SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR EAMCET (MPC) | **DPP TEST-13** | **Time: 3:00 Hrs.**

Date: 23-04-2020 | **Max. Marks: 80 M**

MATHS-A

SYLLABUS: Addition of Vectors

1. **If C is the midpoint of AB and P is any point outside AB then**

1) $\overline{PA}+\overline{PB}=2\overline{PC}$ 2) $\overline{PA}+\overline{PB}=\overline{PC}$ 3) $\overline{PA}+\overline{PB}=2\overline{PC}=\bar{O}$ 4) $\overline{PA}+\overline{PB}+\overline{PC}=\bar{O}$

2. **Let $\bar{a},\bar{b}$ and $\bar{c}$ are three non-zero vectors, no two of which are collinear. If $\bar{a}+2\bar{b}$ is collinear with $\bar{c}$ and $\bar{b}+3\bar{c}$ is collinear with $\bar{a}$ then $\bar{a}+2\bar{b}+6\bar{c}$ is**

1) $\bar{o}$ 2) $\lambda\bar{a}$ 3) $\lambda\bar{b}$ 4) $\lambda\bar{c}$

3. **If $3\bar{a}+4\bar{b}-7\bar{c}=0$ then the ratio in which C(c) divides the join of A (a) and B (b) is**

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

4. **$\bar{p},\bar{q},\bar{r},\bar{s}$ are the position vectors of P,Q,R,S respectively such that $3(\bar{p}-\bar{q})=2(\bar{s}-\bar{r})$ then**

1) $\overline{PQ}$ and $\overline{RS}$ bisect each other 2) $\overline{PQ}$ and $\overline{PR}$ bisect each other

3) $\overline{PQ}$ and $\overline{RS}$ trisect each other 4) $\overline{QS}$ and $\overline{PR}$ intersect at a point which divides then in the ratio 2:3

5. **In ΔABC, if D and E are the mid points of the sides BC and CA respectively, then $2\left(\overline{AD}+\overline{EB}\right)$**

1) $3\overline{AB}$ 2) $\frac{3}{2}\overline{AB}$ 3) $2\overline{AB}$ 4) $3\overline{BC}$

6. **If $a\bar{i}+a\bar{j}+c\bar{k}$, $\bar{i}+\bar{k}$, $c\bar{i}+c\bar{j}+b\bar{k}$ are coplanar then 'C' is _____**

1) A.M of a, b 2) GM of a, b 3) HM of a, b 4) 0

7. **If $\bar{e}=l\bar{i}+m\bar{j}+n\bar{k}$ is unit vector, the maximum value of $lm+mn+nl$ is**

1) $-\frac{1}{2}$ 2) 0 3) 1 4) $\frac{3}{2}$

8. **If $\overline{AB}=-3\bar{i}+4\bar{k}$ and $\overline{BC}=-\bar{i}-2\bar{k}$ are the sides of the triangle ABC, then the length of the median AM is**

1) $\sqrt{\frac{25}{2}}$ 2) $\sqrt{\frac{45}{2}}$ 3) $\sqrt{\frac{65}{4}}$ 4) $\sqrt{\frac{85}{4}}$

9. **P is the point of intersection of the diagonals of the parallelogram ABCD. If S is any point in the space and $\overline{SA}+\overline{SB}+\overline{SC}+\overline{SD}=\lambda\overline{SP}$, then $\lambda=$**

1) 2 2) 4 3) 6 4) 8

10. **ABCDEF is a regular hexagon whose centre is O. Then $\overline{AB}+\overline{AC}+\overline{AD}+\overline{AE}+\overline{AF}$ is**

1) $2\overline{AO}$ 2) $3\overline{AO}$ 3) $5\overline{AO}$ 4) $6\overline{AO}$

11. **The Cartesian equation of the line passing through the point $\bar{i}-2\bar{j}+\bar{k}$ and parallel to the vector $\bar{i}+\bar{j}+3\bar{k}$ is**

1) $(x-1)=(y+2)=(z-1)$ 2) $\frac{(x-1)}{3}=\frac{(y+2)}{1}=\frac{(z-1)}{2}$

3) $\frac{(x-1)}{1}=\frac{(y+2)}{1}=\frac{(z-1)}{3}$ 4) $\frac{(x+1)}{1}=\frac{(y-2)}{1}=\frac{(z+1)}{3}$

12. **P is a point on the line passing through the point** $A\left(3\bar{i}+\bar{j}-\bar{k}\right)$ **and parallel to** $2\bar{i}-\bar{j}+2\bar{k}$ **such that** $AP=9$ **then the position vector of P is**

1) $6\bar{i}-3\bar{j}+6\bar{k}$ 2) $9\bar{i}-2\bar{j}+5\bar{k}$ 3) $-9\bar{i}+2\bar{j}-5\bar{k}$ 4) $\bar{i}+\bar{j}+\bar{k}$

13. $\bar{a},\bar{b},\bar{c}$ **are position vectors of vertices A, B, C of** ΔABC **then the equation of median through A to** $\overline{BC}$ **is**

1) $\bar{r}=\bar{b}+t\left(\dfrac{\bar{a}+\bar{c}-\bar{b}}{2}\right)$ 2) $\bar{r}=\bar{a}+t\left(\dfrac{1}{2}\left(\bar{b}+\bar{c}\right)-\bar{a}\right)$

3) $\bar{r}=\bar{c}+t\left(\dfrac{1}{2}\left(\bar{b}+\bar{c}\right)-\bar{a}\right)$ 4) None

14. $\bar{a},\bar{b},\bar{c}$ **are the position vectors of the vertices of an equilateral triangle whose circumcentre is at the origin . Then the position vector of its orthocenter is**

1) $\bar{O}$ 2) $\bar{a}-\bar{b}+\bar{c}$ 3) $\bar{a}+\bar{b}-\bar{c}$ 4) $\bar{a}-\bar{b}-\bar{c}$

15. **If the diagonals of a parallelogram are given by** $3\bar{i}+\bar{j}-2\bar{k},\ \bar{i}-3\bar{j}+4\bar{k}$ **then the length of its sides are**

1) $\sqrt{8},\sqrt{10}$ 2) $\sqrt{6},\sqrt{14}$ 3) $\sqrt{5},\sqrt{12}$ 4) $\sqrt{6},\sqrt{56}$

16. **For three vectors** $\bar{p},\bar{q}$ *and* $\bar{r}$, **if** $\bar{r}=3\bar{p}+4\bar{q}$ **and** $2\bar{r}=\bar{p}-3\bar{q},$ **then**

1) $|\bar{r}|<2|\bar{q}|$ *and* $\bar{r},\bar{q}$ have the same direction 2) $|\bar{r}|>2|\bar{q}|$ *and* $\bar{r},\bar{q}$ have opposite directions

3) $|\bar{r}|<2|\bar{q}|$ *and* $\bar{r},\bar{q}$ have opposite directions 4) $|\bar{r}|>2|\bar{q}|$ *and* $\bar{r},\bar{q}$ have the same directions

NUMERICAL VALUE QUESTIONS:

17. **Let** $F\left(\bar{t}\right)=[t]\bar{i}-\left(t-[t]\right)\bar{j}+[t+1]\bar{k}$ **is GIF. If** $f\left(\dfrac{5}{4}\right)$ **and** $\bar{i}+\lambda\bar{j}+\mu\bar{k}$ **are parallel vectors then** $\mu=$

18. **3 forces are applied to a vertex of a cube which are 1,2 and 3 in magnitude and are directed along the diagonals of the faces of the cube meeting in that vertex. The magnitude of the resultant of these forces is _____**

19. $\overline{OA}=3\bar{i}+\bar{j}-\bar{k},\left|\overline{AB}\right|=2\sqrt{6}$ **and the direction ratios of** $\overline{AB}$ **are 1,-1,2 then** $\left|\overline{OB}\right|^2=$ ____

20. **In a quadrilateral PQRS, A divides SR in the ratio 1:3 and B is the mid point of PR. If** $3\overline{SR}-\overline{QR}-3\overline{PS}-\overline{PQ}=K\,\overline{AB},$ **then K=_____**

MATHS-B

SYLLABUS: Tangents & Normals

21. **The points where the tangents drawn to the curve** $y=x^3$ **make an angle** $\dfrac{\pi}{3}$ **with the *x*-axis are**

1) $(0,0),(1,1)$ 2) $(0,0),(-1,-1)$ 3) $\left(\pm\dfrac{1}{\sqrt[4]{3}},\pm\dfrac{1}{\sqrt[4]{9}}\right)$ 4) $\left(\pm\dfrac{1}{\sqrt[4]{3}},\pm\dfrac{1}{\sqrt[4]{27}}\right)$

22. **The angle made by the normal to the curve** $y=\log x$ **where it crosses the *x*-axis with the *x*-axis is**

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

23. **The curve** $y-e^{xy}+x=0$ **has a vertical tangent at the point**

1) (1,1) 2) (0,1) 3) (1,0) 4) (3,4)

24. **If the straight line joining the point A (0,3) and B(5, -2) is a tangent to the curve $y=\frac{e}{x+1}$ Then C=_____**

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

25. **The slope of the tangent at (1, 2) to the curve $x=t^2-7t+7$ and $y=t^2-4t-10$ is**

1) $\frac{8}{5}$ 2) $\frac{5}{8}$ 3) $\frac{-8}{5}$ 4) $\frac{-5}{8}$

26. **Tangents are drawn to the curve $y=\sin x$ from the origin. The locus of the points of contact is**

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

27. **The normal to the curve $y(x-2)(x-3)=x+6$ at the point where the curve intersects the y-axis passes through the point.**

1) $\left(\frac{1}{2},\frac{-1}{3}\right)$ 2) $\left(\frac{1}{2},\frac{1}{3}\right)$ 3) $\left(\frac{-1}{2},\frac{-1}{2}\right)$ 4) $\left(\frac{1}{2},\frac{1}{2}\right)$

28. **The area of the triangle formed by the positive x-axis the tangent and normal to the curve $x^2+y^2=16a^2$ at the point $\left(2\sqrt{2}a,2\sqrt{2}a\right)$ is**

1) a^2 2) $16a^2$ 3) $4a^2$ 4) $8a^2$

29. **The coordinates of a point on the curve $x=a(\theta+\sin\theta), y=a(1-\cos\theta)$ where the tangent is inclined at an angle $\frac{\pi}{4}$ to the positive x-axis are**

1) $\left(a\left(\frac{\pi}{2}-1\right),a\right)$ 2) $\left(a\left(\frac{\pi}{2}+1\right),a\right)$ 3) $\left(a\frac{\pi}{2},a\right)$ 4) (a,a)

30. **If the relation between the subnormal 'SN' and sub tangent 'ST' at any point on the curve $by^2=(x+a)^3$ is $p(SN)=q(ST)^2$. Then $\frac{p}{q}=$ _____**

1) $\frac{8}{27a}$ 2) $\frac{8}{27}$ 3) $\frac{8}{27b}$ 4) $\frac{8b}{27}$

31. **The tangent at $A(2,4)$ on the curve $y=x^3-2x^2+4$ cuts the x-axis at T then the length of AT=_____**

1) $\sqrt{10}$ 2) $\sqrt{12}$ 3) $\sqrt{15}$ 4) $\sqrt{17}$

32. **At any point $p(x_1,y_1)$ on a curve if the sub tangent and sub normal are equal then at that point the length of the tangent is equal to**

1) $|y_1|$ 2) $\sqrt{2}|y_1|$ 3) $\sqrt{2y_1}$ 4) $2|y_1|$

33. **If the curves $x^2+py^2=1$ and $qx^2+y^2=1$ are orthogonal to each other then**

1) $p-q=2$ 2) $\frac{1}{p}-\frac{1}{q}=2$ 3) $\frac{1}{p}+\frac{1}{q}=-2$ 4) $\frac{1}{p}+\frac{1}{q}=2$

34. **The angle at which the two curves $x^3-3xy^2=4$ and $3x^2y-y^3=4$ intersect is**

1) $\frac{\pi}{2}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{6}$ 4) 0

35. **If the curves $y^2=6x, 9x^2+by^2=16$ intersect each other at right angles, then the value of b is**

1) $\frac{7}{2}$ 2) 4 3) $\frac{9}{2}$ 4) 6

36. **The condition that the two curves $y^2=4ax$ and $xy=c^2$ cut orthogonally is**

1) $c^2=16a^2$ 2) $c^2=32a^2$ 3) $c^4=16a^4$ 4) $c^4=32a^4$

37. **All the points of the curve $y^2 = 4a\left(x + a\sin\frac{x}{a}\right)$ at which tangents are parallel to x-axis lie on**

1) circle 2) straight line 3) ellipse 4) parabola

38. **The equation of the normal to the curve $y = (1+x)^y + \sin^{-1}(\sin^2 x)$ at $x = 0$ is**

1) $x + y = 1$ 2) $x - y + 1 = 0$ 3) $2x + y = 2$ 4) $2x - y + 1 = 0$

39. **If $2y = 3x - 1$ is a tangent drawn to the curve $y^2 = ax^3 + b$ at $(1,1)$ where a,b are constants then (a, b) = ____**

1) $(1,0)$ 2) $(0,1)$ 3) $(1,-1)$ 4) $(-1,1)$

40. **An angle between the curve $x^2 y = 1$ and $y(x^2+1) = 2$ is**

1) $Tan^{-1}\left(\frac{8}{9}\right)$ 2) $Tan^{-1}(2)$ 3) $Tan^{-1}\left(\frac{1}{2}\right)$ 4) $Tan^{-1}\left(\frac{1}{3}\right)$

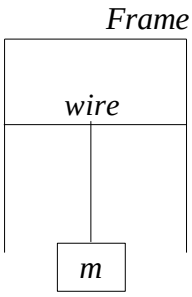
PHYSICS

SYLLABUS :- Mechanical Properties of Fluids (Surface Tension)

41. **Which of the following contribute to the reason behind the origin of surface tension**

1) only cohesive forces 2) only adhesive forces
3) neither cohesive nor adhesive forces 4) both cohesive and adhesive forces

42. **A soap film is trapped between a frame and wire of length 10cm as shown. If the surface tension is given as 0.0049 N/m. What will be the value of m (in mg) such that the wire remains in equilibrium ?**



1) 0.1 2) 1 3) 10 4) 100

43. **What will be the diameter of a water droplet, the pressure inside which is 0.05 N/cm^2 greater than the outside pressure (Take T=0.075 N/m)**

1) 3 2) 0.3 3) 0.6 4) 6

44. **A soap bubble of 'd' mm diameter is observed inside a bucket of water. If the pressure inside the bubble is 0.075 N/cm^2, what will be the value of 'd' ? (Take a T = 0.075 N/m)**

1) 0.4 2) 0.8 3) 1.6 4) 4

45. **A liquid jet 5cm diameter has a pressure difference of N/m^2. (Take T = 0.075 N/m)**

1) 1.5 2) 6 3) 3 4) 12

46. **The rise in the level of a liquid in a tube is h. What will be the rise in the level if the same amount of liquid is poured into a tube of half the diameter?**

1) 0 2) 2h 3) $\frac{h}{2}$ 4) h

47. **The ratio of the surface tension 's' and density 'ρ' of liquid 1 and 2 are 1:2 and 1:4 respectively. Equal amount of the two liquids is poured into two identical tubes. What will be the ratio of the rise in the liquid level in the two tubes (Assume the angle of contact to be same)**

1) 1:2 2) 2:1 3) 8:1 4) 1:8

48. The rise in the level of a liquid in a tube is h. If half the amount is poured out side. What will be the new rise in liquid level ?

1) 0 2) $\frac{h}{2}$ 3) h 4) 2h

49. If a glass tube 10 mm diameter is immersed in water, what will be the rise or fall in capillary ? (Take T = 0.075 N/m, g = 10 m/s^2 and angle of contact = 0^0)

1) 0.75 2) 1.5 3) 3 4) 6

50. A water drop of diameter 1cm breaks into 1000 similar droplets of same diameter what will be the gain or loss in the surface energy (Take T = 0.075 N/m)

1) gain of 0.424 mj 2) gain of 0.212 mj 3) loss of 0.212 mj 4) loss of 0.424 mj

51. A $15cm\times 6cm\times 0.1cm$ slide is suspended with its longest side vertical. 10% part of this side is dipped into water. In this state its apparent weight is equal to its real weight. The surface tension of water in N/m will be____

1) 72.3 2) 72.3×10^{-3} 3) 0.0723×10^{-3} 4) 723

52. Drops of liquid of density 'd' are floating half immersed in a liquid of density 'ρ'. If the surface tension of liquid is T then the radius of the drop will be_____

1) $\sqrt{\frac{3T}{g(3d-\rho)}}$ 2) $\sqrt{\frac{6T}{g(2d-\rho)}}$ 3) $\sqrt{\frac{3T}{g(2d-\rho)}}$ 4) $\sqrt{\frac{3T}{g(4d-\rho)}}$

53. A metallic wire of density 'd' floats horizontal in water. The maximum radius of the wire so that the wire may not sink. Will be _____

1) $\sqrt{\frac{2T}{\pi dg}}$ 2) $\sqrt{\frac{2\pi T}{dg}}$ 3) $\sqrt{\frac{2\pi Tg}{d}}$ 4) $\sqrt{2\pi Tgd}$

54. Two soap bubbles of radii r_1 and r_2 combine to form a bigger bubble under isothermal condition. The radius of bigger bubble will be _____

1) $\frac{r_1r_2}{r_2-r_1}$ 2) $\sqrt{r_1r_2}$ 3) $\sqrt{r_1+r_2}$ 4) $\sqrt{r_1^2+r_2^2}$

55. A tube of 0.8 mm radius is dipped into a liquid with surface tension and density $6\times 10^{-2}N/m$,and 900 Kg/m^3 respectively. If the tube is kept vertical the height of liquid risen in it will be__

1) 0.017 m 2) 0.17 m 3) 1.7 m 4) 17 m

56. If the excess pressure inside a soap bubble is balanced by oil column of height 2 mm, then the surface tension of soap solution will be ___(r = 1 cm & d = 0.8 gm/cc)

1) $3.9\times 10^{-2}N/m$ 2) $3.9N/m$ 3) $3.9\times 10^{-3}dyne/cm$ 4) $3.9dyne/m$

57. The ratio of radii of two soap bubbles is 1:4, the ratio of excess pressures in them will be_____

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

58. The additional force required to lift a flat circular disc of radius 5cm from the surface of water with surface tension 75 dyne/cm, will be _____

1) 750 dyne 2) 750π dyne 3) 30 dyne 4) 60 dyne

59. The work done in forming a soap film of size $10cm\times 10cm$ will be , it if the surface tension of soap solution is $3\times 10^{-2}N/m$.

1) $3\times 10^{-4}\ J$ 2) $3\times 10^{-2}\ J$ 3) $6\times 10^{-4}\ J$ 4) $6\times 10^{-2}\ J$

60. A paper disc of radius R from which a hole of radius 'r' is cut out is floating in a liquid of surface tension T. The force on the disc due to surface tension will be

1) πRT 2) $\pi(R+r)T$ 3) $2\pi T(R+r)$ 4) $4\pi T(R+r)$

CHEMISTRY

SYLLABUS: 14th Group Elements

61. In graphite the bond is
1) ionic 2) covalent 3) co-ordinate 4) metallic

62. Carbonic acid is a
1) weak tribasic 2) weak di basic acid 3) strong tri basic 4) strong di basic acid

63. Organosilicon polymers containing $Si-O-Si$ linkage is called
1) silicates 2) silicones 3) glass 4) silica

64. SiO_4^{4-} ion has geometry
1) triangular 2) tetrahydral 3) pentagonal bi pyramidal 4) linear

65. $C-O$ bond length is maximum in
1) CH_3CHO 2) CO_2 3) CO 4) CO_3^{2-}

66. In carbon family the tendency to show +2 oxidation state increases in order of
1) $Ge < Sn < pb$ 2) $pb < Sn < Ge$ 3) $Sn < Ge < pb$ 4) $Sn < pb < Ge$

67. When $SiCl_4$ is allowed to undergo hydrolysis. It gives
1) SiO_2-silicic acid 2) $Si(OH)_4$-silicic acid
3) $Si(OH)Cl_3$-silicic acid 4) $SiCl_4$ – do not undergo hydrolysis

68. $p\pi - p\pi$ multiple bond is seen in
1) mostly carbon 2) all carbon family member
3) Sn but not in carbon 4) Boron family and not in carbon family

69. $CH_3Cl + Si \xrightarrow[570K]{Cu\ power} (X) \xrightarrow{2H_2O} (Y)$
(Y) and (X) respectively are
1) $(CH_3)_2SiCl_2, (CH_3)_2Si(OH)_2$ 2) $(CH_3)_2Si(OH)_2 (CH_3)_2SiCl_2$
3) $SiCl_4$, $Si(OH)_4$ 4) $Si(OH)_4$, $SiCl_4$

70. (i) $SiO_2 + NaOH \longrightarrow ?$
(ii) $SiO_2 + HF \longrightarrow ?$ **The products of (ii) and (i) respectively are**
1) H_2SiF_6, SiF_4 2) SiF_4, Na_2SiO_3 3) Na_2SiO_3, SiF_4 4) Na_2SiO_4, H_2SiF_6

71. Carbon sub oxide has the formula
1) H_2CO_3 2) C_2O_3 3) C_3O_2 4) CO

72. Which of the following oxides is amphoteric ?
1) SiO_2 2) CO_2 3) SnO_2 4) CaO

73. In graphite, electrons are
1) localized on each c-atom 2) localized on every third c-atom
3) delocalized within the layer 4) present in anti bonding orbital

74. Which of the following oxidation states are the most characteristic for lead and tin respectively ?
1) $+2, +2$ 2) $+4, +2$ 3) $+2, +4$ 4) $+4, +4$

75. Which of the following structure is similar to graphite ?
1) B 2) B_4C 3) B_2H_6 4) BN

76. Calcium carbide on hydrolysis gives
1) Ethylene 2) Acetylene 3) Methane 4) Propyne

$A + CO \rightarrow CO_2$

77. $B + CO \rightarrow CO_2$

$X + O_2 \rightarrow CO_2$

A, B and X respectively are

1) CH_4, *carbon,* Fe_2O_3 2) Fe_2O_3, *ZnO*, CH_4

3) Fe_2O_3, CH_4, *ZnO* 4) *HCOOH*, *carbon*, CH_4

78. The mixture of CO and H_2 is known as

1) water gas or producer gas 2) water gas or synthesis gas

3) synthesis gas or producer gas 4) producer gas

79. Dry ice is composed of

1) solid He 2) solid CO_2 3) solid SO_2 4) solid C_6H_6

80. Which one of the following is properties of CO gas ?

1) it is an colourless gas 2) it is an a odourless gas

3) it is a neutral oxide 4) all of these

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KEY SHEET

MATHS-A

1) **1**	2) **1**	3) **4**	4) **4**	5) **1**	6) **2**	7) **3**	8) **4**	9) **2**	10) **4**
11) **3**	12) **2**	13) **2**	14) **1**	15) **2**	16) **2**	17) **2**	18) **5**	19) **35**	20) **8**

MATHS-B

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

PHYSICS

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

CHEMISTRY

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

HINTS & SOLUTIONS

MATHS-A

1. $\overline{OC} = \dfrac{\overline{OA} + \overline{OB}}{2}$

   $\overline{OA} + \overline{OB} - 2\overline{OP}$

   $2\overline{OC} - 2\overline{OP} = 2\overline{PC}$

2. $\bar{a} + 2\bar{b} = \lambda_1 \bar{c} \ldots.(1)$

   $\bar{b} + 3\bar{c} = \lambda_2 \bar{a} \ldots.(2)$

   $(1) \Rightarrow \bar{a} + 2\left(\lambda_2 \bar{a} - 3\bar{c}\right) = \lambda_1 \bar{c}$

   $1 + 2\lambda_2 = 0$

   $\lambda_2 = \dfrac{-1}{2}$

3. $7\bar{c} = 3\bar{a} + 4\bar{b}$

   $\bar{c} = \dfrac{3\bar{a} + 4\bar{b}}{4+3}$

4. $2\overline{os} + 3\overline{oq} = 3\overline{op} + 2\overline{oR}$

5. $\overline{OD} = \dfrac{\overline{OB} + \overline{OC}}{2}$

   $\overline{OE} = \dfrac{\overline{OC} + \overline{OA}}{2}$

   $2\left(\overline{AD} + \overline{EB}\right) = 2\overline{OD} - 2\overline{OA} + 2\overline{OB} - 2\overline{OC}$

   $\overline{OD} + \overline{OC} - 2\overline{OA} + 2\overline{OB} - \overline{OC} - \overline{OA}$

   $= 3\left(\overline{OB} - \overline{OA}\right)$

6. $\begin{vmatrix} a & a & c \\ 1 & 0 & 1 \\ c & c & b \end{vmatrix} = 0$

   $c^2 = ab$

7. $l^2 + m^2 + n^2 = 1$

   $(l-m)^2 + (m-n)^2 + (n-l)^2 \geq 0$

8. $\overline{AM} = \overline{AB} + \overline{BC}$

   $\left|\overline{AM}\right| = \sqrt{\dfrac{85}{4}}$

9. $\overline{OP} = \dfrac{\overline{OA} + \overline{OC}}{2}$

   $\overline{OP} = \dfrac{\overline{OB} + \overline{OD}}{2}$

   $4\overline{OP} = \overline{OA} + \overline{OB} + \overline{OC} + \overline{OD}$

10. $\overline{AB} + \overline{AC} + \overline{AD} + \overline{AE} + \overline{AF}$

    $\overline{ED} + \overline{AC} + \overline{AD} + \overline{AE} + \overline{CD}$

    $= 3\overline{AD} = 6\overline{AO}$

11. $\frac{x-1}{1}=\frac{y+2}{1}=\frac{z-1}{3}$

12. Verification

13. Mid point of $BC=\frac{\bar{b}+\bar{c}}{2}$

$\bar{r}=(1-t)\bar{a}+t\left(\frac{\bar{b}+\bar{c}}{2}\right)$

14. ortho centre = circum centre $=\bar{o}$

15. $\bar{b}=\frac{\overline{AC}+\overline{BD}}{2}=2\bar{i}-\bar{j}+\bar{k}$

$\bar{a}=\frac{\overline{AC}-\overline{BD}}{2}=\bar{i}+2\bar{j}-3\bar{k}$

16. $\bar{r}=3(2\bar{r}+3\bar{q})+4\bar{q}$

$-5\bar{r}=13\bar{q}$

17. $f\left(\frac{5}{4}\right)=\bar{i}-\frac{1}{4}\bar{j}+2\bar{k}$

$\therefore \mu=2$

18. Diagonal faces are $\bar{i}+\bar{j},\ \bar{j}+\bar{k},\ \bar{k}+\bar{i}$

$|\bar{F}|=\left|\frac{1(\bar{i}+\bar{j})}{\sqrt{2}}+1\frac{2(\bar{j}+\bar{k})}{\sqrt{2}}+\frac{3(\bar{k}+\bar{i})}{\sqrt{2}}\right|=5$

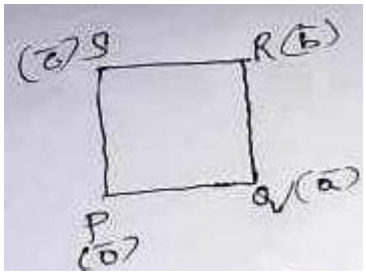
19. $\overline{AB}=\lambda(\bar{i}-\bar{j}+2\bar{k})$

$|\overline{AB}|=|\lambda|\sqrt{6}$

$\lambda=\pm 2.$

$|\overline{OB}|^2=35$

20.



$\overline{PA}=\frac{\bar{b}+3\bar{c}}{2},\ \overline{PB}=\frac{1}{2}\bar{b}$

$3\overline{SR}-\overline{qR}-3\overline{ps}-\overline{pq}=k\overline{AB}$

$8\bar{b}-24\bar{c}=k\bar{b}-3k\bar{c}$

$k=8.$

MATHS-B

21. $\frac{dy}{dx}=3x^2$

$\tan\theta = 3x^2$

$\sqrt{3} = 3x^2$

$x^2 = \frac{1}{\sqrt{3}}$

$x = \pm\frac{1}{\sqrt[4]{3}}$

$\therefore y = \pm\frac{1}{\sqrt[4]{27}}$

Points $= \left(\pm\frac{1}{\sqrt[4]{3}}, \pm\frac{1}{\sqrt[4]{27}}\right)$

22. $y = \log x....(1)$

Equation, meets the $x-axis$

$y = 0$

$x = 1$

point = (1,0)

$\frac{dy}{dx} = \frac{1}{x} = 1$

Slope of normal = -1

$\theta = \frac{3\pi}{4}$

23. $\frac{dy}{dx} = \frac{ye^{xy} - 1}{1 - xe^{xy}}$

It has a vertical tangent

$1 - xe^{xy} = 0$

$e^{xy} = \frac{1}{x}$

By verification $y = 0,\ x = 1$

Point = (1, 0).

24. Equation of a line $\overline{AB}$ is $x + y - 3 = 0....(1)$

$\frac{dy}{dx} = \frac{-C}{(x+1)^2} = -1$

$c = (x+1)^2 .....(2)$

$y = \frac{C}{x+1} = \frac{(x+1)^2}{x+1}$

$y = x + 1$

Sub in eqn (1)

$x + x + 1 = 3$

$2x = 2$

$x = 1$

Sub in eqn (2)

$\boxed{C = 4}$

25. $\frac{dx}{dt} = 2t - 7$

$\frac{dy}{dt} = 2t - 4$

$\frac{dy}{dx} = \frac{2t-4}{2t-7}$

where at $P(1,2)$

$t^2 - 7t + 7 = 1$

$t^2 - 7t + 6 = 0$

$t^2 - 6t - t + 6 = 0$

$t = 6, t = 1$

$Put\ t = 6$

Slope $= \frac{12-4}{12-7} = \frac{8}{5}$

26. $\frac{dy}{dx} = \cos x$

point of contact = $(x, \sin x)$

slope of tangent at p

= slope of p

$\cos x = \frac{\sin x - 0}{x - 0}$

$\cot x = \frac{1}{x}$

$\cot^2 x = \frac{1}{x^2}$

$\cos ec^2 x - 1 = \frac{1}{x^2}$

$\frac{1}{y^2} - 1 = \frac{1}{x^2}$

$\boxed{x^2 y^2 = x^2 - y^2}$

27. When $x = 0, y = 1$

$y\left(x^2 - 5x + 6\right) = x + 6$

$\frac{dy}{dx}\left(x^2\right) - 5x + 6 + y\left(2x - 5\right) = 1$

$at\ P(0,1)$

$\frac{dy}{dx}(6) - 5 = 1$

$\frac{dy}{dx} = 1$

Eqn of the normal at P(0, 1) is

$y - 1 = \frac{-1}{1}(x - 0)$

$x + y = 1$

By verification (4)

28. $2x + 2y.\frac{dy}{dx} = 0$

$\frac{dy}{dx} = -\frac{x}{y}$

$m=\dfrac{-2\sqrt{2}a}{2\sqrt{2}a}=-1$

$\text{Req axes }=\dfrac{1}{2}\left|\dfrac{y_1^2\left(1+m^2\right)}{m}\right|$

$=\dfrac{1}{2}\left|8a^2\dfrac{(1+1)}{-1}\right|$

$=8a^2\,sq\,unit.$

29. $m=\dfrac{dy}{dx}=\dfrac{a\left(0+\sin\theta\right)}{a\left(1+\cos\theta\right)}=\tan\left(\dfrac{\theta}{2}\right)$

$m=\tan\dfrac{\pi}{4}=1$

$\tan\left(\dfrac{\theta}{2}\right)=1$

$\boxed{\theta=\dfrac{\pi}{2}}$

$\text{point }=\left(a\left(\dfrac{\pi}{2}+\sin\dfrac{\pi}{2}\right),a\left(1-\cos\dfrac{\pi}{2}\right)\right)$

$=\left(a\left(\dfrac{\pi}{2}+1\right),a\right)$

30. $26y.\dfrac{dy}{dx}=3\left(x+a\right)^2$

$\dfrac{dy}{dx}=\dfrac{3\left(x+a\right)^2}{26y}$

$L.S.N=\left|y_1m\right|=\dfrac{3}{26}\left(x+a\right)^2=SN.$

$L.S.T=\left|\dfrac{y_1}{m}\right|=\dfrac{y}{\dfrac{3\left(x+a\right)^2}{26y}}$

$ST=\dfrac{2}{3\left(x+a\right)^2}.\left(x+a\right)^3=\dfrac{2}{3}\left(x+a\right)$

$p.\dfrac{3}{26}\left(x+a\right)^2=q.\dfrac{4}{9}\left(x+a\right)^2$

$\dfrac{p}{q}=\dfrac{8b}{27}$

31. $\dfrac{dy}{dx}=3x^2-4x$

$m=3\left(2\right)^2-8=4$

length of tangent = AT

$\left|\dfrac{y_1\sqrt{1+m^2}}{m}\right|=\left|\dfrac{4.\sqrt{1+16}}{4}\right|=\sqrt{17}$

32. L.S.T = L.S.N

$\dfrac{y_1}{m}=y_1m$

$m^2 = 1 \Rightarrow m = \pm 1$

$L.T = \left| \frac{y_1\sqrt{1+m^2}}{m} \right|$

$= \left| \frac{y_1\sqrt{1+1}}{1} \right| = \sqrt{2}\,|y_1|$

33. $\frac{1}{a_1} - \frac{1}{a_2} = \frac{1}{b_1} - \frac{1}{b_2}$

$\Rightarrow \frac{1}{1} - \frac{1}{q} = \frac{1}{p} - \frac{1}{1}$

$\boxed{\frac{1}{p} + \frac{1}{q} = 2}$

34. $3x^2 - 3y^2 - 3x(2y)\frac{dy}{dx} = 0$

$2xy\frac{dy}{dx} = x^2 - y^2$

$m_1 = \frac{x^2 - y^2}{2xy}$

$3x^2\frac{dy}{dx} + 3y(2x) - 3y^2.\frac{dy}{dx} = 0$

$\left(x^2 - y^2\right)\frac{dy}{dx} = -2xy$

$m_2 = -\frac{2xy}{x^2 - y^2}$

$m_1 m_2 = -1$

35.

$y^2 = 6x$

$2y\frac{dy}{dx} = 6$

$m_1 = \frac{3}{y}$

$18x + 2y\frac{dy}{dx} = 0$

$= 2by\frac{dy}{dx} = -18x$

$= \frac{dy}{dx} = \frac{-9x}{by}$

G.T $m_1 m_2 = -1$

$\frac{3}{y}\left(\frac{-9x}{by}\right) = -1$

$\frac{27x}{b(6x)} = -1$

$b = \frac{9}{2}$

36.

$y^2 = 4ax$ | $x\dfrac{dy}{dx} + y(1) = 0$

$2y\dfrac{dy}{dx} = 4a$ | $m_2 = -y/x$

$m_1 = \dfrac{2a}{y}$

$m_1 m_2 = -1$

$\dfrac{2a}{y} \times \dfrac{-y}{x} = -1$

$\boxed{x = 2a}$

$y^2 = 4a(2a) \Rightarrow y^2 = 8a^2$

$xy = C^2$

$x^2y^2 = C^4$

$(4a^2) \times (8a^2) = C^4$

$\boxed{32a^4 = C^4}$

37. $2y.\dfrac{dy}{dx} = 4a\left(1 + a\cos\left(\dfrac{x}{a}\right).\dfrac{1}{a}\right)$

$\dfrac{dy}{dx} = \dfrac{2a}{y}\left(1 + \cos\dfrac{x}{a}\right)$

The tangent are parallel to $\lambda - axis$

$\dfrac{dy}{dx} = 0$

$\dfrac{2a}{y}\left(1 + \cos\left(\dfrac{x}{a}\right)\right) = 0$

$\cos\dfrac{x}{a} = -1$

$\dfrac{x}{a} = \pi$

$\therefore y^2 = xa[x + a\sin\pi]$

$\boxed{y^2 = 4ax}$

38. $(1+x)^y + \sin^{-1}(\sin^2 x) - y = 0$

$\dfrac{dy}{dx} = \dfrac{-\partial f/\partial x}{\partial f/\partial y}$

$= \dfrac{-\left[y(1+x)^{y-1} + \dfrac{1(\sin 2x)}{\sqrt{1-\sin^2 x}} = 0\right]}{(a+x)^y.\log(1+x) - 1}$

if $x = 0$ *sub in G.R*

$y = 1^y$

$\boxed{y = 1}$

Point $= P(0,1)$

$m = \dfrac{-(1+0)}{-1} = 1$

Eqn of normal tangent is

$y - 1 = \dfrac{-1}{1}(x - 0)$

$\boxed{x + y = 1}$

39. $2y\dfrac{dy}{dx} = 3ax^2 \; at \; (1,1)$

$m = \dfrac{3ax^2}{2y} = \dfrac{3a}{2}$

$y - 1 = \dfrac{3a}{2}(x - 1)$

$2y - 2 = 3ax - 3$

$2y = 3ax - 1$

$3a = 3$

$\boxed{a = 1}$

$a + b = 1$

$b = 0$

$(a,b) = (1,0)$

40. From (1) & (1)

$\dfrac{1}{x^2}(x^2 + 1) = 2$

$x = \pm 1$

$y = 1$

$(1,1)$ & $(-1,1)$

$m_1 = -2, \; m_2 = -1$

$Tan\theta = \left|\dfrac{m_1 - m2}{1 + m_1 m_2}\right|.$

PHYSICS

41. The molecules on the surface of a liquid experience cohesive forces due to surrounding liquid molecules acting downward and adhesive forces due to surrounding gaseous molecules acting upwards.

42. $2\sigma l = mg$

$m = \dfrac{2\sigma l}{g} = \dfrac{2 \times 0.0049 \times 0.01}{9.8}$

$m \approx 100mg$

43. $P = \dfrac{4T}{d}$

$d = \frac{4 \times 0.075}{0.05 \times 10^4} = 0.6mm$

44. $P = \frac{8T}{d} \Rightarrow d = \frac{8T}{P} = \frac{8 \times 0.075}{0.075 \times 10^4}$

$d = 0.8mm$

45. $P = \frac{T}{d}$

$P = \frac{0.075}{5 \times 10^{-2}} = 1.5 N/m^2$

46. All other factors remaining constant h,a,d. Thus, if d is halved, h will be doubled, $h = \frac{4T\cos\theta}{\rho dg}$

47. $\frac{T_1}{h_1\rho_1} = 1:2 \; and \; \frac{T_2}{h_2\rho_2} = 1:4$

$\frac{T_1}{h_1\rho_1} = \frac{T_2}{h_2\rho_2} = \frac{1}{2h_1} = \frac{1}{4h_2}$

$2h_1 = 4h_2$

$\frac{h_1}{h_2} = \frac{2}{1}$

$h_1 : h_2 = 2:1$

48. The rise in liquid level for a liquid is independent of the amount of liquid present in the tube, since same tube is used and same liquid is considered, the rise in the liquid level will remain the same

49. $h = \frac{4T\cos\theta}{\rho dg}$

$h = \frac{4 \times 0.075 \times \cos 0^0}{10^3 \times 10 \times 10^{-3} \times 10} = 3mm$

50. Change in surface energy = surface tension $\times$ change in surface area

$= 0.075 \times \left(1000 \times \pi d^2 - \pi D^2\right)$

$= 0.075 \times \left(1000 \times \frac{\pi D^2}{100} - \pi D^2\right) \left(\because D = 10d\right) \left(d = \frac{D}{10}\right)$

$= 0.075 \times 9\pi \times (10-2)^2 = 0.212 mj$

Since the change is + ve , there will be a gain in the surface energy

51. $Vdg = TL$

$\frac{1.5 \times 6 \times 0.1 \times 1 \times 980}{12.2} = 72.3 dy/cm$

$= 0.0723 N/m$

52. Force due to S.T on drop + force of buoyancy = weight of drop

$2\pi rT + \frac{1}{2} \times \frac{4}{3}\pi r^3 \rho g = \frac{4}{3}\pi r^3 dg$

Solving for r

$r = \sqrt{\frac{3T}{g(2d - \rho)}}$

53. The upward force due to surface tension must be equal to the weight of wire

$2Tl\cos\theta = mg = \pi r^2 dg \left(\theta = 0^0\right)$

$r = \sqrt{\frac{2T}{\pi dg}}$

54. Under isothermal condition

$pv = p_1v_1 + p_2v_2$

$p, p_1 \& p_2$ are excess pressures in the bubbles

$\therefore \frac{4T}{r}.\frac{4}{3}\pi r^3 = \frac{4T}{r_1}.\frac{4}{3}\pi r_1^3 + \frac{4T}{r_2}\times\frac{4}{3}\pi r_1^3$

$r^2 = r_1^2 + r_2^2 \Rightarrow r = \sqrt{r_1^2 + r_2^2}$

55. $T = \frac{hrgd}{2} \Rightarrow 6\times10^{-2} = \frac{8\times10^{-4}\times9.8\times h\times900}{2}$

$h = 0.017$

56. $T = \frac{rhgd}{4}$

$T = \frac{10^{-2}\times2\times10^{-3}\times0.8\times9.8\times10^3}{4}$

$T = 0.0392N/m$

57. $\frac{p_1}{p_2} = \frac{r_2}{r_1}$

$\frac{p_1}{p_2} = \frac{4}{1} \Rightarrow 4:1$

58. $F = TL = T\times2\pi r$

$F = 75\times2\times\pi\times5 = 750\pi\ dyne$

59. $w = 2TA$

$w = 2\times3\times10^{-2}\times10^{-2}$

$w = 6\times10^{-4}J$

60. $T = F/L$

$T = \frac{F}{2\pi(R+r)}$

$F = 2\pi(R+r)T$

CHEMISTRY

61. In graphite a carbon atom is attached to another carbon atom.
the two atoms bonded together are equal electro negativity. Thus a covalent bond is formed.

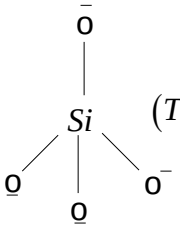
62. $\underset{(aq)}{H_2CO_3} + \underset{(l)}{H_2O} \rightleftharpoons HCO_3^-(aq) + H_3O^+(aq)$

$HCO_3^-(aq) + H_2O(l) \rightleftharpoons \underset{(aq)}{CO_3^{-2}} + H_3O^+(aq)$

carbon dioxide on reaction with water gives a weak dibasic acid .

63. Silicones are polymers having $\left(\begin{array}{c} | \\ -Si-O- \\ | \end{array}\right)_n$ monomer.

64. Orthosilicates $\left(SiO_4^{-4}\right)$



$(Tetrahedral\ geometry)$

65. $Bond\ order\ \alpha \dfrac{1}{Bond\ length}$

66. Due to inert pair effect

67. $SiCl_4 + H_2O \longrightarrow \underset{(Silicic\ acid)}{Si(OH)_4} + 4HCl$

68. Carbon has smaller size. high electro negativity , highest ionization energy and unavailability of de-orbital's due to which it can form only $p\pi - p\pi$ bond.

69. $Si + 2CH_3Cl \longrightarrow (CH_3)_2\ SiCl_2$

$(CH_3)_2\ SiCl_2 + 2H_2O \longrightarrow (CH_3)_2\ Si(OH_2) + 2HCl$

70. $SiO_2 + 2NaOH \longrightarrow Na_2SiO_3 + H_2O$

$SiO_2 + 4HF \longrightarrow SiF_4 + 2H_2O$

71. Carbon sub oxide (C_3O_2)

$O = C = C = C = O$

72. Amphoteric oxide it act as acid and base.

$CaO - Basic\ SnO_2 - Amphoteric$

$CO_2\ and\ SiO_2 - Acidic$

73. In graphite electrons are delocailsed within the layer.

74. Pb^{+2}, Sn^{+4}

75. BN has almost the same structure as graphite

76. $CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + \underset{Acetylene}{C_2H_2}$

77. $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

$ZnO + CO \rightarrow CO2 + Zn$

$CH_4 + 2O2 \rightarrow CO_2 + 2H_2O$

78. $\underset{(steam)}{H_2O} + \underset{(Red\ hot\ fues)}{C} \longrightarrow \underset{\substack{water\ gas\\ (or)\\ synthesis\ gas}}{H_2 + CO}\ \ \Delta H = +131\ kJ/mol$

79. dry ice composed of solid CO_2

80. CO gas it is a colouress and odourless and neutral oxide.

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