SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

EAMCET **Date: 12-04-2019**

Time: 3 Hours **EAMCET DPP- 6** **Max. Marks: 320 M**

MATHEMATICS-IA

Syllabus: Properties of Triangles

1. If p_1, p_2, p_3 are respectively the perpendiculars from the vertices of ΔABC to the opposite sides, then

(i) $\frac{1}{p_1}+\frac{1}{p_2}+\frac{1}{p_3}=$

1) $\frac{1}{r}$ 2) $\frac{1}{r_1}$ 3) $\frac{1}{r_2}$ 4) $\frac{1}{r_3}$

(ii) $\frac{1}{p_1}+\frac{1}{p_2}-\frac{1}{p_3}=$

1) $\frac{1}{r}$ 2) $\frac{1}{r_1}$ 3) $\frac{1}{r_2}$ 4) $\frac{1}{r_3}$

(iii) $\frac{\cos A}{p_1}+\frac{\cos B}{p_2}+\frac{\cos C}{p_3}=$

1) $\frac{1}{r}$ 2) $\frac{1}{R}$ 3) $\frac{1}{r_1}$ 4) $\frac{1}{r_3}$

(iv) $p_1p_2p_3=$

1) $\frac{abc}{8R^2}$ 2) $\frac{a^2b^2c^2}{8R^2}$ 3) $\frac{a^2b^2c^2}{8R^3}$ 4) $\frac{a^3b^3c^3}{8R^2}$

2. If in a triangle PQR; sin P, sin Q, sin R are in A.P; then

1) the altitudes are in A.P 2) the altitudes are in H.P

3) the altitudes are in G.P 4) the medians are in A.P

3. If the radius of the in circle of a triangle with its sides 5k, 6k and 5k is 6, then k is equal to

1) 3 2) 4 3) 5 4) 6

4. If d_1, d_2, d_3 are the diameters of three ex-circles of a triangle then $d_1d_2+d_2d_3+d_3d_1=$

1) Δ^2 2) $4s^2$ 3) $4\Delta^2$ 4) $ab+bc+ca$

5. In an equilateral triangle r : R: r_1 is

1) 1 : 1 : 1 2) $1:\sqrt{2}:3$ 3) 1 : 2 : 3 4) $2:\sqrt{3}:\sqrt{3}$

6. In a triangle ABC, if $r_1=2r_2=3r_3$ then $\frac{a}{b}+\frac{b}{c}+\frac{c}{a}=$

1) $\frac{75}{60}$ 2) $\frac{155}{60}$ 3) $\frac{176}{60}$ 4) $\frac{191}{60}$

7. In a triangle ABC, if $\frac{1}{r_1^2}+\frac{1}{r_2^2}+\frac{1}{r_3^2}+\frac{1}{r^2}=$

1) $\frac{a+b+c}{\Delta}$ 2) $\frac{a^2+b^2+c^2}{\Delta^2}$ 3) $\frac{a^2+b^2+c^2}{\Delta}$ 4) $\frac{a+b+c}{\Delta^2}$

8. In a triangle ABC, if $a\cot A+b\cot B+c\cot C=$

1) r + R 2) 2 (r + R) 3) r - R 4) 2 (r - R)

9. In triangle ABC, if a = 13, b = 14, c = 15, then =

1) 21/2 2) 14 3) 65/8 4) 4

10. The perimeter of a triangle ABC right angled at C is 70, and the inradius is 6, then $|a-b|=$

1) 1 2) 2 3) 8 4) 9

11. In a triangle ABC if 2a = $\sqrt{3}b+c$ then

1) $c^2=a^2+b^2-ab$ 2) $a^2=b^2+c^2$ 3) $b^2=a^2+c^2-ac\sqrt{3}$ 4) a = b = c

12. The ratio between the circumradius and inradius of a right angled isosceles triangle is

1) 2:1 2) $\left(\sqrt{2}+1\right):1$ 3) $1:\left(\sqrt{2}+1\right)$ 4) $\left(\sqrt{2}+1\right):\sqrt{2}$

13. In a triangle ABC, $\cos^2\frac{A}{2}+\cos^2\frac{B}{2}+\cos^2\frac{C}{2}=$

1) $\frac{1}{r}-\frac{1}{2R}$ 2) $1+\frac{r}{R}$ 3) $2+\frac{r}{2R}$ 4) $1-\frac{r}{2R}$

14. In triangle $ABC, \frac{r_1}{bc}+\frac{r_2}{ca}+\frac{r_3}{ab}=$,

1) $\frac{1}{r}-\frac{1}{2R}$ 2) $1+\frac{r}{R}$ 3) $2+\frac{r}{2R}$ 4) $1-\frac{r}{2R}$

15. If α,β,γ are the lengths of the altitudes of ΔABC, then $\frac{\cos A}{\alpha}+\frac{\cos B}{\beta}+\frac{\cos C}{\gamma}=$

1) Δ 2) $1/\Delta$ 3) R 4) 1 / R

16. In ΔABC, with usual notation, observe the two statements given below

Statement: I: $rr_1r_2r_3=\Delta^2$

Statement : II: $r_1r_2+r_2r_3+r_3r_1=s^2$

Which of the following is correct?

1) Both I and II are true. 2) I is true and II is false.
3) I is false and II is true. 4) Both I and II are false.

17. If a,b,c are in A.P., then r_1, r_2, r_3 are in

1) A.P. 2) G.P. 3) H.P. 4) A.G.P

18. $r + r_3 + r_1 - r_2 =$

1) 4R cos A 2) 4R cos B 3) 4R cos C 4) 4R

19. In ΔABC, if a =26, b=30, $\cos C=63/65$, then $r_1:r_2:r_3=$

1) 4:12:1 2) 3: 4:12 3) 1:4:12 4) 4:12:3

20. $\frac{\Delta^2}{a^2+b^2+c^2}\left\{\frac{1}{r_1^2}+\frac{1}{r_2^2}+\frac{1}{r^2}\right\}=$

1) 1 2) 0 3) $4Rr^2$ 4) 1 / r

MATHEMATICS-IIB

Syllabus: Pair of Straight lines

21. The length of the side of the square formed by the lines $2x^2+3xy-2y^2=0, 2x^2+3xy-2y^2+3x-5y+1=0$ **is**

1) $1/\sqrt{3}$ 2) $1/\sqrt{5}$ 3) $1/\sqrt{7}$ 4) $1/\sqrt{10}$

22. If the pair of lines $ax^2+2hxy+by^2+2gx+2fy+c=0$ intersect on Y-axis, then $2fgh=$

1) af^2+ch^2 2) bg^2+ch^2 3) ag^2+ch^2 4) cg^2+bg^2

23. **If the equation $2x^2+7xy+3y^2-x+7y-6=0$ represents a pair of lines then the pair of lines parallel to them and passing through the point $(2,-1)$ is**

1) $2x^2+7xy+3y^2-x-8y-3=0$
2) $2x^2-7xy+3y^2-x-8y-3=0$
3) $2x^2+7xy-3y^2+x-8y-3=0$
4) $2x^2-7xy+3y^2-x+8y-3=0$

24. **If (α,β) is the point of intersection of the pair of lines represented by $ax^2+2hxy+by^2+2gx+2fy+c=0,$ then the equation to the pair of bisectors of angle between them is**

1) $h\left[(x-\alpha)^2-(y-\beta)^2\right]=(a-b)(x-\alpha)(y-\beta)$
2) $h\left[x^2-y^2\right]=(a-b)(x-\alpha)(y-\beta)$
3) $h\left[(x+\alpha^2)-(y+\beta^2)\right]=(a-b)(x+\alpha)(y+\beta)$
4) $h\left[x^2-y^2\right]=(a-b)(x+\alpha)(y+\beta)$

25. **The orthocentre of the triangle formed by the lines $6x^2-5xy-6y^2+x+5y-1=0, x+y-1=0$ is**

1) $(-1/13,5/13)$
2) $(1/13,5/13)$
3) $(1/13,-5/13)$
4) $(-1/13,-5/13)$

26. **The angle between the lines joining the origin to the points of intersection $x^2+hxy-y^2+gx+fy=0$ and $fx-gy=k$ is**

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

27. **If the lines $x^2+2xy-35y^2-4x+44y-12=0$ and $5x+\lambda y-8=0$ are concurrent then the value of λ is**

1) 0
2) 1
3) -1
4) 2

28. **The length of the intercept on the $x-$ axis cut by the pair of lines $2x^2+5xy+3y^2+6x+7y+1=0$ is**

1) $\sqrt{7}$
2) $2\sqrt{7}$
3) $\sqrt{7}/2$
4) $\sqrt{2}$

29. **The condition that the lines joining the origin to the points of intersection of the two curves $a_1x^2+2h_1xy+b_1y^2+2g_1x=0, a_2x^2+2h_2xy+b_2y^2+2g_2x=0$ will be at right angles is**

1) $g_1(a_2+b_2)=g_2(a_1+b_1)$
2) $g_1(a_2-b_2)=g_2(a_1+b_1)$
3) $g_1(a_2+b_2)=g_2(a_1-b_1)$
4) $g_1(a_2-b_2)=g_2(a_1-b_1)$

30. **If $y=ax$ is one of the lines belonging to the family of lines representing the sides of an equilateral triangle with one vertex at the origin, then the product of the slopes of all the lines of this family is**

1) a^3
2) $a(a^2-3)$
3) $a(1-3a^2)$
4) $\frac{a(a^2-3)}{1-3a^2}$

31. **Let PQR be a right angled isosceles triangle right angled at $P(2,1)$. If the equation of the line QR is $2x+3y=3,$ then the equation representing the pair of lines PQ and PR is**

1) $3x^2-3y^2+8xy+20x+10y+25=0$
2) $3x^2-3y^2+8xy-20x-10y+25=0$
3) $3x^2-3y^2+8xy+10x+15y+20=0$
4) $3x^2-3y^2-8xy-10x-15y-20=0$

32. **If the equation $ax^3+3bx^2y+3cxy^2+dy^3=0(a,b,c,d\neq 0)$ represents three coincide lines then**

1) $a=d$
2) $b=c$
3) $a/b=b/c=c/d$
4) $ac=bd$

33. **The line $x+y=1$ meets the lines represented by the equation $y^3-xy^2-14x^2y+24x^3=0$ at the points A, B, C. If O is the point of intersection of the lines represented by the given equation then $OA^2+OB^2+OC^2=$**

1) $\frac{22}{9}$ 2) $\frac{85}{72}$ 3) $\frac{181}{72}$ 4) $\frac{221}{72}$

34. The distance between the parallel lines $16x^2+24xy+ly^2+kx-12y-21=0$ **is**

1) $\frac{7}{\sqrt{5}}$ 2) 2 3) $\frac{2}{\sqrt{5}}$ 4) $\sqrt{\frac{7}{5}}$

35. If p_1, p_2 **denote the lengths of the perpendiculars from the point** $(2,3)$ **on the line given by** $15x^2+31xy+14y^2=0,$ **then if** $p_1 > p_2, p_1^2+\frac{1}{74}-p_2^2+\frac{1}{13}=$

1) -2 2) 0 3) 2 4) none of these

36. A line passing through the point $P(2,3)$ **meets the lines represented by** $x^2-2xy-y^2=0$ **at the points A and B such that** $PA.PB=17,$ **the equation of the line is**

1) $x=2$ 2) $y=3$ 3) $3x-2y=0$ 4) none of these

37. If the centroid of the triangle formed by the lines $2y^2+5xy-3x^2=0$ **and** $x+y=k$ **is** $(1/18, 11/18),$ **then the value of k is**

1) -1 2) 0 3) 1 4) none of these

38. Equation to the pair of bisectors of the angles between the pair of lines $(x-2)^2-3(x-2)(y-3)+2(y-3)^2=0$ **is**

1) $(x-2)^2+(x-2)(y-3)+(y-3)^2=0$ 2) $3(x-2)^2+2(x-2)(y-3)-3(y-3)^2=0$

3) $3(x-2)^2-2(x-2)(y-3)-3(y-3)^2=0$ 4) none

39. If the angle between the lines represented by $2x^2+5xy+3y^2+6x+7y+4=0$ **is** $\tan^{-1}(m)$ **and** $a^2+b^2-ab-a-b+1\le 0,$ **then** $2a+3b=$

1) 1/m 2) m 3) -m 4) m^2

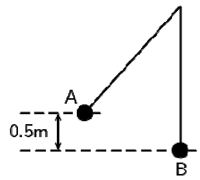
40. The condition that the lines joining the origin to the points of intersection of $2x+3y=k, 3x^2-xy+3y^2+2x-3y-4=0$ **are at a right angles is**

1) $6k^2+5k+52=0$ 2) $6k^2+5k-52=0$ 3) $6k^2-5k+52=0$ 4) $6k^2-5k-52=0$

PHYSICS

Syllabus: WORK ENERGY AND POWER

41. A 2 kg metal ball is suspended from a rope as a pendulum. If it is released from point A and swings down to the point B (the bottom of its arc): (no friction anywhere)



1) velocity of the ball is directly proportional to its mass
2) velocity of the ball is independent of its mass
3) velocity of the ball is inversely proportional to its mass
4) we cannot say

42. A ball bounces to 80% of its original height what friction of its mechanical energy is lost in each bounce in%? (Think: where does this energy go?)

1)10 2) 20 3) 40 4) 60

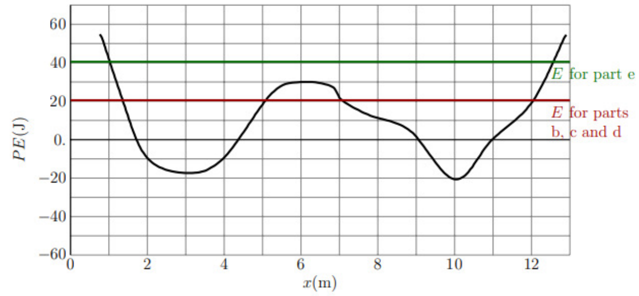
43. A body of mass 5 kg is thrown vertically up with a kinetic energy of 490 J. What is the height at which the kinetic energy of the body becomes half of the original value?

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

44. **A mass of M kg is suspended by a weight-less string, the horizontal force that is required to displace it until the string makes an angle of 60° with the initial vertical direction is**

(1) $Mg/\sqrt{3}$ (2) $Mg\sqrt{2}$ (3) $Mg/\sqrt{2}$ (4) $Mg\sqrt{3}$

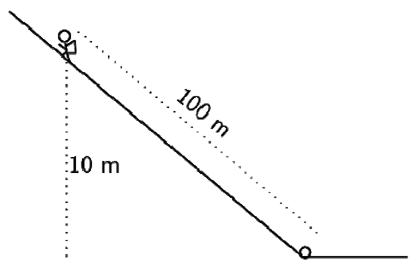
45. **A particle of mass m = 2.0 kg moves in a region of space with the following potential energy function.**



Assume the particle is initially at $x = 11$ m and has a velocity $v_0 = 2\sqrt{5}$ m/s in the positiv x direction. Find the total mechanical energy of the particle.

1)20J 2)30J 3)40J 4)10J

46. **A water bottle dropped by a boy from top of steep icy slope (no friction) slides 100m down the side to a point which is 10 m lower than the initial position. The mass of the boy is 60 kg and his water bottle's mass is 500 g.**



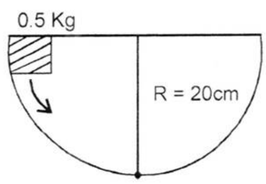
What is the total change in the boy's potential energy as he climbs down the mountain to fetch his fallen water bottle? i.e. what is the difference between his potential energy at the top of the slope and the bottom of the slope?

1) 9800 J 2) 4900 J 3) 5800 J 4) 2900 J

47. **A 10 kg block slides on a horizontal floor with a speed of 4 m/s just before striking the uncompressed spring, and compresses it till the block is motionless. The kinetic friction force is 30 N and spring constant is 100 N/m. The spring compressed by**

(1) 1m (2) 2m (3) 0.5m (4) 0.25m

48. **A body having a mass of 0.5 kg slips along the wall of a hemispherical smooth surface of radius 20 cm shown in figure. What is the velocity of body in** m/s**at the bottom of the surface? (g = 10 m/s^2)**

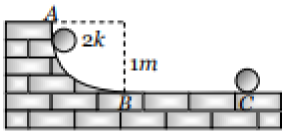


(1) 1 (2) 2 (3) 3 (4) 4

49. **A spring with spring constant K when stretched through 2cmthe potential energy is U. If it is stretched by 6cm. If the potential energy be kU then k is**

(1) 1 (2) 4 (3)9 (4) 16

50. **A block of mass 2kg is released from A on the track that is one quadrant of a circle of radius 1m. It slides down the track and reaches B with a speed of 4m/s and finally stops at C at a distance of 3m from B. The work done against the force of friction is (in J)**



(1) 20 (2)10 (3) 4 (4) 2

51. A body of mass 1 kg is thrown upwards with a velocity 20 m/s. It momentarily comes to rest after a height 18m. How much energy in J is lost due to air friction?

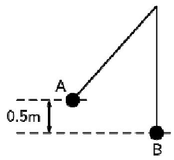
($g = 10ms^{-2}$)

(1) 200 (2) 180 (3) 40 (4) 20

52. A spring gun of spring constant 90 × 10^2 N/m is compressed 4 cm by a ball of mass 16g. If the trigger is pulled, calculatethe velocity in m/s of the ball.

(1) 15 (2) 20 (3) 30 (4) 25

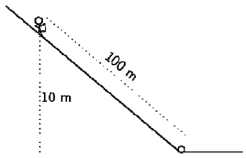
53. A 2 kg metal ball is suspended from a rope as a pendulum. If it is released from point A and swings down to the point B (the bottom of its arc): (no friction anywhere)



calculate the velocity of the ball at point B in m/s, take $g = 9.8ms^{-2}$.

(1) 3.13 (2) 1.41 (3) 1.73 (4) 2.00

54. A water bottle dropped by a boy from top of steep icy slope (no friction) slides 100m down the side to a point which is 10 m lower than the initial position. The mass of the boy is 60 kg and his water bottle's mass is 500 g.



If the bottle starts from rest, how fast (in m/s) is it travelling by the time it reaches the bottom of the slope? (Neglect friction),take $g = 9.8ms^{-2}$

(1) 3.13 (2) 10 (3) 14 (4) 12

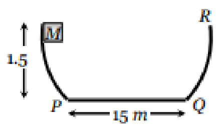
55. A 10 kg block slides on a horizontal floor with a speed of 4 m/s just before striking the uncompressed spring, and compresses it till the block is motionless. The spring constant is 10,000 N/m. The spring compressed by…m

(1) 0.1 (2)0.2 (3)0.01 (4) 0.02

56. A body is attached to the lower end of a vertical spiral spring and it is gradually lowered to its equilibrium position. This stretches the spring by a length x. If the same body attached to the same spring is allowed to fall suddenly, what would be the maximum stretching in this case

(1) x (2) 2x (3) 3x (4) x/2

57. A block of mass M slides along the sides of a bowl as shown in the figure. The walls of the bowl are frictionless and the base has coefficient of friction 0.2. If the block is released from the top of the side, which is 1.5 m high, where will the block come to rest? Given that the length of the base is 15 m

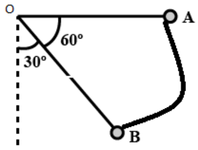


(1) 1 m from P (2) Midpointof PQ (3) 2 m from P (4) At Q

58. A stone projected vertically upwards from the ground reaches a maximum height h. When it is at a height 3h/4, the ratio of its kinetic and potential energies is

(1) 3:1 (2) 1:3 (3) 2:1 (4) 1:2

59. A simple pendulum is released from A as shown in figure. If m and l represent the mass of the bob and the length of the pendulum respectively, the gain in kinetic energy at B is then



(A) $mgl\frac{\sqrt{3}}{2}$ (2) $mgl\frac{1}{2}$ (3) mgl (4) $mgl\frac{1}{\sqrt{2}}$

60. What is the ratio of kinetic energy of the body at the bottom to the kinetic energy at the top, while it is just describing a vertical circle of radius r.

(1) 2:5 (2) 1:5 (3) 5:1 (4) 5:2

CHEMISTRY

Syllabus: States of Matter

61. If the density ratio of O_2 and H_2 is 16:1, then ratio of their v_{rms} will be

1) 1 : 1 2) 1 : 4 3) 16 : 1 4) 1 : 16

62. Which of the following gases will have the highest rate of diffusion?

1) CO_2 2) N_2 3) NH_3 4) O_2

63. A mixture of 40 g of oxygen and 40 g of helium has a total pressure of 0.9 atm. The partial pressure of oxygen is

1) 0.5 atm 2) 0.1 atm 3) 0.9 atm 4) 0.2 atm

64. A certain gas diffuses four times as quickly as oxygen. The molecular weight of the gas is

1) 2 2) 1 3) 16 4) 1.5

65. Which of the following gas molecules have equal total kinetic energy and translational kinetic energy?

1) O_2 2) He 3) CH_4 4) N_2

66. The compressibility factor of an ideal gas is

1) 1 2) 2 3) 4 4) 6

67. In the gas equation: $PV = nRT$

1) V is the volume of one mole of the gas 2) n no. of moles of the gas have volume V
3) n is the number of molecules of the gas 4) P is the pressure of one mole of the gas

68. At what pressure, will a quantity of gas, which occupies 100 mL at a pressure of 720 mm, occupy a volume of 84 mL

1) 820.20 mm 2) 784.15 mm 3) 736.18 mm 4) 857.14 mm

69. Helium atom is two times heavier than a hydrogen molecule. At 298 K, the average kinetic energy of the helium atom is

1) two times that of a hydrogen molecule 2) same as that of a hydrogen molecule
3) four times that of a hydrogen molecule 4) half that of a hydrogen molecule

70. If the r.m.s. speed of gas molecule at 27^0C is $100\sqrt{2}\,ms^{-1}$, the r.m.s. speed at 327^0C would be

1) $100m\,s^{-1}$ 2) $200m\,s^{-1}$ 3) $300m\,s^{-1}$ 4) $400m\,s^{-1}$

71. Dominance of strong repulsive forces among the molecules of the gas (Z = compressibility factor)

1) depends on Z and indicated by Z = 1 2) depends on Z and indicated by Z > 1
3) depends on Z and indicated by Z < 1 4) is independent of Z

72. Critical temperatures for A, B, C and D gases are $25^0C, 10^0C, -80^0C$ and 15^0C respectively. Which gas will be liquefied more easily?

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

73. The root mean square speed of the molecules of diatomic gas is u. When the temperature is doubled, the molecules dissociate into two atoms. The new rms speed of the atom is

1) $\sqrt{2}u$ 2) u 3) $2u$ 4) $4u$

74. Equal weights of CO and CH_4 are mixed together in an empty container at 300 K. The fraction of total pressure exerted by CH_4 is

1) $\frac{16}{17}$ 2) $\frac{7}{11}$ 3) $\frac{8}{9}$ 4) $\frac{5}{16}$

75. In the van der Waal's equation, 'a' signifies

1) intermolecular attraction 2) intramolecular attraction

3) attraction between molecules and walls of container

4) volume of molecules

76. Arrange the following gases in order of their critical temperature. NH_3, H_2O, CO_2, O_2

1) $NH_3 > H_2O > CO_2 > O_2$ 2) $O_2 > CO_2 > H_2O > NH_3$

3) $H_2O > NH_3 > CO_2 > O_2$ 4) $CO_2 > O_2 > H_2O > NH_3$

77. If 300 mL of a gas at 27^0C is cooled to 7^0C at constant pressure, its final volume will be

1) 350 mL 2) 540 mL 3) 135 mL 4) 280 mL

78. Two different gases enclosed in different flasks A and B at same temperature and pressure were found to contain same number of molecules. The ratio of contain same number of molecules. The ratio of volumes of the flasks A and B must be

1) 1 : 3 2) 1 : 1 3) 1 : 4 4) 1 : 2

79. If a gas occupies a volume of 300cc at 27^0C and 620 mm pressure, then the volume of the gas at 47^0C and 640 mm pressure, is

1) 310 cc 2) 410 cc 3) 500 cc 4) 600 cc

80. Pressure in a mixture of 4g of O_2 and 2g of H_2 confined in a bulb of 1 litre at 0^0C is

1) 45.215 atm 2) 31.205 atm 3) 25.215 atm 4) 15.210 atm

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SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

EAMCET
Time: 3 Hours

KEY SHEET

Date: 12-04-2019
Max. Marks:

KEY SHEET

MATHS-IIA

1) **1,4,2,3**	2) **2**	3) **2**	4) **2**	5) **3**	6) **4**	7) **2**	8) **2**	9) **1**	10) **1**
11) **2**	12) **2**	13) **3**	14) **1**	15) **4**	16) **1**	17) **3**	18) **2**	19) **1**	20) **1**

MATHS-IIB

21) **2**	22) **2**	23) **1**	24) **1**	25) **2**	26) **4**	27) **4**	28) **1**	29) **1**	30) **4**
31) **2**	32) **3**	33) **4**	34) **2**	35) **3**	36) **2**	37) **3**	38) **3**	39) **1**	40) **4**

PHYSICS

41) **2**	42) **2**	43) **4**	44) **1**	45) **1**	46) **3**	47) **1**	48) **2**	49) **3**	50) **1**
51) **4**	52) **3**	53) **1**	54) **3**	55) **2**	56) **2**	57) **2**	58) **2**	59) **1**	60) **3**

CHEMISTRY

61) **2**	62) **3**	63) **2**	64) **1**	65) **2**	66) **1**	67) **2**	68) **4**	69) **2**	70) **2**
71) **2**	72) **1**	73) **3**	74) **2**	75) **1**	76) **3**	77)	78) **2**	79) **1**	80) **3**

HINTS & SOLUTOINS

MATHS-IA

1. $A = B = C = 60^0$, $p_1 = p_2 = p_3 = \frac{\sqrt{3}}{2}$

2. $\frac{p}{2R}, \frac{q}{2R}, \frac{r}{2R}$ are in AP,
   $\frac{2\Delta}{p}, \frac{2\Delta}{q}, \frac{2\Delta}{r}$ are in HP

3. $Find\ \Delta\ and\ r = \frac{\Delta}{s}$

4. $d_1 = 2r_1$, $d_2 = 2r_2$, $d_3 = 2r_3$

5. $\frac{1}{2\sqrt{3}} : \frac{1}{\sqrt{3}} : \frac{\sqrt{3}}{2}$

6. $\frac{\Delta}{s-a} = 2\frac{\Delta}{s-b} = 3\frac{\Delta}{s-c}$

7. Using r, r_1, r_2, r_3 results

8. a = 2RSinA, $CotA = \frac{CosA}{SinA}$

9. $s = 21, \Delta = \sqrt{21\times 8\times 7\times 6} = 84,$
   $r_1 = \frac{\Delta}{s-a} = \frac{84}{8} = \frac{21}{2}$

10. $\Delta = rs = 210$
    $\Rightarrow \frac{1}{2}ab = 210 \Rightarrow ab = 420$
    $\&\ a+b = 70-c,\ squaring\ c = 29$
    $\therefore |a-b| = \sqrt{a^2+b^2-2ab} = \sqrt{c^2-2ab} = 1$

11. $a = \frac{\sqrt{3}}{2}b + \frac{c}{2}, \cos C = \frac{\sqrt{3}}{2}, \cos B = \frac{1}{2}$.

12. $A = 90^0$ $B = 45^0$ $C = 45^0$

13. $\frac{1+\cos A}{2}+\frac{1+\cos B}{2}+\frac{1+\cos C}{2}$

$=\frac{3}{2}+\frac{1}{2}[\cos A+\cos B+\cos C]$

$=\frac{3}{2}+\frac{1}{2}[1+\frac{r}{R}]=2+\frac{r}{2R}.$

14. $R.V=\frac{1}{abc}[ar_1+br_2+cr_3]$

$a=2RSinA;r_1=sTan\frac{A}{2}\&simplify$

15. $\alpha=\beta=\gamma=\frac{\sqrt{3}}{2}$

16. Use $r_1=\frac{\Delta}{s-a},r_2=\frac{\Delta}{s-b},r_3=\frac{\Delta}{s-c}$

17. a, b, c are in A.P then r_1,r_2,r_3 are in H.P

18. $r_2-r=4R\sin^2\frac{B}{2}$, $r_1+r_3=4R\cos^2\frac{B}{2}$.

19. $c^2=a^2+b^2-2ab\cos c, c=8.$

20. $\frac{1}{r_1^2}+\frac{1}{r_2^2}+\frac{1}{r_3^2}+\frac{1}{r^2}=\frac{a^2+b^2+c^2}{\Delta^2}$

MATHS-IB

21. Area of the square $=\frac{|1|}{2\sqrt{9/4-2(-2)}}=\frac{1}{5}.$

Side of the square $=\frac{1}{\sqrt{5}}.$

22. Given pair of lines intersect on y-axis $\Rightarrow f^2=bc$

$abc+2fgh-af^2-bg^2-ch^2=0\Rightarrow 2fgh=bg^2+ch^2.$

23. Required equation is

$2(x-2)^2+7(x-2)(y+1)+3(y+1)^2=0$

$\Rightarrow 2x^2+7xy+3y^2-x-8y-3=0.$

24. Required equation is

$h\left[(x-\alpha)^2-(y-\beta)^2\right]=(a-b)(x-\alpha)(y-\beta)$

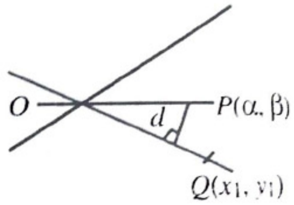
25. Since the given point of lines are perpendicular point of intersection is the orthocentre

$=\left(\frac{(-5/2)(5/2)-(-6)(1/2)}{6(-6)-(-5/2)^2},\frac{(1/2)(-5/2)-6(5/2)}{6(-6)-(-5/2)^2}\right)$

$=\left(\frac{(-25/4)+3}{-36-(25/4)},\frac{(-5/4)-15}{-36-(25/4)}\right)$

$=\left(\frac{-25+12}{-144-25},\frac{-5-60}{-144-25}\right)=\left(\frac{1}{13},\frac{5}{13}\right)$

26. $fx-gy=k\Rightarrow\frac{fx-gy}{k}=1$



Required pair of lines equation is

$x^2+hxy-y^2+(gx+fy)\left(\frac{fx-gy}{k}\right)=0$

$\Rightarrow k(x^2+hxy-y^2)+fgx^2+(f^2-g^2)xy-fgy^2=0$

$\Rightarrow(k+fg)x^2+(kh+f^2-g^2)xy-(k+fg)y^2=0$

Coeff. of x^2 + Coeff. of $y^2=(k+fg)-(k+fg)=0.$

$\therefore$ Angle between the pair of lines is $\frac{\pi}{2}$

27. Point of intersection of $x^2+2xy-35y^2-4x+44y-12=0$ is

$\left(\frac{hg-bg}{ab-h^2},\frac{gh-af}{ab-h^2}\right)$

$=\left(\frac{1(22)-(-35)(-2)}{-35-1},\frac{(-2)(1)-1(22)}{-35-1}\right)$

$=\left(\frac{48}{36},\frac{-24}{-36}\right)=\left(\frac{4}{3},\frac{2}{3}\right).$

Given lines are concurrent $\Rightarrow(4/3,2/3)$ lies on $5x+\lambda y-8=0\Rightarrow 5(4/3)+\lambda(2/3)-8=0$

$\Rightarrow 20+2\lambda-24=0\Rightarrow 2\lambda=4\Rightarrow\lambda=2.$

28. Length of intercept on $x-$axis is

$2\frac{\sqrt{g^2-ac}}{|a|}=\frac{2\sqrt{3^2-(2)(1)}}{|2|}$

$=\frac{2\sqrt{9-2}}{|2|}=\frac{2\sqrt{7}}{2}=\sqrt{7}$

29. Pair of liens joining the origin to the points of inter section is

$a_1x^2+2h_1xy+b_1y^2+\frac{2g_1}{(-2g_2)}(a_2x^2+2h_2xy+b_2x^2)=0$

These lines are at right angles

$\Rightarrow a_1-\frac{g_1a_2}{g_2}+b_1-\frac{g_1b_2}{g_2}=0\Rightarrow a_1+b_1=g_1\left(\frac{a_2+b_2}{g_2}\right)$

$\Rightarrow g_2(a_1+b_1)=g_1(a_2+b_2).$

30. If $a=\tan\theta$, the slopes of the lines making an equilateral triangle with one vertex at the origin are

$\tan\theta.\tan(\theta+60^0).\tan(\theta+120^0).\tan(\theta+180^0)=\tan\theta$

So the product of the slopes is

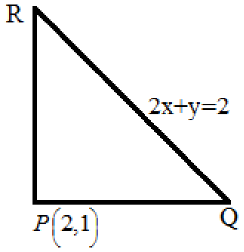
$\tan\theta\tan\left(\theta+60^0\right)\tan\left(\theta+120^0\right)$

$=\tan\theta\tan\left(\theta+60^0\right)\tan\left(\theta-60^0\right)$

$=a.\dfrac{a+\sqrt{3}}{1-a\sqrt{3}}.\dfrac{a-\sqrt{3}}{1+a\sqrt{3}}=\dfrac{a\left(a^2-3\right)}{1-3a^2}.$

31. Let the slopes of PQ and PR be m and $-1/m$ respectively.

Since PQR is an isosceles triangle $\angle PQR=\angle PRQ$



$\Rightarrow\left|\dfrac{m+2}{1-2m}\right|=\left|\dfrac{-\dfrac{1}{m}+2}{1+\dfrac{2}{m}}\right|\left|\because\text{ slope of QR=-2}\right|$

$\Rightarrow m+2=\pm(1-2m)\Rightarrow m=3$ or $-1/3$

So the equations of PQ and PR are

$(y-1)=3(x-2)$ and $y-1=(-1/3)(x-2)$

Thus, joint equation represting PQ and PR is

$\left[3(x-2)-(y-1)\right]\left[(x-2)+3(y-1)\right]=0$

$\Rightarrow 3(x-2)^2-3(y-1)^2+8(x-2)(y-1)=0$

$\Rightarrow 3x^2-3y^2+8xy-20x-10v+25=0$

32. $\therefore$ If the given equation represent three coincident lines $y-mx=0,$ then

$y^3+\dfrac{3c}{d}y^2x+\dfrac{3b}{d}yx^2+\dfrac{a}{d}x^3$

$=(y-mx)^3=y^3-3y^2(mx)+3y(mx)^2-m^3x^3$

$\Rightarrow m^3=\dfrac{a}{d},m^2=\dfrac{b}{d},m=-\dfrac{c}{d}\Rightarrow m=-\dfrac{a}{b}=-\dfrac{b}{c}=-\dfrac{c}{a}\Rightarrow\dfrac{a}{b}=\dfrac{b}{c}=\dfrac{c}{d}$

33. The given cubic can be written as

$(y-2x)(y-3x)(y+4x)=0$

$\therefore$ The three lines given by this equation are $y=2x, y=3x$ and $y=-4x,$ they intersect at $O(0,0)$ and meet the lines $x+y=1$ at the points $A(1/3,2/3),B(1/4,3/4)$ and $C(-1/3,4/3)$

$\therefore OA^2+OB^2+OC^2=\dfrac{5}{9}+\dfrac{10}{16}+\dfrac{17}{9}=\dfrac{221}{72}$

34. $h^2=ab\Rightarrow 144=16l\Rightarrow l=9.$

Distance $=2\sqrt{\dfrac{36-9(-21)}{9(16+9)}}=\dfrac{2\times15}{3\times5}=2.$

35. The lines given by $15x^2+31xy+14y^2=0$ are $5x+7y=0$ and $3x+2y=0$

Length of the perpendiculars from $(2,3)$ on these lines are $p_1=\dfrac{31}{\sqrt{74}}$ and $p_2=\dfrac{12}{\sqrt{13}}$

So that $p_1^2+\dfrac{1}{74}-p_2^2+\dfrac{1}{13}=\dfrac{961}{74}+\dfrac{1}{74}-\left(\dfrac{144}{13}-\dfrac{1}{13}\right)=2$

36. Let the equation of the line through $P(2,3)$ making an angle θ with the positive direction of $x-$axis be $\dfrac{x-2}{\cos\theta}=\dfrac{y-2}{\sin\theta}$

Then the coordinates of any point on this line at a distance r from P are

$(2+r\cos\theta,3+r\sin\theta)$

If $PA=r_1$ and $PB=r_2,$ then r_1,r_2 are the roots of the equation

$(2+r\cos\theta)^2-2(2+r\cos\theta)(3+r\sin\theta)-(3+r\sin\theta)^2=0$

$\Rightarrow r^2(\cos2\theta-\sin2\theta)-2r(\cos\theta+5\sin\theta)-17=0$

$\Rightarrow 17=PA.PB=r_1r_2=\dfrac{17}{\cos2\theta-\sin2\theta}$

$\Rightarrow\cos2\theta-\sin2\theta=1$ which is satisfied by $\theta=0$ and thus the equation of the line is $y=3.$

37. The lines represented by the given equation are $(2y-x)(y+3x)=0\Rightarrow 2y=x, y=-3x$

Solving $2y=x$ and $x+y=k$ we get the point $A(2k/3,k/3)$

Solving $y=-3x$ and $x+y=k$ we get the point $B(-k/2,3k/2)$

The given intersect at $O(0,0)$

$\therefore$ Centroid of the

$\Delta OAB=\left(\dfrac{1}{3}\left(\dfrac{2k}{3}-\dfrac{k}{2}+0\right),\dfrac{1}{3}\left(\dfrac{k}{3}+\dfrac{3k}{2}+0\right)\right)$

$\Rightarrow\left(\dfrac{1}{18},\dfrac{11}{18}\right)=\left(\dfrac{k}{18},\dfrac{11k}{18}\right)\Rightarrow k=1$

38. Equation to the pair of bisectors of the angles is $\dfrac{(x-2)^2-(y-3)^2}{1-2}=\dfrac{(x-2)(y-3)}{-3/2}$

$\Rightarrow 3(x-2)^2-2(x-2)(y-3)-3(y-3)^2=0.$

39. $\tan\theta = \dfrac{2\sqrt{25/4-6}}{2+3}=\dfrac{1}{5}\Rightarrow \theta=\tan^{-1}\left(\dfrac{1}{5}\right)$

$\Rightarrow \tan^{-1}(m)=\tan^{-1}\left(\dfrac{1}{5}\right)\Rightarrow m=\dfrac{1}{5}.$

Given $a^2+b^2-ab-a-b+1\le 0$

$\Rightarrow 2a^2+2b^2-2ab-2a-2b+2\le 0$

$\Rightarrow (a-b)^2+(a-1)^2+(b-1)^2\le 0$

$\Rightarrow a=b=1\Rightarrow 2a+3b=5=1/m.$

40. The given line equation is

$2x+3y=k\Rightarrow \dfrac{2x+3y}{k}=1$

Let A,B be the points of intersection of the given line and the given curve.

The combined equation of $\overleftrightarrow{OA}$ and $\overleftrightarrow{OB}$ is

$3x^2-xy+3y^2+(2x-3y)\left(\dfrac{2x+3y}{k}\right)-4\left(\dfrac{2x+3x}{k}\right)^2=0$

$\Rightarrow k^2(3x^2-xy+3y^2)+k(4x^2-9y^2)-4(4x^2+12xy+9y^2)=0$

$\Rightarrow (3k^2+4k-16)x^2-(k^2+48)xy+(3k^2-9k-36)y^2=0$

$\because \angle AOB=\pi/2,$ we have coefficient of x^2 + coefficient of $y^2=0$

$\Rightarrow 3k^2+4k-16+3k^2-9k-36=0$

$\Rightarrow 6k^2-5k-52=0.$

PHYSICS

41. velocity of the ball is independent of its mass

Explanation: Since there is no friction, mechanical energy is conserved.
Therefore, with point B as reference

$\text{mgh}_1(\text{at point A})=\dfrac{1}{2}mv_2^2(\text{at point B})$

The mass of the ball m appears on both sides of the equation so it can be eliminated so that the equation becomes: $v_2=\sqrt{2gh_1}$

This proves that the velocity of the ball is independent of its mass. It does not matter what its mass is, it will always have the same velocity when it falls through this height.

42. Suppose the mass of body= m & initially edge of height= h, therefore its P.E.= mgh

After the bounce 80% energy lost :.
Height= 80/100×mgh= 0.8mgh
ΔP.E.= mgh-0.8mgh= 0.2mgh

Then fractional lost energy in each bounce=0.2mgh/0.8mgh=1/5
In percentage it is 20% (The energy lost in foam of heat energy).

43. The K. E = 490J; ==> ½ m v^2 = 490 J;

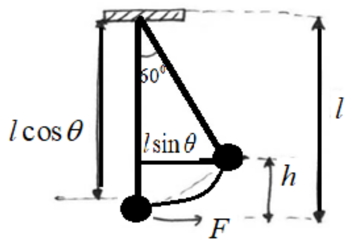
==> v^2 = 2× 490 /5 = 196; or v = 14 m/s

The height at which the entire K. E would be equal to potential energy can be obtained using v^2 = 2 g h; ==> h = v^2 / 2 g

= 196/2×9.8= 10 m

So, the height at which the kinetic energy becomes half of the original = 10m/2 = 5 m (at 5m half of the energy is K.E. and half of it is P.E.)

44.



PE = U = mgh
W = F × d
From figure

ℓ – ℓ cos θ = h

h = ℓ (1 – cos θ)

hence PE = mgh= mgℓ (1 – cos θ)

Work done = F × ℓ sin θ as WD = PE

Fℓ sin θ = mgℓ (1 – cos θ)

F = [{mg(1 – cos θ)} / {sin θ}]= [{mg(1 – [1/2])} / {(√3) / 2} = {(mg) / (√3)}

45.

Initial potential energy (at $x = 11\,\text{m}$) is $PE = 0\,\text{J}$.

Initial kinetic energy: $KE=\dfrac{1}{2}mv^2=\dfrac{1}{2}(2.0\,\text{kg})\left(2\sqrt{5}\,\text{m/s}\right)^2=20\,\text{J}$

Mechanical energy: $E = KE + PE = \boxed{20\,\text{J.}}$

The mechanical energy in these conditions is the horizontal line in the figure.

$W=-\Delta PE=-[PE(4\,\text{m})-PE(5\,\text{m})]=-[20\,\text{J}-(-10\,\text{J})]=\boxed{-30\,\text{J}}$

46. At the top of the slope, his potential energy is: mgh_1=60X9.8X10=5800J (with bottom reference)

At the bottom of the slope, his potential energy is: 0J, Therefore the difference in his potential energy when moving from the top of the slope to the bottom is:5800J

47. Change in kinetic energy = work done by spring + work done against friction

$$\frac{1}{2}mv^2 = \frac{1}{2}kx^2 + fx$$

$$\frac{1}{2}X10X16 = \frac{1}{2}X100Xx^2 + 30x$$

$$80 = 50x^2 + 30x$$

$8 = 5x^2 + 3x$ on solving we get x=1m

48. Potential energy has to be equal to kinetic energy

mgh = (1/2) mv^2

∴ gR = (1/2) v^2

(10) (20 × 10^{-2}) = (1/2) v^2

$V^2 = 4$ V = 2 m/s

49. U = Potential Energy = W = (1/2) Kx^2

i.e U ∝ x^2

$(U_2 / U_1) = (x_2 / x_1)^2$

(U_2 / U)

$=(6/2)^2$ $U_2 = 9U$

50. Block possess potential energy at point $A = mgh = 2 \times 10 \times 1 = 20\ J$

Finally block stops at point C. So its total energy goes against friction *i.e.* work done against friction is 20 J.

51. Energy lost due to friction = Initial Kinetic energy – Potential energy

= (1/2) mv^2 – mgh

= {(1/2) × 1 × 20^2} – (1 × 10 × 18)

= 20 J

52. Loss in PE of spring = gain in KE of boll

(1/2) Kx^2 = (1/2) mV^2

$V^2 = \{(Kx^2) / m\} = [\{90 \times 10^2 \times (4 \times 10^{-2})^2\} / \{16 \times 10^{-3}\}]$

V^2 = 900, therefore V = 30 m/s

53. 3.13

$$v_2 = \sqrt{2gh_1} = \sqrt{2X9.8X0.5} = 3.13ms^{-1}$$

54. mgh_1 (at top point) $= \frac{1}{2}mv_2^2$ (at bottom point)

m:mass of bottle, v_2:velocity of the bottle at bottom

$$v_2 = \sqrt{2X9.8X10} = 14ms^{-1}$$

Note: the distance that the bottle travelled (i.e.100 m) does not play any role in calculating the energies. It is only the height difference that is important in calculating potential energy.

55. Change in kinetic energy = work done by spring $\frac{1}{2}mv^2 = \frac{1}{2}kx^2$ therefore

$$x = vX\sqrt{\frac{m}{k}} = 2\sqrt{\frac{10}{1000}} = 0.2m$$

56.

When spring is gradually lowered to it's equilibrium position

$$kx = mg \therefore x = \frac{mg}{k}.$$

When spring is allowed to fall suddenly it oscillates about it's mean position

Let y is the amplitude of vibration then at lower extreme, by the conservation of energy

$$\Rightarrow \frac{1}{2}ky^2 = mgy \Rightarrow y = \frac{2mg}{k} = 2x.$$

57. Potential energy of block at starting point = Kinetic energy at point P = Work done against friction in traveling a distance s from point P.

$$\therefore \quad mgh = \mu mgs \Rightarrow s = \frac{h}{\mu} = \frac{1.5}{0.2} = 7.5\,m$$

i.e. block come to rest at the mid point between P and Q.

58.

At the maximum height, Total energy = Potential energy = mgh

At the height $\frac{3h}{4}$, Potential energy = $mg\frac{3h}{4} = \frac{3}{4}mgh$

and Kinetic energy = Total energy – Potential energy $= mgh - 3\frac{mgh}{4} = \frac{1}{4}mgh$

$$\therefore \frac{\text{Kinetic energy}}{\text{Potential energy}} = \frac{1}{3}.$$

59. Gain in K.E. is loss in P.E.

$$\text{gain in } KE = mgl\cos 30$$

$$KE = mgl\frac{\sqrt{3}}{2}$$

60.

Let mass of the particle be m

Radius of the circle be r

Minimum velocity at the bottom to be able to make a vertical circle is given by

$V_1 = \sqrt{(5gr)}$

KE at top becomes

$KE_1 = ½mV_1^2$

=> KE_1 = ½ m×5gr

By conservation of energy corresponding veloc

› $V_2 = \sqrt{(gr)}$

$KE_2 = ½ m×gr$

the ratio of kinetic energy of the body at the bottom to the kinetic energy at the top is 5:1

CHEMISTRY

61. $\frac{\rho(O_2)}{\rho(H_2)} = \frac{16}{1} \Rightarrow \frac{M(O_2)}{M(H_2)} = \frac{16}{1}$

$v_{rms} \propto \left(\frac{1}{M}\right)^{\frac{1}{2}}$

$\Rightarrow \frac{v_{rms}(O_2)}{v_{rms}(H_2)} = \left(\frac{M(H_2)}{M(O_2)}\right)^{1/2} = \left(\frac{1}{16}\right)^{1/2} = \frac{1}{4}$

62. Rate of diffusion $\propto \left(\frac{1}{M}\right)$

$M =$ molecular mass

$M(CO_2) = 44, \quad M(N_2) = 28$

$M(NH_3) = 17, \quad M(O_2) = 32$

Therefore, rate of NH_3 diffusion is greater than others

63. No. of moles of $O_2 = \frac{\text{Given mass}}{\text{Mol. mass}} = \frac{40}{32}$

$= 1.25\,\text{mol}$

No. of moles of $He = \frac{40}{4} = 10$ mol

Mole fraction of $O_2 = \frac{1.25}{1.25+10} = \frac{1.25}{11.25} = \frac{1}{9}$

Partial pressure of oxygen $= \frac{1}{9} = 0.9$ atm

$= 0.1$ atm

64. Rate of diffusion $\propto \frac{1}{\sqrt{M}}$

$M =$ Molecular mass

Let $r =$ Rate of diffusion of r (gas)

$\Rightarrow \frac{r_1}{r_2} = 4 = \sqrt{\frac{M_2}{M_1}}$

$M_1 =$ Molecular mass of r

$\Rightarrow \frac{r_1}{r_2} = 4 = \sqrt{\frac{M_0}{M}}, \Rightarrow 16 = \frac{32}{M}, \Rightarrow M_1 = 2$

65. The total kinetic energy of a molecule is the sum of its translational, vibrational and rotational kinetic energies. The monatomic molecules do not possess vibrational and rotational kinetic energies. Hence, noble gases (like He, Ar etc.) fulfill the criteria.

66. Compressibility factor is defined as:

$Z = \frac{PV}{(PV)_{avg}} = \frac{PV}{nRT}$

For non ideal gases, $Z \neq 1$

For ideal gases, $Z = 1$

67. Ideal gas equation is : $PV = nRT$

P = pressure of the gas

V = volume of gas

N = no. of moles of the gas

R = gas constant

T = temperature

68. According to Boyle's law,

$P_1V_1 = P_2V_2$

Putting values here, we get:

$100 \times 720 = P_2 \times 84$

$\Rightarrow P_2 = 857.14$ mm

69. Average kinetic energy per mole does not depend on the nature of the gas i.e., molecular mass of the gas depends only on temperature.

Average kinetic energy per molecule $= \frac{3}{2}kT$

$k =$ Boltzmann constant, $T =$ Temperature.

70. Root mean square velocity is given by:

$V_{rms} = \sqrt{\frac{3RT}{M}} \Rightarrow V_{rms} \propto \sqrt{T}$

$\Rightarrow \frac{V_{rms}(at\ 27^0 C)}{V_{rms}(at\ 327^0 C)} = \sqrt{\frac{(27+273)K}{(327+273)K}}$

$= \sqrt{\frac{300}{600}} = \frac{1}{\sqrt{2}}$

$\therefore V_{rms}(at\,327^0 C) = 100\sqrt{2} \times \sqrt{2} = 200\,ms^{-1}$

71. When the value of Z < 1, it is due to attractive forces between molecules. At high pressure, when Z>1, it is due to repulsive forces between electron clouds of the molecules of gases.

72. Critical temperature of gas may be defined as that temperature above which it cannot be liquefied how so ever high pressure may be applied on the gas.

As we know, $T_C = \frac{8a}{27Rb}$

Where $a =$ van der Waal's constant which is a measure of intermolecular forces of attraction.

Greater the value of a more easily the gas can be liquefied and hence larger T_C mean larger the value of a.

73. $u=\sqrt{\frac{3RT}{M}}$

If $T=2T$ and $M=\frac{M}{2}$, then $u_1=\sqrt{\frac{3R\times 2T}{M/2}}$

$\therefore \frac{u_1}{u}=\sqrt{4}=2$

74. Let the weight of CO = weight of $CH_4 = ag$

Moles of $CO=\frac{a}{28}$

Moles of $CH_4=\frac{a}{16}$

Total moles $=\frac{a}{28}+\frac{a}{16}$

$^{x}CH_r=\frac{\frac{a}{16}}{\frac{a}{28}+\frac{a}{16}}=\frac{a}{16}\times\frac{28\times16}{44a}=\frac{14}{22}=\frac{7}{11}$

$\therefore$ Fraction of pressure exerted by $CH_4=7/11$

75. In van der Waal's equation, a signifies the molecular force of attraction.

76. Greater are the intermolecular forces of attraction, higher is the critical temperature.

77. According to Charle's law.

$\frac{V_1}{T_1}=\frac{V_2}{T_2}$

$\Rightarrow$ Putting the given values :

$\frac{300\,mL}{300\,K}=\frac{V_2}{280}\Rightarrow V_2=280\,mL$

78. The Avozadro's law states that same volume of all gases all the same temperature and pressure, contain equal number of molecules. Hence, ratio of volumes must be 1:1.

79. According to Boyle's law,

$\frac{P_1V_1}{T_1}=\frac{P_2V_2}{T_2}\Rightarrow\frac{620\times300}{300}=\frac{640\times V_2}{320}$

$\Rightarrow V_2=310\,\text{cc}$

80. Moles of oxygen, $^{n}O_2=\frac{4}{32}=0.125$ mol

Moles of hydrogen, $^{n}H_2=\frac{2}{2}=1.00$ mol

Temperature $=273\,K$, Volume =1 litre

$\Rightarrow$ Total pressure $=\frac{\left(^{n}O_1+^{n}H_2\right)\times RT}{1^2}$

$=\frac{1.125\times0.821\times273}{1}=25.215\,atm$