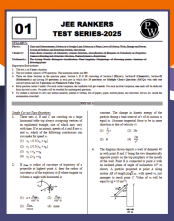
NTA

JEE Main 2025

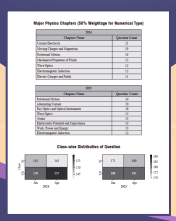
RANKERS TEST SERIES

As per Revised NTA Pattern

15 TEST PAPERS



PAST YEAR ANALYSIS



ANSWER KEY WITH DETAILED EXPLANATIONS

- Mimics JEE Exam Format and difficulty, offering a realistic exam experience
- Excellent Quality of Questions
- Opening and closing Rank of Top NITs

Meticulously Curated and Verified by Expert PW Faculties for JEE-Level Accuracy and Authentic Exam Experience

OPENING AND CLOSING RANK OF TOP NITs

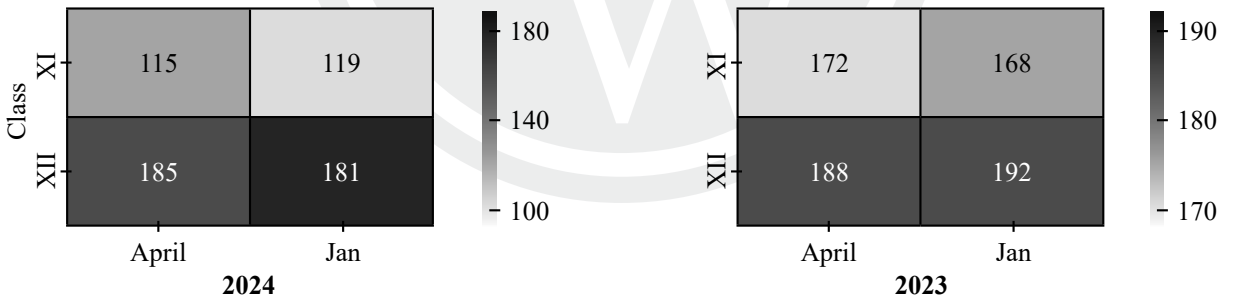
Name of the NIT	Course	Opening Rank (Other State)	Closing Rank (Home State)
Dr. B R Ambedkar National Institute of Technology, Jalandhar	Bio Technology (4 Years, Bachelor of Technology)	28618	67216
	Chemical Engineering (4 Years, Bachelor of Technology)	18997	56585
	Civil Engineering (4 Years, Bachelor of Technology)	32450	66693
	Computer Science and Engineering (4 Years, Bachelor of Technology)	6330	16940
	Data Science and Engineering (4 Years, Bachelor of Technology)	10923	20116
	Electrical Engineering (4 Years, Bachelor of Technology)	14048	33719
	Electronics and Communication Engineering (4 Years, Bachelor of Technology)	11652	26835
	Electronics and VLSI Engineering (4 Years, Bachelor of Technology)	12239	28308
	Industrial and Production Engineering (4 Years, Bachelor of Technology	33488	67982
	Information Technology (4 Years, Bachelor of Technology)	10632	26077
	Instrumentation and Control Engineering (4 Years, Bachelor of Technology	22207	48219
	Mathematics and Computing (4 Years, Bachelor of Technology	9650	26506
	Mechanical Engineering (4 Years, Bachelor of Technology	21917	48460
	Textile Technology (4 Years, Bachelor of Technology)	39483	80933
Malaviya National Institute of Technology Jaipur	Architecture (5 Years, Bachelor of Architecture)	435	2524
	Artificial Intelligence and Data Engineering (4 Years, Bachelor of Technology)	4505	6022
	Chemical Engineering (4 Years, Bachelor of Technology)	16561	27394
	Civil Engineering (4 Years, Bachelor of Technology)	15273	30509
	Computer Science and Engineering (4 Years, Bachelor of Technology)	1501	5435
	Electrical Engineering (4 Years, Bachelor of Technology)	9311	14001
	Electronics and Communication Engineering (4 Years, Bachelor of Technology)	5285	10321
	Mechanical Engineering (4 Years, Bachelor of Technology)	5685	20618
	Metallurgical and Materials Engineering (4 Years, Bachelor of Technology)	31157	36368

Major Mathematics Chapters (50% Weightage for Numerical Type)

2024	
Chapters Name	**Question Count**
Differential Equation	16
3D Geometry	15
Sequence and Series	13
Matrices and Determinant	13
Binomial Theorem	13
Definite Integration	13
Quadratic Equation	11
Set And Relations	11

2023	
Chapters Name	**Question Count**
Permutation and Combination	29
3D Geometry	23
Binomial Theorem	22
Sequence and Series	20
Area Under Curves	13
Definite Integration	12

Class-wise Distribution of Question



JEE's Report Card

JEE (Main) January 2024 shift-wise distribution of total registered candidates

Exam Date	Shift	Male	Female	Total	% of Total Appeared	Number of Scorers Between 99-100	Number of 100 Percentile Scorers
Jan 27	1	82,371	39,816	1,22,187	10	1,180	●●●●●●●●8
	2	85,659	39,613	1,25,272	10.3	1,214	●1
Jan 29	1	82,589	39,734	1,22,323	10	1,203	●1
	2	84,089	40,759	1,24,848	10.2	1,231	●●●●4
Jan 30	1	80,761	41,037	1,21,798	10	1,206	●1
	2	80,936	40,092	1,21,028	9.9	1,185	●●●3
Jan 31	1	83,389	41,705	1,25,094	10.3	1,225	●●2
	2	81,088	39,829	1,20,917	9.9	1,186	●1
Feb 1	1	81,237	39,968	1,21,205	9.9	1,170	●1
	2	78,568	38,384	1,16,952	9.6	1,103	●1
			Total	12,21,624		11,903	

Shiftwise Percentile vs Marks of JEE Main 2024 Session-1

Percentile	27-01 M	27-01 E	29-01 M	29-01 E	30-01 M	30-01 E	31-01 M	31-01 E	01-02 M	01-02 E
99	236	211	203	212	193	191	170	151	161	172
98,5	223	196	190	199	179	178	158	139	150	161
98	213	185	180	189	169	167	148	131	141	148
97.5	204	177	171	181	159	158	141	124	133	139
97	196	170	165	174	152	151	134	118	126	131
96.5	190	164	158	168	146	145	128	114	120	125
96	184	159	153	163	140	139	123	109	115	120
95.5	178	155	148	158	135	132	119	105	110	115
95	173	151	144	154	130	129	114	101	106	109
94	165	143	137	146	123	121	108	94	98	100
93	157	137	130	138	115	113	100	86	91	92
92	151	131	124	132	108	108	95	81	85	87
91	145	126	119	126	103	102	89	76	79	81
90	139	121	114	120	98	97	84	72	74	76

Attendance for JEE (Main)-2024 Session-2

Date of Examination	Registered Candidates	Appeared Candidates
04 April 2024 Shift-I	118246	105288
04 April 2024 Shift-II	118160	105795
05 April 2024 Shift-I	118255	106970
05 April 2024 Shift-II	118161	107160
06 April 2024 Shift-I	118378	107635
06 April 2024 Shift-II	118084	107494
08 April 2024 Shift-I	117867	106992
08 April 2024 Shift-II	117437	106952
09 April 2024 Shift-I	118169	107254
09 April 2024 Shift-II	116812	106419
Total	**1179569**	**1067959**

Shiftwise Percentile vs Marks of JEE Main 2024 Session-2

Percentile	4th April Morning	4th April Evening	5th April Morning	5th April Evening	6th April Morning	6th April Evening	8th April Morning	8th April Evening	9th April Morning	9th April Evening
99	192	200	187	210	215	200	198	208	186	194
98.5	180	188	174	198	203	188	186	194	173	182
98	170	179	165	190	194	179	177	183	164	173
97.5	162	171	157	183	187	171	170	172	156	166
97	156	165	153	177	181	165	165	159	150	160
96.5	151	160	146	172	176	160	159	152	145	155
96	145	155	142	167	171	156	155	152	140	150
95.5	141	151	138	163	166	151	151	146	135	145
95	136	146	134	159	163	147	147	142	131	142
94	130	139	127	152	155	139	139	133	123	135
93.23	125	134	122	146	150	134	134	126	118	130

CONTENTS

Scan this QR Code to Practice JEE Main 2024 Papers-All Shifts

01

JEE RANKERS TEST SERIES-2025

SYLLABUS:

Physics:	Units and Measurements, Motion in a Straight Line, Motion in a Plane, Laws of Motion, Work, Energy and Power, System of Particles and Rotational Motion, Gravitation
Chemistry:	Some basic Concepts of Chemistry, Atomic Structure, Classication of Elements, and Periodicity in Properties, Chemical bonding and Molecular Structure, Thermodynamics, Equilibrium, Redox Reactions
Mathematics:	Basic Maths, Logarithm, Sets, Trigonometric Functions, Quadratic Equations, Linear Inequalities, Permutations and Combinations, Binomial Theorem, Sequences and Series

Important Instructions:

1. The test is of **3 hours** duration.
2. The test booklet consists of **75** questions. The maximum marks are **300**.
3. There are three Sections in the question paper, Section I, II & III consisting of Section-I **(Physics)**, Section-II **(Chemistry)**, Section-III **(Mathematics)** and having **25 questions** in each part in which first **20 questions** are **Multiple Choice Questions (MCQs)** with **only one correct** option and last **5 questions** are **Numerical Value Type**.
4. Each question carries 4 marks. For each correct response, the candidate will get **4 marks**. For each incorrect response, **one** mark will be deducted from the total scores. No marks will be awarded for unattempted questions.
5. No student is allowed to carry any textual material, printed or written, bits of papers, paper, mobile phone, any electronic device, etc. inside the examination room/hall.

PHYSICS

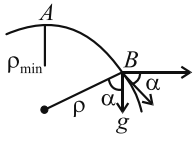
Multiple Choice Questions (MCQs)

1. Three ants *A*, *B* and *C* are crawling on a large horizontal table top always occupying vertices of an equilateral triangle, size of which may vary with time. If at an instant, speeds of *A* and *B* are v_A and v_B, which of the following conclusions can you make for speed v_C

(1) $v_C < 0.5(v_A + v_B)$ (2) $v_C \le 0.5(v_A + v_B)$

(3) $v_C < v_A + v_B$ (4) $v_C \le v_A + v_B$

2. If ρ_{min} is radius of curvature of trajectory of a projectile at highest point *A*, then the radius of curvature ρ of the trajectory at *B* where tangent on it forms α angle with horizontal is



(1) $\rho = \dfrac{\rho_{min}}{\cos^3\alpha}$ (2) $\dfrac{\rho_{min}}{\cos^2\alpha}$

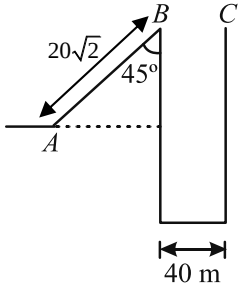
(3) $\dfrac{\rho_{min}}{\cos\alpha}$ (4) none

3. Magnitude of tangential component of net force experienced by a particle moving in a circle with speed *v* is given by $F_t = \dfrac{k}{v}$, where *k* is a positive constant. The change in kinetic energy of the particle during a time interval of *t* of its motion is equal to. (Assume tangential force to be in same direction as that of velocity *v*)

(1) $\dfrac{k}{v^2}t$ (2) $2kt$

(3) kt (4) $\dfrac{2kt}{v^2}$

4. The diagram shown depicts a well of diameter 40 m with point *B* and *C* being the two diametrically opposite points on the top periphery at the mouth of the well. Point *B* is connected to point *A* with an inclined plane of angle of inclination 45º as shown. A particle projected at point *A* along incline *AB* of length $20\sqrt{2}$ m, with speed v_0, just manages to reach point *C*. Value of v_0 will be equal to (g = 10 ms^{-2})



(1) 20 ms^{-1} (2) $20\sqrt{2}$ ms^{-1}

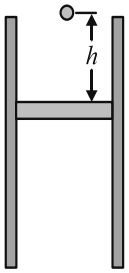
(3) 40 ms^{-1} (4) $40\sqrt{2}$ ms^{-1}

5. A double star, is a system of two stars moving around the centre of mass of the system due to gravitation. The distance between the components of the double star if the total mass of the system is M and time period of revolution around COM is T is

(1) $d=\dfrac{\left(GMT^2\right)^{\frac{1}{3}}}{4\pi^2}$ (2) $d=\left(\dfrac{GMT^2}{4\pi^2}\right)^{\frac{1}{3}}$

(3) $d=\dfrac{\left(GMT^2\right)^{\frac{1}{3}}}{2\pi}$ (4) $d=\left(\pi GMT^2\right)^{\frac{1}{3}}$

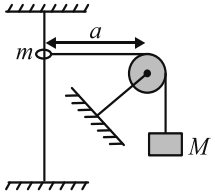
6. A piston of mass M with a ball of mass m rests inside a fixed long vertical tube due to frictional forces acting between the periphery of the piston and the inner surface of the tube. The ball is raised to height h above the piston and then released. All the collisions of the ball with the piston are perfectly elastic. Net frictional force on the piston has a constant value F that is more than the total weight of the ball and the piston. How far will the piston eventually move down in the tube? Acceleration due to gravity is g and air resistance is negligible.



(1) $\dfrac{mgh}{F-(m+M)g}$ (2) $\dfrac{Mgh}{F-(M+m)g}$

(3) $\dfrac{mgh}{F-(m-M)g}$ (4) $\dfrac{Mgh}{F+(m+M)g}$

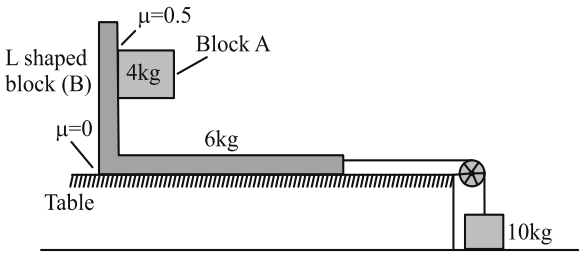
7. The diagram shows a ring of mass m attached to a block of mass M through a light ideal string passing over a smooth fixed pully. A vertical smooth rod passes through the ring. Initially the ring is held with the portion of the string between pulley and ring being horizontal. Now when released from this position the ring first comes to rest after falling a distance equal to



(1) $\dfrac{2mMa}{M^2-m^2}$ (2) $\dfrac{mMa}{M^2-m^2}$

(3) $\dfrac{mMa}{2\left(M^2-m^2\right)}$ (4) $\dfrac{3mMa}{M^2-m^2}$

8. The system shown in the diagram describes a setup of block A held against the wall of an L shaped block B. After the system is set free to move, at an instance when block A is in relative motion with respect to block B, match the following parameters. ($g = 10\ ms^2$)

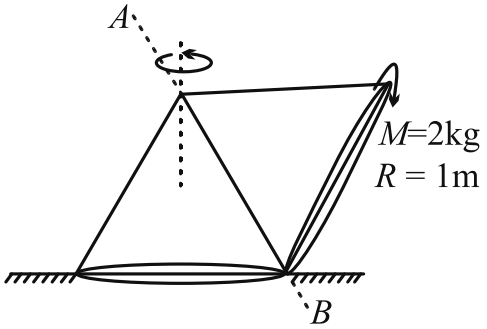


	Column – 1		Column – 2
I	The magnitude of force of friction between block A and B will be	P	50 N
II	The value of tension in string attaching block B with 10 kg mass just after release will be	Q	70 N
III	The value of normal reaction on block A by block B just after release will be	R	20 N
IV	Normal reaction on block B by table just after release will be	S	10 N

	I	II	III	IV
(1)	S	P	R	Q
(2)	P	Q	R	S
(3)	S	Q	P	R
(4)	S	R	Q	P

9. A hollow cone of mass M = 2kg and base radius R = 1m of semi apex-angle 30° is rolling without slipping on a fixed cone (same radius and semi-angle) as shown. If angular speed of rotation of cone about its symmetrical central axis is 2 rad/s, find kinetic energy of the cone.

(Given that moment of inertia of a hollow cone about its slant axis AB is $I=\dfrac{MR^2}{4}\left(1+3\cos^2(\alpha)\right)$, where α is semi apex angle of cone)

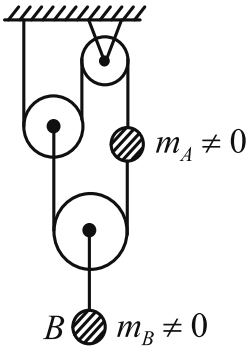


(1) 4 J (2) 6 J

(3) (8/3) J (4) (39/4) J

10. In the system shown all the pulleys and strings are ideal. When released to move freely, the magnitude of acceleration of upper ball of mass m_A, as shown in figure, will be equal to ($m_B = 4\,m_A$)

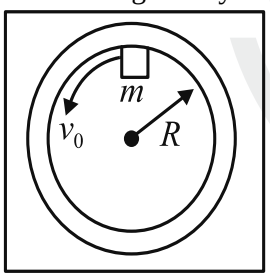
(g acceleration due to gravity)



(1) $8g/5$ (2) $4g/5$

(3) $2g/5$ (4) g

11. The diagram shows the top view of a fixed ring of radius R and a block of mass m kept flat on a smooth table top. The ring is welded with the table top. Surface interface between the ring and the block is rough with coefficient of friction equal to μ. At time $t = 0$ the block kept in contact with the ring is given a push along the inner surface of the ring such that the block starts with tangential velocity v_0. The speed of the block at any time t after start of motion is given by



(1) $v = \dfrac{v_0}{\left(1+\dfrac{\mu v_0 t}{R}\right)}$ (2) $v = \ln\left(\dfrac{1}{\left(1+\dfrac{\mu v_0 t}{R}\right)}\right)$

(3) $v = \dfrac{v_0}{\left(\dfrac{\mu v_0 t}{R}\right)}$ (4) $v = \ln\left(\dfrac{2}{\left(2+\dfrac{\mu v_0 t}{R}\right)}\right)$

12. A spot light S rotates in a horizontal plane with a constant angular velocity of 0.1 rad/s. The spot of light P moves along the wall at a distance 3 m. What is the velocity of the spot P when angle between light and normal of wall is $\theta = 45^\circ$

(1) 0.3 m/s (2) 0.2 m/s

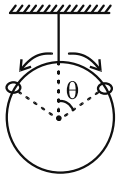
(3) 0.6 m/s (4) 0.1 m/s

13. A small ball of mass 2 kg, thrown at a speed of $20\sqrt{2}\,\text{m/s}$ from ground at an angle of 45° with the horizontal explodes in two equal pieces after 1 second into its journey. One of the two parts comes to rest immediately after the explosion. Value of maximum height achieved by the other part measured from ground is equal to ($g = 10\ \text{m/s}^2$)

(1) 50 m (2) 25 m

(3) 40 m (4) 35 m

14. A smooth circular track of mass M is vertically hung by a string down the ceiling. Two small rings, each of mass m are initially at the top of the track. They slide down simultaneously along the track in opposite directions. Find the position of the rings, when tension in the string becomes zero for the first time.



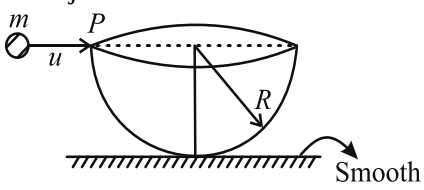
(1) $\theta = \cos^{-1}\left[\dfrac{5}{3}\left(1+\sqrt{1-\dfrac{3M}{2m}}\right)\right]$

(2) $\theta = \sin^{-1}\left[\dfrac{5}{3}\left(1+\sqrt{1-\dfrac{3M}{2m}}\right)\right]$

(3) $\theta = \cos^{-1}\left[\dfrac{1}{3}\left(1+\sqrt{1-\dfrac{3M}{2m}}\right)\right]$

(4) $\theta = \sin^{-1}\left[\dfrac{1}{3}\left(1+\sqrt{1-\dfrac{3M}{2m}}\right)\right]$

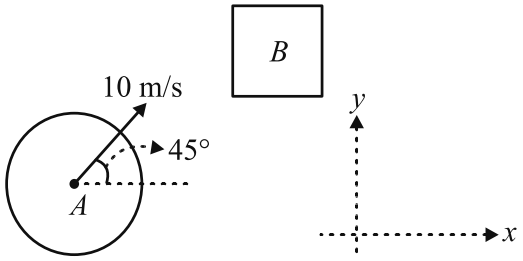
15. A hollow hemispherical bowl of mass m, radius R is placed on a smooth horizontal surface. A particle also of mass m is moving along horizontal with speed u at height R above the horizontal surface as shown strikes the hemispherical bowl at point P and sticks to it. The vertical component of the velocity of particle just after the collision is.



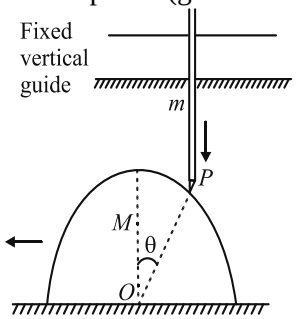
(1) $\dfrac{u}{25}$ (2) $\dfrac{2u}{25}$

(3) $\dfrac{3u}{25}$ (4) $\dfrac{4u}{25}$

24. A thin disc *A* with a mass of 5 kg translates along a horizontal frictionless surface (see figure) in *xy* plane at a speed of 10 m/s. It strikes a square stationary plate *B* with a mass of 10 kg at the middle of a side of square indicated in the diagram. The coefficient of restitution so that disc stops moving in *x* direction after collision is $\frac{n}{2}$. Find *n* ?



25. As shown a smooth hemisphere of mass M = 4 kg and radius a = 2 m, is placed with its plane base on a smooth table. A rod, of mass m = 2 kg is constrained to move in a vertical line with one end P on the curved surface of the hemisphere. Find the angular speed (in rad/s) of point P with respect to centre O of the hemisphere when OP makes an angle $\theta = 60°$ with the vertical. Initially the rod was at the topmost point of the hemisphere. ($g = 10\ m/s^2$)



CHEMISTRY

Multiple Choice Questions (MCQs)

26. In which one of the following process, the magnetic moment value does not change?

(1) $O_2 \rightarrow O_2^-$ (2) $O_2 \rightarrow O_2^+$

(3) $N_2 \rightarrow N_2^+$ (4) $N_2^+ \rightarrow N_2^-$

27. How many moles of NH_3 must be added to 2.0 litre of 0.80 M $AgNO_3$ in order to reduce the Ag^+ concentration to 5×10^{-8} M?
K_f of $[Ag(NH_3)_2]^+ = 10^8$

(1) 0.4 (2) 2

(3) 3.52 (4) 4

28. 25 mL sample of ozonized oxygen at NTP was passed through a solution of KI. The liberated iodine required 15 mL of 0.08 N $Na_2S_2O_3$ solution for complete titration. The volume of ozone at NTP in the given sample is

(1) 15.44 mL (2) 13.44 mL

(3) 14.44 mL (4) 5 mL

29. A reaction at 300 K with $\Delta G° = -1743$ J consists of 3 moles of A(g), 6 moles of B(g) and 3 moles of C(g). If A, B and C are in equilibrium in a 1 L container, then the reaction may be
(ln2 = 0.7, R = 8.3 J/K-mol).

(1) $A + B \rightleftharpoons C$ (2) $A \rightleftharpoons B + 2C$

(3) $2A \rightleftharpoons B + C$ (4) $A + B \rightleftharpoons 2C$

30. Which one of the following reactions is spontaneous only at relatively low temperature?

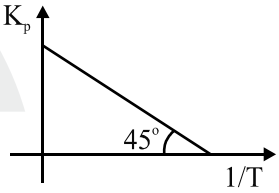
(1) $NH_4Br(s) + 188\ kJ \rightarrow NH_3(g) + Br_2(l)$

(2) $NH_3(g) + HCl(g) \rightarrow NH_4Cl(g) + 176\ kJ$

(3) $2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g) + 196\ kJ$

(4) Both (2) and (3)

31. For a reaction graph of log K_p and 1/T is as follows-

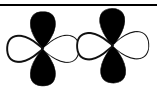
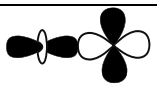


The standard enthalpy change for the reaction will be

(1) 2 cal/mol (2) –2 cal/mol

(3) 4.606 cal/mol (4) –4.606 cal/mol

32. Match the orbital overlap figures shown in Column-I with the description given in Column-II and select the correct answer using the code given below the Columns.

	Column-I		**Column-II**
I		P	pπ-d π antibonding
II		Q	d-d σ bonding
III		R	pπ-d π bonding
IV		S	d-d σ antibonding

	I	**II**	**III**	**IV**
(1)	S	R	Q	P
(2)	P	Q	R	S
(3)	Q	R	P	S
(4)	S	P	Q	R

33. An electron revolving around H-nucleus in ground state absorbs 10.2 eV energy. Its angular momentum increases by

(1) $\frac{h}{2\pi}$ (2) $\frac{h}{\pi}$

(3) $\frac{2h}{\pi}$ (4) $\frac{h}{4\pi}$

34. Match the atoms/ions given in Column-I with their corresponding electron affinity (eV/atom) given in Column-II and select the correct answer using the codes given below the columns.

	Column-I		**Column-II**
I	F	P	3.4
II	F^+	Q	17.4
III	Cl	R	13
IV	Cl^+	S	3.6

	I	**II**	**III**	**IV**
(1)	P	R	S	Q
(2)	Q	P	R	S
(3)	P	Q	S	R
(4)	R	P	Q	S

35. The correct option for free expansion of an ideal gas under adiabatic condition is

(1) $q_{system} < 0$, $\Delta T = 0$, $w = 0$ and $\Delta S_{system} = 0$

(2) $q_{system} = 0$, $\Delta T = 0$, $w = 0$ and $\Delta S_{system} = 0$

(3) $q_{system} = 0$, $\Delta T = 0$, $w = 0$ and $\Delta S_{system} \neq 0$

(4) $q_{system} = 0$, $\Delta T < 0$, $w > 0$ and $\Delta S_{system} \neq 0$

36. Given below are two statements, one is labelled as **Assertion(A)** and the other is labelled as **Reason (R)**

Assertion (A): $FeCl_3$ is more covalent than $FeCl_2$

Reason(R): Fe(III) is more polarising than Fe(II)

In the light of above statements, choose the most appropriate answer from the following.

(1) Both **A** and **R** are correct and **R** is the correct explanation for **A**.

(2) Both **A** and **R** are correct but **R** is not the correct explanation for **A**.

(3) **A** is correct but **R** is incorrect

(4) **A** is incorrect but **R** is correct

37. Which of the following set or order is incorrect for their indicated properties?

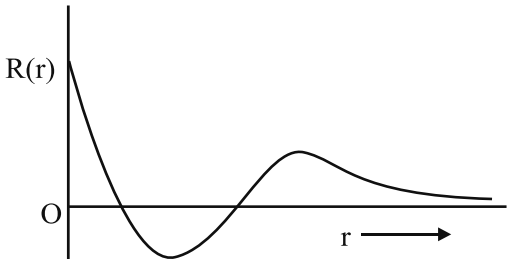
(1) Bond length of O – F: $O_2F_2 > OF_2$

(2) Lewis acidic strength: $BCl_3 > BF_3$

(3) Basic strength: $N(CH_3)_3 < N(SiH_3)_3$

(4) $p\pi - p\pi$ bond strength: $BF_3 > BCl_3$

38. The radial part of wave function of an orbital is plotted against distance from nucleus. Which orbital represents below graph?



(1) 1s (2) 2s

(3) 3s (4) 2p

39. If uncertainty in momentum is twice the uncertainty in position of an electron, then uncertainty in velocity is

(1) $\frac{1}{2m}\sqrt{\frac{h}{2\pi}}$ (2) $\frac{1}{m}\sqrt{\frac{h}{2\pi}}$

(3) $\frac{1}{4m}\sqrt{\frac{h}{2\pi}}$ (4) $\frac{h}{4\pi m}$

40. In PO_4^{3-}, the bond order of P-O bond and formal charge on O-atom are, respectively,

(1) 0.25, –0.25 (2) 0.50, –0.50

(3) 1.25, –0.75 (4) 0.75, –1.25

41. The correct order of ionization energy for the dipositive ions is

(1) $Be^{2+} > N^{2+} > B^{2+} > C^{2+}$

(2) $N^{2+} > B^{2+} > C^{2+} > Be^{2+}$

(3) $Be^{2+} > C^{2+} > N^{2+} > B^{2+}$

(4) $C^{2+} > N^{2+} > B^{2+} > Be^{2+}$

42. Match Column-I with Column-II and select the correct answer using the codes given below the columns

	Column-I (Periodic properties)		**Column-II (Order)**
I	Ionisation energy	P	Sn < Pb
II	Radii	Q	Li > B
III	Electronegativity	R	Li < Be < B
IV	Electron affinity	S	$O^- < S^-$

	I	**II**	**III**	**IV**
(1)	S	P	R	Q
(2)	P	Q	R	S
(3)	S	R	Q	P
(4)	P	S	Q	S

43. The electrons identified by the given quantum numbers 'n' and '*l*'

I. n = 4, *l* = 1 II. n = 4, *l* = 0

III. n = 3, *l* = 2 IV. n = 3, *l* = 1

can be placed in order of increasing energy as (for multielectron species)

(1) III < IV < II < I (2) IV < II < III < I

(3) II < IV < I < III (4) I < III < II < IV

44. Which one of the following statements is correct about various periodic properties?

(1) The electron affinity of an atom under consideration is equal to the negative of the electron gain enthalpy at any temperature.

(2) The electronegativity of any given element is not constant; it varies depending on the element to which it is bound.

(3) The first ionization enthalpy values of group 13 elements varies as B > Al > Ga > In > Tl.

(4) An element with ground state electronic configuration [Xe] $4f^{14}\ 5d^1\ 6s^2$ belongs to d-block in the modern periodic table.

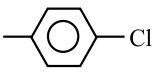
45. Assuming no change in volume, calculate the minimum mass of NaCl necessary to dissolve 0.010 mol AgCl in 100 L solution. [$K_f(AgCl_2^-)$ = 3 × 10^5, K_{sp} (AgCl) = 1 × 10^{-10}]

(1) $\frac{10}{3}$ g (2) 195 g

(3) 19.5 kg (4) 1950 g

Integer Type Questions

46. How many of the following molecules have zero dipole moment?

$CHCl_3$, CH_2Cl_2, SF_4, SF_6, BF_3, NH_3, PCl_3F_2, PCl_2F_3, 

47. 10 ml of 0.1 M weak acid HA ($K_a = 10^{-5}$) is mixed with 10 ml 0.2 M HCl and 10 ml 0.1 M NaOH. If the value of $[A^-]$ in the resulting solution is x × 10^{-5} M the value of 'x' is _____.

48. For H atom like species, at what minimum atomic number a transition from n = 2 to n = 1 energy level would result in the emission of X-ray with $\lambda = 3.0\times10^{-8}$ m?
[Given: $R_H = 1.09 \times 10^7\ m^{-1}$]

49. A fixed mass of an ideal gas contained in a 24.63 L sealed rigid vessel at 1 atm is heated from –73°C to 27°C. Calculate change in Gibb's energy (in J) if entropy of gas is a function of temperature as S = 2 + 10^{-2}T (J/K): [Use 1 atm L = 100 J]
(Take greatest integer of the obtained answer to report the final value)

50. Consider the following chemical reaction

$$Fe_3O_4 + CO \rightarrow Fe + CO_2$$

What mass of Fe_3O_4 (in kg) is required to obtain 2 kg of Fe if the process is 90% efficient?
[Fe : 56 g/mol] (Nearest Integer)

MATHEMATICS

Multiple Choice Questions (MCQs)

51. Number of value (s) of x satisfying the equation $3x^2 - 2x^3 = \log_2\left(x^2+1\right) - \log_2 x$ is

(1) 1 (2) 2

(3) 3 (4) 0

52. The number of values of k for which the expression $\left(2x^2 - 4(k-1)x + 3\right)\left(x^2 + 2kx + k + 1\right)$ is a perfect square is

(1) 0 (2) 1

(3) 2 (4) 4

53. The sum of the series

$$\frac{13}{1.2.3.2} + \frac{26}{2.3.4.4} + \frac{43}{3.4.5.8} + \frac{64}{4.5.6.16} + \ldots\infty$$

(1) 3/4 (2) 7/4

(3) 3/2 (4) 4/3

54. The number of ways to place 11 identical balls in three distinct boxes so that any two boxes together will contain more balls than the other one

(1) 63 (2) 21

(3) 15 (4) None of these

55. If $\left(1+x+x^2\right)^n = \sum_{r=0}^{2n} a_r x^r$, then the value of $\sum_{k=0}^{3r} (-1)^k a_k^n C_{3r-k}$ (where $3r \le n$) equals

(1) $(-1)^r \cdot {}^nC_r$ (2) ${}^nC_{3r}$

(3) $(-1)^{3r} \cdot {}^nC_{3r}$ (4) ${}^nC_r$

56. $\left[\sqrt{3}\,\text{cosec}\,(20°) - \sec(20°)\right]$ is equal to (where [.] denotes greatest integer function)

(1) 1 (2) 2

(3) 3 (4) 4

Test Paper-01

ANSWER KEY

1.	**(4)**	**16.**	**(4)**	**31.**	**(3)**	**46.**	**(4)**	**61.**	**(3)**
2.	**(1)**	**17.**	**(4)**	**32.**	**(3)**	**47.**	**(1)**	**62.**	**(2)**
3.	**(3)**	**18.**	**(1)**	**33.**	**(1)**	**48.**	**(2)**	**63.**	**(2)**
4.	**(2)**	**19.**	**(1)**	**34.**	**(3)**	**49.**	**(781)**	**64.**	**(2)**
5.	**(2)**	**20.**	**(4)**	**35.**	**(3)**	**50.**	**(3)**	**65.**	**(1)**
6.	**(1)**	**21.**	**(675)**	**36.**	**(1)**	**51.**	**(1)**	**66.**	**(1)**
7.	**(1)**	**22.**	**(9)**	**37.**	**(3)**	**52.**	**(2)**	**67.**	**(2)**
8.	**(1)**	**23.**	**(2)**	**38.**	**(3)**	**53.**	**(3)**	**68.**	**(2)**
9.	**(4)**	**24.**	**(1)**	**39.**	**(2)**	**54.**	**(3)**	**69.**	**(3)**
10.	**(1)**	**25.**	**(2)**	**40.**	**(3)**	**55.**	**(4)**	**70.**	**(1)**
11.	**(1)**	**26.**	**(4)**	**41.**	**(3)**	**56.**	**(4)**	**71.**	**(6)**
12.	**(3)**	**27.**	**(4)**	**42.**	**(1)**	**57.**	**(4)**	**72.**	**(3)**
13.	**(4)**	**28.**	**(2)**	**43.**	**(2)**	**58.**	**(4)**	**73.**	**(6)**
14.	**(3)**	**29.**	**(3)**	**44.**	**(2)**	**59.**	**(3)**	**74.**	**(1)**
15.	**(3)**	**30.**	**(2)**	**45.**	**(3)**	**60.**	**(2)**	**75.**	**(1)**

SOLUTIONS

PHYSICS

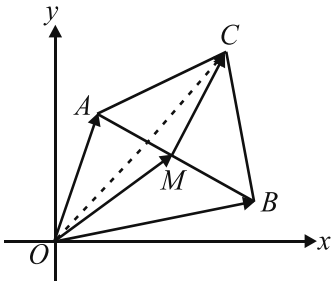
1. (4)

$\overline{OC} = \overline{OM} + \overline{MC}; \overline{MC} = \sqrt{3}\left[\overline{MA} \times \hat{k}\right]$

$\bar{r}_C = \frac{\bar{r}_A + \bar{r}_B}{2} + \sqrt{3}\left[\frac{\bar{r}_A - \bar{r}_B}{2}\right] \times \hat{k}$

Differentiating, we get,

$\bar{v}_c = \frac{\bar{v}_A + \bar{v}_B}{2} + \frac{\sqrt{3}}{2}\left(\bar{v}_A \times \hat{k} - \bar{v}_B \times \hat{k}\right)$



Taking modulus

$v_c \le v_A \left|\sin\left(\frac{\pi}{6} + \theta\right)\hat{i} + \cos\left(\frac{\pi}{6} + \theta\right)\hat{j}\right|$

$+v_B$ |another unit vector|

$v_c \le v_A + v_B$

$\frac{\bar{v}_A}{2} = v_A\left(\frac{\cos\theta}{2}\hat{i} + \frac{\sin\theta}{2}\hat{j}\right)$

$\frac{\sqrt{3}}{2}\left(\bar{v}_A \times \hat{k}\right)$

$= v_A\left(\frac{\sqrt{3}}{2}\cos\left(\theta - \frac{\pi}{2}\right)\hat{i} + \frac{\sqrt{3}}{2}\sin\left(\theta - \frac{\pi}{2}\right)\hat{j}\right)$

2. (1)

$\rho_{min} = \frac{(v\cos\theta)^2}{g}$ and $v'\cos\alpha = v\cos\theta$

$v' = \frac{v\cos\theta}{\cos\alpha}$

$\rho = \frac{v'^2}{g(\cos\alpha)} = \left(\frac{(v\cos\theta)}{\cos\alpha}\right)^2 \frac{1}{g(\cos\alpha)}$

$\rho = \frac{\rho_{min}}{(\cos\alpha)^3}$

3. (3)

$F = \frac{k}{v}$

$m\frac{dv}{dt} = \frac{k}{v}; \int v dv = \frac{k}{m}\int dt$

$\frac{mv^2}{2} = kt$

4. **(2)**

Let v be the velocity acquired by the body at B which will be moving making an angle 45° with the horizontal direction. As the body just crosses the well so, $\frac{v^2}{g} = 40$

or $v^2 = 40g = 40 \times 10 = 400$

or $v = 20 \text{ ms}^{-1}$

Taking motion of the body from A to B along the inclined plane we have

$u = v_0, a = -g\sin 45^\circ = -\frac{10}{\sqrt{2}} \text{ ms}^{-2}$

$s = 20 \text{ m}, v = 20 \text{ ms}^{-1}$

As $v^2 = u^2 + 2as$

$\therefore 400 = v_0^2 + 2\left(-\frac{10}{\sqrt{2}}\right) \times 20\sqrt{2}$

$v_0^2 = 400 + 400 = 800$ or $v = 20\sqrt{2} \text{ ms}^{-1}$

5. **(2)**

Let d be the distance between the stars and let d_1 and d_2 be the distance of star from centre of mass

Therefore,

$d_1 = \left(\frac{d}{m_1 + m_2}\right) m_2$ and $d_2 = \left(\frac{d}{m_1 + m_2}\right) m_1$

Since, we have $\frac{Gm_1m_2}{d^2} = m_1\omega^2 d_1 = m_2\omega^2 d_2$

Also, $m_1 + m_2 = M$ {given}

$\Rightarrow d_1 = \frac{d}{M} m_2$ and $d_2 = \frac{d}{M} m_1$

$\Rightarrow \frac{Gm_1(M - m_1)}{d^2} = m_1\omega^2\left[\frac{d}{M}(M - m_1)\right]$

$\Rightarrow GM = \omega^2 d^3$

$\Rightarrow d^3 = \frac{GMT^2}{4\pi^2} \Rightarrow d = \left(\frac{GMT^2}{4\pi^2}\right)^{\frac{1}{3}}$

6. **(1)**

$\frac{mgh}{F - (m+M)g}$

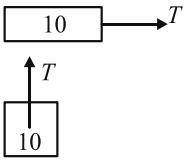
Gravitational potential energy lost has been consumed in doing work against the friction.

7. **(1)**

From conservation of mechanical energy

$mgh = Mg\left(\sqrt{a^2 + h^2} - a\right)$

8. **(1)**



$T = 10a$

$100 - T = 10a$

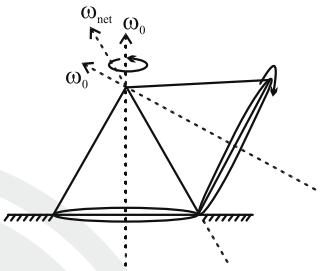
$a = 5 \text{ m/sec}^2$

$N_{AB} = 20 \text{ N}$, friction $= 20 \times 0.5 = 10 \text{ N}$

$N_{\text{table }, B} = 60 + 10 = 70 \text{ N}$

$T = 50 \text{ N}$

9. **(4)**



$\omega_{\text{net}} = 2\omega_0 \cos(\alpha) = 2 \times 2 \times \frac{\sqrt{3}}{2}$

$\omega_{\text{net}} = 2\sqrt{3}$

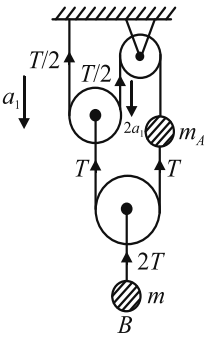
$(KE) = \frac{1}{2} I_\alpha (\omega_{\text{net}})^2$

I_α = Moment of inertia of cone about its slant axis having semi apex-angle α.

$I_\alpha = \frac{MR^2}{4}\left(1 + 3\cos^2(\alpha)\right) = \frac{13MR^2}{16}$

$(KE)_{\text{net}} = \frac{1}{2}\left(\frac{13 \times 2 \times (1)^2}{16}\right) \times 4 \times 3 = \frac{39}{4} \text{ J}$

10. **(1)**



If pulley is ideal,

$a_P = \frac{a_1 + a_2}{2}$

11. (1)

$$N = \frac{mv^2}{R}$$

$$f_{max} = \mu N = \frac{\mu m v^2}{R}$$

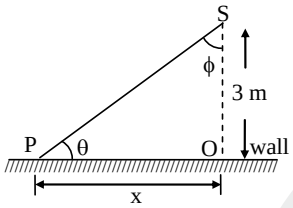
$\Rightarrow$ Retardation $a = \frac{f_{max}}{m} = \frac{\mu v^2}{R}$

$$\Rightarrow \quad -\frac{dv}{dt} = \frac{\mu v^2}{R} \quad \Rightarrow \quad -\int_{v_0}^{v} \frac{dv}{v^2} = \frac{u}{R}\int_0^T dt$$

$$v = \frac{v_0}{\left(1 + \frac{\mu v_0 t}{R}\right)}$$

12. (3)

If x is the distance of point P from O then from fig.s



$\tan \phi = (x/h)$

or $x = h \tan \phi$

or $\frac{dx}{dt} = h\,(\sec^2\phi)\,\frac{d\varphi}{dt}$

i.e. $v = h \sec^2 \phi\, \omega$

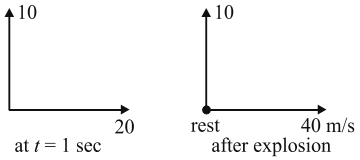
[as $(dx/dt) = v$ and $(d\phi/dt) = \omega$]

Here, $h = 3$ m, $\phi = 180 - (45 + 90) = 45^o$

and $\omega = 0.1$ rad/s.

So $v = 3 \times (\sqrt{2})^2 \times 0.1 = 0.6$ m/s.

13. (4)

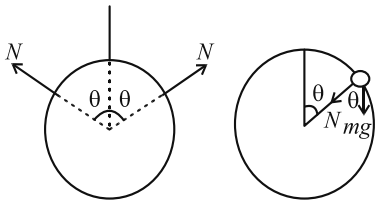


Now $n = \left[20(1) - \frac{1}{2}g(1)^2\right] + \frac{(20)^2}{2g}$

= 35 m

14. (3)

Balance the force in vertical direction



T becomes zero when

$$2N\cos\theta = Mg \qquad ...(1)$$

$$mgR(1-\cos\theta) = \frac{1}{2}mv^2 \qquad ...(2)$$

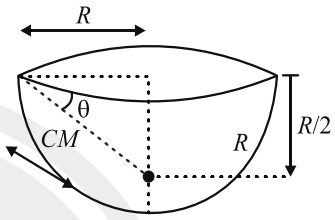
$$mg\cos\theta + N = \frac{mv^2}{R} \qquad ...(3)$$

From equation (1), (2) & (3) we get

$$6m\cos^2\theta - 4m\cos\theta + M = 0$$

$$\cos\theta = \frac{1}{3} \pm \frac{1}{3}\sqrt{1 - \frac{3M}{2m}}$$

15. (3)



$$V_y = \omega x \cos\theta = \frac{\omega R}{2}$$

Using conservation of angular momentum about centre of mass.

$$mu\frac{R}{4} = \left\{\frac{2}{3}mR^2 - \frac{mR^2}{4} + \frac{5mR^2}{16}\right\}\omega + \frac{5mR^2}{16}\omega$$

$$= \frac{25}{24}mR^2\omega \Rightarrow \omega = \frac{6u}{25R}$$

$$\Rightarrow V_y = \frac{3u}{25}$$

16. (4)

$\frac{dx}{dt} = R\omega \cos \omega t$ and $\frac{dy}{dt} = -R\omega \sin \omega t$

$y_{min} = 0$, when $\omega t = \pi$

Now $\frac{dx}{dt} = -R\omega$ and $\frac{dy}{dt} = 0$,

$\therefore\ v = -R\omega$

$y_{max} = 2R$, when $\omega t = 2\pi$

$\frac{dx}{dt} = \omega R$ and $\frac{dy}{dt} = 0$

Now $v = \sqrt{\left[\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right]} = \omega R$

$a_x = \frac{d^2y}{dt^2} = -R\omega^2 \sin \omega t$

HOW TO PREPARE FOR JEE MAIN 2025?

1 Smart Study Strategy

Divide the syllabus into manageable sections. Utilize the Heatmap of Chapter Occurrences Across Different Paper Sessions provided in the book to prioritize key topics effectively.

2 Start with part tests

Begin your preparation by attempting the Part Tests based on the 11th and 12th class syllabus.

3 Analyze and Learn from Solutions

After completing each test, carefully analyze the solutions provided in the booklet to understand the correct answers and learn from your mistakes.

4 Gradually Attempt Full Syllabus Tests

Progress to taking the 9 Full Syllabus Tests, to thoroughly analyze your preparation

5 Opt for Final Mock Tests

Use the last few Full Syllabus Tests as final mock exams to simulate the actual JEE exam scenario.

6 Fine-Tune Your Strategy

Adjust your study plan and focus on areas that need improvement based on the provided insights.

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