MELUHA INTERNATIONAL SCHOOL
HYDERABAD

SR MPC | **JEE MAINS GT 3** | **Date: 05-07-2020**
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. Let distinct lines L_1, L_2 belong to family of lines $(x-2y-3)+\lambda(x+3y+2)=0$ and B_1 is angle bisector of L_1 and L_2 which passes through point A(2,3), then equation of other bisector of L_1 and L_2 is (λ is a parameter)

A) $x+4y+3=0$ B) $4x+y-3=0$ C) $x+y=5$ D) $2x-y=1$

02. $x_1, x_2 ..... x_{34}$ are numbers such that $x_i = x_{i+1} = 150 \ \forall \ i \in \{1,2,3,....9\}$ and $x_{i+1} - x_i + 2 = 0 \ \forall \ i \in \{10,11,12,....33\}$, then median of $x_1, x_2, ...x_{34}$ is

A) 150 B) 140 C) 135 D) 137

03. Let $f(x) = \int_0^x \left(t^2+2t+2\right)dt$ where x is set of real numbers satisfying the inequation $\log_{\sqrt{2}}\left(1+\sqrt{6x-x^2-8}\right) \geq 0$. If range of $f(x)$ is [a,b] then (a+b) is

A) 50 B) 56 C) 72 D) 32

04. A vertical pole of height h stands on a building of height H and the angle of elevation of top of the building from a point on the ground which is 5 units away from the foot of building is α, also the pole subtends an angle β at the same point on the ground. If $2\tan\beta\cot\alpha = 1$, then

A) $H^3+hH^2+25H-50h=0$ B) $H^3+hH^2-25H+50h=0$

C) $H^3+hH^2+50H-25h=0$ D) $H^3+hH^2+25H+50h=0$

05. If $\cot\frac{2x}{3}+\tan\frac{x}{3}=\cos ec\frac{kx}{3}$, then the value of $\tan^{-1}(\tan k)$ equals

A) 2 B) $2-\pi$ C) $\pi-2$ D) $2\pi-2$

06. Let $b_1, b_2, ..., b_n$ be a geometric sequence such that $b_1+b_2=1$ and $\sum_{k=1}^{\infty} b_k = 2$. Given that $b_2 < 0$, then the value of b_1 is

A) $2-\sqrt{2}$ B) $1+\sqrt{2}$ C) $2+\sqrt{2}$ D) $4+\sqrt{2}$

07. The statement $\left[(P \wedge q) \rightarrow p\right] \rightarrow (q \wedge \sim q)$ is

A) tautology B) contradiction

C) open sentence D) neither tautology nor contradiction

08. The line L given by $\frac{x-2}{2}=\frac{y-1}{b}=\frac{z+1}{c}$ passes through the point (1, 2, 3). Another line K is parallel to line L and has the equation $\frac{x+2}{a}=\frac{y-3}{2}=\frac{z+4}{d}$. Then the distance between line L and K is

A) $\frac{\sqrt{297}}{3}$ B) $\frac{\sqrt{243}}{3}$ C) $\frac{\sqrt{272}}{9}$ D) $\frac{\sqrt{291}}{9}$

09. Let $f(x)=\begin{cases} xe^{3x}, & x \leq 0 \\ -x^3+3x^2+x, & x>0 \end{cases}$ then complete values of x for which $f'(x)$ is increasing function is

A) $\left(-\frac{2}{3},2\right)$ B) (-1, 1) C) $\left(\frac{-2}{3},1\right)$ D) $\left(\frac{-2}{3},\frac{-1}{3}\right)\cup(0,1)$

10. 6 different letters of an alphabet are given. Words with four letters are formed from these given letters. Then the number of words which have atleast one letter repeated and no two same letters are together, is

A) 390 B) 360 C) 240 D) 150

11. If z, w are two complex numbers satisfying $\left|\frac{z-1}{z-4}\right|=2$ and $\left|\frac{w-4}{w-1}\right|=2$, then the value of $|z-w|_{\max}+|z-w|_{\min}$ is

A) 8 B) 9 C) 10 D) 11

12. P and Q are two points on the parabola $y^2=8x$ and S is its focus. PS and QS meet the curve again in T and R respectively. If PQ passes through a fixed point (-2,3), then TR also passes through a fixed point whose coordinates are

A) (2, -3) B) (3, -2) C) (-2, 3) D) (-3, 2)

13. Let $f(x)$ be a function continuous on [1,2] and differentiable on (1,2) satisfying $f(1)=2,\ f(2)=3$ and $f'(x)\geq 1\ \forall x\in(1,2)$ Define $g(x)=\int_1^x f(x)\,dt\ \forall x\in[1,2]$ then the greatest value of $g(x)$ on [1,2] is

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

14. The solution of the differential equation $\frac{dy}{dx}=\frac{y}{\left(y^2-x\right)}$ is

A) $y^3-xy=c$ B) $y^3-3xy=c$ C) $y^3+3xy=c$ D) $y^3+xy=c$

15. Consider $f(x)=[x]\left|x^3-2x^2-x+2\right|$ in $\left[-\frac{3}{2},\frac{9}{2}\right]$, then the number of points, where $f(x)$ is discontinuous is (where [.] denotes greatest integer function)

A) 6 B) 5 C) 4 D) 3

16. If $\sin^2 x+\sin x\cos x-6\cos^2 x=0$ and $-\frac{\pi}{2}<x<0$, then the value of $\cos 2x$, is

A) $-\frac{3}{5}$ B) $\frac{3}{5}$ C) $-\frac{4}{5}$ D) $\frac{4}{5}$

17. If for unit vectors $\hat{a},\hat{b}$ and non-zero $\vec{c}$, $\hat{a}\times\hat{b}+\hat{a}=\vec{c}$ and $\hat{b}.\vec{c}=0$, then volume of parallelopiped with conterminous edges $\hat{a},\hat{b}$ and $\vec{c}$ is (in cu.units)

A) 6 B) 4 C) 1 D) ½

18. Tangent to a non-linear curve $y=f(x)$, at any point P intersects x-axis and y-axis at A and B respectively. If normal to the curve $y=f(x)$ at P intersects y-axis at C such that AC=BC and $f(2)=3$ then the equation of the curve is

A) $xy=6$ B) $x^2+y^2=13$ C) $2y^2=9x$ D) $2y=3x$

19. Let α,β be the roots of the quadratic equation $ax^2+bx+c=0$. If a, b, c are in A.P. and $\alpha+\beta=15$, then $\alpha\beta$ equals

A) -21 B) -29 C) -31 D) -39

20. Let I be the set of positive integers. R is a relation on the set I given by

R={ $(a,b)\in I\times I$ *such that* $\log_2\left(\frac{a}{b}\right)$ is a non-negative integer}, then R is

A) neither symmetric not transitive but reflexive
B) reflexive, transitive but not symmetric
C) neither reflexive non transitive but symmetric
D) equivalence relation

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. A die is rolled four times. If the probability that product of first 3 outcomes is equal to fourth outcome is p, then $\left[\frac{1}{\sqrt{p}}\right]$ is equal to (where [.] denotes greatest integer function)

22. let $f(x)=[x]^{\{x\}}+\{x\}^{[x]}$ and $f'\left(\frac{5}{2}\right)=1+\sqrt{\lambda}\ln 2$, then value of λ is (where [.] and {.} represent greatest integer function and fractional part of function)

23. If a, b, c are real numbers greater than 1 and $x=\frac{1}{1+\log_{a^3b^2}\left(c^2/a\right)}+\frac{1}{1+\log_{b^3c^2}\left(a^2/b\right)}+\frac{1}{1+\log_{c^3a^2}\left(b^2/c\right)}$, then 2x is equal to

24. Let two circles C_1 and C_2 of radii 2 and 4 be tangent at point P and tangent to a common straight line (not passing through P) at points Q and R, then value of $PQ^2+QR^2+RP^2$ is

25. Let n be the coefficient of x^6 in $\left(1-x^3\right)^5\left(1+x^2\right)^4\left(1+x^4\right)^8$, when expanded in powers of 'x'. The value of $\left[\frac{n}{19}\right]$ is (where [.] denotes greatest integer function)

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. A particle of mass 'm' is moving with speed $2v$ and collides with a mass '2m' moving with speed v in the same direction. After collision, the first mass is stopped completely while the second one splits into two particles each of mass m, which move at an angle 45^o with respect to the original direction. The speed of each of the moving particle will be

A) $\sqrt{2}v$ B) $\frac{v}{\sqrt{2}}$ C) $\frac{v}{\left(2\sqrt{2}\right)}$ D) $2\sqrt{2}v$

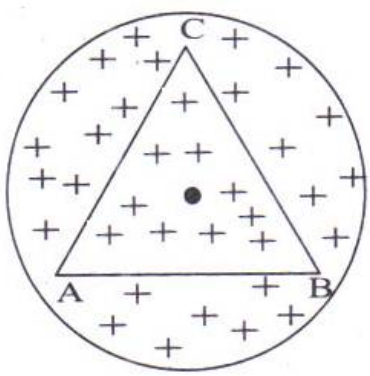
27. Diameter of the objective lens of a telescope is 250 cm. For light of wavelength 600 nm, coming from
a distant object, the limit of resolution of the telescope is close to
A) $1.5\times10^{-7}rad$ B) $2\times10^{-7}rad$ C) $2.9\times10^{-7}rad$ D) $4.5\times10^{-7}rad$

28. An observer moves towards a stationary source of sound with a velocity one-fifth of

velocity of sound. The percentage increase in apparent frequency is

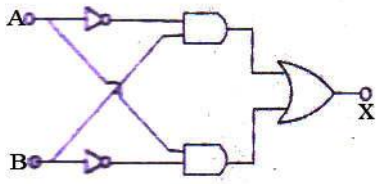
A) 5% B) 20% C) 0 D) 0.5%

29. A triangular wire frame having each side equal to 2m is placed in a region of time varying magnetic field having $dB/dt = \sqrt{3}T/s$. The magnetic field is perpendicular to the plane of the triangle as shown in figure. The base of the triangle AB has a resistance 1Ω while the other two sides have resistance 2Ω each. The magnitude of potential difference between the points A and B will be



A) 0.4 V B) 0.6 V C) 1.2 V D) None

30. With reference to the given logic circuit which of the following output is possible for the given inputs A and B is



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

31. Three capacitors of capacities $8\mu F, 12\mu F, 16\mu F,$ are connected in series. If the potential on $12\mu F$ is 60 V, the potential difference between the ends of the combinations is

A) 390 V B) 195 V C) 210 V D) 120 V

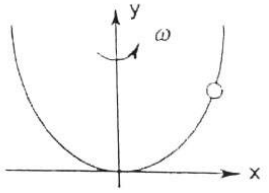
32. Equal amount of water and ice are mixed. The ice is at temperature $-10^{\circ}C$ and water is at $40^{\circ}C$. Assuming no heat exchange between system and surrounding, the fraction of ice melted is $L_f = 80\,cal/g, S_{ice} = 0.5\,cal/g^0C, S_{water} = 1\,cal/g^0C$

A) 7/16 B) 5/6 C) 5/16 D) 9/16

33. A point source of heat of power P is placed at the centre of a spherical shell of mean radius R, the material of the shell has thermal conductivity K. If the temperature difference between inner and outer surface of the shell is not to exceed T, then the thickness of the shell should not be less than

A) $\frac{2\pi R^2 KT}{P}$ B) $\frac{\pi R^2 KT}{4P}$ C) $\frac{\pi R^2 KT}{P}$ D) $\frac{4\pi R^2 KT}{P}$

34. A curved smooth wire as shown in diagram is revolving with constant angular velocity about y-axis, a bead in this wire remain in equilibrium at every position then shape of wire:



A) May be straight line B) Parabolic

C) $y\alpha x^4$ D) Not possible for any shape

35. Two pendulums of same amplitude but time period 3s and 7s start oscillating simultaneously from two opposite extreme positions. After how much time they will be in phase

A) 21/8 S B) 21/4 S C) 21/2 S D) 64/8 S

36. Two vertical parallel rectangular glass plates are partially submerged in water. The separation between the plates is d=0.1 mm and the width of each plate is $\ell = 10cm$. Assuming that the water between the plates does not reach the upper edges of the plates and the contact angle is $\theta = 0^o$. The surface tension of water is $T = 7 \times 10^{-2}\ N/m$ and the density of water is $\rho = 10^3\ kg/m^3$. Then choose the correct option. $\left(g = 10\,m/s^2, atmospheric\ pressure = 10^5\ Pa\right)$

A) The water rises up to height h=16 cm between the plates.

B) The water rises up to height h=28 cm between the plates

C) The force of mutual attraction between the plates is 4.9 N

D) The force of mutual attraction between the plates is 9.8 N

37. Two strings of equal radii but mass per unit length $\mu_1 = 0.9kg/m$ and $\mu_2 = 0.1kg/m$ are join together and stretched between two rigid supports as shown in the figure. A sinusoidal wave pulse of amplitude 3 cm is incident from end "P" and transmission and reflection both take place at the joint "O". There is no loss of power during propagation of wave then choose the correct option

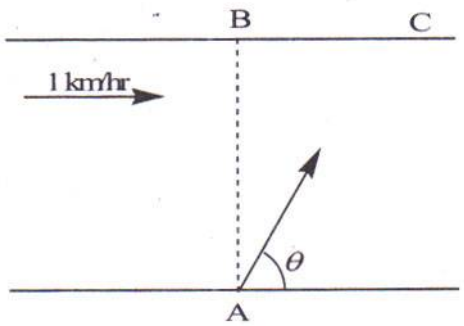
A) The amplitude of the reflected wave is 1.6 cm

B) The amplitude of the transmitted wave is 4.9 cm

C) The percentage of incident power transmitted to the second string is 60%

D) The percentage of incident power reflected to the first string is 25%

38. A river is flowing with a speed of 1 km/hr. A swimmer wants to go to point 'C' starting from 'A'. He swims with a speed of 5 km/hr, at an angle θ w.r.t the river. If AB=BC=400m. Then the value of θ is



A) 37° B) 30° C) 53° D) 45°

39. A body falls freely towards the earth from a height 2R, above the surface of the earth, where initially it was at rest. If R is the radius of the earth then its velocity on reaching the surface of the earth is:

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

40. If a dip circle is kept in vertical plane at angle 30° to the magnetic meridian and in this plane the dip needle makes an angle of 60° with the horizontal. The true value of dip is:

A) $\tan^{-1}\left(\frac{2}{3}\right)$ B) $\tan^{-1}\left(\frac{3}{2}\right)$ C) $\tan^{-1}(3)$ D) $\tan^{-1}(2)$

41. The displacement y of a particle executing simple harmonic motion is given by $y = 4\cos^2\left(\frac{t}{2}\right)\sin(1000t)$. This expression may be considered to be a result of the superposition of how many simple harmonic motions?

A) 2 B) 3 C) 4 D) 5

42. A light beam travelling in +ve x-direction is described by $E_y = 300\sin\left(\omega t - \frac{\omega x}{c}\right)V/m.$ An electron is constrained to move along y direction with a speed of $2\times10^7\, ms^{-1}$. The maximum magnetic force (in Newton) on the electron is

A) 3.2×10^{-18} B) 5.1×10^{-16} C) 6.5×10^{-11} D) 7.8×10^{-12}

43. In young's double-slit experiment, the slit separation is 0.5 mm and the screen is 0.5 m away from the slit. For a monochromatic light of wavelength 500 nm, the distance of 3rd maximum from the 2nd minima on the other side of central maxima is

A) 2.75 mm B) 2.5 mm C) 22.5 mm D) 2.25 mm

44. The shortest wavelength of the Lyman series of hydrogen is equal to the shortest wavelength of the Balmer series of a hydrogen-like atom of atomic number Z. The value of Z is

A) 4 B) 2 C) 3 D) 6

45. A sample of paramagnetic salt contains 3.0×10^{24} atomic dipoles, each of dipole moment $2.5\times10^{-23}\, J/T$. The sample is placed under a homogeneous magnetic field of 0.32T and cooled to a temperature of 4.2K. The degree of magnetic saturation achieved is equal to 20%. The total dipole moment of the sample for a magnetic field of 0.96T and a temperature of 2.8K?
(assume Curie's law)

A) 7.96 J/T B) 67.5 J/T C) 33.75 J/T D) 23.7 J/T

SECTION-II
(Numerical Value Answer Type)

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46. A cubical box contains an ideal gas with molecular radius $\frac{1}{\sqrt{\pi}}A^0$ *at* $27^\circ C,$ the pressure inside the box is $\sqrt{2}\times10^{-3}\, Pa,$ then find the mean free path (in m)? (Take Boltzman constant $k = 1.38\times10^{-23}$ SI units)

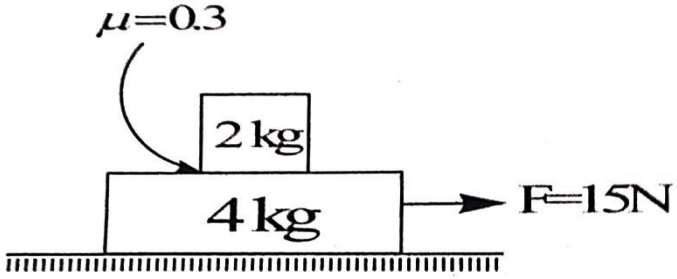
47. The binding energies per nucleon for deuteron $\left({}_1H^2\right)$ and helium $\left({}_2He^4\right)$ are 1.1 MeV and 7.0 MeV, respectively. Calculate the energy released when two deuterons fuse to form a helium nucleus $\left({}_2He^4\right)$ in MeV.

48. A 27 mW laser beam has a cross-sectional area of 10 mm^2. The magnitude of the maximum electric field in this electromagnetic wave is given by_____ kV/m [Given permittivity of space $\varepsilon_0 = 9\times10^{-12}\, SI$ units, Speed of light $c = 3\times10^8\, m/s$]

49. When a d.c. voltage of 200V is applied to a coil of self inductance $\frac{2\sqrt{3}}{\pi}H$, a current of 1A flows through it. But by replacing d.c. source with a.c Source fo 200V, the current in the coil is reduced to 0.5A. The frequency of a.c. supply in Hz is

50. Find the friction force between the blocks in the figure. No friction between 4kg block and ground.

$(g = 10\,ms^{-2})$



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. Metal with low boiling point containing impurities of high boiling point can be purified by
(A) Zone refining (B) Vapour phase refining
(C) Distillation (D) Liquation

52. Number of P-H bonds in phosphinic acid and number of P-OH bonds in phosphonic acid respectively are
(A) 1,1 (B) 1,2 (C) 2,1 (D) 2,2

53. Correct IUPAC name of $\left[Ag(NH_3)_2\right]\left[Ag(CN)_2\right]$ is
(A) Diammineargentate (I) dicyanidoargentate (I)
(B) Diammineargentate (I) dicyanido silver (I)
(C) Diammine silver (I) dicyanidoargentate (I)
(D) Diammine silver (I) dicyanito silver (I)

54. Calculate the energy of photon involved during a transition from n=5 state to n=2 state in the hydrogen atom.
(A) $-4.58\times10^{-18}\,J$ (B) $-4.58\times10^{-19}\,J$ (C) $-4.58\times10^{-20}\,J$ (D) $-4.58\times10^{-17}\,J$

55. Which of the following oxide is amphoteric in nature
(A) N_2O (B) BaO (C) CO_2 (D) As_2O_3

56. Bond order and magnetic nature of O_2^- are respectively
(A) 1.5, diamagnetic (B) 2.5, paramagnetic (C) 2.5, diamagnetic (D) 1.5, paramagnetic

57. Elements of which of the following groups of periodic table do not form hydrides
(A) 6 (B) 7,8 & 9 (C) 13 & 14 (D) 15,16 & 17

58. The average composition of portland cement is

(A) $CaO(40-50\%), SiO_2(30-40\%), Al_2O_3(5-10\%) MgO(2-3\%), Fe(1-2\%) SO_3(1-2\%)$

(B) $CaO(50-60\%), SiO_2(20-25\%), Al_2O_3(5-10\%), MgO(2-3\%), Fe_2O_3(1-2\%), SO_3(1-2\%)$

(C) $CaO(40-50\%), SiO_2(20-25\%), Al_2O_3(2-3\%), MgO(5-10\%), Fe_2O_3 \& SO_3(1-2\%)$

(D) $CaO(50-60\%), SiO_2(30-40\%), Al_2O_3(2-3\%), Mg(5-10\%), Fe_2O_3 \& SO_3(1-2\%)$

59. Borax is not used

(A) in the manufacture of heat resistant glasses

(B) as a flux for soldering metal

(C) as a styptic to stop bleeding

(D) as constituent of medicinal soaps

60. A gaseous mixture contains 70.6 gm dioxygen and 167.5 gm neon . If pressure of the mixture of gases in the cylinder is 25 bar. The partial pressure of dioxygen in the mixture is

(A) 4.25 bar (B) 5.25 bar (C) 6.25 bar (D) 4.35 bar

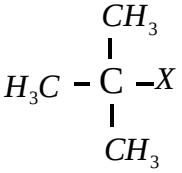
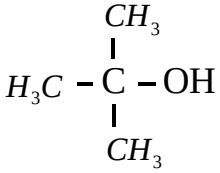
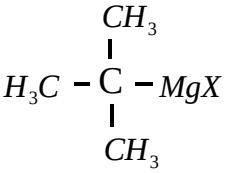
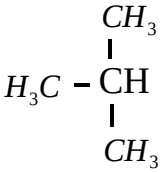
61. Calculate the enthalpy change on freezing of 1.0 mol of water taken at 10.0^0C to ice at -10.0^0C $\Delta H_{fus} = 6.03 KJmol^{-1}$ at 0^0C.

$C_P(H_2O)_{(l)} = 75.3 J.mol^{-1}K^{-1}$ $C_P = (H_2O)_{(S)} = 36.8 J.mol^{-1}K^{-1}$.

(A) $-71.51 KJmol^{-1}$ (B) $-71.51 Jmol^{-1}$ (C) $-7.151 KJmol^{-1}$ (D) $-7.151.J.mol^{-1}$

62. Identify the 'B' in the following reaction

As one of the product

(A)  (B)  (C)  (D) 

63. What are the hydrolysis products of Lactose?

(A) D-Galactose, D-Mannose (B) D-Galactose, D-Galactose

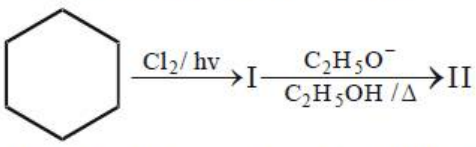
(C) D-Galactose, D-Glucose (D) D-Glucose, D-Glucose

64. Bakelite is not used

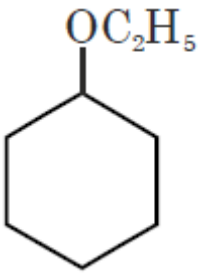
(A) For making combs (B) for making phonograph records

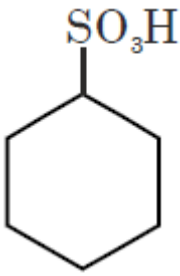
(C) for making handles of various utensils (D) As electrical conductor

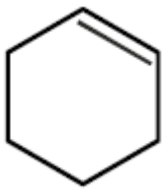
Consider the given sequence of reactions

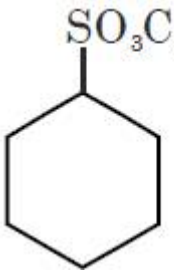


65. The final major product (II) is

A) 

B) 

C) 

D) 

66. Arrange the following in increasing order of their basic strength

a) $C_2H_5NH_2$ b) $C_6H_5NH_2$ c) NH_3 d) $C_6H_5CH_2NH_2$

e) $(C_2H_5)_2\,NH$

(A) $b < c < d < e < a$ (B) $b < c < a < d < e$

(C) $b < c < d < a < e$ (D) $b < c < a < e < d$

67. Identify the 'E' in the following reaction

$$CH_3COOH \xrightarrow{NaOH} A \xrightarrow{Electrolysis} B \xrightarrow[(h\upsilon)]{Cl_2(1mole)} C \xrightarrow{alcKOH} D \xrightarrow{Br_2} E$$

(A) $C_2H_3Br_3$ (B) C_2H_4 (C) $\begin{matrix} CH_2Br \\ | \\ CH_2Br \end{matrix}$ (D) C_2H_5Br

68. The substance which can be used as adsorbent in thin layer chromatography is

(A) Na_2O (B) Al_2O_3 (C) MgO (D) BaO

69. Mark the incorrect choice of ill effects caused by the pollutant

(A) Lead - kidney,liver- reproductive system (B) Fluoride-Bones & teeth

(C) Nitrate-Blue baby's syndrome (D) Sulphur dioxide- laxative effect.

70. The initial concentration of N_2O_5 in the following first order reaction, $N_2O_{5(g)} \rightarrow 2NO_{2(g)} + \frac{1}{2}O_{2(g)}$ was $1.24\times10^{-2}\,molL^{-1}$ at $318K$. The concentration of N_2O_5 after 60 minutes was $0.20\times10^{-2}\,molL^{-1}$. Calculate the rate constant of the reaction at $318K$.(given $\log(62) = 1.79$)

(A) $0.304\,\text{min}^{-1}$ (B) $0.0304\,\text{min}^{-1}$ (C) $0.0304\,\text{sec}^{-1}$ (D) $0.304\,\text{sec}^{-1}$

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 Ostwald's process for the manufacture of nitric acid the first step involves the oxidation of NH_3 gas by oxygen gas to give nitric oxide gas and steam. What is the maximum weight of nitric oxide in grams that can be obtained, starting only with 10.00 gm of NH_3 and 20.00gm of oxygen ?

72. 45gm of ethylene glycol $(C_2H_6O_2)$ is mixed with 600 gm of water. Calculate the freezing point of the solution in kelvin (Freezing.pt of H_2O is 273.15K) $\left[K_f = 1.86k.kg.mol^{-1}\right]$

73. How many number of sp^2 carbon atoms present in Ranitidine ?

74. Calculate the pH of a 0.1M ammonia solution. The dissociation constant of ammonia $K_b = 1.77 \times 10^{-5}$
$(\log 1.77 = 0.248)$

75. Determine $\Delta G^0 \left(inkJ / mol \right)$ for the button cell used in the watches. The cell reaction is
$Zn_{(s)} + Ag_2O_{(s)} + H_2O_{(l)} \rightarrow Zn^{+2}_{(aq)} + 2Ag_{(s)} + 2OH^-{}_{(aq)}$ $E^0{}_{(Ag^+/Ag)} = +0.80V, E^0{}_{\left(Zn^{+2}/Zn\right)} = -0.76V$

MELUHA INTERNATIONAL SCHOOL HYDERABAD

SR MPC | **JEE MAINS GT 3** | **Date: 05-07-2020**

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

KEY SHEET

MATHS

1) **A**	2) **C**	3) **B**	4) **A**	5) **B**	6) **C**	7) **B**	8) **B**	9) **C**	10) **A**
11) **C**	12) **C**	13) **C**	14) **B**	15) **D**	16) **C**	17) **C**	18) **A**	19) **C**	20) **B**
21) **7**	22) **2**	23) **5**	24) **64**	25) **2**					

PHYSICS

26) **D**	27) **C**	28) **B**	29) **A**	30) **D**	31) **B**	32) **A**	33) **D**	34) **B**	35) **A**
36) **D**	37) **D**	38) **C**	39) **A**	40) **B**	41) **B**	42) **A**	43) **D**	44) **B**	45) **B**
46) **51.75**	47) **23.6**	48) **1.41**	49) **50**	50) **5**					

CHEMISTRY

51) **C**	52) **D**	53) **C**	54) **B**	55) **D**	56) **D**	57) **B**	58) **B**	59) **C**	60) **B**
61) **C**	62) **D**	63) **C**	64) **D**	65) **C**	66) **C**	67) **C**	68) **B**	69) **D**	70) **B**
71) **15**	72) **270.9**	73) **6**	74) **11.12**	75) **- 301.08**					

HINTS & SOLUTIONS

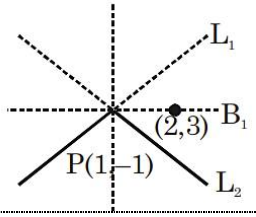
MATHEMATICS

01 Fixed point of family is (1,–1)

$\Rightarrow$ other bisector is

$$y+1=-\frac{1}{4}(x-1)$$

$$x + 4y + 3 = 0$$



02 34 terms so mean of 17^{th} and 18^{th} term is median

$x_{10+n} = 148 + (n-1)(-2) = x_{17} = 136, x_{18} = 134$

hence median = 135

03

$$\log_2\left(1+\sqrt{6x-x^2-8}\right)\geq 0$$

$$\Rightarrow 1+\sqrt{6x-x^2-8}\geq 1\Rightarrow 6x-x^2-8\geq 0$$

$$\Rightarrow x^2-6x+8\leq 0$$

$$\Rightarrow (x-2)(x-4)\leq 0$$

$$\Rightarrow 2\leq x\leq 4.$$

Now $f'(x) = x^2 + 2x + 2 > 0 \ \forall \ x \in R$

$\Rightarrow$ f(x) is strictly increasing in [2, 4]

$$f(x)=\frac{x^3}{3}+x^2+2x$$

$$a=f(2)=\frac{8}{3}+4+4=\frac{32}{3}$$

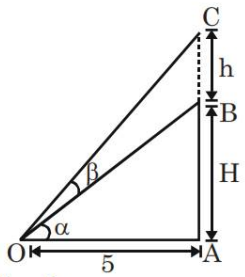
$$b=f(4)=\frac{64}{3}+16+8=\frac{136}{3}$$

$$a+b=56$$

04

$\because \tan\alpha=\frac{H}{5}$ and $2\tan\beta=\tan\alpha\Rightarrow\tan\beta=\frac{H}{10}$

also, $\tan(\alpha+\beta)=\frac{h+H}{5}$



$$\Rightarrow \frac{\frac{H}{5}+\frac{H}{10}}{1-\frac{H}{5}\cdot\frac{H}{10}}=\frac{h+H}{5}$$

$\Rightarrow H^3 + hH^2 + 25H - 50H = 0$

05

$$\text{LHS}: \frac{\cos\frac{x}{3}}{\sin\frac{2x}{3}\cos\frac{x}{3}}=\operatorname{cosec}\frac{2x}{3}\Rightarrow k=2$$

$\tan^{-1}(\tan 2) = 2 - \pi.$

06

$$b_1+b_2=1\Rightarrow b_1(1+r)=1\Rightarrow b_1=\frac{1}{1+r}$$

$$\sum_{k=1}^{\infty}b_k=\frac{1}{(1+r)(1-r)}=\frac{1}{1-r^2}=2\Rightarrow r=\frac{-\sqrt{2}}{2}$$

$$b_1=\frac{1}{1+r}=\frac{1}{1-\frac{\sqrt{2}}{2}}=\left(2+\sqrt{2}\right)$$

07

p	q	$p\wedge q$	$(p\wedge q)\to p$	$\sim q$	$q\wedge\sim q$	$[(p\wedge q)\to p]\to(q\wedge\sim q)$
T	T	T	T	F	F	F
T	F	F	T	T	F	F
F	T	F	T	F	F	F
F	F	F	T	T	F	F

Given compound statement is always false. So it is a contradiction.

08

(1,2,3) lie on

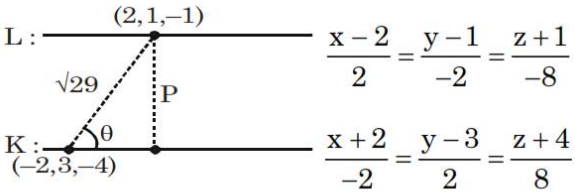
$$L \quad \therefore -\frac{1}{2}=\frac{1}{b}=\frac{4}{c}$$

$$\therefore b=-2,\ c=-8$$

Line L and k are parallel

$$\frac{2}{a}=\frac{b}{2}=\frac{c}{d}\Rightarrow\frac{2}{a}=-1=-\frac{8}{d}$$

$$\therefore a=-2, d=8$$



$$L:\ \frac{x-2}{2}=\frac{y-1}{-2}=\frac{z+1}{-8}$$

$$K:\ \frac{x+2}{-2}=\frac{y-3}{2}=\frac{z+4}{8}$$

$$\cos\theta=\left|\frac{8+4-24}{\sqrt{72}\sqrt{29}}\right|=\frac{\sqrt{2}}{\sqrt{29}}$$

$$\therefore \sin\theta=\frac{\sqrt{27}}{\sqrt{29}}$$

09

$$f'(x)=\begin{cases}e^{3x}(1+3x), & x\le 0\\ 1+6x-3x^2, & x>0\end{cases}$$

$\therefore$ $f'(x)$ is continuous at $x=0$

$$f''(x)=\begin{cases}e^{3x}(6+9x), & x\le 0\\ 6-6x, & x>0\end{cases}$$

for $\uparrow$ fn : $6+9x>0$ or $6-6x>0$

$$x>-\frac{6}{9} \qquad x<1$$

$$\therefore \quad x\in\left(-\frac{6}{9},1\right)$$

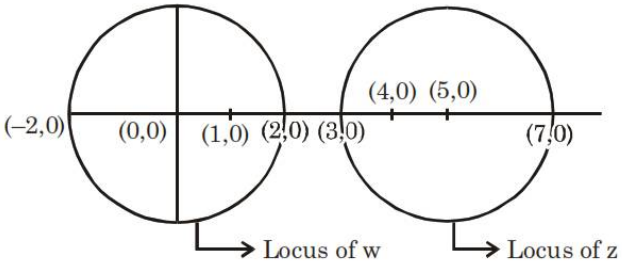
10

2 diff. 2 same : ${}^6C_1.{}^5C_2.2!.{}^3C_2=360$

2 same 2 same : ${}^6C_2.2=30$

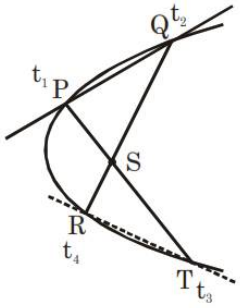
Total 390

11 $\left|\frac{z-1}{z-4}\right| = 2$ and $\left|\frac{w-4}{w-1}\right| = 2$



$\therefore \quad |z-w|_{max} = 9, \quad |z-w|_{min} = 1$

12



$t_1t_3 = t_2t_4 = -1$

PQ : $y(t_1 + t_2) = 2x + 4t_1t_2$

$3(t_1 + t_2) = -4 + 4t_1t_2$ .....(1)

TR : $y(t_3 + t_4) = 2x + 4t_3t_4$ .....(2)

from (1) $-3\left(\frac{1}{t_3} + \frac{1}{t_4}\right) = -4 + \frac{4}{t_3t_4}$

$\Rightarrow \quad 3(t_3 + t_4) = 4t_3t_4 - 4$ .....(3)

using (2) and (3) we can say that TR passes through (–2, 3)

13 Using LMVT on $f(x)$ for intervals [1,x] and [x,2]

$$\frac{f(x)-f(1)}{x-1} = f'(c_1) \Rightarrow \frac{f(x)-2}{x-1} \geq 1$$

$$\Rightarrow f(x) \geq x+1$$

and $\frac{f(2)-f(x)}{2-x} = f'(c_2) \Rightarrow \frac{3-f(x)}{2-x} \geq 1$

$\Rightarrow f(x) \leq x + 1$

$\therefore f(x) = x + 1$

$\therefore$ greatest valueof $g(x) = g(2)$

$$= \int_1^2 (x+1)dx = \frac{5}{2}$$

14 $\frac{dx}{dy} = y - \frac{x}{y} \Rightarrow \frac{dx}{dy} + \frac{1}{y}.x = y$

$\therefore$ solution is $x.y = \int y^2 dy + c \Rightarrow x.y = \frac{y^3}{3} + c$

$\Rightarrow y^3 - 3xy = c$

15 $f(x)$ is discontinuous at x = 0,3,4.

16 $\tan^2 x + \tan x - 6 = 0 \Rightarrow \tan x = -3$

$$\cos 2x = \frac{1-\tan^2 x}{1+\tan^2 x} = \frac{1-9}{1+9} = -\frac{4}{5}$$

17 $\hat{a} \times \hat{b} + \hat{a} = \vec{c}$ ...(i)

$\hat{a} \times \hat{b} = \vec{c} - \hat{a}$

Dot with $\vec{c} \Rightarrow v = \left[\hat{a}\ \hat{b}\ \vec{c}\right] = \vec{c}^2 - \hat{a}.\hat{c}$ ...(ii)

for (i) : dot with $\hat{b}$

$\Rightarrow 0 + \hat{a}.\hat{b} = \hat{b}.\vec{c} = 0 \Rightarrow \hat{a}.\hat{b} = 0$

$\Rightarrow \hat{a} \perp \hat{b}$ ...(iii)

for (i) : squaring

$\left(\hat{a} \times \hat{b}\right)^2 + 1 + 2(0) = \vec{c}^2$ (by (iii))

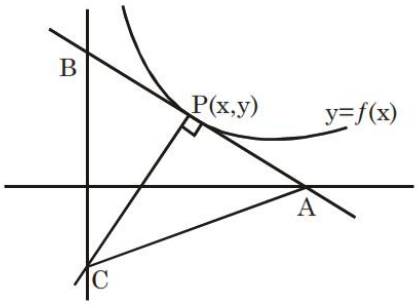
$\Rightarrow \vec{c}^2 = 1 + 1 = 2$ ...(iv)

for (i) : dot with $\hat{a} : \hat{a}^2 = \vec{c}.\hat{a}$ ...(v)

put (iv) & (v) in (ii) :

v = 2 – 1 = 1

18



$\because$ AC = BC

$\therefore$ P is mid point of AB

$\Rightarrow$ A(2x.0) & B(0, 2y)

$$\Rightarrow \frac{dy}{dx} = -\frac{y}{x}$$

$\Rightarrow$ xy = c $\Rightarrow$ xy = 6

19 Given $2b = a + c \Rightarrow \frac{2b}{a} = 1 + \frac{c}{a}$ ...(i)

$$\alpha + \beta = -\frac{b}{a} = 15 \Rightarrow \frac{b}{a} = -15 \Rightarrow \frac{c}{a} = -31$$

$\alpha\beta = -31$.

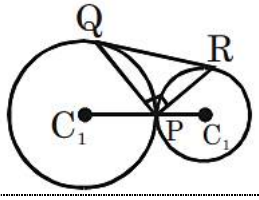
20 a R b $\Leftrightarrow$ $a = 2^k.a$ it is true for k = 0

$\therefore$ reflexive

$(2,1) \in R$ but $(1,2) \notin R \Rightarrow$ it is not symmetric

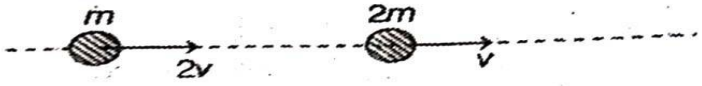
if $a = 2^{k_1} b$ and $b = 2^{k_2} c$, then $a = 2^{k_1 + k_2} c$

$\Rightarrow$ it is transistive.

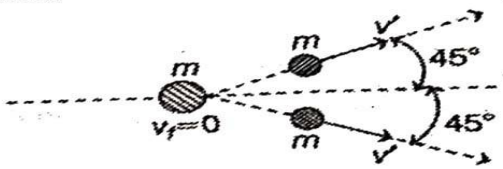
21	$p=\left(\frac{1}{6}\right)^3\frac{1}{6}+3\left(\frac{1}{6}\right)^3\frac{1}{6}+3\left(\frac{1}{6}\right)^3\frac{1}{6}+6\left(\frac{1}{6}\right)^3\frac{1}{6}+3\left(\frac{1}{6}\right)^3\frac{1}{6}+9\left(\frac{1}{6}\right)^3\frac{1}{6}$ $=\frac{25}{6^4}$
22	in $x \in (2,3)$ $f(x) = 2^{x-2} + (x-2)^2$ $f'(x) = 2^{x-2}\ell n2 + 2(x-2)$ $f'\left(\frac{5}{2}\right)=\sqrt{2}\ell n2+1 \Rightarrow \lambda = 2$
23	---
24	$PQ^2 + PR^2 + QR^2 = 2QR^2$ $= 2((C_1C_2)^2 - (r_1 - r_2)^2)$ $= 2[36 - 4] = 64$ 
25	$(1-x^3)^5(1+x^2)^4(1+x^4)^8$ $\left[{}^5C_0 - {}^5C_1x^3 + {}^5C_2x^6 .....\right]\left[{}^4C_0 + {}^4C_1x^2 + {}^4C_2x^4 + {}^4C_3x^6 + {}^4C_4x^8\right]$ $\left[{}^8C_0 + {}^8C_1x^4 + ...\right]$ Coefficient of x^6 $= {}^5C_0\,{}^4C_3\,{}^8C_0 + {}^5C_0\,{}^4C_1\,{}^8C_1 + {}^5C_2\,{}^4C_0\,{}^8C_0$ = 4+32+10 = 46

PHYSICS

26. According to the question, Initial condition,



Final condition



AS we know that, in collision linear momentum is conserved in both x and y directions separately

So,

$(P_x)_{initial} = (P_x)_{final}$

$m(2v) + 2m(v) = 0 + mv'\cos 45^0 + mv'\cos 45^0$

$\Rightarrow 4mv = \frac{2m}{\sqrt{2}}v' \Rightarrow v' = 2\sqrt{2}\,v$

So, each particle will move with a speed of $2\sqrt{2}\,v$

27. Limit of resolution $= \frac{1.22\lambda}{d} = \frac{1.22\times 600\times 10^{-9}}{250\times 10^{-2}} = 2.9\times 10^{-7}\,rad$

28. *Using* $v = v_0\left(\frac{\upsilon_s + \upsilon_0}{\upsilon_s}\right)$, *we get* percentage change

$$= \left(\frac{\frac{6}{5}\vartheta_0 - \vartheta_0}{\vartheta_0} \right) = \frac{100}{5} = 20\%$$

29. EMF induced in the triangular loop is given as loop is given as $e = \frac{d\phi}{dt}$

$\Rightarrow e = A\frac{dB}{dt} \Rightarrow e = \sqrt{3} \times \sqrt{3} = 3V$

By symmetry in each rod emf will be IV. The current in the triangular loop is given as

$i = \frac{e}{R} = \frac{3}{5} = 0.6A$

Voltage drop between A and B $= 0.6 \times 1 = 0.6V$

So voltage across AB is given as

$V_{AB} = 1 - 0.6 = 0.4V$

30. The output of both AND gates will be zero. So, OR gate does not respond.

31. The charge on $12\mu F$ is

$q = (12\mu)(60V) = 720\mu C$

This will be common on all of them.

So net potential difference

$= \frac{q}{C_{eff}} = \frac{720\mu C}{\left(\frac{48}{13}\mu\right)} \Rightarrow \frac{(720\mu C)}{48\mu} \times 13 \Rightarrow 195V$

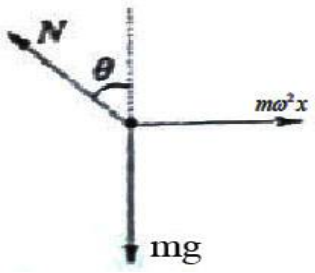
32. Use principle of method of mixture

33. $P = K4x^2 \frac{dT}{dx}, \frac{4\pi K}{P}\int_{T_1}^{T_2} dT = \int_{R_1}^{R_2} \frac{dx}{x^2}$

by integration, we get option

34. $\tan\theta = \frac{\omega^2 x}{g}$

$\frac{dy}{dx} = \frac{\omega^2 x}{g} \Rightarrow y = \frac{\omega^2 x^2}{g}$



35. $y_1 = a\cos w_1 t \ \ and \ \ y_2 = a\cos(\pi + \omega_2 t)$

for same phase $w_1 t = \pi + w_2 t$

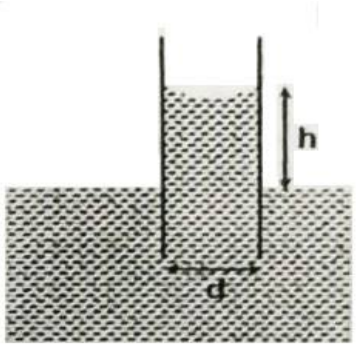
$t = \frac{\pi}{w_1 - w_2} = \frac{21}{8}\text{sec}$

36. $2T\ell = \rho d\ell hg$

$h = \frac{2T}{\rho g d} = \frac{2 \times 7 \times 10^{-2}}{10^3 \times 10 \times 1 \times 10^{-4}} = 14cm$

Force of mutual attraction between the plates is

$$F=\int_0^h \rho g y \ell dy=\frac{\rho g \ell h^2}{2}=\frac{10^3\times 10\times 0.10\times\left(14\times 10^{-2}\right)^2}{2}=9.8\,N$$



37. $A_r=\left(\frac{V_2-V_1}{V_1+V_2}\right)A_i=\frac{\sqrt{\mu_1}-\sqrt{\mu_2}}{\sqrt{\mu_1}+\sqrt{\mu_2}}=1.5cm$

$A_t=\left(\frac{2V_2}{V_2+V_1}\right)A_i=4.5cm$

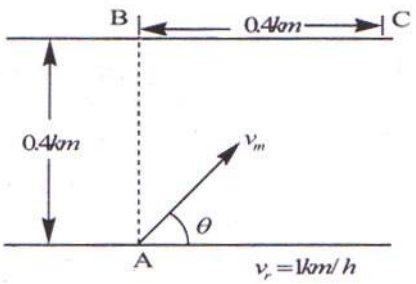
Now, $\frac{P_r}{P_i}=\left(\frac{A_r}{A_i}\right)^2=\left(\frac{1.5}{3}\right)^2=\frac{1}{4}$

$=\frac{1}{4}\times 100=25$

$=100-25=75$

38. $v_m\sin\theta=\frac{0.4}{t}$ .....(1)

$v_m\cos\theta+v_r=\frac{0.4}{t}$ ..... (2)



From (1) *and* (2)

$v_m\sin\theta=v_m\cos\theta+v_r$

$5\sin\theta=5\cos\theta+1$

$5\sqrt{1-\cos^2\theta}=5\cos\theta+1$

$25\left(1-\cos^2\theta\right)=25\cos^2\theta+1+10\cos\theta$

$50\cos^2\theta+10\cos\theta-24$

$\cos\theta=\frac{3}{5},-\frac{4}{5}$

$\theta=53^\circ$

39. Initially energy of the body = $-\frac{GMm}{\left(R+2R\right)}$

Final energy of the body = $-\frac{GMm}{R}+\frac{1}{2}mv^2$

Where m is the mass of the body and M is the mass of the earth. By conservation of energy

$-\frac{GMm}{3R}=-\frac{GMm}{R}+\frac{1}{2}mv^2$

$\frac{1}{2}mv^2=\frac{2GMm}{3R}$

$v^2=\frac{4GM}{3R}$

$$v=\sqrt{\frac{4GMR}{3R^2}}$$

$$v=\sqrt{\frac{4GMR}{3R^2}}=\sqrt{\frac{4}{3}gR}$$

40. The apparent dip angle is related to the angle between magnetic meridian ant the vertical plane in which it is measured is given as

$$\tan 60=\frac{V}{H\cos 30}\Rightarrow\sqrt{3}=\frac{V}{H\cos 30}$$

$$\Rightarrow\tan\delta=\frac{V}{H}=\sqrt{3}\times\cos 30=\sqrt{3}\times\left(\sqrt{3}/2\right)$$

$$\delta=\tan^{-1}\left(3/2\right)$$

41. As the expression is a third order expression in degree of sinusoidal function hence it is a superposition of three simple harmonic motions

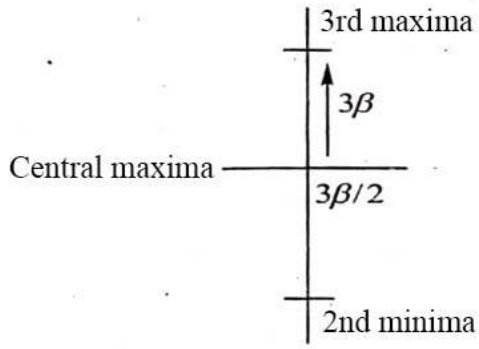
42. $B_0=\frac{E_0}{C}=\frac{300}{3\text{x}10^8}=10^{-6}T$

$F_{\max}=qvB_0=1.6\text{x }10^{-19}\text{x }2\text{ x}10^7\text{ x}10^{-6}=3.2\text{x}10^{-18}N$

43. d=0.5mm and D=0.5m

Separation = $3\beta+1.5\beta=4.5\beta$

$$=4.5\times\frac{\lambda D}{d}=2.25mm$$



44. $R\left[\frac{1}{1^2}-\frac{1}{\infty^2}\right]=RZ^2\left[\frac{1}{2^2}-\frac{1}{\infty^2}\right]\ or\ Z=2$

45.

$$\Rightarrow\frac{\chi_1}{\chi_2}=\frac{M_1}{M_2}X\frac{B_2}{B_1}=\frac{T_2}{T_1}\Rightarrow M_2=\frac{B_2T_1M_1}{B_1T_2}$$

$$M_1=\frac{20}{100}\left(3X10^{24}X\,2.5X10^{-23}\right)=15\frac{J}{T}$$

46. $\lambda=\frac{1}{\sqrt{2}\,\pi d^2n}\ \ and\ P=\frac{1}{3}mnv_{rms}^2=\frac{1}{3}mn\text{x}\frac{3\text{RT}}{M}=\frac{mnRT}{mN_A}=nKT$

$$\Rightarrow n=\frac{P}{KT}\ where\ n=number\ of\ molecules\ \ perunit\ \ volume$$

47. The equation of fusion is represented as ${}_1H^2+{}_1H^2\rightarrow{}_2He^4+Energy$

The binding energy per nucleon of deuteron is 1.1 MeV. Therefore, the net initial binding energy $=4\times1.1=4.4MeV$. The binding energy per nucleon of ${}_2He^4$ *is* 7.0 *MeV*. Therefore the net final binding energy is $=4\times7.0=28.0MeV$. Hence, energy released $=28.0MeV-4.4MeV=23.6MeV$

48. Intensity of EM wave is given by

$$I = \frac{Power}{Area} = \frac{1}{2} = \varepsilon_0 E_0^2 C$$

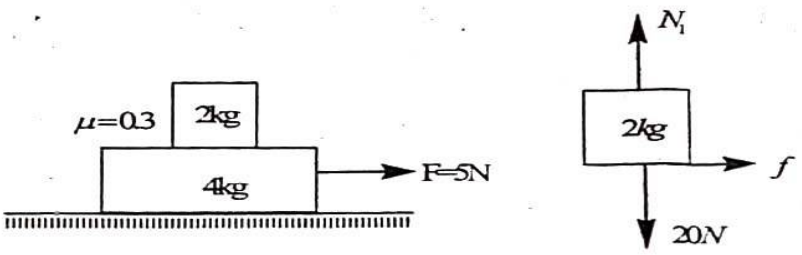
$$= \frac{27\times10^{-3}}{10\times10^{-6}} = \frac{1}{2}\times9\times10^{-12}\times E^2\times3\times10^8$$

$$E = \sqrt{2}\times10^3 kV/m = 1.4 kV/m$$

49. For coil R = 200/1 = 200 Ω

With a.c. $i = \frac{200}{\sqrt{R^2 + x_L^2}}$

50.



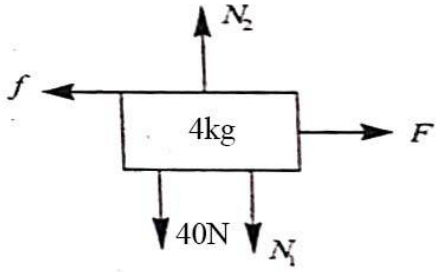
Limiting friction between blocks is $f_{max} = \mu N_1 = 0.3\times20 = 6N$

To start sliding between blocks we use

$$f_{max} = 2\left(\frac{F}{6}\right) = 6 \Rightarrow F = 18N$$

$\Rightarrow$ at F = 15N both blocks move together at $a = \frac{F}{6} = \frac{5}{2} m/s^2$

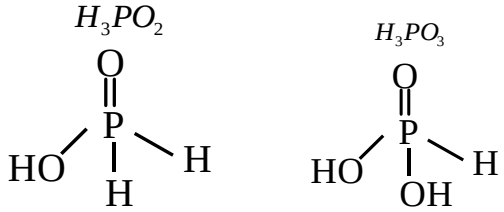
$$\Rightarrow f = 2a = 2\times\frac{5}{2} = 5N$$



CHEMISTRY

51. Conceptual

52.



53. Conceptual

54. $\Delta E = -2.18\times10^{-18} J\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$$= -2.18\times10^{-18}\left[\frac{1}{2^2} - \frac{1}{5^2}\right]$$

$$= -2.18\times10^{-18}\left[\frac{25-4}{100}\right]$$

$$= -2.18\times10^{-18}\left[\frac{21}{100}\right]$$

$$= 2.18\times10^{-20}\times21 = -4.578\times10^{-19}\ \text{J}$$

55. Conceptual

56. $B.O = \frac{1}{2}\left\{B.e^{-} - A.B.e^{-}\right\}$

$$= \frac{1}{2}\{10-7\} = \frac{3}{2} = 1.5$$

Paramagnetic.

57. Conceptual

58. Conceptual

59.

60. $n_{O_2} = \frac{70.6}{32} = 2.21mol \qquad n_{Ne} = \frac{167.5}{20} = 8.375mol$

M.F of $O_2 = \frac{2.21}{2.21+8.375} = \frac{2.21}{10.585} = 0.21$

P.P of $O_2 = M.F\times25$

$= 5.25bar$

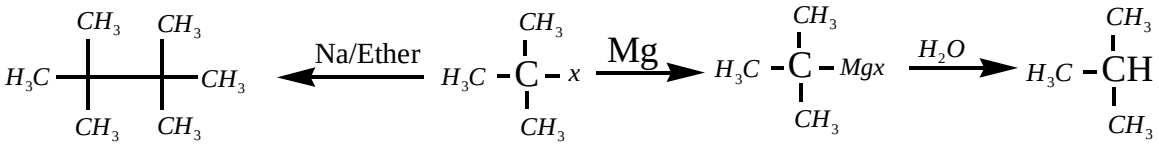
61. $\Delta H = C_P\left[H_2O(l)\right]\Delta T + \Delta H_{freezing} + C_P\left[H_2O_{(S)}\right]\Delta T$

$= 753(0-10) + \left(-6.03\times10^3\right) + 36.8(-10-0)$

$= -753 - 6030 - 368$

$= -7151J.mol^{-1} = -7.151K.J.mol^{-1}$

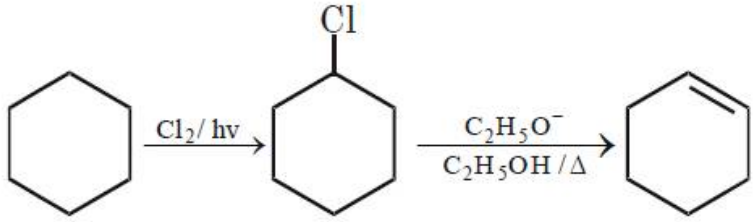
62.



63. $Latose + H_2O \rightarrow \beta - D - Galactose + \beta - D - Glu\cos e$

64. Conceptual

65.



66. Conceptual

67.

$$CH_3COOH \xrightarrow{NaOH} CH_3COONa \xrightarrow{Electrolysis} C_2H_6 \xrightarrow[(h\vartheta)]{Cl_2(1mole)} C_2H_5Cl \xrightarrow{alcKOH} C_2H_4 \xrightarrow{Br_2} C_2H_4Br_2$$

68. Conceptual

69. Conceptual

70. $k = \frac{2.303}{t}.\log\frac{a}{a-x}$

$$= \frac{2.303}{(60-0)} . \log \frac{1.24\times10^{-2}}{0.20\times10^{-2}}$$

$$= \frac{2.303}{60} \log \frac{124}{20}$$

$$\frac{2.303}{60} . \log 6.2$$

$$= \frac{2.303}{60}(0.79)$$

$$= 0.03032 \min^{-1}$$

71. $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O + energy$

$4\times17 \rightarrow 5\times32$ $\qquad \frac{5\times32\times10}{4\times17} = 23.52$

$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O + Energy$

$5\times32 \rightarrow 4\times30$

$20 \rightarrow ?$

$$\frac{4\times30\times20}{5\times32} = 15gm$$

72. $\Delta T_f = ikf \times m$

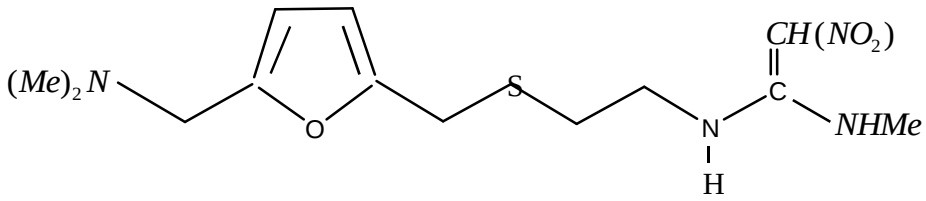
$$= 1\times1.86\times\frac{45}{62}\times\frac{1000}{600}$$

$$= 2.25$$

$\Delta T_f = T_f^0 - T_f^s$

$T_f^s = T_f^0 - \Delta T_f = 273.15 - 2.25 = 270.90K$

73.



74. $P^{OH} = \frac{1}{2}(P^{Kb} - \log C)$

$$= \frac{1}{2}(5 - \log 1.77 + 1)$$

$$= \frac{5.752}{2} = 2.876$$

$P^H = 14 - 2.876 = 11.124$

75. $E^0 = E^0_{cathode} - E^0_{anode}$

$= 0.80 - (-0.76)$

$= 1.56$

$\Delta G^0 = -nFE^0 cell$

$= -2\times96500\times1.56$

$= -301.08kJ$