JEE MAIN MODEL GRAND TEST (2017)

PHYSICS

31. The dimensional method can be used to obtain dependence of

1) the height to which liquid rises in the capillary tube

2) speed of sound in elastic medium and modulus of elasticity

3) height to which a body, projected upwards with a certain velocity, will rise in time t

4) the decrease in energy of a damped oscillator on time t

32. In the determination of the value of g by simple pendulum, the time period (T) is measured by a stop watch having a least count of 0.5 s and the length of the thread is measured with a metre scale having a least count of 1 mm. The diameter of the bob is measured with vernier callipers having least count 0.01 cm. The following observations were recorded.
1) Length of the thread, L = 153.2 cm 2) Diameter of the bob, D = 3.54 cm
3) Time of 10 oscillations, t = 25.0 s
The acceleration due to gravity at that place is ….. (consider proper significant figures)

1) $978 \pm 4.06\%$ cm s^{-2} 2) $978 \pm 2.06\%$ cm s^{-2}

3) $981 \pm 1.02\%$ cm s^{-2} 4) $981 \pm 4.06\%$ cm s^{-2}

33. A particle is projected from a point (0, 1) on y-axis (assume +y direction vertically upward) aiming towards a point (4, 9). It fell on ground along x – axis in 1 s. Take g = 10 m s^{-2} and all coordinates in metre. Find the x-coordinate where it fell. ?

1) (3,0) 2) (4,0) 3) (2,0) 4) $(2\sqrt{5}, 0)$

34. If the gravitational force had varied as $r^{-\frac{5}{2}}$ instead of r^{-2}, the potential energy of a particle at a distance r from the centre of the earth would be proportional to ….

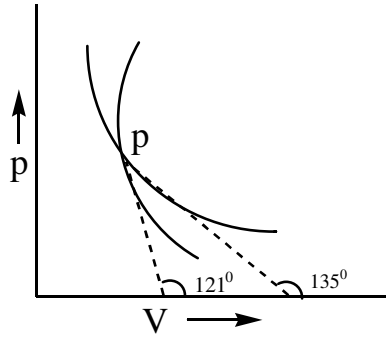
1) r^{-1} 2) r^{-2} 3) $r^{-\frac{3}{2}}$ 4) $r^{-\frac{5}{2}}$

35. There are some passengers in a stationary railway compartment. The centre of mass of compartment itself (without passengers) is c_1, while centre of mass of compartment plus the passengers is c_2. If the passengers move inside the compartment [The surface on which compartment is at rest is smooth]
1) Both c_1 and c_2 will move w.r.t. ground
2) Neither c_1 nor c_2 will move w.r.t. ground
3) c_1 will move but c_2 will remain stationary w.r.t. ground
4) c_2 will move but c_1 will remain stationary w.r.t. ground

36. A small ball rolls off the top landing staircase. It strikes the midpoint of the first step and then at the midpoint of second step. The steps are smooth, and identical in height and width. The coefficient of restitution between the ball and the first step is ….

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

37. A gas undergoes an adiabatic process and an isothermal process. The two processes are plotted on a p – V diagram.



The resulting curves intersect at a point P. Tangents are drawn to the two curves at P. These make angles of 135° and 121° with the positive V – axis. The gas is likely to be ……

$(\tan 59° \approx 1.66)$

1) monoatomic 2) diatomic
3) triatomic 4) a mixture of monoatomic and diatomic gases

38. In YDSE, how many maxima can be obtained on a screen, if two slits are separated by a distance of $\frac{5\lambda}{2}$ where λ is the wavelength of light?

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

39. A ray of light travelling parallel to the principal axis of a concave mirror of radius of curvature R strikes the mirror at an angle of incidence θ. At what distance from the pole will the reflected ray of light meet the principal axis?

1) $\frac{R}{2}$ 2) $\frac{R}{2}\sec\theta$ 3) $\frac{R}{2}(1-\cos\theta)$ 4) $R\left(1-\frac{\sec\theta}{2}\right)$

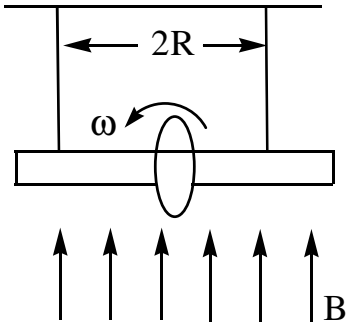
40. The electric field part of an electromagnetic wave in a medium is represented by $E_x = E_z = 0$ and $E_y = 2.5\frac{N}{C}\cos\left[\{2\pi\, x10^{-6}\, rad\, m^{-1}\}t - \{\pi\, x10^{-2}\, rad\, s^{-1}\}x\right]$. The wave is …..

1) moving along x-direction with frequency 10^6 Hz and wavelength 100 m
2) moving along x-direction with frequency 10^6 Hz and wavelength 200 m
3) moving along y-direction with frequency 10^6 Hz and wavelength 200 m
4) moving along y-direction with frequency $2\pi\times10^6$ Hz and wavelength 200 m

41. A solid conducting sphere having a charge Q is surrounded by an uncharged concentric conducting hollow spherical shell. Let the potential difference between the surface of solid sphere and that of the outer surface of the hollow shell is V. If the shell is now given a charge of -3Q, the new potential difference between the same two surfaces would be …

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

42. A ring of radius R having uniformly distributed charge Q is mounted on a rod suspended by two identical light strings, as shown in the figure.



The tension in the strings in equilibrium is T_0. Now a vertical magnetic field is switched on and the ring is rotated at constant angular velocity ω. The maximum value ω that the ring can acquire if the strings can withstand a maximum tension of $\frac{3T_0}{2}$ is …..

1) $\frac{4T_0}{R^2BQ}$ 2) $\frac{T_0}{RBQ}$ 3) $\frac{2T_0}{RBQ}$ 4) $\frac{2T_0}{R^2BQ}$

43. A radioactive sample with half-life T emits α-particles. Its total activity is A_i at some time and A_f at a later time. The number of α-particles emitted by the sample between these two points in time is ….

1) $\left(A_i - A_f\right)$ 2) $\frac{T}{\ln 2}\left(A_i - A_f\right)$

3) $\frac{\ln 2}{T}\left(A_i - A_f\right)$ 4) $\frac{T}{\ln 2}\left(\frac{1}{A_f} - \frac{1}{A_i}\right)$

44. Assume that He^+ obeys the Bohr Theory exactly. Which of the following transitions in He will not give rise to a spectral line which has the same wavelength as some spectral line in the hydrogen spectrum?

1) n = 4 to n = 2 2) n = 6 to n = 2

3) n = 8 to n = 4 4) n = 6 to n = 3

45. A uniform ball of radius r = 4 cm rolls without slipping down from the top of a sphere of radius R = 13 cm. The angular velocity of the ball at the moment it breaks off the sphere is ….. (The initial velocity of the ball is negligible and $g = 10\,m\,s^{-2}$)

1) 50 rad s^{-1} 2) $\frac{5}{\sqrt{2}}$ rad s^{-1} 3) 5 rad s^{-1} 4) 25 rad s^{-1}

46. If the focal length of objective lens is increased then magnifying power of …..

1) microscope and telescope both will increase

2) microscope will decrease and telescope will increase

3) microscope and telescope both will decrease

4) microscope will increase and telescope will decrease

47. A closed rectangular tank 1.2 m high, 2.4 m long and 1.5 m wide is two-third full of gasoline of relative density 0.8. The acceleration which may be imparted to the tank so that the bottom front end of the tank is just exposed is …..

1) 2.55 ms^{-2} 2) 4.30 ms^{-2} 3) 7.35 ms^{-2} 4) 13.0 ms^{-2}

48. Soap water drips from a capillary. When the drop breaks away, the diameter of its neck is D. the mass of the drop is m. the surface tension of soapy water is ….

1) $\frac{mg}{\pi D}$ 2) $\frac{mg}{2\pi D}$ 3) $\frac{2mg}{\pi D}$ 4) $\frac{\pi D}{mg}$

49. The velocity of sound in air is measured by using a resonance tube method. The observations made during the experiment are as follows.

Frequency of the tuning fork (Hz)	Resonance	Position of water level at resonance (cm)		Room temperature $\left(t^0c\right)$
		Water falling	Water rising	
480	First	16.8	17.0	27
	Second	52.2	52.4	

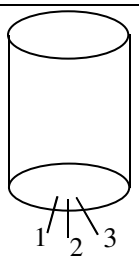
The velocity of sound at $0\,°C$ and end correction for the tube respectively are …… ms^{-1}, …… cm.

1) 324, 0.8 2) 340, 0.8 3) 330, 0.75 4) 324, 0.75

50. In an optics experiment, with the position of the object fixed, a student varies the position of a convex lens of focal length f and for each position the screen is adjusted to get a clear image of the object. A graph between the object distance (u) and image distance (v), from the lens, is plotted using the same scale for the two axes. A straight line passing through the origin and making an angle of $45°$ with the x – axis meets the experimental curve at P. the coordinates of P will be …

1) (f, f) 2) (4f, 4f) 3) (2f, 2f) 4) $\left(\frac{f}{2},\frac{f}{2}\right)$

51. Consider the transistor shown in the figure. Its terminals are marked as 1, 2 and 3. Using multimeter a student tries to identify the base of transistor, he proceeds as follows.



Experiment I: He touches the common lead of the multimeter to 2, then on touching other lead of multimeter to 1, he has not get any beep (indication of conduction) but when connected to 3, he gets a beep.

Experiment II: He connects the common lead of multimeter to 1 and other lead to 2 and 3, turn by turn and then he gets a beep of both the connections.

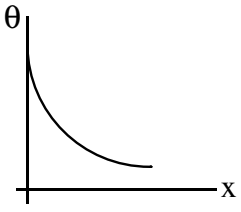
From this we conclude that …..

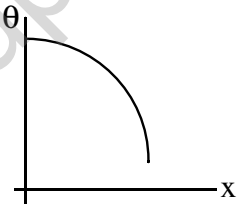
1) 1 is base 2) 2 is base 3) 3 is base 4) data insufficient

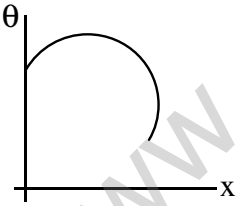
52. An ideal gas is expanding such that PT^2 = constant. The coefficient of volume expansion of the gas is …

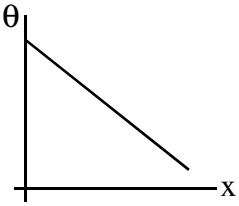
1) $\frac{1}{T}$ 2) $\frac{2}{T}$ 3) $\frac{3}{T}$ 4) $\frac{4}{T}$

53. A long metallic bar is carrying heat from one of its ends to the other end under steady state. The variation of temperature θ along the length x of the bar from its hot end is best described by which of the following figures?

1) 

2) 

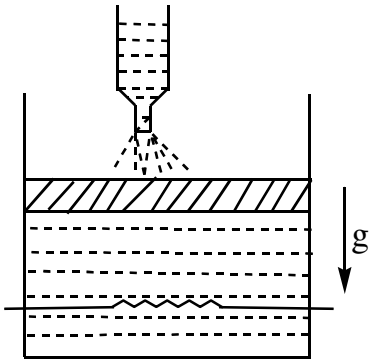
3) 

4) 

54. Three travelling waves in the same direction are superimposed. The equations of the waves are $y_1 = A_0 \sin(kx - \omega t)$, $y_2 = 3\sqrt{2}A_0 \sin(kx - \omega t + \phi)$ and $y_3 = 4A_0 \cos(kx - \omega t)$. If $0 \le \phi \le \frac{\pi}{2}$ and the phase difference between resultant wave and first wave is $\frac{\pi}{4}$, then ϕ is?

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

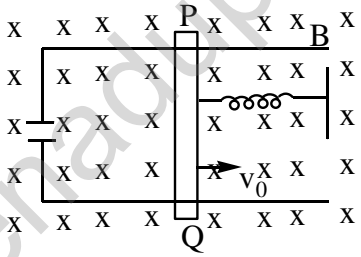
55. A resistance coil of resistance $7.5\ \Omega$, connected to an external battery, is placed inside the thermally insulating smooth piston and containing an ideal monoatomic gas.



A current of 2 A is passed through the coil such that it is generating heat at a constant rate inside the cylinder. Volume of the chamber of the cylinder is $5\,m^3$ and area of the piston is $0.1\,m^2$. The mass rate of dropping sand on the piston such that the piston always remains stationary will be … (Assuming that the sand is dropped very swiftly and g = $10\,m\,s^{-2}$)

1) $0.01\,kg\,s^{-1}$ 2) $0.02\,kg\,s^{-1}$ 3) $0.03\,kg\,s^{-1}$ 4) $0.04\,kg\,s^{-1}$

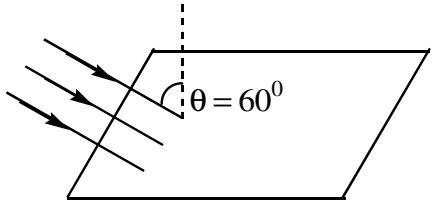
56. A conducting rod *PQ* of mass *m* and of length *l* is placed on two long parallel (smooth and conducting) rails connected to a capacitor as shown below. The rod *PQ* is connected to a non-conducting spring of spring constant k, which is initially in relaxed state. The entire arrangement is placed in a magnetic field perpendicular to the plane of the figure



Neglect the resistance of rails and rod. Now the rod is imparted a velocity v_0 towards right. Then acceleration of the rod as a function of its displacement x is given by ….

1) $\frac{kx}{m}$ 2) $\frac{kx}{m+B^2l^2C}$ 3) $\frac{kx}{m-B^2l^2C}$ 4) $\frac{kx}{B^2l^2C}$

57. A square loop of wire of side 5 cm is lying on a horizontal table. An electromagnet above and to one side of the loop is turned on, causing a uniform magnetic field downwards at an angle of $60°$ to the vertical as shown in the figure.



The magnetic induction is 0.50 T. The average induced emf in the loop, if the field increases from zero to its final value in 0.2 s is ….

1) 5.4 mV 2) 3.12 mV 3) zero 4) 0.25 mV

58. A light bulb and an open coil inductor are connected in series to an Ac source through a key. The switch is closed and after sometime, an iron rod is inserted into the interior of the inductor. The glow of the light bulb ….

1) Increases 2) Decreases

3) unchanged 4) data insufficient

59. The collector plate in an experiment on photoelectric effect is kept vertically above the emitter plate. Light source is put on and a saturation photoelectric current is recorded. An electric filed is switched on which has a vertically downward direction, then …

1) The photo electric current will increase

2) The kinetic energy of electrons will decrease

3) The threshold wavelength increase

4) The stopping potential will increase

60. The main scale of vernier calipers reads in millimeter and its vernier is divided into 10 divisions which coincide with 9 divisions of the main scale. When the two jaws of the instrument touch each other, the seventh division of the vernier scale coincides with a scale division and zero of the vernier lies to the right of the zero of the main scale. Furthermore, when a cylinder is tightly placed along its length between the two jaws, the zero of the vernier scale lies slightly to the left of 3.2 cm and the fourth vernier division coincides with a scale division. The measured length of the cylinder is …..

1) 3.20 cm 2) 3.10 cm 3) 3.14 cm 4) 3.07 cm

CHEMISTRY

61. Hydrogen peroxide in aqueous solution decomposes on warming to give oxygen according to the equation

$$\underset{(aq)}{2H_2O_2} \rightarrow \underset{(l)}{2H_2O} + \underset{(g)}{O_2}$$

Under these conditions where 1 mol of a gas occupies $24\,dm^3$, 100 ml of XM solutions of H_2O_2 produces $3\,dm^3$ of O_2 thus X is

1) 2.5 2) 0.5 3) 0.25 4) 1

62. For the reactions : $M^{+x} + MO_4^- \rightarrow MO_3^- + M^{2+} + \frac{1}{2}O_2$ of 1 mole of MO_4^- oxidises 1.67 mole of M^{+x} to MO_3^- then the value of 'x' in the reaction is

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

63. Which of the following statement is incorrect

1) wave mechanical model treated electron only as particle

2) s- orbital is non-directional

3) maximum number of electrons in n^{th} orbit $= 2n^2$

4) In the same shell the energies of sub-shells is, s $> p > d > f$

64. A graph is plotted between $\log V$ and $\log T$ for 2 moles of gas at constant pressure of 0.0821 atm V & T are in litre & K respectively which of the following are correct

I. The curve is straight line with Slope '-1' II. The curve Straight line with slope '+1'

III. The Intercept on Y-axis is equal to 2 IV. The Intercept on Y-axis is equal to 0.3010

1) I,II 2) III, IV 3) II, IV 4) I,III

65. The molar enthalpies of combustions of $C_2H_{2(g)}$, $C_{(graphite)}$ & $H_{2(g)}$ are -1300, -394 & $-286\ kJ\ mol^{-1}$ respectively. The standard enthalpy of formation of $C_2H_{2(g)}$ is

1) $-226\,kJ\,mol^{-1}$ 2) $-626\,kJ\,mol^{-1}$ 3) $+226\,kJ\,mol^{-1}$ 4) $+626\,kJ\,mol^{-1}$

66. The pressure necessary to obtain 50% dissociation of PCl_5 at $250^0 C$ is numerically ____ times of k_p

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

67. In a tetragonal crystal

1) $a = b = c\ \&\ \alpha = \beta = 90^0; \gamma \neq 90^0$ 2) $a = b \neq c\ \&\ \alpha = \beta = \gamma = 90^0$

3) $a \neq b \neq c; \alpha = \beta = \gamma = 90^0$ 4) $a = b \neq c; \alpha = \beta = 90^0\ \gamma = 120^0$

68. $\wedge_m^0$ is for $NaCl$, HCl and CH_3COONa are 126.4, 425.9 and $91\,Scm^2mol^{-1}$ respectively $\wedge_m^0$ of CH_3COOH is $\left(S\,cm^2\,mol^{-1}\right)$

1) 461.3 2) 390.5 3) 208.5 4) 642.9

69. Which of the following is not a first order reaction

1) Inversion of sucrose in the presence of an acid

2) Acid catalyzed hydrolysis of ethyl acetate

3) Hydrolysis of tertiary butyl halide with alkali

4) oxidation of I^- can by $S_2O_8^{2-}$ ion

70. The migration of colloidal particles towards opposite electrodes is

1) Electro Osmosis 2) dialysis

3) Electrification 4) Electro phoresis

71. Which of the following is incorrect regarding Henry's law constant (K_H)

1) K_H increases with increase of temperature for a given gas

2) K_H is same for all gases Irrespective of their nature

3) At given temperature, lower the K_H value has higher solubility

4) K_H depends upon Nature of gas

72. The correct order of first ionisation enthalphies of group 13 elements

1) $B > Tl > Ga > Al > In$ 2) $B > Al > In > Ga > Tl$

3) $B > Al > In > Tl > Ga$ 4) $B > Tl > In > Tl > Ga$

73. The incorrect statement in the following

1) Dipolemoment of $NH_3 > NF_3$

2) Li_2^+ is less stable than Li_2

3) $O_2^+ \& O_2^-$ both are paramagnetic speries

4) Formal charge of central oxygen in ozone is -1

74. The correct set of statements regarding $BeCl_2$ is

a) $BeCl_2$ is covalent and is soluble in organic solvents

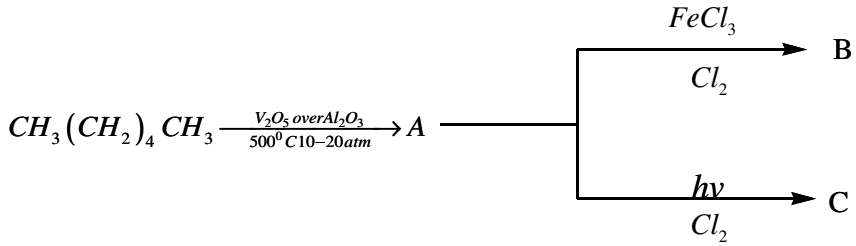
b) In solid state it consists of Be^{2+} & Cl^- ions is CCP arrangement

c) At higher temperature of order 1200k it exists as linear monomer

d) In vapour phase at low temperature (Below 1200k) it exists as dimer

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

75.



The incorrect statement

1) B is chloro Benzene

2) C is Gammaxene

3) B is Addition Product while C is substitution product

4) B is aromatic which C is non aromatic

76.

$$\begin{matrix} CH_3 \\ \\ CH_3 \end{matrix}\!\!\diagdown\!\!\diagup C = CH_2 + O_3 \rightarrow X \xrightarrow{Zn+H_2O} Y + Z$$

Y is a ketone and Z is an aldehyde Then the correct set of statements regarding this

a) 'Y' undergoes aldol condensation in the presence of dil $NaOH$

b) 'Z' in the presence of Conc. $NaOH$ undergo disproportionation

c) 'Z' with Grignard reagent followed by hydrolysis gives secondary alcohol

d) Y is more reactive than Z towards Nucleophilic addition

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

77. In nitration of Benzene with nitration mixture the Incorrect statement is

1) Nitronium ion is electrophile 2) HNO_3 acts as Lewis acid

3) HNO_3 acts as Bronsted base 4) H_2SO_4 acts as Bronsted acid

78. The following is not a common component of photochemical smog .

1) O_3 2) $CH_2 = CH - CHO$

3) $CH_3COOONO_2$ 4) CO_2

79. The P^{ka} of CH_3COOH and P^{kb} of NH_4OH are 4.76 & 4.75 respectively The P^H of Aqueous solution CH_3COONH_4 is nearly

1) 4.80 2) 7 3) 10.4 4) 6.5

80. The correct statement among the following

1) Cis - $\left[CrCl_2(ox)_2\right]^{3-}$ is optically active

2) Boric acid is a Tribasic acid

3) MnO_4^{-2} dis-proportionates into MnO_4^- and MnO_2 is Alkaline medium

4) Stability of $Sn^{2+} > Sn^{4+}$

81. The incorrect statement among the following

1) $(CH_3)_2 SiCl_2$ upon hydrolysis followed by condensation polymerisation gives linear silicone

2) ZSM-5 converts gasoline into Alcohol

3) ΔH_f^0 of graphite is taken as zero

4) Carboxy haemoglobin is 300 times more stable than oxy-Haemoglobin

82. The product not formed when P_4 reacts with Thionyl chloride

1) PCl_5 2) SO_2 3) S_2Cl_2 4) PCl_3

83. The orange precipitate Which is soluble in yellow Ammonium sulphide is

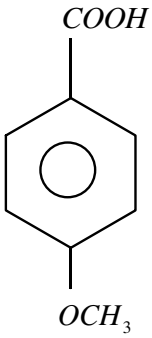
1) SnS 2) As_2S_3 3) Sb_2S_3 4) CdS

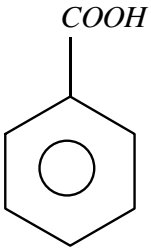
84. Incorrect order in the following

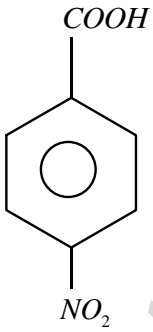
1) Bond energy of $F_2 > Cl_2 > Br_2 > I_2$ 2) E A of $Cl > F > Br > I$

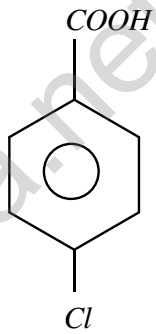
3) E N of $F > Cl > Br > I$ 4) Oxidation power of $F_2 > Cl_2 > Br_2 > I_2$

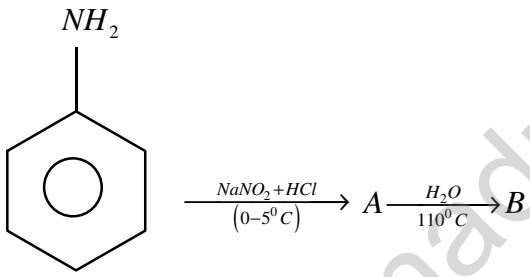
85. The one with higher acidic nature

1) 

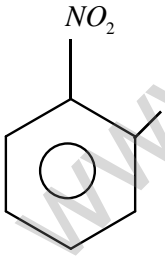
2) 

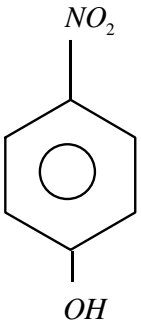
3) 

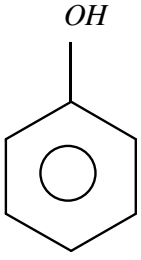
4) 

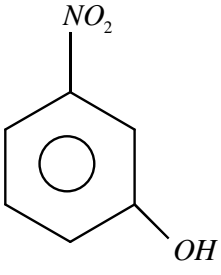
86. 

B is

1) 

2) 

3) 

4) 

87. The Incorrect statement among the following is

1) Amylopectin is water soluble

2) Lactose is composed of $\beta - D -$ galactose and $\beta - D -$ glucose joined by 1,4-glycosidic linkage

3) Sucrose is a non-reducing sugar

4) glycine is optically inactive amino acid

88. The correct order of increasing intermolecular forces of polymers

1) Buna – S, polyethene, Nylon -6,6 2) Nylon -6,6, polyethene, Buna – S

3) Polyethene, Nylon -6,6, Buna – S 4) Buna – S, Nylon -6,6, polyethene

89. Antacid that prevents the interactions of histamine with the receptors of stomach walls is

1) sodium hydrogen carbonate 2) Equanil

3) Ranitidine 4) meprobamate

90. Match the following

A is Complex While B is the number of moles of $AgCl$ precipitated by the addition of excess of $AgNO_3$ per mole of complex

A	B
a) $Pd\,Cl_2\,4NH_3$	p) 2
b) $PtCl_4.2HCl$	q) 0
c) $CoCl_3.4NH_3$	r) 3
d) $PtCl_2.2NH_3$	s) 1
	t) 4

	a	b	c	d
1)	p	t	r	q
2)	p	q	t	r
3)	p	q	s	q
4)	q	p	s	p

JEE MAIN GRAND TEST

KEY SHEET

MATHEMATICS

1) 2	2) 2	3) 2	4) 1	5) 3	6) 2	7) 4	8) 1	9) 1	10) 1
11) 3	12) 3	13) 3	14) 3	15) 1	16) 1	17) 3	18) 4	19) 2	20) 4
21) 3	22) 1	23) 1	24) 3	25) 1	26) 2	27) 1	28) 4	29) 1	30) 4

PHYSICS

31) 2	32) 1	33) 3	34) 3	35) 3	36) 2	37) 1	38) 1	39) 4	40) 2
41) 1	42) 3	43) 2	44) 4	45) 4	46) 2	47) 3	48) 1	49) 1	50) 3
51) 1	52) 3	53) 4	54) 3	55) 4	56) 3	57) 2	58) 2	59) 4	60) 4

CHEMISTRY

61) 1	62) 3	63) 1	64) 3	65) 3	66) 4	67) 2	68) 2	69) 4	70) 4
71) 2	72) 1	73) 4	74) 4	75) 3	76) 3	77) 2	78) 4	79) 2	80) 1
81) 2	82) 1	83) 3	84) 1	85) 3	86) 3	87) 1	88) 1	89) 3	90) 3

HINTS & SOLUTIONS

MATHEMATICS

1. $\angle C = \frac{\pi}{2} \Rightarrow a^2 + b^2 = c^2$

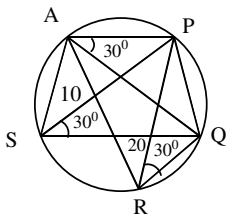
Clearly $|x| < 1$ and $\frac{a^2x^2}{c^2} + \frac{b^2x^2}{c^2} = x^2 \le 1$

$\Rightarrow x = \frac{ax}{c}\sqrt{1 - \frac{b^2x^2}{c^2}} + \frac{bx}{c}\sqrt{1 - \frac{a^2x^2}{c^2}}$

$\Rightarrow C^4 = C^4x^2$ (or) $x = 0$

$\Rightarrow x = 0$ (or) ± 1

2.



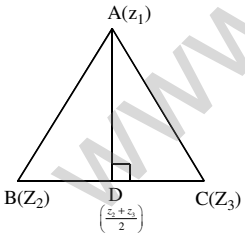
$\angle PAQ = \angle PSQ = \angle PQR = 30^0$

$\angle RAS = 90^0 - \angle RAQ = 90^0 - (90^0 - 30^0) = 30^0$

$RS^2 = 20^2 + 10^2 - 2.10.20.\cos 30^0 = 500 - 200\sqrt{3}$

$\therefore PQ = RS = \sqrt{(500 - 200\sqrt{3})}$

3. $\arg\left(\frac{z_2 + z_3 - 2z_1}{z_3 - z_2}\right)$



$= \arg\left(\frac{\frac{z_2 + z_3}{2} - z_1}{z_3 - z_2}\right)$ $\frac{\pi}{2}$ as $AD \perp BC$

4. Let $z_1 = re^{i\theta}$ then $\overline{z_1} = re^{-i\theta}$ $\frac{z_1}{\overline{z_1}} = e^{2i\theta} = e^{2\pi i/n} \Rightarrow \theta = \pi/n$

Also $(\text{Im}\, z_1 / \text{Re}\, z_1) = \tan\theta = \tan\pi/n = \sqrt{2} - 1 = \tan\frac{\pi}{8}$

5. CONCEPTUAL

6. $27^{160} = 3^{480} = 81^{120} = (1+80)^{120} = 1 + 120 \times 80 + 120C_2 80^2 + ...$

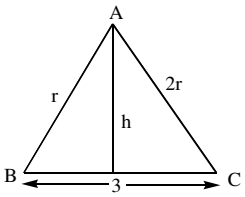
1 + multiple of 100 which ends in 01.

7. $\sum_{r=1}^{100} a_{2r} = \sum_{r=1}^{100} (a_{2r-1} + d) = \sum_{r=1}^{100} a_{2r-1} + 100d$

$\alpha = \beta + 100d$ i.e., $d = \dfrac{\alpha - \beta}{100}$

8. $\Delta = \dfrac{3h}{2}$, $S = \dfrac{3r+3}{2}$

$\Delta^2 = \dfrac{3r+3}{2} \cdot \dfrac{3r-3}{2} \cdot \dfrac{r+3}{2} \cdot \dfrac{3-r}{2}$



$\Rightarrow 4h^2 = -9 + 10r^2 - r^4$

$\dfrac{2^x + 2^{-x} + x^{-2} + x + x}{5} \geq \left(2^x \cdot 2^{-x} \cdot x^{-2} x^2\right)^{1/5} = 1$

$\therefore$ Given question has no solution

9. $\Delta_1 = \begin{vmatrix} f & 2d & e \\ 2z & 4x & 2y \\ e & 2a & b \end{vmatrix} = -\begin{vmatrix} 2d & f & e \\ 4x & 2z & 2y \\ 2a & e & b \end{vmatrix} (C_1 \leftrightarrow C_2)$

$= -\begin{vmatrix} 2d & b & e \\ 4x & 2y & 2z \\ 2d & e & f \end{vmatrix} = \begin{vmatrix} 2a & b & e \\ 2d & e & f \\ 4x & 2y & 2z \end{vmatrix} = \Delta_2$

$\therefore \ \Delta_1 / \Delta_2 = 1$

10. $A^2 = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

$A^n = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} = \begin{bmatrix} b_{11} & b_{12} \\ b_{12} & b_{22} \end{bmatrix}$

$\therefore \lim_{n\to\infty} \dfrac{A^n}{n} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ as $\lim_{n\to\infty} \dfrac{b_{ij}}{n} = 0$

11. Conceptual

12. Conceptual

13. Conceptual

14. Let B^1 be the image of B w.r.t y = x.

$\Rightarrow$ P is the point of intersection of y = x and the line AB^1.

$y-4=\frac{3}{10}(x-3)$

i.e., $3x-10y=-31$

Solving it with $y=x$, We get $P=\left(\frac{31}{7},\frac{31}{7}\right)$

15. Conceptual

16. Q is $\left(\frac{at^2}{4},at\right), N=\left(at^2,0\right)$

$y=\frac{-at}{at^2-\left(at^2/4\right)}\cdot\left(x-at^2\right)$ T is $\left(0,\frac{4}{3}at\right)$

17. $4x^2+9y^2=36$ and $y=mx+c$ $\left(9m^2+4\right)x^2+18cm\ x+9C^2-36=0$

$9m^2\geq C^2-4$

18. Conceptual

19. Each of the function on the right is periodic with periods. $2\pi, 2\pi, 2^2\pi, 2^2\pi, \ldots\ldots, 2^n\pi, 2^n\pi$

Here $f(x)$ is periodic with period $2^n\pi$

20. P = $\lim\limits_{x\to5^+}\frac{x^2-9x+20}{x-[x]}=\lim\limits_{h\to0}\frac{(5+h)^2-9(5+h)+20}{5+h-[5+h]}$

= $\lim\limits_{h\to0}\frac{h^2+h}{h}=1$ $\lim\limits_{x\to4^-}\frac{x^2-9x+20}{x-[x]}=\lim\limits_{h\to0}\frac{(4-h)^2-9(4-h)+20}{4-h-[4-h]}$ $\lim\limits_{h\to0}\frac{h^2+h}{1-h}=0$ P 1

$Q=\underset{x\to4^+}{\text{Lt}}\frac{x^2-9x+20}{x-4}-\underset{x\to5^-}{\text{Lt}}\frac{x^2-9x+20}{x-4}=\underset{x\to4^+}{\text{Lt}}(x-5)-\underset{x\to5^-}{\text{Lt}}(x-5)=(-1)$

$\therefore\frac{P}{Q}=-1$

21. $\Rightarrow f(x)=\frac{x^2-2x+2\sqrt{3}-3}{\sqrt{3}-x}$ $x\neq\sqrt{3}$ $\therefore f\left(\sqrt{3}\right)=\lim\limits_{x\to\sqrt{3}}f(x)=2\left(1-\sqrt{3}\right)$

22. $y=(1+x)\left(1+x^2\right)\left(1+x^4\right)\ldots\left(1+x^{2^n}\right)$ $\frac{dy}{dx}=\frac{-2^{n+1}x\left(2^{n+1}-1\right)(1-x)+\left(1-x^{2^{n+1}}\right)}{\left(1-x^2\right)}$

at $x=0$, $\frac{dy}{dx}=\frac{1}{1}=1$

23. $e^x=\frac{\cos(\theta/2)-\sin(\theta/2)}{\cos(\theta/2)+\sin(\theta/2)}$ $\left(\cos\theta/2>\sin\theta/2\therefore e^x>0\right)$

$\Rightarrow x=\log\tan\left(\frac{\pi}{4}-\frac{\theta}{2}\right)$, $y=0$ $\frac{dy}{dx}=\frac{1}{(-1/\cos\theta)}=-\cos\theta$ $\left(\frac{dy}{dx}\right)_{t=\frac{1}{2}}=\left(\frac{dy}{dx}\right)_{\left(\cos\theta=\frac{1}{2}\right)}=-\frac{1}{2}$

24. $I=-\int e^{\tan^{-1}x}\left(1+x+x^2\right)\cdot\frac{1}{1+x^2}dx=-\int e^{\tan^{-1}x}dx-\int\frac{e^{\tan^{-1}x}}{1+x^2}\cdot xdx=-\int e^{\tan^{-1}x}dx-\left\{e^{\tan^{-1}x}.x-\int e^{\tan^{-1}x}\cdot dx\right\}+c$

25. $f(x)=f(a-x), g(x)+g(a-x)=0$

$$I=\int_0^a f(a-x)\,g(a-x)\,dv=\int_0^a f(x)\,g(a-x)\,dv$$

$$2I=\int_0^a f(x)\{g(x)+g(a-x)\}\,dv=\int_0^a 2f(x)\,dx \quad I=\int_0^a 2f(x)\,dx$$

26. $=\int_0^{4a}\left(2\sqrt{a}\sqrt{x}-x^2/4a\right)dx$

$$\frac{16a^2}{3}$$

27. Conceptual

28. Conceptual

29. Conceptual

30. $\sin\theta=\cos\theta$

$$|\bar{a}||\bar{b}|\sin\theta=|\bar{a}||\bar{b}|\cos\theta$$

$$\theta=45^0$$

PHYSICS

31. (2)

The height of a liquid in capillary tube depends on $\cos\theta$

The height S to which a body rises is given by $\cos\theta$, which is sum of two terms

The energy of damped oscillator decreases exponentially with time

32. (1)

Length of the pendulum, $L=l+r=l+\frac{D}{2}=153.2+1.77=155.0$

$t=25.0\,s,\Delta t=0.5\,s$ *and* $\Delta L=0.1\,cm$

We have $T=2\pi\sqrt{\frac{L}{g}}\Rightarrow g=4\pi^2\left(\frac{L}{T^2}\right)$

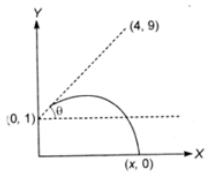
Time period, T=$T=\frac{total\ time(t)}{No.\ of\ \ oscillations}=\frac{t}{10}$

$$\therefore g=4\pi^2\left(\frac{L}{\left(t/10\right)^2}\right)=400\pi^2\left(\frac{L}{t^2}\right)=400(3.14)^2\left(\frac{155}{25^2}\right)=978\,cm\,s^{-2}$$

Permissible percentage error in g, $\frac{\Delta g}{g}\times100=\left(\frac{\Delta L}{L}+2\frac{\Delta t}{t}\right)\times100=4.06\%$

$$\therefore g=978\pm4.06\ cm\,s^{-2}$$

33. (3)



$\tan\theta = \frac{8}{4} = 2 \Rightarrow \sin\theta = \frac{2}{\sqrt{5}}$

For vertical motion. $-1 = u\sin\theta \times t - \frac{1}{2}gt^2 \Rightarrow u = 2\sqrt{5}\, ms^{-1}$

Horizontal distance = $x = u\cos\theta \times t = 2\sqrt{5} \times \frac{1}{\sqrt{5}} \times 1 = 2m$

So coordinates will be (2,0)

34. (3)

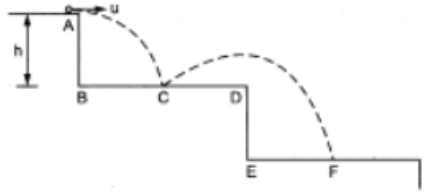
Potential energy at a distance r from the centre of earth is $U = -\int_0^r -F dr$

where F is the gravitational force and $F = \frac{GMm}{r^{5/2}}$

$\therefore U = \int_0^r \frac{GMm}{r^{5/2}} dr = -\frac{2}{3}\frac{GMm}{r^{3/2}}$ $\quad i.e.\ U \propto r^{-3/2}$

35. (3) As no external force is acting on (compartment + passengers) system, so C_2 remains fixed. But as passengers move inside the compartment, friction between compartment and passengers feet acting on compartment displaces its centre of mass.

36. (2)



The horizontal velocity of the ball remains constant.

$\therefore$ the time of flight from C to F is twice the time of flight from A to C.

For the vertical motion from A to C, time $t = \sqrt{\frac{2h}{g}}$

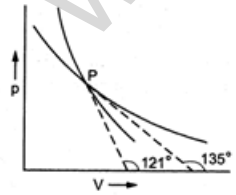
The vertical component of velocity before impact at C, $v = \sqrt{2gh}$

The vertical upward component of velocity after impact at C = ev

For the vertical motion from C to F

$-h = ev(2t) + \frac{1}{2}(-g)(2t)^2 \Rightarrow -h = 2e\left(\sqrt{2gh}\right)\left(\sqrt{\frac{2h}{g}}\right) - 2g\left(\sqrt{\frac{2h}{g}}\right)^2 \Rightarrow e = \frac{3}{4}$

37. (1)



slope of isothermal curve, $\tan 135° = -1$

slope of adiabatic curve, $\tan 121° = -\tan 59° \approx -1.66$

but slope of adiabatic curve = γ (slope of isothermal curve)

$\therefore \gamma = \frac{-1.66}{-1} = \frac{5}{3}$

38. (1)

In YDSE, path diference $\Delta x = d\sin\theta$ and For maxima $\Delta x = n\lambda$ where $n = 0, \pm1, \pm2, \pm3.....$

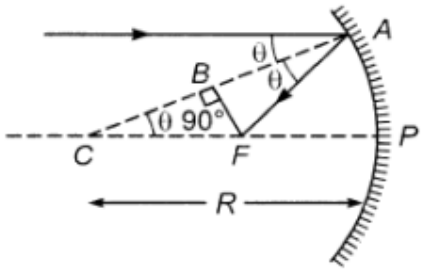
Given that $d = \frac{5\lambda}{2}$ $\quad \therefore \frac{5\lambda}{2}\sin\theta = n\lambda \Rightarrow \sin\theta = \frac{2n}{5}$

$-1 \le \sin\theta \le +1 \Rightarrow -1 \le \frac{2n}{5} \le +1 \Rightarrow \frac{-5}{2} \le n \le \frac{5}{2}$

So, possible values of n are -2, -1, 0, 1, 2

Thus total number of 5 maximas will be formed

39. (4)



P be the pole of concave mirror. C its centre of curvature and A be the point of incidence.

It is clear from the figure that ΔACF is an isosceles.

Hence $CF = AF = CB\sec\theta = \frac{1}{2}CA\sec\theta = \frac{R}{2}\sec\theta$

$\therefore PF = CP - CF = R - \frac{R}{2}\sec\theta = R\left(1 - \frac{\sec\theta}{2}\right)$

40. (2) As wave travelling along + x- direction is given by $E_y = E_0\cos[\omega t - kx]$.

$\omega = 2\pi f = 2\pi\times10^6 \Rightarrow f = 10^6\ Hz$ and $k = \frac{2\pi}{\lambda} = \pi\times10^{-2} \Rightarrow \lambda = 200m$

41. (1)

Potential difference between two concentric conducting spheres is independent of the charge on the outer sphere.

42 . (3) Initially in equilibrium, $T_1 + T_2 = mg$ *and* $T_1 = T_2 = T_0 \Rightarrow T_0 = \frac{mg}{2}$

When the magnetic field is switched on, let the tensions in the left and right strings be T_1' *and* T_2' respectively. Magnetic moment, $M = iA = \frac{Q}{\left(2\pi/\omega\right)}\times\pi R^2$

and torque $\tau = MB\sin90° = \frac{Q}{\left(2\pi/\omega\right)}\times\pi R^2 B = \frac{\omega BQR^2}{2}$

For translational equilibrium $T_1' + T_2' = mg$ ---- (i)

For rotational equilibrium, $\left(T_1' - T_2'\right)R = \frac{\omega BQR^2}{2} \Rightarrow T_1' - T_2' = \frac{QB\omega R}{2}$ ---- (ii)

From (i) and (ii), we get $T_1' = \frac{mg}{2} + \frac{QB\omega R}{4} > T_2'$

GIVEN $T_1' \le \frac{3T_0}{2} \Rightarrow \frac{mg}{2} + \frac{QB\omega_{max}R}{4} = \frac{3T_0}{2} \Rightarrow T_0 + \frac{QB\omega_{max}R}{4} = \frac{3T_0}{2} \Rightarrow T_0 = \frac{QB\omega_{max}R}{2}$

$\therefore \omega_{max} = \frac{2T_0}{RBQ}$

43. (2)

Let N_i *and* N_f be the initial and final number of active nuclei present.

$$\therefore A_i = \lambda N_i \text{ and } A_f = \lambda N_f$$

The number of α-particles emitted = the number of nuclei disintegrating

$$= N_i - N_f = \frac{A_i}{\lambda} - \frac{A_f}{\lambda} = \frac{T}{\ln 2}\left(A_i - A_f\right)$$

44. (4)

For a transition from n = p to n = q in hydrogen, photon energy= $\varepsilon_1 = 13.6\left(\frac{1}{q^2} - \frac{1}{p^2}\right) eV$

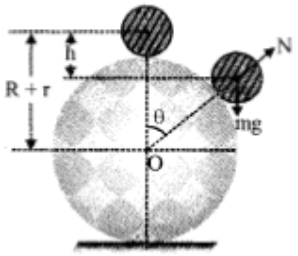
For a transition from n = a to n = b in helium,

photon energy= $\varepsilon_2 = 4\times 13.6\left(\frac{1}{b^2} - \frac{1}{a^2}\right) eV = 13.6\left(\left(\frac{2}{b}\right)^2 - \left(\frac{2}{a}\right)^2\right) eV$

For the photons of same energy to appear in the spectra, $\frac{1}{q^2} - \frac{1}{p^2} = \left(\frac{2}{b}\right)^2 - \left(\frac{2}{a}\right)^2$

This will be satisfied if b = 2q and a = 2p

45. (4)



Let V be the velocity and θ is the angle made by the radius vector with the vertical at the instant when the ball break off the sphere.

Let it happens at a vertical height h below the top. Therefore

We have $mgh = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$

$\Rightarrow mg(R+r)(1-\cos\theta) = \frac{1}{2}m\left(r\omega\right)^2 + \frac{1}{2}I\omega^2$ ----- (i)

At the break off, $mg\cos\theta = N + \frac{mv^2}{\left(R+r\right)}$

Substituting N=0 and $v = r\omega$ we get $mg\cos\theta = \frac{m\left(r\omega\right)^2}{\left(R+r\right)}$ ---- (ii)

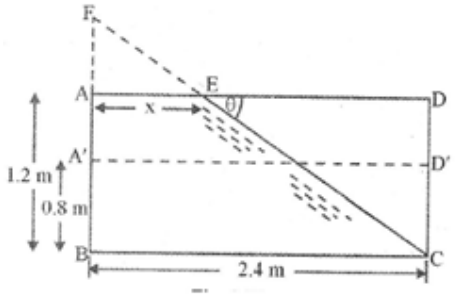
Solving equations (i) and (ii), we get $\omega = \sqrt{\frac{10g\left(R+r\right)}{17r^2}}$

46. (2)

Magnifying power of Microscope, $|m| = \frac{L}{f_0}\left(1 + \frac{D}{f_e}\right) \propto \frac{1}{f_0}$

Magnifying power of telescope , $|m| = \frac{f_0}{f_e}\left(1 + \frac{D}{f_e}\right) \propto f_0$

47. (3)



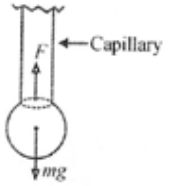
The height of the gasoline = $\frac{2}{3}\times 1.2 = 0.8m$

Since tank is closed, therefore volume of liquid inside it remain as such. Suppose free surface makes θ with the horizontal and x is the distance of free surface from A, then
Volume of AECBA = Volume of $A'D'CB$

$\therefore \frac{1}{2}(2.4+x)\times 1.2\times 1.5 = 2.4\times 1.5\times 0.8 \Rightarrow x = 0.8m$

From geometry $\tan\theta = \frac{CD}{DE} = \left(\frac{1.2}{2.4-0.8}\right) = 0.75$ And also $\tan\theta = \frac{a_x}{g} \Rightarrow a_x = g\tan\theta$

48. (1)



When the drop breaks away from the capillary,
Weight of drop = force due to surface tension

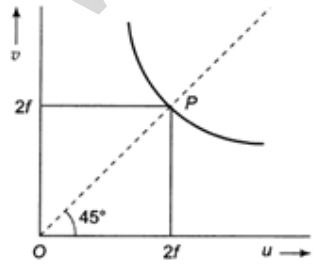
$$mg = \pi D\times T \Rightarrow T = \frac{mg}{\pi D}$$

49. (1) Velocity of sound at room temperature, $V_t = 2f(l_2 - l_1) = V_0\left(1+\frac{t}{546}\right)$

Where l_1 = mean first resonating length = 16.9 cm = 0.169 m
l_2 = mean second resonating length = 52.3 cm = 0.523 m

end correction, $e = \frac{l_2 - 3l_1}{2}$

50. (3)



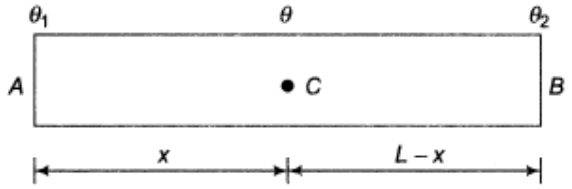
For a convex lens forming real image, $\frac{1}{v}+\frac{1}{u} = \frac{1}{f}$ --(i)

The graph of v against u is shown in the figure.

Since u and v scales are the same, u = v at point P.
Putting u = v in (i) gives u = v = 2f.
Hence coordinates of P are (2f, 2f)

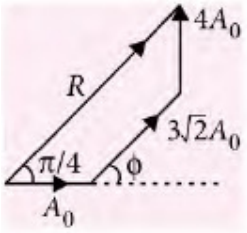
51. (1)
To identify the base of the transistor, the multimeter has to show conduction between emitter and base as well between collector and base keeping one lead of the multimeter common in both cases. Then the terminal of the transistor to which the lead of multimeter is common is base of transistor.

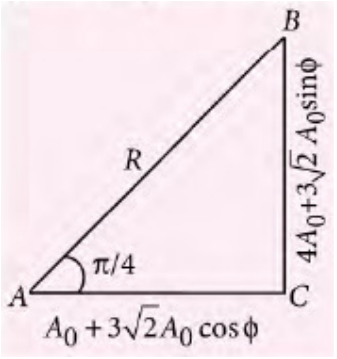
52. (3)
Given, $PT^2 = k(cons\tan t)$ From PV = nRT we have $P = \frac{nRT}{V}$
Hence $nRT^3 = kV$ On differentiation we get, $3nRT^2\Delta T = k\Delta V \Rightarrow \frac{\Delta V}{\Delta T} = \frac{3nRT^2}{k}$
Coefficient of volume expansion is $\gamma = \frac{\Delta V}{V\Delta T} = \frac{3nRT^2}{kV} = \frac{3}{T}$

53. (4)


Let θ be the temperature at point C at a distance x from end A of the bar whose ends are kept at temperatures θ_1 *and* θ_2 *with* $\theta_1 > \theta_2$. L – length of the bar.
In steady state, the rate of flow of heat from A to C = rate of heat flow from C to B
i.e. $\frac{KA(\theta_1 - \theta)}{x} = \frac{KA(\theta - \theta_2)}{L - x} \Rightarrow \theta = \theta_1 - \left(\frac{\theta_1 - \theta_2}{L}\right)x$
Thus, the graph of θ versus x is a straight line with a positive intercept and negative slope.

54. (3)
Given $y_1 = A_0\sin(kx - \omega t)$, $y_2 = 3\sqrt{2}A_0\sin(kx - \omega t + \phi)$ and $y_3 = 4A_0\cos(kx - \omega t)$
These waves can be represented by phase diagram a shown.





From phase diagram, $\tan\left(\frac{\pi}{4}\right) = \frac{BC}{AC} = \frac{A_0\left(4 + 3\sqrt{2}\sin\phi\right)}{A_0\left(1 + 3\sqrt{2}\cos\phi\right)} \Rightarrow \cos\phi - \sin\phi = \frac{1}{\sqrt{2}}$
On squaring on both sides and simplifying, we get $\phi = \frac{\pi}{12}$

55. (4)

Rate of heat generation, $H = i^2R = 2^2 \times 7.5 = 30\,J\,s^{-1}$

As volume of the gas is constant, heat given = change in internal energy

$$Hdt = nC_v dT \Rightarrow \frac{dT}{dt} = \frac{H}{nC_v} \text{ ---- (i)}$$

From ideal gas equation PV=nRT, on differentiating at constant volume, we get

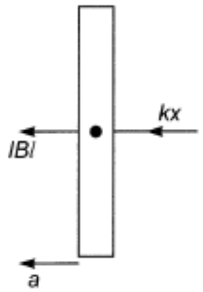
$$VdP = nRdT \Rightarrow \frac{dT}{dt} = \frac{V}{nR}\frac{dP}{dt} \text{ --- (ii)}$$

From (i) and (ii), we get

$$\frac{dP}{dt} = \frac{HR}{VC_v} \Rightarrow \frac{d}{dt}\left(\frac{mg}{A}\right) = \frac{HR}{V(3R/2)}$$

$$\Rightarrow \frac{g}{A}\frac{dm}{dt} = \frac{2H}{3V} \Rightarrow \frac{dm}{dt} = \frac{2HA}{3gV} = \frac{2\times30\times0.1}{3\times10\times5} = 0.04\,kg\,s^{-1}$$

56. (3)



Let the velocity of rod be v when it has been displaced by x. Due to motion of rod an emf will be induced in rod given by e = B*v*l. Due to this induced emf, charging of the capacitor takes place as a current flows in the circuit (for very small time). As a result of current, the rod experiences a magnetic force given by iB*l*.

From newton's second law, iB*l* +kx = ma --- (i)

$$i = \frac{d}{dt}(Q) = \frac{d}{dt}(C \times Bvl) = CBla \text{ --- (ii)}$$

From (i) and (ii) we get $a = \frac{kx}{m - B^2l^2C}$

57. (2)

$$\varepsilon = \frac{d\phi}{dt} = \frac{(NBA\cos\theta - 0)}{t} = \frac{\left(1\times0.5\times25\times10^{-4}\times\cos60° - 0\right)}{0.2} = 3.12\,mV$$

58. (2)

As the iron rod is inserted, the magnetic field inside the coil magnetises the iron increasing the magnetic field inside it. Hence, the inductance of the coil increases. Consequently, the inductive reactance of the coil increases. As a result, a larger fraction of the applied AC voltage appears across the inductor, leaving less voltage across the bulb. Therefore, the glow of the light bulb decreases.

59. (4)

When an electric field is acting vertically downwards, the photoelectron being negatively charged will experience force due to electric field acting vertically upwards, which is the initial direction of motion of emitted photoelectron. Due to which the electron gets accelerated and hence its kinetic energy increases and there by Stopping Potential

60. (4)

1 MSD = 1.0 mm and No. of vernier divisions = 10

Least count of vernier callipers, C $= \frac{1MSD}{N} = \frac{1}{10} = 0.1\ mm = 0.01 cm$

The instrument has positive error, e=NC=7(0.01)=0.07 cm

Zero correction = -0.07 cm MSR = 3.1 cm vernier coincidence = 4(0.01) = 0.04cm

Length of the cylinder = MSR + Vernier coincidence +zero correction

= 3.1 + 0.04 – 0.07 = 3.07 cm

CHEMISTRY

61. $24\,dm^3 \rightarrow 1\,mol$

$3\,dm^3 \rightarrow \frac{1}{8} mol$

$\frac{1}{8} mol\, O_2$ Vol at $STP = V_{O_2} = \frac{1}{8} \times 22.4\,lit \quad V_{O_2} = V_{S(H_2O_2)} \times V_{(H_2O_2)}$

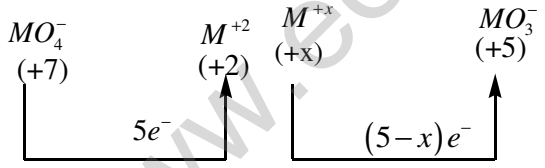
$\frac{1}{8} \times 22.4 = V_{s(H_2O_2)} \times \frac{100}{1000}$

$V_{s(H_2O_2)} = \frac{224}{8}$

$M = \frac{V_{S(H_2O_2)}}{11.2} = \frac{224}{8 \times 11.2}$

=2.5 M

62.



(5-x) moles $MnO_4^- \equiv 5 moles\ M^{+x}$

1 mole $MnO_4^- \equiv \frac{5}{5-x} moles\ M^{+x}$

$\frac{5}{5-x} = 1.67 = \frac{5}{3}$

$15 = 25 - 5x$

$x = 2$

63. Conceptual

64. $V = \frac{nR}{P}T$

$V = \frac{2\times 0.0821}{0.0821}\times T$

$V = 2\times T$

$\log V = \log T + \log 2$

$\log V = 1(\log T) + 0.3010$

$Y = mX + C$

65. $2C + H_2 \rightarrow C_2H_2; \Delta H_{f(C_2H_2)} = ?$

$\Delta H_{f(C_2H_2)} = \Delta H_{Comb(R)} - \Delta H_{Comb(P)}$

$= \left[2(-394) + 1(-286)\right] - \left[-1300\right]$

66. $PCl_5 \rightleftharpoons PCl_3 + Cl_2$

Initial	1	0	0	
	$1-\alpha$	α	α	
Eq n →	0.5	0.5	0.5	$(\because \alpha = 0.5)$
X →	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	
Pressure	$\frac{P}{3}$	$\frac{P}{3}$	$\frac{P}{3}$	

$$K_P = \frac{(P/3)(P/3)}{(P/3)}$$

$$P = 3k_p$$

67. Conceptual

68. $\wedge_m^0(CH_3COOH) = \wedge_m^0(CH_3COONa) + \wedge_m^0(HCl) - \wedge_m^0(NaCl)$

$= 91 + 425.9 - 126.4$

=390.5

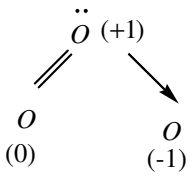
69. $S_2O_8^{2-} + 2I^- \rightarrow 2SO_4^{2-} + I_2$ Follows second order Kinetics

70. Conceptual

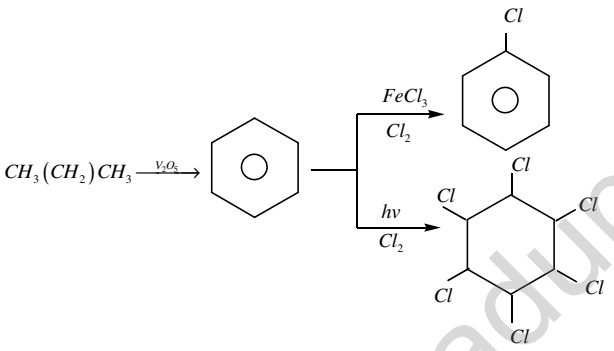
71. K_H depends upon temperature and nature of gas $(K_H \alpha T)$

72. Conceptual

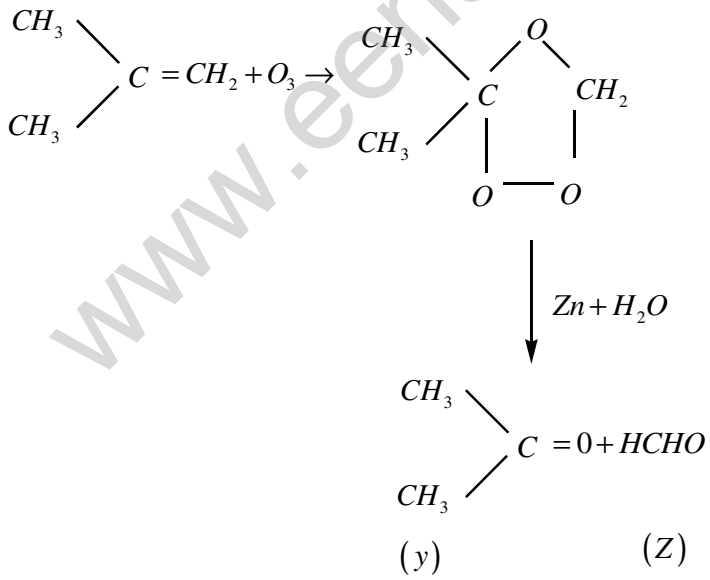
73.



74 $BeCl_2$ ion solid state polymeric with chlorine bridges



75.



76. Conceptual

77. $H_2SO_4 + HO - NO_2 \rightarrow HSO_4^{\ominus} + H_2O^{\oplus} - NO_2 \rightarrow H_2O + NO_2^{\oplus}$

78. Memory based

79. $P^H = 7 + \frac{1}{2}P^{k_a} - \frac{1}{2}P^{k_b}$

80. Conceptual

81. ZSM-5 Converts Alcohols to gasoline

82. $P_4 + 8SOCl_2 \rightarrow 4PCl_3 + 4SO_2 + 2S_2Cl_2$

83. Orange PPt is Sb_2S_3 which is soluble in YAS

84. Conceptual

85. Strongly with drawing groups (-I) increase acidic nature

86. $C_6H_5NH_2 \xrightarrow{HNO_2} C_6H_5\overset{+}{N}_2C\bar{l} \xrightarrow[\Delta]{H_2O} C_6H_5OH$

87. Memory based

88. Depends upon polarity

89. Memory based

90. $Pd(NH_3)_4\ Cl_2$

$H_2[PtCl_6]$

$[Co(NH_3)_4Cl_2]Cl$

$[Pt(NH_3)_2Cl_2]$

Question paper with solutions were prepared by

VARSITY EDUCATION MANAGEMENT LIMITED