JEE EXPERT

STAYHOME#STAYSAFE

CORONA KO STOP KARNA HAI
AT LOCKDOWN, UNLOCK YOUR POTENTIAL
PRACTICE TEST – 06

Time Allotted: 3 Hours **Maximum Marks: 243**

INSTRUCTIONS

Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.

A. General Instructions

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains Three Parts.
3. **Part-I** is Physics, **Part-II** is Chemistry and **Part-III** is Mathematics.
4. Each part is further divided into two sections: **Section-A & Section-B**
5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
6. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

B. Filling of OMR Sheet

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
2. On the OMR sheet, darken the appropriate bubble with HB pencil for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.

C. Marking Scheme For All Three Parts.

(i) **Section-A (01 – 09)** contains 9 multiple choice questions which have only one correct answer. Each question carries **+3 marks** for correct answer and **– 1 mark** for wrong answer.

Section-A (10 – 13) contains 4 Assertion-Reasoning (multiple choice questions) which have only one correct answer. Each question carries **+3 marks** for correct answer and **– 1 mark** for wrong answer.

Section-A (14 – 19) contains 2 paragraphs. Based upon paragraph, 3 multiple choice questions have to be answered. Each question has only one correct answer and carries **+4 marks** for correct answer and **– 1 mark** for wrong answer.

(ii) **Section-B (01 – 03)** contains 3 Matrix Match Type question containing statements given in 2 columns. Statements in the first column have to be matched with statements in the second column. Each question carries **+6 marks** for all correct answer. For each correct row **+1 mark** will be awarded. There may be one or more than one correct choice. No marks will be given for any wrong match in any question. There is no negative marking.

Useful Data Chemistry:

Gas Constant	R	=	$8.314\ J\ K^{-1}\ mol^{-1}$
		=	$0.0821\ Lit\ atm\ K^{-1}\ mol^{-1}$
		=	$1.987 \approx 2\ Cal\ K^{-1}\ mol^{-1}$
Avogadro's Number	N_a	=	6.023×10^{23}
Planck's Constant	h	=	6.626×10^{-34} Js
		=	6.25×10^{-27} erg.s
1 Faraday		=	96500 Coulomb
1 calorie		=	4.2 Joule
1 amu		=	1.66×10^{-27} kg
1 eV		=	1.6×10^{-19} J

Atomic No : H=1, D=1, Li=3, Na=11, K=19, Rb=37, Cs=55, F=9, Ca=20, He=2, O=8, Au=79.

Atomic Masses: He=4, Mg=24, C=12, O=16, N=14, P=31, Br=80, Cu=63.5, Fe=56, Mn=55, Pb=207, Au=197, Ag=108, F=19, H=2, Cl=35.5, Sn=118.6

Useful Data Physics:

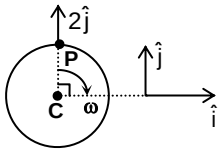
Acceleration due to gravity g = 10 m/s^2

PART – I : PHYSICS

SECTION – A
(Single Correct Choice Type)

This section contains **9 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

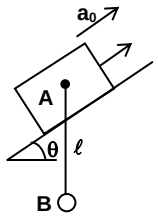
1. A disc, having plane parallel to the horizontal is moving such that velocity of point P with respect to ground on its periphery is 2 m/s $\hat{j}$ as shown in the figure. If radius of disc is R = 1 m and angular speed of disc about vertical axis passing through disc is ω = 2 rad/s, the velocity of centre of disc in m/s is



(A) $2\hat{j}$ (B) $2\hat{i}+2\hat{j}$

(C) $-2\hat{i}+2\hat{j}$ (D) none of these

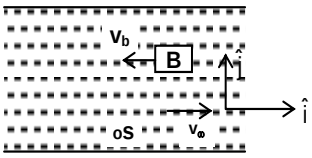
2. A block A is made to move over an inclined plane of inclination θ with constant acceleration a_0 as shown in figure. Initially, bob B hanging from block A by string is held vertical. The magnitude of acceleration of block A relative to bob immediately after bob is released is



(A) a_0 (B) $a_0 \sin\theta$

(C) $a_0 \cos\theta$ (D) $(a_0 - g\sin\theta)$

3. A boat 'B' is moving upstream with velocity 3 m/s with respect to ground. An observer standing on boat observes that a swimmer 'S' is crossing the river perpendicular to the direction of motion of boat. If river flow velocity is 4 m/s and swimmer crosses the river of width 100 m in 50 sec. Then



(A) velocity of swimmer w.r.t ground is $\sqrt{13}$ m/s

(B) drift of swimmer along river is zero

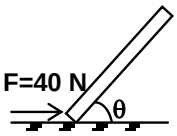
(C) drift of swimmer along river will be 50 m

(D) velocity of swimmer w.r.t ground is 2 m/s

4. A block is resting on a horizontal plate in the xy plane and the coefficient of friction between block and plate is μ. The plate begins to move with velocity $u = bt^2$ in x direction. At what time will the block start sliding on the plate.

(A) $\frac{\mu b}{g}$ (B) $\frac{\mu bg}{2}$ (C) $\frac{\mu g}{b}$ (D) $\frac{\mu g}{2b}$

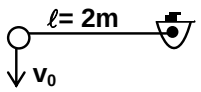
5. A homogeneous rod of mass 3 kg is pushed along the smooth horizontal surface by a horizontal force F equals to 40 N. The angle θ for which rod has pure translation motion is ($g = 10\ m/s^2$)



(A) 45° (B) 37°

(C) 53° (D) 60°

6. A small sphere is given vertical velocity of magnitude v_0 = 5 m/s and it swings in a vertical plane about the end of massless string. The angle θ with the vertical at which string will break, knowing that it can withstand a maximum tension equal to twice the weight of the sphere, is [$g = 10\ m/s^2$]



(A) $\cos^{-1}\frac{2}{3}$ (B) $\cos^{-1}\left(\frac{1}{4}\right)$ (C) 60° (D) 30°

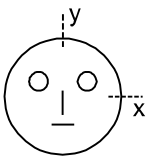
7. A small satellite of mass m is revolving around earth in a circular orbit of radius r_0 with speed v_0. At certain point of its orbit, the direction of motion of satellite is suddenly changed by angle $\theta = \cos^{-1}(3/5)$ by turning its velocity vector, such that speed remains constant. The satellite, consequently goes to elliptical orbit around earth. The ratio of speed at perigee to speed at apogee is

(A) 3 (B) 9 (C) 1/3 (D) 1/9

8. A particle initially at rest moves along x-axis. It is subjected to an acceleration which varies with time according to the equation : a = 2t + 5. Its velocity after 2 second will be

(A) 9 m s^{-1} (B) 12 m s^{-1} (C) 14 m s^{-1} (D) 18 m s^{-1}

9. Look at the drawing given in the figure which has been drawn with ink of uniform line-thickness. The mass of ink used to draw each of the two inner circles, and each of the two line segments is m. The mass of the ink used to draw the outer circle is 6m. The coordinates of the centres of the different parts are: outer circle (0, 0), left inner circle (–a, a), right inner circle (a, a), vertical line (0, 0) and horizontal line (0, –a) The y-coordinate of the centre of mass of the ink in this drawing is :



(A) $\frac{a}{10}$ (B) $\frac{a}{8}$

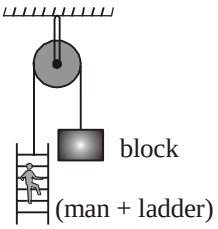
(C) $\frac{a}{12}$ (D) $\frac{a}{3}$

(Assertion-Reason Type)

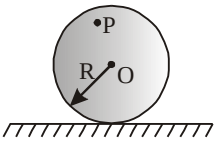
This section contains **4 questions**. Each question consists of an Assertion & Reason and has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Direction : Given below consists of an Assertion (A) and Reason (R). Use the following key to choose the appropriate answer.
(A) Both **Assertion** and **Reason** are true and **Reason** is correct explanation of **Assertion**
(B) Both **Assertion** and **Reason** are true but **Reason** is not correct explanation of **Assertion**.
(C) **Assertion** is true, **Reason** is false.
(D) **Assertion** is false, **Reason** is true.

10. **Assertion (A)** : If mass of (Man + Ladder) is equal to mass of block. If man moves upwards wrt to the ladder the centre of mass of system will not move.
Reason (R) : For a system having net external force zero and initial v_{cm} = 0, position of centre of mass of system will not change.



11. A uniform disc rolls without slipping on a rough horizontal surface with uniform angular velocity.
Assertion (A) : The velocity of point P on the disc changes in magnitude with time.
Reason (R) : The tangential acceleration of point P w.r. to 'O' on the disc is always zero.



12. **Assertion (A)** : Refrigerator transfers heat from lower temperature to higher temperature.
Reason (R) : Heat can be transferred from lower temperature to higher temperature by doing some work.

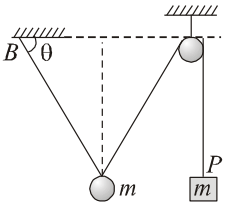
13. **Assertion (A)** : If an Ideal gas is allowed to expand freely in vacuum in an insulated container, then $\Delta Q = \Delta W = \Delta U$ = zero.
Reason (R) : Temperature of gas remain constant during expansion.

(Paragraph Type)

This section contains **2 paragraphs.** Based upon the paragraphs **3 multiple choice questions** have to be answered. Each of these questions has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Paragraph for Question no. 14 to 16

In the given figure a pulley is shown which is frictionless and a ring of mass m can slide on the string without any friction. One end of the string is attached to point B and to the other end, a block 'P' of mass m is attached. The whole system lies in vertical plane.



14. If the system is released from rest, it is found that the system remains at rest. What is the value of θ ?
(A) 30° (B) 45° (C) 60° (D) 75°

15. Now another block 'C' of same mass m is attached to the block 'P' and system is released from rest. If a_1 and a_2 are the magnitudes of initial accelerations of ring and blocks, respectively, then ratio of accelerations $\frac{a_1}{a_2}$ will be at t = 0 : (considering θ as calculated in above question)
(A) 1 (B) 2 (C) 3 (D) 4

16. Value of a_1 at t = 0 will be :
(A) $a_1 = g/2$ (B) $a_1 = g/3$ (C) $a_1 = g/4$ (D) $a_1 = g/5$

Paragraph for Question no. 17 to 19

Two particles are moving near to the surface of earth with uniform acceleration g = 10m/sec^2 towards the ground. At the initial moment, the particles were located at one point in space and moving with velocity v_1 = 4 m/sec and v_2 = 9 m/sec horizontally in opposite direction

17. The time when velocity of the particles are mutually perpendicular to each other :
(A) 0.2 sec (B) 0.4 sec (C) 0.6 sec (D) 0.8 sec

18. The distance between the particles at above moment is :
(A) 3.8 m (B) 5.8 m (C) 5 m (D) 7.8 m

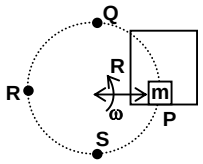
19. The relative speed between the particle is :
(A) 5 m/sec (B) 13 m/sec (C) $\sqrt{97}$ m/sec (D) $\sqrt{75}$ m/sec

SECTION – B

(Matrix Type)

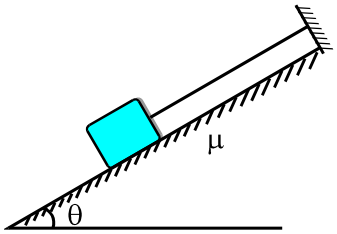
This section contains **3 question**. Each question has **four statements** (A, B, C and D) given in **Column I** and **four statements** (p, q, r and s) in **Column II.** Any given statement in **Column I** can have correct matching with one or more statement(s) in **Column II.** For example, if for a given question, statement B matches with the statements given in Q and R, then for that particular question, against statement B, darken the bubbles corresponding to Q and R in the ORS.

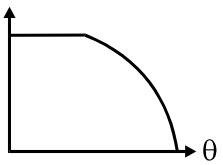
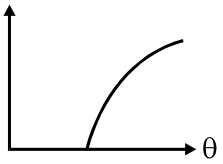
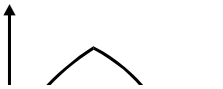
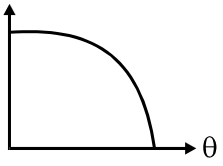
1. A small block of mass m is placed in a cabin. Cabin is now rotated in a circular path in vertical plane about axis fixed in ground frame with constant angular speed ω. Block rotates in a circular path of radius R and remains at rest with respect to the cabin.



Column A		Column B	
(A)	Maximum frictional force on block is at	(p)	Position P
(B)	Maximum torque about axis through centre of mass of block and perpendicular to plane of motion due to normal contact force on block is at	(q)	Position Q
(C)	Maximum contact force on block is at	(r)	Position R
(D)	Maximum normal contact force on block is at	(s)	Position S

2. A block of mass m is put on a rough inclined plane of inclination θ, and is tied with a light thread shown. Inclination θ is increased gradually from $\theta = 0°$ to $\theta = 90°$. Match the column according to corresponding curve.



Column-I		Column-II	
(A)	Tension in the thread versus θ	(p)	
(B)	Normal reaction between the block and the incline versus θ	(q)	
(C)	friction force between the block and the (R) incline versus θ	(r)	
(D)	Net interaction force between the block and (S) the incline versus θ	(s)	

3. The velocity of an aircraft as seen by the driver of a car is 5 m/s upwards. A passenger in a train simultaneously sees the car to move southwards with 5 m/s. The conductor of a bus feels that the train is moving north with a velocity of 10 m/s. A dacoit running towards the bus feels it moving 6 m/s eastwards. A police jeep chasing the dacoit feels him to be moving westwards with 3 m/s. A person standing on the ground sees the police jeep moving north-west with $15\sqrt{2}$ m/s.

Column-I		Column-II	
(A)	Velocity of the aircraft as seen by the conductor	(p)	$-3\hat{i}-5\hat{j}-5\hat{k}$
(B)	Velocity of the conductor as seen by the police	(q)	$5\hat{j}+5\hat{k}$
(C)	Velocity of the aircraft	(r)	$3\hat{i}$
(D)	Velocity of police as seen by the pilot of aircraft	(s)	$-12\hat{i}+20\hat{j}+5\hat{k}$

PART – II : CHEMISTRY

SECTION – A
(Single Correct Choice Type)

This section contains **9 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. 2 moles of each HCl and NaOH are dissolved in 500 ml of water. What will be the equilibrium constant of neutralization reaction. (Given Kw = 1×10^{-14} and conc. of H_2O after dissolving HCl & NaOH = 55.5)
(A) 1 (B) 1×10^{14} (C) 5.5×10^{15} (D) 1.8×10^{-14}

2. The ionization constant of NH_4^+ in water is 5.6×10^{-10} at 25°C. The rate constant for the reaction of NH_4^+ and OH^- to form NH_3 and H_2O at 25°C is 3.4×10^{10} L mol^{-} S^{-1}. What will be the rate constant for proton transfer form water to NH_3?
(A) 1.66×10^{-7} (B) 5.6×10^{4} (C) 1.7×10^{-5} (D) 6.07×10^{5}

3. Of these molecules, which two have the identical shape ?
(A) CO_2 and O_3 (B) O_3 and CH_2O (C) O_3 and SO_2 (D) CH_2O and SO_2

4. A gas obeys the equation of state $\left(P+\frac{a}{V^2}\right)V = RT$, where a = 12.4 bar L^2/mol^2. What is the value of the compressibility factor for 1 mol of gas in a 6.34 L container at 250°C ?
(A) 0.906 (B) 0.955 (C) 1.045 (D) 1.094

5. Which of the following has the highest reactivity towards water ?
(A) Na (B) Rb (C) Li (D) K

6. A piece of magnesium ribbon is heated to redness in an atmosphere of nitrogen and on cooling with water, the product evolves a gas. The gas is :
(A) N_2O (B) NO_2 (C) N_2O_4 (D) NH_3

7. A hydrogen ion (H^+) strikes an electron of energy 0 ev, resulting in the formation of a neutral hydrogen atom in the ground state. As a result only one photon is emitted. The wavelength of the emitted photon is :
(A) $\frac{6.62\times10^{-27}\times3\times10^{10}}{13.6\times1.6\times10^{-19}}$ (B) $\frac{6.62\times10^{-34}\times3\times10^{8}}{13.6\times1.6\times10^{-19}}$
(C) $\frac{6.62\times10^{-34}\times3\times10^{8}}{3.4\times1.6\times10^{-19}}$ (D) $\frac{6.62\times10^{-24}\times3\times10^{10}}{3.4\times1.6\times10^{-19}}$

8. Which energy level in Li^{2+} has same energy as the fourth energy level of H-atom :
(A) 2 (B) 4 (C) 10 (D) 12

9. In Bohr's model of the hydrogen atom the ratio between the period of revolution of an electron in the orbit n = 1 to the period revolution of the electron in the orbit n = 2 is :
(A) 1 : 2 (B) 2 : 1 (C) 1 : 4 (D) 1 : 8

(Assertion-Reason Type)

This section contains **4 questions**. Each question consists of an Assertion & Reason and has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Direction : Given below consists of an Assertion (A) and Reason (R). Use the following key to choose the appropriate answer.
(A) Both **Assertion** and **Reason** are true and **Reason** is correct explanation of **Assertion**
(B) Both **Assertion** and **Reason** are true but **Reason** is not correct explanation of **Assertion**.
(C) **Assertion** is true, **Reason** is false.
(D) **Assertion** is false, **Reason** is true.

10. **Assertion (A) :** In SO_3^{2-} all S—O bonds are equal in length

Reason (R) : SO_3^{-2} is a triangular planar, symmetrical.

11. **Assertion (A)** : The van der Waals co-efficients 'a' and 'b' can be negative and are independent of temperature.
Reason (R) : The van der Waals co-efficient '*a*' and '*b*' are characteristics of a gas.

12. **Assertion (A)** : Heavier gases effuse at slower rate, under similar conditions.
Reason (R) : Heavier gases have smaller root mean square speed.

13. **Assertion (A)** : Lithium has the highest oxidation potential out of all alkali metals.
Reason (R) : IP of lithium is less than that of any alkali metal.

(Paragraph Type)

This section contains **2 paragraphs.** Based upon the paragraphs **3 multiple choice questions** have to be answered. Each of these questions has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Paragraph for Question no. 14 to 16

Consider the adjacent diagram to answer these questions.
Initially, flask A contained O_2 gas at 27°C and 950 mm of Hg and flask B contained Neon gas at 27°C and 900 mm of Hg, the flasks were Joined by means of a narrow tube of negligible volume equipped with a stopcock and gases were allowed to mix-up freely. The final pressure in the combined system was found to be 910 mm of Hg.

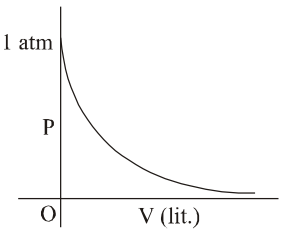
14. What is the correct relationship between volumes of the two flasks ?
(A) $V_B = 3V_A$ (B) $V_B = 4V_A$ (C) $V_B = 5V_A$ (D) $V_B = 4.5\ V_B$

15. If volume of flask B was measured to be 10 L, mass of oxygen gas present initially in flask was :
(A) 2.00 g (B) 4.00 g (C) 8.00 g (D) 16.00 g

16. How many moles of gas present in flask A in the final condition ?
(A) 0.155 (B) 0.122 (C) 0.022 (D) 0.222

Paragraph for Question no. 17 to 19

Suppose a gas obeys the relationship $Pe^{V/2} = nCT$ where C is constant, V in lit., P in atm, T in kelvin and *n* is number of moles. A curve is plotted between P and V of 2 moles of the gas at 500 K.



17. The value of constant C is :
(A) 0.01 (B) 0.001 (C) 0.005 (D) 0.002

18. Find the slope of the curve plotted between P vs T for closed container of volume 2 lit. having 2 moles of gas :
(A) $\frac{e}{2000}$ (B) 2000 *e* (C) 500 *e* (D) $\frac{2}{1000e}$

19. If a closed container of volume 200 lit. of O_2 gas (ideal) at 1 atm & 200 K behaves as the above gas, find the pressure in atm of oxygen gas at 821 K in the same container :
(A) $e^{10/100}$ (B) $e^{20/50}$ (C) 1 (D) 2

SECTION – B

(Matrix Type)

This section contains **3 question**. Each question has **four statements** (A, B, C and D) given in **Column I** and **four statements** (p, q, r and s) in **Column II.** Any given statement in **Column I** can have correct matching with one or more statement(s) in **Column II.** For example, if for a given question, statement B matches with the statements given in Q and R, then for that particular question, against statement B, darken the bubbles corresponding to Q and R in the ORS.

1. Match the following column :

Column-I (Molecules)		Column-II (Properties)	
(A)	O_2	(p)	Paramagnetic
(B)	B_2	(q)	Diamagnetic
(C)	C_2	(r)	Bond order = 2
(D)	N_2	(s)	Last molecular orbital (M) filled is bonding MO

2. Match the following column :

Column-I		Column-II	
(A)	$HClO_3$	(p)	sp^3d^2
(B)	PCl_4^+	(q)	sp^2
(C)	NO_3^-	(r)	sp^3
(D)	PCl_6^-	(s)	sp^3d

3. Match the following columns :

Column-I		Column-II	
(A)	$BeF_2 > MgF_2 > CaF_2 > SrF_2 > BaF_2$	(p)	Lattice energy
(B)	LiBr < NaBr < KBr < RbBr < CsBr	(q)	Solubility in water
(C)	$Be(OH)_2 < Mg(OH)_2 < Ca(OH)_2 < Sr(OH)_2 < Ba(OH)_2$	(r)	Thermal stability
(D)	$BeCO_3 < MgCO_3 < CaCO_3 < SrCO_3 < BaCO_3$	(s)	% ionic character

PART – III : MATHEMATICS

SECTION – A
(Single Correct Choice Type)

This section contains **9 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. If any two numbers a, b(a < b) are selected from the interval $\left[-\frac{1}{2}, 2\right]$. Then maximum value of $a\sqrt{4-b^2} - b\sqrt{4-a^2}$ is :
(A) 4 (B) 2 (C) 3 (D) 1

2. If p, q, r, s $\in Q^+$ such that r + s – rs = 0 then minimum value of $\left(\frac{p^r}{r} + \frac{q^s}{s}\right)$ is :
(A) p + q (B) pq (C) p – r (D) p/q

3. A circle is passing through the origin and touches the line x = 1, x + y = 2, then radius of the circle is a root of the equation :
(A) $(3 - 2\sqrt{2})\, t^2 - 2\sqrt{2}\, t + 2 = 0$ (B) $(3 - 2\sqrt{2})\, t^2 - 2\sqrt{2}\, t - 2 = 0$
(C) $(3 + 2\sqrt{2})\, t^2 - 2\sqrt{2}\, t + 2 = 0$ (D) None of these

4. Find the number of values of the real parameter 'a' for which 'ai' ($i = \sqrt{-1}$) is a solutions of polynomial equation $z^4 - 2z^3 + 7z^2 - 4z + 10 = 0$
(A) 3 (B) 1 (C) 2 (D) 4

5. If a, b, –c, are positive integers. The equation $ax^2 + bx + c = 0$ has one root in (–1, 0) and other root in (0, 1). If the least value of a+ c is k then k must be :
(A) 0 (B) 1 (C) 2 (D) 3

6. Number of positive real solutions (a, b, c, d) of the system
a + b + c + d = 12 and abcd = 27 + ab + bc + ac + ad + bd + cd is
(A) Exactly one (B) Exactly $4\underline{|4}$ (C) $\underline{|3}$ (D) None of these

7. The abscissa of centre of circle which are orthogonal to the curve | z | = 1 and | z – 1 | = 4 is :
(A) –1 (B) –3 (C) –7 (D) None of these

8. If l, m, n be the three positive roots of the equation $x^3 - ax^2 + bx - 48 = 0$, then the minimum value of $(1/\ell) + (2/m) + (3/n)$ equals :
(A) 1 (B) 2 (C) 3/2 (D) 5/2

9. The sum of values of x satisfying the equation $(31+8\sqrt{15})^{x^2-3} + 1 = (32+8\sqrt{15})^{x^2-3}$ is :
(A) 3 (B) 0 (C) 2 (D) none of these

(Assertion-Reason Type)

This section contains **4 questions**. Each question consists of an Assertion & Reason and has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Direction : Given below consists of an Assertion (A) and Reason (R). Use the following key to choose the appropriate answer.
(A) Both **Assertion** and **Reason** are true and **Reason** is correct explanation of **Assertion**
(B) Both **Assertion** and **Reason** are true but **Reason** is not correct explanation of **Assertion**.
(C) **Assertion** is true, **Reason** is false.
(D) **Assertion** is false, **Reason** is true.

10. Two tangents to the parabola $x^2 = 6y$ meet at the point $\left(-1, -\frac{3}{2}\right)$.

Assertion (A) : The tangents are perpendicular to each other.
Reason (R) : Mutually perpendicular tangents to the parabola meet on the line $2y + 3 = 0$.

11. Let $z_1 = r_1 e^{i\theta_1}$ and $z_2 = r_2 e^{i\theta_2}$, where $r_1 > 1$, $r_2 > 1$.

Assertion (A) : $|1 - \bar{z}_1 z_2| > |z_1 - z_2|$
Reason (R) : $|z_1 - z_2| < |z_1| + |z_2|$

12. **Assertion (A) :** $1 \cdot 3 \cdot 5 \cdot \ldots \cdot (2n-1) > n^n$, $n \in N$.
Reason (R) : The sum of the first n odd natural numbers is equal to n^2.

13. Let a, b, c be real such that $ax^2 + bx + c = 0$ and $x^2 + x + 1 = 0$ have a common root.
Assertion (A) : $a = b = c$.
Reason (R) : Two quadratic equations with real coefficients cannot have only one imaginary root common.

(Paragraph Type)

This section contains **2 paragraphs.** Based upon the paragraphs **3 multiple choice questions** have to be answered. Each of these questions has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

Paragraph for Question no. 14 to 16

In a ΔABC, cosec A + cot A = λ_1
cosec B + cot B = λ_2
cosec C + cot C = λ_3

14. The value of $\lambda_1 + \lambda_2 + \lambda_3$ is equal to :
(A) 1 (B) $\sqrt{3}$ (C) 2 (D) None of these

15. The least value of $\lambda_1\lambda_2\lambda_3$ is equal to :
(A) 2 (B) $3\sqrt{3}$ (C) 4 (D) 9

16. The value of sec A – tan A is equal to :
(A) $\lambda_1^2 - \lambda_1 + 1$ (B) $\frac{2}{\lambda_1}$ (C) $\frac{\lambda_1 - 1}{\lambda_1 + 1}$ (D) $\frac{2\lambda_1}{1 - \lambda_1^2}$

Paragraph for Question no. 17 to 19

For each parabola $y = x^2 + px + q$, $p, q \in R$ meeting the co-ordinate axis in three distinct points, a circle through these points is drawn. If all such circles passes through a fixed point $A(\alpha, \beta)$ then :

17. The value of $|\alpha| + |\beta|$ is euqal to :
(A) 5 (B) 9 (C) 11 (D) None of these

18. Reflection of $A(\alpha, \beta)$ with respect to line $y = x + 1$ is :
(A) (2, 1) (B) (3, 2) (C) (0, 1) (D) None of these

19. If OA is rotated through an angle 90° in clockwise direction so that point A goes to point B then co-ordinate of point B is :
(A) (1, 2) (B) (2, 3) (C) (1, 0) (D) (0, 1)

SECTION – B

(Matrix Type)

This section contains **3 question**. Each question has **four statements** (A, B, C and D) given in **Column I** and **four statements** (p, q, r and s) in **Column II.** Any given statement in **Column I** can have correct matching with one or more statement(s) in **Column II.** For example, if for a given question, statement B matches with the statements given in Q and R, then for that particular question, against statement B, darken the bubbles corresponding to Q and R in the ORS.

1. If $a, b, c, d \in R$ satisfying $a + b = 8$, $ab + c + d = 23$

Column I		Column II	
(A)	a + b + c + d	(p)	15
(B)	ab + cd	(q)	16
(C)	ac + bd	(r)	27
(D)	Ab	(s)	28

2. Match the following column :

Column I		Column II	
(A)	The normal chord at a point t on the parabola $y^2 = 4x$ subtends a right angle at the vertex, then t^2 is :	(p)	4
(B)	The area of the triangle inscribed in the curve $y^2 = 4x$, the parameter of coordinates whose vertices are 1, 2 and 4 is	(q)	2
(C)	The number of distinct normal possible from $\left(\frac{11}{4}, \frac{1}{4}\right)$ to the parabola $y^2 = 4x$ is	(r)	3
(D)	The normal at (a, 2a) on $y^2 = 4ax$ meets the curve again at $(at^2, 2at)$, then the value of $\lvert t - 1 \rvert$ is	(s)	6

3. Match the following columns :

Column I		Column II	
(A)	If $\Sigma n = 210$, then Σn^2 is divisible by the greatest prime number which is greater than	(p)	16
(B)	Between 4 and 2916 is inserted odd number (2n + 1) G.M's. Then the (n + 1)th G.M. is divisible by greatest odd integer which is less than	(q)	10
(C)	In a certain progression, four consecutive terms are 40, 30, 24, 20. Then the integral part of the next term of the progression is more than	(r)	34
(D)	$1+\frac{4}{5}+\frac{7}{5^2}+\frac{10}{5^3}+\cdots\cdots+\infty=\frac{a}{b}$, where H.C.F. (a, b) = 1, then a – b is less than	(s)	30