **2** 30) **3**

31) **4** 32) **4** 33) **3** 34) **1** 35) **2** 36) **3** 37) **4** 38) **4** 39) **3** 40) **4**

PHYSICS

41) **3** 42) **1** 43) **2** 44) **2** 45) **2** 46) **3** 47) **1** 48) **3** 49) **3** 50) **4**

51) **3** 52) **1** 53) **3** 54) **1** 55) **2** 56) **4** 57) **1** 58) **2** 59) **1** 60) **1**

CHEMISTRY

61) **3** 62) **1** 63) **4** 64) **1** 65) **2** 66) **1** 67) **1** 68) **1** 69) **3** 70) **3**

71) **3** 72) **2** 73) **3** 74) **2** 75) **4** 76) **3** 77) **4** 78) **3** 79) **4** 80) **1**

HINTS & SOLUTIONS
MATHS- A

1. $\sum_{i=1}^{\infty} P(x_i) = 1$

$K + 2K + 3K + 4K = 1$

$K = \frac{1}{10}$

Now $P(X < 3) = P(X = 1) + P(X = 2)$

$= K + 2K = 3K$

$\frac{3}{10}$

2.

$X = x$	0	1	2	3
$P(X = x)$	x	Y	0.3	2y

$x + 3y + 0.3 = 1$

$x + 0.3 = 0.7$

$x = 0.4$

Let $P(X = 0)\, x$

$P(X = 1) = y$

$0 + y + 0.6 + 6y = 1.3$

$y = 0.1$

3.

$X = x$	3	4	5	6
$P(X = x)$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$

$\mu = \frac{3}{8} + \frac{12}{8} + \frac{15}{8} + \frac{6}{8} = \frac{36}{8} = 4.5$

4. Here $V(x) = 5$

$a = -3$

$V(ax \pm b) = a^2 V(x) = 45$

5. $\sum_{K=1}^{\infty} \frac{3^{CK}}{K!} = 1$

$\sum_{K=0}^{\infty} \frac{\left(3^C\right)^K}{K!} = 2$

$e^{3^C} = 2$

$3^C = \log_e^2$

$c = \log_3^{\log_e^2}$

6. $\sigma^2 = \sum_{r=1}^{K} r^2 \left(\frac{1}{K}\right) - \mu^2$

$\frac{1}{K} \frac{K(K+1)(2K+1)}{6} - \frac{(K+1)^2}{2} = \frac{K^2 - 1}{12}$

7. $\lambda+2\lambda+3\lambda+4\lambda=1$

$\lambda=\frac{1}{10}$

$\alpha=P(X=1)+P(X=2)=\lambda+2\lambda=\frac{3}{10}$

$\beta=P(X=3)+P(X=4)=3\lambda+4\lambda=\frac{7}{10}$

$\alpha:\beta=3:7$

8. $P(E)=0.23+0.12+0.20+0.07=0.62$

$P(F)=0.15+0.23+0.12=0.50$

$P(E\cap F)=0.23+0.12=0.35$

$P(E\cup F)=P(B)+P(F)-P(E\cap F)=0.62+0.50-0.35=0.77$

9. $P(X=Y)=n_{c_r}P^r g^{n-r}$

$9\,6_{c_4}\,p^4q^2=6_{c_2}\,p^2q^4$

$8p^2+2p-1=0$

$p=\frac{1}{4}$

$p=\frac{-1}{2}$ *not possible*

10. $np=4,\ npq=3$

$p=\frac{1}{4}, q=\frac{3}{4}, n=16$

$P(X=1)=1-P(X=0)$

$=1-16_{c_0}\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^{16-0}$

$=1-\left(\frac{3}{4}\right)^{16}$

11. $N=800,\ p=q=\frac{1}{2}, n=4$

Now $N\,P(X\geq 1)=N\left(1-P(x=0)\right)=800\left(1-4_{c_0}\left(\frac{1}{2}\right)^0\left(\frac{1}{2}\right)^{4-0}\right)$

$=800\left(1-\frac{1}{16}\right)$

$=800\left(\frac{15}{16}\right)=750$

12. $P(X\geq 1)>\frac{9}{10}$ where $P=\frac{1}{3}, q=\frac{2}{3}$

$1-\left(\frac{2}{3}\right)^n>\frac{9}{10}$

$\left(\frac{3}{2}\right)^n>10$

$n=6$

13. $np=8,\ npq=4$

$q=\frac{1}{2}\Rightarrow p=\frac{1}{2}, n=16$

$p(X=r)=16_{c_r}\left(\frac{1}{2}\right)^6$

$p(X\le 2)=\frac{16_{c_0}+16_{c_1}+16_{c_2}}{2^{16}}=\frac{137}{2^{16}}$

14. $np=4,\ npq=2$

$p=q=\frac{1}{2},\ n=8$

$P(x=2)=8_{c_2}\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^6=\frac{7}{64}$

15. $\frac{e^{-3}3^0}{0}=\frac{e^{-3}\lambda!}{1!}$

$\lambda=1$

$P(X=2)=\frac{e^{-1}1^2}{2!}=\frac{e^{-1}}{2}=\frac{1}{2e}$

16. $P(X=K)=P(X=K+1)$

$\frac{e^{-\lambda}\lambda^k}{K!}=\frac{e^{-\lambda}\lambda^{k+1}}{(K+1)!}$

$\frac{1}{K!}=\frac{\lambda}{(K+1)K!}\Rightarrow\lambda=K+1$

17. $\lambda=\frac{5}{100}=0.05$

$P(X=2)=\frac{e^{-0.05}(0.05)^2}{2!}$

18. $\lambda=200\times\frac{2}{100}=4$

$P(X\le 5)=\sum_{x=0}^{5}\frac{e^{-4}4^x}{x!}$

19. $\lambda=np=300\times 0.01=3$

$P(X=2)=\frac{e^{-\lambda}\lambda^2}{2!}=\frac{e^{-3}3^2}{2!}=\frac{9}{2e^3}$

20. $\lambda=2$

$P(x>1.5)=1-P(X\le 1)=1-P(X=0)-P(X=1)$

$=1-e^{-2}-\frac{e^{-2}2}{1}$

$=1-\frac{1}{e^2}-\frac{2}{e^2}$

$=\frac{e^2-3}{e^2}$

MATHS- B

21. $\frac{1}{4}\left[\tan^{-1}\left(x^4\right)\right]_0^1$

22. $\int_0^{\frac{\pi}{4}} \tan^2 x \sec^2 x dx = \left[\frac{\tan^3 x}{3}\right]_0^{\frac{\pi}{4}}$

23. $\frac{1}{8}\int_0^k \frac{1}{\left(\frac{1}{2}\right)^2 + x^2} dx = \frac{\pi}{16}$

24. $\int_0^{\frac{\pi}{4}} e^{\tan x} \times \sec^2 x \, dx =$

Put $\tan x = t$

25. put $\tan\frac{x}{2} = t$

26. $\int_0^a \left(1 - \frac{2a}{x+a}\right) dx = x - 2a\left[\log\left(x+a\right)\right]_0^a$

27. $\int_0^1 \frac{e^x}{1+\left(e^x\right)^2} dx = \left[\tan^{-1}\left(e^x\right)\right]_0^1$

28. $\left[\frac{\left(\tan^{-1} x\right)^4}{4}\right]_0^1$

29. put $\frac{1}{x} = t$

$\frac{1}{x^2} dx = -dt$

$= -\int_{\pi}^{\frac{\pi}{2}} \cos t \, at$

30. Conceptual

31. Conceptual

32. $\int_0^a f\left(x\right) dx = \int_0^a f\left(a-x\right) dx$

33. $\left(a+b\right)\frac{\pi}{4}$

$a = 200, \quad b = 100$

34. $\log\left(\frac{2-\sin\theta}{2+\sin\theta}\right)$ is odd function

35. $\int_{\frac{-\pi}{2}}^{0} -\sin x dx + \int_0^{\frac{\pi}{2}} \sin x dx$

36. put $x = \tan\theta$

37. put $x = \sin^2\theta$

38. $\frac{7}{10} \times \frac{5}{8} \times \frac{3}{6} \times \frac{1}{4} \times \frac{1}{2} \times \frac{\pi}{2}$

39. put $e^x - 1 = t^2$

40. $\int_0^{\frac{\pi}{2}} \log(\sin x)\,dx = \frac{-\pi}{2} = \int_0^{\frac{\pi}{2}} \log(\cos x)\,dx$

PHYSICS

41. Conceptual
Energy band gap is greatest for carbon and least for Germanium

42. $E = \frac{V}{d}$

$= \frac{0.5}{5\times10^{-7}} = 10^6 V/m$

43. $n_e n_n = n_i^2$

$n_e = \frac{n_i^2}{n_n} = \frac{\left(1.5\times10^6\right)^2}{4.5\times10^{22}}$

$= 5\times10^9 m^{-3}$

44. $R_{forward} = \frac{\Delta V}{\Delta I}$

$= \frac{0.8-0.7}{20-10}$

$= \frac{0.1}{10} = 10\Omega$

45. $I = \frac{E - V_B}{R} = \frac{6-0.6}{270} = 20mA$

46. $R = \frac{V}{I} = \frac{3}{55\times10^{-3}} = 54.5\Omega$

47. $P_{\max} = V_z I_{z(\max)}$

$I_{z(\max)} = \frac{P_{\max}}{V_z}$

$= \frac{364\times10^{-3}}{9.1}$

$I_{z(\max)} = 40mA$

48. $I_E = I_B + I_C$

$I_B = 10\%\ of\ I_C$

$= \frac{10}{100}\times10$

$= 1mA$

$I_E = 1+10$

$= 11mA$

49. $\beta = \frac{\Delta I_C}{\Delta I_B}$

$40 = \frac{160}{\Delta I_B}$

$\Delta I_B = 4mA$

50. $A_V = \beta \frac{R_L}{R_i}$

$= 50 \times \frac{4000}{500}$

$A_V = 400$

51. $n_C = \frac{96}{100} \times 10^{10}$

$= 0.96 \times 10^{10}$

$I_E = \frac{n_E \times e}{t}, \quad I_C = \frac{n_C \times e}{t}$

$\alpha = \frac{I_C}{I_E} = \frac{n_C}{n_E}$

$= \frac{0.96 \times 10^{10}}{10^{10}}$

$\alpha = 0.96$

52. Voltage gain =current gain $\times$ Resistance gain

$= 0.98 \times \frac{R_o}{R_i}$

$= 0.98 \times \frac{5 \times 10^3}{70}$

0.07×10^3

$A_V = 70$

Power gain = current gain $\times$ voltage gain

$= 0.98 \times 70$

$A_P = 68.6$

53. β lies between 20 – 100

54. Conceptual

55. Efficiency = $\frac{output\ power}{input\ power}$

$\eta = \frac{P_{dc}}{P_{ac}}$

56. Use logic gates truth tables and verify from options

57. $y = A.\overline{B} + B.\overline{A}$

$= 1.0 + 1.0$

$= 0 + 0$

$= 0$

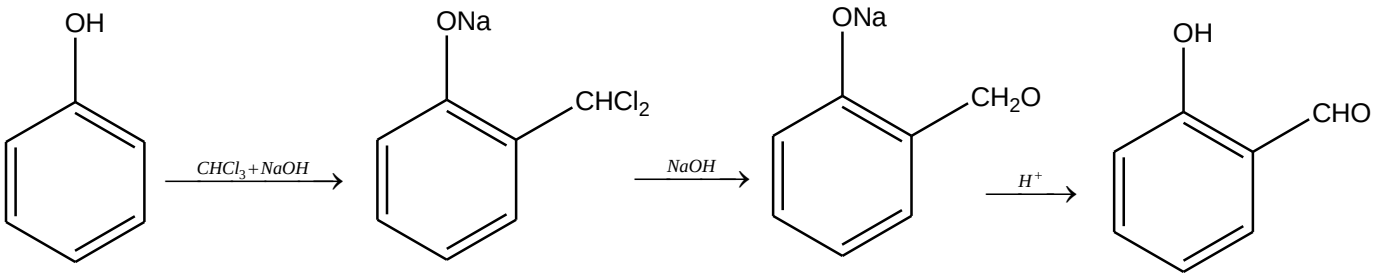
58. Use Boolean algebra function

59. By using truth tables, verify from options

60. Conceptual

CHEMISTRY

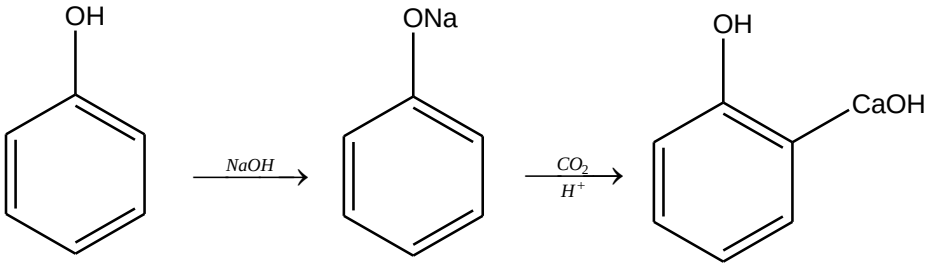
61.



salicylaldehyde

62. Conceptual

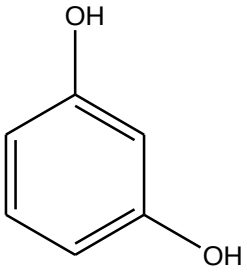
63.



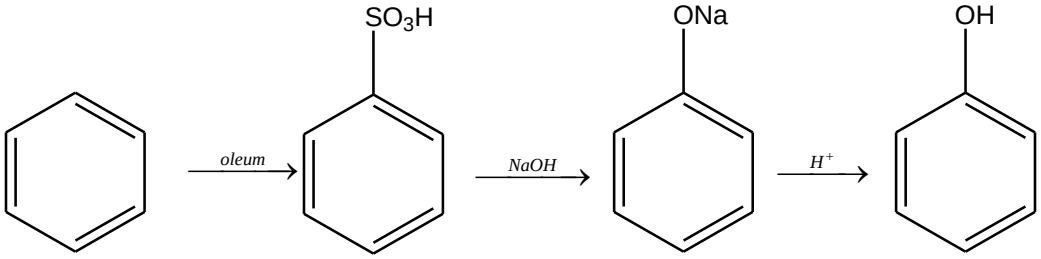
64. Conceptual

65. Conceptual

66.

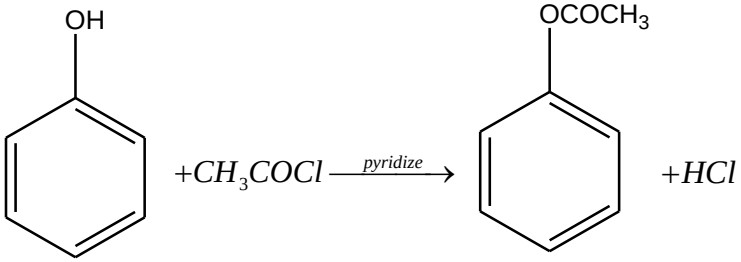


67.

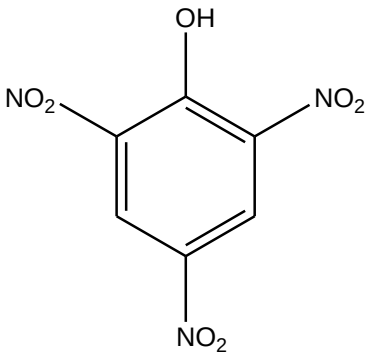


68. Phenol cannot react $NaHCO_3$ whereas carboxylic acid can react with them

69.



70.



71. $H_3C_2-O-C_2H_5\left(SP^3 Hybridization\right)$

72. Conceptual

73. $2C_2H_5OH \xrightarrow{Al_2O_3/523K} C_2H_5OC_2H_5 + H_2O$

74. $C_2H_5-O-C_2H_5 + \underset{(hot)}{2HI} \xrightarrow[\Delta]{} 2C_2H_5I + H_2O$

75. $C_2H_5-O-C_2H_5 + PCl_5 \rightarrow 2C_2H_5Cl + POCl_3$

76. Conceptual

77. Conceptual

78. $C_2H_5-O-C_2H_5 \xrightarrow{dil.H_2SO_4} 2C_2H_5OH$

79. $C_2H_5-O-C_2H_5 + CH_3COCl \xrightarrow{AlCl_3} C_2H_5Cl + CH_3COOC_2H_5$

80. Conceptual

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