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	**WTA-12**	**Date: 08-09-2024**
Time: 09:00AM to 12:00PM	**JEE-ADV_(2021-P1)**	**Max. Marks: 180**

2021_PAPER-I

08-09-2024_Jr.Super60_STERLING BT_ Jee-Adv (2021-P1)_WTA-12_Syllabus

PHYSICS : Collisions: Elastic Collision In two Dimensions, Perfectly Inelastic Collision, The Ballistic Pendulum, Impulsive Tensions, COM Reference, Variable Mass System, Conservation of Linear Momentum, COM frame

CHEMISTRY : Molecular orbital theory(MOT), MOT, Bond parameters,Resonance structures, Calculation of bond order for molecules showing resonance, Dipole moments (μ), Hydrogen bonding,3-center-2-electron bond, Metallic bonding (Basic idea), HYDROGEN AND ITS COMPOUNDS:
Position of hydrogen in periodic table, occurrence, isotopes,preparations of hydrogen,

MATHEMATICS : 2-D GEOMETRY: Distance Formula, Section formula, Harmonic conjugates, Locus(Simple problems),Finding various Centres with given vertices of a triangle, Area of Triangle, Collinearity of Points, TRANSFORMATION OF AXES

Name of the Student: _____ **H.T. NO:** | | | | | | | |

JEE-ADVANCE-2021-P1-Model

Time:3Hr's **IMPORTANT INSTRUCTIONS** **Max Marks: 180**

PHYSICS:

Section	Question Type	+Ve Mark	- Ve Mark	No.of Qs	Total marks
Sec – I(Q.N : 1 – 4)	Questions with Single Correct Choice	+3	-1	4	12
Sec – II(Q.N : 5 – 10)	Paragraph Questions with Numerical Value Answer Type	+2	0	6	12
Sec – III(Q.N : 11 – 16)	Questions with Multiple Correct Choice with partial mark	+4	-2	6	24
Sec – IV(Q.N : 17 – 19)	Questions with Non-negative Integer Value Type	+4	0	3	12
Total				**19**	**60**

CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 20 – 23)	Questions with Single Correct Choice	+3	-1	4	12
Sec – II(Q.N : 24 – 29)	Paragraph Questions with Numerical Value Answer Type	+2	0	6	12
Sec – III(Q.N : 30 – 35)	Questions with Multiple Correct Choice with partial mark	+4	-2	6	24
Sec – IV(Q.N : 36– 38)	Questions with Non-negative Integer Value Type	+4	0	3	12
Total				**19**	**60**

MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 39 – 42)	Questions with Single Correct Choice	+3	-1	4	12
Sec – II(Q.N : 43 – 48)	Paragraph Questions with Numerical Value Answer Type	+2	0	6	12
Sec – III(Q.N : 49 – 54)	Questions with Multiple Correct Choice with partial mark	+4	-2	6	24
Sec – IV(Q.N : 55 – 57)	Questions with Non-negative Integer Value Type	+4	0	3	12
Total				**19**	**60**

PHYSICS **Max Marks: 60**

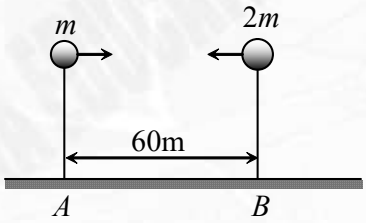
SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 4 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONLY ONE option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and –1 in all other cases. Section 1 (Max Marks: 12)

- Section 1 contains Four questions
- Each Question has Four Options and Only One of these four will be the correct answer.
- For each question, choose the option corresponding to the correct answer
- The Marking scheme to evaluate Answer to each question will be :
- Full Marks: **+3** (If the answer is correct)
- Zero Marks: **0** (If the question is unanswered)
- Negative Marks: -1 (In all other cases)

1. Two particles one of mass m and the other of mass $2m$ are projected horizontally towards each other from the same level above the ground with velocities 10 m/s and 5 m/s respectively. They collide in air and stick to each other. The distance from A, where the combined mass finally land is $(g = 10m/s^2)$



A) 40 m B) 20 m C) 30 m D) 45 m

2. A body of mass m makes an elastic collision with another identical body at rest. Just after collision the angle between the velocity vector of one body with the initial line of motion is 15° then the angle between velocity vector of the other body with the initial line of motion is

A) 75^0 B)60^0 C) 45^0 D) 30^0

3. A ball of mass m falls vertically from a height h and collides with a block of equal mass moving horizontally with velocity v on a smooth surface. The co-efficient of kinetic friction between the block and ball is 0.2 and co-efficient of restitution is 0.5. The difference in velocity of block before and after collision, is

A) $0.1\sqrt{2gh}$ B) $0.2\sqrt{2gh}$ C) $0.3\sqrt{2gh}$ D) $0.4\sqrt{2gh}$

4. A pendulum consists of a wooden bob of mass m and length l. A bullet of mass m_1 is fired towards the pendulum with a speed v_1. The bullet emerges out of the bob with a speed $v_1/3$ and the bob just completes motion along a vertical circle. Then v_1 is

A) $\left(\frac{m}{m_1}\right)\sqrt{5gl}$ B) $\frac{3}{2}\left(\frac{m}{m_1}\right)\sqrt{5gl}$ C) $\frac{2}{3}\left(\frac{m_1}{m}\right)\sqrt{5gl}$ D) $\left(\frac{m_1}{m}\right)\sqrt{gl}$

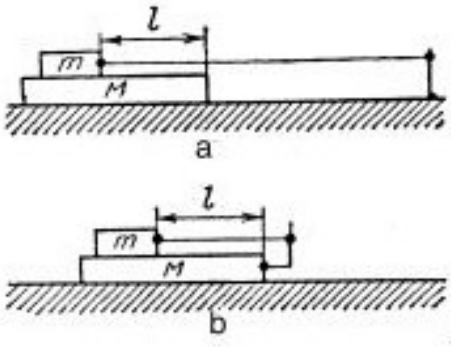
SECTION-II
(PARAGRAPH WITH NUMERICAL VALUE TYPE)

- This section contains **THREE (03)** questions stems.
- There are **TWO (02)** questions corresponding to each question stem.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value corresponding to the answer in the designated place using the mouse and the on-screen virtual numeric keypad.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks:* +2** If ONLY the correct numerical value is entered at the designated place;
- **Zero Marks:0** in all other cases

Question Stem for Question Nos. 5 and 6

Question Stem

A long bar with the mass $M = 1kg$ is placed on a smooth horizontal surface of a table where it can move frictionless. A carriage equipped with a motor can slide along the upper horizontal panel of the bar, the mass of the carriage is $m = 0.1kg$. The friction coefficient of the carriage is $\mu = 0.02$. The motor is winding a thread around a shaft at a constant speed $v_0 = 0.1m/s$. The other end of the thread is tied up to a rather distant stationary support in one case (Fig.1, a), Whereas in the other case it is attached to a picket at the edge of the bar (Fig.1, b). While holding the bar fixed one allows the carriage to start moving at the velocity V_0 then the bar is let loose.



By the moment the bar is released the front edge of the carriage is at the distance $l = 0.5m$ from the edge of the bar in both figures. $(g = 10m/s^2)$

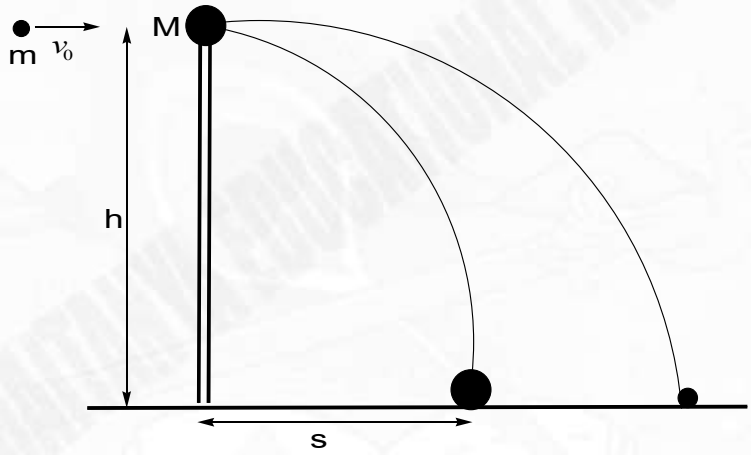
5. In figure a, after what time (in sec) friction between the carriage and bar will ceases to act ?

6. In figure b, find time (in sec) taken by carriage to reach the front edge of the bar ?

Question Stem for Question Nos. 7 and 8

Question Stem

A small ball with mass M=0.2 kg rests on a vertical column with length h=5m. A bullet with mass m=0.01kg, moving with velocity ν_0=500m/s, passes horizontally through the carrier of the ball. The ball reaches the ground at a distance s=20 m. Neglect resistance of the air. Assume that g=10m/s^2.



7. Where does the bullet reach from the base of the vertical column (In meters)?
8. Find heat produced in the collision (In joules)?

Question Stem for Question Nos. 9 and 10

Question Stem

20 people, each has mass 50 kg are standing on a cart, resting on a Friction less horizontal ground. The mass of the cart is 2000 kg. Initially, the cart is stationary. Then, the people jump off from the back of the cart in horizontal direction with velocity '*v*' relative to *the cart*. What is the final velocity (m/s) of the cart if……. (Given $\nu = 30m/s, \left[\frac{1}{60}+\frac{1}{59}+\frac{1}{58}+\cdots\cdots\cdots+\frac{1}{41}\simeq 0.4\right]$

9. 20 people jump off simultaneously?

10. One jump off after the other?

SECTION-III
(ONE OR MORE CORRECT ANSWER TYPE)

- This section contains **SIX (06)** 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*** If only (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** one option is chosen and it is a correct option;
- ***Zero Marks: 0*** If 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 the correct answer, then

Choosing ONLY (A), (B) and (D) will get +4 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(s) (i.e. the question is unanswered) will get 0 marks and

Choosing any other option(s) will get -2 marks.

11. A ball of mass m moving horizontally at a speed v_0 collides with the bob of a simple pendulum at rest. The mass of the bob is also m.

A) If the collision is perfectly inelastic, the height to which the two balls rise after the collision is $\frac{v^2}{8g}$.

B) If the collision is perfectly inelastic, the kinetic energy of the system immediately after the collision becomes half of that before collision.

C) If the collision is perfectly elastic, the bob of the pendulum will rise to a height Of $\frac{v^2}{2g}$.

D) If the collision is perfectly elastic, the kinetic energy of the system immediately after the collision is equal to that before collision.

12. Velocity of a particle of mass 2 kg changes from $\vec{v}_1 = -2\hat{i} - 2\hat{j}\ m/s$ to $\vec{v}_2 = (\hat{i} - \hat{j})m/s$ after colliding with a plane surface $(g = 10 m/s^2)$

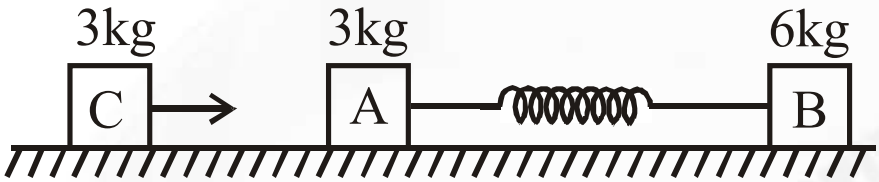
A) the angle made by the plane surface with the positive x–axis is $90^\circ + \tan^{-1}\left(\frac{1}{3}\right)$

B) the angle made by the plane surface with the positive x–axis is $\tan^{-1}\left(\frac{1}{3}\right)$

C) the direction of change in momentum makes an angle $\tan^{-1}\left(\frac{1}{3}\right)$ with the +ve x–axis

D) the direction of change in momentum makes an angle $90^\circ + \tan^{-1}\left(\frac{1}{3}\right)$ with the plane surface.

13. Initially spring connecting A and B are elongated by a distance of 3 cm and placed on smooth horizontal surface. When spring is in its natural length (block A moving right and block B is moving left) block C moving towards A with speed 0.4 m/s (towards right) collides and get stuck with it.



Spring constant $K = 200\frac{N}{m}$

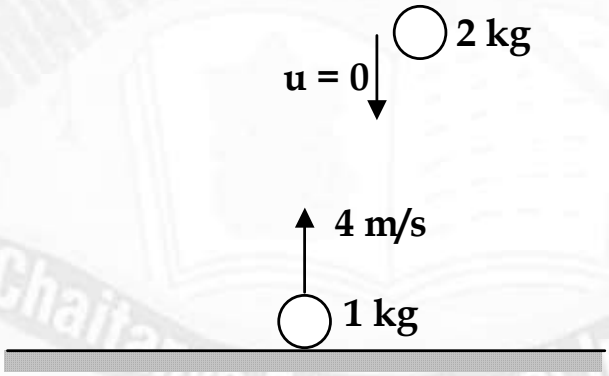
A) Velocity of B before collision is 0.1 m/s

B) Velocity of center of mass of whole system after colliding (m/s) is 0.2 m/s

C) Velocity of center of mass of whole system after colliding (m/s) is 0.1 m/s

D) Loss of energy during collision is 0.05 J.

14. A ball of mass 1 kg is thrown up with an initial speed of 4 m/s. A second ball of mass 2 kg is released from rest from some height as shown in the figure.



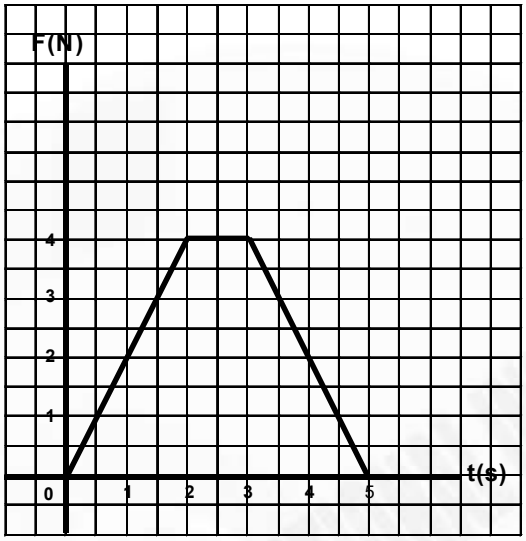
A) The centre of mass of the two balls comes down with acceleration g /3.

B) The centre of mass first moves up and then comes down

C) The acceleration of the centre of mass is g downwards

D) The centre of mass of the two balls remains stationary.

15. The force F_x acting on a 2.0 kg particle varies in time as shown in figure. Choose correct alternatives.



A) The impulse of the force is $12.0 kgms^{-1}$.

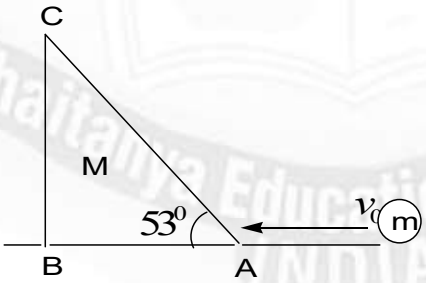
B) The final velocity is $8ms^{-1}$ of the particle if it is initially at rest.

C) Its final velocity is $8ms^{-1}$ if it is initially moving along the x-axis with a velocity Of 2.0 m/s.

D) The average force exerted on the particle for the time interval $t_i = 0$ to $t_f = 5.0s$ is $2.4N$

16. A right angled wedge ABC of mass M = 4Kg and base angle $\alpha = 53^0$ is resting over a smooth horizontal plane. A shell of mass m = 0.5 kg moving horizontally with velocity V_0 = 40m/sec, collides with the wedge just above point A. As a consequence, wedge starts to move towards the left with velocity v=5m/sec.

Choose the correct alternatives. $(g = 10 m/s^2)$



A) Heat generated during collision is 125 J.

B) Maximum height reached by the shell is 45 m.

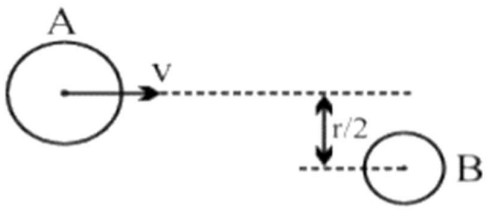
C) Heat generated during collision is 100 J.

D) Maximum height reached by the shell is 35 m.

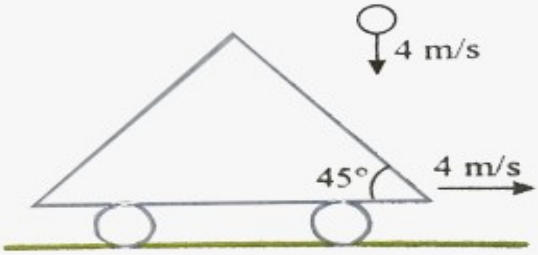
SECTION-IV
(INTEGER ANSWER TYPE)

- This section contains **THREE (03)** question.
- The answer to each question is a **NON-NEGATIVE INTEGER.**
- For each question, enter the correct integer corresponding to the answer the using the mouse and the on-screen 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.

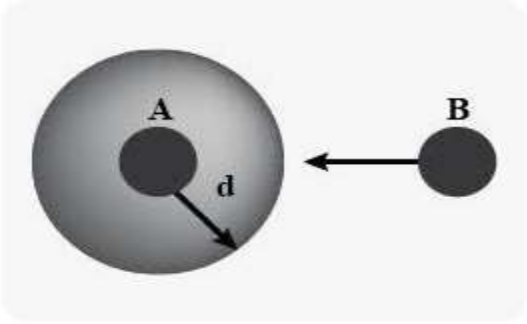
17. A disk A of radius r moving on perfectly smooth surface at a speed v undergoes an elastic collision with an identical stationary disk B. The velocity of the disk B after collision is $\frac{v\sqrt{x}}{4}$, Find X? (The impact parameter is r/2 as shown in the figure)



18. A small ball falling vertically downward with constant velocity 4m/s strikes elastically a massive inclined cart moving with velocity 4m/s horizontally as shown. The velocity of the rebound of the ball is $4\sqrt{x}$ m/s. Find X? $(g = 10 m/s^2)$



19. The elastic collision between two bodies, A and B, can be considered using the following model. A and B are free to move along a common line without friction. When their distance is greater than $d = 1m$, the interacting force is zero, when their distance is less than d, a constant repulsive force $F = 6N$ is present. The mass of body A is $m_A = 1kg$ and it is initially at rest; the mass of body B is $m_B = 3kg$ and it is approaching body A head – on with a speed $v_0 = 2m/s$. the minimum distance between A and B is X . Find X (In cm).



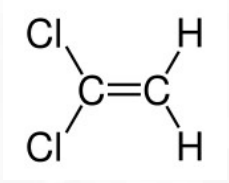
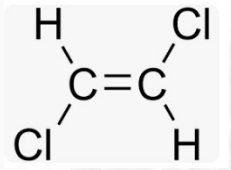
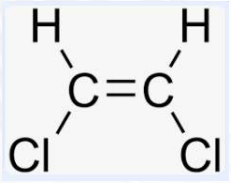
CHEMISTRY **Max. Marks: 60**

SECTION-I
(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 the none of the options is chosen (i.e. the question is unanswered);
- *Negative Marks* : -1 In all other cases.

20. Among the following which one has resonating structures?
A) SF_6 B) PCl_5 C) O_3 D) IF_7

21. Dipole moment is highest for
A) CH_2Cl_2 B) CH_4 C) CH_3Cl D) CCl_4

22. Which one among the following has zero dipole moment?
A)  B)  C)  D) Both (B) and (C)

23. Solubility of KCl is relatively more in ?
A) $C_6H_6(D=0)$ B) $(CH_3)_2CO(D=2)$
C) $CH_3OH(D=32)$ D) $CCl_4(D=0)$

SECTION-II
(PARAGRAPH WITH NUMERICAL VALUE TYPE)

- This section contains **THREE (03)** questions stems.
- There are **TWO (02)** questions corresponding to each question stem.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value corresponding to the answer in the designated place using the mouse and the on-screen virtual numeric keypad.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks*** **: +2** If ONLY the correct numerical value is entered at the designated place;
- ***Zero Marks*** **: 0** In all other cases.

Question Stem for Question Nos. 24 and 25

Question Stem

The overall shape of a molecule is determined by its bond angle. Bond angle of a molecule, together with the bond length, precisely define the size and shape of a molecule.

24. Bond angle in NO_2^- is (in degree)

25. Bond angle in $H-B-H$ bond of $\overset{\ominus}{B}H_4$ is (in degree)

Question Stem for Question Nos. 26 and 27

Question Stem

Bond order is a formal measure of the multiplicity of a covalent bond between two atoms.

26. Bond order of NO is :

27. Bond order of C_6H_6 is :

Question Stem for Question Nos. 28 and 29

Question Stem

H – bonding is an electrostatic force of attraction between a H atom which is covalently bonded to a more electronegative atom.

28. The maximum number of hydrogen bonds in which water molecule can participate is

29. How many among the following can show Inter molecular hydrogen bonding in given form. $liq\ HF$, $liq\ NH_3$, CH_4, CH_3OH, N_2O_4, Phenol, Water.

SECTION-III
(ONE OR MORE CORRECT ANSWER TYPE)

- This section contains **SIX (06)** 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** If only (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** one option is chosen and it is a correct option;
- ***Zero Marks:* 0** If 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 the correct answer, then

Choosing ONLY (A), (B) and (D) will get +4 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(s) (i.e. the question is unanswered) will get 0 marks and
Choosing any other option(s) will get -2 marks.

30. Dipole moment in shown by :

A) 1, 4 – dichlorobenzene

B) Cis – 1, 2 – Dichloroethene

C) Trans – 1, 2 – Dichloroethene

D) Trans – 1, 2 – dichloro – 2 - pentene

31. Which of the following compound/s is/are non-polar?

A) NO_2 B) $B_3N_3H_6$ C) B_2H_6 D) PF_2Cl_3

32. Which of the following statement/s is/ are wrong?

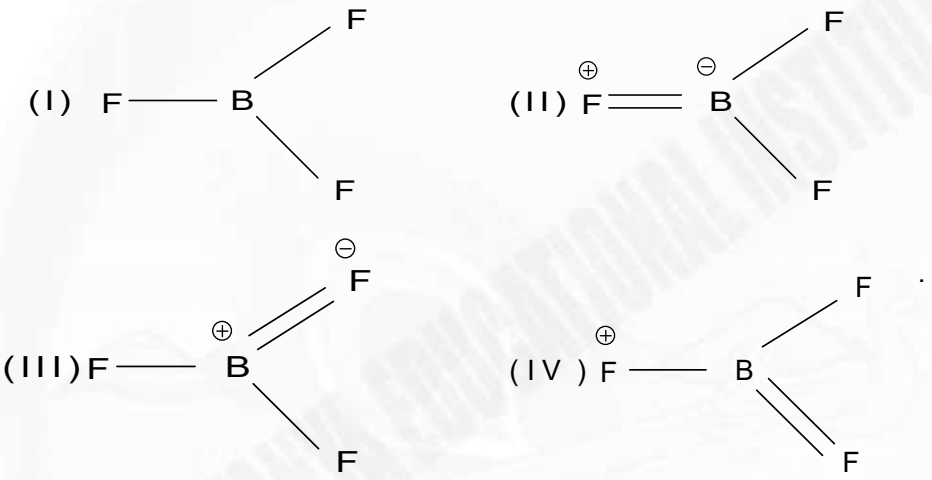
A) Dipole moment of NF_3 is zero

B) Dipole moment of NF_3 > Dipole moment of NH_3

C) Dipole moment of NF_3 = Dipole moment of NH_3

D) Dipole moment of NH_3 is zero

33. Which of the following statement/s is/are correct about the molecular structure of boron trifluoride?



A) All the structures contribute equally to the resonance hybrid

B) Structure I contributes maximum to the resonance hybrid

C) Structures II and IV contribute to a greater extent to the resonance hybrid

D) The $B-F$ bond has been found to possess $\pi-$ character

34. Hydrogen bonding plays a central role in the following phenomenon

A) Ice floats on water

B) Hydrogen bond is weaker than covalent bond

C) Boiling point of H_2O is higher than H_2S

D) In gaseous state also hydrogen bond exist between molecules of HF

35. Which is/are correct variation for $O_2^+, O_2, O_2^-, O_2^{2-}$

A) $O_2^+ < O_2 < O_2^- < O_2^{2-}$ $(O-O)$ bond length

B) $O_2^+ > O_2 > O_2^- > O_2^{2-}$ (bond order)

C) $O_2^+ > O_2 > O_2^- > O_2^{2-}$ (bond energy)

D) $O_2^{2-} < O_2^- = O_2^+ > O_2$ (bond order)

SECTION-IV
(INTEGER ANSWER TYPE)

- This section contains **THREE (03)** question.
- The answer to each question is a **NON-NEGATIVE INTEGER.**
- For each question, enter the correct integer corresponding to the answer the using the mouse and the on-screen 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.

36. How many among the following have unpaired electrons?

$Li_2, Be_2^+, B_2, C_2^{+2}, N_2, O_2, F_2^-, Ne_2, O_2^-, NO$

37. How many among the following are paramagnetic & have more than four electrons in their Antibonding orbitals. $O_2, O_2^+, F_2, NO, NO^+, O_2^-, O_2^{-2}, N_2^+, N_2$

38. Bond length of HCl is $1.275A^0$ $\left(e=4.8\times10^{-10}esu\right)$. If $\mu=1.02D$ then HCl is $x\%$ ionic then $\frac{x}{2}=?$ (rounding to nearest integer)

MATHEMATICS **Max. Marks: 60**

SECTION-I
(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 the none of the options is chosen (i.e. the question is unanswered);
- *Negative Marks* : -1 In all other cases.

39. $A(a, b)$ and $B(0, 0)$ are two fixed points. If M_1 is the midpoint of $\overline{AB}$, M_2 is midpoint of $\overline{AM_1}$, M_3 is midpoint of $\overline{AM_2}$ and so on then M_6 is

A) $\left(\frac{7a}{8}, \frac{7b}{8}\right)$ B) $\left(\frac{15a}{16}, \frac{15b}{16}\right)$ C) $\left(\frac{31a}{32}, \frac{31b}{32}\right)$ D) $\left(\frac{63a}{64}, \frac{63b}{64}\right)$

40. $OPQR$ is a square and M, N are the middle points of the sides PQ and QR respectively, then the ratio of the areas of the triangle OMN and the square is

A) $4:3$ B) $8:3$ C) $2:1$ D) $4:1$

41. $A=(1, -1)$, locus of B is $x^2+y^2=16$. If P divides AB in the ratio $3:2$ then locus of P is

A) $(x-2)^2+(y-3)^2=4$ B) $(x+1)^2+(y-2)^2=4$

C) $(x-3)^2+(y-2)^2=4$ D) $(5x-2)^2+(5y+2)^2=144$

42. If the square $ABCD$ where $A(0, 0), B(2, 0), C(2, 2)$ and $D(0, 2)$ undergoes the following three transformations successively :

(i) $f_1(x, y) \to (y, x)$

(ii) $f_2(x, y) \to (x+3y, y)$

(iii) $f_3(x, y) \to \left(\frac{x-y}{2}, \frac{x+y}{2}\right)$

Then the final figure is:

A) Square B) Parallelogram C) Rhombus D) Rectangle

SECTION-II
(PARAGRAPH WITH NUMERICAL VALUE TYPE)

- This section contains **THREE (03)** questions stems.
- There are **TWO (02)** questions corresponding to each question stem.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value corresponding to the answer in the designated place using the mouse and the on-screen virtual numeric keypad.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks: +2*** If ONLY the correct numerical value is entered at the designated place;
- ***Zero Marks: 0*** In all other cases.

Question Stem for Question Nos. 43 and 44

Question Stem

A line segment AB of length 'a' moves with its ends on co-ordinate axes. P is point of locus which divides the line segment AB in the ratio $1:2$ is $px^2+qy^2=4a^2$ then

43. $\left[\frac{p}{8}\right]+\left(\frac{q}{37}\right)$ is….(Where $[.]$ is G.I.F $(.)$ is L.I.F)

44. $\left(\sqrt{p}+\sqrt{q}\right)Cos\left(\left\{\frac{q}{2p}\right\}+\left\{\frac{4p}{q}\right\}\right)$ is (Where $\{.\}$ is fractional part function)

Question Stem for Question Nos. 45 and 46

Question Stem

Orthocenter of $P\left(\sqrt{3},\sqrt{10}\right), Q\left(\sqrt{7},\sqrt{6}\right), R\left(\sqrt{5},\sqrt{8}\right)$ is

$A=\left(\sqrt{l}+\sqrt{m}+\sqrt{n},\ \sqrt{a}+\sqrt{b}+\sqrt{c}\right)$ & circumcenter is $B(d,e)$ then

45. $a+b+c+d+e$ is _____

46. $l^2+m^2+n^2$ is _____

Question Stem for Question Nos. 47 and 48

Question Stem

If the axes are translated to circumcentre of triangle formed by $(9,3),(-1,7),(-1,3)$ then centroid of triangle in the new system is (p,q) and area of triangle in new system is r then

47. If $A=\begin{pmatrix}3p & p-q\\ 2p+q & 3q\end{pmatrix}$ the det (adjA) is

48. If $A=\begin{pmatrix}3p & p-q & p+q\\ q-p & 3q & 2p+q\\ q+p & 2p+q & r\end{pmatrix}$ then tr(A)=

SECTION-III
(ONE OR MORE CORRECT ANSWER TYPE)

- This section contains **SIX (06)** 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** If only (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** one option is chosen and it is a correct option;
- ***Zero Marks*** **: 0** If 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 the correct answer, then

Choosing ONLY (A), (B) and (D) will get +4 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(s) (i.e. the question is unanswered) will get 0 marks and
Choosing any other option(s) will get -2 marks.

49. The point A divides the join of $P(-5,1)$ and $Q(3,5)$ in the ratio $k:1$. The values of k for which the area of ΔABC where $B(1,5), C(7,-2)$ is $2 sq.units$ is

A)7 B) $\frac{31}{9}$ C) $\frac{1}{7}$ D) $\frac{9}{31}$

50. Let $A(h,k), B(1,1), C(2,1)$ be the vertices of a right angle triangle with AC as its hypotenuse. If the area of the triangle is '1' then k can be

A) -3 B) -1 C) 3 D) -2

51. If $A(1,1), B(2,3), C(-1,1)$ and P is a point of Locus such that area of quadrilateral $PABC$ is $3 sq.units$ is $ax^2+by^2+cx+dy=0$ then

A) $a+c=0$ B) $6b+d=0$

C) $a+6b+c+3d=-12$ D) $a-6b+c-d=0$

52. Which of the following is true?

A) Locus of the point, for which sum of squares of distances from co-ordered axes is 25 is $x^2+y^2=25$.

B) Locus of the point whose distance from x-axis is twice that of y-axis is $4x^2-y^2=0$

C) Number of points in the Locus represented by $x^2+y^2=0$ is '1'

D) Locus of the $(t^2+1, 2t)$ is parabola.

53. The transformed equation of $4xy-3x^2=10$ when the axes are rotated through an angle whose tangent is '2' is $AX^2+2HXY+BY^2=10$

A) $4A+B=0$ B) $A^2+B^2+H^2=17$

C) $5A-B=9$ D) $AH=B^2$

54. The point $(4,3)$ when the axes translated to the point $(3,1)$ and then axes are rotated through 30^0 about the origin, then the new position of the point is

A) $\left(\frac{2\sqrt{3}+1}{2},\frac{\sqrt{3}-2}{2}\right)$ B) $\left(\frac{\sqrt{3}+1}{2},\frac{2\sqrt{3}+1}{2}\right)$

C) $\left(\frac{\sqrt{3}+2}{2},\frac{2\sqrt{3}-1}{2}\right)$ D) $\left(\frac{\sqrt{3}-2}{2},\frac{\sqrt{3}+1}{2}\right)$

SECTION-IV
(INTEGER ANSWER TYPE)

- This section contains **THREE (03)** question.
- The answer to each question is a **NON-NEGATIVE INTEGER.**
- For each question, enter the correct integer corresponding to the answer the using the mouse and the on-screen 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.

55. If G be the centroid and I be the in centre of the triangle with vertices $A(-36,7), B(20,7)$ and $C(0,-8)$ and $GI=\frac{25}{3}\sqrt{205}\,\lambda$ then $[\lambda+2]$is

(Where [.] is G.I.F)

56. The Locus of the point $(\tan\theta+\sin\theta,\tan\theta-\sin\theta)$ is $(px^2+qy^2)^2=rxy$ then $p+q+r$ is (θ is a parameter)

57. Let L be the line $2x+y-2=0$. The axes are rotated by 45^0 in clockwise direction then the line L on the new axes is $AX+BY+C=0$ then $\left[\left|\frac{2c}{A+B}\right|\right]$ is (Where [.] is G.I.F)

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