



SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR MPC
Time: 3 Hours

JEE MAINS JR GT

Date: 05-04-2020
Max. Marks: 300

SECTION – I

(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

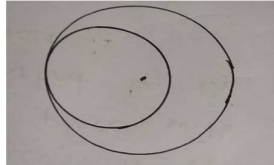
Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

MATHS

- Let $a, b, c \in R$. If $f(x) = ax^2 + bx + c$ is such that $a + b + c = 3$ and $f(x + y) = f(x) + f(y) + xy$, $\forall x, y \in R$ then $\sum_{n=1}^{10} f(n)$ is equal to
A) 190 B) 255 C) 330 D) 165
- If $f(x) = 2^{10} \cdot x + 1$, $g(x) = 3^{10} \cdot x - 1$ and $f \circ g(x) = x$ then 'x' is equal to
A) $\frac{3^{10} - 1}{3^{10} - 2^{10}}$ B) $\frac{2^{10} - 1}{2^{10} - 3^{10}}$ C) $\frac{1 - 3^{-10}}{2^{10} - 3^{-10}}$ D) $\frac{1 - 2^{-10}}{3^{10} - 2^{-10}}$
- If A is any 3 x 3 matrix with $|A| \neq 0$ and $(A - 3I)(A - 5I) = 0$ where $I = I_3$ and $O = O_3$. If $\alpha A + \beta A^{-1} = 4I$ then $\alpha + \beta$ is equal to
A) 13 B) 7 C) 12 D) 8
- If A is orthogonal matrix of order 3 then $\det(\text{adj } 2A) =$
A) 4 B) 16 C) 64 D) 27
- If $5(\tan^2 x - \cos^2 x) = 2 \cos 2x + 9$, then the value of $\cos 4x$ is
A) $\frac{2}{9}$ B) $\frac{-7}{9}$ C) $\frac{-3}{5}$ D) $\frac{1}{3}$
- The sum of all values of $\theta \in \left(0, \frac{\pi}{2}\right)$ satisfies $\sin^2 2\theta + \cos^4 2\theta = \frac{3}{4}$ is
A) π B) $\frac{\pi}{2}$ C) $\frac{3\pi}{8}$ D) $\frac{5\pi}{4}$
- $\sin^{-1}(\sin 10) =$
A) 10 B) $10 - 3\pi$ C) $3\pi - 10$ D) $3\pi + 10$
- In ΔABC , if $c^4 - 2(a^2 + b^2)c^2 + a^4 + a^2b^2 + b^4 = 0$ then $\angle C =$
A) 30° B) 45° C) 60° D) 75°
- If a vector \vec{a} of magnitude 50 is collinear with vector $\vec{b} = 6\hat{i} - 8\hat{j} - \frac{15}{2}\hat{k}$ and makes an acute angle with positive z – axis then
A) $\vec{a} = 4\vec{b}$ B) $\vec{a} = -4\vec{b}$ C) $\vec{b} = 4\vec{a}$ D) $\vec{a} = -2\vec{b}$
- Number of real solutions of $\sin(e^x) \cos(e^x) = 2^{x-1} + 2^{-x-1}$ is
A) zero B) one C) two D) infinite

11. The equation of the line whose y-intercept is $\frac{4}{5}$ and which is perpendicular to $5x + 2y + 7 = 0$ is
 A) $2x - 5y + 4 = 0$ B) $10x - 15y - 4 = 0$ C) $28x - 21y + 12 = 0$ D) $20x + 12y - 9 = 0$
12. The angle between the line joining the points $(1, -2), (3, 2)$ and the line $x + 2y - 7 = 0$ is
 A) 0 B) $\frac{\pi}{4}$ C) $\frac{\pi}{2}$ D) π
13. If $A = (3, 1, -2)$ $B = (-1, 0, 1)$ and l, m are the projections of AB on the y-axis, zx plane respectively then $3l^2 - m + 1 =$
 A) -1 B) 0 C) 1 D) 9
14. A plane which bisects the angle between the two given planes $2x - y + 2z - 4 = 0$ and $x + 2y + 2z - 2 = 0$ passes through the point
 A) $(1, 4, -1)$ B) $(2, -4, 1)$ C) $(2, 4, 1)$ D) $(1, -4, 1)$
15. If the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-2}{4}$ meets the plane $x + 2y + 3z = 15$ at a point 'p' then the distance of 'p' from the origin is
 A) $\frac{7}{2}$ B) $2\sqrt{5}$ C) $\frac{9}{2}$ D) $\frac{\sqrt{5}}{2}$
16. $\lim_{y \rightarrow x} \frac{\sin^2 y - \sin^2 x}{y - x} =$
 A) $\sin 2y$ B) $\sin 2x$ C) $\cos^2 y$ D) $\cos^2 x$
17. $\lim_{n \rightarrow \infty} \frac{1.1! + 2.2! + \dots + n.n!}{(n+1)!} =$
 A) -1 B) 1 C) $\frac{1}{2}$ D) 0
18. If $x \log_e(\log_e^x) - x^2 + y^2 = 4$ ($y > 0$) then $\frac{dy}{dx}$ at $x = e$ is equal to
 A) $\frac{1+2e}{2\sqrt{4+e^2}}$ B) $\frac{e}{\sqrt{4+e^2}}$ C) $\frac{2e-1}{2\sqrt{4+e^2}}$ D) $\frac{1+2e}{\sqrt{4+e^2}}$
19. The tangent to the curve $y = xe^{x^2}$ passing through the point $(1, e)$ also passed through the point
 A) $\left(\frac{4}{3}, 2e\right)$ B) $(2, 3e)$ C) $(3, 6e)$ D) $\left(\frac{5}{3}, 2e\right)$
20. The height of a right circular cylinder of maximum volume inscribed in a sphere of radius 3 is
 A) $2\sqrt{3}$ B) $\frac{2}{3}\sqrt{3}$ C) $\sqrt{6}$ D) $\sqrt{3}$

31. A force acts on a 2kg object so that its position is given as a function of time as $x = 3t^2 + 5$.
What is the work done by this force in first 5 seconds?
1) 850 J 2) 900J 3) 875 J 4) 950J
32. A plastic ball falling from a height of 19.6 m rebounds numbers of times. If total time for second collision is 4 seconds, then co – efficient of restitution is
1) 0.1 2) 0.3 3) 0.5 4) 0.7
33. From a uniform circular disc of radius R, a disc of radius R/2 is removed as shown. Then the distance of centre of mass of the remaining part from the center of mass of the original disc is



- 1) $\frac{R}{6}$ 2) $\frac{R}{8}$ 3) $\frac{R}{4}$ 4) $\frac{R}{3}$
34. A wheel of moment of inertia 30 kgm^2 is making 20 rev/min. The torque required to stop it in 10 seconds is
1) 3.14 N-m 2) 6.28 N-m 3) 1.57N-m 4) 4 N-m
35. If **translatory** K.E of a rolling solid sphere is 35J then its total Kinetic energy is
1) 42J 2) 49 J 3) 56J 4) 63 J
36. A pendulum clock runs fast by 5 seconds per day at 20°C and goes slow by 10 seconds per day at 35°C . It shows correct time at a temperature of
1) 27.5°C 2) 25°C 3) 30°C 4) 33°C
37. a body takes 10 minutes to cool from 60°C to 50°C . The temperature of surroundings is constant at 25°C . Then, the temperature of the body after next 10 minutes will be approximately.
1) 47°C 2) 43°C 3) 41°C 4) 45°C
38. A Carnot engine takes in 3000 Kcal of heat form a reservoir at 627°C and gives it to a sink at 27°C . The work done by the engine is
1) $4.2 \times 10^6 \text{ J}$ 2) $8.4 \times 10^6 \text{ J}$ 3) $16.8 \times 10^6 \text{ J}$ 4) zero
39. $1/2$ mole of helium gas is contained in a container at S.T.P. The heat energy needed in cal to double the pressure of the gas keeping the volume constant is ($R=2 \text{ cal mol}^{-1}\text{K}^{-1}$)
1) 3276 2) 1683 3) 918 4) 409.5
40. One mole of mono atomic gas at 27°C is mixed with three moles of mono atomic gas at 127°C . If there is no exchange of heat with the atmosphere, then the final temperature will be
1) 102°C 2) 170°C 3) 375°C 4) 423°C
41. A particle of mass 10 grams is kept on the surface of a uniform sphere of mass 100kg and radius 10cm. Find the work done against the gravitational force between them to take the particle for away from the sphere.
1) $13.34 \times 10^{-10}\text{J}$ 2) $3.33 \times 10^{-10}\text{J}$ 3) $6.67 \times 10^{-9} \text{ J}$ 4) $6.67 \times 10^{-10}\text{J}$
42. A catapult consists of two parallel rubber strings, each of length 10cm and cross – sectional area 10mm^2 . When stretched by 5 cm, it can throw a stone of mass 100 grams to a vertical height of 25m. the Young’s modulus of rubber is
1) $9.8 \times 10^7 \text{ N/m}^2$ 2) $9.8 \times 10^8 \text{ N/m}^2$ 3) $9.8 \times 10^9 \text{ N/m}^2$ 4) $9.8 \times 10^{10} \text{ N/m}^2$
43. A large wooden piece in the form of a cylinder floats on water with two – thirds of its length immersed. When a man stands on its upper surface, a further one – sixth of its length is immersed. The ratio of masses of man and the wooden piece is
1) 1:2 2) 1:3 3) 1:4 4) 1:5
44. A particle executing SHM oscillates between two fixed points separated by 20cm. If its maximum velocity is 40 cm/s, then find its velocity when its displacement is 5cm from its mean position.
1) $20\sqrt{3} \text{ m/s}$ 2) 20 m/s 3) $20\sqrt{3} \text{ cm/s}$ 4) 20 cm/s

55. Which of the following molecule has two sigma (σ) and two pi (π) bonds?

- 1) C_2H_4 2) N_2F_2 3) $C_2H_2Cl_2$ 4) HCN

56. Among the following which is a redox reaction

- 1) $N_2 + O_2 \xrightarrow{2000K}$ 2) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$
 3) Reaction between $NaOH$ and H_2SO_4 4) Reaction between H_2SO_4 and $NaCl$

57. Oxidation number of 'K' in K_2O, K_2O_2 and KO_2 respectively is

- 1) +1, +2 and +4 2) +1, +4 and +2 3) +1, +1 and +1 4) +2, +1 and $+\frac{1}{2}$

58. A compound (A: $B_3N_3H_3Cl_3$) reacts with $LiBH_4$ to form inorganic benzene (B). (A) reacts with (C) to form $B_3N_3H_3(CH_3)_3$ (B) and (C) are respectively.

- 1) Boron nitride, $MeMgBr$ 2) Boron nitride, $MeBr$
 3) Borazine, $MeBr$ 4) Borazine, $MeMgBr$

59. No. of SP^2 hybrid orbitals in benzene is

- 1) 18 2) 24 3) 6 4) 12

60. If Z is a compressibility factor, vanderwaal's equation at moderate pressure can be written as:

- 1) $Z = 1 + \frac{RT}{pb}$ 2) $Z = 1 - \frac{a}{VRT}$ 3) $Z = 1 - \frac{pb}{RT}$ 4) $Z = 1 + \frac{pb}{RT}$

61. Experimentally it was found that a metal oxide has formula $M_{0.98}O$. Metal M, is present as M^{+2} and M^{+3} in its oxide. Fraction of the metal which exists as M^{+3} would be:

- 1) 4.08% 2) 6.05% 3) 5.08% 4) 7.01%

62. What will be the value of ΔG^0 , if equilibrium constant for a reaction is 10

- 1) $-50.44 \text{ KJ mol}^{-1}$ 2) $-57.44 \text{ KJ mol}^{-1}$ 3) $-25.44 \text{ KJ mol}^{-1}$ 4) -10 KJ mol^{-1}

63. Which of the following conditions in drinking water causes blue baby syndrome

- 1) >100 ppm of sulphate 2) >50 ppm of lead
 3) >50 ppm of nitrate 4) >50 ppm of chloride

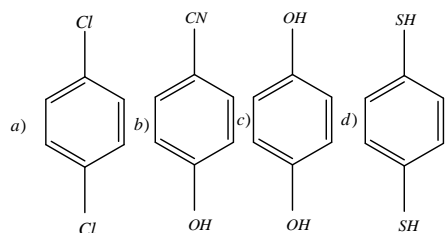
64. The chloride that cannot get hydrolysed in

- 1) $PbCl_4$ 2) $SiCl_4$ 3) CCl_4 4) $SnCl_4$

65. The chemical nature of hydrogen peroxide is

- 1) oxidizing agent in acidic medium, but not in basic medium
 2) Oxidising and reducing agent in both acidic and basic medium
 3) Reducing agent in basic medium, but not in acidic medium
 4) oxidizing and reducing agent in acidic medium but not in basic medium.

66. For which of the following molecule $\mu \neq 0$?



- 1) only a 2) a and b 3) only c 4) c and d



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KEY SHEET

MATHEMATICS

1) C	2) D	3) D	4) C	5) B	6) B	7) C	8) C	9) B	10) A
11) A	12) C	13) A	14) B	15) C	16) B	17) B	18) C	19) A	20) A
21) -1.25	22) 2.25	23) 57.50	24) 7	25) 12					

PHYSICS

26) C	27) B	28) D	29) A	30) B	31) B	32) C	33) A	34) B	35) B
36) B	37) B	38) B	39) D	40) A	41) D	42) A	43) C	44) C	45) D
46) 36.05	47) 6.2 8	48) 103 .88	49) 9.5 3	50) 765.00 0					

CHEMISTRY

51) A	52) C	53) C	54) A	55) D	56) A	57) C	58) D	59) A	60) B
61) A	62) B	63) C	64) C	65) B	66) D	67) B	68) C	69) D	70) D
71) 9.5	72) 4	73) 4	74) 9	75) 2.5					

HINTS & SOLUTIONS
MATHS

1. $f(x+y) = f(x) + f(y) + xy$
 $\Rightarrow (2a-1)xy - c = 0 \forall x, y \in R$
 $\Rightarrow a = \frac{1}{2}, c = 0 \Rightarrow b = \frac{5}{2}$

$$f(x) = \frac{1}{2}x^2 + \frac{5}{2}x$$

$$\Rightarrow \sum_{n=1}^{10} f(n) = \frac{1}{2} \sum_{n=1}^{10} n^2 + \frac{5}{2} \sum_{n=1}^{10} n$$

$$= \frac{1}{2} \left[\frac{10 \times 11 \times 21}{6} \right] + \frac{5}{2} \left[\frac{10 \times 11}{2} \right]$$

$$= \frac{385}{2} + \frac{275}{2} = \frac{660}{2} = 330$$

2. $f(3^{10} \cdot x - 1) = x$
 $2^{10}(3^{10} \cdot x - 1) + 1 = x$
 $2^{10} \cdot 3^{10} \cdot x - 2^{10} + 1 = x$
 $x[2^{10} \cdot 3^{10} - 1] = 2^{10} - 1$

$$x = \frac{2^{10} - 1}{2^{10} \cdot 3^{10} - 1} = \frac{1 - 2^{-10}}{3^{10} - 2^{-10}}$$

3. $(A-3I)(A-5I) = 0$
 $A^2 - 8A + 15I = 0$
 $A - 8I + 15A^{-1} = 0$
 $\Rightarrow A + 15A^{-1} = 8I$
 $\Rightarrow \frac{1}{2}A + \frac{15}{2}A^{-1} = 4I$
 $\alpha + \beta = \frac{1}{2} + \frac{15}{2} = 8$

4. $|A| = \pm 1, |adj 2A| = |2A|^{n-1} = [2^n |A|]^{n-1}$
 $= [2^3 (\pm 1)]^2 = 64$

5. Put $\tan^2 x = t$

$$5 \left(t - \frac{1}{1+t} \right) = 2 \left(\frac{1-t}{1+t} \right) + 9$$

$$5 \left[\frac{t+t^2-1}{1+t} \right] = \frac{2-2t+9+9t}{1+t}$$

$$5t^2 + 5t - 5 = 7t + 11$$

$$5t^2 - 2t - 16 = 0$$

$$5t^2 - 10t + 8t - 16 = 0$$

$$5t(t-2) + 8(t-2) = 0 \Rightarrow \tan^2 x = 2$$

$$\cos 2x = \frac{1-2}{1+2} = \frac{-1}{3} \Rightarrow \cos 4x = 2 \left(\frac{1}{9} \right) - 1 = \frac{-7}{9}$$

6.

$$\sin^2 2\theta + (1 - \sin^2 2\theta)^2 = \frac{3}{4}$$

$$\sin^2 2\theta + 1 + \sin^4 2\theta - 2\sin^2 2\theta = \frac{3}{4}$$

$$4\sin^4 2\theta - 4\sin^2 2\theta + 1 = 0 \Rightarrow (2\sin^2 2\theta - 1)^2 = 0$$

$$\Rightarrow \sin^2 2\theta = \frac{1}{2} \Rightarrow \sin 2\theta = \pm \frac{1}{\sqrt{2}}$$

$$\Rightarrow 2\theta = \frac{\pi}{4}, \frac{3\pi}{4} \Rightarrow \theta = \frac{\pi}{8}, \frac{3\pi}{8}$$

$$\Rightarrow \text{sum of all values} = \frac{\pi}{8} + \frac{3\pi}{8} = \frac{\pi}{2}$$

7. From graph of $\sin^{-1}(\sin x)$

8.

$$(a^2 + b^2 - c^2)^2 - a^2 b^2 = 0$$

$$a^2 + b^2 - c^2 = \pm ab$$

We have

$$\cos c = \frac{a^2 + b^2 - c^2}{2ab} = \frac{\pm ab}{2ab} = \pm \frac{1}{2}$$

$$\Rightarrow c = 60^\circ$$

9. $\vec{a} = \lambda(6\hat{i} - 8\hat{j} - \frac{15}{2}\hat{k})$

$$\Rightarrow \sqrt{36\lambda^2 + 64\lambda^2 + \frac{225}{4}\lambda^2} = 50$$

$$\frac{25}{2}\lambda = \pm 50 \Rightarrow \lambda = \pm 4$$

$$\Rightarrow \vec{a} = \pm 4(6\hat{i} - 8\hat{j} - \frac{15}{2}\hat{k})$$

But \vec{a} makes acute angle with z axis

$$\Rightarrow \vec{a} = -4\vec{b}$$

10. $\sin(2e^x) = 2^x + 2^{-x}$

But $2^x + 2^{-x} \geq 2 \Rightarrow$ no solution.

11. $c = \frac{4}{5}$, slope of $5x + 2y + 7 = 0$ is $-\frac{5}{2}$

Req. line slope = $\frac{2}{5}$

Equation of line $y = \frac{2}{5}x + \frac{4}{5}$

12. $m_1 = \frac{2+2}{3-1} = 2$

$m_2 = \frac{-1}{2}$

$m_1 m_2 = -1$

13.

$l = |y_1 - y_2| = 1$

$m = \sqrt{(x_1 - x_2)^2 + (z_1 - z_2)^2} = \sqrt{16+9} = 5$

$3l^2 - m + 1 = 3 - 5 + 1 = -1$

14. angle bisector

$\frac{2x - y + 2z - 4}{3} = \pm \frac{x + 2y + 2z - 2}{3}$

$x - 3y = 2, 3x + y + 4z = 6$

15. a point on given line

$(1 + 2\lambda, -1 + 3\lambda, 2 + 4\lambda)$

Substitute In plane

$1 + 2\lambda - 2 + 6\lambda + 6 + 12\lambda = 15$

$\lambda = \frac{1}{2}$

Point $(2, \frac{1}{2}, 4)$

Distance From origin =

$\sqrt{4 + \frac{1}{4} + 16} = \frac{9}{2}$

16. by L-H rule

$\lim_{y \rightarrow x} \frac{2 \sin y \cos y}{1} = \sin 2x$

17. $1.1! + 2.2! + 3.3! + \dots + n.n! = (n+A)! - 1$

18. Differentiate w.r to x

$\frac{x}{\log x} \cdot \frac{1}{x} + \log(\log x) - 2x + 2yy' = 0$

$\frac{1}{\log x} + \log_e(\log x) + 2yy' = 2x \dots (1)$

$x = e$ in given curve

$0 - e^2 + y^2 = 4$

$y = \pm \sqrt{4 + e^2}$

Substitute in (1) $1 + 0 + 2yy' = 2e$

$y' = \frac{2e-1}{2y} = \frac{2e-1}{2\sqrt{4+e^2}}$

19.

$y = xe^{x^2}$

$\frac{dy}{dx} = 2x^2 e^{x^2} + e^{x^2}$

Equation of tangent is

$y - e = 3e(x - 1)$

Which passes through $(\frac{4}{3}, 2e)$

20. $\frac{h^2}{4} + r^2 = 9$

$r^2 = 9 - \frac{h^2}{4}$

$V = \pi \left(9 - \frac{h^2}{4} \right) h$

$V' = 9\pi - \frac{3}{4}\pi h^2 = 0$

$3\pi \left(3 - \frac{1}{4}h^2 \right) = 0$

$h = 2\sqrt{3}$.

21. Given $x^2 f(x) + f(1-x) = 2x - x^4$

$(1-x)^2 f(1-x) + f(x) = 2(1-x) - (1-x)^4$

By eliminating $f(1-x)$, we get

$f(x) = 1 - x^2 \Rightarrow f\left(\frac{3}{2}\right) = 1 - \frac{9}{4} = \frac{-5}{4} = -1.25$

22. $x + y = 5$
 $x - y = 4 \Rightarrow x = \frac{9}{2}, y = \frac{1}{2}$

$f(5, 4) = \left(\frac{9}{2}\right)\left(\frac{1}{2}\right) = \frac{9}{4} = 2.25$

23. $K = \sum_{n=1}^{20} \frac{n(n+1)}{n} = \frac{1}{2} [2+3+4+\dots+21]$

$= \frac{1}{2} \left[\frac{21 \times 22}{2} - 1 \right] = \frac{1}{2} (230) = 115$

$\frac{k}{2} = 57.50$

24.

$f'(x) = 3x^2 - 3(a-2).2x + 3a$;

$$f'(1) = 0 \Rightarrow a = 5 ;$$

$$\frac{f(x)-14}{(x-1)^2} = \frac{x^3 - 9x^2 + 15x + 7 - 14}{(x-1)^2} = 0$$

$$x - 7 = 0$$

$$x = 7$$

PHYSICS

$$26. \quad v = \frac{dx}{dt}$$

$$a = \frac{dv}{dt} = 0$$

$$27. \quad R = \frac{u^2 \sin 2\theta}{g}, h_1 = \frac{u^2 \sin^2 \theta}{2g} \text{ and}$$

$$h_2 = \frac{u^2 \cos^2 \theta}{2g}$$

$$28. \quad a = \frac{(m_1 - m_2)g}{m_1 + m_2}; s = \frac{1}{2}at^2$$

$$\mu = \tan \theta$$

$$29. \quad v^2 = u^2 - 2as$$

$$a = -g(\sin \theta + \mu \cos \theta)$$

$$30. \quad \text{Impulse} = \int_0^t F \cdot dt$$

31.

$$x = 3t^2 + 5$$

$$v = \frac{dx}{dt} = 6t$$

$$\text{At } t = 0 \text{ s, } u = 0$$

$$\text{At } t = 5 \text{ s, } v = 30 \text{ m/s}$$

$$w = \frac{1}{2}m[v^2 - u^2]$$

$$32. \quad t = \sqrt{\frac{2h}{g}} [1 + 2e]$$

$$33. \quad \text{shift in cm} = \frac{m_1 x_1 - m_2 x_2}{m_1 - m_2}$$

$$34. \quad T = I\alpha; \alpha = \frac{w_2 - w_1}{t}$$

$$35. \quad \text{Total K. E} = \frac{1}{2}mv^2 \left[1 + \frac{K^2}{R^2} \right]$$

25.

$$\frac{2c^2}{|ab|} = \frac{2 \times 36}{2 \times 3} = 12$$

$$5 = \frac{1}{2}\alpha[t - 20] \dots (1)$$

36.

$$10 = \frac{1}{2}\alpha[35 - t] \dots (2)$$

From (1) and (2), $t = 25^\circ\text{C}$

$$37. \quad \frac{\theta_1 - \theta_2}{t} = K \left[\frac{\theta_1 + \theta_2}{2} - \theta_s \right]$$

$$38. \quad \eta = \frac{W}{Q} = 1 - \frac{T_2}{T_1}$$

$$39. \quad du = nC_v dT$$

40. Resultant temperature =

$$\frac{n_1 C_{v2} T_1 + n_2 C_{v2} T_2}{n_1 C_{v1} + n_2 C_{v2}}$$

$$41. \quad W = \frac{GMm}{R}$$

$$42. \quad U = \left[\frac{1}{2} \times \text{stress} \times \text{strain} \times \text{volume} \right] \times 2$$

$$U = mgh$$

43. weight of floating body

$$Mg = V\rho g$$

$$44. \quad V_{\max} = AW$$

$$V = w\sqrt{A^2 - x^2}$$

$$A = 10 \text{ cm}$$

$$45. \quad \frac{\Delta v}{v} = \left[\frac{\Delta s}{s} + \frac{\Delta t}{t} \right] \times 100\%$$

$$46. \quad V = \sqrt{V_x^2 + V_y^2}$$

$$V_x = u \cos \theta$$

$$V_y = u \sin \theta - gt$$

$$47. \quad T = 2\pi \sqrt{\frac{1}{g \left[1 - \frac{p}{\sigma} \right]}}$$

$$48. \quad P = P_0 + \frac{2T}{r}$$

$$49. \quad P_1 V_1 = P_2 V_2$$

$$50. \quad t_1 = \frac{W}{V_b}$$

$$t_2 = \frac{W}{\sqrt{V_b^2 - v_R^2}}$$

$$t_2 - t_1 = 6$$

CHEMISTRY

51. $r_n = 0.529 \times n^2 \text{ \AA}^0$ or $r_n = 0.53 \times n^2 \text{ \AA}^0$
 $= 0.53 \times 2^2 \text{ \AA}^0$
 $r_n = 2.12 \text{ \AA}^0$

52. $2\pi r = n\lambda, 2\pi a_0 \frac{n^2}{z} = n\lambda$

$$2\pi a_0 = \frac{n^2}{z} = n \cdot 1.5\pi a_0$$

$$\frac{n}{z} = \frac{1.5}{2} = \frac{3}{4} = 0.75$$

53. Due to small size and more inter electronic repulsions, EA of fluorine is less

than chlorine.

54. In CN^- , total no. of electrons = 14, then Bond order = 3

Filling in molecular orbitals

$$\sigma 15^{2\sigma} 15^{2\sigma} 25^{2\sigma} 25^{2\sigma} \pi 2P_x^2 = \pi 2P_y^2 \sigma 2P_z^2$$

$$B.O = \frac{Nb - Na}{2} = \frac{10 - 4}{2} = 3$$

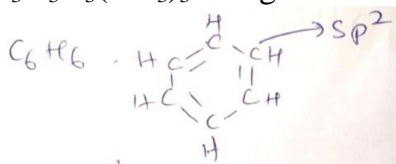
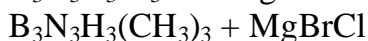
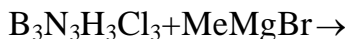
It is diamagnetic.

55. $H-C \equiv N$ has 2 σ & 2 π bonds

56. (1) $N_2^0 + O_2^0 \xrightarrow{2000K} 2N^{+2}O^{-2}$ in 2, 3, 4 there is no change in the oxidation states of elements.

57. K belongs to IA group its common oxidation state is +1. Only.

58. $B_3N_3H_3Cl_3 + LiBH_4 \rightarrow B_3N_3H_6 + LiCl + BCl_3$



59. Each 'c' forms 3 Sp^2 hybrid orbitals

$$\therefore 6c \times 3 = 18 \text{ H.O}$$

60. $\left(P + \frac{a}{v^2}\right)(v-b) = RT$

At low pressure

$$\left(P + \frac{a}{v^2}\right)_{XV} = RT$$

$$Pv + \frac{a}{v} = RT$$

$$\frac{PV}{RT} + \frac{a}{VRT} = 1 \Rightarrow z + \frac{a}{VRT} = 1$$

61. Metal oxide = $M_{0.98}O$

If 'x' ions of M are in +3 state, then

$$3x + (0.98 - x) \times 2 = 2$$

$$X = 0.04$$

\therefore the percentage of metal in +3 state

$$\text{would be} = \frac{0.04}{0.98} \times 100 = 4.08\%$$

62. $\Delta G = -2.303RT \log K$

$$= 2.303 \times 8.314 \times 10^{-3} \times 300$$

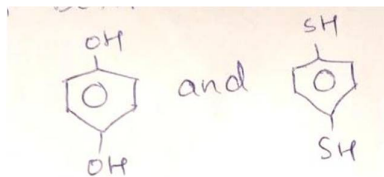
$\log 10$

$$\Delta G = -57.44 \text{ KJ/mol}$$

63. If NO_3^- is >50 ppm then it causes blue baby syndrome

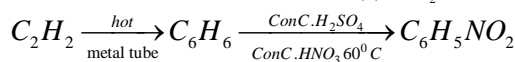
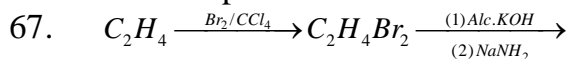
64. 'C' in CCl_4 does not have vacant orbital required for hydrolysis.

65. H_2O_2 is oxidizing agent as well as reducing agent in both acidic and basic medium.



66.

Are non planar molecules



68.

It does not follow Huckel's rule

$$4n+2 = \text{No. of } \pi e^-$$

$$4n = 2 = 4 \Rightarrow 4n = 2 \quad n = \frac{2}{4} = 0.5$$

69. Alc. KOH is dehydrohalogenating agent

70. $H_2O < CH_3SO_3^- < CH_3COO^- < OH^-$

lone pair donating tendency on oxygen is reduced nucleophilicity reduced.

71. $P^H = P^{Ka} + \log \frac{[salt]}{[Acid]}$

$$p^{Ka} = 4.5$$

As acid is 50% ionized

$$[\text{salt}] = [\text{acid}]$$

$$p^{OH} = 14 - 4.5 = 9.5$$

72. For 100 parts - 0.33 gm of Fe

68000 parts - ?

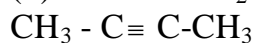
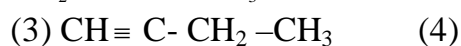
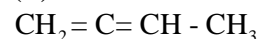
$$\frac{68000}{100} \times 0.33 = 224.4 \text{ gm of Fe.}$$

56gm is the wt of 1 Fe atom

224 gm is the wt of 4 Fe atoms.

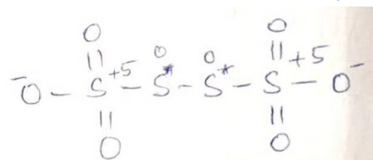
73. The total no. of acyclic isomers of

C_4H_6 are 4



74. Number of orbitals = $n^2 = 3^2 = 9$

75. Tetrathionate ion is $S_4O_6^{-2}$



Average of four oxidation number of sulphurs of the $S_4O_6^{-2}$ is

