JEE-ADVANCE: TEST-1

PAPER-II

Time : 3 hrs. **M.M.: 180**

TEST CODE - A

TOPIC COVERED :

PHYSICS:	Kinematics, Laws of Motion, Work, Power, Energy, Centre of Mass and Collisions
CHEMISTRY:	Mole Concept, Stoichiometry, Redox Reaction, Analytical Structure of Atom, Chemical Bonding, Gaseous State and Periodic Table.
MATHEMATICS:	Complex Number, Quadratic Equations, Sequence Series and Coordinate Geometry

ATTENTION: Kindly ask for the Roll No. from the invigilator to fill in OMR SHEET. Mark the Roll No. & Test code on the answer sheet properly. (No other sheet will be issued)

GENERAL INSTRUCTIONS :

1. The Test Paper consists of **60** questions

2. There are ***Three Subjects (Physics, Chemistry & Mathematics)*** in the question paper.

3. ***This paper is divided into 3 parts: Physics Section (I), (II) and (III); Chemistry Section (I), (II) and (III) & Mathematics Section (I), (II) and (III).***

- *Multiple correct answer type questions :* ***Physics Section (II) (1 to 8) Chemistry Section II (21 to 28) and Mathematics Section II (41 to 48), 3 marks*** *for each correct answer and* ***–1 mark*** *for incorrect answer.*
- *Linked Comprehension type questions:* ***Physics Section-II (9 to 16)*** *(4 comprehensions, with 2 questions);* ***Chemistry Section-II (29 to 36)*** *(4 comprehension, with 2 questions);* ***Mathematics Section- II (49 to 56)*** *(3 comprehension, with 3 and 2 questions)* ***3 marks*** *for each correct answer and* ***–1 mark*** *for incorrect answer.*
- *Match the following:* ***Physics Section-III (17 to 20); Chemistry Section-III (37 to 40) and Mathematics Section- IV (57 to 60) 3 marks*** *for each correct answer and* ***–1 mark*** *for incorrect answer.*

Name of the Student : _____

Section : _____

Centre : _____

Invigilator's Signature : _____

PHYSICS

SECTION- I: MULTIPLE CORRECT ANSWERS TYPE

This section contains 8 multiple choice questions numbered 1 to 8. Each question has 4 choice (A), (B), (C) and (D), out of which ONE OR MORE is/are correct

1. A particle is acted upon by a force of constant magnitude. Which is always perpendicular to the velocity of the particle? The motion of the particle takes place in a plane. It follows that

(a) its magnitude of velocity is constant (b) its magnitude of acceleration is constant

(c) its kinetic energy is constant (d) it moves in a circular path

2. A smooth sphere of mass m is moving on a horizontal plane with a velocity $3\mathbf{i} + \mathbf{j}$. It collides with a vertical wall which is parallel to the vector $\mathbf{j}$. If the coefficient of restitution between the sphere and wall is 1/2. Then

(a) The velocity of sphere after impact = $-\frac{3}{2}\mathbf{i} + \mathbf{j}$

(b) The loss in kinetic energy causes by the impact = $\frac{27}{8}m$J

(c) The impulse $\mathbf{j}$ that act on the sphere is $-\frac{9}{2}m\mathbf{i}$

(d) none of these

3. A body of mass m_1 moving with certain velocity collides elastically with another body of mass m_2 at rest. The percentage kinetic energy transferred by m_1 to m_2

(a) 100% if $m_1 = m_2$ (b) 80% if $m_2 = 2m_1$ (c) 75% if $m_2 = 3m_1$ (d) none of these

4. A body of mass 2 kg is being dragged with a uniform velocity 2 m/s on a rough horizontal plane. The coefficient of friction between the body and surface is 0.2. Given 1 cal = 4.2 J and $g = 9.8$ m/s^2. Then

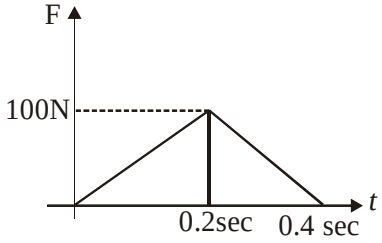
(a) Distance travelled in 5 sec is 10 m

(b) Distance travelled in 5 sec is 20 m

(c) Amount of heat is generated in 5 sec is 9.33 cal.

(d) all of these

5. The figure shows the force versus time graph for a particle. Then



(a) Change in momentum of the particle is 20 N-S

(b) Average Force acting on the particle is 50 N

(c) Change in momentum of the particle is 50 N-S

(d) Average Force acting on the particle is 20 N

6. A ball of mass m_1, collides elastically and head on with ball of mass m_2 at rest. Then

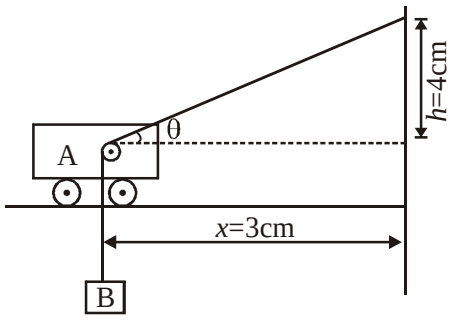
(a) The transfer of kinetic energy to the second ball is maximum when $m_1 = m_2$

(b) The change of momentum of first ball is maximum, when $m_1 << m_2$.

(c) The velocity of the second ball is maximum, when $m_1 >> m_2$

(d) none of these

7. The string shown in the figure is passing over small smooth pulley rigidly attached to trolley A. If speed of trolley is constant and equal to V_A. Speed and magnitude of acceleration of block B at the instant shown in the figure is



(a) $V_B = V_A$, $a_B = 0$ (b) $\frac{\sqrt{34}}{5} V_A$

(c) $V_B = \frac{3}{5} V_A$ (d) $a_B = \frac{16 V_A}{125}$

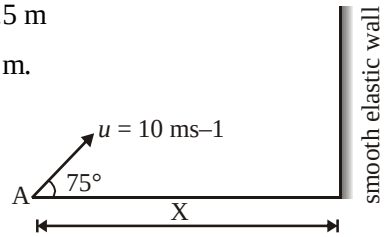
8. A particle is projected with a velocity of 10 m/s at an angle of 75° with the horizontal, then

(a) The value of 'X' for the ball to return to its initial point of projection is 2.5 m

(b) The value of 'X' for the ball to return to its initial point of projection is 5 m.

(c) The horizontal component of velocity is $\frac{5(\sqrt{3}-1)}{\sqrt{2}}$

(d) The horizontal component of velocity is $\frac{10(\sqrt{3}-1)}{\sqrt{2}}$

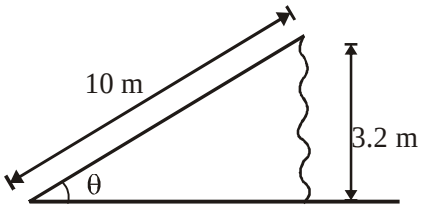


SECTION- II: PARAGRAPH TYPE

This Section contains **4 paragraphs** each describing theory, experiment, data etc. **Eight questions** relate to four paragraphs with two questions on each paragraph. Each question of a paragraph has **only one correct answer** amount the four choice (A), (B), (C) and (D).

Paragraph for Question 9 to 10

A small block of mass 200 gram is placed at the bottom of an incline plane which is 10 m long, and 3.2 m high. Coefficient of friction between the block and inclined plane is 0.1 ($g = 10$ m/s^2).



9. Work required to lift the block from ground and put it at the top is

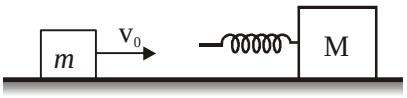
(a) 3.2 J (b) 6.4 J (c) 9.6 J (d) 1.6 J

10. Work required to slide the block up the incline and taking it to top is

(a) 3.2 J (b) 6.4 J (c) 8.4 J (d) 10 J

Paragraph for Question 11 to 12

A block of mass *m* moves with velocity v_0 toward a stationary block of mass M on a smooth horizontal surface



11. Velocity of centre of mass when spring compression is half the maximum compression, is

(a) $\frac{mv_0}{M+m}$ (b) $\frac{mv_0}{M}$ (c) $\frac{mv_0}{M-m}$ (d) $\frac{v_0}{2}$

12. Initial velocity of block of *m* w.r.t. centre of mass

(a) $\frac{Mv_0}{m+M}$ (b) $\frac{mv_0}{M+m}$ (c) $\frac{v_0}{2}$ (d) $\frac{v_0}{3}$

Paragraph for Question 13 to 14

Two pendulum bobs of mass *m* and 2*m* collide elastically at the lowest point in their motion. If both the balls are released from height H above the lowest point

13. Velocity of the bob of mass *m* is

(a) $\frac{\sqrt{2gH}}{3}$ (b) $\frac{5}{3}\sqrt{2gH}$ (c) $\sqrt{2gH}$ (d) none of these

14. The bob of mass *m* rise after the collision is

(a) $\frac{25H}{9}$ (b) $\frac{H}{9}$ (c) $\frac{16H}{9}$ (d) $\frac{H}{4}$

Paragraph for Question 15 to 16

Boats ply between two ports A and B. All boats travel with the same unsiform speed with respect to river and the distance AB = 20 km. Boats can go from A to B in one hour and from B to A in 2 hours. A boat leaves each port at an interval of 20 minutes. After reaching any port, the boat stays at the port for 20 minutes for maintenance and then leaves the port. The boats start from each port at 11 am and the last boat leaves the port at 6 pm.

15. Find the minimum number of boats required to cover the trips from 11 am to 6 pm.

(a) 8 (b) 11 (c) 14 (d) 17

16. Find the maximum number of times a particular boat plying from A to B will meet a boat plying from B to A on its way

(a) 5 (b) 8 (c) 9 (d) 13

SECTION- III: MATCHING LIST TYPE

This Section contains **4 multiple choice questions**. Each question has matching lists. The codes for lists have choice (A), (B), (C) and (D) out of which **ONLY ONE** may be correct.

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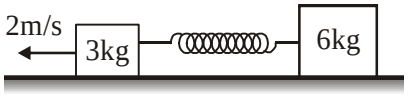
17. A particle is moving in a curvilinear path. Its velocity and acceleration at some instant of time are $\vec{v} = 4\hat{i}$ m/s and $\vec{a} = (3\hat{i} - 4\hat{j})$ m/s2. Then match the following

A.	Tangential acceleration	(p)	4 units
B.	Normal acceleration	(q)	3 units
C.	Radius of curvature	(r)	5 units
D.	Net acceleration	(s)	16 units

(a) A-(q), B-(p), C-(p), D-(r) (b) A-(q), B-(r), C-(p), D-(s)

(c) A-(s), B-(r), C-(p), D-(q) (d) A-(r), B-(p), C-(p), D-(q)

18. Two blocks of masses 3 kg and 6 kg are connected by an ideal spring and are placed on a frictionless horizontal surface. The 3 kg block is imparted a speed of 2 m/s towards left. (consider left as positive direction)

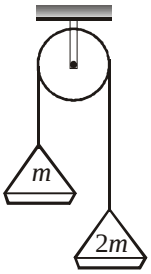


A.	When the speed of 3 kg block is 2/3 m/s	(p)	Velocity of centre of mass is 2/3 m/s
B.	When the speed of 3 kg block is 2 m/s	(q)	Deformation of the spring is zero
C.	When the speed of 3 kg block is minimum	(r)	Deformation of the spring is maximum
D.	When the speed of 6 kg block is maximum	(s)	Both the blocks are at rest with respect to each other.

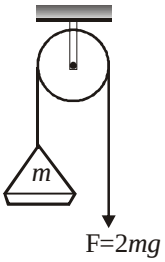
(a) A-(p),(r); B-(p); C-(p); D-(p) (b) A-(p),(r),(s); B-(p),(q); C-(p); D-(p),(q)

(c) A-(p); B-(p),(q); C-(p),(q), D-(p),(s) (d) A-(r),(s); B-(q); C-(p), D-(q)

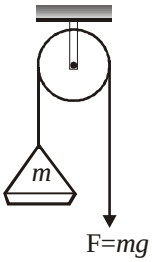
19. Match the following and write the correct pairs for the most generalized cases

A. 

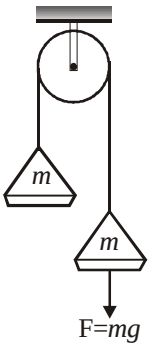
(p) The acceleration of mass m is $a = g$

B. 

(q) The acceleration of mass m is $a = 0$

C. 

(r) The acceleration of mass m is $a = g/3$

D. 

(s) The acceleration of mass m is $a = g/2$

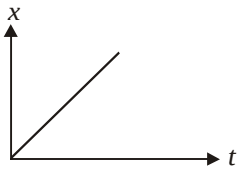
(a) A-(p); B-(s); C-(q); D-(r)

(b) A-(r); B-(p); C-(q); D-(s)

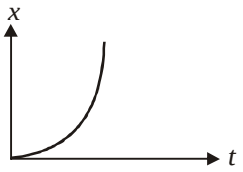
(c) A-(r); B-(p); C-(q); D-(r)

(d) A-(s); B-(p); C-(q); D-(s)

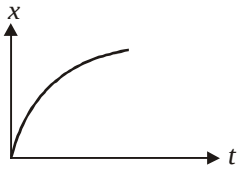
20. A. Velocity zero (p)



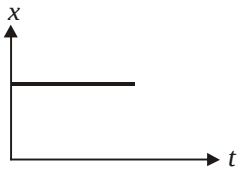
B. Velocity decreasing (q)



C. Velocity constant (r)



D. Velocity increasing (s)



(a) A-(q); B-(r); C-(p); D-(s) (b) A-(s); B-(r); C-(p); D-(q)

(c) A-(p); B-(r); C-(s); D-(q) (d) A-(s); B-(p); C-(q); D-(r)

CHEMISTRY

SECTION- I: MULTIPLE CORRECT ANSWERS TYPE

This section contains 8 multiple choice questions numbered 21 to 28. Each question has 4 choice (A), (B), (C) and (D), out of which ONE OR MORE is/are correct

21. 0.1 mole acidic solution of $KMnO_4$ can oxidise:

(a) 0.6 mole $K_2Cr_2O_7$ (b) 0.5 mole of $FeSO_4$

(c) 0.25 mole of $C_2O_4^{2-}$ ions (d) 0.167 mole of FeC_2O_4

22. H_2O_2 acts as oxidising and reducing agents. Which of the following statements are true for its 1.7 gm?

(a) It is equal to 0.56 volume H_2O_2

(b) It is equal to 170 milliequivalent H_2O_2

(c) It can reduce 20 mL of 5 N acidic $KMnO_4$ solution

(d) It can oxidise 15.2 gm $FeSO_4$ in acidic medium

23. In reaction $2KMnO_4 + 10KI + 8H_2SO_4 \rightarrow 6K_2SO_4 + 2MnSO_4 + 5I_2 + 8H_2O$, which of the following statements are correct?

(a) 10 moles of electrons are exchanged

(b) Total moles of electrons taken by $KMnO_4$ is equal to moles of electrons given by H_2SO_4

(c) Moles of H^+ reduced are 8

(d) Total change in oxidation state of Mn is 10.

24. Which of the following statement are correct?

(a) The value of a' is higher for CO_2 than H_2 (b) Hydrogen bonding is present in H_2S

(c) The value of a' is higher for NH_3 than He (d) Hydrogen bonding is present in HF

25. Which of the following statements are correct on the basis of Charle's law?

(a) It is not possible to attain absolute zero

(b) At zero pressure, all molecular motion ceases in a gas and it does not exert any pressure on the wall of the container

(c) The pressure of ideal gas can be zero

(d) The volume of ideal gas can never zero

26. Which of the following species have linear geometry?

(a) I_3^- (b) XeF_2 (c) I_3^+ (d) ICl_2^+

27. Which of the following statements for ψ^2 is correct?

(a) ψ^2 may be +ve, –ve or imaginary

(b) ψ^2 is proportional to electron density

(c) If ψ^2 is high, the probability of finding the electron is high

(d) If ψ^2 is low the probability of finding the electron is high

28. In which of the following orbitals, the probability of finding an electron in the *x*, *y* plane is zero?

(a) d_{xz} (b) d_z^2 (c) p_x (d) p_z

SECTION- II: PARAGRAPH TYPE

This Section contains **4 paragraphs** each describing theory, experiment, data etc. **Eight questions** relate to four paragraphs with two questions on each paragraph. Each question of a paragraph has **only one correct answer** amount the four choice (A), (B), (C) and (D).

Paragraph for Question 29 to 30

Molarity is number of moles of solute dissolved per litre of the solution while normality is number of gm-equivalent of solute dissolved per litre of solution. Molality is number of moles of solute dissolved per Kg of solvent. Normality and molarity change with change of temperature of solution but molality is independent of temperature. In case of monobasic acid normality and molarity are equal but in dibasic acid or base molarity is two times of normality. In redox and neutralisation processes number of milliequivalents of reactants as well as products are always equal.

29. When 1000 mL of 0.5 M HCl solution was heated, 2.25 gm HCl was lost and volume of solution became 750 mL. The molarity of resulting solution will be about:

(a) 0.75 M (b) 0.075 M (c) 0.58 M (d) 1.16 M

30. The volume of 0.1 M $Ca(OH)_2$ required to neutralise 0.2 M H_3PO_3 solution of volume 0.25 dm^3 will be:

(a) 100 mL (b) 250 mL (c) 500 mL (d) 750 mL

Paragraph for Question 31 to 32

There are two types of iodine titration (a) Iodometric and (b) Iodimetric. Iodometric method is indirect method of I_2 estimation. Any oxidant which liberates I_2 from KI solution, the liberated iodine is estimated by titrating it with $Na_2S_2O_3$ solution as:

$$I_2 + 2Na_2S_2O_3 \longrightarrow 2NaI + Na_2S_4O_6$$

31. 100 mL of *x* M $K_2Cr_2O_7$ solution is added to excess of KI solution in acidic medium. The liberated iodine required 50 mL of 0.1N $Na_2S_2O_3$ solution. The volume of *x* is

(a) $\frac{1}{10}$M (b) $\frac{1}{20}$M (c) $\frac{1}{12}$M (d) $\frac{1}{120}$M

32. 8.25 gm oxalic acid is oxidised by 50 mL of 0.1 M $KMnO_4$ solution in presence of H^+ ions. The remaining $KMnO_4$ was heated with excess of KI solution and the liberated I_2 was titrated with 10 mL of 0.05 $Na_2S_2O_3$ solution. The percentage of purity of oxalic acid is:

(a) 8.6% (b) 17.18% (c) 25.8% (d) 34.4%

Paragraph for Question 33 to 34

Among the oxides of nitrogen NO on oxidation changes to NO_2 which dimerizes to N_2O_4 both having different magnetic property NO by loosing an electron changes to NO^+ and by gaining electron to NO^-. Similarly NO_2 changes to NO_2^+ and NO_2^- having different shapes and bond angles. Answer the following questions:

33. In which of the following the O — N — O bond angle is highest?

(a) NO_2 (b) NO_2^+ (c) NO_2^- (d) NO_3^-

34. In which of the following is correct decreasing bond order to NO, NO^+ and NO^-?

(a) $NO > NO^+ > NO^+$ (b) $NO^- > NO^+ > NO$

(c) $NO^- > NO > NO^+$ (d) $NO^+ > NO > NO^-$

Paragraph for Question 35 to 36

H-spectrum is obtained when excited electrons are de-excited and several kind of spectral series like Lyman, Balmer, Pauchen, Bracket and Pfund ... are obtained in different region like UV, IR....

The wavelength of different spectral lines can be calculated by using Rydberg's formula.

$\frac{1}{\lambda} = \bar{\nu} = Rz^2\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$ where, R = Rydberg's constant = 1.1×10^7 m^{-1}

35. What hydrogen like ion has the wavelength difference between the first lines of Balmer and Lyman series equal to 59.3 mm? $R_H = 109678$ cm^{-1}

(a) 3 (b) 2 (c) 4 (d) 5

36. Find the quantum no. '*n*' corresponding to the excited state of He^+ ion if on transition to the ground state that ion emits two photons in succession with wavelengths 108.5 and 30.4 nm.

(a) 3 (b) 5 (c) 1 (d) 2

SECTION- III: MATCHING LIST TYPE

This Section contains **4 multiple choice questions**. Each question has matching lists. The codes for lists have choice (A), (B), (C) and (D) out of which **ONLY ONE** may be correct.

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37. Match Column I with Column II

Column I	**Column II**
A. $Cu^{2+} + I^- \longrightarrow I_2 + \ldots$	(p) Eq. wt. of oxidant = $\frac{M.wt}{3}$
B. $Cu^{2+} + Cl^- \longrightarrow CuCl_2 + \ldots$	(q) Eq. wt. of oxidant = $\frac{M.wt}{5}$
C. $MnO_4^- + H^+ + e \longrightarrow Mn^{2+} + \ldots$	(r) Eq. wt. of oxidant = $\frac{M.wt}{1}$
D. $Cr_2O_7^{2-} \xrightarrow{\Delta} CrO_4^{2-} + Cr_2O_3 + \ldots$	(s) Eq. wt. of oxidant = $\frac{M.wt}{2}$

(a) A-(q), B-(p), C-(p), D-(r) (b) A-(q), B-(r), C-(p), D-(s)

(c) A-(s), B-(r), C-(p), D-(q) (d) A-(r), B-(s), C-(q), D-(p)

38. A. Compressibility factor (z) < 1 (p) H_2w

B. Boyle's temperature (T_B) (q) $\frac{2a}{Rb}x$

C. Inversion temperature ($T_{i)}$ (r) CH_{4y}

D. van der Waals constant (a) = 0.024 (s) $\frac{a}{Rb}z$

(a) A-(q), B-(p), C-(p), D-(r) (b) A-(q), B-(r), C-(p), D-(s)

(c) A-(s), B-(r), C-(p), D-(q) (d) A-(r), B-(s), C-(q), D-(p)

39. A. $\left(\frac{cp}{cv}\right)$ for CO (p) 1 : 1

B. $\left(\frac{V_{rms}}{V_{Av}}\right)$ (q) 2 : 1

C. K.E. for CO_2/K.E. of SO_2 at 300 K (r) 1.4 : 1

D. $\frac{T_i}{T_B}$ (s) 1.086 : 1

(a) A-(q), B-(p), C-(p), D-(r) (b) A-(r), B-(s), C-(p), D-(q)

(c) A-(s), B-(r), C-(p), D-(q) (d) A-(q), B-(r), C-(p), D-(s)

40. A. 1.72g impure $FeSO_4$ consumed 20 mL of 0.1 M acidic $KMnO_4$ (p) 75% pure sample

B. 8.4 gm impure oxalic acid consumed 0.1 mole NaOH (q) 79.67% pure sample

C. 9.84g $FeSO_4(NH_4)_2SO_4$ impure sample reduced 0.02 equivalent $K_2Cr_2O_4$ acidic solution (r) 82.67% pure sample

D. 11.2 volume of H_2O_2 reduced 75 gm $KMnO_4$ in acidic medium (s) 88.3% pure sample

(a) A-(q), B-(p), C-(p), D-(r) (b) A-(r), B-(s), C-(p), D-(q)

(c) A-(s), B-(p), C-(q), D-(r) (d) A-(q), B-(r), C-(p), D-(s)

MATHEMATICS

SECTION- I: MULTIPLE CORRECT ANSWERS TYPE

This section contains 8 multiple choice questions numbered 41 to 48. Each question has 4 choice (A), (B), (C) and (D), out of which ONE OR MORE is/are correct

41. If the circle $x^2 + y^2 = 1$ cuts the rectangular hyperbola $xy = 1$ in four points (x_i, y_i) $i = 1, 2, 3, 4$ then

(a) $x_1x_2x_3x_4 = -1$ (b) $y_1y_2y_3y_4 = 1$ (c) $x_1 + x_2 + x_3 + x_4 = 0$ (d) $y_1 + y_2 + y_3 + y_4 = 0$

42. Three normals to the parabola $y^2 = x$ are drawn through a point $(c, 0)$, then

(a) $c = \frac{3}{4}$ (b) $0 < c < \frac{1}{2}$ (c) $c > \frac{1}{2}$ (d) $c = \frac{1}{2}$

43. An isosceles triangle ABC is inscribed in a circle $x^2 + y^2 = a^2$ with the vertex A at $(a, 0)$ and the base angle B and C each equal to 75°, then coordinates of an end point of the base are

(a) $\left(\frac{\sqrt{3}a}{2}, \frac{a}{2}\right)$ (b) $\left(-\frac{\sqrt{3}a}{2}, \frac{a}{2}\right)$ (c) $\left(\frac{a}{2}, \frac{\sqrt{3}a}{2}\right)$ (d) $\left(-\frac{\sqrt{3}a}{2}, -\frac{a}{2}\right)$

44. The diagonals of a square are alone the pair of lines whose equation is $2x^2 - 3xy - 2y^2 = 0$. If (2, 1) is a vertex of the square, then the other vertices of the square are

(a) (1, 2) (b) (–1, 2) (c) (1, –2) (d) (–2, –1)

45. If all three vertices of an isosceles right angle triangle be integral points and length of base is also an integer, then which of the point is/are always a rational point (A point P(x, y) is a rational point if both x and y are rational)

(a) centroid (b) incentre (c) circumcentre (d) orthocentre

46. All the terms of an A.P. are natural numbers and the sum of the first 20 terms is greater than 1072 and less than 1162. If the sixth term is 32, then

(a) first term is 12 (b) first term is 7 (c) common difference is 4 (d) common difference is 5

47. If α is the fifth root of unity, then

(a) $|1 + \alpha + \alpha^2 + \alpha^3 + \alpha^4| = 0$ (b) $|1 + \alpha + \alpha^2 + \alpha^3| = 1$

(c) $|1 + \alpha + \alpha^2| = 2 \cos \pi/5$ (d) $|1 + \alpha| = 2\cos \pi/10$

48. The set of real values of k for which the equation $x^2 - 4|x| + 3 - |k-1| = 0$ will have exactly four roots is

(a) $(-2, 4)$ (b) $(-4, 4)$ (c) $(-4, 2)$ (d) $(-1, 0)$

SECTION- II: PARAGRAPH TYPE

This Section contains **3 paragraphs** each describing theory, experiment, data etc. **Eight questions** relate to four paragraphs with two questions on each paragraph. Each question of a paragraph has **only one correct answer** amont the four choice (A), (B), (C) and (D).

Paragraph for Question 49 to 51

Suppose two quadratic equations $a_1x^2 + b_1x + c_1 = 0$ and $a_2x^2 + b_2x + c_2 = 0$ have a common root α, then

$a_1\alpha^2 + b_1\alpha + c_1 = 0$ .....(i) and $a_2\alpha^2 + b_2\alpha + c_2 = 0$ ....(ii)

Eliminating α using cross-multiplication method gives us the condition for common root. Solving two equations simultaneously, the common root can be obtained.

Now consider three quadratic equation, $x^2 - 2rp_rx + r = 0$; $r = 1, 2, 3$

49. The common root between the equations obtained by $r = 1$ and $r = 3$ is

(a) 1 (b) $\sqrt{\frac{1}{2}}$ or $-\sqrt{\frac{1}{2}}$ (c) $\sqrt{\frac{3}{2}}$ or $-\sqrt{\frac{3}{2}}$ (d) $\frac{1}{3}$

50. If common roots between 1st and 2nd is α, between 2nd and 3rd is γ and 1st and 3rd is β, then $\frac{\gamma}{\beta} =$

(a) 2 (b) 3 (c) 1 (d) $\frac{1}{2}$

51. In the notations of previous question, $\frac{\gamma}{\alpha} =$

(a) 2 (b) 3 (c) $\frac{1}{2}$ (d) $\frac{1}{3}$

Paragraph for Question 52 to 54

Suppose z and w be two complex numbers such that $|z| \le 1$, $|w| \le 1$ and $|z + iw| = |z - iw| = 2$. Use the result $|z|^2 = z\bar{z}$ and $|z + w| \le |z| + |w|$, answer the following questions

52. Which of the following is true about $|z|$ and $|w|$

(a) $|z| = |w| = \frac{1}{2}$ (b) $|z| = \frac{1}{2}, |w| = \frac{3}{4}$ (c) $|z| = |w| = \frac{3}{4}$ (d) $|z| = |w| = 1$

53. Which of the following is true for z and w

(a) $\text{Re}(z) = \text{Re}(w)$ (b) $I_m(z) = I_m(w)$ (c) $\text{Re}(z) = I_m(w)$ (d) $I_m(z) = \text{Re}(w)$

54. Complex number w satisfying the above conditions is/are

(a) 1 or $-i$ (b) -1

(c) i or $-i$ (d) w or w^2 (w is complex cube root of unit)

Paragraph for Question 55 to 56

Let E be an ellipse whose major axis and minor axis are of lengths $2a$ and $2b$ respectively. The ellipse sliding between coordinate axes in first quadrant. Then answer the following questions

55. The equation of the locus of the centre of the ellipse E is

(a) $x^2 + y^2 = a^2 + b^2$ (b) $x^2 + y^2 - ax - by = 0$ (c) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (d) $y^2 = 4abx$

56. At certain position the coordinate of foci of the ellipse E are (x_1, y_1) and (x_2, y_2), then $x_1 x_2$ is equal to

(a) a^2 (b) b^2 (c) ab (d) none of these

SECTION- III: MATCHING LIST TYPE

This Section contains **4 multiple choice questions**. Each question has matching lists. The codes for lists have choice (A), (B), (C) and (D) out of which **ONLY ONE** may be correct.

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57. Let $ax + by = 1$ be a chord of the curve $3x^2 - y^2 - 2x + 4y = 0$ intersecting the curve at the points A and B such that AB subtends a right angle at the origin O. Match the entries from the following two columns

A.	$a - 2b + 1$ is equal to	(p)	0
B.	The distance from the origin of the farthest chord cannot exceed	(q)	2
C.	If the triangle OAB is isoceless then the area of the triangle cannot exceed	(r)	$\sqrt{5}$
D.	The number of chords such that ΔOAB is isoceless cannot exceed	(s)	5

(a) A-(q); B-(p),(s); C-(s); D-(p) (b) A-(p); B-(p),(r); C-(s); D-(s)

(c) A-(q); B-(r),(s); C-(s); D-(s) (d) A-(r); B-(q),(s); C-(q); D-(r)

58. Observe the following lists

A. If a, b, c be positive numbers then $(a + b + c)\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$ must be greater than or equal to (p) 4

B. If h be the H.M. and g be the G.M. of two positive numbers a and b such that $h : g = 4 : 5$, then $\frac{a}{b}$ can be equal to (q) 9

C. If $S = \sum_{r=0}^{\infty}\frac{1}{2^r}$ and $S_{n+1} = \sum_{r=0}^{n}\frac{1}{2^r}$ and $S - S_{n+1} > 10^{-3}$, then n is greater than or equal to (r) 10

D. If $(1 + x)(1 + x^2)(1 + x^4)(1 + x^8) \ldots (1 + x^{128}) = \sum_{r=0}^{n} x^r$, then n is equal to (s) 255

(a) A-(p),(q); B-(p); C-(p),(q),(r); D-(s)
(b) A-(r),(s); B-(q); C-(p),(q),(r); D-(s)
(c) A-(s); B-(p); C-(q),(r); D-(q),(s)
(d) A-(p),(q),(s); B-(r); C-(q),(r),(s); D-(p)

59. A. If two distinct chords of a parabola $y^2 = 4ax$ passing through the point $(a, 2a)$ are bisected by the line $x + y = 1$, then the length of the latus rectum can be (p) –1

B. The parabola $y = x^2 – 5x + 4$ cuts the x-axis at P and Q. A circle is drawn through P and Q so that the origin lies outside it. The length of a tangent to the circle from the origin is equal to (q) 0

C. If $y + b = m_1 (x + a)$ and $y + b + m_2(x + a)$ are two tangents to $y^2 = 4ax$, then m_1m_2 is equal to (r) 1

D. If the point $(h, –1)$ is exterior to both the parabolas $y^2 = |x|$, then the integral part of h can be equal to (s) 2

(a) A-(p),(s); B-(s); C-(s); D-(p),(s)
(b) A-(r),(s); B-(s); C-(p); D-(p),(q)
(c) A-(q),(s); B-(r); C-(p); D-(r),(s)
(d) A-(p); B-(r); C-(p),(r); D-(s)

60. Let the circle $(x-1)^2 + (y-2)^2 = 25$ cuts a rectangular hyperbola with transverse axis along $y = x$ at four points A, B, C and D having coordinates (x_i, y_i), $i = 1, 2, 3, 4$ respectively. O being the centre of the hyperbola. Now match the entries from the following two columns:

A. $x_1 + x_2 + x_3 + x_4$ is equal to	(p) 2
B. $x_1^2 + x_2^2 + x_3^2 + x_4^2$ is equal to	(q) 44
C. $OA^2 + OB^2 + OC^2 + OD^2$ is equal to	(r) 56
D. $y_1^2 + y_2^2 + y_3^2 + y_4^2$ is equal to	(s) 100

(a) A-(p); B-(q); C-(r); D-(s)

(b) A-(p); B-(r); C-(q); D-(s)

(c) A-(s); B-(s); C-(q); D-(r)

(d) A-(q); B-(p); C-(s); D-(r)

JEE-ADVANCE: TEST-1

PAPER-I

Time : 3 hrs. **M.M.: 180**

TEST CODE - A

ANSWERS

Physics: Section I to II

1	(c)	2.	(b)	3.	(b)	4.	(c)	5.	(b)	6.	(a)
7.	(c)	8.	(a)	9.	(b)	10.	(a)	11.	(c,d)	12.	(b,c)
13.	(a,b,d)	14.	(a,b,c)	15.	(a,b,c)						

Chemistry: Section I to II

16.	(d)	17.	(a)	18.	(d)	19.	(c)	20.	(d)	21.	(a)
22.	(c)	23.	(b)	24.	(c)	25.	(d)	26.	(a,b,d)	27.	(a,b,d)
28.	(b,d)	29.	(a,b,c)	30.	(a,d)						

Mathematics: Section I to II

31.	(d)	32.	(d)	33.	(c)	34.	(c)	35.	(a)	36.	(b)
37.	(d)	38.	(b)	39.	(c)	40.	(a)	41.	(a,b)	42.	(a,b,c)
43.	(b,c)	44.	(a,b,c,d)	45.	(a,b)						

Section-III (PCM)

1	(8)	2.	(8)	3.	(8)	4.	(0)	5.	(3)	6.	(9)
7.	(7)	8.	(3)	9.	(2)	10.	(4)	11.	(2)	12.	(8)
13.	(1)	14.	(0)	15.	(8)						

JEE-ADVANCE: TEST-1

PAPER-II

Time : 3 hrs. **M.M.: 180**

TEST CODE - A

ANSWERS

Physics: Section I to III

1	(a,b,c,d)	2.	(a,b)	**3.**	**(a,c)**	4.	(a,c)	5.	(a,b)	6.	(a,b,c)
7.	(b,d)	**8.**	**(a,c)**	**9.**	**(b)**	10.	(c)	11.	(a)	12.	(a)
13.	(b)	14.	(a)	15.	(b)	16.	(b)	17.	(a)	18.	(b)
19.	(b)	20.	(b)								

Chemistry: Section I to III

21.	(b,c,d)	22.	(a,c,d)	23.	(a,d)	24.	(a,c,d)	25.	(a,b,d)	26.	(a,b)
27.	(b,c)	28.	(b,d)	29.	(c)	30.	(c)	31.	(d)	32.	(b)
33.	(b)	34.	(d)	35.	(a)	36.	(b)	37.	(d)	38.	(d)
39.	(b)	40.	(c)								

Mathematics: Section I to III

41.	(b,c,d)	42.	(a,c)	43.	(a,d)	44.	(b,c,d)	45.	(a,c,d)	46.	(b,d)
47.	(a,b,c)	48.	(a,d)	49.	(c)	50.	(a)	51.	(b)	52.	(d)
53.	(b)	54.	(c)	55.	(a)	56.	(b)	57.	(c)	58.	(a)
59.	(b)	**60.**	**(a) grace**								