JEE EXPERT

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CORONA KO STOP KARNA HAI
AT LOCKDOWN, UNLOCK YOUR POTENTIAL
PRACTICE TEST – 05

Time: 3 Hours ***Maximum Marks: 240***

Instructions:

A. Question paper format:

The question paper consists of **3 Section** (Physics, Chemistry and Mathematics). Each section has 3 parts.

Part–A:

(i) It contains **8** multiple choice questions. Each question has 3 choices (a), (b), (c) and (d) for its answer, out of which **only one is correct.**

(ii) It contains **4** multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) for its answer, out of which **one or more is/are correct.**

Part–B: It contains **2** questions. Each question has four statements (A, B, C and D) given in column I and five statements (p, q, r, s and t) in Column II. Any given statement in column I can have correct matching with **one or more** statements(s) given 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 OMR sheet.

Part–C: It contains **6** questions. The answer to each of the questions is a single–digit integer, ranging from 0 to 9. The answer will have to appropriately bubbled in the OMR sheet as per the instructions given at the beginning of the section.

B. Marking scheme:

The question paper consists of **3 parts** (Physics, Chemistry and Mathematics). Each section consists **of four types questions.**

(i) **Single Correct Choice:** You will be awarded **3 marks (Total Marks: 24)** if you darken only the bubble corresponding to the correct answer and **zero mark** if no bubbles are darkened. In all other cases, **minus one (−1) mark** will be awarded.

(ii) **Multiple Correct Answers Type:** You will be awarded **4 marks (Total Marks: 16)** if you darken only the bubble corresponding to the correct answers and zero mark if no bubbles are darkened. No negative marks will be awarded in this Section.

(iii) **Matrix– Match Type:** You will be awarded **2 marks (Total Marks: 16)** for each row in which your darkened the bubbles(s) corresponding to the correct answer. Thus each question in this section carries a maximum of **8 marks.** There is **no negative mark** awarded for incorrect answer(s) in this Section.

(iv) **Integer Answer Type:** You will be awarded **4 marks (Total Marks: 24)** if you darken only the bubble corresponding to the correct answer and **zero mark** if no bubbles are darkened. No negative marks will be awarded in this Section.

Atomic No. : H=1, He=2, Li=3, Be=4, B=5, C=6, N=7, O=8, F=9, Na=11, Mg=12, Al = 13, Si = 14, P = 15, S = 16, Cl = 17, Ar =18, K=19, Ca=20,Cr=24, Mn=25, Fe=26, Co=27, Ni=28, Cu=29, Zn=30, As=33, Br = 35, Ag = 47, Si = 21, Sn = 50, Ti = 22,I = 53, Xe = 54, Ba = 56, Pb = 82, U = 92, V = 50.

Atomic masses: H =1, He=4, Li=7, Be=9, B=11, C=12, N=14, O=16, F=19, Na=23, Mg=24, Al=27, Si=28, P=31, S=32, Cl=35.5, K=39, Ca=40, Cr=52, Mn=55, Fe=56, Co=59, Ni=58.7, Cu=63.5, Zn = 65.4, As = 75, Br = 80, Ag = 108, Sn = 118.7, I = 127, Xe = 131, Ba = 137, Pb = 207, U = 238.

Enrollment No.: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name: ……Centre ……

Batch: …… Date ……...

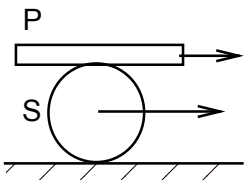
PHYSICS

SECTION–1 (PART– A)

Single Correct Choice Type

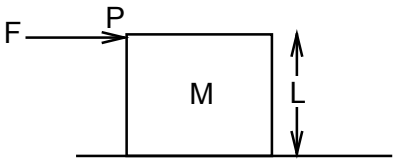
This section contains 8 multiple choice questions. Each of these questions has four choices (a), (b), (c) and (d) out of WHICH ONLY ONE CORRECT. [+3 for correct, –1 for wrong attempt]

1. A plank P is placed on a solid cylinder S, which rolls on a horizontal surface. The two are of equal mass. There is no slipping at any of the surfaces in contact. The ratio of kinetic energy of P to the kinetic energy of S is



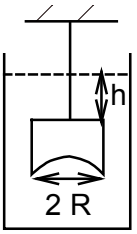
(a) 1 : 1 (b) 2 : 1
(c) 8 : 3 (d) 11 : 8

2. A cubical block of side L rests on a rough horizontal surface with coefficient of friction μ. A horizontal force F is applied on the block as shown. If the co efficient of friction is sufficiently high so that the block does not slide before toppling, the minimum force F required to topple the block is



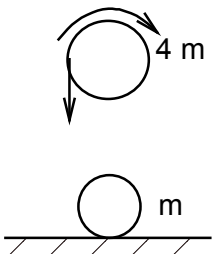
(a) Infinitesimal (b) Mg/4
(c) Mg/2 (d) $Mg(1-\mu)$

3. A hemispherical portion of radius R is removed from the bottom of a cylinder of radius R. The volume of the remaining cylinder is V and its mass is M. It is suspended by a string in a liquid of density ρ where it stays vertical. The upper surface of the cylinder is at a depth h below the liquid surface. The force on the bottom of the cylinder by the liquid is



(a) Mg (b) $Mg-V\rho g$
(c) $Mg+\pi R^2h\rho g$ (d) $\rho g(V+\pi R^2h)$

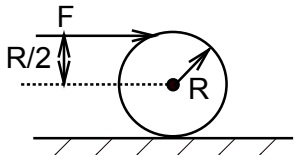
4. A disc falls with a speed of 15 m/s & $e=\frac{2}{3}$. The disc collide with another disc of mass m and radius 1 m along their common normal. The coefficient of friction (u_k) is $\mu_k = 0.2$ between the discs. Road is also rough. If the mass m starts pure rolling after some time then [Give radius of disc = 1m]



(a) Initial angular speed of m is 40 rad/s
(b) Initial angular speed of m is 50 rad/s
(c) Final angular speed of m is 25 rad/s
(d) Final angular speed of m is 20 rad/s

Space for rough work

5. A uniform spherical shell of radius R is placed on a rough horizontal surface. A force F is applied horizontally at a height R/2 above the centre. If the sphere starts rolling without slipping on the surface, the frictional force acting on the sphere will be



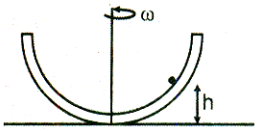
(a) In forward direction
(b) In the backward direction

(c) Zero
(d) None of the above

6. A thin rectangular plate of area A is immersed in liquid vertically. Where the density of liquid varies with depth as $\rho=\rho_o\left(1+\frac{x}{H}\right)$, where x is the depth, H is the length of the vertical side immersed in liquid is H. The thrust on one side of the plate due to liquid (density of water = ρ) is (neglect atmospheric pressure)

(a) $\frac{2}{3}AH\rho_o g$ (b) $\frac{5}{6}AH\rho_o g$ (c) $\frac{A^2\rho_o g}{2H}$ (d) $\frac{A^2\rho_o g}{H}$

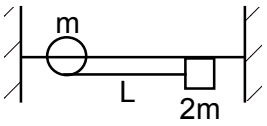
7. A small body of mass m can slide without friction along a trough bent in the form of a semi-circular arc of radius R. At what height h will the body be at rest with respect to the trough, if the trough rotates with uniform angular velocity ω about a vertical axis symmetrically with respect to the trough.



(a) R (b) $R-\frac{2g}{\omega^2}$

(c) $R+\frac{2g}{\omega^2}$ (d) $R-\frac{g}{\omega^2}$

8. A bead can slide on a smooth straight wire and particle of mass m is attached to the bead by a light string of length L. The particle is held in contact with the wire with the string taut and is then let fall. If the bead has mass 2m. Then, when the string makes an angle θ with the wire then bead would have slipped a distance



(a) $\frac{L}{3}(1-\cos\theta)$ (b) $\left(\frac{L}{2}\sin\theta+\frac{L}{2}\right)$

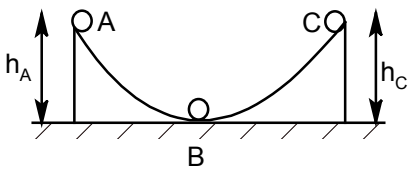
(c) $\frac{2L}{3}(1-\cos\theta)$ (d) $\frac{L}{2}\cos\theta$

Space for rough work

Multiple Correct Choice Type

This section contains 4 multiple choice questions. Each question has four choices (a),(b), (c) and (d) out of which ONE OR MORE may be correct. [+4 for correct, no negative marking and Partial marks will be awarded for partially correct answers]

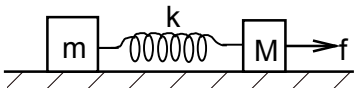
9. A ball moves over a fixed track as shown in the figure. From A to B the ball rolls with out slipping. If surface B to C is frictionless and K_A, K_B and K_C are kinetic energies of the ball at A, B and C respectively, then



(a) $h_A > h_C$; $K_B > K_C$ (b) $h_A > h_C$; $K_C > K_A$

(c) $h_A = h_C$; $K_B = K_C$ (d) $h_A < h_C$; $K_B > K_C$

10. A block of mass m is connected to another block of mass M by a massless spring of spring constant k. A constant force f starts acting as shown in figure, then



(a) as observed from ground both blocks will come to momentarily rest simultaneously

(b) as observed from their centre of mass blocks will come to monetarily rest simultaneously

(c) maximum extension in spring will $\frac{2mf}{k(m+M)}$

(d) maximum extension in spring will $\frac{mf}{k(m+M)}$

11. Two separate air bubbles (radii 0.002 m and 0.004 m) formed of the same liquid (surface tension 0.07 N/m) come together to form a double bubble.

(a) Radius is 0.002 m

(b) Radius is 0.0043

(c) Interface will move towards larger sphere

(d) Interface will move towards smaller sphere.

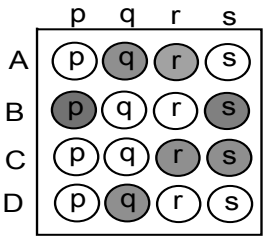
12. A piece of metal weighs 210 g in air, 180 g in water and 120 g in liquid. Then, specific gravity of

(a) Metal is 3 (b) Metal is 7 (c) Liquid is 3 (d) Liquid is 1/3

Space for rough work

SECTION – III
Matrix Match Type

This section contains 2 questions. Each question contains statements given in two columns, which have to be matched. The statements in Column I are labeled A, B, C and D, while the statements in Column II are labelled p, q, r, s and t. Any given statement in Column I can have correct matching with ONE OR MORE statement(s) in Column II. The appropriate bubbles corresponding to the answers to these questions have to be darkened as illustrated in the following example:



If the correct matches are A – q and r; B – p and s; C – r and s; and D – q; then the correct darkening of bubbles will look like the following:

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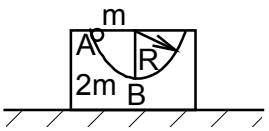
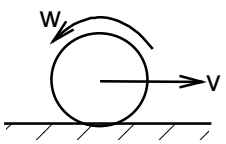
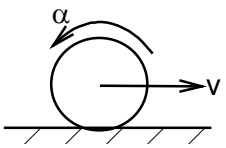
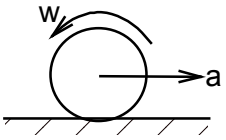
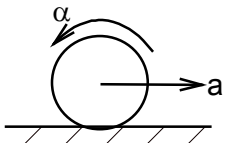
13. In the system shown In figure, mass m is released from rest from position A. Suppose potential energy of m at point A with respect to point B is E. Dimensions of m are negligible and all surfaces are smooth. When mass m reaches at point B



Column – I		*Column - II*	
(a)	Kinetic energy of m	(p)	$\frac{E}{3}$
(b)	Kinetic energy of 2 m	(q)	$\frac{2E}{3}$
(c)	Momentum of m	(r)	$\sqrt{\frac{4}{3}mE}$
(d)	Momentum of 2 m	(s)	$\sqrt{\frac{2}{3}mE}$
		(t)	None

Space for rough work

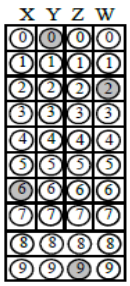
14. In column various bodies of same mass and radius R are being lowered on a rough horizontal surface.

Column – I	Column – II
(a)  Disc starts moving with linear speed v & angular speed w on a frictionless surface.	(p) Locus of the I AOR is a rectangular Hyperbola ($xy = c^2$)
(b)  Disc starts moving with linear speed v & angular acceleration α on a frictionless surface	(q) Locus of the I AOR is a straight line
(c)  Disc starts moving with a linear acceleration a & angular speed w on a frictionless surface.	(r) Locus of the IAOR is a parabola
(d)  The disc starts moving with an angular accelerations α & linear accelerations a. on a frictionless surface.	(s) Locus of the IAOR is an ellipse.

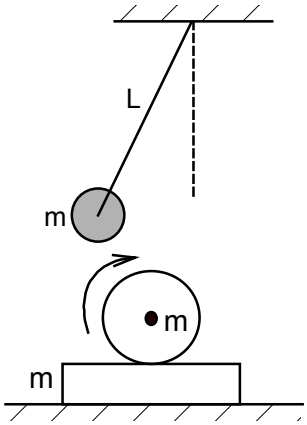
Space for rough work

SECTION – IV
Integer Type

This section contains 6 questions. The answer to each question is a single digit integer ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled. [+4 for correct, no negative marking]

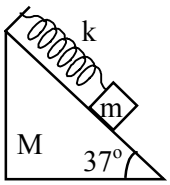


1. A ball of mass (m) 0.5 kg is attached to the end of a string having length (L) 0.5 m. The ball is rotated on a horizontal circular path about vertical axis. The maximum tension that the string can bear is 324 N. The maximum possible value of angular velocity of ball (in radian/s) is



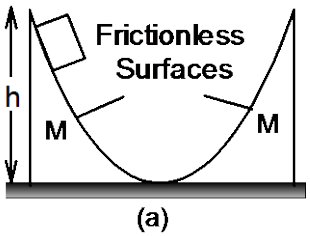
2. A sphere of mass m is given some angular velocity about a horizontal axis through the center, and gently placed on a plank of mass m. The coefficient of friction between the two is μ. The plank rests on a smooth horizontal surface. The initial acceleration of the sphere relative to the plank will be $k\mu g$. Find k

3. The system of the wedge and the block connected by a massless spring as shown in the figure is released with the spring in its natural length. Friction is absent maximum elongations in the spring will be $=\frac{nmg}{5k}$. Find n. (Friction is absent everywhere)



Space for rough work

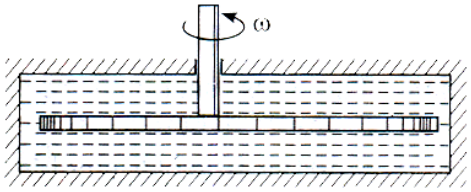
4. Two identical wedges of mass M are smoothly conjugated. The wedges are free to move on a smooth horizontal surface. A block of mass m is released from a height h on one of the wedges. The height h to which the mass m ascends the right wedge is $h_{max} = \left(\frac{M}{M+m}\right)^n h$ then n is



(a)

5. Two particles move in a uniform gravitational field with an acceleration g. At the initial moment the particles were located at one point and move with velocities $\upsilon_1 = 3.0\,m/s$ and $\upsilon_2 = 4.0\,m/s$ horizontally in opposite directions. The distance between the particles at the moment when their velocity vectors become mutually perpendicular is $\frac{7\sqrt{3}}{k}$. Find k

6. A thin circular disc of radius R is made to rotate with a constant angular speed ω within a oil filled (coeff of viscosity η) cylindrical box as shown in the figure. The clearance between the disc & the horizontal planes of the cylindrical box is very small & is equal to h. Considering that the vertical side of the cylindrical box is almost in contact with the disc, the power to be supplied to the system to maintain the constant angular speed is $\pi h w^x R^y / \eta$. Then x + y is



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CHEMISTRY

SECTION–1 (PART– A)

Single Correct Choice Type

This section contains 8 multiple choice questions. Each of these questions has four choices (a), (b), (c) and (d) out of WHICH ONLY ONE CORRECT. [+3 for correct, –1 for wrong attempt]

1. An ideal gas undergoes a reversible isothermal expansion from a volume V_1 to a volume 10 V_1 and thereby does 10 kJ of work. The initial pressure was 1×10^7 Pa. Calculate V_1
(a) 0.522 litre (b) 0.434 litre
(c) 0.4234×10^{-3} litre (d) 0.529 litre

2. At constant volume at 27°C, heat of combustion of benzene and acetylene are 800 kcal and 310 kcal respectively. What will be the heat of polymerization of acetylene to benzene at constant pressure?
(a) – 131.8 kcal (b) – 130 kcal (c) 131.8 kcal (d) 128.8 kcal

3. The solubility product of AgCl is 1×10^{-10}. The equilibrium constants for the reactions $AgCl(s) + Br^- \rightleftharpoons AgBr(s) + Cl^-$ and $2AgBr(s) + S^{-2} \rightleftharpoons Ag_2S(s) + 2Br^-$ are 2×10^2 and 1.6×10^{24} respectively. Calculate K_{sp} of Ag_2S.
(a) 1.56×10^{-49} (b) 6.4×10^{-48} (c) 3.125×10^{-37} (d) 6.4×10^{48}

4. The rate of a first order reaction is 0.04 mol litre^{-1} s^{-1} at 10 minutes and 0.03 mol litre^{-1} s^{-1} at 20 minutes after initiation. The half life of the reaction is
(a) 144 sec (b) 24 sec (c) 24 min. (d) 144 min.

5. The degree of dissociation of HI at a particular temperature is 0.8. Calculate the volume of 2M $Na_2S_2O_3$ solution required to reduce the I_2 present in an equilibrium mixture when 2 moles each of H_2 and I_2 are heated in a closed vessel of 2 litre capacity
(a) 1 litre (b) 1.6 litre (c) 2 litre (d) 2.5 litre

6. A gas obeys the equation of state P(V – b) = RT. The slope for an isochore will be
(a) Negative (b) zero (c) $\frac{R}{(V-b)}$ (d) $\frac{R}{P}$

7. The kinetic energy of an electron in the 3rd Bohr orbit of a hydrogen atom is [a_0 is Bohr radius]
(a) $\frac{h^2}{4\pi^2 m a_o^2}$ (b) $\frac{h^2}{32\pi^2 m a_o^2}$ (c) $\frac{h^2}{64\pi^2 m a_o^2}$ (d) $\frac{h^2}{72\pi^2 m a_o^2}$

8. Carborundum is obtained when silica is heated at high temperature with
(a) Carbon (b) Carbon monoxide (c) Carbon dioxide (d) Calcium carbonate

Space for rough work

Multiple Correct Choice Type

This section contains 4 multiple choice questions. Each question has four choices (a),(b), (c) and (d) out of which ONE OR MORE may be correct. [+4 for correct, no negative marking and Partial marks will be awarded for partially correct answers]

9. A plot of ln $[A]_t$ vs t (where, $[A]_t$ is the concentration of the reactant at time t) for a reaction is linear with a negative slope of 0.0231 sec^{-1}. Then

(a) The initial concentration of the reactant will reduce to half in 30 seconds.

(b) A plot of $t_{1/2}$ vs concentration of reactant will give a straight line passing through origin.

(c) The reaction will be 90% complete in 100 seconds.

(d) The line in $\ln[A]_t$ vs t plot will be steeper at higher temperature.

10. Choose the correct statement (s) form the following :
(A) Density of graphite is higher than that of diamond.
(B) Graphite has higher electrical and thermal conductivity than diamond.
(C) Graphite has higher C – C bond order than that of diamond.
(D) Graphite is thermodynamically more stable than diamond.

11. $B(OH)_3 + NaOH \rightleftharpoons NaBO_2 + Na\left[B(OH)_4\right] + H_2O$

How can this reaction be made to proceed in forward direction?

(a) Addition of cis 1, 2 diol (b) Addition of glycerol

(c) Addition of trans 1, 2 diol (d) Addition of Na_2HPO_4

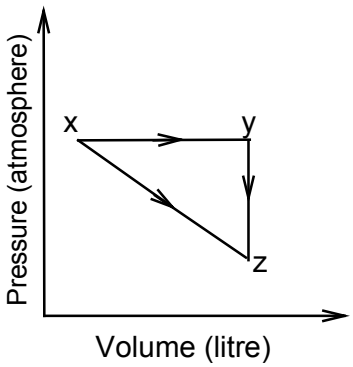
12. For an ideal gas, consider only P – V work in going from an initial state X to final state Z. The final state Z can be reached by either of the two paths shown in figure. Which of the following choice (s) is (are) correct? [Take ΔS as change is entropy ΔH change is enthalpy and W as work done]

(A) $\Delta S_{x\to z} = \Delta S_{x\to y} + \Delta S_{y\to z}$

(B) $W_{x\to z} = W_{x\to y} + W_{y\to z}$

(C) $W_{x\to y\to z} = W_{x\to y}$

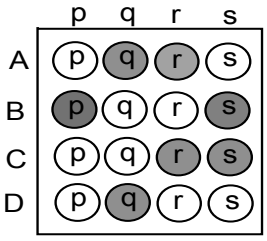
(D) $\Delta H_{x\to y\to z} = \Delta H_{x\to z}$



Space for rough work

SECTION – III
Matrix Match Type

This section contains 2 questions. Each question contains statements given in two columns, which have to be matched. The statements in Column I are labeled A, B, C and D, while the statements in Column II are labeled p, q, r, s and t. Any given statement in Column I can have correct matching with ONE OR MORE statement(s) in Column II. The appropriate bubbles corresponding to the answers to these questions have to be darkened as illustrated in the following example:



If the correct matches are A – q and r; B – p and s; C – r and s; and D – q; then the correct darkening of bubbles will look like the following:

13.

Column I (Pair of species)	***Column II (Identical property in pairs of species)***
(a) PCl_3F_2 and PCl_2F_3	(p) Hybridisation of central atom
(b) BF_3 and BCl_3	(q) Shape of molecule
(c) CO_2 and CS_2	(r) Dipole moment
(d) C_6H_6 and $B_3N_3H_6$	(s) Total number of electrons
	(t) Formal charge on central atom

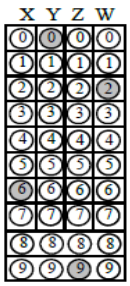
14.

Column I	**Column II**
(a) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ in a closed system	(p) $\Delta H < \Delta E$
(b) $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$ in a closed system	(q) $\Delta H = \Delta E \neq 0$
(c) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ in a closed system	(r) $\Delta H > \Delta E$
(d) $CO(g) + \frac{1}{2}O_2(g) \rightleftharpoons CO_2(g)$ in an isolated system	(s) $\Delta E = 0$
	(t) $\Delta H = 0$

Space for rough work

SECTION – IV
Integer Type

This section contains 6 questions. The answer to each question is a single digit integer ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled. [+4 for correct, no negative marking]



1. Assume that the decomposition of HNO_3 can be presented by the following equation $4HNO_3(g) \rightleftharpoons 4NO_2(g) + 2H_2O(g) + O_2(g)$ and the reaction approaches equilibrium at 400 K and 30 atmosphere. At equilibrium, the partial pressure of HNO_3 is 2 atm. If the value of K_C in $(mol/L)^3$ at 400 K is 2^x, find x. (consider R = 0.08 L atm k^{-1} mol^{-1})

2. Two Solid compound X and Y dissociate at a certain temperature as follows

$X(s) \rightleftharpoons A(g) + 2B(g); K_{P_1} = 7.2 \times 10^{-2}\ atm^3$

$Y(s) \rightleftharpoons 2B(g) + C(g); K_{P_2} = 3.6 \times 10^{-2}\ atm^3$

The total pressure of gases over the mixture of X and Y is P × 10^{-1} atm. Find the value of P.

3. How many electrons of Argon atom have m_ℓ = + 1?

4. The kinetic data for the given reaction A(g) + 2B(g) $\xrightarrow{k}$ C(g) is provided in the following table for three experiments at 300 K

Ex. No	$[A]_o$ (moles/litre)	$[B]_o$(moles/litre)	Initial rate (moles/litre sec)
1.	0.01	0.01	6.93 × 10^{-6}
2.	0.02	0.01	1.386 × 10^{-5}
3.	0.02	0.02	1.386 × 10^{-5}

The overall order of the reaction is?

5. Reaction of Br_2 with Na_2CO_3 in aqueous solution gives sodium bromide and sodium bromate with evolution of CO_2 gas. The ratio of the number of sodium bromide and sodium bromate molecules involved in the balanced chemical equation is?

6. 5 × 10^{-5} M solution of a strong acid shows a pOH value of 10 at 25°C. How many moles of such an acid will be required to neutralize 1 mole of a strong diacidic base?

Space for rough work

MATHEMATICS

SECTION–1 (PART– A)

Single Correct Choice Type

This section contains 8 multiple choice questions. Each of these questions has four choices (a), (b), (c) and (d) out of WHICH ONLY ONE CORRECT. [+3 for correct, –1 for wrong attempt]

1. Let α, β be the roots of $x^2 - x + p = 0$ and γ, δ be the roots of $x^2 - 4x + q = 0$. If $\alpha, \beta, \gamma, \delta$ are in G.P. , then the integral value of p and q respectively are

   (a) −2, −32 (b) −2, 3 (c) −6, 3 (d) −6, −32

2. If the roots of $x^2 + (a - 2)x + a^2 = 0$ are equal in magnitude but opposite in signs, then

   (a) $a \in \left(\frac{-1-\sqrt{13}}{3}, \frac{-1+\sqrt{13}}{3}\right)$ (b) $a \in \left(\frac{-1-\sqrt{13}}{3}, \infty\right)$

   (c) $a \in \left(\frac{-1+\sqrt{13}}{3}, \infty\right)$ (d) none of these

3. If $1.3 + 2.3^2 + 3.3^3 + \ldots\ldots + n.3^n = \frac{(2n-1)3^a + b}{4}$ then (a, b) is :

   (a) (n –2, 3) (b) $(n-1,3)$ (c) $(n,3)$ (d) $(n+1,3)$

4. If the normals at the end points of a variable chord PQ of the parabola $y^2 - 4y - 2x = 0$ are perpendicular, then the tangents at P and Q will intersect at

   (a) x + y = 3 (b) 3x – 7 = 0 (c) y+3 = 0 (d) 2x + 5 = 0

5. The coordinates of the point on the parabola $y = x^2 + 7x + 2$, which is nearest to the straight line y = 3x – 3 are

   (a) (-2, -8) (b) (1, 10) (c) (2, 20) (d) (-1, -4)

Space for rough work

6. The value of the expression $2\left(1+\frac{1}{\omega}\right)\left(1+\frac{1}{\omega^2}\right)+3\left(2+\frac{1}{\omega}\right)\left(2+\frac{1}{\omega^2}\right)+4\left(3+\frac{1}{\omega}\right)\left(3+\frac{1}{\omega^2}\right)+$ . . . $+(n+1)\left(n+\frac{1}{\omega}\right)\left(n+\frac{1}{\omega^2}\right)$, where ω is an imaginary cube root of unity, is

(a) $\frac{n\left(n^2+2\right)}{3}$ (b) $\frac{n\left(n^2-2\right)}{3}$ (c) $\frac{n^2(n+1)^2+4n}{4}$ (d) none of these

7. If z_1 and z_2 are two complex numbers satisfying the equation $\left|\frac{z_1+iz_2}{z_1-iz_2}\right|=1$, then $\frac{z_1}{z_2}$ is a

(a) purely real (b) of unit modulus (c) purely imaginary (d) none of these

8. Let a, b and c be positive real numbers such that a + b + c = 6. Then range of ab^2c^3 is

(a) $(0, \infty)$ (b) (0, 1) (c) (0, 108] (d) (6, 108]

Space for rough work

Multiple Correct Choice Type

This section contains 4 multiple choice questions. Each question has four choices (a),(b), (c) and (d) out of which ONE OR MORE may be correct. [+4 for correct, no negative marking and Partial marks will be awarded for partially correct answers]

9. If $\left|\frac{z_1 z - z_2}{z_1 z + z_2}\right| = k, (z_1, z_2 \neq 0)$ then

(a) for k = 1 locus of, z is a straight line

(b) for $k \notin \{1, 0\}$, z lies on a circle

(c) for k = 0, z represents a point

(d) for k = 1,z lies on the perpendicular bisector of the line segment joining $\frac{z_2}{z_1}$ and $-\frac{z_2}{z_1}$

10. Slope of tangent to $x^2 = 4y$ from (-1, -1) can be

(a) $\frac{-1+\sqrt{5}}{2}$ (b) $\frac{-1-\sqrt{5}}{2}$ (c) $\frac{1-\sqrt{5}}{2}$ (d) $\frac{1+\sqrt{5}}{2}$

11. The set of points on the axis of the parabola $2((x-1)^2 + (y-1)^2) = (x+y)^2$, from which 3 distinct normals can be drawn to the parabola, is the set of points (h, k) lying on the axis of the parabola such that

(a) h > 3 (b) h > 3/2 (c) k > 3/2 (d) k > 3

12. If the sum of the slopes of the line given by $4x^2 - 2|k|xy - 7y^2 = 0$ is equal to the product of the slopes then k =

(a) – 4 (b) 4 (c) – 2 (d) 2

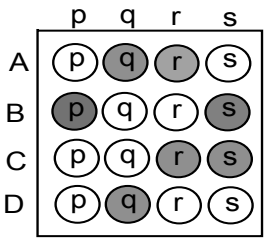
Space for rough work

SECTION – III

Matrix Match Type

This section contains 2 questions. Each question contains statements given in two columns, which have to be matched. The statements in Column I are labeled A, B, C and D, while the statements in Column II are labelled p, q, r, s and t. Any given statement in Column I can have correct matching with ONE OR MORE statement(s) in Column II. The appropriate bubbles corresponding to the answers to these questions have to be darkened as illustrated in the following example:

If the correct matches are A – q and r; B – p and s; C – r and s; and D – q; then the correct darkening of bubbles will look like the following:



13.

	Column – I		Column - II
(a)	The number of tangent(s) to the parabola $y^2 = 8x$ through (2, 1) is	(p)	3
(b)	If PSQ is the focal chord of the parabola $y^2 = 8x$ such that SP = 6 then the length SQ is	(q)	4
(c)	If $2x + y + k = 0$ is a normal to the parabola $y^2 = -8x$, then the value of k is	(r)	0
(d)	If the line $x - 1 = 0$ is the directrix of the parabola $y^2 - kx + 8 = 0$, then one of the values of k is	(s)	24

14.

	Column – I		Column - II
(a)	In an infinite G.P., each term is equal to the sum of all the succeeding terms. The common ratio of the G.P. is	(p)	4
(b)	If $\left(1-\sqrt{2}\right)^n, 1, \left(1+\sqrt{2}\right)^n$ are in G.P., then n can be.	(q)	$\frac{1}{2}$
(c)	The least value of n for which $1 + 3 + 3^2 + 3^3 + \ldots + 3^{n-1} > 1000$ is	(r)	7
(d)	If $3 + 5r + 7r^2 + \ldots\ldots \infty$ is $\frac{44}{9}$, then r is equal to	(s)	$\frac{1}{4}$
		(t)	2

Space for rough work

SECTION – IV
Integer Type

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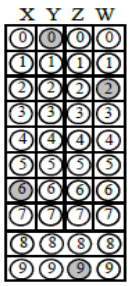

1. Three normals are drawn from a point (c, 0) to the parabola $y^2 = x$. One normal is always the x-axis. The value of 4c for which the other two normals are perpendicular to each other is ……..

2. Distinct normals are drawn from a point to a parabola $y^2 = 4ax$. The ordinates of the foot of two normals are – 1 and 3 on the parabola. The ordinate of the foot of third normal is (– K), then K is……

3. A family of lines is given by $(1+2\lambda)x+(1-\lambda)y+\lambda=0, \lambda$ being a parameter. The line belonging to this family at the maximum distance from the point (1, 4) is ax + by + c = 0, then the value of $\left|\frac{b-a}{c}\right|$ is

4. If z_1, z_2, z_3, z_4 are roots of the equation $z^4 + z^3 + z^2 + z + 1 = 0$, then least value of $[|z_1 + z_2|] + 1$ is ([.] denotes G.I.F.) _____.

5. Normals are drawn from a point P with slopes m_1, m_2 and m_3 to the parabola $y^2 = 4x$. For $m_1m_2 = \alpha$, if the locus of the point P is a part of the parabola itself, then the value of α is.

6. The least value of $2\log_{100} a - \log_a 0.0001$, $a > 1$ is.

Space for rough work