



**MENTORS EDUSERV SCHOLASTIC APTITUDE TEST (ME-SAT)
SAMPLE TEST PAPER**
[For Students presently in Class 11 going to Class 12 in 2019]
(Stream: Engineering)

Time : 2 hours

Maximum Marks: 192

INSTRUCTIONS

[A] General :

- The question paper consists of **3 Sections, A to C** (Physics, Chemistry and Mathematics) having total **60** questions (**20** questions in each Physics, Chemistry and Mathematics).
- This Question Paper contains **17 pages**.
- Each Section consists of 3 parts :**
 - Part-1** contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.
 - Part-2** contains **3 paragraphs** each describing theory, experiment, data etc. There are **6 multiple choice questions** relating to three paragraphs with **2 questions on each paragraph**. Each question of a particular paragraph has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.
 - Part-3** contains **4 questions**. The answer to each question is a **single digit integer**, ranging from 0 to 9 (both inclusive).
- The Question Paper has blank spaces at the bottom of each page for rough work.No additional sheets will be provided for rough work.
- Blank papers, clip boards, log tables, slide rule, calculators, cellular phones, pagers and electronic gadgets, in any form, are **NOT** allowed.
- The **OMR** (Optical Mark Recognition) sheet shall be provided separately.

[B] Answering on the OMR:

- Each question will have **4 choices** in both the Sections, out of which **only one choice is correct**.
- Fill the bubble with **Ball Pen (Blue or Black) ONLY**.

[C] Filling – Name and Registration No.

- On the **OMR sheet**, write your Name and Registration No. using ball pen. Also, put your signature in the appropriate box using ball pen.

[D] Marking Scheme:

- For each question in **Part-1 and Part-2**, you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer **ONLY** and **zero (0) marks** if no bubbles are darkened. In all other cases, **minus one (-1) mark** will be awarded in these sections.
- For each question in **Part-3**, you will be awarded **4 marks** if you darken the bubble corresponding to the correct answer **ONLY**. In all other cases **zero (0) marks** will be awarded. **No negative marks** will be awarded for incorrect answer in this section.

Name :

Registration No.:

DONOT BREAK THE SEALS ON THIS BOOKLET, AWAIT INSTRUCTIONS FROM THE INVIGILATOR.

SEAL

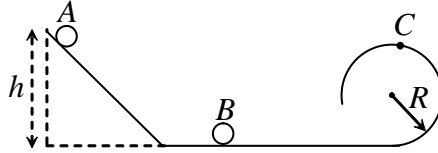
SECTION-A : PHYSICS**PART – 1****(Single Correct Answer Type)**

This part contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D), out of which **ONLY ONE is correct**.

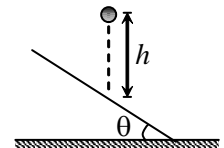
1. A constant power is supplied to a rotating disc. Angular velocity (ω) of disc varies with number of rotations (n) made by the disc as
(A) $\omega \propto n^{1/3}$ (B) $\omega \propto n^{3/2}$ (C) $\omega \propto n^{2/3}$ (D) $\omega \propto n^2$
2. A body of mass m is kept stationary on a rough inclined plane of inclination θ . The magnitude of force acting on the body by the inclined plane is
(A) mg (B) $mg \sin \theta$ (C) $mg \cos \theta$ (D) $mg\sqrt{1+\cos^2 \theta}$
3. The x and y co-ordinates of a particle at any time t are given by $x = 7t + 4t^2$ and $y = 5t$ where x and y are in metre and t in sec. The acceleration of the particle at 5 s is
(A) zero (B) 8 m/s^2 (C) 20 m/s^2 (D) 40 m/s^2
4. A particle is thrown with a speed of 12 m/s at an angle 60° with the horizontal. The time interval between the moments when its speed is 10 m/s is ($g = 10 \text{ m/s}^2$)
(A) 1.0 s (B) 1.2 s (C) 1.4 s (D) 1.6 s
5. A locomotive of mass m starts moving so that its velocity varies as $v = \alpha s^{2/3}$, where α is a constant and s is the distance traversed. The total work done by all the forces acting on the locomotive during the first t second after the start of motion is
(A) $\frac{1}{8}m\alpha^4 t^2$ (B) $\frac{m\alpha^6 t^4}{162}$ (C) $\frac{m\alpha^6 t^4}{81}$ (D) $\frac{m\alpha^4 t^2}{2}$

Space for rough work

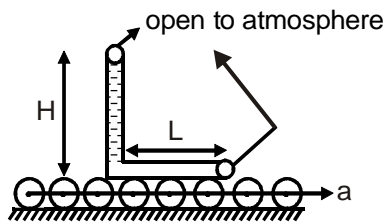
6. Ball A of mass m after sliding from an inclined plane strikes elastically with another ball B of mass $3m$ at rest. The minimum height h , so that the ball B just completes the circular portion of the surface at C, will be (all surfaces are smooth)



- (A) $h = \frac{5}{2}R$ (B) $h = 5R$ (C) $h = 8R$ (D) $h = 10R$
7. A ball after falling through a distance h collides with an inclined plane of inclination θ as shown in the figure. It moves horizontally after the impact. The co-efficient of restitution between inclined plane and ball is



- (A) 1
 (B) $\tan^2 \theta$
 (C) $\cot^2 \theta$
 (D) $\sin^2 \theta$
8. A narrow tube completely filled with a liquid is lying on a series of cylinders as shown in figure. Assuming no sliding between any surfaces, the value of acceleration of the cylinders for which liquid will not come out of the tube from anywhere is given by –



- (A) $\frac{gH}{2L}$ (B) $\frac{gH}{L}$ (C) $\frac{2gH}{L}$ (D) $\frac{gH}{\sqrt{2}L}$

Space for rough work

9. A ball of mass m and radius r is released in viscous liquid. The value of its terminal velocity is proportional to
 (A) $1/r$ only (B) m/r (C) $(m/r)^{1/2}$ (D) m only
10. Given $|\vec{A}_1| = 2, |\vec{A}_2| = 3$ and $|\vec{A}_1 + \vec{A}_2| = 3$. Find the value of $(\vec{A}_1 + 2\vec{A}_2) \cdot (3\vec{A}_1 - 4\vec{A}_2)$
 (A) -64 (B) 60 (C) -60 (D) 64

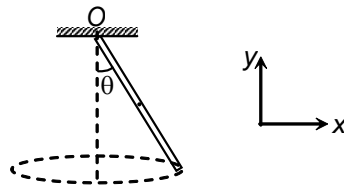
PART – 2

(Paragraph Type)

This part contains **6 multiple choice questions** relating to three paragraphs with **two questions on each paragraph**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

Paragraph for Questions 11 and 12

A thin uniform rod of mass m and length l rotates with constant angular velocity ω about the vertical axis passing through the rod's suspension point O . In doing so, the rod describes a conical surface with a half aperture angle θ (see figure).

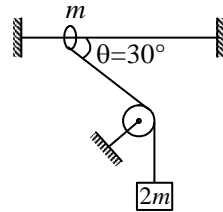


11. Component of reaction force at O in $-ve$ x -direction is
 (A) $m\omega^2 l$ (B) $\frac{m\omega^2 l}{2}$ (C) $\frac{m\omega^2 l}{2} \sin \theta$ (D) $\frac{m\omega^2 l}{2} \cos \theta$
12. Magnitude of angular momentum of rod about axis of rotation is
 (A) $\frac{ml^2 \omega}{12} \sin^2 \theta$ (B) $\frac{ml^2 \omega}{12}$ (C) $\frac{ml^2 \omega}{3} \sin^2 \theta$ (D) $\frac{ml^2 \omega}{3}$

Space for rough work

Paragraph for Questions 13 and 14

A smooth ring of mass m can slide on a fixed horizontal rod. A massless string tied to the ring passes over a fixed smooth pulley of mass m and carries a block of mass $2m$ as shown in figure. At an instant the string between ring and pulley makes an angle $\theta = 30^\circ$ with the horizontal.



13. Acceleration of block is

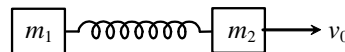
- (A) $\frac{3}{5}g$ (B) $\frac{g}{3}$ (C) $\frac{2\sqrt{3}}{5}g$ (D) none of these

14. Acceleration of ring is

- (A) $\frac{3}{5}g$ (B) $\frac{g}{3}$ (C) $\frac{2\sqrt{3}}{5}g$ (D) none of these

Paragraph for Questions 15 and 16

Two blocks of masses m_1 and m_2 are connected by a spring of spring constant k . The block of mass m_2 is given a sharp impulse so that it acquires a velocity v_0 toward right.



15. Velocity of centre of mass will be

- (A) zero (B) $\frac{m_1 v_0}{m_1 + m_2}$ (C) $\frac{m_2 v_0}{m_1 + m_2}$ (D) $\left(\frac{m_1 v_0}{m_1 + m_2}\right)v_0$

16. Find maximum elongation of spring

- (A) $v_0 \left[\frac{m_1 m_2}{(m_1 + m_2)k} \right]^{\frac{1}{2}}$ (B) $v_0 \left(\frac{m_1^2}{(m_1 + m_2)k} \right)^{\frac{1}{2}}$ (C) $v_0 \left[\frac{m_2^2}{(m_1 + m_2)k} \right]$ (D) data insufficient

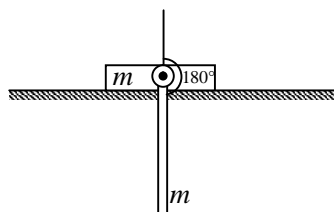
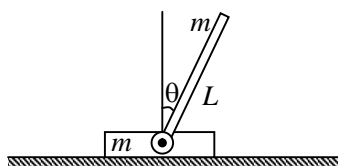
Space for rough work

PART – 3**(Integer Answer Type)**

This part contains 4 questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9. The appropriate bubbles below the respective question numbers in the ORS have to be darkened. For example, if the correct answers to question numbers X, Y, Z and W (say) are 6, 0, 9 and 2, respectively, then the correct darkening of bubbles will look like the following:

	X	Y	Z	W
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

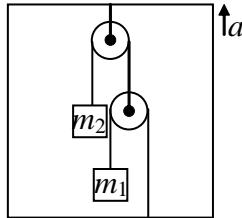
17. A rod of mass m and length L ($= 50/3m$) is hinged in plank of same mass m . The plank is kept on a smooth horizontal surface and rod makes θ with the vertical. The system is released from $\theta = 0^\circ$. If velocity (in m/s) of plank when the rod makes $\theta = 180^\circ$ is v find the value of $v/2$. ($g = 10 \text{ m/s}^2$)



18. A ball is immersed in water kept in container and released. At the same time container is accelerated in horizontal direction with acceleration, $\sqrt{44} \text{ m/s}^2$. Acceleration of ball w.r.t. container (in m/s^2) is (specific gravity of ball = $12/17$, $g = 10 \text{ m/s}^2$) -

Space for rough work

19. Two blocks of mass $m_1 = 2 \text{ kg}$ and $m_2 = 4 \text{ kg}$ are attached to pulleys as shown in the figure. If the entire system is placed inside a lift and the lift which accelerates upward with acceleration 2 m/s^2 then acceleration of m_2 is $x \text{ m/s}^2$ upwards. Find x .



20. A ball is thrown upwards from the foot of a tower. The ball crosses the top of the tower twice after an interval of 4 second and the ball reaches ground after 8 seconds then the height of tower is $15n$ metre. Find the value of n .

Space for rough work

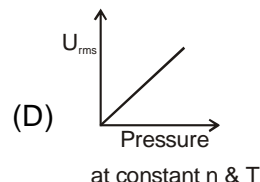
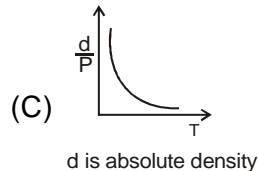
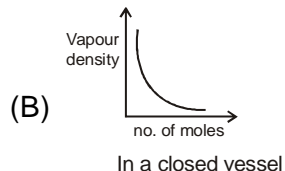
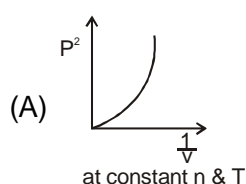
SECTION-B : CHEMISTRY

PART – 1

(Single Correct Answer Type)

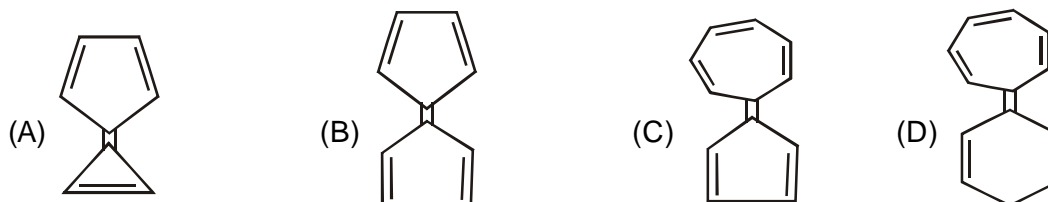
This part contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D), out of which **ONLY ONE is correct**.

21. Spin multiplicity of Fe^{2+} will be
 (A) 4 (B) 5 (C) 6 (D) None
22. In a hydrogen atom, an electron is present in certain excited state having energy $(E) = -0.85 \text{ eV}$. Maximum number of spectral lines in Balmer series will be
 (A) 2 (B) 1 (C) 4 (D) 3
23. Which of the following statement(s) is/are incorrect according to kinetic theory of gases.
 (A) Kinetic energy of a gas is directly proportional to its temperature.
 (B) Molecules of a gas undergo inelastic collisions.
 (C) Actual volume of the gas molecule is negligible as compared to volume occupied by the gas only at low pressure.
 (D) Both B & C.
24. 20 mL of 0.1 M weak acid HA is titrated with 0.1 M KOH. At half equivalence point, pH is found to be 5. Calculate the approximate pH at equivalence point. [Given : $\log 2 = 0.3$]
 (A) 10.15 (B) 12.4 (C) 8.85 (D) 7.2
25. Which of the following graph for an ideal gas is incorrect.

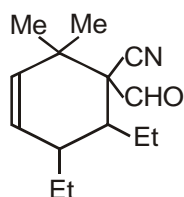


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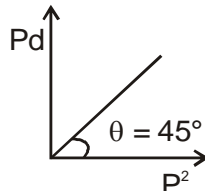
26. The most polar compound at room temperature is :



27. The correct IUPAC name of the given compound is



- (A) 5, 6-Diethyl-2, 2-dimethyl-1-formylcyclohexanenitrile
 (B) 1-Cyano-2, 3-diethyl-6, 6-dimethylcyclohexanecarbaldehyde
 (C) 1-Cyano-5, 6-diethyl-1-formyl-6, 6-dimethylcyclohexene
 (D) 5, 6-Diethyl-1-formyl-2, 2-dimethylcyclohexanecarbonitrile.
28. If a graph is plotted between Pd vs P^2 (where, P is pressure in atm and d is density in gm/liter) at 200 K for a gas then it is found to be as shown below. (use $R = 0.08 \text{ atm L mol}^{-1}\text{K}^{-1}$)



Gas can be

- (A) CH_4 (B) O_2 (C) He (D) CO_2

Space for rough work

29. Which of the following option is correct ?

- (A) Addition of catalyst changes the value of K_c .
- (B) Addition of inert gas at constant pressure may or may not change equilibrium position.
- (C) $\text{H}_2\text{O}(\text{s}) \rightleftharpoons \text{H}_2\text{O}(\text{l})$, this reaction moves forward by adding inert gas in a vessel of constant volume.
- (D) both B & C

30. Consider the following statements

1. Be^{+2} is more highly hydrated than other alkaline earth metals.
2. Lattice energy of CsF is greater than CsCl.
3. Second ionization energy of 'P' is less than S.
4. Al_2O_3 and MgO are amphoteric in nature.

of these statements :

- (A) 1, 2 and 3 are correct
- (B) 1 and 2 are correct
- (C) 2 and 3 are correct
- (D) All

Space for rough work

PART – 2**(Paragraph Type)**

This part contains **6 multiple choice questions** relating to three paragraphs with **two questions on each paragraph**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

Paragraph for Questions 31 and 32

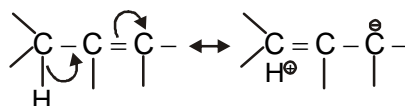
Oleum is considered as a solution of SO_3 in H_2SO_4 , which is obtained by passing SO_3 in solution of H_2SO_4 . When 100g sample of oleum is diluted with desired weight of H_2O then the total mass of H_2SO_4 obtained after dilution is known as % labeling in oleum.

For example, an oleum labeled as '109% H_2SO_4 ' means the 109 g total mass of pure H_2SO_4 will be formed when 100 g of oleum is diluted by 9g of H_2O which combines with all the free SO_3 present in oleum to form H_2SO_4 as $\text{SO}_3 + \text{H}_2\text{O} \longrightarrow \text{H}_2\text{SO}_4$.

31. What is the % of free SO_3 is an oleum that is labeled as '104.5% H_2SO_4 '?
 (A) 10 (B) 20 (C) 40 (D) none of these
32. 9.0 g water is added into 100g oleum sample labeled as "112%" H_2SO_4 then the amount of free SO_3 remaining in the solution is
 (A) 14.93 L at STP (B) 7.46 L at STP (C) 3.73 L at STP (D) 11.2 L at STP

Paragraph for Questions 33 and 34

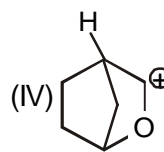
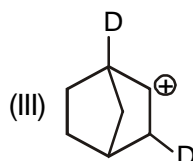
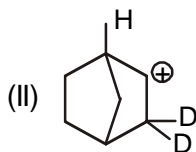
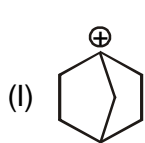
Hyperconjugation is no bond resonance in which σ electron delocalised. The delocalisation of σ electron affects the stability of carbocation carbon free radical or alkene



Bond strength C – D is greater than C – H, no bond resonance of α D is also more effective than Inductive effect but less effective than resonance effect.

Space for rough work

33. Correct stability order is



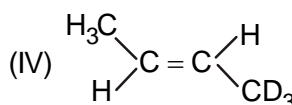
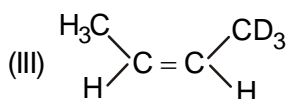
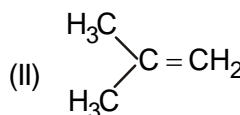
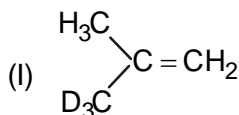
(A) IV > III > II > I

(B) I > II > III > IV

(C) IV > II > III > I

(D) II > III > IV > I

34. For the given compounds :



Correct stability order is

(A) I > II > IV > III

(B) II > I > IV > III

(C) IV > III > I > II

(D) IV > III > II > I

Paragraph for Questions 35 and 36

Rate of diffusion is defined as amount of gas coming out of cylinder in unit time. Rate of diffusion/effusion depends upon partial pressure of gas in cylinder, temperature of gas. Area of cross-section of pinhole & molecular mass of gas.

35. If in a mixture of CH_4 & He, 4 gm each of both gases are present in a cylinder then mole ratio of gases in mixture coming out of cylinder through a pinhole will be

(A) 2 : 1

(B) 1 : 8

(C) 2 : 8

(D) 4 : 1

36. In a vessel, equal moles of H_2 and He are present. $\text{H}_2(\text{g})$ is found to effuse $\sqrt{2}$ times faster than He. If density of H_2 is 1.2 gm/L, then partial pressure of He will be :

(Given : Temperature of vessel is 300K)

(A) 20.3 atm

(B) 18.31 atm

(C) 14.77 atm

(D) 10.42 atm

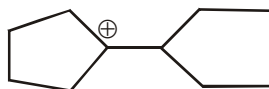
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PART – 3
(Integer Answer Type)

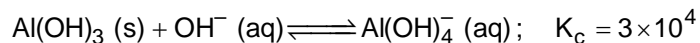
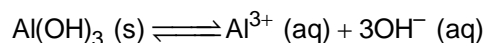
This part contains 4 questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9. The appropriate bubbles below the respective question numbers in the ORS have to be darkened. For example, if the correct answers to question numbers X, Y, Z and W (say) are 6, 0, 9 and 2, respectively, then the correct darkening of bubbles will look like the following:

	X	Y	Z	W
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

37. A 1 L vessel contains 3 moles each of gas A and B at equilibrium. Reaction is given to be $A(g) \rightleftharpoons 2B(g)$. If 1 mole of each gas is removed from equilibrium vessel then K_c of reaction will be :
38. How many hyperconjugative structures are possible in the most stable rearranged carbocation of given carbocation :



39. A salt $Al(OH)_3$ dissolves in water in two ways as shown :



What should be K_{sp} of $Al(OH)_3$ if its solubility is maximum at pH equal to 13 ?

40. The number of carbon atoms arranged linearly in the molecule, $CH_3-C \equiv C - \underset{\substack{| \\ H}}{C} = CH_2$ is-

Space for rough work

SECTION-C : MATHEMATICS

PART – 1

(Single Correct Answer Type)

This part contains **10 multiple choice questions**. Each question has four choices (A), (B), (C) and (D), out of which **ONLY ONE is correct**.

41. If the equation $\cot^4 x - 2 \operatorname{cosec}^2 x + a^2 = 0$ has at least one solution then sum of all possible integral values of 'a' is :
- (A) 0 (B) 1 (C) 2 (D) 4
42. If $\theta_k \in [0, \pi]$ for $1 \leq k \leq 10$, then the maximum value of $\prod_{k=1}^{10} (1 + \sin^2 \theta_k)(1 + \cos^2 \theta_k)$ is
- (A) $\left(\frac{3}{2}\right)^{10}$ (B) $\left(\frac{9}{4}\right)^{10}$ (C) $10 \cdot \left(\frac{3}{2}\right)^2$ (D) $\left(\frac{9}{4}\right)^{20}$
43. t_1, t_2, t_3 are 3 points on $y^2 = 4x$ such that normal at t_1 intersects parabola at t_2 and normal at t_2 intersects parabola at t_3 . If $3t_1 + 13t_2 + 9t_3 = 0$, then $\frac{t_1^2 + 5}{t_2^2 - 6}$ is equal to
- (A) 1 (B) 3 (C) -2 (D) 5
44. The least value of $f(x) = |x - 1| + |x - 2| + |x - 3|$ is
- (A) 1 (B) 2 (C) 3 (D) 4
45. Let ABC and PQR be two triangles such that $\sin A = \frac{(a^2 + b^2 + c^2)(p^2 + q^2 + r^2)}{(ap + bq + cr)^2}$ and Area of $\triangle ABC >$ Area of $\triangle PQR$, where a, b, c and p, q, r are the sides of triangles ABC and PQR respectively. If p, q, r ($p < q < r$) are consecutive natural numbers. Also a, b, c $\in \mathbb{N}$ and perimeter of triangle ABC is 24, then the value of $ab + bc + ac$ is
- (A) 104 (B) 188 (C) 428 (D) None of these

Space for rough work

46. A polynomial $P(x)$ with integral coefficients takes the value 5 at exactly four distinct integral values of x . The number of integral solutions of the equation $P(x) - 3 = 0$ is
 (A) 0 (B) 4 (C) 2 (D) None of these
47. Let $N = a a a a a a$ be a 6 digit number (all digit repeated) and N is divisible by 924 and let α, β be the roots of the equation $x^2 - 11x + \lambda = 0$ then product of all values of λ is
 (A) 670 (B) 672 (C) 625 (D) None of these
48. If $f(x) = \sqrt{2x^2 - 6x + 5} + \sqrt{2x^2 - 40x + 218}$, then the minimum value of $f(x)$ is
 (A) 8 (B) 13 (C) 15 (D) None of these
49. Let $A = \{(x, y) : x + y = \alpha\}$ and $B = \{(x, y) : x^3 + y^3 < \alpha\}$ be two sets such that $A \cap B = \phi$ for some real number α , then the exhaustive set of values of α is :
 (A) $[-2, 2]$ (B) $\{0\} \cup [2, \infty)$ (C) $(-\infty, -2] \cup \{0\}$ (D) $\{x \mid x \in \mathbb{N}, x \leq 3\}$
50. Number of real solutions of $|x - 1|^{(|x-2|-1)} = 1$ will be
 (A) 4 (B) 3 (C) 2 (D) 1

PART – 2

(Paragraph Type)

This part contains **6 multiple choice questions** relating to three paragraphs with **two questions on each paragraph**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

Paragraph for Questions 51 and 52

A variable circle touches straight line $y = x$ and cut off a constant length of $2\sqrt{2}$ units from $x + y = 0$. the locus of centre of circle is curve 'C'.

51. The eccentricity of the curve 'C' is

- (A) 1 (B) $\sqrt{2}$ (C) 2 (D) $\frac{1}{2}$

Space for rough work

52. The line $x + 2y = 1$ intersects the curve C at P and Q (where P is above x-axis). The centre of circle which touches the curve C at P and passes through Q is

- (A) $\left(-\frac{1}{4}, \frac{1}{4}\right)$ (B) $\left(\frac{1}{4}, \frac{1}{4}\right)$ (C) $\left(\frac{1}{4}, -\frac{1}{4}\right)$ (D) $\left(-\frac{1}{4}, -\frac{1}{4}\right)$

Paragraph for Questions 53 and 54

If S_1 and S_2 are the two concentric ellipse with equal length of major axis and equal eccentricities 'e' passes through the foci of each other.

53. Then the minimum value of e^2 is

- (A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{3}{4}$ (D) $\frac{\sqrt{3}}{2}$

54. If θ is the eccentric angle on the point on the ellipse S_1 which is the focus of S_2 , then the value of $\sin^2 \theta$ is

- (A) $\frac{1+e^2}{2+e^2}$ (B) $\frac{1-e^2}{1+e^2}$ (C) $\frac{1-e^2}{e^2}$ (D) None of these

Paragraph for Questions 55 and 56

Let the equations $\alpha x^2 + 2\beta x + \gamma = 0$ and $hx^2 + 2kx + m = 0$ have a common roots when $\alpha, \beta, \gamma, h, k, m$ are positive real number and $\frac{\alpha}{h}, \frac{\beta}{k}, \frac{\gamma}{m}$ are in A.P.

55. Then h, k, m are in

- (A) H.P. (B) G.P. (C) A.P. (D) None of these

56. Then the common roots is

- (A) $\frac{-m}{n}$ (B) $\frac{-m}{k}$ (C) $\frac{-k}{h}$ (D) $\frac{-k}{m}$

Space for rough work

PART – 3**(Integer Answer Type)**

This part contains **4** questions. The answer to each of the questions is a single digit integer, ranging from **0 to 9**. The appropriate bubbles below the respective question numbers in the ORS have to be darkened. For example, if the correct answers to question numbers X, Y, Z and W (say) are 6, 0, 9 and 2, respectively, then the correct darkening of bubbles will look like the following:

	X	Y	Z	W
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

57. Let x and y be positive real number and θ is an angle $\left(\text{where } \theta \neq \frac{n\pi}{2}\right)$. If for any integer n and

$$\frac{\sin \theta}{x} = \frac{\cos \theta}{y}, \text{ we have } \frac{\cos^4 \theta}{x^4} + \frac{\sin^4 \theta}{y^4} = \frac{97 \sin 2\theta}{x^3 y + y^3 x}, \text{ then the value of } \frac{x}{y} + \frac{y}{x} \text{ is}$$

58. Minimum distance between the curve $y = \sqrt{4 - x^2}$ and the straight line $y = x - 2\sqrt{2}$ is k then $[2k]$ is equal to (where $[\]$ denotes greatest integer function).
59. Let the lengths of the altitudes drawn from the vertices of a triangle ABC to the opposite sides are 2, 2 and 3. If the area of triangle ABC is Δ , then the value of $2\sqrt{2}\Delta$ is
60. Number of integral solution of the equation $\log_{\sqrt{x}}(x + |x - 2|) = \log_x(5x - 6 + 5|x - 2|)$ is

Space for rough work

ANSWER - KEY

SECTION - A : PHYSICS

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (A) | 2. (A) | 3. (B) | 4. (D) | 5. (B) |
| 6. (D) | 7. (B) | 8. (A) | 9. (B) | 10. (A) |
| 11. (C) | 12. (C) | 13. (A) | 14. (C) | 15. (C) |
| 16. (A) | 17. (5) | 18. (5) | 19. (2) | 20. (4) |

SECTION - B : CHEMISTRY

- | | | | | |
|---------|---------|---------|---------|---------|
| 21. (B) | 22. (B) | 23. (D) | 24. (C) | 25. (D) |
| 26. (C) | 27. (D) | 28. (A) | 29. (D) | 30. (A) |
| 31. (B) | 32. (C) | 33. (A) | 34. (B) | 35. (B) |
| 36. (C) | 37. (3) | 38. (6) | 39. (1) | 40. (4) |

SECTION - C : MATHEMATICS

- | | | | | |
|---------|---------|---------|---------|---------|
| 41. (A) | 42. (B) | 43. (B) | 44. (B) | 45. (B) |
| 46. (A) | 47. (B) | 48. (B) | 49. (B) | 50. (B) |
| 51. (B) | 52. (C) | 53. (A) | 54. (C) | 55. (B) |
| 56. (B) | 57. (4) | 58. (1) | 59. (9) | 60. (1) |