CODE - A

NTPL
FLASH BACK TEST

Batch - 2001+2002+2003 [Engg.]

Time : 3 Hours ***Maximum Marks : 360***

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

A. General :

1. This booklet is your Question Paper containing **90 questions**.
2. The Question Paper **CODE** is printed on the right hand top corner of this booklet. This should be entered on the OMR Sheet.
3. Fill the bubbles completely and properly using a **Blue/Black Ball Point Pen** only.
4. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers, and electronic gadgets in any form are not allowed to be carried inside the examination hall.
5. The answer sheet, a machine-readable Optical mark recognition sheet (OMR Sheet), is provided separately.
6. DO NOT TAMPER WITH / MUTILATE THE OMR OR THE BOOKLET.
7. Do not break the seals of the question-paper booklet before being instructed to do so by the invigilator.

B. Question paper format & Marking Scheme :

8. The question paper consists of **3 parts** (Physics, Chemistry and Maths).
9. The test is of **3 hours** duration. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct. Each question carries **+4 marks** for correct answer and **-1 mark** for wrong answer.

Name of the Candidate (in Capitals) ______________________________

Test Centre ____________________ Centre Code ____________________

Candidate's Signature ____________________ Invigilator's Signature ____________________

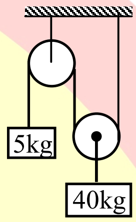
1. A metal ball of mass 2 kg moving with speed of 36 km/h has a head-on collision with a stationary ball of mass 3 kg. If after collision, both the balls move together, then the loss in kinetic energy due to collision is

(a) 40 J (b) 60 J (c) 100 J (d) 140 J

2. Two balls of masses $m_1 = 3$ kg and $m_2 = 2$ kg are moving towards each other with speeds u_1 and u_2. The ball m_1 stops after collision and m_2 starts moving with speed u_1. The co-efficient of restitution between the balls is

(a) zero (b) 1 (c) $\frac{2}{3}$ (d) $\frac{1}{2}$

3. The acceleration of centre of mass of the system shown in figure will be



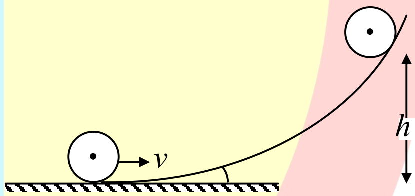
(a) 10 m/s^2 (b) $-\frac{10}{3}$ m/s^2

(c) $\frac{5}{3}$ m/s^2 (d) –5 m/s^2

4. A thin circular ring of mass M and radius R is rotating about its axis with a constant angular velocity ω. Two objects, each of mass m, are attached gently to the opposite ends of a diameter of the ring. The ring rotates now with an angular velocity

(a) $\frac{\omega M}{M+m}$ (b) $\frac{\omega(M-2m)}{M+2m}$ (c) $\frac{\omega M}{M+2m}$ (d) $\frac{\omega(M+m)}{M}$

5. A disc of mass M and radius R rolls on a horizontal surface and then rolls up and inclined plane as shown in the figure. If the velocity of the disc is v, then height to which the disc will rise will be



(a) $\frac{3v^2}{2g}$ (b) $\frac{3v^2}{4g}$

(c) $\frac{v^2}{4g}$ (d) $\frac{v^2}{2g}$

6. A thick walled hollow sphere has outer radius R. It rolls down an inclined plane without slipping and its speed at bottom is v_0. Now the incline is waxed so that the friction becomes zero. The sphere is observed to slide down without rolling and the speed now is $(5\ v_0/4)$. The radius of gyration of the hollow sphere about the axis through its centre is

(a) $\frac{3R}{4}$ (b) $\frac{R}{2}$ (c) $\frac{R}{4}$ (d) $\frac{4}{5}R$

7. The escape velocity on the surface of the earth is 11.2 km/s. What would be the escape velocity on the surface of another planet of the same mass but 1/4 times the radius of the earth?

(a) 44.8 km/s (b) 22.4 km/s (c) 5.6 km/s (d) 11.2 km/s

8. The depth d at which the value of acceleration due to gravity becomes $\frac{1}{n}$ times the value at the surface, is (R = radius of the earth)

(a) $\frac{R}{n}$ (b) $R\left(\frac{n-1}{n}\right)$ (c) $\frac{R}{n^2}$ (d) $R\left(\frac{n}{n+1}\right)$

9. A metal wire of length L and radius r is clamped rigidly at one end. A force F is applied at another end so that its length increases by L. The increase in length of another metal wire of length $2L$ and radius $2r$, when stretched by a force $2F$, will be

(a) $2L$ (b) L (c) $L/2$ (d) $L/4$

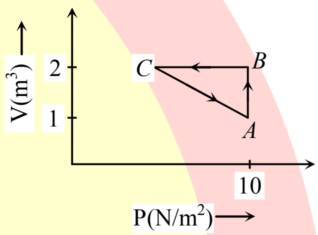
10. A tuning fork of known frequency 256 Hz makes 5 beats per second with the vibrating string of a piano. The beat frequency decreases to 2 beats per second when the tension in the piano string is slightly increased. The frequency of the piano string before increasing the tension was

(a) 261 Hz (b) 258 Hz (c) 254 Hz (d) 251 Hz

11. If the temperature of the sun is increased from T to $2T$ and its radius from R to $2R$, then the ratio of the radiant energy received on earth to what it was previously will be

(a) 4 (b) 16 (c) 32 (d) 64

12. An ideal gas is taken through the cycle $A \to B \to C \to A$ as shown in figure. If the net heat supplied to the gas in the cycle is 5 J, the work done by the gas in the process $C \to A$ is

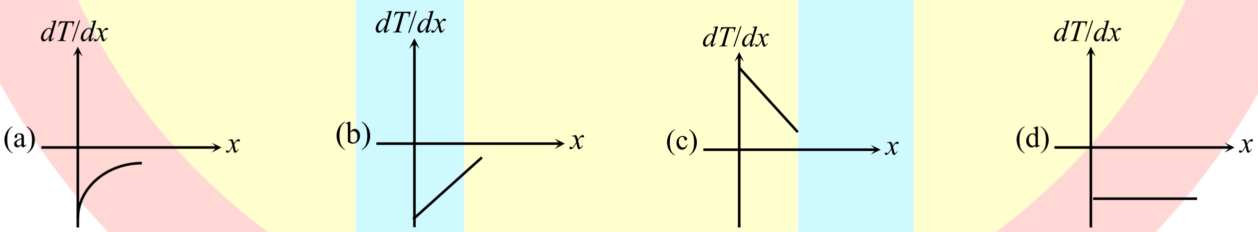


(a) – 5 J (b) – 10 J
(c) – 15 J (d) – 20 J

13. If amount of heat given to a system be 50 J and work done on the system be 15 J, then change in internal energy of the system is

(a) 35 J (b) 50 J (c) 65 J (d) 15 J

14. The curved surface of uniform rod is thermally isolated from surrounding. Its ends are maintained at temperature T_1 and T_2 $(T_1 > T_2)$. If in steady state temperature gradient at a distance x from hot end is equal to $\frac{dT}{dx}$, then which one of the following graphs is correct?



15. Temperature of source is 330ºC. Temperature of sink is changed in order to increase the efficiency of engine from $\frac{1}{5}$ to $\frac{1}{4}$, by

(a) 30ºK (b) 303 K (c) 603 K (d) 60 K

16. A body cools from 60°C to 50°C in 10 minutes. If the room temperature is 25°C and assuming Newton's law of cooling to hold good, the temperature of the body at the end of the next 10 minutes will be

(a) 38.5°C (b) 40°C (c) 42.85°C (d) 45°C

17. The amount of heat required will be minimum when a body is heated through

(a) 1 K (b) 1°C

(c) 1°F (d) it will be the same in all the three cases

18. A constant volume gas thermometer shows pressure reading of 50 cm and 90 cm of mercury at 0°C and 100°C respectively. When the pressure reading is 60 cm of mercury, the temperature is

(a) 25°C (b) 40°C (c) 15°C (d) 12.5°C

19. A hot body is being cooled in air according to Newton's law of cooling, the rate of fall of temperature being k times the difference of its temperature with respect to that of surroundings. The time, after which the body will lose half the maximum heat it can lose, is

(a) $\frac{1}{k}$ (b) $\frac{\ln 2}{k}$ (c) $\frac{\ln 3}{k}$ (d) $\frac{2}{k}$

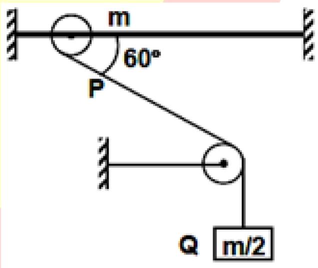
20. A swimmer can swim in still water with a speed of $\sqrt{5}$ m/s. While crossing a river his average speed is 3 m/s. If he cross the river in the shortest possible time, what is the speed of flow of water?

(a) 2 m/s (b) 4 m/s (c) 6 m/s (d) 8 m/s

21. A car starting from rest is accelerated at constant rate until it attains a constant speed v. It is then retarded at a constant rate until it comes to rest. Considering that the car moves with constant speed for half of the time of total journey, the average speed of the car for the journey is

(a) $\frac{v}{4}$ (b) $\frac{3v}{4}$ (c) $\frac{3v}{2}$ (d) Data insufficient

22. A smooth ring P of mass m can slide on a fixed horizontal rod. A string tied to the ring passes over a fixed pulley and carries a block Q of mass (m/2) as shown in the figure. At an instant, the string between the ring and the pulley makes an angle 60° with the rod.



The initial acceleration of the ring is

(a) $\frac{2g}{3}$ (b) $\frac{2g}{6}$

(c) $\frac{2g}{9}$ (d) $\frac{g}{3}$

23. A block of mass M is hanging over a smooth and light pulley through a light string. The other end of the string is pulled by a constant force F. If kinetic energy of the block increases by 20 J in 1s. Then

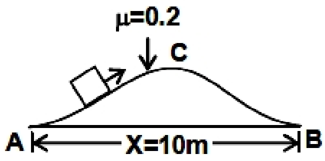
(a) tension in the string is Mg.

(b) tension in the string is F

(c) Work done by the tension on the block is 20 J in 1 sec.

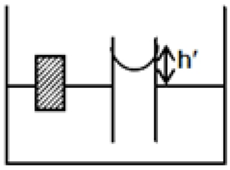
(d) Work done by the force of gravity is 20 J in 1 sec.

24. A block of mass 1 kg is pulled along the curve path ACB by a tangential force as shown in figure. The work done by the frictional force when the block moves from A to B is



(a) 5 J (b) 10 J
(c) 20 J (d) none of these

25. In a capillary tube placed inside the liquid of density (ρ)in a container, the rise of liquid is h. When block of density 'σ' is placed on the liquid as shown in figure, liquid in the tube is h'. If $\sigma < \rho$ then



(a) $h' = h$
(b) $h' < h$
(c) $h' > h$
(d) insufficient data

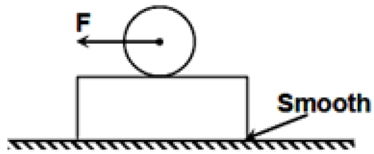
26. A light rod of length L, is hanging from the vertical smooth wall of a vehicle moving with acceleration $\sqrt{3}$ g having a small mass attached at it's one end is free to rotate about an axis passing through the other end. The minimum velocity given to the mass at it's equilibrium position so that it can complete vertical circular motion is

(a) $\sqrt{5gL}$ (b) $\sqrt{4gL}$ (c) $\sqrt{8gL}$ (d) none of these

27. During an adiabatic process, the density of a gas is found to be proportional to cube of temperature. The degree of freedom of gas molecule is

(a) 6 (b) 5 (c) 4 (d) 3

28. A disc of mass m and radius R is placed over a plank of same mass m. There is sufficient friction between the discs and the plank to prevent slipping. A force F is applied at the centre of the disc. Choose the correct statements.

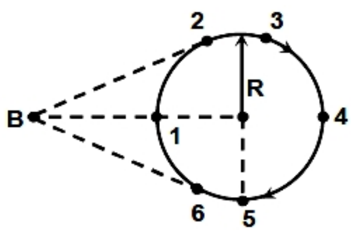


(a) Acceleration of the plank is $\frac{F}{4m}$
(b) Acceleration of the plank is $\frac{F}{2m}$
(c) Force of friction between disc and plank is $\frac{F}{6}$
(d) Force of friction between disc and plank is $\frac{F}{2}$

29. A certain amount of ideal monoatomic gas undergoes, process given by $UV^{1/2} = C$ where U is the internal energy of the gas. The molar specific heat of the gas for the process will be

(a) R/2 (b) 3R (c) 5R/2 (d) –R/2

30. An isotropic sound source A is moving in a circle of radius R with a small speed v. An observer B is hearing this sound (See figure). The intensity of the sound heard by B will be maximum when the source is at point.



(a) 1
(b) 2
(c) 6
(d) none of these

31. In a solid 'AB' having the NaCl structure, 'A' atoms occupy the corners of the cubic unit cell If all the face centered atoms along one of the axes are removed, then the resultant stoichiometry of the solid is:

(a) AB_2 (b) A_2B (c) A_4B_3 (d) A_3B_4

32. Fraction of void present in fcc lattice is:

(a) 0.74 (b) 0.68 (c) 0.48 (d) 0.26

33. Choose the incorrect statement:

(a) In the lattice of fcc one of the possible unit cell is body centred tetragonal.

(b) coordination number of fcc is 12.

(c) number of next nearest neighbour in fcc is 6

(d) number of next nearest neighbour in body centred tetragonal system is 12.

34. The tetrahedral voids formed by ccp arrangement of Cl^- ions in rock salt structure are

(a) Occupied by Na^+ ions (b) Occupied by Cl^- ions

(c) Occupied by either Na^+ or Cl^- ions (d) Vacant

35. 'C' represent the height of the HCP unit cell and 'a' represent edge length of the hexagonal surface of the HCP unit cell. What is the value of C/a ?

(a) $\sqrt{\frac{2}{3}}$ (b) $\sqrt{\frac{8}{3}}$ (c) $\sqrt{\frac{32}{3}}$ (d) $\sqrt{\frac{3}{2}}$

36. What type of crystal defect is indicated the diagram below?

Na^+	Cl^-	Na^+	Cl^-	Na^+	Cl^-
Cl^-	Cl^-	Na^+	Na^+	Na^+	Cl^-
Cl^-	Na^+	Cl^-	Cl^-	Na^+	Cl^-
Na^+	Na^+				

(a) Frenkel defect (b) Schottky defect

(c) Interstitial defect (d) Frenkel and Schottky defect

37. At room temperature, sodium crystallizes in a body centred cubic lattice with a = 4.24 Å. The theoretical density of sodium (At. wt. of Na = 23) is-

(a) $1.002\ g\ cm^{-3}$ (b) $2.002\ g\ cm^{-3}$ (c) $3.002\ g\ cm^{-3}$ (d) None of these

38. The radius of the Na^+ is 95 pm and that of Cl^- ion is 181 pm. Predict the co-ordination number of Na^+

(a) 4 (b) 6 (c) 8 (d) unpredictable

39. The enthalpy of formation for $C_2H_4(g)$, $CO_2(g)$ and $H_2O(\ell)$ at 25ºC and 1 atm, pressure be 52, – 394 and – 286 $KJ\ mol^{-1}$ respectively. The enthalpy of combustion of $C_2H_4(g)$ will be -

(a) $+ 1412\ KJ\ mol^{-1}$ (b) $– 1412\ KJ\ mol^{-1}$ (c) $+ 141.2\ KJ\ mol^{-1}$ (d) $– 141.2\ KJ\ mol^{-1}$

40. The favourable conditions for a spontaneous reaction are –

(a) $T\Delta S > \Delta H$, $\Delta H = +ve$, $\Delta S = +ve$ (b) $T\Delta S > \Delta H$, $\Delta H = +ve$, $\Delta S = -ve$

(c) $T\Delta S = \Delta H$, $\Delta H = -ve$, $\Delta S = -ve$ (d) $T\Delta S = \Delta H$, $\Delta H = +ve$, $\Delta S = +ve$

41. Calculate the temperature at which $\Delta G = – 5.2\ KJmol^{-1}$, $\Delta H = 145.6\ KJ\ mol^{-1}$ and $\Delta S = 216\ JK^{-1}\ mol^{-1}$ for a chemical reaction

(a) 698ºC (b) 425ºC (c) 650 K (d) 650ºC

42. The heat of atomisation of $PH_3(g)$ is 228 kcal mol^{-1} and that of $P_2H_4(g)$ is 355 kcal mol^{-1}. The energy of P—P bond is

(a) 62 kcal (b) 51 kcal (c) 52 kcal (d) 53 kcal

43. Which of the following statements is correct?

(a) Slope of adiabatic P-V curve is smaller than that in isothermal one

(b) Slope of the adiabatic P-V curve will be same as that in isothermal one

(c) Slope of adiabatic P-V curve will be larger than in isothermal one

(d) Both (B) and (C)

44. Determine the value of ΔH and ΔE for the reversible isothermal evaporation of 900g of water at 100°C. Assume that water vapour behaves as an ideal gas and heat of evaporation of water is 540 cal g^{-1} (R = 20 cal mol^{-1} K^{-1}).

(a) 2.83×10^6 (b) 28.3×10^6 (c) 2.83×10^{14} (d) 283×10^6

45. In which of the following case work done by the system is maximum at the definite external pressure?

(a) $C(S) + \frac{1}{2}O_2(g) \longrightarrow CO(g)$ (b) $HCl(g) \longrightarrow \frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g)$

(c) $H_2O(\ell) \longrightarrow H_2O(g)$ (d) $H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(\ell)$

46. The exothermic formaton of ClF_3 is represented by the equation –

$Cl_{2(g)} + 3F_{2(g)} \rightleftharpoons 2\,ClF_{3(g)}$; $\Delta_rH = -329$ kJ

Which of the following will increase the quantity of ClF_3 in an equilibrium mixture of Cl_2, F_2 and ClF_3?

(a) Removing Cl_2 (b) Increasing the temperature

(c) Adding F_2 (d) Increasing the volume of the container

47. What is the equilibrium expression for the reaction $P_{4(S)} + 5O_{2(g)} \rightleftharpoons P_4O_{10(s)}$?

(a) $K_C = [P_4O_{10}] / [P_4][O_2]^5$ (b) $K_C = [P_4O_{10}] / 5[P_4][O_2]$

(c) $K_C = [O_2]^5$ (d) $K_C = 1/[O_2]^5$

48. The equilibrium constant for the reaction $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$ at temperature T is 4×10^{-4}. The value of K_C for the reaction $NO_{(g)} \rightleftharpoons \frac{1}{2}N_{2(g)} + \frac{1}{2}O_{2(g)}$ at the same temperature is -

(a) 2.5×10^2 (b) 50 (c) 4×10^{-4} (d) 0.02

49. The equilibrium constants Kp_1 and Kp_2 for the reactions $X \rightleftharpoons 2Y$ and $Z \rightleftharpoons P + Q$, respectively are in the ratio of 1 : 9. If the degree of dissociation of X and Z be equal then the ratio of total pressures at these equilibria is -

(a) 1 : 1 (b) 1 : 3 (c) 1 : 9 (d) 1 : 36

50. An amount of solid NH_4HS is placed in a flask already containing ammonia gas at a certain temperature and 0.50 atm pressure. Ammonium hydrogen sulphide decomposes to yield NH_3 and H_2S gases in the flask. When the decomposition reaction reaches equilibrium, the total pressure in the flask rises to 0.84 atm? The equilibrium constant for NH_4HS decomposition at this temperature is –

(a) 0.18 (b) 0.30 (c) 0.11 (d) 0.17

51. What is the free energy change ΔG, When 1.0 mole of water at 100ºC and 1 atm pressure is converted in to steam at 100ºC and 1 atm pressure?

(a) 540 cal (b) – 9800 cal (c) 9800 cal (d) 0 cal

52. 100 ml of 1.0 N CH_3COOH are added to 100 ml of 1.0 N NaOH solution. What will be the p^H of resulting solution –

(a) 7.0 (b) > 7.0 (c) < 7.0 (d) Zero

53. The solubility in water of a sparingly soluble salt AB_2 is 1.0×10^{-5} mol L^{-1}. Its solubility product will be –

(a) 1×10^{-15} (b) 1×10^{-10} (c) 4×10^{-15} (d) 4×10^{-10}

54. The dissociation constants of monobasic acids A, B, C and D are 6×10^{-4}, 5×10^{-5}, 3.6×10^{-6}, and 7×10^{-10} respectively. The pH values of their 0.1 molar aqueous solutions are in the order –

(a) A < B < C < D (b) A > B > C > D (c) A = B = C = D (d) A > B < C > D

55. In a buffer solution X^- and HX concentration are same. If K_b value for X^- is 10^{-8} then p^H of the buffer solution is –

(a) 8.0 (b) 6.0 (c) 4.0 (d) 10.0

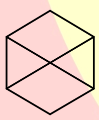
56. Write the IUPAC name of the following compound

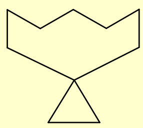
$$CH_3-CH=\underset{\underset{CH=CH_3}{|}}{CH}-\overset{\overset{O}{\|}}{C}-OH$$

(a) 2-ethenylbit-2-enric acid (b) 2-ethylenebit-2-enoic acid

(c) 2-Alkylenebit-2-enoic acid (d) none of these

57. Find the D.B. F.


A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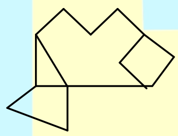
C

(a) A, B, C — 4, 2, 4 (b) A, B, C — 2, 4, 4 (c) A, B, C — 4, 4, 2 (d) None of these

58. Which one of shows both electrophile and nucleophile

(a) $-N=O$ (b) $-OH$ (c) $-NH_2$ (d) $-CH_3$

59. Which will show metamers

(a) $CH_3-O-COC_3H_7$ (b) $CH_3-O-C_3H_7$ (c) $C_2H_5-S-C_2H_5$ (d) All of these

60. Which one shows both $+M$ and $-M$

(a) $-CH=CH_2$ (b) $-OH$ (c) $-CH=O$ (d) $-CN$

61. Number of terms common to the two sequences 17, 21, 25, …, 417 and 16, 21, 26, …, 466 is :

(a) 19 (b) 20 (c) 21 (d) 22

62. If $x>1,\ y>1,\ z>1$ are in G.P., then $\log_{ex} e,\ \log_{ey} e,\ \log_{ez} e$ are in :

(a) A.P. (b) H.P. (c) G.P. (d) A.G.P.

63. If $x=\cos\alpha+\cos\beta-\cos(\alpha+\beta)$ and $y=4\sin\frac{\alpha}{2}\sin\frac{\beta}{2}\cos\left(\frac{\alpha+\beta}{2}\right)$, then $(x,\ y)$ equals :

(a) 0 (b) 1 (c) –1 (d) –2

64. If $\tan B=\frac{n\sin A\cos A}{1-n\cos^2 A}$, then $\tan(A+B)$ equals :

(a) $\frac{\sin A}{(1-n)\cos A}$ (b) $\frac{\sin A}{(1-n)\cos A}$ (c) $\frac{\sin A}{(n-1)\cos A}$ (d) $\frac{\sin A}{(n+1)\cos A}$

65. If $\left(\frac{1}{6}\right)\sin x,\ \cos x,\ \tan x$ are in G.P., then x is equal to

(a) $n\pi\pm\frac{\pi}{3},\ n\in I$ (b) $2n\pi\pm\frac{\pi}{3},\ n\in I$ (c) $n\pi+(-1)^n\frac{\pi}{3},\ n\in I$ (d) None of these

66. If $1+\sin\theta+\sin^2\theta+.....$ to $\infty=4+2\sqrt{3},\ 0<\theta<\pi,\ \theta\neq\pi/2$, then

(a) $\theta=\pi/6$ (b) $\theta=\pi/3$ (c) $\theta=\pi/3$ or $\pi/6$ (d) $\theta=\pi/3$ or $2\pi/3$

67. The medians of a triangle meet at (0, –3) and its two vertices are at (–1, 4) and (5, 2). Then the third vertex is at :

(a) (4, 15) (b) (–4, –15) (c) (–4, 15) (d) (4, –15)

68. In a triangle ABC, if $A(2,\ -1)$ and $7x-10y+1=0$ and $3x-2y+5=0$ are equations of an altitude and an angle bisector respectively drawn from B, then equation of BC is :

(a) $x+y+1=0$ (b) $5x+y+17=0$ (c) $4x+9y+30=0$ (d) $x-5y-7=0$

69. Given the family of lines, $a(2x+y+4)+b(x-2y-3)=0$. Among the lines of the family, the number of lines situated at a distance of $\sqrt{10}$ from the point M (2, –3) is :

(a) 0 (b) 1 (c) 2 (d) ∞

70. Sum of all the radii of the circles touching the coordinate axes and the line $3x+4y=12$, is :

(a) 1 (b) 2 (c) 12 (d) $\frac{9}{2}$

71. From the point $A(0,\ 3)$ on the circle $x^2+4x+(y-3)^2=0$ a chord AB is drawn and extended to a point M such that $AM=2AB$. The equation of the locus of M is :

(a) $x^2+8x+y^2=0$ (b) $x^2+8x+(y-3)^2=0$

(c) $(x-3)^2+8x+y^2=0$ (d) $x^2+8x+8y^2=0$

72. A circle of radius 5 is tangent to the line $4x-3y=18$ at $M(3,-2)$ and lies above the line. The equation of the circle, is :

(a) $x^2+y^2-9x+4y-12=0$ (b) $x^2+y^2+2x-2y-3=0$

(c) $x^2+y^2+2x-2y-23=0$ (d) $x^2+y^2+6x+4y-12=0$

73. From $(3, 4)$ chords are drawn to the circle $x^2+y^2-4x=0$. The locus of the mid points of the chords is:

(a) $x^2+y^2-5x-4y+6=0$ (b) $x^2+y^2+5x-4y+6=0$

(c) $x^2+y^2-5x+4y+6=0$ (d) $x^2+y^2-5x-4y-6=0$

74. Co-ordinates of a point on the parabola $y^2=8x$ whose focal distance is 4, are

(a) $\left(\frac{1}{2}, \pm 2\right)$ (b) $\left(1, \pm 2\sqrt{2}\right)$ (c) $(2, \pm 4)$ (d) None of these

75. The normal chord at a point 't' on the parabola $y^2=4ax$ subtends a right angle at the vertex. Then t^2 is equal to

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

76. The tangent and normal at the point $P(at^2, 2at)$ to the parabola $y^2=4ax$ meet the x-axis in T and G respectively, then the angle at which the tangent at P to the parabola is inclined to the tangent at P to the circle through P, T, G is

(a) $\tan^{-1}(t^2)$ (b) $\cot^{-1}(t^2)$ (c) $\tan^{-1}(t)$ (d) $\cot^{-1}(t)$

77. The eccentricity of the ellipse $(x-3)^2+(y-4)^2=\frac{y^2}{9}$ is :

(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{3\sqrt{2}}$ (d) $\frac{1}{\sqrt{3}}$

78. An ellipse having foci at (3, 3) and (–4, 4) and passing through the origin has eccentricity equal to :

(a) $\frac{3}{7}$ (b) $\frac{2}{7}$ (c) $\frac{5}{7}$ (d) $\frac{3}{5}$

79. Locus of the feet of the perpendiculars drawn from either foci on a variable tangent to the hyperbola $16y^2-9x^2=1$ is :

(a) $x^2+y^2=9$ (b) $x^2+y^2=\frac{1}{9}$ (c) $x^2+y^2=\frac{7}{144}$ (d) $x^2+y^2=\frac{1}{16}$

80. Eccentricity of the hyperbola conjugate to the hyperbola $\frac{x^2}{4}-\frac{y^2}{12}=1$ is :

(a) $\frac{2}{\sqrt{3}}$ (b) 2 (c) $\sqrt{3}$ (d) $\frac{4}{3}$

81. Let $n \in N$ and n is even. If the sum, of the series $\frac{1}{1\cdot(n-1)!}+\frac{1}{3!(n-3)!}+\frac{1}{5!(n-5)!}+...+\frac{1}{(n-1)!1!}=\frac{2}{45}$ then the value of n equals :
(a) 4 (b) 5 (c) 6 (d) 7

82. If the constant term of the binomial expansion $\left(2x-\frac{1}{x}\right)^n$ is –160, then n is equal to :
(a) 4 (b) 6 (c) 8 (d) 10

83. A 5 digit number divisible by 3 is to be formed using the numerals 0, 1, 2, 3, 4 and 5 without repetition. The total number of ways this can be done is :
(a) 3125 (b) 600 (c) 240 (d) 216

84. If all the letters of the word "QUEUE" are arranged in all possible manner as they are in a dictionary then the rank of the word QUEUE is :
(a) 15^{th} (b) 16^{th} (c) 17^{th} (d) 18^{th}

85. If α and β are the roots of equation $x^2-a(x+1)-b=0$ where $a,b\in R-\{0\}$ and $a+b\neq 0$, then the value of $\frac{1}{\alpha^2-a\alpha}+\frac{1}{\beta^2-a\beta}-\frac{2}{a+b}$ is equal to :
(a) $\frac{4}{a+b}$ (b) $\frac{2}{a+b}$ (c) 0 (d) $\frac{1}{a+b}$

86. If the equation $x^2+ax+b=0$ has one root equal to unity and other root lies between roots of the equation $x^2-7x+12=0$, then the range of a is :
(a) (–5, –4) (b) (–4, –3) (d) (–3, –2) (d) (4, 5)

87. If the roots of the quadratic equation $x^2+px+q=0$ are $\tan 30°$ and $\tan 15°$ respectively, then the value of $(2+q-p)$ is :
(a) 2 (b) 3 (c) 0 (d) 1

88. In the quadratic equation $x^2+(p+iq)x+3i=0$, p and q are real. If the sum of the squares of the roots is 8 then :
(a) $p=3, q=-1$ (b) $p=-3, q=-1$ (c) $p=\pm 3, q=\pm 1$ (d) $p=-3, q=1$

89. The complex number z satisfying $z+|z|=1+7i$ then the value of $|z|^2$ equals :
(a) 625 (b) 169 (c) 49 (d) 25

90. The locus represented by the equation, $|z-1|+|z+1|=2$ is :
(a) an ellipse with foci $(1, 0)$; $(-1, 0)$
(b) one of the family of circles passing through the points of intersection of the circles $|z-1|=1$ and $|z+1|=1$
(c) the radical axis of the circle $|z-1|=1$ and $|z+1|=1$
(d) the portion of the real axis between the points $(1, 0)$; $(-1, 0)$ including both

ANSWER KEY

PHYSICS									
1	2	3	4	5	6	7	8	9	10
B	**C**	**B**	**C**	**B**	**A**	**B**	**B**	**B**	**D**
11	12	13	14	15	16	17	18	19	20
D	**A**	**C**	**D**	**A**	**C**	**C**	**A**	**B**	**A**
21	22	23	24	25	26	27	28	29	30
B	**C**	**B**	**C**	**A**	**C**	**A**	**A**	**D**	**A**
CHEMISTRY									
31	32	33	34	35	36	37	38	39	40
D	**D**	**D**	**D**	**B**	**B**	**A**	**B**	**B**	**A**
41	42	43	44	45	46	47	48	49	50
B	**B**	**C**	**D**	**C**	**C**	**D**	**B**	**A**	**C**
51	52	53	54	55	56	57	58	59	60
D	**B**	**C**	**A**	**B**	**A**	**A**	**A**	**D**	**A**
MATHS									
61	62	63	64	65	66	67	68	69	70
B	**B**	**B**	**A**	**B**	**D**	**B**	**B**	**B**	**C**
71	72	73	74	75	76	77	78	79	80
B	**C**	**A**	**C**	**B**	**C**	**B**	**C**	**D**	**A**
81	82	83	84	85	86	87	88	89	90
B	**B**	**D**	**C**	**C**	**A**	**B**	**C**	**A**	**D**