MELUHA INTERNATIONAL SCHOOL

HYDERABAD

SR MPC | **JEE MAINS GT-5** | **Date: 09-07-2020**

Time: 3 Hours | **Max Marks : 300**

JEE MAIN MODEL
MATHEMATICS

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 01 – 20)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 21 – 25)	Questions with Numerical Answer Type (+/ - Decimal Numbers)	4	0	5	20
Total				25	100

PHYSICS

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 26 – 45)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 46 – 50)	Questions with Numerical Answer Type (+/ - Decimal Numbers)	4	0	5	20
Total				25	100

CHEMISTRY

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 51 – 70)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 71 – 75)	Questions with Numerical Answer Type (+/ - Decimal Numbers)	4	0	5	20
Total				25	100

MATHS
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.

01. If a, b and c are three numbers (not necessarily different) chosen randomly and with replacement from the set $\{1,2,3,4,5\}$, then the probability that $(ab+c)$ is even, is

A) $\frac{35}{125}$ B) $\frac{59}{125}$ C) $\frac{64}{125}$ D) $\frac{75}{125}$

02. Let $f(x)=\lim_{h\to 0}\left(\frac{\sin(x+h)^{\ln(x+h)}-(\sin x)^{\ln x}}{h}\right)$ then $f\left(\frac{\pi}{2}\right)$ is

A) equal to 0 B) equal to 1 C) $\ln\left(\frac{\pi}{2}\right)$ D) non existent

03. Let $y=f(x)$ and $f:R\to R$ be an odd function which is differentiable such that $f'''(x)>0$ and $\phi(\alpha,\beta)=\sin^8\alpha+\cos^8\beta+2-4\sin^2\alpha\cos^2\beta$.

If $f''(\phi(\alpha,\beta))=0$ then $\sin^2\alpha+\sin^2\beta=$

A) 0 B) 1 C) 2 D) 3

04. Locus of a point $P(x,y)$ satisfying the equation $\sqrt{x^2+y^2+24y+144}=13-\sqrt{x^2+y^2-10x+25}$ is

A) a line segment B) hyperbola
C) part of a circle with finite radius D) ellipse

05. A particle moves along the curve $y=x^{3/2}$ in the first quadrant in such a way that its distance from the origin increases at the rate of 11 units per second. The value of $\frac{dx}{dt}$ when $x=3$ is

A) 4 B) 9/2 C) $\frac{3\sqrt{3}}{2}$ D) $\sqrt{3}$

06. Let $\bar{a}$ be vector parallel to line of intersection of planes P_1 *and* P_2 through origin. If P_1 is parallel to the vectors $2\bar{j}+3\bar{k}$ *and* $4\bar{j}-3\bar{k}$ *and* P_2 is parallel to $\bar{j}-\bar{k}$ and $3\bar{i}+3\bar{j}$, then the angle between $\bar{a}$ and $2\bar{i}+\bar{j}-2\bar{k}$ is

A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{3}$ D) $\frac{\pi}{6}$

07. If $\sin x+\cos x+\tan x+\cot x+\sec x+\operatorname{cosec} x=7$ and $\sin 2x=a-b\sqrt{7}$ then ordered pair $(a,b)=$

A) $(6,2)$ B) $(8,3)$ C) $(22,8)$ D) $(11,4)$

08. The range of the values of p for which the equation $\sin\cos^{-1}\left(\cos\left(\tan^{-1}x\right)\right)=p$ has a solution is

A) $\left(-\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}\right]$ B) $[0,1)$ C) $\left[\frac{1}{\sqrt{2}},1\right)$ D) $(-1,1)$

09. The range of values of 'a' such that the angle θ between the pair of tangents drawn from $(a,0)$ to the circle $x^2+y^2=1$ satisfies $\frac{\pi}{2}<\theta<\pi$, is

A) $(1,2)$ B) $\left(-\sqrt{2},-1\right)\cup\left(1,\sqrt{2}\right)$ C) $\left(-\sqrt{2},-1\right)$ D) $\left(1,\sqrt{2}\right)$

10. In the truth table for the statement $(p\to q)\leftrightarrow(\sim p\vee q)$ the last column (final truth value column of the given statement) has the truth values in the following order

A) T, T, F, F B) F, F, F, F C) T, T, T, T D) F, T, F, T

11. The number of integral solutions of the system of equations $x_1+x_2+x_3+x_4+x_5=20$ *and* $x_1+x_2=15$ *when* $x_k\geq 0$ *is*…….. (where k = 1, 2, 3, 4, 5)

A) 336 B) 350 C) 300 D) 316

12. The weighted mean of first n natural numbers whose weights are equal to the squares of corresponding numbers is

A) $\frac{n+1}{2}$ B) $\frac{3n(n+1)}{2(2n+1)}$ C) $\frac{(n+1)(2n+1)}{6}$ D) $\frac{n(n+1)}{2}$

13. The equation $\sqrt{x+3-4\sqrt{x-1}}+\sqrt{x+8-6\sqrt{x-1}}=1$ *has*

A) no solution B) only one solution

C) only two solutions D) more than two solutions

14. Let $f\left(\frac{x+y}{2}\right)=\frac{f(x)+f(y)}{2}\forall x,y\in R$. If $f^1(0)$ exists and equal to -1. Then $f^1\left(\frac{x}{2}\right)=$

A) -1 B) 1 C) 0 D) $\frac{1}{2}$

15. The number of symmetric relations that can be defined on the set $\{1,2,3,4,5,6,7\}$ is

A) 2^{49} B) 2^7 C) 7^7 D) 2^{28}

16. The values of 'k' for which one root of the equation $x^2-(k+1)x+k^2+k-8=0$ exceeds 2 and the other is less than 2, are given by

A) $k>3$ B) $9<k<10$ C) $-2<k<3$ D) $-1<k<2$

17. The area bounded by the curves of $y=\sqrt{5-x^2}$ *and* $y=|x-1|$ *is*

A) $\left(\frac{5\pi}{2}-4\right)$*sq.units* B) $\left(\frac{5\pi+2}{4}\right)$*sq.units* C) $\left(\frac{5\pi-2}{4}\right)$*sq.units* D) $\left(\frac{5\pi-2}{2}\right)$*sq.units*

18. The radius of the circle which touches the line $y=x$ and has centre on the x-axis and cuts of a chord of length 2 units along the line $\sqrt{3}y-x=0$ is

A) 1 B) $\sqrt{2}$ C) $\sqrt{3}$ D) $\sqrt{5}$

19. Let $f(x)=|x-1|+|x+1|$. Then f is differentiable in

A) $(-\infty,\infty)$ B) $(-\infty,0)$ C) $(-1,1)$ D) $[-1,1]$

20. The line which passes through the origin and intersects the two lines $\frac{x-1}{2}=\frac{y+3}{4}=\frac{z-5}{3},\ \frac{x-4}{2}=\frac{y+3}{3}=\frac{z-14}{4}$ is

A) $\frac{x}{1}=\frac{y}{-3}=\frac{z}{5}$ B) $\frac{x}{-1}=\frac{y}{3}=\frac{z}{5}$ C) $\frac{x}{1}=\frac{y}{3}=\frac{z}{5}$ D) $\frac{x}{1}=\frac{y}{4}=\frac{z}{3}$

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical value. If the numerical value has more than two decimal places, **round-off the value** of Two decimal places. Answer to each question will be evaluated according to the following marking scheme:
Marking scheme: +4 for correct answer, 0 in all other cases.

21. If M (x_o, y_o) is the point on the curve $3x^2 - 4y^2 = 72$ which is nearest to the line $3x + 2y + 1 = 0$, then the value of $(x_o + y_o)$ is equal to_____

22. If $P = \begin{bmatrix} 1 & \alpha & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{bmatrix}$ is the adjoint of a 3×3 matrix A and |A| = 4, then α is equal to_____

23. $\sum_{j=1}^{n-1} \frac{1}{1 - e^{\frac{2\pi ij}{n}}} = \frac{n-1}{k}$, find k. $\left(i = \sqrt{-1}\right)$

24. *Let* $f(x) = \text{maximum}\{x + |x|, x - [x]\}$, where [x] is the greatest integer less than or equal to x. Then $\int_{-2}^{2} f(x)\,dx =$

25. Coefficient of x^6 in $\left((1+x)(1+x^2)^2(1+x^3)^3 \ldots (1+x^n)^n\right)$ is

PHYSICS

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.

26. The percentage errors in the measurements of the length of a simple pendulum and its time period are 2% and 3% respectively. The maximum error in the value of the acceleration due to gravity obtained from these measurements is
A) 5% B) 1% C) 8% D) 10%

27. A body is projected from the ground with a velocity u at an angle θ with the horizontal. The average velocity of the body between its point of projection and the highest point of its trajectory is
A) $\frac{u}{2}(1+\cos\theta)$ B) $\frac{u}{2}(1+\cos^2\theta)^{1/2}$ C) $\frac{u}{2}(1+2\cos^2\theta)^{1/2}$ D) $\frac{u}{2}(1+3\cos^2\theta)^{1/2}$

28. A balloon of mass M is rising up with an acceleration a. If a mass m is removed from the balloon, its acceleration becomes
A) $\frac{Ma+mg}{M-m}$ B) $\frac{Ma+mg}{M+m}$ C) $\frac{ma+Mg}{M-m}$ D) $\frac{ma+Mg}{M+m}$

29. A steel ball falls from a height h on a floor for which the coefficient of restitution is e. The height attained by the ball after two rebounds is
A) eh B) e^2h C) e^3h D) e^4h

30. A circular ring of mass M and radius R is rotating about its axis at an angular frequency ω. Two blocks, each of mass m, are gently placed on the opposite ends of a diameter of the ring. The angular frequency of the ring becomes ω_0. The ratio ω_0/ω is

A) $\frac{M}{(M+2m)}$ B) $\frac{2M}{(M+2m)}$ C) $\frac{2m}{M}$ D) $\frac{M}{2m}$

31. Astronauts in a stable orbit around the earth are said to be in a weightless condition. The reason for this is that

A) The capsule and its contents are falling freely at the same rate
B) There is no gravitational force acting on them
C) The gravitational force of the earth balances that of the sum
D) There is no atmosphere at the height at which they are orbiting

32. A liquid is kept in a cylindrical vessel. When the vessel is rotated about its axis, the liquid rises at its sides. If the radius of the vessel is 0.05 m and the frequency of rotation is 2 revolutions per second, the difference in the heights of the liquid at the centre and at the sides of the vessel will be $\left(take\ g=10\,ms^{-2}\ and\ \pi^2=10\right)$

A) 2 cm B) 4 cm C) 1 cm D) 8 cm

33. A composite slab consists of two slabs A and B of different materials but of the same thickness placed one on top of the other. The thermal conductivities of A and B are $k_1\ and\ k_2$, respectively. A steady temperature difference of 12^0C is maintained across the composite slab. If $k_1=k_2/2$, the temperature difference across slab A will be

A) 4^0C B) 8^0C C) 12^0C D) 16^0C

34. Transverse waves of the same frequency are generated in two steel wires A and B. The diameter of A is twice that of B and the tension in A is half that in B. The ratio of the velocities of waves in A and B is

A) 1:2 B) $1:\sqrt{2}$ C) $1:2\sqrt{2}$ D) $3:2\sqrt{2}$

35. A galvanometer of resistance 20Ω gives full scale deflection when a current of 1 mA is passed through it. It is converted into a voltmeter by connecting a resistance of 4980Ω in series with it. The maximum potential difference this voltmeter can measure is

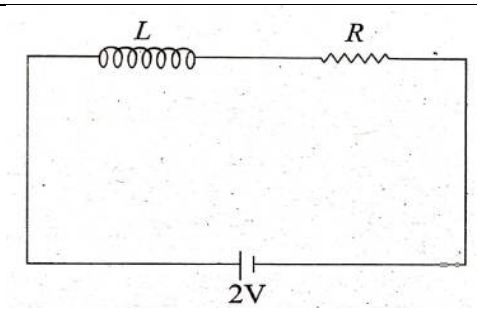
A) 5 mV B) 0.05 V C) 5.0 V D) 50 V

36. A proton of velocity $\left(3\hat{i}+2\hat{j}\right)ms^{-1}$ enters a magnetic field of $\left(2\hat{j}+3\hat{k}\right)$ tesla. The acceleration produced in the proton is (charge to mass ratio of proton $=0.96\times10^8\,C\,kg^{-1}$)

A) $2.88\times10^8\left(2\hat{i}-3\hat{j}\right)$ B) $2.88\times10^8\left(2\hat{i}-3\hat{j}+2\hat{k}\right)$

C) $2.88\times10^8\left(2\hat{i}+3\hat{j}\right)$ D) $2.88\times10^8\left(\hat{i}-3\hat{j}+2\hat{k}\right)$

37. An inductor of inductance 100 mH is connected in series with a resistor of resistance 0.2Ω. This combination is connected across a 2V battery as shown in Fig. The energy stored in the inductor will become to 1/9 of its maximum value in time



A) $\frac{1}{2}\ln\left(\frac{3}{2}\right)$ second B) $\frac{1}{2}\ln(3)$ second C) $\frac{1}{9}\ln(2)$ second D) $2\ln(9)$ second

38. An AC voltage source of a fixed peak value V_0 and variable angular frequency ω is connected in series with an inductor of inductance L and a bulb of resistance R (inductance zero). When ω is increased, the brightness of the bulb will

A) Increase B) decrease C) remain unchanged D) become zero

39. The amplitude of the electric field of a plane electromagnetic wave in air is $6.0\times10^{-4}Vm^{-1}$. The amplitude of the magnetic field will be

A) $1.8\times10^{5}T$ B) $5.0\times10^{3}T$ C) $2.0\times10^{-4}T$ D) $2.0\times10^{-12}T$

40. Lights of two different frequencies whose photons have energies 2 eV and 10 eV respectively, successively illuminate a metal of work function 1 eV. The ratio of the maximum speeds of the emitted electrons will be

A) 1:5 B) 3:11 C) 1:9 D) 1:3

41. The ratio of the wavelength of the longest wavelength lines in the Lyman and Balmer series of hydrogen spectrum is

A) 3/23 B) 5/27 C) 7/29 D) 9/31

42. Which of the following statements is correct for an unbiased pn junction diode

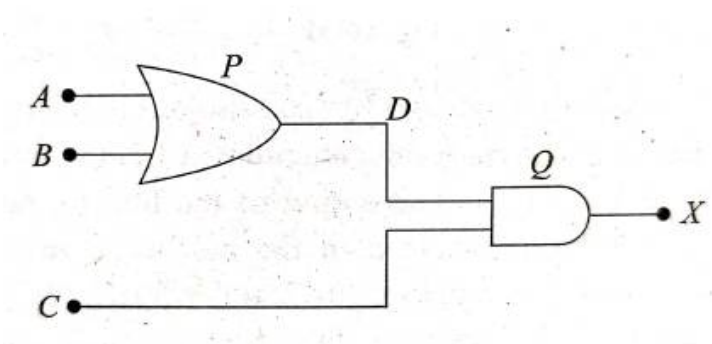
A) The potential is the same everywhere

B) The p-type side is at a higher potential than the n-type side

C) There is an electric field at the junction directed from the n-type side to the p-type side

D) There is an electric field at the junction directed from the p-type side to the n-type side

43. In order to obtain the final output X=1 from the combination of gates P and Q. Shown in Fig, the



inputs A, B and C must be

A) $A=1,B=0,C=0$ B) $A=0,B=1,C=0$

C) $A=1,B=1,C=0$ D) $A=1,B=0,C=1$

44. An audio signal is sent on a carrier wave of frequency 30 MHz. The minimum length of the antenna at the transmitting station must be

A) 22.5 m B) 30 m C) 10 m D) 2.5 m

45. A small steel ball of radius r experience a viscous force F when it is falling in a jar of glycerine with terminal velocity v. The viscous force experienced by a steel ball of radius r/2 falling in glycerine with terminal velocity v/2 is

A) F B) F/2 C) F/4 D) F/8

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical value. If the numerical value has more than two decimal places, **round-off the value** of Two decimal places. Answer to each question will be evaluated according to the following marking scheme:
Marking scheme: +4 for correct answer, 0 in all other cases.

46. If the pressure of a gas contained in a rigid closed vessel is increased by 0.4% when heated through $1C^0$, the initial temperature has been

47. A Carnot's engine working between $27^0 C \; and \; 127^0 C$ takes up 800 J of heat from the reservoir in one cycle. What is the work done by the engine? (in Joule)

48. An electric field of $200 Vm^{-1}$ exists in the region between the plates of an isolated parallel plate capacitor of plate separation 5 cm. The potential difference between the plates when a slab of dielectric constant 4 and thickness 5 cm inserted between the plates is (in volt)

49. In Young's double slit experiment the fringe width with light of wavelength $6000 \overset{0}{A}$ is found to be 4.0 mm. What will be the fringe width if light of wavelength $4800 \overset{0}{A}$ is used? (in mm)

50. A body of mass 5 kg rests on a rough horizontal surface of coefficient of friction 0.2. The body is pulled through a distance of 10 m by a horizontal force of 25 N. The kinetic energy acquired by it is (in Joule) $\left(take \; g = 10 ms^{-2} \right)$

CHEMISTRY

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.

51. Among the following incorrect statement is/are

A) Terrestrial hydrogen contains 0.0156% of deuterium mostly in the form of D_2

B) In water gas shift reaction iron chromate is catalyst and carbon dioxides removed by scrubbing with solution arsenite solution

C) In modern periodic table group 7,8 and 9 is called hydride gap

B) Among H_2, LPG, CH_4 and octane, calorific value is highest for H_2

52. $NaBH_4 + I_2 \rightarrow NaI + A(gas) + B$(diatomic gas) incorrect statement regarding 'A' is

A) On an industrial scale 'A' can be produced by the reaction of BF_3 with sodium hydride

B) 'A' catches fire spontaneously upon exposure to air

C) One mole of 'A' on hydrolysis with water ,gives six moles of gas 'B'

D) 'A' undergo unsymmetrical cleavage with carbon monoxide

53. Which one of the following ions cannot liberate hydrogen gas from acids

A) Ti^{2+} B) V^{2+} C) Cr^{2+} D) Mn^{3+}

54. $NaCl_{(s)} + Conc.H_2SO_4 \xrightarrow{420K} A + B$; A and Bare respectively

A) $Na_2SO_4 + HCl$ B) $NaHSO_4 + HCl$ C) $SO_2 + Cl_2$ D) $NaHSO_4 + Cl_2$

55. In which of the following molecules, 2s – 2p mixing possible as per M.O.T

A) N_2 B) O_2 C) F_2 D) Ne_2

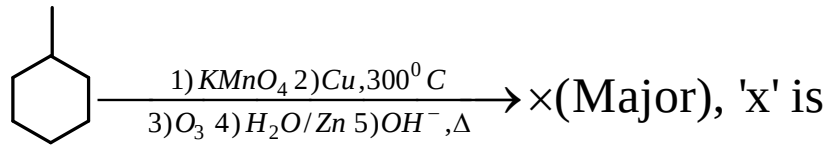
56. In the extraction of Ag and Au from their native ore, oxidising and reducing agents used respectively are

A) O_2, Pt B) O_2, Zn C) S^{2-}, Zn D) O_2, C

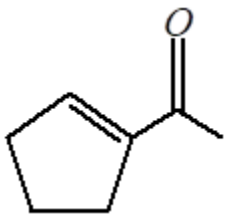
57. Clean water would have BOD value of less than

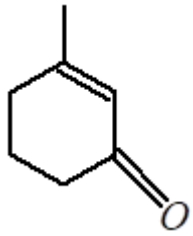
A) 5 ppm B) 9 ppm C) 17 ppm D) 50 ppm

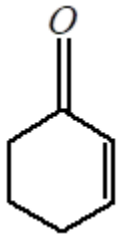
58.

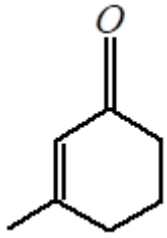


×(Major), 'x' is

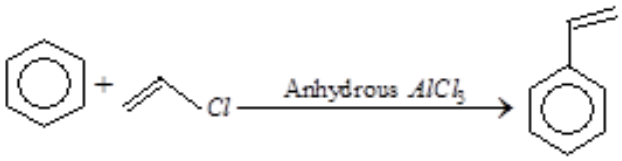
A) 

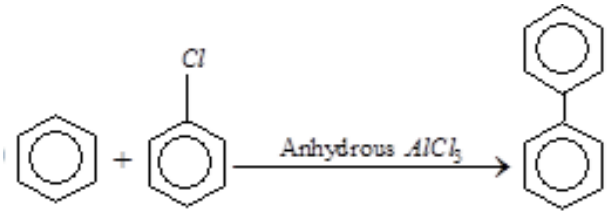
B) 

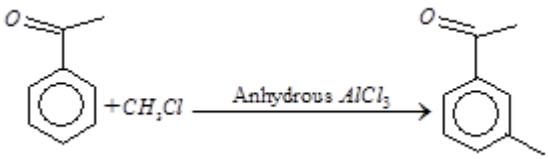
C) 

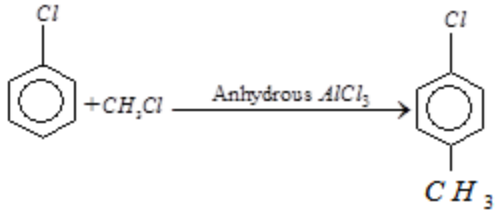
D) 

59. Which one of the following reactions possible

A) 

B) 

C) 

D) 

60. The correct melting point order of

a) o – Dichlorobenzene b) m – dichlorobenzene c) p – Dichlorobenzene

A) $a > b > c$ B) $a > c > b$ C) $c > b > a$ D) $c > a > b$

61. The enthalpy change on freezing of one mole of water at $10^0 C$ to $-10^0 C$ is (Given date: $\Delta_{fus} H = 6.03$ KJ/mol at $0^0 C$, $C_P of H_2O_{(l)} = 75.3$ J/mol K, $C_P H_2O_{(s)} = 36.8$ J/mol/ K)

A) $-7151J$ B) $-4917J$ C) $-1127.03J$ D) $-6415J$

62. Which of the following phenomenon explained by wave nature of electromagnetic radiation

I) Block – body radiation II) Photoelectric effect

III) Variation of heat capacity of solids as a function of temperature

IV) Line spectrum of hydrogen

A) Only IV B) Only III and IV C) I and II only D) Non of I,II,III and IV

63. What is the correct sequence of reagents required to convert 4 – nitrotoluene to 2 – Bromobenzoic acid

A) I) $Sn + HCl$ II) Br_2 III) $NaNO_2 + HCl, 0 - 5^0 C$ IV) $H_3PO_2 + H_2O$ V) $KMnO_4 / OH^-, \Delta$

B) I) $Sn + HCl$ II) $NaNO_2 + HCl, 0 - 5^0 C$ III) $H_3PO_2 + H_2O$ IV) Br_2 / Fe V) $KMnO_4 / OH^-, \Delta$

C) I) $Sn + HCl$ II) $NaNO_2 + HCl, 0 - 5^0 C$ III) $H_3PO_2 + H_2O$ IV) $KMnO_4 / OH, \Delta$ V) Br_2 / Fe

D) I) Br_2 / Fe II) $Sn + HCl$ III) $NaNO_2 + HCl, 0 - 5^0 C$ IV) $H_3PO_2 + H_2O$ V) $KMnO_4 / OH^-, \Delta$

64. Glycerol separated from spent – lye in soap industry by which technique

A) Simple distillation B) Fractional distillation

C) Distillation under reduced pressure D) Steam distillation

65. Which of the following food adulterants tests are correct

a) To the molten butter added a small amount of sugar and few drops of HCl and shake the mixture for 5 minutes. Appearance of pink colour indicates the presence of vanaspati ghee in the butter

b) To the turmeric powder, dil. H_2SO_4 is added, evolution of effervescences show the presence of coloured chalk powered in turmeric

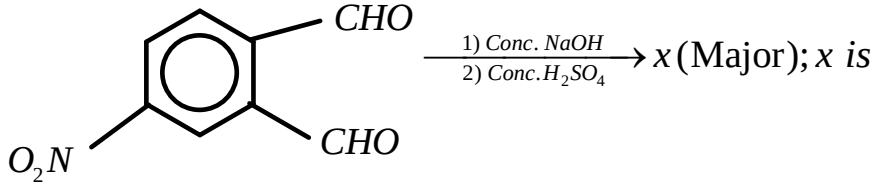
c) To the turmeric powder few drops of conc. HCl added. Instant appearance of violet colour which persists on dilution with distilled water indicates the presence of saw dust coloured with metanil yellow (a coaltar dye)

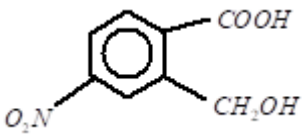
d) Oil / fat is mixed with the mixture of sulphuric acid and glacial acetic acid in the ratio 1:4. Now the mixture on heating, appearance of pink colour indicates the presence of dyes in oil / fat

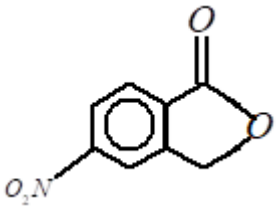
A) a,b,c and d B) Only b C) Only a,b,d D) Only a,c

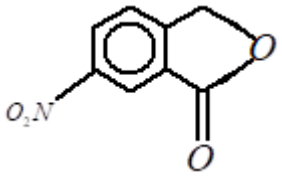
66. Which one of the following cannot decolourise the bromine water

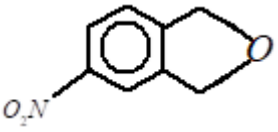
A) Phenol B) Aniline C) Alkenes D) Benzene

67. 

A) 

B) 

C) 

D) 

68. For H_2S first and second ionization constant are 9.1×10^{-8} and 1.2×10^{-13}. What are the concentrations of HS^- and S^{2-} in the mixture $0.1M\ H_2S + 0.001M\ HCl$?

A) $9.1\times10^{-8}M, 1.2\times10^{-13}M$ B) $9.1\times10^{-8}M, 1.2\times10^{-11}M$

C) $9.1\times10^{6}M, 1.2\times10^{-18}M$ D) $9.1\times10^{-6}M, 1.092\times10^{-15}M$

69. Benzene and toluene form ideal solution over the entire range of composition. The vapour pressure of pure benzene and toluene at 300K are 50 mm of Hg and 30 mm of Hg respectively. What is the mole fraction of benzene in vapour when 1 mole of benzene and 4 mole of toluene are mixed at 300K?

A) 0.2 B) 0.29 C) 0.71 D) 0.8

70. $CO(g) + 3H_2(g) \rightarrow CH_4(g) + H_2O(g)$ catalyst for the above reaction is

A) $ZnO - Cr_2O_3$ B) Cu C) Co D) Ni

SECTION-II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical value. If the numerical value has more than two decimal places, **round-off the value** of Two decimal places. Answer to each question will be evaluated according to the following marking scheme:
Marking scheme: +4 for correct answer, 0 in all other cases.

71. In Br_3O_8, oxidation number of middle bromine is

72. Total number of sterio isomers possible for the octahedral complex $\left[M(ab)_2C_2\right]$ are where (ab) – unsymmetrical bidentate ligand , C- mono dentate ligand

73. During the estimation of nitrogen present in an organic compound (Containing three nitrogens per molecule) by kjeldahls method, the ammonia evolved from 0.5g of the compound in kjeldahls estimation of nitrogen, neutralized 10ml of $1M\ H_2SO_4$. Gram molecular weight (in gram) of the compound is

74. In a reaction $2A \rightarrow$ product, the concentration of 'A' decreases from 10M to 4M in one hour. The average rate of reaction during this time interval (in mole $|lt|$ min) is

75. What would be the change in electrode potential (in mV) of the followings half cell when pH of solution increased by one $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$ (2.303RT/F= 0.06)

MELUHA INTERNATIONAL SCHOOL
HYDERABAD

SR MPC | **JEE MAINS – GT 5** | **Date: 09-07-2020**
Time: 3 Hours | **Max Marks : 300**

KEY SHEET

MATHS

1) **B**	2) **A**	3) **C**	4) **A**	5) **A**	6) **B**	7) **C**	8) **B**	9) **B**	10) **C**
11) **A**	12) **B**	13) **D**	14) **A**	15) **D**	16) **C**	17) **C**	18) **B**	19) **C**	20) **A**
21) **-3**	22) **11**	23) **2**	24) **5**	25) **28**					

PHYSICS

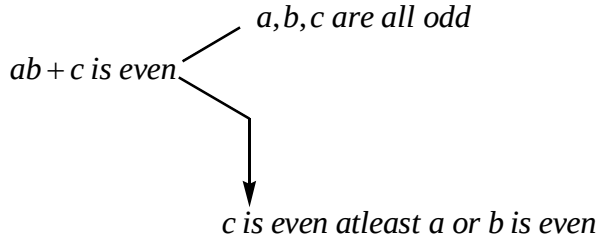
26) **C**	27) **D**	28) **A**	29) **D**	30) **A**	31) **A**	32) **A**	33) **B**	34) **C**	35) **C**
36) **B**	37) **A**	38) **B**	39) **D**	40) **D**	41) **B**	42) **C**	43) **D**	44) **D**	45) **C**
46) **250**	47) **200**	48) **2.5**	49) **3.2**	50) **150**					

CHEMISTRY

51) **A**	52) **D**	53) **D**	54) **B**	55) **A**	56) **B**	57) **A**	58) **A**	59) **D**	60) **D**
61) **A**	62) **D**	63) **D**	64) **C**	65) **A**	66) **D**	67) **B**	68) **D**	69) **B**	70) **D**
71) **4**	72) **8**	73) **75**	74) **0.05**	75) **-96**					

HINTS & SOLUTIONS
MATHEMATICS

01. P(number chosen is odd) = 3/5
P(number chosen is even)=2/5



E: $(ab+c)$ is even note that even E can occurs in two cases

E_1 : all the three numbers a,b and 'c' are odd $P(E_1)=\left(\frac{3}{5}\right)^3=\frac{27}{125}$

E_2 : 'c' is even and at least one of a or b is even $P(E_2)=\frac{2}{5}\left(1-\frac{9}{25}\right)=\frac{2}{5}.\frac{16}{25}=\frac{32}{125}$

$P(E)=P(E_1 \text{ or } E_2)$

$= P(E_1) + P(E_2)$

$= \frac{59}{125}$

02.

Let $g(x) = (\sin x)^{\ln x} = e^{\ln x . \ln(\sin x)}$

$f(x) = g'(x) = (\sin x)^{\ln x}\left[\cot x(\ln x) + \frac{\ln(\sin x)}{x}\right]$

Hence $f\left(\frac{\pi}{2}\right) = g'\left(\frac{\pi}{2}\right) = 1(0+0) = 0$

03. $f''(x)$ is an odd function

$\therefore \phi(\alpha, \beta) = 0 \Rightarrow \left(\sin^4\alpha - 1\right)^2 + \left(\cos^4\beta - 1\right)^2 + 2\left(\sin^2\alpha - \cos^2\beta\right)^2 = 0$

$\Rightarrow \sin^2\alpha + \sin^2\beta = 1$

04. The given equation denotes that PA+PB=13
Point P lies on line segment AB

05. $y = x^{3/2}; \frac{dr}{dt} = 11$

$\frac{dx}{dt}$ *when* $x = 3$

$r^2 = x^2 + y^2 \quad \Rightarrow r = 6$

$r\frac{dr}{dt} = x\frac{dx}{dt} + y\frac{dy}{dt}.....(1)$

Also, $\frac{dy}{dt} = \frac{3}{2}\sqrt{x}\frac{dx}{dt}.....(2)$

$r\frac{dr}{dt} = x\frac{dx}{dt} + y\frac{3}{2}\sqrt{x}\frac{dx}{dt}$

$r\frac{dr}{dt} = \left(x + \frac{3y\sqrt{x}}{2}\right)\frac{dx}{dt}$

$6.11 = \left(3 + \frac{3.3\sqrt{3}.\sqrt{3}}{2}\right)\frac{dx}{dt}$

$66 = \left(3 + \frac{27}{2}\right)\frac{dx}{dt}$

$\Rightarrow 66 = \left(\frac{33}{2}\right)\frac{dx}{dt}$

$\Rightarrow \frac{dx}{dt} = 4$

06. D.R's normal to the plane P1 is parallel to
$(2j + 3k) \times (4j - 3k)$

$\begin{vmatrix} i & j & k \\ 0 & 2 & 3 \\ 0 & 4 & -3 \end{vmatrix}$

$i(-6-12) = -18i$

D.R's normal to the plane P2 is parallel to
$(j - k) \times (3i + 3j)$

$$\begin{vmatrix} i & j & k \\ 0 & 1 & -1 \\ 3 & 3 & 0 \end{vmatrix}$$

$i(3)-j(3)+k(-3)$

D.R's parallel to the line of intersection of planes P_1 *and* P_2 is

$$\begin{vmatrix} i & j & k \\ -1 & 0 & 0 \\ 1 & -1 & -1 \end{vmatrix} = i(0)-j(1)+k(1) = -j+k$$

$=(0,-1,1)$

Angle between $\cos\theta = \left|\frac{0-1-2}{3\sqrt{2}}\right|$

$\theta = \frac{\pi}{4}$

07. $(\sin x+\cos x)+\left(\frac{\sin x}{\cos x}+\frac{\cos x}{\sin x}\right)+\left(\frac{1}{\cos x}+\frac{1}{\sin x}\right)=7$

$(\sin x+\cos x)+\frac{1}{\sin x\cos x}+\left(\frac{\sin x+\cos x}{\sin x\cos x}\right)=7$

$(\sin x+\cos x)\left(1+\frac{2}{\sin 2x}\right)=7-\frac{2}{\sin 2x}$

Squaring we get

$(1+\sin 2x)\left(1+\frac{4}{\sin^2 2x}+\frac{4}{\sin 2x}\right)=49+\frac{4}{\sin^2 2x}-\frac{28}{\sin 2x}$

$\Rightarrow \sin^3 2x-44\sin^2 2x+36\sin 2x=0$

$\sin^2 2x-44\sin 2x+36=0 \quad \because \sin 2x\neq 0$

$\therefore \sin 2x = 22-8\sqrt{7} \ \therefore a=22\ b=8$

08. $\sin\cos^{-1}\left(\cos\left(\tan^{-1}x\right)\right)=p$

For $x\in R; \tan^{-1}x\in\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$

$\cos\left(\tan^{-1}x\right)\in(0,1]$

$\cos^{-1}\cos\left(\tan^{-1}x\right)\in\left[0,\frac{\pi}{2}\right)$

$\sin\left[\cos^{-1}\cos\left(\tan^{-1}x\right)\right]\in[0,1)$

09. Equation of pair of tangents, $(a^2-1)y^2-x^2+2ax-1=0$

angle between them, $\tan\theta=\frac{2\sqrt{h^2-ab}}{a+b}=\frac{2\sqrt{a^2-1}}{a^2-2}<0 \Rightarrow a\in(-\sqrt{2},-1)\cup(1,\sqrt{2})$

10.

P	q	$p\to q$	$\sim p$	$\sim pvq$	$p\to q\leftrightarrow(\sim pvq)$
T	T	T	F	T	T
T	F	F	F	F	T
F	T	T	T	T	T
F	F	T	T	T	T

11. $x_1+x_2=15;\ x_r\geq 0; r=2; n=15$

No. of non negative integral solutions $={}^{n+r-1}C_{r-1}={}^{16}C_1=16$

$x_1+x_2+x_3+x_4+x_5=20$

$x_3+x_4+x_5=5\Rightarrow {}^{5+3-1}C_{3-1}={}^{7}C_2=21$

Total no. of solutions = 16 x 21 = 336

12. $\overline{x}=\dfrac{1.1^2+2.2^2+3.3^2+.....+n.n^2}{1^2+2^2+.....+n^2}=\dfrac{\sum n^3}{\sum n^2}=\dfrac{3n(n+1)}{2(2n+1)}$

13. put $\sqrt{x-1}=t$ *or* $x=t^2+1$

$\sqrt{t^2+4-4t}+\sqrt{t^2+9-6t}=1$

$\Rightarrow\sqrt{(t-2)^2}+\sqrt{(t-3)^2}=1\Rightarrow|t-2|+|t-3|=1$

This equation is satisfied for all values of t between 2 and 3 that is $2\le t\le 3$ thus the given equation satisfied for all values of x lying between 5 and 10

14. $f'(x)=\underset{h\to 0}{lt}\dfrac{f(x+h)-f(x)}{h}$

$=\underset{h\to 0}{lt}\dfrac{f\left(\dfrac{2x+2h}{2}\right)-f(x)}{h}$

$=\underset{h\to 0}{lt}\dfrac{\dfrac{f(2x)+f(2h)}{2}-f(x)}{h}$

We have $f\left(\dfrac{x+y}{2}\right)=\dfrac{f(x)+f(y)}{2}$

$x=2x,\ y=0\ then\ f(x)=\dfrac{f(2x)+f(0)}{2}$

$f(2x)=2f(x)-f(0)$

$f'(x)=\underset{h\to 0}{lt}\dfrac{2f(x)-f(0)+2f(h)-f(0)-2f(x)}{2h}$

$\underset{h\to 0}{lt}\dfrac{f(h)-f(0)}{h}=f'(0)=-1$

15. $2^{n\left(\frac{n+1}{2}\right)}=2^{7\times 4}=2^{28}$

16. Let α,β *be roots and*

$\alpha>2\ \beta<2$

$(\alpha-2)(\beta-2)<0$

$\alpha\beta-2(\alpha+\beta)+4<0$

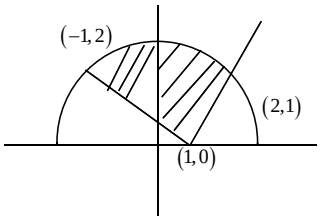
$k^2+k-8-2(k+1)+4<0$

$k^2-k-6<0$

$(k-3)(k+2)<0,\quad also\ \Delta>0\Rightarrow 3k^2+2k-33<0\Rightarrow(3k+11)(k-3)<0\Rightarrow\dfrac{-11}{3}<k<3,$

$-2<k<3$

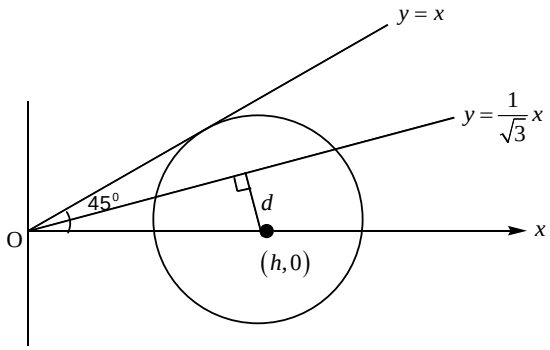
17.



Area = $\int_{-1}^{2}\left(\sqrt{5-x^2}-|x-1|\right)dx$

$=\int_{-1}^{2}\sqrt{5-x^2}\,dx+\int_{-1}^{1}(x-1)\,dx-\int_{1}^{2}(x-1)\,dx$

18.



$r=\frac{h}{\sqrt{2}}$ *and* $d=\frac{h}{2}$

$2\sqrt{\frac{h^2}{2}-\frac{h^2}{4}}=2\Rightarrow h=2$

$r=\sqrt{2}$

19. $f(x)=\begin{cases}-2x & for\ \ x\le -1\\ 2 & for -1\le x\le 1\\ 2x & for\ x\ge 1\end{cases}$

F is diff in $(-1,1)$

20. Let the line be $\frac{x}{a}=\frac{y}{b}=\frac{z}{c}$

This intersects the given line

$\begin{vmatrix}1 & -3 & 5\\ a & b & c\\ 2 & 4 & 3\end{vmatrix}=0$ *and* $\begin{vmatrix}4 & -3 & 14\\ a & b & c\\ 2 & 3 & 4\end{vmatrix}=0$

21. Slope of the give line = $-\frac{3}{2}$

The points on the curve at which the tangent is parallel to the given line. So, differentiating both sides with respect to x of $3x^2-4y^2=72$ we get

$\frac{dy}{dx}=\frac{3x}{4y}=\frac{-3}{2}(given)$

$\Rightarrow\frac{x}{y}=-2$

Now $3\left(\frac{x}{y}\right)^2-4=\frac{72}{y^2}\Rightarrow y^2=9\Rightarrow y=-3,3$

So, points are $(-6,3)$ *and* $(6,-3)$

Now, distance of $(-6,3)$ from the given line = $\left|\frac{-18+6+1}{\sqrt{13}}\right|=\frac{11}{\sqrt{13}}$

And distance of $(6,-3)$ from the given line = $\left|\frac{18-6+1}{\sqrt{13}}\right|=\frac{13}{\sqrt{13}}$

Clearly , the required point is on $(-6,3)=(x_o,y_o)$ (given)

So, $x_o = -6, y_o = 3$

Hence $(x_0 + y_o) = -6 + 3 = -3$

22.

$|P| = 1(12 - 12) - \alpha(4 - 6) + 3(4 - 6)$
$= 2\alpha - 6$
$|P| = |A|^2 = 16$
$2\alpha - 6 = 16$
$\alpha = 11.$

23. k = 2,

Let $e^{i\frac{2\pi}{n}} = \alpha$ then $\sum_{j=1}^{n-12} \frac{1}{1-e^j} = \frac{1}{1-\alpha} + \frac{1}{1-\alpha^2} + ... + \frac{1}{1-\alpha^{n-1}}$

Where α is a nth root of unity $(\alpha, \alpha^2, \alpha^3, ...\alpha^{n-1})$ are the roots of

$\frac{x^n - 1}{x-1} = (x-\alpha)(x-\alpha^2).....(x-\alpha^{n-1})$

Taking log on both side

$\log \frac{x^n - 1}{x-1} = \log(x-\alpha) + \log(x-\alpha^2) + ... + \log(x-\alpha^{n-1})$

Diff w.r.t. x and use $\lim_{x\to 1}$

$\Rightarrow \frac{n-1}{2} = \frac{1}{1-\alpha} + \frac{1}{1-\alpha^2} + ... + \frac{1}{1-\alpha^{n-1}}$

24.

$$\int_{-2}^{2} f(x)dx = \int_{-2}^{0} (x - [x])dx + \int_{0}^{2} (x + |x|)dx = 5$$

25. The coefficient of x^6 in the given expression = coefficient of x^6 in

$(1 + {}^6C_1 x^6)(1 + {}^5C_1 x^5)(1 + {}^4C_1 x^4)(1 + {}^3C_1 x^3 + {}^3C_2 x^6)(1 + {}^2C_1 x^2 + {}^2C_2 x^4)(1 + x)$

= coefficient of x^6 in $(1 + 6x^6 + 5x^5 + 4x^4)(1 + 2x^2 + 3x^3 + x^4 + 6x^5 + 3x^6)(1 + x)$

= coefficient of x^6 in $(11x^5 + 17x^6)(1 + x)$

= 28

PHYSICS

26. $T = 2\pi\sqrt{\frac{l}{g}}$ or $g = 4\pi^2 \frac{l}{T^2}$

or $\log g = \log(4\pi^2) + \log l - 2\log T$. The maximum error in g is

$\frac{\Delta g}{g} = \frac{\Delta l}{l} + 2\frac{\Delta T}{T} = 2\% + 2 \times 3\% = 8\%$

27. Refer to Fig. A is the highest point on the trajectory

Average velocity $= \frac{displacement\ OA}{time\ taken}$

$= \frac{\sqrt{h_{max}^2 + \frac{R^2}{4}}}{\frac{1}{2}t_f}$

Where $h_{max} = \frac{u^2 \sin^2\theta}{2g}$

$$R = \frac{u^2 \sin^2 2\theta}{g}$$

and $t_f = \frac{2u \sin\theta}{g}$

Using these in Eq. (1) and simplifying we get average velocity $= \frac{u}{2}\left(1+3\cos^2\theta\right)^{1/2}$

So the correct choice is (d)

28. The forces acting on the balloon are its weight acting downwards and upthrust F acting upwards. Thus

$F - Mg = Ma$

When mass m is removed, we have

$F - (M-m)g = (M-m)a'$

Where a' is the new acceleration. Eliminating F from (i) and (ii) and simplifying we get

$a' = \frac{Ma + mg}{M-m}$

Which is choice

29. The velocity attained after a fall through a height h is given by

$v^2 = 2gh$

Thus $h \propto v^2$. The velocity after first rebound is ev. Therefore, the height attained after first rebound $= e^2 h$. Velocity after second rebound is $e^2 v$. Hence the height attained after second rebound is $e^4 h$. Thus the correct choice is

30. From the law of conservation of angular momentum we have

$I\omega = I'\omega'$

Here $I = MR^2 \; and \; I' = (M+2m)R^2$. Therefore

$$\frac{\omega'}{\omega} = \frac{I}{I'} = \frac{M}{(M+2m)}$$

Hence the correct choice

32. Using Bernoulli's theorem, we have

$$\frac{1}{2}\rho v^2 = p = \rho g h$$

or $h = \frac{v^2}{2g}$

Now $v = r\omega = r(2\pi v)$. Using this in (1) we get

$$h = \frac{2\pi^2 v^2 r^2}{g}$$

Given $v = 2\,rev.$ per second, $r = 0.05\,m, g = 10\,ms^{-2} \; and \; \pi^2 = 10$

Using these values, we get h= 0.02 m = 2 cm, which is choice

33. Let $\theta_1 \; and \; \theta_2$ be the temperatures at the two faces of the composite slab and let θ be the temperature at the common face of the slab. If l is the length of each slab and A the area of their face, then in the steady state, the rate of flow of heat across A=rate of flow of heat across B, ie

$$\frac{k_1 A(\theta_1 - \theta)}{l} = \frac{k_2 A(\theta - \theta_2)}{l}$$

or $k_1(\theta_1 - \theta) = k_2(\theta - \theta_2)$

Now $k_2 = 2k_1$. Therefore

$(\theta_1 - \theta) = 2(\theta - \theta_2)$

Also, $\theta_1 - \theta_2 = 12^0 C \; or \; \theta_2 - \theta_1 - 12$

Using (ii) in (i) we have

$(\theta_1 - \theta) = 2\{\theta - (\theta_1 - 12)\}$

or $3(\theta_1 - \theta) = 24$

or $\theta_1 - \theta = 8^0 C$

Hence the correct choice

34. The velocity of transverse waves is given by $v = \sqrt{T/m}$ where T= tension and m = mass per unit length of the wire. If r is the radius of the wire and ρ its density, then $m = \pi r^2 \rho$. Therefore,

$v = \frac{\sqrt{T}}{r\sqrt{\pi\rho}}$. *Thus* $v_A = \frac{\sqrt{T_A}}{r_A\sqrt{\pi\rho}}$

and $v_B = \frac{\sqrt{T_B}}{r_B\sqrt{\pi\rho}}$

Now $\frac{v_A}{v_B} = \sqrt{\frac{T_A}{T_B}}.\frac{r_B}{r_A}$

It is given that $r_A = 2\ r_B$ *and* $T_A = \frac{1}{2}T_B$. Hence

$\frac{v_A}{v_B} = \frac{1}{2\sqrt{2}}$. The correct choice is

35. Given $I = 1mA = 10^{-3}A,\ G = 20\Omega$ *and* $R = 4980\Omega$

Now $I = \frac{V}{R+G}$

or $V = I(R+G) = 10^{-3} \times (4980 + 20)$

$= 5.0V$

Hence the correct choice is

36. Given $v = \left(3\hat{i} + 2\hat{j}\right) ms^{-1}$ *and* $B = \left(2\hat{j} + 3\hat{k}\right)$ tesla.

Force experienced by the proton is

$F = q(v \times B) = q\left(3\hat{i} + 2\hat{j}\right) \times \left(2\hat{j} + 3\hat{k}\right)$

$= q\left(6\hat{i} \times \hat{j} + 9i \times \hat{k} + 4\hat{j} \times \hat{j} + 6\hat{j} \times \hat{k}\right)$

$= q\left(6\hat{k} - 9\hat{j} + 0 + 6\hat{i}\right)$

$= 3q\left(2\hat{i} - 3\hat{j} + 2\hat{k}\right)$ newton

$\therefore$ Acceleration $= \frac{F}{m} = \frac{3q}{m}\left(2\hat{i} - 3\hat{j} + 2\hat{k}\right)$

$= 3 \times \left(0.96 \times 10^8\right)\left(2\hat{i} - 3\hat{j} + 2\hat{k}\right)$

$= 2.88 \times 10^8 \left(2\hat{i} - 3\hat{j} + 2\hat{k}\right) ms^{-2}$

Hence the correct choice is

37. Let I_0 be the maximum current and I be the current at time t when the energy stored in inductor becomes 1/9 of the maximum energy, then

$\frac{1}{2}LI^2 = \frac{1}{9} \times \frac{1}{2}LI_0^2 \Rightarrow I = \frac{I_0}{3} \Rightarrow I_0 = 3I$

Time constant $\tau = \frac{L}{R} = \frac{100 \times 10^{-3}}{0.2} = \frac{1}{2}$ second

Now $I = I_0\left(1 - e^{-t/\tau}\right)$

$\Rightarrow\ I = 3I\left(1-e^{-t/\tau}\right)$

$\Rightarrow\ e^{-t/\tau} = \frac{2}{3}$

$\Rightarrow\ e^{t/\tau} = \frac{3}{2}$

$\Rightarrow\ \frac{t}{\tau} = \ln\left(\frac{3}{2}\right)$

$t = \tau \ln\left(\frac{3}{2}\right) = \frac{1}{2}\ln\left(\frac{3}{2}\right) \sec ond$

So the correct choice is

38. Impedance $z = \sqrt{R^2 + (\omega L)^2}$ $and\ I_0 = \frac{V_0}{Z}.As\ \omega$ is increased, Z increase. Hence current I_0 decreases. As a result the brightness of the bulb will decrease. So the correct choice is

39. $B_0 = \frac{E_0}{c} = \frac{6.0\times10^{-4}}{3\times10^8} = 2.0\times10^{-12}T$ which is choice is

40. $E = \frac{1}{2}mv^2 = hv_0 - W_0.Now\ E_1 = 2-1 = 1eV$ and

$E_2 = 10-1 = 9eV$. Therefore $E_1 / E_2 = 1/9 i.e$

$\frac{\frac{1}{2}mv_1^2}{\frac{1}{2}mv_2^2} = \frac{1}{9}$

or $\frac{v_1}{v_2} = \frac{1}{3}.$ Hence the correct choice is

41. The longest wavelengths in the two series are given by

$\frac{1}{\lambda_L} = R\left(\frac{1}{1^2} - \frac{1}{2^2}\right) = R.\frac{3}{4}$

and $\frac{1}{\lambda_B} = R\left(\frac{1}{2^2} - \frac{1}{3^2}\right) = R.\frac{5}{36}$

$\therefore\ \frac{\lambda_B}{\lambda_L} = \frac{3}{4}\times\frac{36}{5} = \frac{27}{5}\ or\ \lambda_L : \lambda_B = 5:27$

42. A pn junction diode is formed by joining a p-type semiconductor to an n-type semiconductor. Separately, the two semiconductors are electrically neutral. When they are joined, some electrons near the junction diffuse from the n-type into the p-type semiconductor, where they fill a few of the holes. Consequently, the n-type is left with a positive charge and the p-type acquires a net negative charge. Therefore a potential difference is established, with the n-type at a higher potential than the p-type. Hence an electric field is set up at the junction and it is directed from the n-type side to the p-type side. Thus the correct choice is

43. Gate P is OR gate and gate Q is AND gate. The output of gate Q is $X = 1$ only if D=1 and C=1 If $A = 1 and\ B = then\ D = 1$. So the only correct choice is

44. $\lambda_{\min} = \frac{\lambda}{4}$

45. $F = 6\pi\eta rv$

$F' = 6\pi\eta\left(\frac{r}{2}\right)\times\left(\frac{v}{2}\right) = \frac{1}{4}\times6\pi\eta rv = \frac{F}{4}$

So the correct choice is

46. sol: As $\frac{P_2}{P_1}=\frac{T_2}{T_1},\frac{\left(P+\frac{0.4}{100}P\right)}{P}=\frac{T+1}{T}$

or $1+\frac{0.4}{100}=1+\frac{1}{T}$

Whence, $T=250\,K$

47. $T_1=127^0C=127+273=400\,K,\ T_2=27^0C=300\,K, Q=800\,J$

The efficiency of the engine is given by

$\eta=\frac{W}{Q}=1-\frac{T_2}{T_1}$

$\therefore$ Work done $W=Q\left(1-\frac{T_2}{T_1}\right)$

$=800\times\left(1-\frac{300}{400}\right)=200\,J$

Hence the correct choice is

48. Potential difference between the plates before the slab is introduced is

$V=E\times d=200\times 0.05=10V$

The capacitance of the capacitor is given by

$C=\frac{\varepsilon_0 A}{d}=\frac{\varepsilon_0 A}{0.05}$ *or* $\varepsilon_0 A=0.05C$

When a slab of dielectric constant K and thickness t is introduced, the capacitance becomes

$C'=\frac{\varepsilon_0 A}{d-t\left(1-\frac{1}{K}\right)}=\frac{0.05C}{0.05-0.01\left(1-\frac{1}{4}\right)}=\frac{20C}{17}$

Now $Q-CV=C'V'$. Therefore

$V'=\frac{CV}{C'}=\frac{CV}{20C/17}=\frac{17V}{20}=\frac{17\times 10}{20}=8.5V$

49. Given $\beta=4.0\,mm$ *and* $\lambda=6000\overset{0}{A}$

We know that the fringe width is given by

$\beta=\frac{\lambda D}{d}$

for $\lambda'=4800\overset{0}{A},$ the fringe width will be

$\beta'=\frac{\lambda' D}{d}$

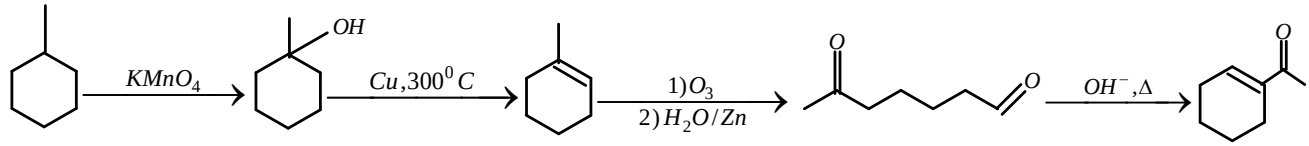
From (i) and (ii) we have

$\beta'=\beta\frac{\lambda'}{\lambda}=\frac{4.0mm\times 4800\overset{0}{A}}{6000\overset{0}{A}}=3.2\,mm$

50. Friction force $=\mu mg=0.2\times 5\times 10=10\,N$. Effective force F = applied force - frictional force = 25-10= 15 N. Kinetic energy = work done by force F in pulling the body through a distance $S\left(=10\,m\right)=15\times 10=150\,J,$ which is choice is

CHEMISTRY

51. NCERT – XI, VOL – II, P.NO: 277,278, 281, 287
52. NCERT – XI, VOL – II, P.NO: 313
53. NCERT – XII, VOL – I, P.NO: 220
54. NCERT – XII, VOL – I, P.NO:199
55. NCERT – XI, VOL – I, P.NO: 127
57. NCERT – XI, VOL – II, P.NO: 407
58.



60. NCERT – XII, VOL – II, P.NO: 291
61. NCERT – XI, VOL – I, P.NO: 183

$\Delta = -10 \times 75.3 - 6030 - 36.8 \times 10$

$= -753 - 6030 - 368 = -7151\,J$

62. NCERT – XI, VOL – I, P.NO: 36
63. NCERT – XII, VOL – II, P.NO: 399
64. NCERT – XI, VOL – II, P.NO: 350
68. NCERT – XI, VOL – I, P.NO: 228, Q.NO: 7.45

$\left[H^+\right]$ from H_2S is negligible when compared with, $\left[H^+\right]$ from HCl

$$K_{a1} = \frac{\left[H^+\right]\left[HS^-\right]}{\left[H_2S\right]} \Rightarrow \left[HS^-\right] = K_{a1}\frac{\left[H_2S\right]}{\left[H^+\right]} = 9.1\times10^{-18}\times\frac{10^{-1}}{10^{-3}}$$

$$= 9.1\times10^{-6}\,M$$

$$K_{a1}K_{a2} = \frac{\left[H^+\right]^2\left[S^{2-}\right]}{\left[H_2S\right]}\left[S^{2-}\right] = \frac{9.1\times10^{-8}\times1.2\times10^{-13}\times0.1}{\left(10^{-3}\right)^2}$$

$$= 10.92\times10^{-16}\,M$$

69. NCERT – XII, VOL – I, P.NO: 62

$P_{\text{Benzene}} = \frac{1}{5}\times50 = 10\,mm$ of Hg

$P_{\text{Toluene}} = \frac{4}{5}\times30 = 24\,mm$ of Hg

In vapour phase $x_{\text{Benzene}} = \frac{10}{34} = 0.29$

70. NCERT – XII, PART – I, P.NO: 130
71. NCERT – XI, VOL –I I, P.NO: 265
73. NCERT – XI, VOL – II, P.NO: 358

$\omega\%$ of $N = \frac{1.4\times10\times2}{0.5} = 56\%$

$56 = \frac{14\times3}{G.M.W\,(ing)}\times100 \Rightarrow G.M.W = 75g$

74. NCERT – XII, VOL – I, P.NO: 98

Average rate $= \frac{1}{2}\left[-\frac{\Delta\left[A\right]}{\Delta t}\right] = \frac{1}{2}\times\frac{6}{60} = 0.05$ mole $\left|lt\right|$ min

75. $$E_{MnO_4^-/Mn^{2+}} = E^0_{MnO_4^-/Mn^{2+}} - \frac{0.06}{5}\log\frac{\left[Mn^{2+}\right]}{\left[MnO_4^-\right]\left[H^+\right]^8}$$

$$= E^0_{MnO_4^-/Mn^{2+}} - 0.012\log\frac{\left[Mn^{2+}\right]}{\left[MnO_4^-\right]} - 0.096\,pH$$