A-0010-Z

MODULUS ADMISSION TEST

(MAT)

FIRST YEAR (XI)

Time: 3 hours *Max. Marks: 360*

Instructions to the Candidates

A. General

1. This booklet is your Question Paper containing 90 questions.
2. 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.
3. Fill in the boxes provided for Name and Enrolment No.
4. Answers are to be marked/written in the question paper itself and question paper should be handed over to invigilator after attempting the question paper.
5. For Objective question correct answer should be tick marked (✓). For subjective questions correct answer should be written in front of question.

B. Question paper format:

7. The question paper consists of **4 parts (Mental Ability, Mathematics, Physics and Chemistry)**.
8. Mental Ability ontains **30** Multiple Choice questions.

For Mathematics, Physics and Chemistry

9. **Section I** contains **15 Multiple Choice questions**. Each question has four choices (A), (B) , (C) and (D) out of which only **ONE** is correct.
10. **Section II** contains **5 questions**. Each question is numerical value. For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to second decimal place. (e.g. 6.25, 7.00, - 0.33, - .30, 30.27, - 127.30)

C. Marking Scheme

11. **Section I**,
+4 for correct answer
-1 for incorrect answer
0 for all other case

Section II,
+4 for correct answer
0 for all other case
There is **No negative** marking in Section-II

(**Mental Ability** section have same marking scheme as of **Section-I**)

Name of the Student : _____

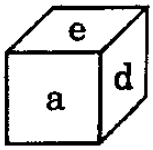
Phone Number: _____ **Date of Examination:**_____

MENTAL ABILITY

1. I am facing east. I turn 100° in the clockwise direction and then 145° in the anti clockwise direction. Which direction am I facing now?
(A) East (B) North-east (C) North-West (D) South-west

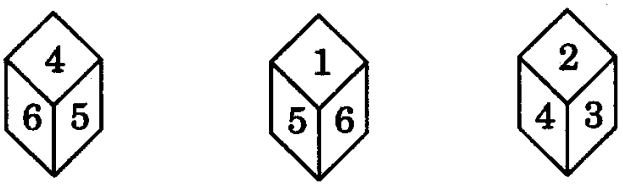
2. A watch reads 4.30. If the minute hand points East, in what direction will the hour hand point ?
(A) North (B) North-west (C) South-east (D) North-east

3 In a dice a, b, c and d are written on the adjacent faces, in a clockwise order and e and f at the top and bottom. When c is at the top, what will be at the bottom?



(A) a (B) b (C) c (D) Data insufficient

4. Which number is on the face opposite 3, if the three different positions of a dice are as shown in the figures given below.



(A) 5 (B) 6 (C) 2 (D) 1

5. If P means x, R means +, T means ÷ and S means –, then 18 T 3 P 9 S 8 R 6 =?
(A) $-1\frac{1}{3}$ (B) 52 (C) 46 (D) 58

6. If ÷ means +, – means ÷, x means – and + means x, then
$$\frac{(36\times 4)-8\div 4}{4+8\times 2+16\div 1}=?$$
(A) 0 (B) 8 (C) 12 (D) 16

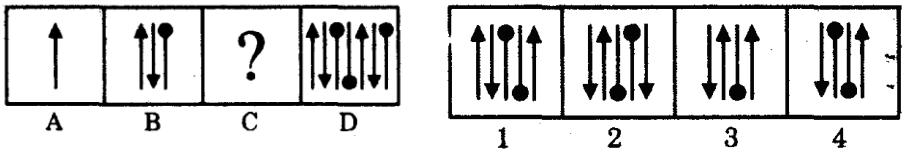
Direction (7 to 8) : Select the word that comes last when the words are arranged in a way it is arranged in a dictionary.

7. (A) radical (B) radiate (C) racket (D) radar

8. (A) understand (B) unnecessary (C) uncertain (D) unethical

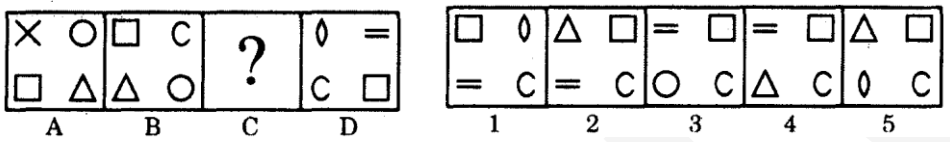
Direction (9 to 11): you are given a set of figures called problem Figures that follow a certain sequence and hence form a series. However one of these figures is missing and is indicated by a question mark. This figures is to be selected from another set of figures called Answer figures, that would replace the question mark so as to establish the series.

PROBLEM FIGURES **ANSWER FIGURES**

9. 

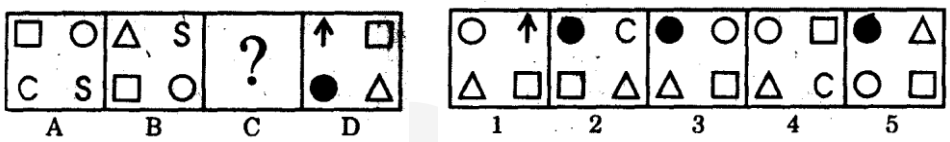
(A) 4 (B) 3 (C) 2 (D) 1

PROBLEM FIGURES **ANSWER FIGURES**

10. 

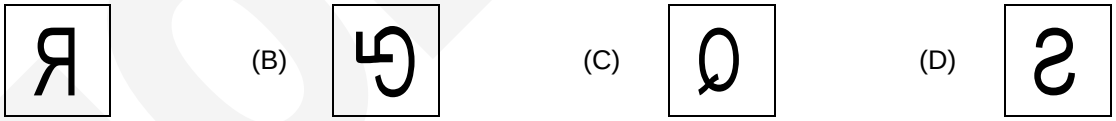
(A) 5 (B) 3 (C) 1 (D) 2

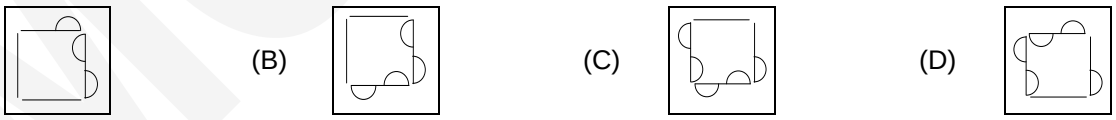
PROBLEM FIGURES **ANSWER FIGURES**

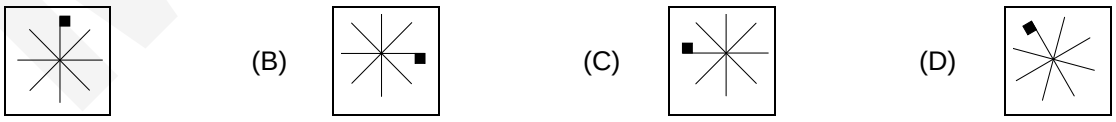
11. 

(A) 5 (B) 3 (C) 1 (D) 2

Directions(12 to 14): Out of the four figures (A), (B), (C) and (D), given in each problem, three are similar in a certain way. However, one figure is not like the other three. Choose the figure which is different from the rest.

12.  (B) (C) (D)

13.  (B) (C) (D)

14.  (B) (C) (D)

Direction (15-17): Read the following information carefully and answer the questions given below:

Seven children A, B, C, D, E ,F and G are standing in a line. G is to the right of D and to the left of B. A is on the right of C. A and D have one child between them. E and B have two children between them. D and F have two children between them**.**

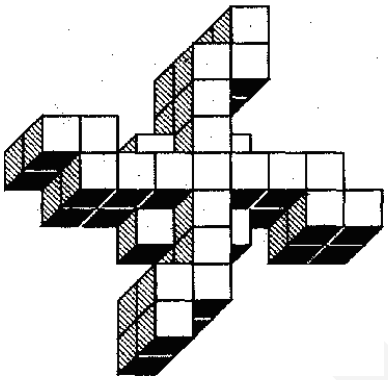
15. Who is on the extreme right?

(A) F (B) E (C) B (D) G

16. Who is exactly in the middle?
(A) A (B) C (C) D (D) E

17. Who is on the extreme left?
(A) A (B) C (C) B (D) D

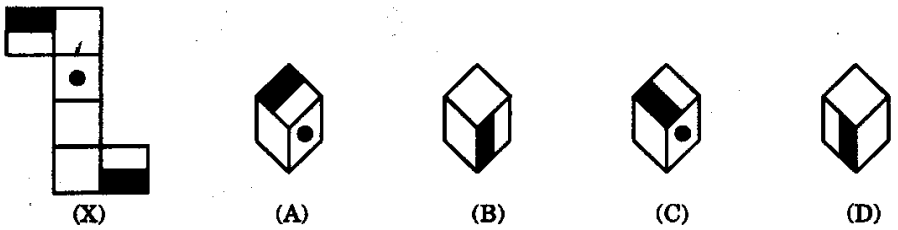
18. Count the number of cubes in the following figure.



(A) 64 (B) 46 (C) 58 (D) 50

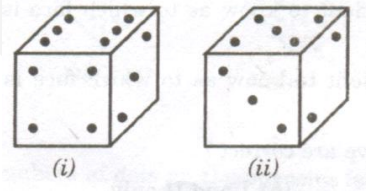
Direction (19) : After closing the given open cube how it will look like.

19.



(A) A and B only (B) B and C only (C) B and D only (D) A, B, C and D

20. Two positions of a block are shown below. When 2 is at the bottom, which number will be at the top?



(A) 1 (B) 4 (C) 6 (D) cannot be determined

21. If '<' means 'minus', '>' means 'plus', '=' means 'multiplied by' and '$' means 'divided by', then what would be the value of 6 > 15 $ 9 < 6?
(A) 6 (B) 4 (C) 36 (D) 30

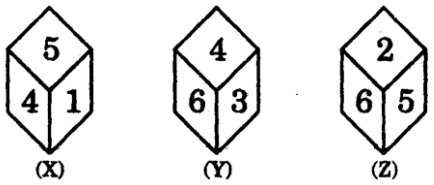
22. If A stands for +, B stands for –, C stands for x, then what is the value of (10 C 4) A (4 C 4) B 6?
(A) 60 (B) 56 (C) 50 (D) 46

23. A direction pole was situated on the crossing. Due to an accident the pole turned in such a manner that the pointer which was showing East, started showing South. One traveller went to the wrong direction thinking it to be West. In what direction actually he was travelling?
(A) North (B) South (C) East (D) West

24. If 'South-east' is called 'East', 'North-west' is called 'West', 'South-west' is called 'South' and so on, what will 'North' be called?
(A) East (B) North-east (C) North-west (D) South

25. In a certain code MONKEY is written as XDIMNL, what will be the code of TIGER?
(A) QDEHS (B) SDFHS (C) SHFDQ (D) UJHFS

26. Three different positions X, Y and Z of a dice are shown in the figures given below. Answer the following questions which are based upon these figures.



Which of the hidden numbers adjacent to 5 in position X is/are common to the hidden numbers adjacent to 5 in position Z ?
(A) 1 and 4 (B) 2 (C) 6 (D) None

27. If L denotes ÷, M denotes x, P denotes + and Q denotes –, then which of the following statements is true?
(A) 32 P 8 L 16 Q 4 = $-\frac{3}{2}$ (B) 6 M 18 Q 26 L 13 P 7 = $\frac{173}{13}$
(C) 11 M 34 L 17 Q 8 L 3 = $\frac{38}{3}$ (D) 9 P 9 L 9 Q 9 M 9 = – 71

28. Two ladies and two men are playing cards and are seated at North, East, South and West of a table. No lady is facing East. Persons sitting opposite to each other are not of the same sex. One man is facing South. Which directions are the ladies facing ?
(A) East and West (B) South and East (C) North and East (D) North and West

29. A, B, C and D are playing cards. A and B are partners. D faces towards North. If A faces towards West, then who faces towards west?
(A) B (B) C (C) D (D) A

30. A man has certain number of small boxes to pack into parcels. If he packs 3, 4, 5 or 6 in a parcel, he is left with one over; if he packs 7 in a parcel, None of these is left over, what is the number of boxes he may have to pack?
(A) 106 (B) 301 (C) 309 (D) 400

MATHEMATICS

Section-I :: Single Correct Answer Type

31. If $A=3^{\log_5 7}+\sqrt[3]{2}^{\log_{0.5} 0.125}$ & $B=7^{\log_5 3}+\sqrt[3]{3}^{\log_{0.1} 0.001}$ then

(A) A>B (B) A<B (C) A=B (D) None

32. If $*(a,b)=a^b$, $\theta(a,b)=\log_b a$, $\Delta(a,b)=\log_b(a/b)$, then

$*\left[5,\left[\theta(2,3)\times\theta(3,4)\times\theta(4,5)\times.....\theta(10,11)\right]\right]=$

(A) $*(5,\theta(11,12))$ (B) $*(2,\theta(5,11))$ (C) $*(5,\theta(2,\pi))$ (D) None

33. A.M of four +ve numbers x_1,x_2,x_3,x_4 $(x_1<x_2<x_3<x_4)$ is 70. $\max(x_1,x_2,x_3,x_4)$ is 90, then $\max(x_1+x_3)$ is _____

(A) 179 (B) 139 (C) 103 (D) None of these

34. If two balanced dice are tossed once, the probability of the event, that the sum of the integers coming on the upper sides of the two dice is 9, is

(A) 7/18 (B) 5/36 (C) 1/9 (D) 1/6

35. Without actual multiplication or by using algebraic identities find

$\frac{1}{2}\left(\sqrt{15}+\sqrt{67}+\sqrt{82}\right)\left(\sqrt{15}+\sqrt{67}-\sqrt{82}\right)\left(\sqrt{15}-\sqrt{67}+\sqrt{82}\right)\left(-\sqrt{15}+\sqrt{67}+\sqrt{82}\right)$

(A) 2009 (B) 2010 (C) 2012 (D) None of these

36. A particle begins at the origin and moves successively in the following directions :

1 unit to the right, $\frac{1}{2}$ unit up, $\frac{1}{4}$ unit to the right , $\frac{1}{8}$ unit down, $\frac{1}{16}$ unit to the right etc.,The length of each move is half the length of the previous move, and movement continues in the "zig zag" manner described. Find the coordinates of the point to which the zigzag converges.

(A) $\left(\frac{4}{3},\frac{2}{5}\right)$ (B) $\left(\frac{3}{4},\frac{5}{2}\right)$ (C) $\left(\frac{5}{2},\frac{3}{4}\right)$ (D) $\left(\frac{2}{5},\frac{4}{3}\right)$

37. Solve: $\sqrt{x+\sqrt{x}}+\sqrt{x-\sqrt{x}}=\sqrt[3]{\frac{x}{x+\sqrt{x}}}$

(A) $\frac{5}{4}$ (B) $\frac{25}{16}$ (C) $\frac{9}{16}$ (D) None of these

38. Find the orthocentre of the triangle formed with the vertices $(0,0),(2010,0)$ and $(2000,2010)$

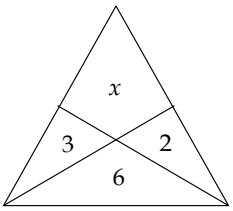
(A) $\left(2000,\frac{2000}{201}\right)$ (B) $\left(2010,\frac{2001}{201}\right)$ (C) $\left(2,\frac{7}{3}\right)$ (D) None of these

39. If $\underbrace{a^n+a^n+a^n+.....+a^n}_{m\ times}=a^{n+1}$, $\underbrace{b^m+b^m+b^m+.....+b^m}_{n\ times}=b^{m+1}$ then the value of

$mn-(ab-2015)=$

(A) $m+n$ (B) 2013 (C) mn (D) 2015

40. Triangle ABC is divided into four regions with areas as shown in the diagram, then the value of x is



(A) 8/5 (B) 9/5
(C) 17/5 (D) 1/5

41. x and $y(\neq 1)$ are real numbers that satisfy $\frac{x^3+12xy}{1-y^3}=8$ and $3x+5y=2$. Value of $x-y$ is :

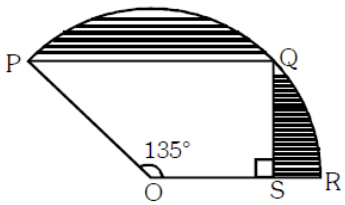
(A) – 10 (B) 10 (C) 8 (D) – 8

42. $A(2,3), B(2,4), C(3,4)$ are the vertices of ΔABC then

	Column I		**Column II**
P)	Centroid	1)	$(2,4)$
Q)	Orthocentre	2)	$\left(\frac{7}{3},\frac{11}{3}\right)$
R)	Circum centre	3)	$(2,3)$
		4)	$\left(\frac{5}{2},\frac{7}{2}\right)$

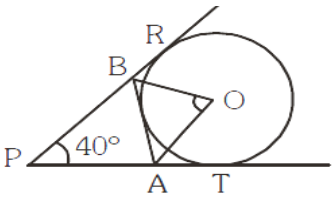
(A) 2-P, 1-Q , 3-R (B) 2-P , 1-Q , 4-R (C) 2-P , 3-Q , 1-R (D) 2-P , 4- Q , 3-R

43. In the figure, PQSO is a trapezium in which PQ ||OS, $\angle$POS = 135° and $\angle$OSQ = 90°. Points P, Q and R lie on a circle with centre O and radius 12 cm. The area of the shaded part, in cm^2, is



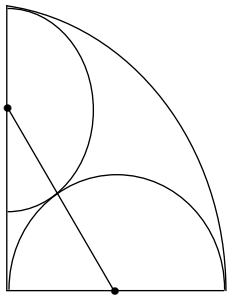
(A) $61\frac{2}{7}$ (B) $61\frac{5}{7}$ (C) $73\frac{5}{7}$ (D) $73\frac{2}{7}$

44. In the figure, Δ APB is formed by three tangents to the circle with centre O. If $\angle$APB = 40º, then the measure of $\angle$BOA is



(A) 50º (B) 55º
(C) 60º (D) 70º

45. OAB is a quadrant of a circle with radius 'R' units. Two semi circles inscribed in a quadrant as shown in the figure. They touch at a point such that the line joining the centres of two semi circles passes through the point of contact. If the radius of smaller semi circle is 'r' units then $r:R$ is



(A) 3 : 1 (B) 2 : 5
(C) 1 : 3 (D) None of these

Section-II :: Numerical Based

46. The roots of $x^3+3x^2+4x=11$ are a,b,c. The equation whose roots are $a+b, b+c$ and $c+a$ is $x^3-rx^2+5x+t=0$. Value of 't' is _____

47. Number of solutions to be the equation: $4^{2\sin^2 x}16^{\tan^2 x}2^{4\cos^2 x}=256, 0<x<\frac{\pi}{2}$ _____

48. Let a,b,c be positive integers less than 10 such that $(100a+10b+c)^2=(a+b+c)^5$, what is $\left(a^2+b^2+c^2\right)$? _____

49. If N is a [positive integer with $(n+1)$ digits where $a_i (i=0,1,2,3.....n)$ are digits and $N=a_n 10^n+a_{n-1}10^{n-1}+.....+a_1 10+a_0$. We define $F(N)$ as $F(N)=(a_n+1)(a_{n-1}+1).....(a_1+1)(a_0+1)$, then the number of two digit numbers such that $F(N)=N+1$ is _____

50. Four positive integers a, b, c and d have a product of 8! And satisfy
ab + a + b = 524
bc + b + c = 146
cd + c + d = 104
then find the value of a – d. ($8! = 1\times2\times3\times4\times5\times6\times7\times8$) _____

PHYSICS

Section-I :: Single Correct Answer Type

51. A body travels for 15 sec starting from rest with constant acceleration. If it travels distances S_1, S_2 and S_3. In the first five seconds, second five seconds and next five seconds respectively the relation between S_1 and S_2 and S_3 is

(A) $S_1 = S_2 = S_3$ (B) $5S_1 = 3S_2 = S_3$ (C) $S_1 = \frac{1}{3}S_2 = \frac{1}{5}S_3$ (D) $S_1 = \frac{1}{5}S_2 = \frac{1}{3}S_3$

52. The distance between the centre of moon and the earth is D, the mass of the earth is 81 times the mass of the moon. At what distance from the centre of the earth, the gravitational force will be zero

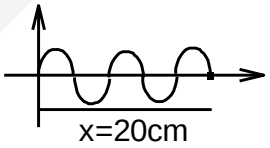
(A) $\frac{D}{2}$ (B) $\frac{20}{3}$ (C) $\frac{4D}{3}$ (D) $\frac{9D}{10}$

53. Two masses m and m_1 are tied with a thread passing over a pulley m_1 is on a frictionless horizontal surface and m is hanging freely. If acceleration due to gravity is g the acceleration of m_1 in this arrangement will be $(m > m^1)$

(A) g (B) $\frac{mg}{(m+m_1)}$ (C) $\frac{m_1 g}{(m+m_1)}$ (D) $\frac{g(m-m_1)}{(m+m_1)}$

54. For the wave shown in figure, the frequency and wavelength if its speed is 320 m/sec are

(A) 8 cm, 400 Hz (B) 8 cm, 4000 Hz
(C) 80 cm, 40 Hz (D) 40 cm, 8000 Hz



55. 2000 J of work is done in sliding a 2 kg block up an inclined plane of height 20 m. Taking $g = 10 m/s^2$ work done against friction by

(A) 1600 J (B) 400 J (C) 800 J (D) 1200 J

56. A straight wire of length 0.5 m and carrying a current of 1.2 A is placed in uniform magnetic field of induction 2T. The magnetic field is perpendicular to the length of the wire. The force on the wire is

(A) 2.4 N (B) 1.2 N (C) 3.0 N (D) 2.0 N

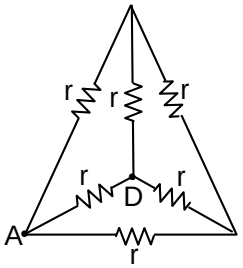
57. A thin concave and a thin convex lens are in contact. The ratio of the magnitude of power of two lenses is 2/3 and focal length of combination is 30 cm. Then the focal length of individual lenses are

(A) $-15cm, 10cm$ (B) $-75cm, 50cm$ (C) $75cm, -50cm$ (D) $75cm, 50cm$

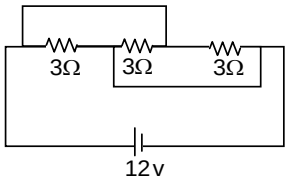
58. In the given network, the equivalent resistance between A and D is

(A) $\frac{2}{5}r$ (B) $\frac{5r}{2}$

(C) $\frac{r}{2}$ (D) none of these

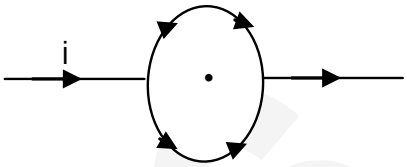


59. Find current in the circuit



(A) 4 A (B) 2A
(C) 1.3 A (D) 12 A

60. The field at the centre of a loop of radius R due to the current of I ampere in the loop as shown in figure will be



(A) $\frac{\mu_0 i}{2R}$ (B) zero

(C) $\frac{\mu_0}{4\pi}\frac{2i}{R}(\pi-1)$ (D) $\frac{\mu_0}{4\pi}\frac{2i}{R}$

61. Find the mass required to generate energy of 1.3×10^{19} joule in nuclear reaction

(A) $1.44\times10^{-2}g$ (B) $1.44\times10^{-2}kg$ (C) 144 kg (D) 144 g

62. From an automatic gun a man fires 120 bullets per minute with a speed 1080 km/hr. If each bullet weighs 20 g, the power of gun is

(A) 300 W (B) 1800 W (C) 1 KW (D) 450 W

63. In an explosion a body breaks up into two pieces of unequal masses. Then

(A) lighter part will have more momentum
(B) heavier part will have more momentum
(C) both parts will have numerically equal momentum
(D) both parts will have equal kinetic energy

64. A mass of 1 kg is suspended by a thread. It is

(a) lifted up with an acceleration $4.9 m/s^2$

(b) lowered with an acceleration $4.9 m/s^2$

The ratio of the tension in thread is

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

65. The area of parallelogram formed by vectors $A=i+2j+3k$ and $B=3i-2j+k$ as adjacent sides is

(A) $8\sqrt{3}$ units (B) 64 units (C) 32 units (D) $\sqrt{3}$ units

Section-II :: Numerical Based

66. A body weights 60 g in air . If its volume is 10 cc in water. How much H will weigh in water (in gram) _____

67. A convex mirror of focal length 20 cm produces an image 1/5th of the size of object. What is the distance of the image from the mirror (in cm) _____

68. A ball is dropped from a height. If it takes 0.2 s to cross the last 6 m before hitting the ground, the height from which it was dropped? (g= 10 m/s^2) (in m) _____

69. A 20 N metal block is suspended by a spring balance. A beaker containing some water is placed on a weighing machine which reads 40 N. The spring balance is now lowered so that the block gets immersed in the water. The spring balance now reads 16 N. The reading of the weighing machine will be (in N) _____

70. A bullet of mass 50 g is fired from below into the bob of mass 450 g of a long simple pendulum. The bullet remains inside the bob and the bob rises through a height of 1.8 m. Find the speed of the bullet. (in m/s) _____

CHEMISTRY

Section-I :: Single Correct Answer Type

71. 2 moles of CO_2 has
(A) Mass – 88 gm (B) $6N_A$ of atoms (C) Molecules – 2 N_A (D) All

72. Which of the following pair has smaller ion first followed by the larger ion
(A) Al^{3+}, Na^+ (B) O^{2-}, Na^+ (C) K^+, Ca^{2+} (D) S^{2-}, S^-

73. α – ray contains _____ particles
(A) electrons (B) protons (C) He^{2+} ions (D) H^+ ions

74. Identify the metal which can produced H_2 gas with dil HNO_3
(A) Fe (B) Mn (C) Zn (D) Cu

75. Homogenous mixture
(A) can exhibit Tyndall effect (B) has uniform distribution of a particles
(C) can exist only in liquid state (D) is highly unstable

76. The flux used in smelting of iron ore is
(A) coke (B) haematite ore (C) lime stone (D) calcium silicate

77. Which of the following properties does not favour formation of cation
(A) large size (B) low electronegativity
(C) low electronafffinity (D) High ionization energy

78. The components of X can be separated into Y and Z by sublimation. The components of Y can be separated by electrolysis in the molten state.
Then X, Y and Z may be
(A) $X - S_8 + I_2$ $Y - S_8$, $Z - I_2$ (B) $X - NaCl + I_2$ $Y - I_2$, $Z - NaCl$
(C) $X - NaCl + I_2$ $Y - NaCl$, $Z - I_2$ (D) $X - S_8 + I_2$ $Y - I_2$, $Z - S_8$

79. Dichromate ion is
(A) $Cr_2O_7^{2-}$ (B) CrO_4^{2-} (C) $Cr_2O_4^{2-}$ (D) CrO_3^{2-}

80. Match the following

List-I	List-II
(i) Evaporation	(A) Purification of comphore
(ii) Vaporization	(B) Causes cooling
(iii) Sublimation	(C) Increases volume of water below 0°C
(iv) Condensation	(D) Takes place at 100°C and 1 atm for pure water
(v) Freezing	(E) Converts vapours to liquid

(A) i-B, ii-D, iii-A, iv-C, v-E (B) i-B, ii-D, iii-C, iv-A, v-E
(C) i-B, ii-D, iii-E, iv-C, v-A (D) i-B, ii-D, iii-A, iv-E, v-C

81. Smallest atom in the 2nd period is
(A) Li (B) N (C) O (D) F

82. The region of space around the nucleus where probability of finding an electron is maximum is called
(A) orbital (B) orbit (C) nucleus (D) sub-shell

83. Which of the following cases, the first element has higher atomic mass than second element?
(A) Te , I (B) K , Ca (C) Sc , Ti (D) Na , Mg

84. Boiling point of pure water is maximum at
(A) 1 atm pressure (B) 2 atm pressure
(C) 3 atm pressure (D) equal in all cases

85. 2 kg sample of 40% pure sulphur powder when burnt in excess O_2 what volume of SO_2 will be produced at STP?
$S + O_2 \rightarrow SO_2$
(A) $5.6L$ (B) $56L$ (C) $560L$ (D) $5600L$

Section-II :: Numerical Based

86. The first member of ketone homologous series has _____ carbon atoms in it

87. Number of subshells in 4^{th}-orbit = _____

88. The covalency of 'O' in H_2O is _____

89. The differentiating electron of sodium has possible magnetic quantum number _____

90. Number of moles of $CaCO_3$ in 200 g sample is _____

All the Best