JEE MAIN 2026

Sample Paper - 17

Time Allowed: 3 hours **Maximum Marks:** 300

General Instructions:

1. The test consists of total 75 questions.

2. Each subject (PCM) has 25 questions.

3. Each subject divided into two sections. Section A consists of 20 multiple-choice questions & Section B consists of 5 numerical value-type questions.

4. Marking Scheme:

- Section A (MCQs): +4 marks for each correct answer, -1 mark for each incorrect answer, 0 marks for unattempted.
- Section B (Numerical): +4 marks for each correct answer, 0 marks for incorrect or unattempted.

5. Any textual, printed, or written material, mobile phones, calculator etc. is not allowed for the students appearing for the test.

6. All calculations/written work should be done in the rough sheet is provided with the Question Paper.

MATHEMATICS

Max Marks: 100

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 in all other cases.

1. Let $P=\begin{bmatrix}3 & -1 & -2\\ 2 & 0 & \alpha\\ 3 & -5 & 0\end{bmatrix}$, where $\alpha \in R$. Suppose $Q=\left[q_{ij}\right]$ is a matric satisfying PQ = kI_3 for some non-zero $k \in R$, If $q_{23}=-\frac{k}{8}$ and $|Q|=\frac{k^2}{2}$, then α^2+k^2 is equal to

1) 13 **2)** 15 **3)** 17 **4)** 21

2. Statement – I: If $\alpha=\cos\left(\frac{2\pi}{7}\right)+i\sin\left(\frac{2\pi}{7}\right), p=\alpha+\alpha^2+\alpha^4, q=\alpha^3+\alpha^5+\alpha^6$, then the equation whose roots are p and q is $x^2 + x + 2$.

Statement – II: If α is a root of $Z^7 = 1$, then $1 + \alpha + \alpha^2 + \ldots + \alpha^6 = 0$

1) Statement 1 is true, Statement – 2 is true

2) Statement 1 is false, Statement – 2 is false

3) Statement 1 is true, Statement – 2 is false

4) Statement 1 is false, Statement – 2 is true

3. The letters of the word 'MANKIND' are written in all possible orders and arranged in serial order as in an English dictionary. Then the serial number of the word 'MANKIND' is

1) 1492 **2)** 1493 **3)** 1490 **4)** 1491

4. Match the following

Column 1		Column - 2	
A)	Number of triangle that can be made using the vertices of a polygon of 10 sides as their vertices and having exactly one side common with the polygon is	**p)**	75
B)	Number of triangle that can be made using the vertices of a polygon of 10 sides as their vertices and having exactly 2 sides common with the polygon is	**q)**	110
C)	Number of quadrilaterals that can be made using the vertices of a polygon of 10 sides as their vertices and having exactly 2 sides common with the polygon is	**r)**	60
D)	Number of quadrilaterals that can be made using the vertices of a polygon of 10 sides as their vertices had having 3 sides common with the polygon is	**s)**	10

1) A-r, B-s, C-p, D-q **2)** A-s, B-r, C-p, D-s

3) A-r, B-s, C-p, D-s **4)** None of these

5. Let there be three independent events E_1, E_2 and E_3. The probability that only E_1 occurs is α, only E_2 occurs is β and only E_3 occurs is γ. Let 'p' denote the probability of none of events occurs that satisfies the equation $(\alpha-2\beta)p=\alpha\beta$ and $(\beta-3\gamma)p=2\beta\gamma$. All the given probabilities are assumed to lie in the interval (0,1).

Then $\frac{probability\ of\ occurance\ of\ E_1}{probability\ of\ occurance\ of\ E_3}$ is equal to

1) 9 **2)** 3 **3)** 7 **4)** 6

6. Let the circumcenter of a triangle with vertices A(a, 3), B(b, 5) and C(a, b), ab > 0 be P(1, 1). If the line AP intersects the line BC at the point $Q(k_1,k_2)$, then k_1+k_2 is equal to

1) 2 **2)** $\frac{4}{7}$ **3)** $\frac{2}{7}$ **4)** 4

7. The number of real solutions of the equation $e^{4x}+4e^{3x}-58e^{2x}+4e^{x}+1=0$ is

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

8. A wire of length 20 m is to be cut into two pieces. A piece of length ℓ_1 is bent to make a square of area A_1 and the other piece of length ℓ_2 is made into a circle of area A_2. If $2A_1 + 3A_2$ is minimum then $(\pi\ell_1):\ell_2$ is equal to

1) 6 : 1 **2)** 3 : 1 **3)** 1 : 6 **4)** 4 : 1

9. Let $f(x)=4x^3-11x^2+8x-5, x\in R$. Then f :

1) has a local minima at $x=\frac{1}{2}$. **2)** has a local minima at $x=\frac{3}{4}$

3) in increasing in $\left(\frac{1}{2},\frac{3}{4}\right)$ **4)** is decreasing in $\left(\frac{1}{2},\frac{4}{3}\right)$

10. Let for a triangle ABC,

$\overline{AB}=-2\hat{i}+\hat{j}+3\hat{k}$

$\overline{CB}=\alpha\hat{i}+\beta\hat{j}+\gamma\hat{k}$

$\overline{CA}=4\hat{i}+3\hat{j}+\delta\hat{k}$

If $\delta>0$ and area of the triangle ABC is $5\sqrt{6}$, Then $\overline{CB}.\overline{CA}$ is equal to

1) 60 **2)** 120 **3)** 108 **4)** 54

11. If the shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{\lambda}$ and $\frac{x-2}{1}=\frac{y-4}{4}=\frac{z-5}{5}$ is $\frac{1}{\sqrt{3}}$, then the sum of all possible values of λ is :

1) 16 **2)** 6 **3)** 12 **4)** 15

12. If $15\sin^4\alpha+10\cos^4\alpha=6$, for $\alpha\in R$, then the value of $27\sec^6\alpha+8\operatorname{cosec}^6\alpha$ is equal to:

1) 350 **2)** 250 **3)** 400 **4)** 500

13. Let $S_1=\left\{x\in R-\{1,2\}:\frac{(x+2)(x^2+3x+5)}{-2+3x-x^2}\geq 0\right\}$ and $S_2=\left\{x\in R:3^{2x}-3^{x+1}-3^{x+2}+27\leq 0\right\}$. Then, $S_1\cup S_2$ is equal to

1) $(-\infty,-2]\cup(1,2)$ **2)** $(-\infty,-2]\cup[1,2]$ **3)** $(-2,1]\cup(2,\infty)$ **4)** $(-\infty,2]$

14. The integral $\int\left(\frac{x}{x\sin x+\cos x}\right)^2 dx$ is equal to (where C is a constant integration):

1) $\tan x-\frac{x\sec x}{x\sin x+\cos x}+C$ **2)** $\sec x+\frac{x\tan x}{x\sin x+\cos x}+C$

3) $\sec x-\frac{x\tan x}{x\sin x+\cos x}+C$ **4)** $\tan x+\frac{x\sec x}{x\sin x+\cos x}+C$

15. The area of the region $S=\left\{(x,y):y^2\le 8x, y\ge\sqrt{2}x, x\ge 1\right\}$ is

1) $\frac{13\sqrt{2}}{6}$ **2)** $\frac{11\sqrt{2}}{6}$ **3)** $\frac{5\sqrt{2}}{6}$ **4)** $\frac{19\sqrt{2}}{6}$

16. Let $y=y(x), y>0$ be a solution curve of the differential equation $(1+x^2)dy=y(x-y)dx$. If $y(0)=1$ and $y(2\sqrt{2})=\beta$, then

1) $e^{3\beta^{-1}}=e(3+2\sqrt{2})$ **2)** $e^{\beta^{-1}}=e^{-2}(5+\sqrt{2})$

3) $e^{\beta^{-1}}=e^{-2}(3+2\sqrt{2})$ **4)** $e^{3\beta^{-1}}=e(5+\sqrt{2})$

17. The number of terms common to the two A.P,'s 3, 7, 11,…, 407 and 2, 9, 16,…,709 is ____.

1) 7 **2)** 14 **3)** 21 **4)** 28

18. Consider the following frequency distribution:

Class:	0-6	6-12	12-18	18-24	24-30
Frequency:	a	b	12	9	5

If mean $=\frac{309}{22}$ and median = 14, then the value $(a-b)^2$ is equal to____.

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

19. Let $\overset{50}{\underset{i=1}{U}}X_i=\overset{n}{\underset{i=1}{U}}Y_i=T$, where each X_i contains 10 elements and each Y_i contains 5 elements. If each element of the set T is an element of exactly 20 of sets X_i's and exactly 6 of sets Y_i's then n is equal to

1) 15 **2)** 50 **3)** 45 **4)** 30

20. Let the function

$$f(x)=\begin{cases}\dfrac{\log_e(1+5x)-\log_e(1+\alpha x)}{x} & ;if\ x\neq 0\\ \dfrac{}{10} & ;if\ x=0\end{cases}$$

Be continuous at x = 0. Then absolute value of 'α' is equal to

1) 2 **2)** 3 **3)** 4 **4)** 5

SECTION-II (NUMERICAL VALUE TYPE)

This section contains **5 Numerical Value Type Questions.** The Answer should be within **0 to 9999.** If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i,e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11).**

Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases.

21. Consider a matrix $A=\begin{bmatrix}\alpha & \beta & \lambda\\ \alpha^2 & \beta^2 & \lambda^2\\ \beta+\lambda & \lambda+\alpha & \alpha+\beta\end{bmatrix}$ where α,β,λ are three distinct natural numbers.

If $\dfrac{\det\left(adj\left(adj\left(adj\left(adjA\right)\right)\right)\right)}{(\alpha-\beta)^{16}(\beta-\gamma)^{16}(\gamma-\alpha)^{16}}=2^{32}\times 3^{16}$, then the number of such 3-triples (α,β,γ) is_____.

22. The probability distribution of X is:

X	0	1	2	3
P(X)	$\frac{1-d}{4}$	$\frac{1+2d}{4}$	$\frac{1-4d}{4}$	$\frac{1+3d}{4}$

For the minimum possible value of d, sixty times the mean of X is equal to ____.

23. If the system of equations

$x+y+z=16$

$2x+5y+\alpha z=\beta$

$x+2y+3z=14$

has infinitely many solutions, then $\alpha+\beta$ is equal to

24. If the length of the latus rectum of the ellipse $x^2+4y^2+2x+8y-\lambda=0$ is 4, and l is the length of its major axis, then $\lambda+l$ is equal to:

25. If the length of the perpendicular drawn from the point (a, 4, 2), a > 0 on the line $\dfrac{x+1}{2}=\dfrac{y-3}{3}=\dfrac{z-1}{-1}$ is $2\sqrt{6}$ units and $Q(\alpha_1,\alpha_2,\alpha_3)$ is the image of the point P on this line, then $a+\sum_{i=1}^{3}\alpha_i$ is equal to

PHYSICS **Max Marks: 100**

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 in all other cases.

26. If force (F), Velocity (V) and time (T) are considered as fundamental physical quantity, then dimensional formula of density will be:

1) $FV^{-2}T^{2}$ **2)** $FV^{-4}T^{-2}$ **3)** $FV^{4}T^{+2}$ **4)** $F^{2}V^{-2}T^{6}$

27. A projectile is fired with velocity v at angle of θ with horizontal. Find the radius of curvature of path at highest point.

1) $\frac{v^2\cos^2\theta}{g}$ **2)** $\frac{v^2}{g\cos\theta}$ **3)** $\frac{v^2\cos\theta}{g}$ **4)** $\frac{v^2\cos^2\theta}{2g}$

28. **Statement 1** : If an electric dipole of dipole moment 30×10^{-5} cm is enclosed by a closed surface, the net flux coming out of the surface will be zero.

Statement 2 : electric dipole consists of two equal and opposite charges.

1) Statement-1 is True, Statement-2 is True; Statement -2 is a correct explanation for Statement-1

2) Statement-1 is True, Statement-2 is True; Statement -2 is NOT a correct explanation for Statement-1.

3) Statement -1 is True, Statement-2 is False.

4) Statement -1 is False, Statement-2 is True.

29. A particle of mass *m* moves towards a smooth vertical wall with a speed u (relative to the ground) and collides elastically with the wall; the wall moving towards the particle with a speed 2u (also relative to the ground). Assuming that the wall is extremely massive, the magnitude of impulse delivered to the particle equals

1) 5 mu **2)** 6 mu **3)** 4 mu **4)** 2 mu

30. The electric field of an electromagnetic wave in free space is represented by $\vec{E} = E_0 \cos(\omega t - kz)\hat{i}$ The corresponding magnetic induction vector will be

1) $\vec{B} = (E_0 C)\cos(\omega t - kz)\hat{j}$ **2)** $\vec{B} = \left(\frac{E_0}{C}\right)\cos(\omega t - kz)\hat{j}$

3) $\vec{B} = E_0 \cos(\omega t + kz)\hat{j}$ **4)** $\vec{B} = -\left(\frac{E_0}{C}\right)\cos(\omega t - kz)\hat{j}$

31. Assertion: The time period of a pendulum of infinite length whose bob hangs near the surface of the earth will be infinite. and

Reason: The time period of a pendulum of length L near the surface of the earth is $2\pi\sqrt{\frac{L}{g}}$, if L is reasonably small.

1) Assertion is True, Reason is True, Reason is correct explanation for Assertion

2) Assertion is True, Reason is True, Reason is NOT a correct explanation for Assertion

3) Assertion is True, Reason is false

4) Assertion is False, Reason is True

32. A spherical drop of radius r and density n is falling in air with terminal velocity. The density of air is n_0 and its coefficient of viscosity μ . The power developed by gravity is

1) $\frac{\pi r^5 n}{\mu}(n - n_0)g^2$ **2)** $\frac{27}{8\mu} r^5 n(n - n_0)g^2$ **3)** $\frac{8\pi r^5}{27\mu} n(n - n_0)g^2$ **4)** $\frac{\pi r^5}{27\mu} n(n - n_0)g^2$

33. A particle moves according to the law $x = a\cos\frac{\pi t}{2}$. The distance covered by it in the time internal between t = 0 to t = 3 sec is

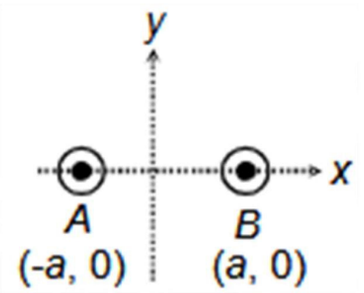
1) 2a **2)** 3a **3)** 4a **4)** a

34. A heavy but uniform rope of length L is suspended from a ceiling. A particle is dropped from the ceiling at the instant when the bottom end is given a transverse wave pulse. Where will the particle meet the pulse

1) at a distance $\frac{2L}{3}$ from the bottom **2)** at a distance $\frac{L}{3}$ from the bottom

3) at a distance $\frac{3L}{4}$ from the bottom **4)** at a distance $\frac{L}{2}$ from the bottom

35. Two very long current carrying wires A and B carrying current I_0 (along z- axis) are placed at (–a, 0) and (a, 0) as shown. Find the value of magnetic field at (0, a)



1) $\frac{\mu_0 I_0}{\sqrt{2}\pi a}$ **2)** $\frac{\mu_0 I_0}{2\pi a}$ **3)** $\frac{\mu_0 I_0}{4\pi a}$ **4)** $\frac{\mu_0 I_0}{2\sqrt{2}\pi a}$

36. Curie temperature is the temperature above which:

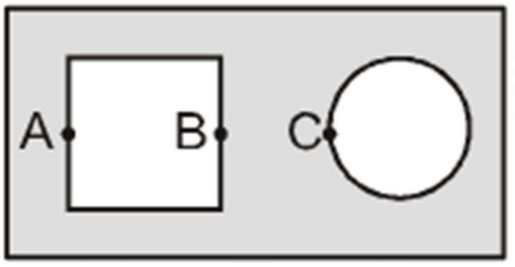
1) a ferromagnetic material becomes paramagnetic.

2) a paramagnetic material becomes diamagnetic.

3) a ferromagnetic material becomes diamagnetic.

4) a paramagnetic material becomes ferromagnetic.

37. Two large holes are cut in a metal sheet as shown. If this is heated, which distance will decrease:



1) BC **2)** AB **3)** AC **4)** None of these

38. STATEMENT-1: Each molecule of a gas moves with rms speed if the temperature of gas is constant. and

STATEMENT-2: The rms speed of molecules of a gas is equal to $\sqrt{\frac{3RT}{M}}$, where T and M are the temperature and molecular mass of the gas. R is the ideal gas constant.

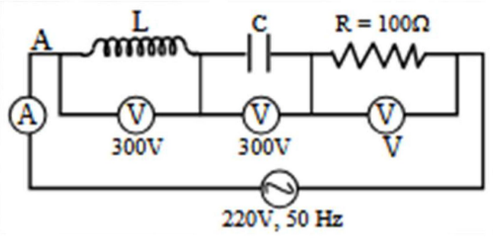
1) Statement-1 is True, Statement-2 is True; Statement -2 is a correct explanation for Statement-1.

2) Statement-1 is True, Statement-2 is True; Statement -2 is NOT a correct explanation for Statement-1.

3) Statement -1 is True, Statement-2 is False.

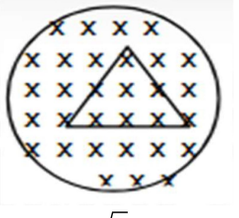
4) Statement -1 is False, Statement-2 is True.

39. In the circuit shown below, what will be the reading of the voltmeter and ammeter?



1) 800 V, 2A **2)** 300 V, 2A **3)** 220 V, 2.2A **4)** 0 V,1A

40. An equilateral triangular loop having a resistance R and length of each side 'ℓ' is placed in a magnetic field which is varying at $\frac{dB}{dt} = 1$ T/s. The induced current in the loop will be



1) $\frac{\sqrt{3}}{4}\frac{\ell^2}{R}$ **2)** $\frac{4}{\sqrt{3}}\frac{\ell^2}{R}$ **3)** $\frac{\sqrt{3}}{4}\frac{R}{\ell^2}$ **4)** $\frac{4}{\sqrt{3}}\frac{R}{\ell^2}$

41. An electron in a hydrogen atom makes a transition $n_1 \rightarrow n_2$, where n_1 and n_2 are the principal quantum numbers of the two states. Assume Bohr model to be valid

Column-I		Column-II	
A)	The electron emits an energy of 2.55 eV	p)	$n_1 = 2,\ n_2 = 1$
B)	time period of the electron in the initial state is eight times that in the final state	q)	$n_1 = 4, n_2 = 2$
C)	Speed of electron become two times	r)	$n_1 = 5, n_2 = 3$
D)	Radius of orbit of electron becomes $4.77A^0$	s)	$n_1 = 6, n_2 = 3$
		t)	$n_1 = 8, n_2 = 4$

1) A→p, B→p,t, C→p,q,t, D→r

2) A→p, B→p,t, C→p,q,s,t, D→r

3) A→q, B→p,q,s,t, C→p,q,s,t, D→r,s

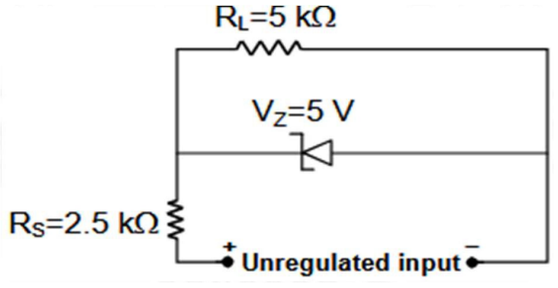
4) A→r, B→p , C→p,q,s,t, D→q

42. Radius of ${}^{x}_{32}Ge$ (germanium) nucleus is measured to be twice the radius of ${}^{9}_{4}Be$ nucleus.

Number of neutrons in Ge are

1) 38 **2)** 40 **3)** 42 **4)** 64

43. In the DC voltage regulator circuit shown, the Zener breakdown voltage $V_Z = 5\ V$. If the unregulated input varies between 11 V to 15 V, maximum zener current (in mA) is



1) 1 **2)** 2 **3)** 3 **4)** **0**

44. Assertion: Rolling without slipping cannot possible in absence of friction.
Reason: During rolling without slipping, energy can remain conserved in absence of external applied force.

1) Assertion is True, Reason is True, Reason is correct explanation for Assertion

2) Assertion is True, Reason is True, Reason is NOT a correct explanation for Assertion

3) Assertion is True, Reason is false

4) Assertion is False, Reason is True

45. In Young's double slit experiment the two slits act as coherent sources of equal amplitude A and wavelength λ. In another experiment with the same set-up the two slits are source of equal amplitude A and wavelength λ, but are incoherent. The ratio of the intensity of light at the midpoint of the screen in the first case to that is second case is

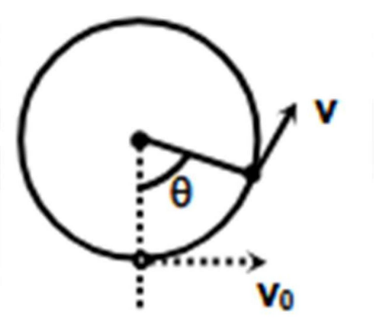
1) 1 **2)** 2 **3)** 3 **4)** 4

SECTION-II (NUMERICAL VALUE TYPE)

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999.** If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i,e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

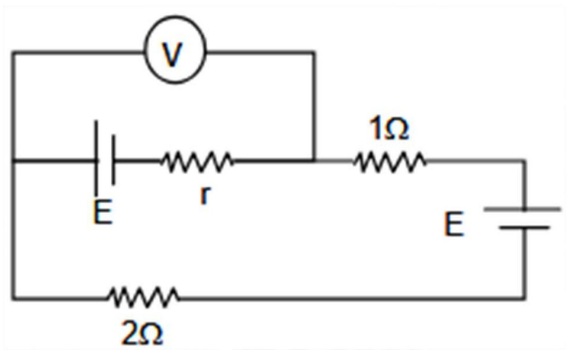
Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

46. A pendulum of length $\ell = 1\,\text{m}$ having a bob of mass m = 1 kg is hanging from a rigid support. If the bob is projected horizontally with a velocity $v_0 = \sqrt{35}\,m/s$. The tension in the string is 6k Newton when angle made by the string is 60^0 from vertical as shown. Find the value of k.



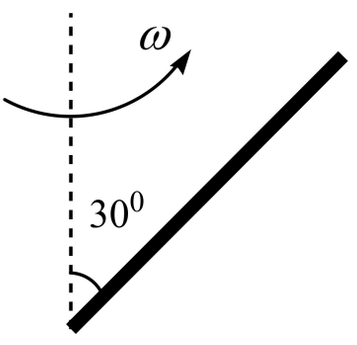
47. The electric field on axis of ring of charge 'Q' and radius 'R' is maximum at $\frac{R}{\sqrt{2N}}$. Find N.

48. In the given circuit the reading of ideal voltmeter is E/2. Find the internal resistance of the battery in Ω.



49. For an equilateral prism, it is observed that when a ray strikes grazingly at one face it emerges grazingly at the other. Find the refractive index of the prism

50. The moment of inertia of rod shown in the figure is $\frac{ML^2}{6N}$. Find N.



CHEMISTRY

Max Marks: 100

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 in all other cases.

51. Amongst the following, the most stable complex is

1) $\left[Fe(H_2O)_6\right]^{3+}$ **2)** $\left[Fe(NH_3)_6\right]^{3+}$

3) $\left[Fe(C_2O_4)_3\right]^{3-}$ **4)** $\left[FeCl_6\right]^{3-}$

52. Which of the following have square planar geometry-

A) $[NiCl_4]^{-2}$ **B)** $\left[Cu(NH_3)_4\right]^{+2}$ **C)** $\left[Ni(CO)_4\right]$ **D)** XeF_4

1) b,c and d **2)** a,b and c **3)** b and d **4)** All

53. **Statement 1:** The second ionization energy of 'O' is greater than that of 'N'

Statement 2: The half filled p-orbitals cause greater stability.

1) Statement 1 and Statement 2 both are correct and Statement 2 is the correct explanation of Statement 1

2) Statement 1 and Statement 2 both are correct, but Statement 2 is not the correct explanation of Statement 1

3) Statement 1 is true, but Statement 2 is false

4) Statement 1 and Statement 2 both are false

54. Consider the reactions.

$$2S_2O_3^{2-}(aq) + I_{2(s)} \longrightarrow S_4O_6^{2-}(aq) + 2I^-(aq)$$

$$S_2O_3^{2-}(aq) + 2Br_{2(l)} + 5H_2O_{(l)} \longrightarrow 2SO_4^{2-}(aq) + 4Br^-{}_{aq} + 10H^+(aq)$$

Why thiosulphate (reductant) react differently with iodine & Bromine?

1) Bromine is a stronger reducing agent than iodine

2) Thiosulphate undergoes reduction by bromine and oxidation by iodine

3) Bromine is a stronger oxidant than iodine

4) Bromine is weaker oxidizing agent than iodine

55. The quantum number of four electrons (e1, e2, e3, e4) are given below:

	n	l	m	s
e1	3	0	0	+1/2
e2	4	0	1	+½
e3	3	2	2	-1/2
e4	3	1	-1	+½

Decreasing energy of these electrons in multi-electron species :

1) e4 > e3 > e2 > e1 **2)** e2 > e3 > e4 > e1

3) e3 > e2 > e4 > e1 **4)** e1 = e2 = e3 = e4

56. The heat evolved in combustion of rhombic sulphur (S_R) and monoclinic sulphur (S_M) are respectively, 70960 and 71030 cal/mol. What will be heat of conversion of rhombic sulphur to monoclinic sulphur.

1) 70960 cal **2)** 71030 Cal **3)** -70 **4)** +70

57. Out of CO_2, SO_2, NH_3, I_3^- and I_3^+ number of non-linear species are:

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

58. **Statement A**: The Actinide contraction is more as compared to the lanthanide contraction.
Statement B: 5f electrons have much lower shielding effect as compared to 4f electrons because 5f-orbitals less diffused than 4f-orbitals.
Statement C: For f –block elements with increase in number of f–electrons, the radius decreases due to poor shielding of f-electrons.
Statement D: f-block elements belongs to 3rd group of long form of periodic table.
The correct statements are:

1) AB **2)** ABC **3)** ACD **4)** A only

59. **Assertion A**: Among the two O-H bonds in H_2O molecule, the energy required to break the first O-H bond and the other O-H bond is the same.
Reason R: This is because the electronic environment around oxygen is the same even after breakage of one O-H bond.

1) A and R both are correct and R is the correct explanation of A

2) A and R both are correct, but R is not the correct explanation of A

3) A is true, but R is false

4) A and R both are false

60. The value of K_c is 64 at 800 K for the reaction $N_2(g)+3H_2(g)\rightleftharpoons 2NH_3(g)$

The value of K_c for the following reaction is :

$$NH_3(g)\rightleftharpoons\frac{1}{2}N_2(g)+\frac{3}{2}H_2(g)$$

1) 8 **2)** $\frac{1}{8}$ **3)** $\frac{1}{4}$ **4)** $\frac{1}{64}$

61. **Assertion A**: An aqueous solution of ammonium acetate can act as a buffer.

Reason R: Acetic acid is a weak acid and NH_4OH is a weak base.

1) Both A and R are true and R is the correct explanation of A

2) Both A and R are true but R is not the correct explanation of A

3) A is false but R is true

4) Both A and R are false

62. Which of the following carbohydrate is monosaccharide?

1) Glucose **2)** Lactose **3)** Cellulose **4)** Maltose

63. Choose the correct example for a non-ideal solution?

1) Benzene + Toluene **2)** Hexane + Heptane

3) Chlorobenzene + Bromobenzene **4)** Ethanol + Hexane

64. $MnO_4^- + xe^- \rightarrow MnO_4^{2-}$

$+ye^-$ (Acidic medium) $\rightarrow$ A

$+ze^-$ (Neutral medium) $\rightarrow$ B

per mole of MnO_4^- ; x,y and z are respectively :

1) 1,2,3 **2)** 1,5,3 **3)** 1,3,5 **4)** 5,3,1

65. If X specific resistance of the electrolyte solution and Y is the molarity of the solution, then $\wedge_m$ is given by:

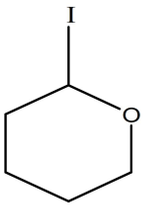
1) $\frac{1000X}{Y}$ **2)** $1000\frac{X}{Y}$ **3)** $\frac{1000}{XY}$ **4)** $\frac{XY}{1000}$

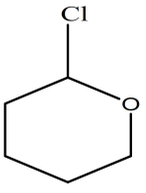
66. Two isomeric ketones, 3-pentanone and 2-pentanone can be distinguished by:

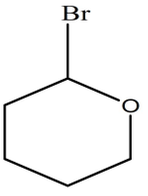
1) $I_2 / NaOH$ **2)** $NaSO_3H$

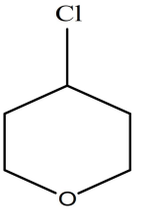
3) $NaCN / HCl$ **4)** $2,4-DNP$

67. Which of the following compound will be most reactive for S_N1 and S_N2 reactions

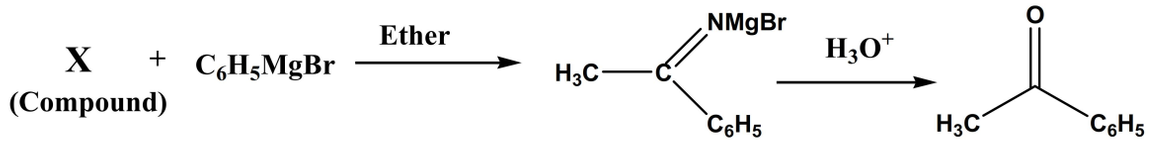
1) 

2) 

3) 

4) 

68.



Compound (X) on reduction with $LiAlH_4$ gives compound (Y).

Which of the following is incorrect about compound (Y).

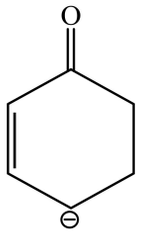
1) Compound (Y) can undergo carbylamine reaction.

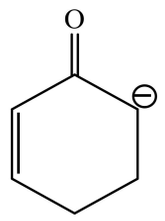
2) Compound (Y) is $2°$ - amine.

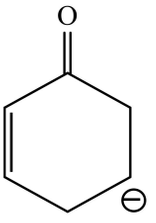
3) Compound (Y) is more basic than NH_3.

4) Compound (Y) on reaction with HNO_2 gives aliphatic Diazonium salts which liberate N_2 gas and form alcohol.

69. Compare basic strength of below compounds?

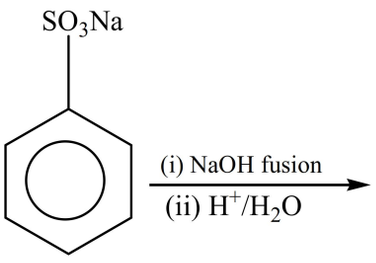
A) 

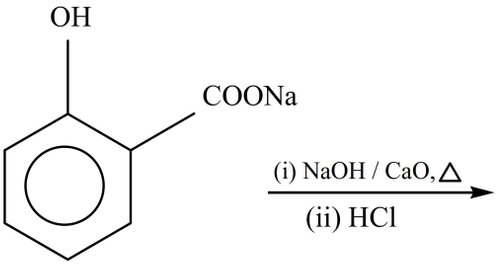
B) 

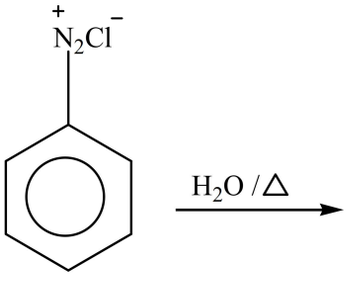
C) 

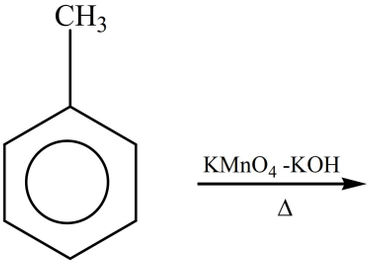
1) A > B > C **2)** B > A > C **3)** C > A > B **4)** C > B > A

70. Which of the following sets of reaction will not give phenol?

1) 

2) 

3) 

4) 

SECTION-II (NUMERICAL VALUE TYPE)

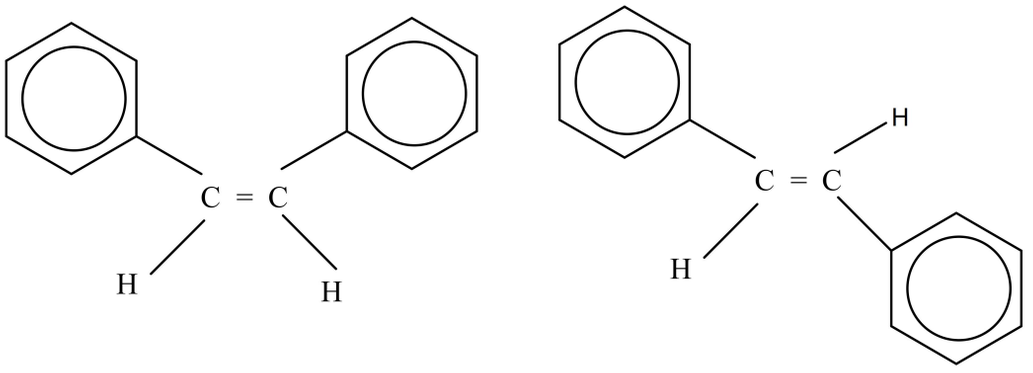
This section contains **5 Numerical Value Type Questions.** The Answer should be within **0 to 9999.** If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i,e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11).**

Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

71. 29.2 % (w/w) HCl stock solution has density of 1.25 g/mL. The molecular weight of HCl is 36.5 g/mol. The volume (mL) of stock solution required to prepare a 100 mL solution of 0.4M HCl is ____

72. The average oxidation number of Br in Br_3O_8 is 'x' and the average oxidation number of C in C_3O_2 is 'y' then $\frac{x}{y} =$ ____

73. How many statements are true for the following pair of compounds?



Cis Trans

i) The dipole moment of trans isomer is zero

ii) The boiling point of cis isomer is more than trans isomer

iii) Cis isomer is more stable than the trans isomer

iv) These are also called configurational diastereomers

v) These are readily inetrconvertible under normal conditions

vi) The melting point of trans isomer is more than the cis isomer

vii) Trans isomer is more soluble than cis isomer in polar solvents

74. How many isomers of $C_4H_{10}O$ reacts with Na metal evolve H_2 gas? (excluding stereoisomers)

75. How many of the following are optically inactive?

i) trans $-\left[Co(en)_2Cl_2\right]^{2+}$ **ii)** cis $-\left[Co(en)_2Br_2\right]^{+}$ **iii)** $\left[Co(NH_3)_3Cl_3\right]$

iv) trans $-\left[Co(NH_3)_4Cl_2\right]^{+}$ **v)** trans $-\left[CoCl_2(C_2O_4)_2\right]^{3-}$

ANSWER KEY

MATHEMATICS

1	**3**	2	**1**	3	**1**	4	**3**	5	**4**
6	**2**	7	**3**	8	**1**	9	**4**	10	**1**
11	**1**	12	**2**	13	**2**	14	**1**	15	**2**
16	**1**	17	**2**	18	**3**	19	**4**	20	**4**
21	**42**	22	**75**	23	**34**	24	**75**	25	**8**

PHYSICS

26	**2**	27	**1**	28	**1**	29	**2**	30	**2**
31	**4**	32	**3**	33	**2**	34	**2**	35	**2**
36	**1**	37	**4**	38	**4**	39	**3**	40	**1**
41	**3**	42	**2**	43	**3**	44	**4**	45	**2**
46	**5**	47	**1**	48	**1**	49	**2**	50	**2**

CHEMISTRY

51	**3**	52	**3**	53	**1**	54	**3**	55	**3**
56	**4**	57	**2**	58	**3**	59	**4**	60	**2**
61	**2**	62	**1**	63	**4**	64	**2**	65	**3**
66	**1**	67	**1**	68	**2**	69	**4**	70	**4**
71	**4**	72	**4**	73	**4**	74	**4**	75	**4**

SOLUTION
MATHEMATICS

1. Given that PQ = kI

$|P|.|Q| = k^3 \quad \Rightarrow |P| = 2k \neq 0 \Rightarrow P$ is an invertible matrix

$\because PQ = kI \quad \therefore Q = kP^{-1}I \quad \left[\because P^{-1}P = I\right]$

$\therefore Q = \frac{adj.P}{2} \quad \because q_{23} = -\frac{k}{8}$

$\therefore -\frac{(3\alpha+4)}{2} = \frac{k}{8} \Rightarrow 12\alpha + 16.....(i)$

$\therefore |P| = 2k \Rightarrow k = 10 + 6\alpha$

From (i) and (ii) we get α = -1, k = 4 $\quad \therefore \alpha^2 + k^2 = 17$

2. α is 7^{th} root of unity $\quad \Rightarrow 1 + \alpha + a^2 + ... + a^6 = 0, p + q = -1$

$pq = \alpha^4 + a^6 + \alpha^5 + \alpha^7 + \alpha^8 + \alpha^7 + \alpha^9 + \alpha^{10} = 3 + \left(\alpha + \alpha^2 + \alpha^3 + ... + \alpha^6\right) = 3 + (1) = 2$

$\Rightarrow x^2 + x + 2 = 0$

Both I and II are true and II is the correct explanation.

3.

M	A	N	K	I	N	D

$\left(\frac{4\times 6!}{2!}\right) + (5! \times 0) + \left(\frac{4! \times 3}{2!}\right) + (3! \times 2) + (2! \times 1) + (1! \times 1) + (0! \times 0) + = 1492$

$\Rightarrow 1440 + 36 + 12 + 4 = 1492$

4. (A) No. of such triangles = 10 $^6C_1$ + = 60

(B) No. of such triangles = 10

(C) No. of such quadrilaterals = 10 $^5C_1$ + = 75

(D) No. of such quadrilaterals = 10 (when four consecutive points are taken)

5. Let $p(E_1) = x.p(E_2) = y$ *and* $p(E_3) = z$

$\alpha = p\left(E_1 \cap \overline{E_2} \cap \overline{E_3}\right) = p(E_1).p\left(\overline{E_2}\right).p\left(\overline{E_3}\right)$

$\Rightarrow \alpha = x(1-y)(1-z) \quad$ .....(i)

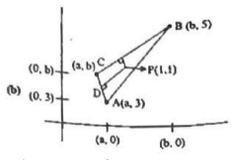
Similary,

$\beta = (1-x).y(1-z) \quad$ .....(ii)

$\gamma = (1-x)(1-y).z \quad$ .....(iii)

$p = (1-x)(1-y)(1-z) \quad$ .....(iv) and solve equation.

6.



slope of $AC = \infty$

Slope of $PD = 0$

$D\left(\frac{a+a}{2}, \frac{b+3}{2}\right) = D\left(a, \frac{b+3}{2}\right)$

$\frac{b+3}{2}-1=0, b+3-2=0 \Rightarrow b=-1$

$b=-1$

$E\left(\frac{b+a}{2}, \frac{5+b}{2}\right)=\left(\frac{a-1}{2}, 2\right)$

slope of $BC \times$ slope of $EP=-1$

$\left(\frac{5-b}{b-a}\right) \times\left(\frac{2-1}{\frac{a-1}{2}-1}\right)=-1 \Rightarrow\left(\frac{6}{-1-a}\right) \times\left(\frac{2}{a-3}\right)=-1 \Rightarrow 12=(1+a)(a-3)$

$\Rightarrow 12=a^2-3a+a-3 \Rightarrow a^2-2a-15=0$

$a=-3$ accept

Equation of AP $A(-3,3), P(1,1)$

$y-1=\left(\frac{3-1}{-3-1}\right)(x-1) \Rightarrow x+2y=3$

Equation of BC $B(-1,5), C=(-3,-1)$

$Y+1=\left(\frac{5+1}{-1+3}\right)(x+3)=3x+9 \;\; 3x-y+8=0$

$Q \equiv\left(\frac{-13}{7}, \frac{17}{7}\right)$

7. Given equation is

$e^{4x}+4e^{3x}-58e^{2x}+4e^{x}+1=0$

Take, $f(x)=\left(e^{2x}+\frac{1}{e^{2x}}+4\left(e^{x}+\frac{1}{e^{x}}\right)-58\right)$

Let $e^{x}+\frac{1}{e^{x}}=p(>0)$ .....(i)

$p^2+4p-60=0 \;\; p=6 \;\; or \;\; =-10$

Only p = is allowed $e^{x}+\frac{1}{e^{x}}=6$

Two real and distinct value od x

8. Since, given $\ell_1+\ell_2=20 \Rightarrow \frac{d\ell_2}{d\ell_1}=-1$

Now, $A_1=\left(\frac{\ell_1}{4}\right) and \;\; A_2=\pi\left(\frac{\ell_2}{2\pi}\right)^2$

Let $S=2A_1+3A_2=\frac{\ell_1^2}{8}+\frac{3\ell_2^2}{4\pi}$

For max or min

$\frac{ds}{d\ell_1}=0 \Rightarrow \frac{2\ell_1}{8}+\frac{6\ell_2}{4\pi}.\frac{d\ell_2}{d\ell_1}=0 \Rightarrow \frac{\ell_1}{4}=\frac{6\ell_2}{4\pi} \Rightarrow \frac{\pi\ell_1}{\ell_2}=6$

9. Let $f(x)=4x^3-11x^2+8x-5 \forall x \in R$

$\Rightarrow f'(x)=12x^2-22x+8 \quad and \quad f'(x)>0$

10. Since, we know $\overline{AB}+\overline{BC}+\overline{CA}=\overline{0} \quad \Rightarrow \alpha=2,\beta=4,\gamma-\delta=3$

Now, $\frac{1}{2}\left|\overline{AB}\times\overline{AC}\right|=5\sqrt{6}$

$(\delta-9)^2+(2\delta+12)^{12}+100=600\Rightarrow\delta=5,\gamma=8$

Hence, $\overline{CB}.\overline{CA}=60$

11. Given points and direction ratios are shown below.

$a_1=(1,2,3),a_2=(2,4,5),\overrightarrow{b_1}=2\hat{i}+3\hat{j}+\lambda\hat{k}$

$\overrightarrow{b_2}=\hat{i}+4\hat{j}+5\hat{k}$

Apply shortest distance formula,

12. $15\sin^4\alpha+10\left(1-\sin^2\alpha\right)^2=6,25\sin^4\alpha-20\sin^2\alpha+4=0$

$\Rightarrow 25\sin^4\alpha-10\sin^2\alpha-10\sin^2 a+4=0$

$\Rightarrow\left(5\sin^2 a-2\right)=0\Rightarrow\sin^2 a=\frac{2}{5}$

13. For, S_1 we have $\quad \Rightarrow\frac{(x+1)\left(x^2+3x+5\right)}{x^2-3x+2}\le 0$

$\Rightarrow x\in(-\infty,-2)\cup(1,2)$

For S_2, we have

$3^x\left(3^x-3\right)-3^2\left(3^x-3\right)\le 0$

For S_2, $x\in[1,2] \quad \Rightarrow(-\infty,-2)\cup[1,2]$

14. $\int\frac{x^2}{(x\sin x+\cos x)}dx \qquad \because\frac{d}{dx}(\sin x+\cos x)=x\cos x$

$$\int\frac{x\cos x}{(x\sin x+\cos x)^2}\left(\frac{x}{\cos x}\right)dx=\frac{x}{\cos x}\left[\frac{-1}{x\sin x+\cos x}\right]$$

Use by parts method

15. Area: $\int_1^4\left(2\sqrt{2}\sqrt{x}-\sqrt{2}x\right)dx$

16. Given, $\left(1+x^2\right)dy=y(x-y)dx$

Where, $y(0)=1,y\left(2\sqrt{2}\right)=\beta$

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

$\frac{dy}{dx}+y\left(\frac{-x}{1+x^2}\right)=\left(\frac{-1}{1+x^2}\right)y^2$,divide by y^2 both sides and proceed

17. First common term of both the series is 23 and common difference is 7 x 4 = 28

$\because$ Last term $\le 407 \Rightarrow 23+(n-1)\times 28\le 407\Rightarrow (n-1)\times 28\le 384$

$\Rightarrow n\le \frac{384}{28}+1\Rightarrow n\le 14.71$

Hence, number of terms common are 14

18. N = (26 + a + b), f_ix_i = (504 + 3a + 9b)

19. $\underset{i=1}{\overset{50}{U}} X_i=\underset{i=1}{\overset{50}{U}} Y_i=T;\because n(X_i)=10, n(Y_i)=5$

So, $\underset{i=1}{\overset{50}{U}} X_i=500, \underset{i=1}{\overset{50}{U}} Y_i=5n\Rightarrow \frac{500}{20}=\frac{5n}{6}\Rightarrow n=30$

20. Given function is

$\lim\limits_{x\to 0}\frac{(5x+...)-\ln(1+\alpha x)}{x}=0$

$f(x)=\begin{cases}\frac{\ln(1+5x)-\ln(1+\alpha x)}{x} & : \quad x\neq 0\\ 10 & : \ x=0\end{cases}$

Applying expansion of $\ln(1+x)$.

$\lim\limits_{x\to 0}(5-\alpha)=10 \qquad 5-\alpha=10\Rightarrow \alpha=-5$

21. Given matrix is $A=\begin{pmatrix}\alpha & \beta & \gamma\\ \alpha^2 & \beta^2 & \gamma^2\\ \beta+\gamma & \lambda+\alpha & \alpha+\beta\end{pmatrix}$

$R_3\to R_3+R_1$

$\Rightarrow |A|=|\alpha+\beta+\gamma|\begin{vmatrix}\alpha & \beta & \gamma\\ \alpha^2 & \beta^2 & \gamma^2\\ 1 & 1 & 1\end{vmatrix}$

$\Rightarrow |A|=(\alpha+\beta+\gamma)(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha) \ \because |adjA|=|A|^{n-1}$

$|adj(adjA)|=|A|^{(n-1)2}$

$|adj(adj(adj(adjA)))|=|A|^{(n-1)4}=|A|^{2^4}=|A|^{16}\ \therefore(\alpha+\beta+\gamma)=2^{32}.3^{16}$

22. $0\le\frac{1-d}{4}\le 1\Rightarrow -3\le d\le 1 \quad .....(i)$

$0\le\frac{1+2d}{4}\le 1\Rightarrow -\frac{1}{2}\le d\le\frac{3}{2} \quad .....(ii)$

$0\le\frac{1-4d}{4}\le 1\Rightarrow -\frac{3}{4}\le d\le\frac{1}{4} \quad .....(iii)$

$0\le\frac{1+3d}{4}\le 1\Rightarrow -\frac{1}{3}\le d\le 1 \quad .....(iv)$

From $(i),(ii),(iii)$ and (iv)

$-\frac{1}{3} \le d \le \frac{1}{4}$ minimum value of $d = -\frac{1}{3}$

Mean $= 0 + \frac{1+2d}{4} + \frac{2(1-4d)}{4} + \frac{3(1+3d)}{4}$

$X = \frac{6+3d}{4} = \frac{1}{4}\left(6 - 3\times\frac{1}{3}\right) = \frac{5}{4} \Rightarrow 60\overline{X} = 60\times\frac{5}{4} = 75$

23. It has infinitely many solutions.

24. we have $x^2 + 4y^2 + 2x + 8y - \lambda = 0$

$\Rightarrow \frac{(x+1)^2}{\lambda+5} + \frac{(y+1)^2}{\frac{\lambda+5}{4}} = 1 \quad \because \frac{2b^2}{a} = 4$

$\frac{2(\lambda+5)}{4} = 4\left(\sqrt{\lambda+5}\right)$

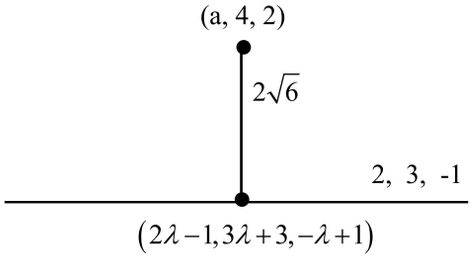
On solving $\Rightarrow \lambda = 59$

$\lambda = -5$

$1 = 2a = 2\sqrt{\lambda+5} = 2\sqrt{65} = 16$

$\Rightarrow \lambda + l = 59 + 16 + 75$

25.



Given line $\frac{X+1}{2} = \frac{Y-3}{3} = \frac{Z-1}{-1} = \lambda$

$X = 2\lambda - 1, Y = 3\lambda + 3, Z = -\lambda + 1$

$(2\lambda - 1 - a)2 + (3\lambda - 1)3 + (-\lambda - 1)(-1) = 0$

$\Rightarrow 4\lambda - 2 - 2a + 9\lambda - 3 + \lambda + 1 = 0$

$14\lambda - 4 - 2a = 0 \Rightarrow 7\lambda - 2 - a = 0$

$\Rightarrow (5\lambda - 1)^2 + (3\lambda - 1)^2 + (\lambda - 1)^2 = 24$

$35\lambda^2 - 14\lambda - 21 = 0 \Rightarrow (\lambda - 1)(35\lambda + 21) = 0$

For, $\lambda = 1 \Rightarrow a = 5$

Let $(\alpha_1, \alpha_2, \alpha_3)$ be reflection point P

$\alpha_1 + 5 \quad \alpha_2 + 4 = 12 \quad \alpha_3 + 2 = 0$

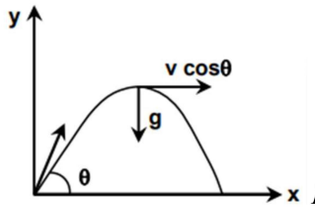
$\alpha_1 = -3 \quad \alpha_2 = 8 \quad \alpha_3 = -2$

$a + \alpha_1 + \alpha_2 + \alpha_3 = 8$

PHYSICS

26. $M^1L^{-3}T^0 = \left(M^1L^1T^{-2}\right)^a \left(LT^{-1}\right)^b T^c \quad a=1, b=-4, \ c=-2$

27. Rate of change of speed is minimum at highest point. Since at highest position.



$R = \dfrac{(v\cos\theta)^2}{g}$

28. Inside a closed Guassian surface $Q_{enc} = 0$

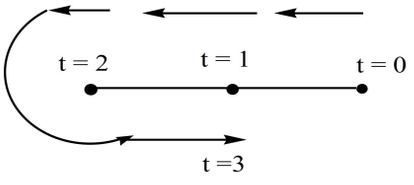
29. In 1D collisions formula for $v_1 = \dfrac{m_1 - m_2}{m_1 + m_2} v_1 + \dfrac{2m_2}{m_1 + m_2} v_2$, when $m_1 << m_2, \vec{v_1} = -\vec{u_1} + 2\vec{u_2}$.

30. $\vec{E} \times \vec{B}$ gives direction of $\vec{V}$

31. Time period becomes $2\pi\sqrt{\dfrac{R}{g}}$ in statement 1. We can't neglect roundness of earth for pendulum of infinite length.

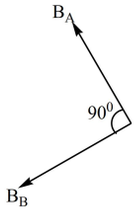
32. $V_T = \dfrac{2}{9}\dfrac{r^2 g(\rho_B - \rho_l)}{\eta}, Power = \vec{F}.\vec{V}$

33. T = 4sec, Body starts at extreme position and ends at mean position as shown



34. For dropped body $L - x = \dfrac{1}{2}gt^2$, for pulse $t = 2\sqrt{\dfrac{x}{g}}$ .x is the distance from bottom free end of row.

35. For infinitely long wire $B = \dfrac{\mu_0 I_0}{2\pi r}$, $r = a\sqrt{2}, B_{Res} = \sqrt{2}B$



36. Above curie temperature ferro becomes para.
37. Distance between any two points when only increase.
38. V_{avg}, V_{rms} , V_{mp} will all exist at a particular temperature.

39. IN resonance $V_L = V_C, V_{res} = V_R, Z = R$ $\quad i_{Rms} = \frac{V_{Rms}}{Z}$

40. $emf \in = A\frac{dB}{dt}, i = \frac{\in}{R}$.

41. $E_n = -13.6\frac{Z^2}{n^2}ev$, $r_n = 0.529\frac{n^2}{z}A^0$, $V_n = 2.2\times10^6\frac{z}{n}m/s$, $T = \frac{2\pi r_n}{v_n}$.

42. $\frac{R_{Ge}}{R_{Be}} = \left(\frac{X}{9}\right)^{1/3}$ X = 72, Number of neutron = 72 – 32 = 40

43. Zener current will be maximum, when V = 15V ,15 – (i × 2.5k) = 5, i = 4 mA ,i_z = 3 mA

44. In uniform pure rolling, the linear velocity is constant. If no external force or torque is applied, the body will remain in a state of uniform pure rolling. In this case, the friction force is always zero, so there will not be any effect of the frictional force on the body.

45. $\frac{I_{coherent}}{I_{Incoherent}} = \frac{4I}{2I} = 2$

46. $\frac{1}{2}mv_0^2 = \frac{1}{2}mv^2 + mgl(1-\cos\theta)$ $\quad T - mg\cos\theta = \frac{mv^2}{R}$.

47. $E = \frac{KQx}{\left(R^2+x^2\right)^{3/2}}, \frac{dE}{dx} = 0$ is maximum $x = \frac{R}{\sqrt{2}}$.

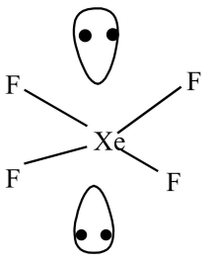
48. $\frac{E}{2} = E - ir, 2E = i(3+r)$,r = 1.

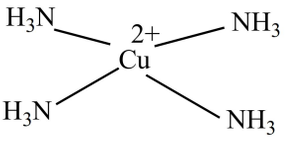
49. $(1)\sin 90^0 = \mu\sin 30^0$

50. $I = \frac{ML^2}{3}\sin^2\theta$,angle is with vertical

51. Stability of complex $\propto$ chelation

52.





53. Statement 2 is the reason for statement 1

54. Oxidation power order : $F_2 > Cl_2 > Br_2 > I_2$

55. Energy $\propto (n+l)$

$$(n+l)\begin{bmatrix} e_3 & > & e_2 & > & e_4 & > & e_1 \\ 3+2 & & 4+0 & & 3+1 & & 3+0 \\ 5 & & 4 & & 4 & & 3 \end{bmatrix}$$

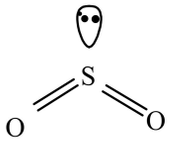
56. $S_R + O2 \longrightarrow SO_2 \Delta H, = -70960 Cal \_\_\_\_(i)$

$S_M + O2 \longrightarrow SO_2 \Delta H, = -71030 Cal \_\_\_\_(ii)$

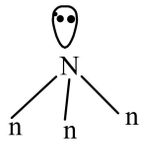
Subtracting eqn (II) from (i) we get ,

$\Delta H = \Delta H_1 - \Delta H_2 = (-70960) - (-71030) = +70 Cal$

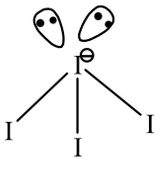
57.



Bent



Pyramidal



Bent

58. The correct statement for B is 5f electrons have much lower shielding effect as compared to 4f electrons because 5f- orbitals more diffused than 4f-orbitals

59. **Correct assertion** The bond enthalpies of the two O-H bonds in H-O-H are not equal.
Correct reason This is because electronic environment around O is not same after breakage of one O-H bond.

60. $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g); K_c$

$2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g); \frac{1}{K_c}$

Multiplying by $\frac{1}{2}$, reaction becomes

$NH_3(g) \rightleftharpoons \frac{1}{2} N_2(g) + \frac{3}{2} H_2(g)$

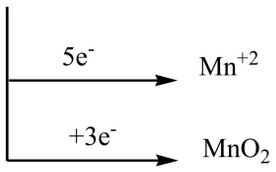
$$\therefore New\ K_c = \left(\frac{1}{K_c}\right)^{\frac{1}{2}} = \left(\frac{1}{64}\right)^{\frac{1}{2}} = \frac{1}{8}$$

61. Both assertion and reason are true but reason is not correct explanation of assertion.
Ammonium acetate is a salt of weak acid (CH_3COOH) and weak base (NH_4OH).

62. $C_6H_{12}O_6$ **(GLUCOSE)** monosaccharide.

63. Ethanol and hexane forms positively deviated non-ideal solution.

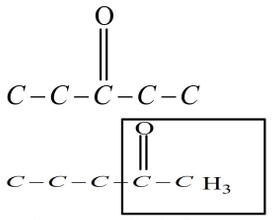
64. $MnO_4^- + e^- \longrightarrow MnO_4^{2-}$



65. $n_m = \frac{k \times 1000}{m}$

Specific conductance $= \frac{1}{specific\ resis\tan ce} = \left(\frac{1}{x}\right)$ $\qquad n_m = \frac{1}{x} \times \frac{1000}{y}$

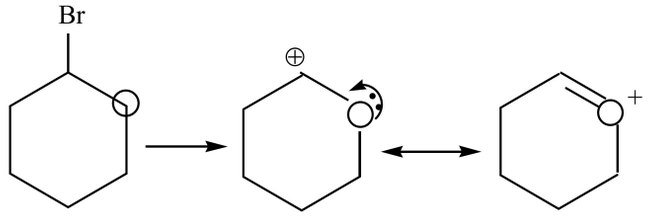
66.



gives +ve Iodoform test

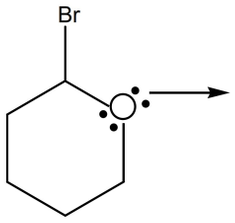
67.

SN1



[Carbocation isstablized by resonance & Br is good leaving group]

S_N2

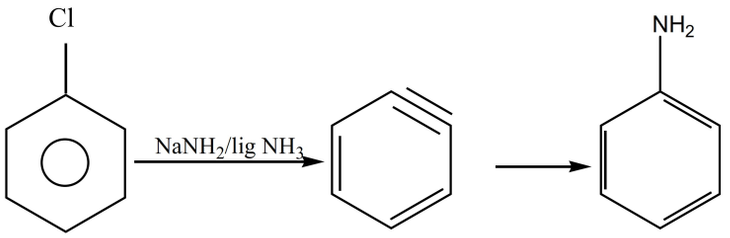


Negative Inductive group favours incoming nucleophile to attack readily

68. Compound (Y) is 1^0-amine.

69. Basic strength $\propto \frac{1}{stability\ of\ Anion}$

70.



71. $\frac{4mL}{M} = \left(\frac{\%(w/w)\times d\times 10}{molar\ mass}\right) = \frac{(29.2)\times 1.25\times 10}{36.5} = 10M$

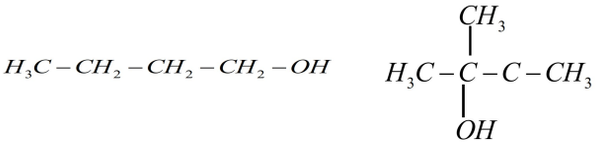
According to dilution, eqn, $M_iV_i = M_fV_f$

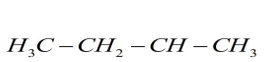
$V_f = \frac{0.4\times 100}{10} = 4mL$

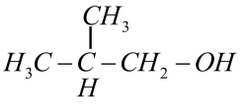
72. $\frac{16/3}{4/3} = 4$

73. (i),(ii),(iv),(vi)

74. $C_4H_{10}O$







75. (i),(iii),(iv),(v)