हिन्दुस्तान मार्गदर्शन स्कॉलरशिप प्रोग्राम 2017-18

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Margdarshan

for JEE (Main & Advanced), NTSE, KVPY, Olympiad

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HINDUSTAN MARGDARSHAN SCHOLARSHIP TEST-2017-18

SAMPLE PAPER

FOR

CLASS 11th (Moving to 12th), [ENGG.]

INSTRUCTIONS

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.

[A] General :

1. Attempt ALL the questions. Answer have to be marked on the **OMR** sheets
2. This question paper contains **90 questions**.
3. The question paper consists of **THREE Parts Physics, Chemistry & Mathematics**
4. Blank spaces are provided at the bottom of each page for rough work. No additional sheets will be provided for rough work.
5. Blank paper, clipboard, log tabes, silde rules, calculators, cellular phones, pagers and electronic gadgets in any form are **NOT** allowed.
6. Do not Tamper / multilate the **OMR sheet** or this booklet.
7. Do not break the seals of the question-paper booklet before instructed to do so by the invigilator.
8. SUBMIT the OMR sheet to the invigilator after completing the test & take away the test paper with you.

[B] Filling of OMR Sheet :

9. In all the parts, each question will have 4 choices out of which **only one choice is correct**
10. Use only Black/Blue ball point pen for filling the OMR sheet.
11. On the OMR sheet, darken the appropriate bubble for each character of your name, Registration No., Phone No. etc.

[C] Marking Scheme :

12. For each right answer you will be **awarded 4 marks** if you darken the bubble corresponding to the corrrect answer and **zero marks** if no bubble is darkened. In case of bubbling of incorrect answer, **minus one (-1)** mark will be awarded.

(PHYSICS)

1. The position vector of a particle is given as $\vec{r} = (t^2 - 4t + 6)\hat{i} + (t^2)\hat{j}$. The time after which the velocity vector and acceleration vector becomes perpendicular to each other is equal to :-

(A) 1 sec (B) 2 sec (C) 1.5 sec (D) Not possible

2. A particle is projected from a point P with a velocity v at an angle θ with horizontal. At a certain point Q it moves at right angle to its initial direction. Then :-

(1) Velocity of particle at Q is v sin θ (2) Velocity of particle at Q is v cot θ

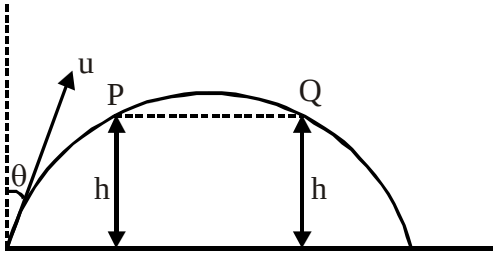
(3) Time of flight from P to Q is $\frac{v}{g}$ cosec θ (4) Time of flight from P to Q is $\frac{v}{g}$ sec θ

(A) 1,4 (B) 1,3 (C) 2,3 (D) 2,4

3. A blind person after walking 10 steps in one direction each of length 80 cm, turns randomly to the left or to right by 90°. After walking a total of 40 steps, the maximum displacement of the person from its starting point can be :-

(A) Zero (B) $8\sqrt{2}$ m (C) $16\sqrt{2}$ m (D) 32 m

4. A particle is thrown with velocity u making an angle θ with the vertical. It just crosses the top of two poles each of height h after 1s and 3s respectively. The maximum height of projectile is :-



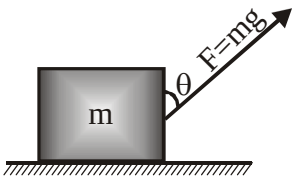
(A) 9.8 m (B) 19.6 m (C) 39.2 m (D) 4.9 m

5. If retardation produced by air resistance of projectile is one-tenth of acceleration due to gravity, the time to reach the maximum height:-

(A) Decreases by 11 percent (B) Increases by 11 percent

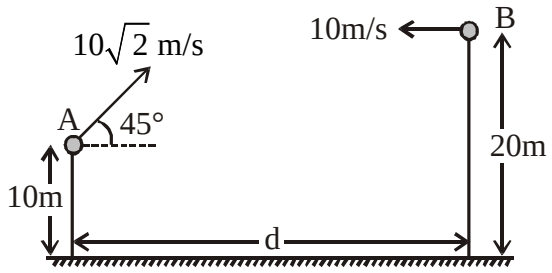
(C) Decreases by 9 percent (D) Increases by 9 percent

6. A block of mass m rests on a rough horizontal surface as shown in the figure. Coefficient of friction between the block and the surface is μ. A force F = mg acting at angle θ with the vertical side of the block pulls it. In which of the following cases can the block be pulled along the surface?



(A) $\tan\theta \geq \mu$ (B) $\cot\theta \geq \mu$ (C) $\tan\frac{\theta}{2} \geq \mu$ (D) $\cot\frac{\theta}{2} \geq \mu$

7. Two particles are projected from the two towers simultaneously as shown in the figure. What should be the value of d for then collision.

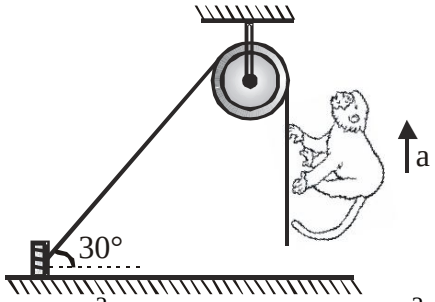


(A) 20 m (B) $20\sqrt{2}$ m (C) $30\sqrt{2}$ m (D) 40 m

8. The length of a spring is λ and its spring constant is k. It is cut into two parts of lengths λ_1 and λ_2 and $\lambda_1 = n\lambda_2$. The spring constant k_1 of the part λ_1 will be

(A) $k\left[1+\frac{1}{n}\right]$ (B) $k\left[1-\frac{1}{n}\right]$ (C) $k\left[1+\frac{1}{2n}\right]$ (D) $k\left[1-\frac{1}{2n}\right]$

9. A light string fixed at one end to a clamp on ground passes over a fixed pulley and hangs at the other side. It makes an angle of 30° with the ground. A monkey of mass 5 kg climbs up the rope. The clamp can tolerate a vertical force of 40N only. The maximum acceleration in upward direction with which the monkey can climb safely is (neglect friction and take g' = 10 m/s^2)

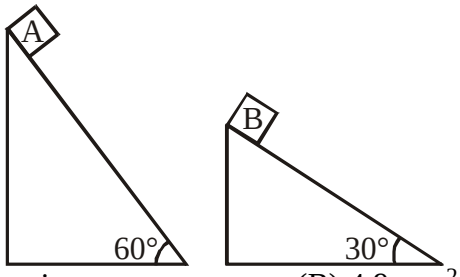


(A) 2 m/s^2 (B) 4 m/s^2 (C) 6 m/s^2 (D) 8 m/s^2

10. A man slides down a light rope whose breaking stength is η times his weight. What should be his maximum acceleration so that the rope just not breaks ?

(A) $g(1-\eta)$ (B) ηg (C) $\frac{g}{1+\eta}$ (D) $\frac{g}{1-\eta}$

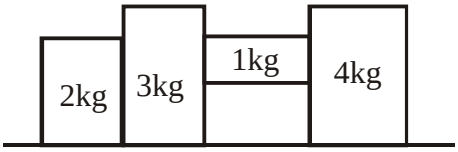
11. Two fixed frictionless inclined planes making an angle 30° and 60° with the vertical are shown in the figure. Two blocks A and B are placed on the two planes. What is the relative vertical acceleration of A with respect to B ?



(A) 4.9 ms^{-2} in vertical direction. (B) 4.9 ms^{-2} in horizontal direction

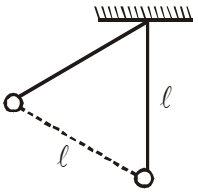
(C) 9.8 ms^{-2} in vertical direction (D) Zero

12. What should be the value of F so that block of mass 1 kg remains in equilibrium. The co-efficient of friction between 1kg and 4kg block is 0.5 and except it all surfaces are smooth :-



(A) 220 N (B) 170 N (C) 135 N (D) 150 N

13. A bob hangs from a rigid support by an inextensible string of length ℓ. If it is displaced through a distance ℓ (from the lowest position) keeping the string straight & released, the speed of the bob at the lowest position is:



(A) gl (B) 3gl (C) 2gl (D) 5gl

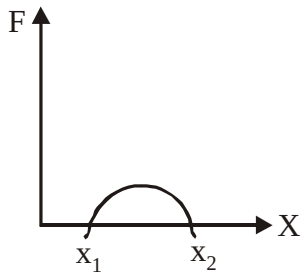
14. A body is displaced from (0, 0) to (1m, 1m) along the path x = y a force $\vec{F} = (x^2\hat{j} + y\hat{i})$ N .The work done by this force will be :-

(A) $\frac{4}{3}$J (B) $\frac{5}{6}$J (C) $\frac{3}{2}$J (D) $\frac{7}{5}$J

15. A constant power P is applied to a particle of mass m. The distance travelled by the particle when its velocity increases from v_1 to v_2 is (neglect friction) :-

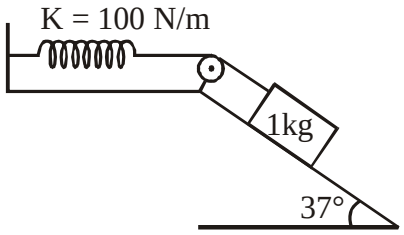
(A) $\frac{3P}{m}\left(v_2^2 - v_1^2\right)$ (B) $\frac{m}{3P}\left(v_2 - v_2\right)$ (C) $\frac{m}{3P}\left(v_2^3 - v_1^3\right)$ (D) $\frac{m}{3P}\left(v_2^2 - v_1^2\right)$

16. The force acting on a body moving along x-axis varies with the position of the particle as shown in the figure. The body is in stable equilibrium at



(A) $x = x_1$ (B) $x = x_2$ (C) both x_1 and x_2 (D) neither x_1 nor x_2

17. In the given diagram the block is released from rest with spring in the unstretched position. The block moves 10 cm down the incline before coming to rest. The co-efficient of friction between the block and incline is :-

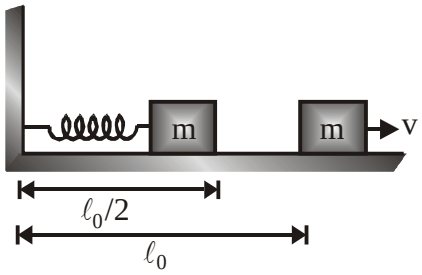


(A) 0.0625 (B) 0.625 (C) 0.125 1kg (D) 0.75

18. The bob of a pendulum is released from a horizontal position. The length of the pendulum is 1.5 m. What is the speed with which the bob arrives at the lowermost point. Given that 5% of its initial energy is dissipated against air resistance ($g = 10\ m/s^2$)

(A) 5.47 m/s (B) 5.89 m/s (C) 6.25 m/s (D) 5.34 m/s

19. A block of mass m is pushed against a spring of spring constant k fixed at one end to a wall. The block can slide on a frictionless table as shown in fig. The natural length of the spring is l_0 and it is compressed to half of its natural length when the block is released. Then final velocity of the block will be-



(A) $\frac{\ell_0}{2}\sqrt{\frac{k}{m}}$ (B) $\frac{\ell_0}{4}\sqrt{\frac{k}{m}}$ (C) $\frac{1}{2}\sqrt{\frac{k\ell_0}{m}}$ (D) $\sqrt{\frac{k\ell_0}{2m}}$

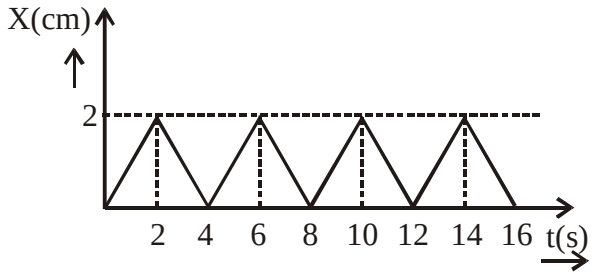
20. A projectile of mass 3m explodes at highest point of its path. It breaks into three equal parts. One part retraces its path, the second one comes to rest. The distance of the third part from the point of projection when it finally lands on the ground is - (The range of the projectile was 100 m if no explosion would have taken place)

(A) 100 m (B) 150 m (C) 250 m (D) 300 m

21. Two billiard balls each of mass 0.05 kg moving in opposite directions with speed of 6 ms^{-1} collide and rebound with the same speed. What is the impulse imparted to each ball by the other?

(A) 0.6 kg m/sec (B) 6 kg m/sec (C) 60 kg m/sec (D) 3 kg m/sec

22. The position-time graph of a body of mass 0.04 kg is shown the magnitude of each impulse will be (in m/s)



(A) 8×10^{-2} (B) 8×10^{-4} (C) 4×10^{-2} (D) 4×10^{-4}

23. A trolley of mass 300 kg carrying a sandbag of 25 kg is moving uniformly with a speed of 27 km/h on a frictionless track. After a while, sand starts leaking out of a hole on the floor of the trolley at the rate of 0.05 kg s^{-1}. What is the speed of the trolley after the entire sand bag is empty ?

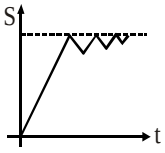
(A) more than 27 km/hr (B) less than 27 km/hr

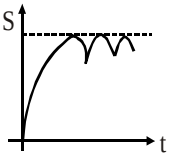
(C) zero (D) 27 km/hr (No change)

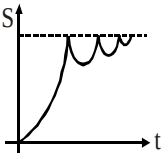
24. A bullet of mass 0.01 kg and travelling at a speed of 500 m/sec strikes a block of 2 kg which is suspended by a string of length 5 m. The centre of gravity of the block is found to rise a vertical distance of 0.1 m. What is the speed of the bullet after it emerges from the block ?

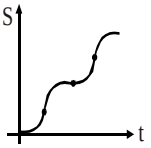
(A) 200 m/s (B) 220 m/s (C) 204 m/s (D) 284 m/s

25. A ball is dropped from a certain height on a horizontal floor. The coefficient of restitution between the ball and the floor is 1/2. The displacement-time graph of the ball will be :-

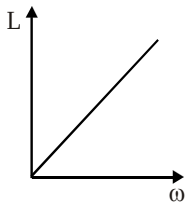
(A) 

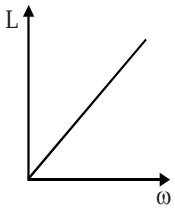
(B) 

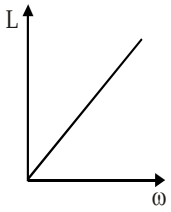
(C) 

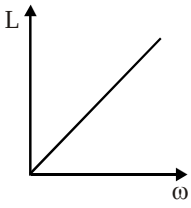
(D) 

26. The graph between the angular momentum (L) and angular velocity (ω) will be :-

(A) 

(B) 

(C) 

(D) 

27. Let $\vec{F}$ be the force acting on a particle having position vector $\vec{r}$ and $\vec{T}$ be the torque of this force about the origin then :-

(A) $\vec{r} \cdot \vec{T} = 0$ and $\vec{F} \cdot \vec{T} = 0$ (B) $\vec{r} \cdot \vec{T} = 0$ and $\vec{F} \cdot \vec{T} \neq 0$

(C) $\vec{r} \cdot \vec{T} \neq 0$ and $\vec{F} \cdot \vec{T} = 0$ (D) $\vec{r} \cdot \vec{T} \neq 0$ and $\vec{F} \cdot \vec{T} \neq 0$

28. A mass m is moving with a constant velocity along a line parallel to x-axis. Its angular momentum with respect to origin is :-

(A) Zero (B) Remains constant

(C) Goes on increasing (D) Goes on decreasing

29. In rotational motion of a rigid body, all particles may move with :-

(A) Same linear and angular velocity

(B) Same linear and different angular velocity

(C) With different linear velocities and same angular velocity

(D) With different linear velocities and different angular velocities

30. Find the torque of a force $\vec{F} = -3\hat{i} + \hat{j} + 5\hat{k}$. acting at a point $\vec{r} = 7\hat{i} + 3\hat{j} + \hat{k}$:-

(A) $14\hat{i} - 38\hat{j} + 16\hat{k}$ (B) $4\hat{i} + 4\hat{j} + 6\hat{k}$ (C) $-14\hat{i} + 38\hat{j} - 16\hat{k}$ (D) $-21\hat{i} + 3\hat{j} + 5\hat{k}$

31. 2 gms of hydrogen diffuses from a container in 10 minutes. How many gms of oxygen would diffuse through the same time under similar conditions ?

(A) 0.5 gm (B) 4 gm (C) 6 gm (D) 8 gm

32. The rms speed of a gas molecules at temperature 27 K and pressure 1.5 bar is 1×10^4 cm/sec. If both temperature and pressure are raised three time, the rms speed of the gas will be -

(A) 9×10^4 cm/sec (B) 3×10^4 cm/sec (C) $\times 10^4$ cm/sec (D) 1×10^4 cm/sec

33. The temperature of a sample of gas is raised from 127 ºC to 527 ºC. The average kinetic energy of the gas -

(A) Does not changes (B) Is doubled (C) Is halved (D) Cannot be calculated

34. When one mole of an ideal gas is compressed to half its initial volume and simultaneously heated to twice its initial temperature, the change in entropy (ΔS) is -

(A) $C_V \ln 2$ (B) $C_p \ln 2$ (C) $R \ln 2$ (D) $(C_V - R) \ln 2$

35. A gas expands from 3 dm^3 to 5 dm^3 against a constant pressure of 3 atm. The work done during expansion is used to heat 10 mole of water of temperature 290 K. Then the final temperature of water will be [Specific heat of water = 4.184 J g^{-1} K^{-1}.]

(A) 245.4 K (B) 283.3 K (C) 293 K (D) 290.81 K

36. When Fe (s) is dissolved in aqueous HCl in a closed vessel the work done is _____.

(A) positve (B) negative (C) Zero (D) cann;t be defined

37. 10 g of argon gas is compressed isothermally and reversibly at a temperature of 27°C from 10 L to 5 L . q, W, ΔE and ΔH for this process are [R = 2.0 cal K^{-1} mol^{-1}, $\log_{10} 2 = 0.30$. Atomic wt. of Ar = 40.]

(A) W = 106.635 cal, q = 103.635 cal, $\Delta E \neq 0$ & $\Delta H = 0$

(B) W = 53.635 cal, q = – 53.635 cal, $\Delta E \neq 0$ & $\Delta H = 0$

(C) W = – 53.635 cal, q = 63.635 cal, ΔE & $\Delta H \neq 0$

(D) W = 103.635 cal, q = – 103.635 cal, ΔE & $\Delta H = 0$

38. In an experiment 20 mL of a decinormal HCl solution was added to 15 mL of a decinormal $AgNO_3$ solution. AgCl was percipitated out and excess of acid was titrated with N/20 NaOH solution. The volume of NaOH required was :

(A) 10 mL (B) 20 mL (C) 30 mL (D) 5 mL

39. A sample of ammonium phosphate $(NH_4)_3PO_4$ contains 3.18 mol of H atoms. The number of mol of O atoms is the sample is :

(A) 0.265 (B) 0.795 (C) 1.06 (D) 3.18

38. 0.5 mol of $BaCl_2$ is mixed with 0.2 mol of $(NH_4)_3$ PO_4. Maximum number of mol of barium phosphate formed in this reaction is :

(A) 0.1 (B) 0.2 (C) 0.3 (D) 0.5

41. If water samples are taken from sea, rivers, clouds, lake or snow, they were be found to contain H and O in the approximate ratio of 1 : 8. This indicates the law of -

(A) Multiple proportion (B) Definite proportion

(C) Reciprocal proportion (D) None of these

42. Three flasks of equal volumes contain CH_4, CO_2 and Cl_2 gases respectively. They will contain equal number of molecules if -

(A) the mass of all the gases is same

(B) the moles of all the gas is same but temperature is different

(C) temperature and pressure of all the flasks are same

(D) temperature, pressure, and masses are same in the flasks

43. Equal volumes of different gases at any definite temperature and pressure have -

(A) Equal atoms (B) Equal masses (C) Equal densities (D) Equal molecules

44. Which of the following does not occupy a volume of 4.48 L at S.T.P. ?

(A) 0.2 mol of H_2 (B) 12.8 g of SO_2 (C) 3.2 g of O_2 (D) 800 mg of He

45. The product of atomic weight and specific heat of any element is constant which is approximately 6.4. This is known as -

(A) Newton's law (B) Avogadro's law (C) Dalton's law (D) Dulong Petit's law

46. A compound of vanadium has a magnetic moment (μ) of 1.73 BM. If the vanadium ion in the compound is present as V^{x+}, then, the value of x is ?

(A) 1 (B) 2 (C) 3 (D) 4

47. What is the maximum number of electrons in an atom that can have the quantum number n = 4, m = + 1 ?

(A) 4 (B) 15 (C) 3 (D) 6

48. Incorrect order of radius is

(A) $Sr^{2+} < Rb^{+} < Br^{-} < Se^{2-}$ (B) $Nb^{5+} < Zr^{4+} < Y^{3+}$

(C) $Co > Co^{2+} > Co^{3+} > Co^{4+}$ (D) $Ba^{2+} < Cs^{+} < Se^{2-} < As^{3-}$

49. Among Al_2O_3, SiO_2, P_2O_3 and SO_2 the correct order of acid strength is:

(A) $SO_2 < P_2O_3 < SiO_2 < Al_2O_3$ (B) $SiO_2 < SO_2 < Al_2O_3 < P_2O_3$

(C) $Al_2O_3 < SiO_2 < SO_2 < P_2O_3$ (D) $Al_2O_3 < SiO_2 < P_2O_3 < SO_2$

50. In which of the following arrangements the order is not according to the property indicated against it ?

(A) $Al^{3+} < Mg^{2+} < Na^{+} < F^{-}$ - increasing ionic size

(B) $B < C < N < O$ - increasing first ionisation enthalpy

(C) $I < Br < F < Cl$ - increasing electron gain enthalpy (with negative sign)

(D) $Li < Na < K < Rb$ – increasing metallic radius

51. Indicate the wrong statement :

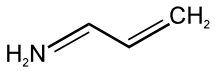
(A) A sigma bond is stronger then π - bond

(B) p-orbitals always have only sidewise overlapping

(C) s-orbitals never form π - bonds

(D) There can be only one sigma bond between two atoms

52. Molecular shapes of SF_4, CF_4 and XeF_4 are respectively :
(A) the same with 2, 0 and 1 lone pair of electrons respectively.
(B) the same with 1, 1 and 1 lone pair of electrons respectively.
(C) different with 0, 1 and 2 lone pair of electrons respectively.
(D) different with 1, 0 and 2 lone pair of electrons respectively.

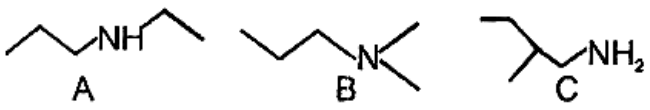
53. Which of the following represent the given mode of hybridisation $sp^2 - sp^2 - sp - sp$ from left to right.
(A) $H_2C = CH - C \equiv N$ (B) $HC \equiv C - C \equiv CH$
(C) $H_2C = C = C = CH_2$ (D) 

54. The correct order of stability for the following species is
(A) $Li_2 < He_2^+ < O_2^+ < C_2$ (B) $C_2 < O_2^+ < Li_2 < He_2^+$
(C) $He_2^+ < Li_2 < C_2 < O_2^+$ (D) $O_2^+ < C_2 < Li_2 < He_2^+$

55. Which of the following hydrides has the lowest boiling point?
(A) AsH_3 (B) SbH_3 (C) PH_3 (D) NH_3

56. Which of the following compound is wrongly named ?
(A) $CH_3CH_2CH_2\underset{\displaystyle Cl}{\underset{|}{C}}HCOOH$; 2-Chloro pentanoic acid
(B) $CH_3C \equiv \underset{\displaystyle CH_3}{\underset{|}{C}}CHCOOH$; 2- Methyl hex-3-enoic acid
(C) $CH_3CH_2CH = CHCOCH_3$; Hex -3- en-2-one
(D) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{C}}HCH_2CH_2CHO$; 4-Methyl pentanal

57. Total number of 2° amine isomers of $C_4H_{11}N$ would be (only structural)
(A) 4 (B) 3 (C) 5 (D) 2

58. About the following structure Incorrect statement is :


(A) A & B are functional isomers (B) B & C are metamers
(C) B & C are functional isomers (D) A & C are functional isomers

59. Total number of position isomers of trichlorocyclohexane which can show geometrical isomerism.
(A) 2 (B) 3 (C) 4 (D) 6

60. The correct order of bond angles (smallest first) in H_2S, NH_3, BF_3 and SiH_4 is :
(A) $H_2S < SiH_4 < NH_3 < BF_3$ (B) $NH_3 < H_2S < SiH_4 < BF_3$
(C) $H_2S < NH_3 < SiH_4 < BF_3$ (D) $H_2S < NH_3 < BF_3 < SiH_4$

61. Length of the latus rectum of the parabola $25[(x-2)^2+(y-3)^2] = (3x-4y+7)^2$ is:

(A) 4 (B) 2 (C) 1/5 (D) 2/5

62. The locus of point of trisections of the focal chords of the parabola, $y^2 = 4x$ is:

(A) $y^2 = x - 1$ (B) $9y^2 = 4.(3x-4)$ (C) $y^2 = 2(1-x)$ (D) None of these

63. Equation of line passing through mid point of intercepts made by circle $x^2 + y^2 - 4x - 6y = 0$ on

co-ordinate axes is

(A) $3x + 2y - 12 = 0$ (B) $3x + y - 6 = 0$ (C) $3x + 4y - 12 = 0$ (D) $3x + 2y - 6 = 0$

64. The condition so that the line $(x+g)\cos\theta + (y+f)\sin\theta = k$ is a tangent to $x^2 + y^2 + 2gx + 2fy + c = 0$ is

(A) $g^2 + f^2 = c + k^2$ (B) $g^2 + f^2 = c^2 + k$ (C) $g^2 + f^2 = c^2 + k^2$ (D) $g^2 + f^2 = c + k$

65. The latus rectum of a parabola whose focal chord is PSQ such that SP = 3 and SQ = 2 is given by:

(A) 24/5 (B)) 12/5 (C) 6/5 (D) 23/5

66. If $y = 2x - 3$ is a tangent to the parabola $y^2 = 4a\left(x - \frac{1}{3}\right)$, then 'a' is equal to, where $a \neq 0$:

(A) 1 (B) -1 (C) $\frac{14}{3}$ (D) $\frac{-14}{3}$

67. The locus of the mid point of a chord of the circle $x^2 + y^2 = 4$ which subtends a right angle at the origin is:

(A) $x + y = 2$ (B) $x^2 + y^2 = 1$ (C) $x^2 + y^2 = 2$ (D) $x + y = 1$

68. There are n A.M's between 3 and 54, such that the 8th mean: $(n-2)^{th}$ mean:: 3: 5. The value of n is. (A) 12 (B) 16 (C) 18 (D) 20

69. One side of an equilateral triangle is 24 cm. The mid–points of its sides are joined to form another triangle whose mid – points are in turn joined to form still another triangle. This process continues indefinitely. Then the sum of the perimeters of all the triangles is

(A) 144 cm (B) 212 cm (C) 288 cm (D) 172 cm

70. If $3 + \frac{1}{4}(3+d) + \frac{1}{4^2}(3+2d) + \ldots\ldots +$ upto $\infty = 8$, then the value of d is:

(A) 9 (B) 5 (C) 1 (D) 4

71. Equation of the circle cutting orthogonally the three circles $x^2 + y^2 - 2x + 3y - 7 = 0$, $x^2 + y^2 + 5x - 5y + 9 = 0$ and $x^2 + y^2 + 7x - 9y + 29 = 0$ is

(A) $x^2 + y^2 - 16x - 18y - 4 = 0$ (B) $x^2 + y^2 - 7x + 11y + 6 = 0$

(C) $x^2 + y^2 + 2x - 8y + 9 = 0$ (D) $x^2 + y^2 + 16x - 18y - 4 = 0$

72. An equation of a tangent common to the parabolas $y^2 = 4x$ and $x^2 = 4y$ is

(A) $x - y + 1 = 0$ (B) $x + y - 1 = 0$ (C) $x + y + 1 = 0$ (D) $y = 0$

73. The eccentricity of the ellipse $4x^2 + 9y^2 + 8x + 36y + 4 = 0$ is

(A) $\frac{5}{6}$ (B) $\frac{3}{5}$ (C) $\frac{\sqrt{2}}{3}$ (D) $\frac{\sqrt{5}}{3}$

74. If $\frac{x}{a} + \frac{y}{b} = \sqrt{2}$ touches the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at a point P, then eccentric angle of P is

(A) 0 (B) 45° (C) 60° (D) 90°

75. A straight line through P (1, 2) is such that its intercept between the axes is bisected at P. Its equation is :

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

76. In a ΔABC, side AB has the equation $2x + 3y = 29$ and the side AC has the equation $x + 2y = 16$. If the mid point of BC is (5, 6), then the equation of BC is

(A) $2x + y = 16$ (B) $x + y = 11$ (C) $2x - y = 4$ (D) $x + y = 10$

77. If F_1 & F_2 are the feet of the perpendiculars from the focii S_1 & S_2 of an ellipse $\frac{x^2}{5} + \frac{y^2}{3} = 1$ on the tangent at any point P on the ellipse, then $(S_1F_1).(S_2F_2)$ is equal to :

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

78. P & Q are corresponding points on the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$, and the auxiliary circle respectively. The normal at P to the ellipse meets CQ in R where C is centre of the ellipse. Then ℓ(CR) is

(A) 5 units (B) 6 units (C) 7 units (D) 8 units

79. An ellipse and a hyperbola have the same centre origin, the same foci and the minor-axis of the one is the same as the conjugate axis of the other. If e_1, e_2 be their eccentricities respectively, then $\frac{1}{e_1^2} + \frac{1}{e_2^2} =$

(A) 1 (B) 2 (C) 4 (D) 10

80. If $f(x) = x^2 + 2bx + 2c^2$ and $g(x) = -x^2 - 2cx + b^2$ are such that min f(x) > max g(x), then the relation between b and c, is

(A) no relation (B) $0 < c < b/2$ (C) $c^2 < 2b$ (D) $c^2 > 2b^2$

81. The equation, $\pi^x = -2x^2 + 6x - 9$ has:

(A) no solution (B) one solution (C) two solutions (D) infinite solutions

82. A square of side 'a' lies above the x-axis and has one vertex at the origin. The side passing through the origin makes an angle $\alpha \left(0 < \alpha < \frac{\pi}{4}\right)$ with the positive direction of x-axis. The equation of its diagonal not passing through the origin is :

(A) $y(\cos\alpha - \sin\alpha) - x(\sin\alpha - \cos\alpha) = a$ (B) $y(\cos\alpha + \sin\alpha) + x(\sin\alpha - \cos\alpha) = a$

(C) $y(\cos\alpha + \sin\alpha) + x(\sin\alpha + \cos\alpha) = a$ (D) $y(\cos\alpha + \sin\alpha) + x(\cos\alpha - \sin\alpha) = a$

83. The set of values of 'b' for which the origin and the point (1, 1) lie on the same side of the straight line, $a^2x + a by + 1 = 0 \ \forall \ a \in R, b > 0$ are :

(A) $b \in (2, 4)$ (B) $b \in (0, 2)$ (C) $b \in [0, 2]$ (D) $(2, \infty)$

84. The eccentricity of the hyperbola whose latus rectum is 8 and conjugate axis is equal to half the distance between the foci, is :

(A) $\frac{4}{3}$ (B) $\frac{4}{\sqrt{3}}$ (C) $\frac{2}{\sqrt{3}}$ (D) $\frac{5}{\sqrt{3}}$

85. Find locus of centroid of ΔABC, if B(1, 1), C(4, 2) and A lies on the line $y = x + 3$.

(A) $3x + 3y + 1 = 0$ (B) $x + y = 3$ (C) $3x - 3y + 1 = 0$ (D) $x - y = 3$

86. If P ($\sqrt{2}$ sec θ, $\sqrt{2}$ tan θ) is a point on the hyperbola whose distance from the origin is $\sqrt{6}$ where P is in the first quadrant then θ =

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{15}$

87. For the equation $3x^2 + px + 3 = 0$, $p > 0$ if one of the roots is square of the other, then p is equal to:

(A) 1/3 (B) 1 (C) 3 (D) 2/3

88. Consider the equation $x^2 + 2x - n = 0$, where $n \in N$ and $n \in [5, 100]$. Total number of different values of 'n' so that the given equation has integral roots, is

(A) 4 (B) 6 (C) 8 (D) 3

89. If $x \in R$, the numbers $5^{1+x} + 5^{1-x}$, a/2, $25^x + 25^{-x}$ form an A.P. then 'a' must lie in the interval:

(A) [1, 5] (B) [2, 5] (C) [5, 12] (D) [12, ∞)

90. The sum $\sum_{r=2}^{\infty} \frac{1}{r^2 - 1}$ is equal to:

(A) 1 (B) 3/4 (C) 4/3 (D) 3/2

ANSWER KEY

PHYSICS

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

CHEMISTRY

31.	D	**32.**	C	**33.**	B	**34.**	D	**35.**	D	**36.**	C	**37.**	D
38.	A	39.	C	38.	B	**41.**	A	**42.**	C	**43.**	D	44.	C
45.	D	46.	D	47.	D	48.	D	49.	D	50.	B	**51.**	B
52.	D	**53.**	A	54.	C	**55.**	C	56.	B	**57.**	B	**58.**	B
59.	B	**60.**	C										

MATHEMATICS

61.	D	**62.**	D	**63.**	D	**64.**	A	**65.**	A	**66.**	D	**67.**	C
68.	B	**69.**	A	**70.**	A	**71.**	A	**72.**	C	**73.**	D	**74.**	B
75.	D	**76.**	B	**77.**	B	**78.**	C	**79.**	B	**80.**	D	**81.**	A
82.	D	**83.**	B	**84.**	C	**85.**	C	**86.**	A	**87.**	C	**88.**	C
89.	D	**90.**	B									