gms. The weight of the teacher is

a) 45 kgs   b) 55 kgs   c) 62 kgs   d) 64 kgs

66. In an alley a 25m tall ladder is placed against a wall touching the wall at apoint 24m high from the level ground. When the ladder is switched. over to the wall on the other side of the alley, without changing the base position of the ladder, it touches the wall at a point 7m hight from the ground. The width of the alley is

a) 28m   b) 31m   c) 33m   d) 35m

67. There are 250 seniors in a class. 60% have plans to go to college. Of those with plans to go to college, 40% plan to go to a college out of state. The number of students plan to attend in state college is

a) 60   b) 50   c) 90   d) 20

68. Sum of the cubes of the roots of $x^3-15x^2+71x - 105 = 0$ is

a) 495   b) 105   c) 1060   d) -71

69. ABCDE is a pentagon inscribed in a circle with centre O. If AB = BC = CD and angle ABC is 132^0 then angle AEB is

a) 48^0 b) 24^0 c) 60^0 d) 132^0

70. Suppose $f(x) = ax^2+bx+c$. f(x) leaves a remainder 18 when divided by x+2 and a remainder 13 when divided by x-3. Also f(0)=4. Then 2a+ b +c is equal to

a) 2   b) 3   c) 5   d) -35

IIT Ramaiah Entrance Test Papers - SAT - 2019
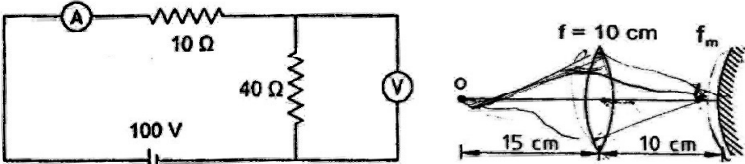Time : 3 Hrs.   Marks: 360
Each Question has 4 choices (a), (b), (c) and (d)- out of which ONE or MORE THAN ONE CORRECT.
For correct answer +4 marks and -1 mark for wrong answers.

1. The apparent weight of a solid body when measured in water and a liquid are 90 N and 80 N respectively. If the true weight of the body is 100 N, the relative densities of the solid and the liquid are
a) 5 and 2   b) 10 and 2   c) 2 and 1   d) 8 and 4

2. A body moves in a circular path at a constant speed of π m/s. The magnitude of average velocity of this body for half a revolution is
a) 1 ms^{-1} b) 2 ms^{-1} c) 3 ms^{-1} d) 4 ms^{-1}

3. A freely falling body strikes a horizontal surface and raises to a height 1/64 of the height from which it was dropped. If the velocity with which it hits the floor is v, the change in the magnitude of velocity due to impact with the floor is
a) 7v/8   b) 5v/8   c) 3v/8   d) 9v/8

4. In the previous question, magnitude of the change in the of velocity of the body due to impact is
a) 7v/8   b) 5v/8   c) 3v/8   d) 9v/8

5. The mass of a spherical planet is 8 times that of the earth and its density is same as that of earth. The acceleration due to gravity (in ms^{-2}) on the surface of this planet will be (gravity on earth is 9.8 ms^{-2})
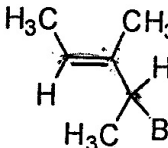
53. One end of a diameter of a circle having center at (-2, 5) is (2, 3) . The other end of the diameter is

   a) (2, -5)   b) (-6,7)   c) (0, 2)   d) (0, -2)

54. If a trapezium is cyclic then

   a) Its parallel sides are equal
   b) Its non parallel sides are equal
   c) Its diagonals are not equal
   d) It must be a rectangle

55. The points (a, 0) and (0, a), (-a, 0) and (0, -a) are the vertices of a

   a) Square
   b) Parallelogram but not a rhombus
   c) rectangle but not a square
   d) rhombus but not a square

56. Suppose O is the circumcentre of $\triangle$ ABC such that O lies inside the triangle. If angle BOA is 110^0 and angle COA is 90^0 then angle BAC is

   a) 20^0 b) 60^0 c) 80^0 d) 40^0

57. If $f(x) = \dfrac{x^4 + x^2 + 1}{x^2 - x + 1}$, then the minimum value of f(x) is

   a) 1/4   b) 3/4   c) -1/4   d) -3/4

58. Two equal circles having centres at A and B are intersecting in two points P and Q. If AB= 8 and PQ = 6 then the radius of the circles is

   a) 2   b) 4   c) 5   d) 7

12. The reading of the ammeter (below, left) in the circuit (Assume voltmeter and ammeter are ideal) is
   a) 2 A   b) 1 A   c) 3 A   d) 4 A

13. In the previous question, reading of the voltmeter is
   a) 20 V   b) 40 V   c) 80 V   d) 60 V

14. A convex lens of focal length 10 cm and a convex mirror of focal length f_m are mounted coaxially (above right). The image of a point object located on the axis 15 cm to the left of the lens coincides with the object itself. Focal length f_m of the mirror is
   a) 5 cm   b) 10 cm   c) 15 cm   d) 20 cm

15. In the previous question if the mirror is removed, the distance between the image and object will be
   a) 30 cm   b) 45 cm   c) 60 cm   d) 75 cm

16. A long straight horizontal wire carries a current from south to north. Magnetic field vertically above the wire is directed
   a) westward   b) eastward
   c) northward   d) southward

17. All atoms of same element must have same
   a) number of neutrons   b) number of nucleons
   c) atomic number   d)mass number

18. A changed particle is moving in a magnetic field at right angles to the field in a circular path of radius R. If a particle with same charge and twice greater mass were to be moving with half the velocity in the same magnetic field with its velocity at right angles to the field, the radius of its circular path would be

a) 78.4   b) 19.6   c) 9.8   d) 4.9

6. A constant horizontal force acts on a body of mass 9 kg lying at rest on a smooth horizontal surface for 10 s. If the body moves 25m in this time, the magnitude of the force is
    a) 4.5 N   b) 2 N   c) 3 N   d) 4 N

7.   Steam at 100^0C is passed in to a calorimeter of water equivalent 10 g containing 290g of water at 30^0C till the temperature of water raises to 40^0C. The mass of steam condensed is (Latent heat of steam is 540 cal/g)
    a) 10 g   b) 2.5 g   c) 3 g   d) 5 g

8. An electric bulb is rated 40 W at 80 V. If it is connected in parallel to a 40 V supply having negligible internal resistance, the current through the bulb is
    a) 1 A   b) 2 A   c) 0.5 A   d) 0.25 A

9. Electromagnetic radiations in the increasing order of wavelength from the following is
    a) Infrared waves, radio waves, x rays, visible light
    b) radio waves, Infrared waves, visible light , x rays
    c) x rays, visible light, Infrared waves, radio waves
    d) radio waves, visible light, Infrared waves, x rays

10. The angle of minimum deviation of an equilateral prism is 30^0. The velocity of light inside the prism is (velocity of light in vaccum = 3×10^8 ms^{-1})
    a) 1.8×10^8 ms^{-1} b) 2×10^8 ms^{-1}
    c) 2.121×10^8 ms^{-1} d) 7.07×10^7 ms^{-1}

11. The resistivity of the material of a wire is 10^{-7} Ω m. If the wire is streatched to increase its length by 50%, then its resistivity will be (assume stretching does not change the temparature)
    a) 10^{-7} Ω m   b) 1.5×10^{-7} Ω m
    c) 2.25×10^{-7} Ω m   d) 2×10^{-7} Ω m

59. When $x^4+ax^3+5x^2+8x-31$ is divided by x-2 the remaineder is 5 then a is
    a) 3   b) -2   c) 2   d) 5

60. If f(x) = 2 (sin^{6}x+Cos^{6}x)-3(cos^{4}x+sin^{4}x) the value of f(π/8) - 3f(3π/8) =

    a) 1   b) -1   c) 2   d) 0

61. Notation : $\pi_{i=1}^{k} x_i = x_1.x_2....x_k$. If $x = \pi_{r=1}^{89} \log_e \tan r^0$ and

    $y = \pi_{r=1}^{89} \log_e \cot r^0$ then cos(x^2-y^2+3xy) is equal to

    a) 0   b) 1   c) -1   d) 1/2

62. If the sides of a triangle are 7, 24, 25, then the distance between its circumcentre and orthocentre of the triangle is

    a) 7   b)12   c)12.5   d) 28

63. The number of numbers from 1 to 100 each of which is not only exactly divisible by 4 but also has 4 as a digit is

    a) 7   b) 10   c) 20   d) 21

64. In a trapezium the lengths of the parallel sides are 10 and 24. P, Q are the mid points of the non parallel sides. If the line PQ intersects the diagonals in R and S then RS is equal to

    a) 5   b) 12   c) 16   d) 7

65. The average weight of a class of 29 students is 49 kgs. If the weight of the teacher be included, the average raises by 500

a) 2 R   b) R   c) 3R   d) 4 R

19. A radionuclide of atomic mass 300 amu on fission liberates 200 MeV of energy. The energy liberated when 1 g of this radionuclide undergoes fission is (given Avogadrao number = 6×10^{23})
a) 6.4×10^{10} J   b) 6.4×10^{11} J
c) 6.4×10^{12} J   d) 6.4×10^{13} J

20. A nuclear reactor operates using the fissionable material mentioned in the previous question. If it were to use 540 g of the material in a day, it's power would be (assume 50% efficiency in conversion of energy released in the fission in to electrical energy)
a)100 MW   b) 200 MW   c) 300 MW   d) 400 MW

21. What is the IUPAC name of the following compound?
a) 3- Bromo - 1,2- dimethylbut-1 ene
b) 4-Bromo-3-methylpent-2-ene
c) 2-Bromo-3-methylpent -3-ene
d) 3-Bromo-3-methyl-1,2-dimethylprop-1-ene

H_3C CH_3
H_3C Br

22. Iodine reacts with concentrated HNO_3 to yield Y along with other products. The oxidation state of iodine in Y, is
a) 5   b) 3   c) 1   d) 7

23. In a chemical reaction A + 2B $\rightleftharpoons$ 2C+D, the initial concentration of B was 1.5 times of the concentration of A, but the equilibrium concentrations of A and B were found to be equal. The equilibrium constant (K) for the aforesaid chemical reaction is
a) 16   b) 4   c) 1   d) $\dfrac{1}{4}$

24. 50 mL of 0.5 M oxalic acid is needed to neutralize 25mL sodium hydroxide solution. The amount of NaOH in 500mL of the given sodium hydroxide solution is :
a) 40 g   b) 20 g   c) 80 g   d) 10 g

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a) 3/5   b) 2/3   c) 3/2   d) 9/25

49. In a triangle ABC, A = 40^0, B= 60^0. If the bisector of angle A meets the circum circle of triangle ABC in X then the angle subtended by the segment BX at the circum-centre is

a) 20^0 b) 30^0 c) 40^0 d) 45^0

50. Statement 1: If x is a real number such that $\sqrt{x^2}$ =4 then x= 4.

Statement 2: If x is a real number such that $\sqrt{x^2}$ = 9 then x= $\pm$ 3.

a) Both the statements are true
b) Statement 1 is true but Statement 2 is false
c) Both the statements are false
d) Statement 2 is true but statement 1 is false

51. E, F are the mid points of the sides BC and CA, respectively, of $\triangle$ ABC right angled at B and of area 24. Area of the triangle CEF is
a) 6   b) 4   c) 8   d) $\sqrt{24}$

52. Statement I: Two similar triangles of equal area are congruent.

Statement II: ABCD is a square. Area of the equilaterial triangle having one of its sides as AC is equal to $\sqrt{2}$ times the area of the equilateral triangle having one of its sides as AB.

a) Both the statements are true
b) Statement I is true, Statement II is false
c) Statement I is false, Statement II is true
d) Both the statements are false

F respectively, such that AD = 2019 DB. Then $\frac{AE.FC}{AF.EP}$ is equal to

a) 2019   b) 2017   c) 1   d) 2019/2020

42. If the domain of f(x) is the largest possible subset of natural numbers such that $f(x) = \sqrt{676x-x^2-2019}$ is defined then the number of elements in the domain of f(x) is
    a) 2019   b) 676   c) 670   d) 671

43. If D (3 , -1), E (2, 6) and F (-5 , 7) are the mid points of the sides of $\triangle$ABC then the area of $\triangle$ABC is
    a) 24   b) 48   c) 72   d) 96

44. In $\triangle$ABC, AB = x, AC = y. If D is a point on the side BC such that AD is the internal angle bisector of the angle A then BC:BD is
    a) x+y : x   b) xy : x   c) 1 : x   d) xy : y

45. A function f:R $\rightarrow$ R is defined by f(x) = |x-1|+|x-2|+|x-3| for all real numbers x. Then
    a) f(x) = 6-3x, for all x<0   b) f(x)= x, for all x<2
    c) f(x)= 6-3x, for all x>2019   d) f(x)= 3x+6, for all x<2019

46. in $\triangle$ABC, AB=4, AC=6, BC=9. If D is a point on $\overline{BC}$ such that 3BD = 2DC then $\frac{\angle BAD}{\angle CAD}$ is
    a) 2/3   b) 3/2   c) 4/9   d) 1

47. Sum of the solutions of the equation [x]+4 = 2x is ([x] denotes the greatest integer less than or equal to x)
    a) 7   b) 7.5   c) 2019   d) not finite

48. Triangles ABC, DEF are two similar triangles such that B = E = 90^0, AB = 8, BC = 9 and area of the triangle DEF is 100 then AC/DF is

25. The metal that forms nitride by reacting directly with N_2 of air, is :

    a) K   b) Cs   c) Li   d) Rb

26. For the reaction, 2A + B $\rightarrow$ Products, when the concentrations of A and B both were doubled, the rate of the reaction increased from 0.3 mol L^{-1} S^{-1} to 2.4 mol $L^{-1}S^{-1}$. When the concentration of A alone is doubled, the rate increased from 0.3 mol L^{-1} S^{-1} to 0.6mol $L^{-1}S^{-1}$.
    Which one of the following statement is correct?

    (a) Order of the reaction with respect to B is 2
    (b) Order of the reaction with respect to A is 2
    (c) Total order of the reaction is 4
    (d) Order of the reaction with respect to B is 1

27. For the following reaction, the mass of water produced from 445 g of $C_{57}H_{110}O_6$ is : $2C_{57}H_{110}O_6$(s) + 163 O_2(g) $\rightarrow$ 114 CO_2 (g) + 110 H_2O (1)

    (a) 495 g   (b) 490 g   (c)890 g   (d) 445g

28. When the first electron affinity of oxygen is - 141 kJ/mol, its second electron affinity is :
    (a) almost the same as that of the first
    (b) negative, but less negative than the first
    (c) a positive value
    (d) a more negative value than the first

29. An open vessel at 27^0C is heated until two fifth of the air (assumed as an ideal gas) in it has escaped from the vessel. Assuming that the volume of the vessel remains constant, the temperature at which the vessel has been heated is:
    a) 750^0C   b) 500^0C   c) 750 K   d) 500 K

30. If K_{sp} of Ag_2CO_3 is 8×10^{-12}, the molar solubility of Ag_2CO_3 in 0.1M $AgNO_3$ is :
a) $8 \times 10^{-12}M$ b) $8 \times 10^{-10}M$ c) $8 \times 10^{-11}M$ d) $8 \times 10^{-13}M$

31. Chlorine on reaction with hot and concentrated sodium hydroxide gives:
a) Cl^- and ClO_2^- b) Cl^- and ClO_3^-
c) Cl^- and ClO^- d) ClO_3^- and ClO_2^-

32. 0.5 moles of gas A and x moles of gas B exert a pressure of 200 Pa in a container of volume 10 m^3 at 1000 k. given R is the gas constant in JK^{-1} mol^{-1}, x is
a) $\dfrac{2R}{4+R}$ b) $\dfrac{2R}{4-R}$ c) $\dfrac{4-R}{2R}$ d) $\dfrac{4+R}{2R}$

33. In general, the properties that decrease and increase down a group in the periodic table, respectively are :
a) electronegativity and electron gain enthalpy
b) electronegativity and atomic radius
c) atomic radius and electronegativity
d) electron gain enthalpy and electronegativity

34. The hydride that is NOT electron deficient is:
a) B_2H_6 b) AlH_3 c) SiH_4 d) GaH_3

35. Match the following items in column I with the corresponding items in ColumnII

	Column I		Column II
i)	$Na_2CO_3.10H_2O$	P)	Portland cement ingredient
ii)	$Mg(HCO_3)_2$	Q)	Castner Keller process
iii)	NaoH	R)	Solvay process
iv)	$Ca_3Al_2O_6$	S)	Temporary hardness

a) i) $\rightarrow$ R;ii) $\rightarrow$ Q;iii) $\rightarrow$ S ;iv) $\rightarrow$ P
b) i) $\rightarrow$ R; ii) $\rightarrow$ S; iii) $\rightarrow$ Q ; iv) $\rightarrow$ P
c) i) $\rightarrow$ S; ii) $\rightarrow$ P; iii) $\rightarrow$ Q; iv) $\rightarrow$ R
d) i) $\rightarrow$ Q; ii) $\rightarrow$ R; iii) $\rightarrow$ P ; iv) $\rightarrow$ S

36. 25ml of the given HCl solution requires 30 ml of 0.1M sodium carbonate solution. What is the volume of this HCl solution required to titrate 30 ml of 0.2M aqueous NaOH solution?

(a) 25 ml   (b) 50ml   (c) 12.5ml   (d) 75ml

37. The correct order of the atomic radii of C, Cs, AL and S is :
a) S <C < Al < Cs   b) S < C < Cs < Al
c) C < S < Cs < Al   d) C <S < Al < Cs

38. The pair that does NOT require calcinations is:
a) ZnO and MgO   b) Fe_2O_3 and $CaCO_3$ $MgCO_3$
c) ZnO and $Fe_2O_3.xH_2O$ d) $ZnCO_3$ and CaO

39. 5 moles of AB_2 weigh 125×10^{-3} kg and 10 moles of A_2B_2 weigh 300×10^{-3} kg. The molar mass of $A(M_A)$ and molar mass of $B(M_B)$ in kg mol-1 are :

a) $M_A = 50 \times 10^{-3}$ and $M_B = 25 \times 10^{-3}$
b) $M_A = 25 \times 10^{-3}$ and $M_B = 50 \times 10^{-3}$
c) $M_A = 5 \times 10^{-3}$ and $M_B = 10 \times 10^{-3}$
d) $M_A = 10 \times 10^{-3}$ and $M_B = 5 \times 10^{-3}$

40. The mole fraction of a solvent in aqueous solution of a solute is 0.8. The molality (in mol kg^{-1}) of the aqueous solution is
a) 13.88×10^{-1} b) 13.88×10^{-2}
c) 13.88   d) 13.88×10^{-3}

41. In ABC, P is a point on the line segment BC. A line l parrellel to the side BC interesects the line segments AB, AP and AC in D, E,