



JEE ADVANCED



Sri Chaitanya IIT Academy., India.

★ A.P ★ T.S ★ KARNATAKA ★ TAMILNADU ★ MAHARASTRA ★ DELHI ★ RANCHI

A right Choice for the Real Aspirant

ICON Central Office, Madhapur – Hyderabad

Sec: Jr.Super60_STERLING BT

JEE-ADV_2023-P1

Date: 25-08-2024

Time: 09.00Am to 12.00Noon

WTA-10

Max. Marks:180

2021_PAPER-I

**11-08-2024_Jr.Super60_STERLING BT_ Jee-Adv
(2023-P1)_WTA-10_Syllabus**

MATHEMATICS

: Matrices: Types of Matrices and their properties, Algebra of Matrices, Transpose of Matrix, Symmetric & Skew-Symmetric Matrix, Idempotent, Nilpotent & Involuntary matrices, Determinant of a square Matrix (only basics), Adjoint and Inverse of a matrix and its properties, Orthogonal Matrix

PHYSICS

: Center of Mass: Introduction, Center of Mass of a two Particle System, Generalization of the Concept of the Centre of Mass to N-Particle System, Center of mass of a two particle system, Center of mass of Rigid Bodies, Motion of Center of Mass, Momentum Conservation, Miscellaneous Problems

CHEMISTRY

: CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES:
Modern periodic law and the present form of periodic table; electronic configuration of elements, periodic trends in atomic radius, ionic radius, ionization enthalpy, electron gain enthalpy, valence, oxidation states, electronegativity, and chemical reactivity

Name of the Student: _____

H.T. NO:

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JEE-ADVANCE-2023-P1-Model
Time:3Hr's
IMPORTANT INSTRUCTIONS
Max Marks: 180
MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 3)	Questions with Multiple Correct Choice with partial mark	+4	-2	3	12
Sec – II(Q.N : 4 – 7)	Questions with Single Correct Choice	+3	-1	4	12
Sec – III(Q.N : 8 – 13)	Questions with Integer Answer Type	+4	0	6	24
Sec – IV(Q.N : 14 – 17)	Matching Type	+3	-1	4	12
Total				17	60

PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 18 – 20)	Questions with Multiple Correct Choice with partial mark	+4	-2	3	12
Sec – II(Q.N : 21 – 24)	Questions with Single Correct Choice	+3	-1	4	12
Sec – III(Q.N : 25 – 30)	Questions with Integer Answer Type	+4	0	6	24
Sec – IV(Q.N : 31 – 34)	Matching Type	+3	-1	4	12
Total				17	60

CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 35 – 37)	Questions with Multiple Correct Choice with partial mark	+4	-2	3	12
Sec – II(Q.N : 38 – 41)	Questions with Single Correct Choice	+3	-1	4	12
Sec – III(Q.N : 42 – 47)	Questions with Integer Answer Type	+4	0	6	24
Sec – IV(Q.N : 48 – 51)	Matching Type	+3	-1	4	12
Total				17	60

MATHEMATICS
Max Marks: 60
SECTION – I
(ONE OR MORE CORRECT ANSWER TYPE)

 This section contains **THERE (03)** questions.

- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks :+4 ONLY if (all) the correct option(s) is(are) chosen;

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen;

Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct ;

Partial Marks: +1 If two or more options are correct but **ONLY** two options are chosen, and it is a correct option ;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -2 In all other cases.

For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then choosing **ONLY** (A), (B) and (D) will get +4 marks; choosing **ONLY** (A) and (B) will get +2 marks; choosing **ONLY** (A) and (D) will get +2 marks; choosing **ONLY** (B) and (D) will get +2 marks; choosing **ONLY** (A) will get +1 mark; choosing **ONLY** (B) will get +1 mark; choosing **ONLY** (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -2 marks.

01. Let $x \in R$ and Let $P = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 2 \\ 0 & 0 & 3 \end{bmatrix}$, $Q = \begin{bmatrix} 2 & x & x \\ 0 & 4 & 0 \\ x & x & 6 \end{bmatrix}$ and $R = P Q P^{-1}$. Then which of the following

is/are correct?

- A) There exists a real number x such that $PQ = QP$.

B) $\det R = \det \begin{bmatrix} 2 & x & x \\ 0 & 4 & 0 \\ x & x & 6 \end{bmatrix} + 8$, for all $x \in R$.

C) For $x=1$, there exists a unit vector $\alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}$, for which $R \begin{bmatrix} \alpha \\ \beta \\ \gamma \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

D) For $x=0$, if $R \begin{bmatrix} 1 \\ a \\ b \end{bmatrix} = 6 \begin{bmatrix} 1 \\ a \\ b \end{bmatrix}$, then $a+b=5$

02. If A and B are square matrices such that $AB=B$ and $BA=A$. Then which of the following is/are always true?

- A) A is an idempotent matrix. B) B is an involuntary matrix.

C) $A^6 + B^6 = A^8 + B^8$ D) $A^2 + B^2 = A + I$

03. Let $\alpha = \frac{\pi}{5}$ and $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then $B = A + A^2 + A^3 + A^4$ is

- A) Singular

- B) Non-singular

- C) Skew symmetric

D) $|B|=1$



SECTION – II
(SINGLE CORRECT ANSWER TYPE)

This section contains **FOUR (04)** questions.

- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +3 If **ONLY** the correct option is chosen;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases

04. If both $A - \frac{1}{2}I$ and $A + \frac{1}{2}I$ are orthogonal matrices, then
- A) A is orthogonalB) A is skew symmetric of even order
- C) $A^2 = \frac{3}{4}I$ D) None
05. If A and B are symmetric matrices of the same order and $X = AB + BA$ and $Y = AB - BA$, then $(XY)^T$ is equal to
- A) XYB) YXC) -YXD) I
06. If $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & a & 1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1/2 & -1/2 & 1/2 \\ -4 & 3 & c \\ 5/2 & -3/2 & 1/2 \end{bmatrix}$, then the values a and c are equal to
- A) 1, 1B) 1, -1C) 1, 2D) -1, 1
07. Let $A = \begin{bmatrix} 2 & 1 \\ 4 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}$, $C = \begin{bmatrix} 3 & -4 \\ -2 & 3 \end{bmatrix}$, then $\text{tr}(A) + \text{tr}\left(\frac{ABC}{2}\right) + \text{tr}\left(\frac{A(BC)^2}{4}\right) + \text{tr}\left(\frac{A(BC)^3}{8}\right) + \dots + \infty =$
- A) 6B) 9C) 12D) 15

SECTION-III

(NON-NEGATIVE INTEGER.)

This section contains **SIX (06)** questions.

- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme

Full Marks : +4 If **ONLY** the correct integer is entered; **Zero Marks** : 0 In all other cases.

8. Let $A = \begin{bmatrix} a & x & p \\ y & q & b \\ r & c & z \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ where $a, b, c, x, y, z, p, q, r \in R$.
If $\text{tr}(AB + AB^3 + AB^5 + \dots + AB^{19}) = 210$, then $p + q + r = \underline{\hspace{2cm}}$.

9. Let $k \in R, k > 0$ and $A = \begin{bmatrix} 2k-1 & 2\sqrt{k} & 2\sqrt{k} \\ 2\sqrt{k} & 1 & -2k \\ -2\sqrt{k} & 2k & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 2k-1 & \sqrt{k} \\ 1-2k & 0 & 2 \\ -\sqrt{k} & -2\sqrt{k} & 0 \end{bmatrix}$.

If $\det(\text{adj } A) + \det(\text{adj } B) = 10^6$, then $[k]$ is equal to $\underline{\hspace{2cm}}$. ([.] is G.I.F)

**THE PERFECT HAT-TRICK WITH ALL- INDIA RANK 1
IN JEE MAIN 2023 JEE ADVANCED 2023 AND NEET 2023**

**JEE MAIN
2023**
SINGARAJU
VENKAT KOUNDRINA
SRI CHAITANYA
BSC 12th Class
**310
300**



**JEE Advanced
2023**
VAVILALA
CHIOVILAS REDDY
SRI CHAITANYA
BSC 12th Class
**341
360**



**NEET
2023**
BORA VARUN
CHAKRAVARTHI
SRI CHAITANYA
BSC 12th Class
**720
720**



10. Let $A = \begin{bmatrix} 1 & -1 \\ 4 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 \\ 2 & -2 \end{bmatrix}$. X, Y are two matrices such that $XA = B$ and $AY = B$, then $|3(X + Y)| = \underline{\hspace{2cm}}$.

11. Let β be a real number. Let $A = \begin{bmatrix} \beta & 0 & 1 \\ 2 & 1 & -2 \\ 3 & 1 & -2 \end{bmatrix}$. If $A^7 - (\beta - 1)A^6 - \beta A^5$ is a singular matrix, then $9\beta = \underline{\hspace{2cm}}$.

12. If trace of a 2×2 matrix A is 3 and $tr(A^3) = -18$, then $|A| = \underline{\hspace{2cm}}$.

13. If the product of n matrices $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} \dots \begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 378 \\ 0 & 1 \end{bmatrix}$, then the value of n is _____.

SECTION – IV (MATCHING TYPE)

This section contains **FOUR (04)** Matching List Sets.

- Each set has **ONE** Multiple Choice Question.
- Each set has **TWO** lists : **List-I** and **List-II**.
- **List-I** has **Four** entries (I), (II), (III) and (IV) and **List-II** has **Five** entries (P), (Q), (R), (S) and (T).
- **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks: +3 ONLY if the option corresponding to the correct combination is chosen;

Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks: -1 In all other cases.

14. Let $A = \begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$

	COLUMN-I		COLUMN-II
A)	A^{-1}	P)	$\begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$
B)	$(adjA)^{-1}$	Q)	$2 \begin{bmatrix} 1 & -\tan x \\ \tan x & 1 \end{bmatrix}$
C)	$adj(adjA)$	R)	$\frac{1}{2} \begin{bmatrix} 1 + \cos 2x & -\sin 2x \\ \sin 2x & 1 + \cos 2x \end{bmatrix}$
D)	$adj(2A)$	S)	$\frac{1}{2} \begin{bmatrix} 1 + \cos 2x & \sin 2x \\ -\sin 2x & 1 + \cos 2x \end{bmatrix}$

Then the correct option is

- | | |
|-----------------------|-----------------------|
| A) A-R; B-S; C-P; D-Q | B) A-R; B-P; C-Q; D-S |
| B) A-S; B-P; C-Q; D-P | D) A-R; B-P; C-S; D-Q |

15.

	COLUMN-I		COLUMN-II
A	A is a square matrix such that $A^2 = A$. If $(I + A)^8 = I + \lambda A$, then $\lambda + 1$ is	P	64
B	If A is a square matrix of order 3 such that $ A =2$, then $\left \left(\text{adj} A^{-1} \right)^{-1} \right $ is	Q	1
C	Let $A = [a_{ij}]_{3 \times 3} \neq O$. Each element a_{ij} is multiplied by λ^{i-j} . Let $ B $ is the resulting determinant where $ A =k B $, then k is	R	256
D	A is a diagonal matrix of order 3×3 is cumulative with every square matrix of 3×3 under multiplication and $\text{tr}(A)=12$, then $ A = \underline{\hspace{2cm}}$.	S	4

Then the correct option is

- A) A-R; B-Q; C-S; D-P B) A-R; B-S; C-P; D-Q
 B) A-R; B-S; C-Q; D-P D) A-S; B-R; C-Q; D-P

16. α, β are the maximum and minimum values of $f(x) = (2 + \sin 2x) \begin{vmatrix} 1 & \cos^2 x & \sin 2x \\ 0 & \cos^2 x & \sin^2 x \\ 0 & -1 & 1 \end{vmatrix}$, then

	COLUMN-I		COLUMN-II
A)	$\alpha + \beta^{87} =$	P)	6
B)	$\alpha^2 - 3\beta^{11} =$	Q)	2
C)	$f\left(\frac{\pi}{4}\right) =$	R)	4
D)	$f\left(\frac{\pi}{2}\right) =$	S)	3

Then the correct option is

- A) A-Q; B-S; C-P; D-R B) A-R; B-P; C-Q; D-S
 B) A-P; B-R; C-S; D-Q D) A-R; B-P; C-S; D-Q

17.

	COLUMN-I		COLUMN-II
A)	$(I - A)^n$ is $\underline{\hspace{2cm}}$, If A is Idempotent.	P)	$2^{n-1}(I - A)$
B)	$(I - A)^n$ is $\underline{\hspace{2cm}}$, If A is involutory.	Q)	$I - nA$
C)	$(I - A)^n$ is $\underline{\hspace{2cm}}$, If A is nilpotent of index 2.	R)	A
D)	If A is orthogonal, then $(A^T)^{-1} =$ $\underline{\hspace{2cm}}$	S)	$I - A$

Then the correct option is

- A) A-P; B-S; C-Q; D-R B) A-S; B-P; C-Q; D-R
 B) A-S; B-P; C-R; D-Q D) A-Q; B-P; C-S; D-R



PHYSICS**Max Marks: 60**

SECTION – I
(ONE OR MORE CORRECT ANSWER TYPE)

This section contains **THERE (03)** questions.

- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks :+4 ONLY if (all) the correct option(s) is(are) chosen;

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen;

Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct ;

Partial Marks: +1 If two or more options are correct but **ONLY** two options are chosen, and it is a correct option ;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

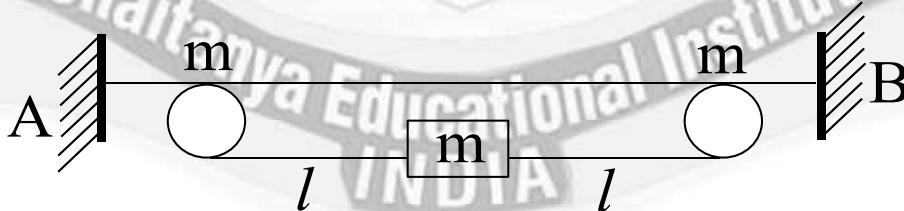
Negative Marks : -2 In all other cases.

For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then choosing **ONLY** (A), (B) and (D) will get +4 marks; choosing **ONLY** (A) and (B) will get +2 marks; choosing **ONLY** (A) and (D) will get +2 marks; choosing **ONLY** (B) and (D) will get +2 marks; choosing **ONLY** (A) will get +1 mark; choosing **ONLY** (B) will get +1 mark; choosing **ONLY** (D) will get +1 mark; choosing **no option** (i.e. the question is unanswered) will get 0 marks; and choosing **any other combination of options** will get -2 marks.

18. Two particles having equal masses are projected simultaneously from the roof of the tower of height 20m with same speed 20m/s, one horizontally and other vertically upwards. Select the correct alternative(s). ($g = 10 \text{ m/s}^2$)

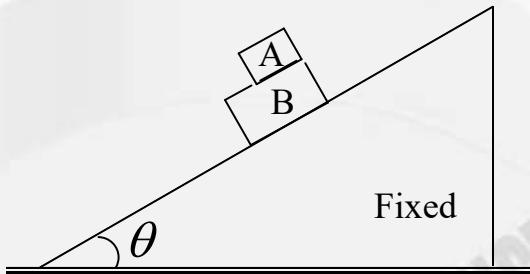
- A) The acceleration of centre of mass is $\frac{g}{2}$ downwards
- B) The acceleration of centre of mass is g downwards
- C) Maximum height of centre of mass from the ground is 25m
- D) Maximum height of centre of mass from the ground is 40m

19. Two small rings, each of mass ' m ', are connected to the block of same mass ' m ' through an extensible massless string of length ' l '. Rings are constrained to move over smooth rod AB . Initially, the system is held at rest as shown in figure, Let u and v be the velocities of ring and block, respectively when string makes an angle 60° with the vertical then



$$\text{A) } u = \sqrt{\frac{gl}{5}} \quad \text{B) } u = \sqrt{\frac{8gl}{5}} \quad \text{C) } v = \sqrt{3gl} \quad \text{D) } v = \sqrt{\frac{3gl}{5}}$$

20. A block A slides over another block which is placed over a smooth inclined plane as shown in figure. The coefficient of friction between the two blocks A and B is μ . Mass of block B is twice the mass of block A. The acceleration of the centre of mass of two block is/are not equal to



- A) $\frac{g \sin \theta - \mu g \cos \theta}{3}$ B) $\frac{2g \sin \theta - \mu g \cos \theta}{3}$ C) $\frac{g \sin \theta}{3}$ D) $g \sin \theta$

SECTION – II
(SINGLE CORRECT ANSWER TYPE)

This section contains **FOUR (04)** questions.

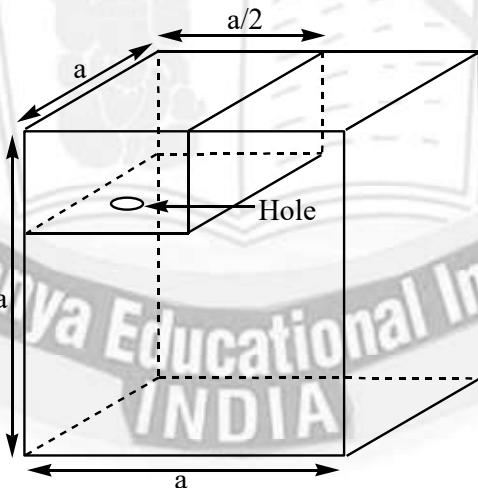
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
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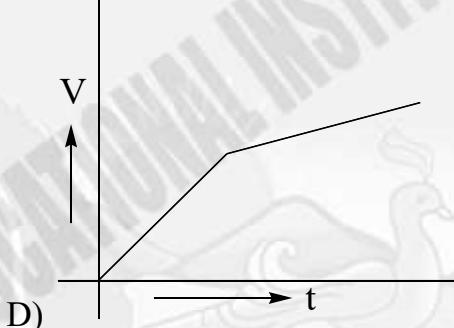
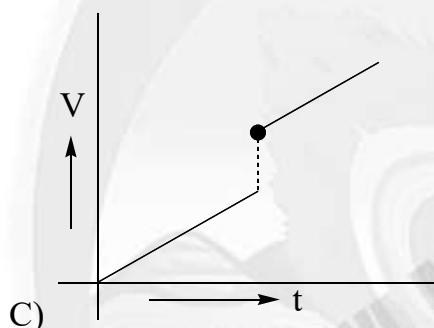
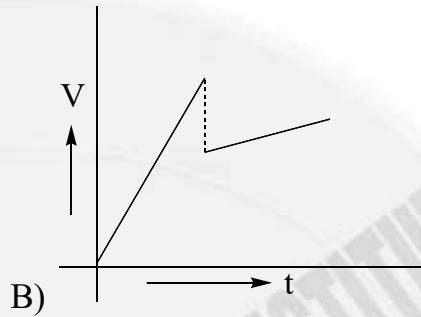
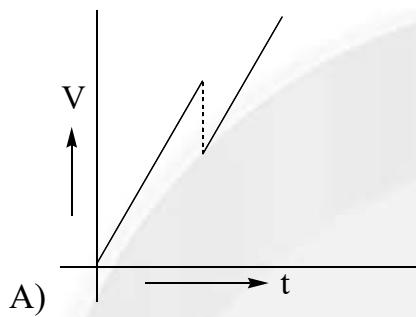
Negative Marks : -1 In all other cases

21. Figure shows a hollow cube of side ' a ' and volume ' V '. There is a small chamber of volume $V/4$ as shown. The chamber is filled with m Kg of water. Water leaks through a hole H and spreads in the whole cube. Then the work done by gravity in this process assuming that the complete water finally lies at the bottom of the cube is

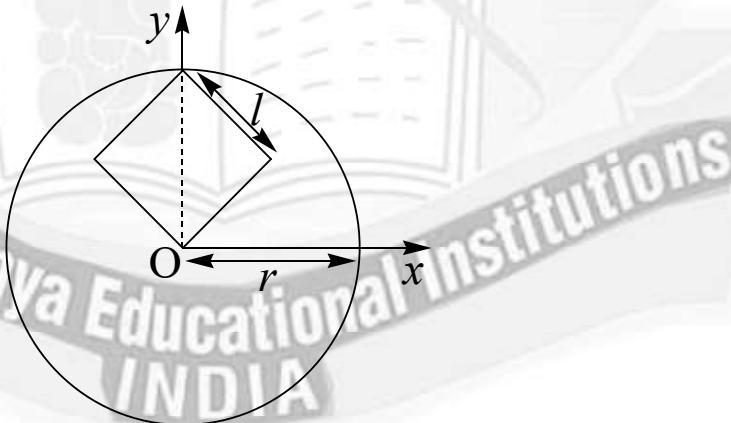


- A) $\frac{1}{2}mga$ B) $\frac{3}{8}mga$ C) $\frac{5}{8}mga$ D) $\frac{1}{8}mga$

22. Two balls of the same mass are released simultaneously from height h and $2h$ from the ground level. The balls collide with the floor and sticks to it. Then the velocity-time graph of centre of mass of the two balls is best represented by



23. A disc (of radius r cm) of uniform thickness and uniform density ρ has a square hole with sides of length $l = \frac{r}{\sqrt{2}} \text{ cm}$. One corner of the hole is located at the centre of the disc and centre of the hole lies on y -axis as shown. Then the y -coordinate position of centre of mass of disc with hole (in cm) is



$$\text{A) } -\frac{r}{2\left(\pi - \frac{1}{4}\right)} \quad \text{B) } -\frac{r}{4\left(\pi - \frac{1}{4}\right)} \quad \text{C) } -\frac{r}{4\left(\pi - \frac{1}{2}\right)} \quad \text{D) } -\frac{3r}{4\left(\pi - \frac{1}{4}\right)}$$

24. A shell of mass $2m$ fired with a speed u at an angle θ to the horizontal explodes at the highest point of its trajectory into two fragments of mass m each. If one fragment falls vertically, the distance at which other fragment falls from the gun is given by:

A) $\frac{u^2 \sin 2\theta}{g}$ B) $\frac{3u^2 \sin 2\theta}{2g}$ C) $\frac{2u^2 \sin 2\theta}{g}$ D) $\frac{3u^2 \sin 2\theta}{g}$

SECTION-III

(NON-NEGATIVE INTEGER.)

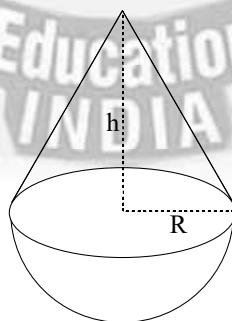
This section contains **SIX (06)** questions.

- The answer to each question is a **NON-NEGATIVE INTEGER**.
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Full Marks : +4 If ONLY the correct integer is entered; Zero Marks : 0 In all other cases..

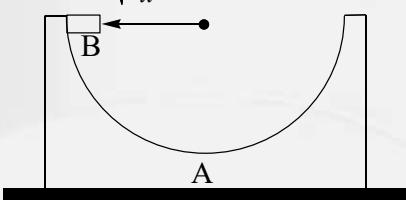
25. A block of mass $m_1 = 2Kg$ slides on a frictionless table with speed of 10m/s . In front of it, another block of mass $m_2 = 5Kg$ is moving with speed 3m/s in the same direction. A massless spring of spring constant $k = 1120\text{N/m}$ is attached on the backside of m_2 as shown. The maximum compression of the spring in cm when the blocks collide is ____ cm.



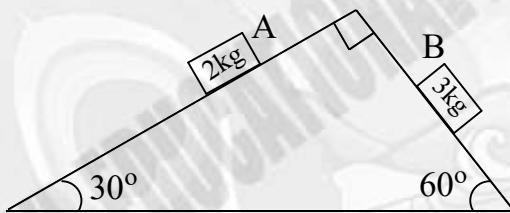
26. The mass per unit length of a non-uniform rod of length L varies as $m = m_o \frac{x^2}{L}$, where m_o is a constant and x is the distance of any point on the rod measured from one end. The centre of mass of the rod is at $\frac{nL}{4}$. Find n .
27. A uniform solid right circular cone of base radius R is joined to a uniform solid hemisphere of radius R and of same density, so as to have a common face. The centre of mass of the composite solid lies on the common face. The height of the cone is $\sqrt{n}R$. The value of n is ____.



28. Figure shows a block A of mass 6m having smooth semicircular groove of radius a placed in a smooth horizontal surface. A block B of mass m is released from a position in groove where its radius is horizontal. The speed of bigger block when smaller block reaches its bottommost position is $\sqrt{\frac{ga}{x}}$. Find x.



29. Figure shows a fixed wedge on which two blocks of masses 2Kg and 3Kg are placed on its smooth inclined surfaces. When the two blocks are released from the rest, the acceleration of centre of mass of two blocks is $\frac{g\sqrt{n}}{10}$. Find n.



30. A circular plate of uniform thickness has a diameter 56cm. A circular portion of diameter 42cm is removed from the right edge of the plate with centres for both lying on the same line. The position of the centre of mass of the remaining portion is ____ cm to the left of the origin.

SECTION – IV (MATCHING TYPE)

This section contains **FOUR (04)** Matching List Sets.

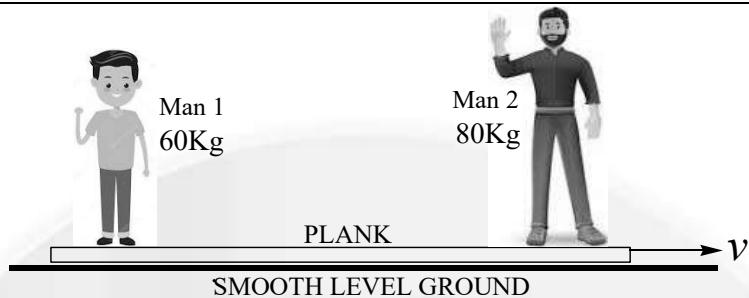
- Each set has **ONE** Multiple Choice Question.
- Each set has **TWO** lists : **List-I** and **List-II**.
- **List-I** has **Four** entries (I), (II), (III) and (IV) and **List-II** has **Five** entries (P), (Q), (R), (S) and (T).
- **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks:+3 ONLY if the option corresponding to the correct combination is chosen;

Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks: -1 In all other cases.

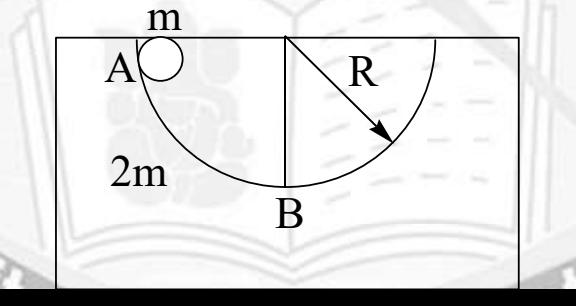
31. Two men of mass 60Kg and 80Kg stand on a plank of mass 20Kg. Both of them can jump with a velocity of 1m/s relative to the plank. In each event shown in Column-I, Find the velocity of plank after the event.



	COLUMN-I		COLUMN-II
i)	Man '1' alone jumps to the left	a)	$-\frac{17}{40} m/s$
ii)	Man '2' alone jumps to the right	b)	$-\frac{1}{2} m/s$
iii)	Man '1' jumps to the left and Man '2' jumps to the right simultaneously	c)	$\frac{3}{8} m/s$
iv)	Man '1' jumps to the left and after that Man '2' jumps to the right	d)	$-\frac{1}{8} m/s$

- A) (i - b); (ii - a); (iii - c); (iv - d) B) (i - c); (ii - b); (iii - d); (iv - a)
 C) (i - b); (ii - c); (iii - d); (iv - b) D) (i - d); (ii - c); (iii - b); (iv - a)

32. In the system shown in figure, mass m is released from position A. Suppose potential of m at point A with respect to point B is E. Size of m is 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 $2m$	Q.	$\frac{2E}{3}$



C.	Momentum of m	R.	$\sqrt{\frac{4}{3}mE}$
D.	Momentum of $2m$	S.	$\sqrt{\frac{2}{3}mE}$

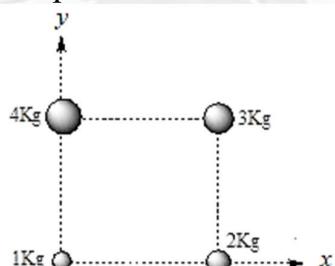
- A) (A-Q); (B-P); (C-R); (D-R)
 B) (A-P); (B-Q); (C-R); (D-S)
 C) (A-Q); (B-P); (C-R); (D-S)
 D) (A-P); (B-Q); (C-S); (D-R)

33. A particle of mass 1Kg has velocity $\vec{v}_1 = (2t)\hat{i}$ and another particle of mass 2Kg has velocity $\vec{v}_2 = (t^2)\hat{j}$. Match the quantities in Column-I at $t = 2s$ to their respective values in Column-II.

	COLUMN-I		COLUMN-II
A.	Magnitude of net force on centre of mass	P.	$\frac{20}{9}\text{units}$
B.	Magnitude of momentum of centre of mass	Q.	$\sqrt{68}\text{units}$
C.	Magnitude of velocity of centre of mass	R.	$\frac{\sqrt{80}}{3}\text{units}$
D.	Distance of centre of mass from origin	S.	$\sqrt{80}\text{units}$

- A) (A-Q); (B-P); (C-S); (D-R)
 B) (A-P); (B-Q); (C-S); (D-R)
 C) (A-Q); (B-S); (C-R); (D-P)
 D) (A-P); (B-S); (C-Q); (D-R)

34. Four point masses are placed at four corners of a square of side 4m as shown. Match the quantities in column-I to their respective values in Column-II.



	COLUMN-I		COLUMN-II
A.	x co-ordinate of centre of mass of 4Kg and 2Kg	P.	$\frac{7}{2}m$
B.	x co-ordinate of centre of mass of 4Kg, 2Kg and 3Kg	Q.	$\frac{4}{3}m$
C.	y co-ordinate of centre of mass of 1Kg, 4Kg and 3Kg	R.	3m
D.	y co-ordinate of centre of mass of 1Kg and 3Kg	S.	$\frac{20}{9}m$

- A) (A-Q); (B-P); (C-R); (D-S)
 B) (A-Q); (B-S); (C-P); (D-R)
 C) (A-S); (B-P); (C-R); (D-Q)
 D) (A-P); (B-Q); (C-S); (D-R)



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MCA
Sri Chaitanya
BSC 12th Class
300
300 RANKJEE Advanced
2023VAVILALA
CHIOWILAS REDDY
MCA
Sri Chaitanya
BSC 12th Class
341
360 RANKNEET
2023BORA VARUN
CHAKRavarthi
MCA
Sri Chaitanya
BSC 12th Class
720
720 RANK

CHEMISTRY**Max Marks: 60**

SECTION – I
(ONE OR MORE CORRECT ANSWER TYPE)

This section contains **THERE (03)** questions.

- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks :+4 ONLY if (all) the correct option(s) is(are) chosen;

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen;

Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct ;

Partial Marks: +1 If two or more options are correct but **ONLY** two options are chosen, and it is a correct option ;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -2 In all other cases.

For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then choosing **ONLY** (A), (B) and (D) will get +4 marks; choosing **ONLY** (A) and (B) will get +2 marks; choosing **ONLY** (A) and (D) will get +2 marks; choosing **ONLY** (B) and (D) will get +2 marks; choosing **ONLY** (A) will get +1 mark; choosing **ONLY** (B) will get +1 mark; choosing **ONLY** (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -2 marks.

35. The sum of IE_1 and IE_2 , IE_3 and IE_4 for elements A and B are given below:

	$IE_1 + IE_2$	$IE_3 + IE_4$
A	2.45	8.82
B	2.85	6.11

Then according to the given information the correct statements is/are

- A) A^{2+} is more stable than B^{2+} B) A^{2+} is less stable than B^{2+}
 C) A^{4+} is more stable than B^{4+} D) A^{4+} is less stable than B^{4+}

36. There are three elements A , B and C their atomic number are z_1 , z_2 and z_3 respectively.

If $z_1 - z_3 = 2$ and $\frac{z_1 + z_2}{2} = z_3 - 2$ and the electronic configuration of element A is $[Ar]3d^64s^2$,

then the correct order of magnetic moment is/are

- A) $B^+ > A^{2+} > C^{2+}$ B) $A^{3+} > B^{2+} > C$ C) $B > A > C^{2+}$ D) $B = A^{3+} > C^{3+}$

37. Assign the position of the element having outer electronic configuration

- (a) ns^2np^2 ($n=6$) (b) $(n-1)d^2ns^2$ ($n=4$) (c) $(n-2)f^7(n-1)d^1ns^2$ ($n=6$)

Which of the following statements is/are correct

- A) The element “a” belong 3rd period and 16th group
 B) The element “b” belong 4th period and 4th group
 C) The element “c” belong 6th period and 3rd group and is lanthanidic element
 D) All a, b, c are metals

SECTION – II
(SINGLE CORRECT ANSWER TYPE)

This section contains **FOUR (04)** questions.

- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +3 If **ONLY** the correct option is chosen;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases

38. $\frac{N_o}{2}$ atoms of $X(g)$ are converted into $X^-(g)$ by absorbing E_1 energy. $2N_o$ atoms of $X(g)$ are converted into $X^-(g)$ by releasing E_2 energy. Calculate the ionisation enthalpy and electron gain enthalpy of $X(g)$ per atom.

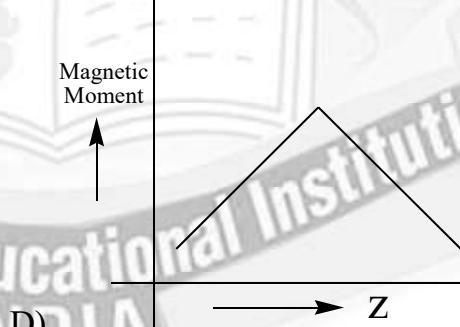
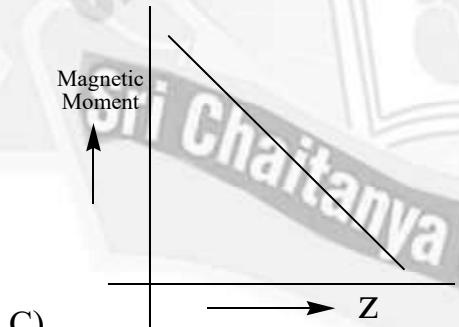
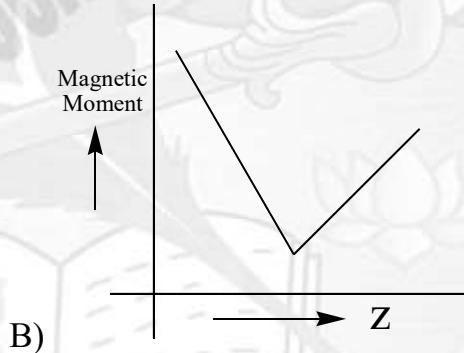
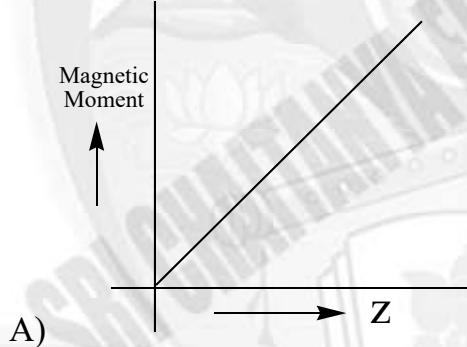
A) $IE = \frac{2E_1}{N_o}; \Delta_{eg}H = \frac{-E_2}{2N_o}$

B) $IE = \frac{-E_2}{2N_o}; \Delta_{eg}H = \frac{2E_1}{N_o}$

C) $IE = \frac{E_1}{2N_o}; \Delta_{eg}H = \frac{-E_2}{2N_o}$

D) $IE = \frac{N_o}{2E_1}; \Delta_{eg}H = \frac{-2N_o}{E_2}$

39. Which of the following graph is correct representation between atomic number (z) and magnetic moment of d-block elements [outer configuration $(n-1)d^{10}ns^{1or2}$] ?



40. If the ionization enthalpy and electron gain enthalpy of an element are 275 and 86 Kcal/mole respectively, then the electro-negativity of the element on the Pauling scale is

A) 2.8

B) 0

C) 4

D) 2.6



41. In which of the following arrangements, the order is not correct according to the property indicated against it.
- A) Electron Affinity – $Cl > S > O > N$ B) Increasing size $Al^{3+} < Mg^{2+} < Na^+ < F^-$
- C) Increasing EA₁ – $I < Br < F < Cl$ D) Increasing IE₁ – $B < C < N < O$

SECTION-III

(NON-NEGATIVE INTEGER.)

This section contains **SIX (06)** questions.

- The answer to each question is a **NON-NEGATIVE INTEGER**.
 - For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
 - Answer to each question will be evaluated according to the following marking scheme
- Full Marks : +4 If ONLY the correct integer is entered; Zero Marks : 0 In all other cases.

42. The number of electron for Zn^{2+} cation that have the value of azimuthal quantum number (l)=0 is _____.
43. Total number of elements which have only single oxidation state (other than zero) in their corresponding stable compounds :
Cs, Ba, F, Zn, Al, Be, Sr, Ga, Pb
44. A element ‘X’ has its electronic configuration of ‘k’ shell is $(n-5)s^2$ and it has total number of electrons in its outermost, penultimate and antipenultimate shells are 2, 8 and 25 respectively. Then find out total number of unpaired electrons in element ‘X’ in their ground state.
45. Find out total number of representative element in the given elements :
Cd, Nb, Ta, Te, Ra, Mo, Po, Pd, Tc
46. The values of IE₁, IE₂, IE₃, IE₄ and IE₅ are 7.4, 15.2, 34.5, 50.1 and 165.2 eV respectively. Number of valence electrons in that element is _____.
47. Atomic number of Ag is 47. In the same group, the atomic numbers of elements placed above and below Ag in periodic table will be x and y. Give the value of $\frac{(x+y)}{12}$

SECTION – IV

(MATCHING TYPE)

This section contains **FOUR (04)** Matching List Sets.

- Each set has **ONE** Multiple Choice Question.
- Each set has **TWO** lists : **List-I** and **List-II**.
- **List-I** has **Four** entries (I), (II), (III) and (IV) and **List-II** has **Five** entries (P), (Q), (R), (S) and (T).
- **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.

- Answer to each question will be evaluated according to the following marking scheme :

Full Marks: +3 **ONLY** if the option corresponding to the correct combination is chosen;

Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks: -1 In all other cases..

48.

	COLUMN-I		COLUMN-II
A)	$IE_1=2372$, $IE_2=5251$	P)	More reactive metal
B)	$IE_1=520$, $IE_2=7300$	Q)	Reactive non-metal
C)	$IE_1=900$, $IE_2=1760$	R)	Noble gas
D)	$IE_1=1680$, $IE_2=3380$	S)	Metal forms a stable binary halides of the formula AX_2
		T)	Exhibit +2 electrovalency

- A) A-R; B-P; C-Q; D-S
 C) A-R; B-P; C-S,T; D-Q

- B) A-P; B-R; C-S,T, D-Q
 D) A-S; B-Q; C-P; D-R

49.

	COLUMN-I		COLUMN-II
A)	$1s^2 2s^2 2p^6 3s^2 3p^1$	P)	Largest IE_1
B)	$1s^2 2s^2 2p^6 3s^2 3p^5$	Q)	Largest IE_4
C)	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$	R)	Largest IE_3
D)	$1s^2 2s^2 2p^6 3s^2 3p^6$	S)	Lowest IE_1
		T)	Largest IE_2

- A) A-Q; B-R; C-S,T; D-P
 C) A-P; B-S; C-Q; D-T

- B) A-R; B-Q; C-P; D-S,T
 D) A-Q; B-P; C-S,T; D-R

50.

	COLUMN-I (Atomic number)		COLUMN-II
A)	53	P)	d-block
B)	55	Q)	p-block
C)	57	R)	f-block
D)	62	S)	s-block

- A) A-P; B-Q; C-R; D-S
 C) A-Q; B-P; C-R; D-S

- B) A-Q; B-S; C-P; D-R
 D) A-P; B-R; C-Q; D-S

51.

	COLUMN-I (consider elements of 4 th period)		COLUMN-II
P)	Number of elements which has ns^1 configuration	A)	4
Q)	$(n+l)$ for last electron of last element	B)	5
R)	Maximum unpaired electron in any of the element	C)	6
S)	$(n+l)$ for outermost electron of 1 st element	D)	3

- A) P-D; Q-B; R-C; S-A
 B) P-B; Q-D; R-C; D-A

- B) P-D; Q-C; R-B; S-A
 D) P-A; Q-B; R-C; S-D



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