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*A right Choice for the Real Aspirant*

**ICON Central Office - Madhapur - Hyderabad**

**SEC: Jr.Super60\_NUCLEUS BT**

**WTA-27**

**Date: 27-10-2024**

**Time: 09:00AM to 12:00PM**

**JEE-ADV (2020-P1)**

**Max. Marks: 198**

## **2020\_PAPER-I**

**27-10-2024\_Jr.Super60\_NUCLEUS BT\_Jee-Adv(2020-P1)\_WTA-27\_Syllabus**

### **PHYSICS**

: Units and dimensional analysis of physical quantities taught till now, Significant figures, Rounding off of numbers, Accuracy, Precision (All rules pertaining to above topics only as per NCERT text book) (Deleted pertaining to JEE MAINS but still in JEE ADV Syllabus), Error Analysis of Physical quantities, Vernier callipers, Screw gauge

### **CHEMISTRY**

: GOC II :Reaction intermediates : Homolytic and heterolytic cleavage of bonds, Carbocations: Generation, Structure and stability, Rearrangement of carbocations., Carbocations: Generation, Structure and stability, Rearrangement of carbocations., Carbanions and free radicals: Generation, Structure and Stability, Benzyne, carbenes, nitrenes and radical ions: Generation, Structure and Stability,

### **MATHEMATICS**

: Differentiability at a point, LHD & RHD, Differentiability in an interval & theorems on Differentiability, Problems on continuity and differentiability

Name of the Student: \_\_\_\_\_

H.T. NO:

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## JEE-ADVANCE-2020-P1-Model

Time: 3:00Hour's

### IMPORTANT INSTRUCTIONS

Max Marks: 198

### PHYSICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total mark
Sec – I(Q.N : 1 – 6)	Questions with Single Correct Choice	3	-1	6	18
Sec – II(Q.N : 7 – 12)	Questions with Multiple Correct Choice +1 partial marks	4	-2	6	24
Sec – III(Q.N : 13 – 18)	Questions with Numerical Value Answer Type	4	0	6	24
<b>Total</b>				<b>18</b>	<b>66</b>

### CHEMISTRY:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 19 – 24)	Questions with Single Correct Choice	3	-1	6	18
Sec – II(Q.N : 25 – 30)	Questions with Multiple Correct Choice +1 partial marks	4	-2	6	24
Sec – III(Q.N : 31 – 36)	Questions with Numerical Value Answer Type	4	0	6	24
<b>Total</b>				<b>18</b>	<b>66</b>

### MATHEMATICS:

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 37 – 42)	Questions with Single Correct Choice	3	-1	6	18
Sec – II(Q.N : 43 – 48)	Questions with Multiple Correct Choice +1 partial marks	4	-2	6	24
Sec – III(Q.N : 49 – 54)	Questions with Numerical Value Answer Type	4	0	6	24
<b>Total</b>				<b>18</b>	<b>66</b>

Sec: Jr.Super60\_NUCLEUS BT

Space for rough work

Page 2

**SECTION – I**  
**(SINGLE CORRECT ANSWER TYPE)**

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

- Each question has **FOUR** options. **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

- Consider  $S = x \cos(\theta)$  for  $x = (2.0 \pm 0.2) \text{ cm}$ ,  $\theta = 53^\circ \pm 2^\circ$ . Find S.
 

A)  $S = (1.2 \pm 0.18) \text{ cm}$

B)  $S = (1.2 \pm 0.16) \text{ cm}$

C)  $S = (1.2 \pm 0.07) \text{ cm}$

D)  $S = (1.2 \pm 0.05) \text{ cm}$
- Intensity observed in an interference pattern is  $I = I_0 \sin^2 \theta$ . At  $\theta = 30^\circ$  intensity  $I = 5 \pm 0.0020 \text{ W/m}^2$ . Find percentage error in angle if  $I_0 = 20 \text{ W/m}^2$ 

A)  $\frac{4}{\pi} \sqrt{3} \times 10^{-2} \%$

B)  $\frac{2}{\pi} \sqrt{3} \times 10^{-2} \%$

C)  $\frac{1}{\pi} \sqrt{3} \times 10^{-2} \%$

D)  $\frac{3}{\pi} \sqrt{3} \times 10^{-2} \%$
- If speed ‘V’, force ‘F’ and acceleration ‘a’ are chosen as the fundamental physical quantities, then the dimension of Young’s modulus in terms of V,F and a are
 

A)  $[V^{-3} F a]$

B)  $[V^{-4} F^2 a^2]$

C)  $[V^{-4} F a^2]$

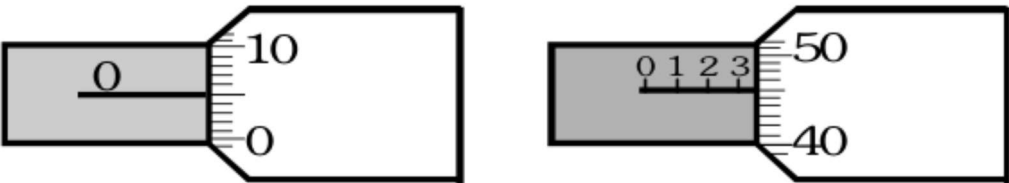
D)  $[V^{-4} F^2 a]$
- The number of significant figures in 28000 kg, if the least count of the scale was 1 quintal.
 

A) 2

B) 3

C) 4

D) 5
- The circular scale of micrometer has 200 divisions and pitch of 2 mm. Find the measured value of thickness of a thin sheet. (One complete rotation of circular scale corresponds to one main scale division)



- A) 3.41 mm

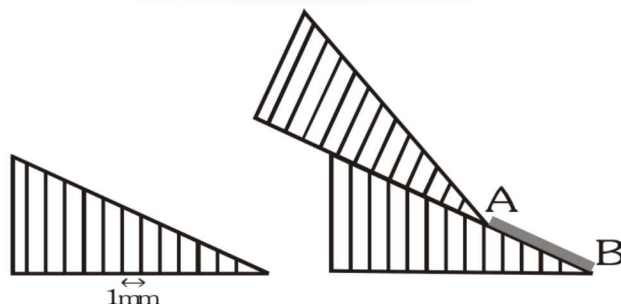
B) 6.41 mm

C) 3.46 mm

D) 3.51 mm



6. A brilliant student of Sri Chaitanya constructed a vernier calipers as shown in figure. He used two identical inclines of inclination  $37^\circ$  and tried to measure the length of line AB. The length of line AB is



- A)  $\frac{21}{4}$  mm      B)  $\frac{25}{4}$  mm      C)  $\frac{18}{4}$       D) None of these

**SECTION – II**  
**(ONE OR MORE CORRECT ANSWER TYPE)**

- This section contains **SIX** (06) questions.
  - Each question has **FOUR** options. **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 none of the options is chosen (i.e. the question is unanswered);  
**Negative Marks** : -2 In all other cases

7. Student  $I_1, J_1, J_3$  and  $I_2$  perform an experiment for measuring the acceleration due to gravity ( $g$ ) using a simple pendulum. They use different lengths of the pendulum and record time for different number of oscillations. The observations are shown in the table. Least count for length = 0.1 cm, Least count for time = 1 s

Students	Length of the pendulum (cm)	No. of oscillations (n)	Time period of pendulum (s)
$I_1$	100.0	20	20
$J_1$	400.0	10	40
$J_3$	100.0	10	20
$I_2$	400.0	20	40

If  $P_1, P_2, P_3$  and  $P_4$  are the % error in  $g$  for students  $I_1, J_1, J_3$  and  $I_2$  respectively then

- A)  $P_1 = P_3$       B)  $P_3$  is maximum      C)  $P_4$  is minimum      D)  $P_2 = P_4$

8. Both the figures shows situation when the jaws of vernier calipers are touching each other. Each main scale division is of 1 mm

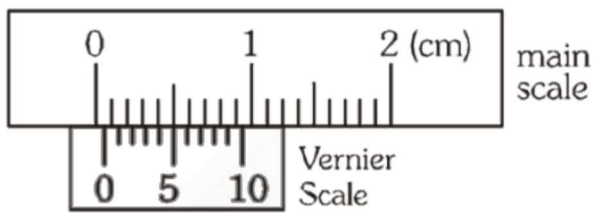


Figure (1)

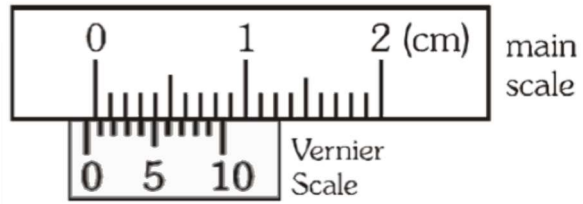


Figure (2)

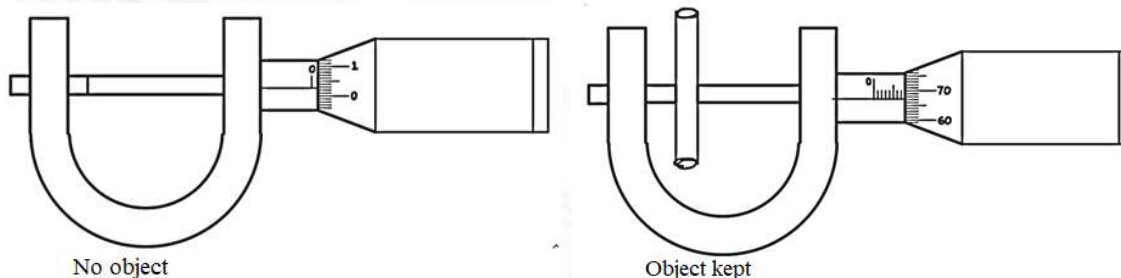
- A) Error correction in fig(1) is  $-0.5$  mm  
 B) fig (2) has negative zero error of  $-0.4$  mm  
 C) fig (2) has negative zero error of  $-0.6$  mm  
 D) fig (1) has negative zero error of  $-0.5$  mm
9. Which of the following dimensions are matching
- A) [Velocity gradient] =  $\left[ \sqrt{\frac{C^5}{Gh}} \right]$   
 B) [Velocity head] =  $\left[ \sqrt{\frac{Gh}{C^3}} \right]$   
 C)  $\left[ \frac{\text{Bulk modulus} \times \text{moment of inertia}}{\text{Weight}} \right] = \left[ \sqrt{\frac{hc}{G}} \right]$   
 D) [ Pressure gradient ] = [ energy density]
10. Which of the following equation can be derived using dimensional analysis (constant are given)
- A)  $R = \frac{\rho v d}{\eta}$  [R: Reynolds number,  $\rho$ : density V: speed, d: diameter,  $\eta$ : Coefficient of viscosity]  
 B)  $\dot{Q} = \frac{\pi r^4}{8\eta l} (\Delta p)$  [ $\dot{Q}$ : volume flow rate, r: radius of the tube, l: length of the tube,  $\eta$ : Coefficient of viscosity  $\Delta p$ : presume difference ]  
 C)  $T = 2\pi \sqrt{\frac{I}{mgd}}$  [T: time period, I: moment of inertia, m : mass, g: acceleration due to gravity, d: distance from centre of mass]  
 D)  $x = A \sin(\omega t)$  [x : displacement, A: amplitude,  $\omega$ : angular frequency, t : time]

11. From the point of view of significant figures which of the following statements are correct?
- A)  $10.2 \text{ cm} + 8 \text{ cm} = 18.2 \text{ cm}$       B)  $2.53 \text{ m} - 1.2 \text{ m} = 1.33 \text{ m}$   
 C)  $4.2 \text{ m} \times 1.4 \text{ m} = 5.88 \text{ m}^2$       D)  $3.6 \text{ m} / 1.75 \text{ sec} = 2.1 \text{ m/s}$
12. Which of the following statements are correct
- A) The order of magnitude of earth radius 6400 km is 7  
 B) Systematic errors are bidirectional errors.  
 C) Least count error can be classified as both random error and systematic error  
 D) If we have choice of two instruments P & Q such that  
 P: accurate but not precise  
 Q: precise but not accurate, we must chose Q for the experiments

### SECTION – III (NUMERICAL VALUE TYPE)

- This section contains **SIX (06)** questions. The answer to each question is a **NUMERICAL VALUE**.
  - For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. **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** : +4 **If ONLY** the correct numerical value is entered;  
**Zero Marks** : 0 In all other cases

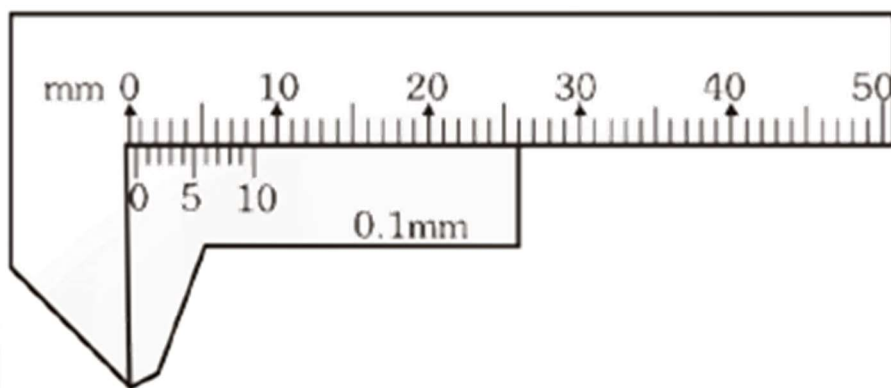
13. Find diameter of wire in mm



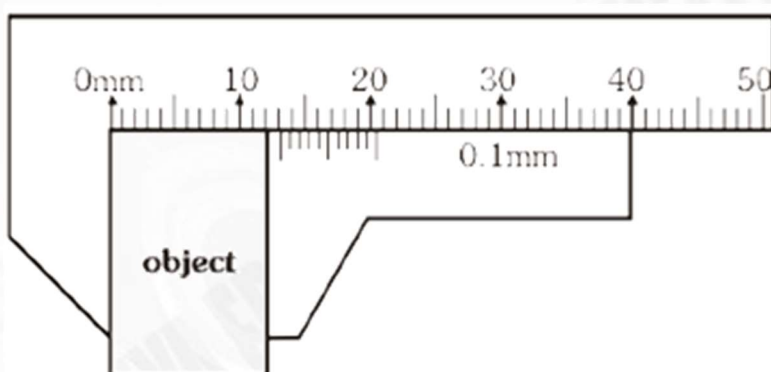
14. The pitch of a screw gauge is 1 mm and there are 50 divisions on its circular scale. When nothing is put in between the studs, 44<sup>th</sup> division of the circular scale coincides with the reference line and zero of the main scale is not visible. When a glass plate is placed between the students, the main scale reads three divisions and the circular scale reads 26 divisions. Calculate the thickness of the plate (in mm)



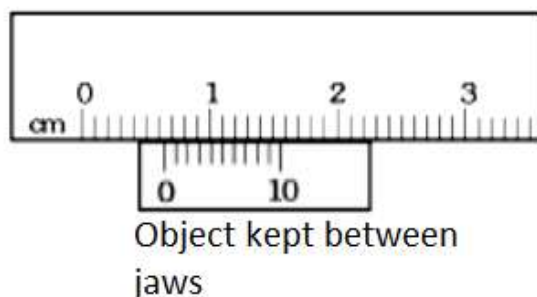
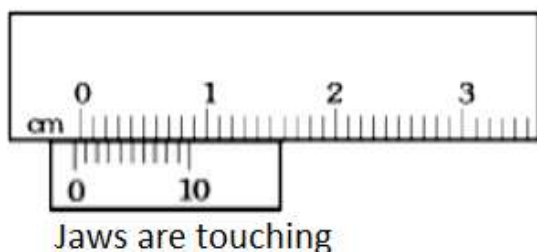
15. Find the object size in mm .When the jaws of touching each other



When object is kept between the jaws



16. The main scale of a vernier reads in millimeter and its vernier is divided into 10 divisions which coincides with 9 divisions of the main scale. The reading for shown situation is found to be  $(x/10)$  mm. Find the value of  $x$ .



17. Count the number of physical quantities among the given quantities with no dimensions.  $\sin \theta$ , relative permittivity, permeability, susceptibility, Mechanical equivalent of heat, Mach number, Avogadro number, Reynold's number, solid angle, angular frequency, refractive index, thermal strain, Rydberg constant,
18. Two resistors are given  $R_1 = (6 \pm 0.3) \Omega$ ,  $R_2 = (10 \pm 0.2) \Omega$  find the percentage error in their parallel combination



## CHEMISTRY

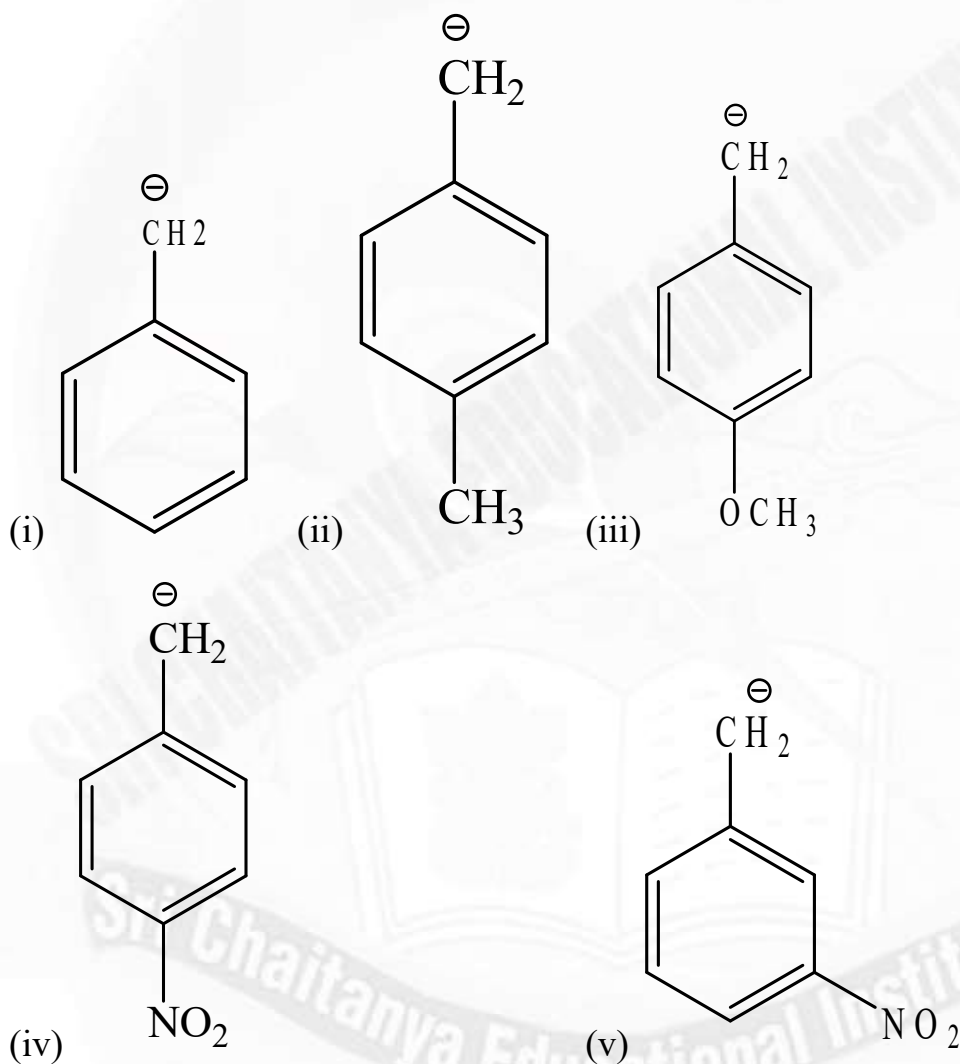
Max Marks: 66

SECTION – I  
(SINGLE CORRECT ANSWER TYPE)This section contains **SIX** (06) questions.• Each question has **FOUR** options. **ONLY ONE** of these four options is the correct answer.

• For each question, choose the option corresponding to the correct answer.

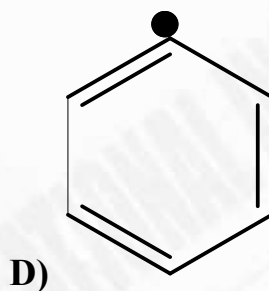
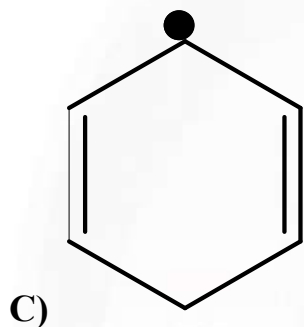
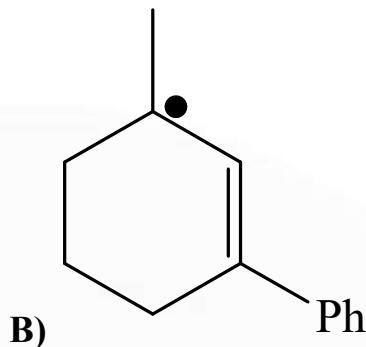
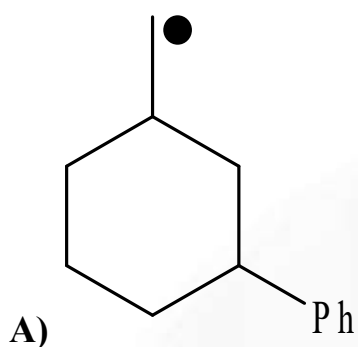
• Answer to each question will be evaluated **according to the following marking scheme:****Full Marks** : +3 If **ONLY** the correct option is chosen;**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered);**Negative Marks** : -1 In all other cases

19. The correct order of stability of carbanions is

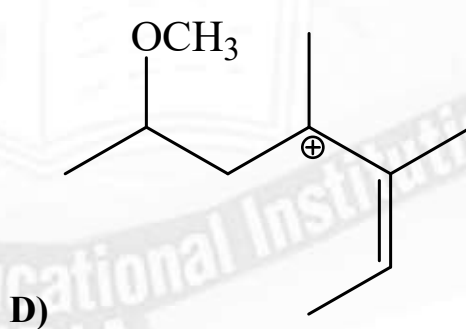
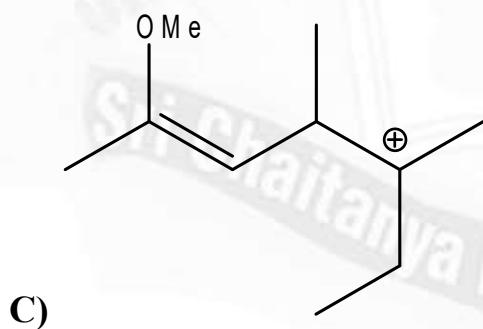
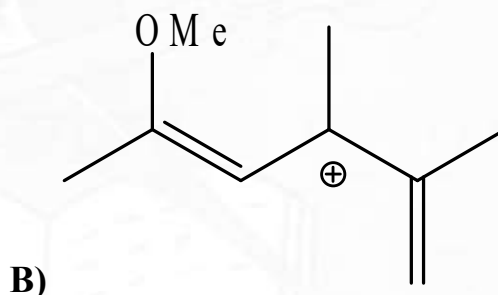
A)  $i > ii > iii > iv > v$ B)  $ii > iii > i > v > iv$ C)  $iv > v > i > ii > iii$ D)  $iii > ii > iv > v > i$ 



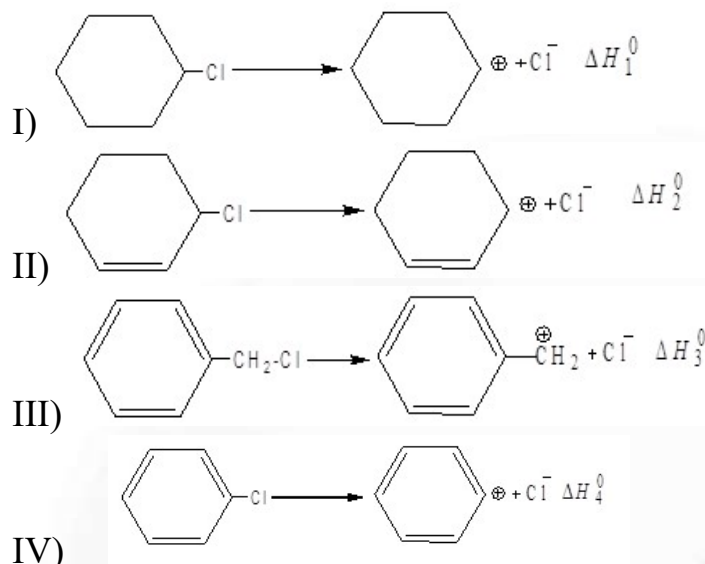
20. Which one of the following is more stable



21. Which of the following is most stabilised carbocation



22. For the reaction



The decreasing order of bond enthalpies of reaction for producing carbocation is

A)  $\Delta H_1^0 > \Delta H_2^0 > \Delta H_3^0 > \Delta H_4^0$       B)  $\Delta H_4^0 > \Delta H_1^0 > \Delta H_2^0 > \Delta H_3^0$

C)  $\Delta H_3^0 > \Delta H_2^0 > \Delta H_1^0 > \Delta H_4^0$       D)  $\Delta H_2^0 > \Delta H_1^0 > \Delta H_4^0 > \Delta H_3^0$

23. Correct match of the C-H Bonds (shown in bold) in column. J with their BDE in column K is

Column-J (Molecule)		Column K BDE $\text{KCal mol}^{-1}$	
P.	$H - \text{C} \equiv \text{CH}$	i.	95
Q.	$H - \text{CH}_2\text{Ph}$	ii.	132
R.	$H - \text{CH} = \text{CH}_2$	iii.	110
S.	$H - \text{CH}(\text{CH}_3)_2$	iv.	80

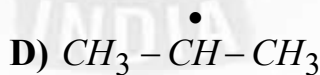
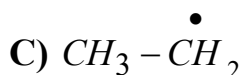
A) P-ii, Q-iv, R-iii, S-i

B) P-i, Q-ii, R-iii, S-iv

C) P-iii, Q-ii, R-i, S-iv

D) P-ii, Q-i, R-iv, S-iii

24. The most stable free radical among the following is



## SECTION – II

(ONE OR MORE CORRECT ANSWER TYPE)

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Space for rough work

Page 10



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

**JEE MAIN 2023**  
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Sri Chaitanya  
AIR 200  
**300**  
**300**



**RANK 1**

**JEE Advanced 2023**  
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Sri Chaitanya  
AIR 200  
**341**  
**360**



**RANK 1**

**NEET 2023**  
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Sri Chaitanya  
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**720**

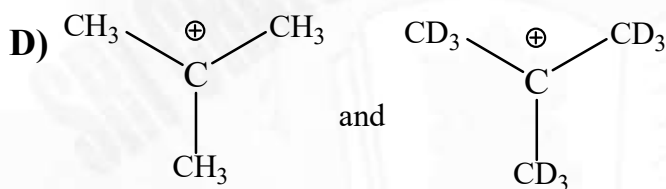
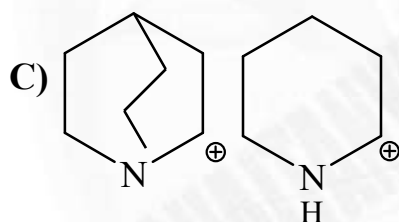
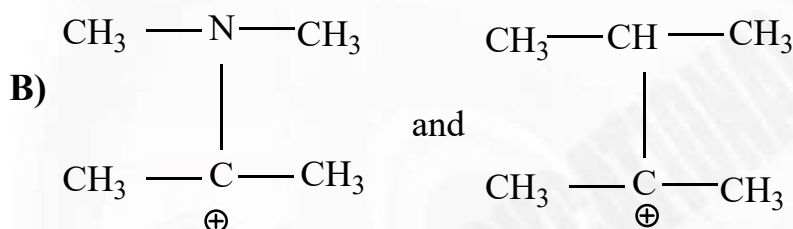
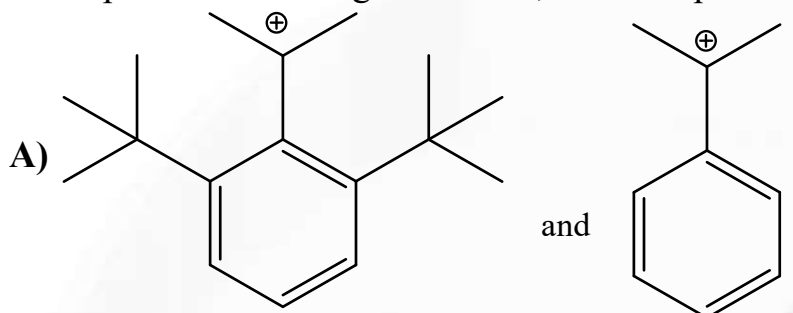


**RANK 1**

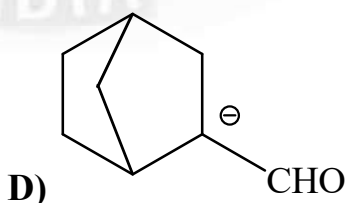
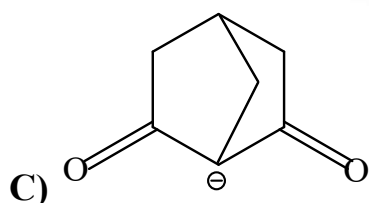
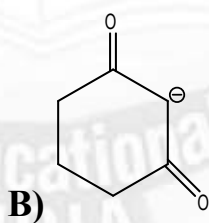
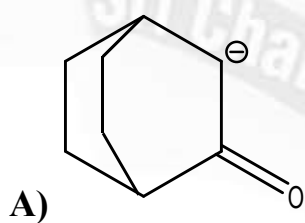
• Answer to each question will be evaluated **according to the following marking scheme:**

<b>Full Marks</b>	: +4 If only (all) the correct option(s) is(are) chosen;
<b>Partial Marks</b>	: +3 If all the four options are correct but ONLY three options are chosen;
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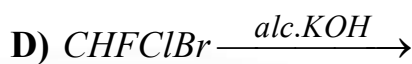
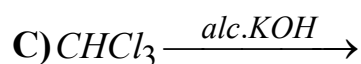
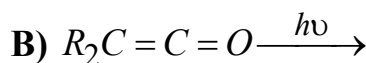
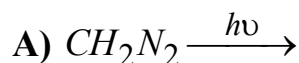
25. Some pairs of ions are given below, in which pair first ion more stable than second?



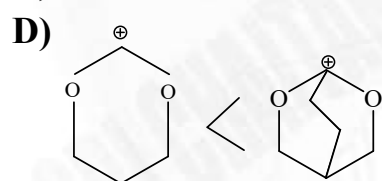
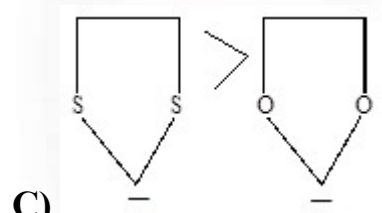
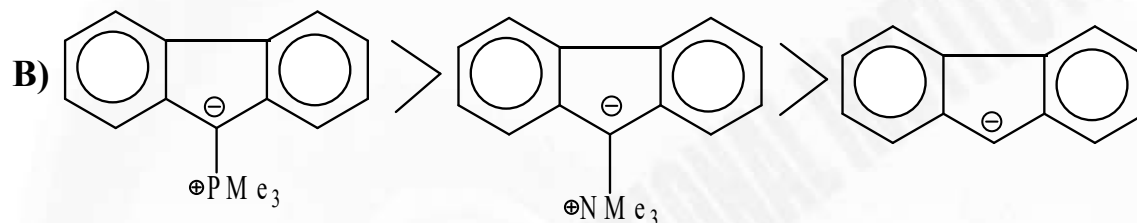
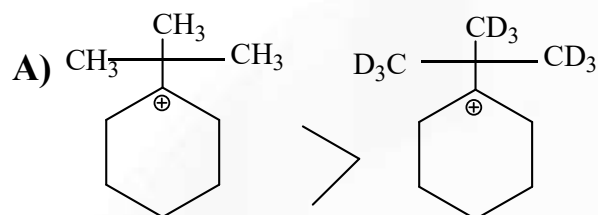
26. Which of the following carbanions are resonance stabilized



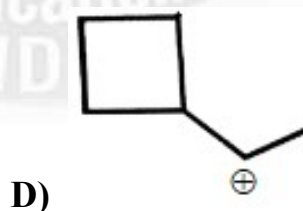
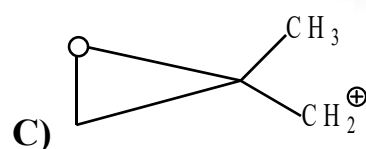
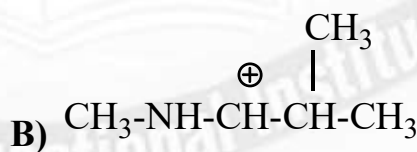
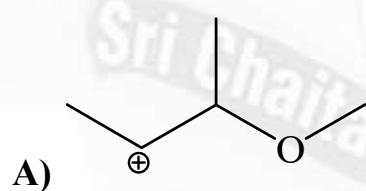
27. Which of the following reaction(s) generate carbene ?



28. Which of the following is/are correct order of stability

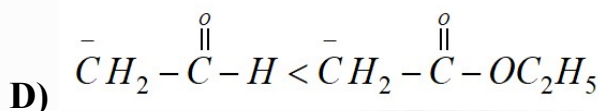
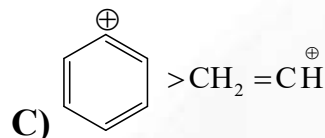
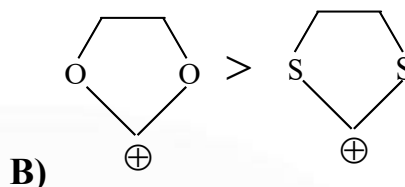
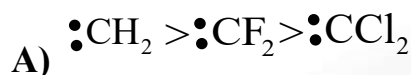


29. Which of the following carbocation(s) undergo favorable rearrangement into more stable one?





30. Which of the following represent the correct order of stability?



### SECTION – III

#### (NUMERICAL VALUE TYPE)

• This section contains **SIX** (06) questions. The answer to each question is a **NUMERICAL VALUE**.

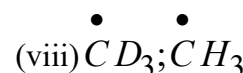
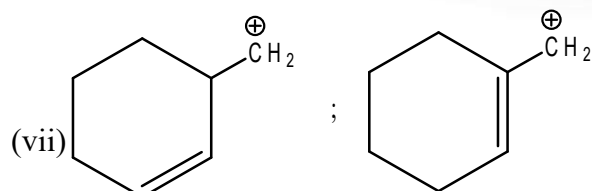
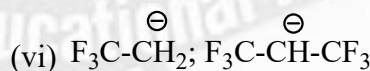
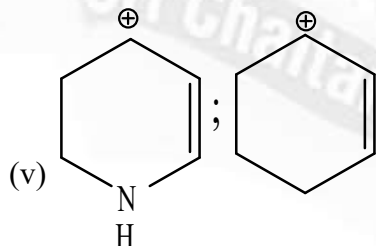
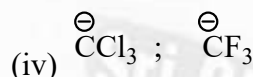
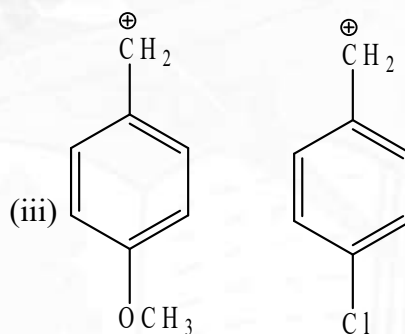
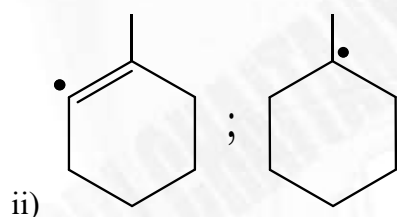
• For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. **If** the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.

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

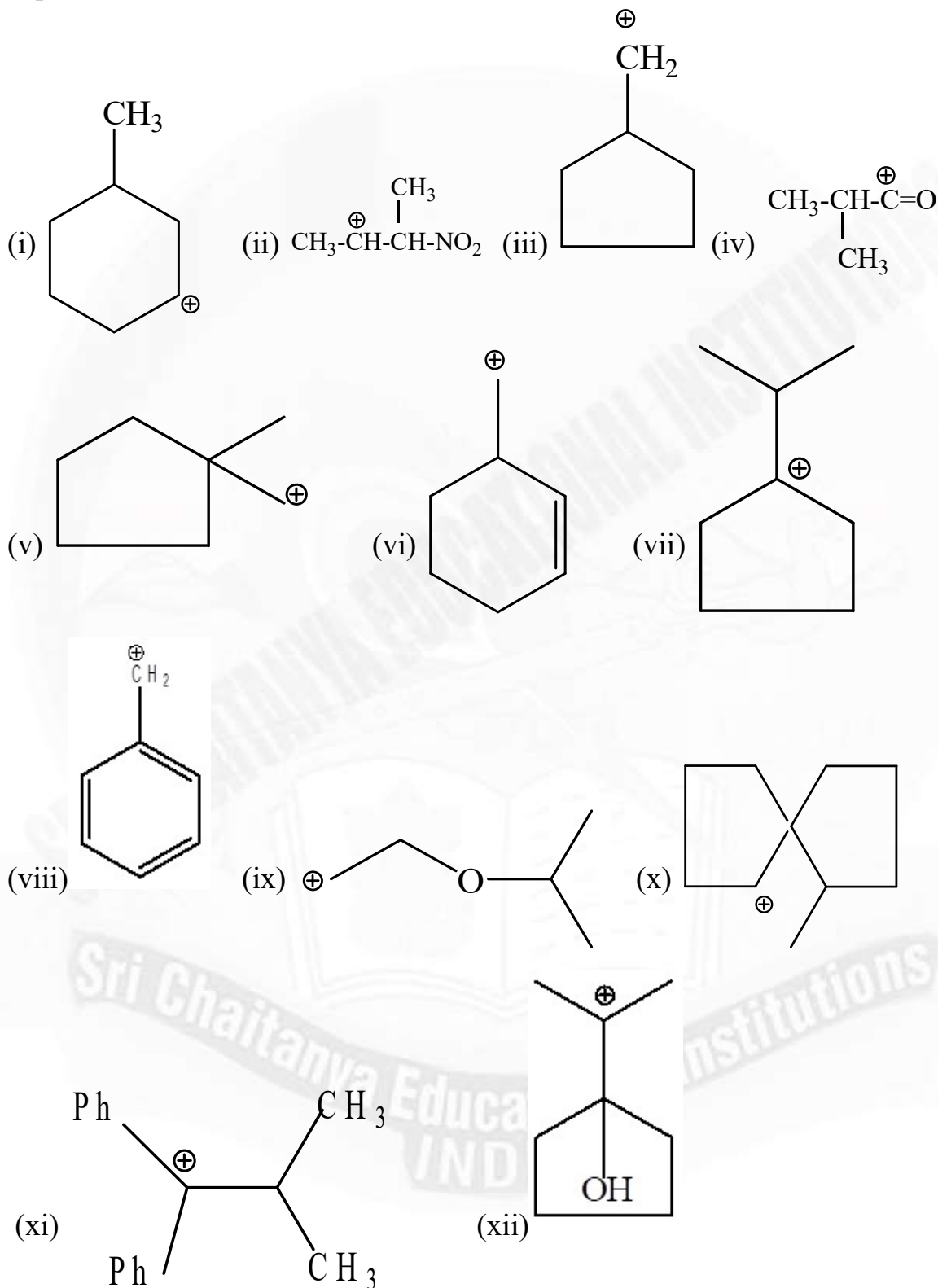
**Full Marks** : +4 **If ONLY** the correct numerical value is entered;

**Zero Marks** : 0 In all other cases

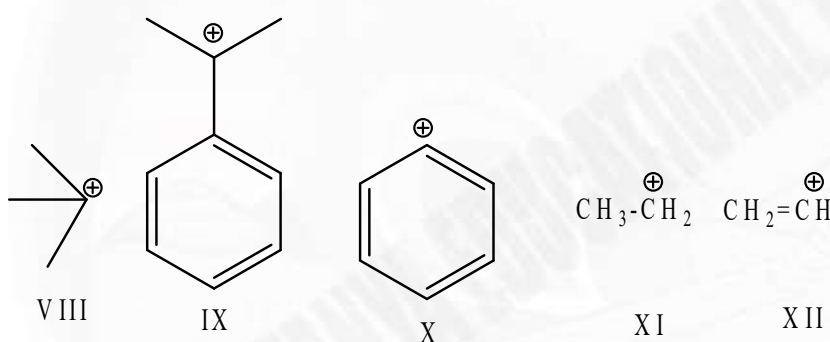
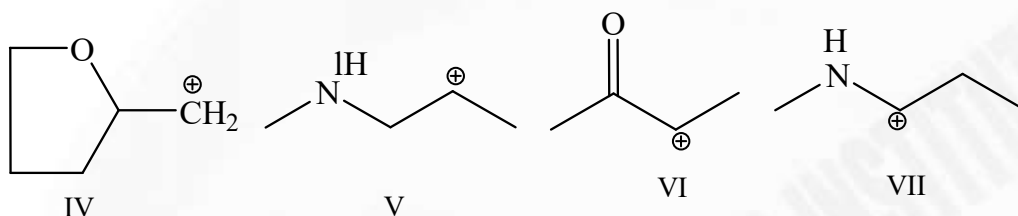
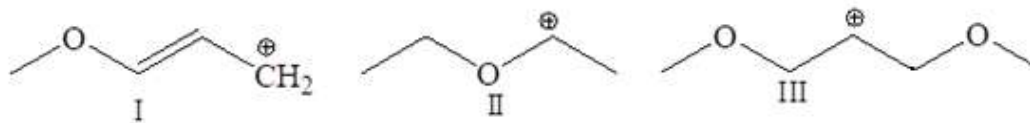
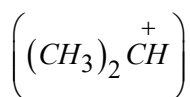
31. How many of the following pairs; first intermediate more stable than second one?



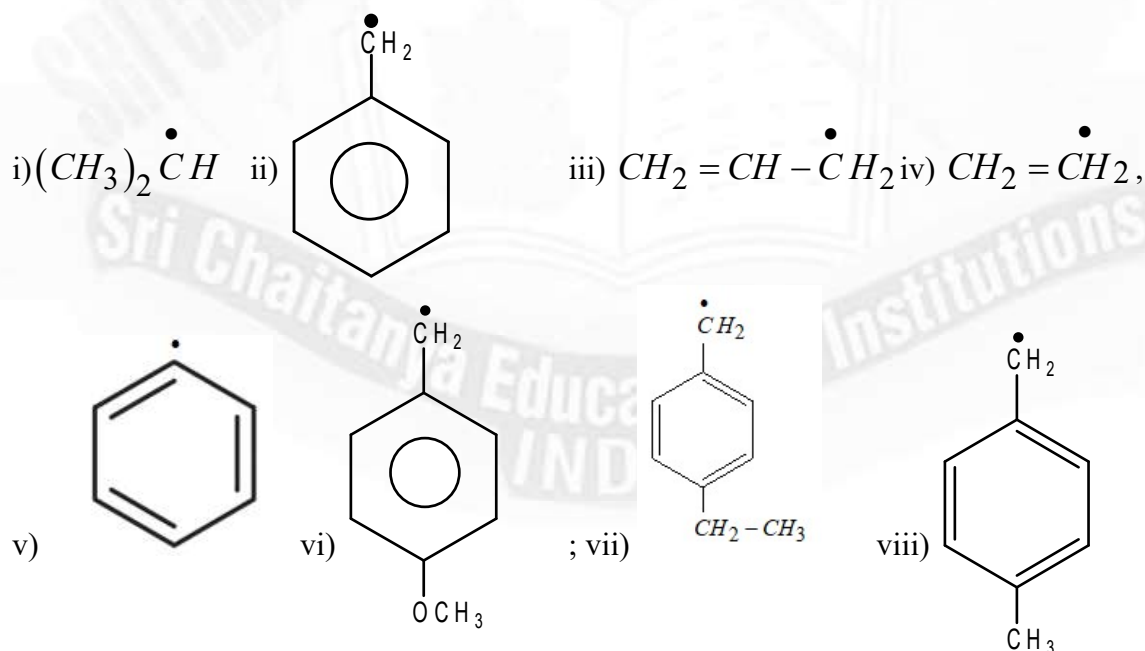
32. How many among the given will undergoes carbocation rearrangement (including ring expansion)



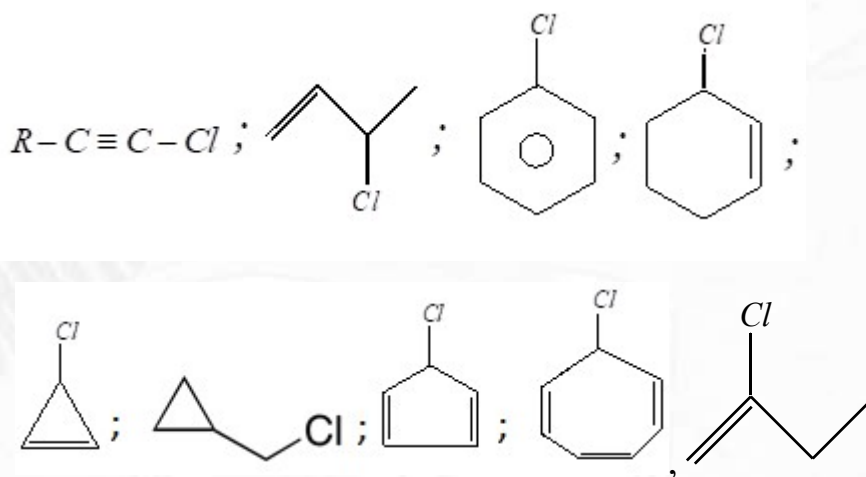
33. How many of the following carbocations have stability greater than an isopropyl cation



34. How many of the following species are more stable than  $(CH_3)_3\dot{C}$



35. How many of following statements are correct
- 1) Energy needed for homolytic bond fission is less than that required for heterolytic bond fission
  - 2) Triplet  $\overset{\cdot\cdot}{C}H_2$  is more stable than singlet  $\overset{\cdot\cdot}{C}H_2$
  - 3) Homolytic bond fission gives neutral species which is paramagnetic nature
  - 4) Singlet  $\overset{\cdot\cdot}{C}H_2$  has angular shape
  - 5) Cation and anion is produced by heterolytic bond fission
  - 6) singlet carbenes obey's Hund's rule
  - 7) The spin multiplicity of triplet carbene is 3
36. How many of the following will give white precipitate with aqueous  $AgNO_3$ ?





SECTION – I

(SINGLE CORRECT ANSWER TYPE)

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

- Each question has **FOUR** options. **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

37. Let  $f(x) = \sin(x^2 + [x])$  (where  $[.]$  is greatest integer function), then
- A)  $f(x)$  is differentiable at  $x = 1$ .

B)  $f(x)$  is continuous at  $x = 1$ .

C)  $f(x)$  is differentiable at  $x = \sqrt{\pi - 1}$

D)  $f(x)$  is not differentiable at  $x = \sqrt{\pi - 1}$
38. Let f be a composite function of x defined by  $f(u) = \frac{1}{u^3 - 6u^2 + 11u - 6}$
- Where  $u(x) = \frac{1}{x}$ . Then the number of points x Where f is discontinuous is:
- A) 4

B) 3

C) 2

D) 1
39. If  $f(x) = \lim_{n \rightarrow \infty} \frac{\log(2+x) - x^{2n} \sin x}{1 + x^{2n}}$  then  $f(x)$  is discontinuous at
- A)  $x = 1$  Only

B)  $x = -1$  only

C)  $x = -1, 1$  Only

D) no point
40. If  $f(x) = (x^2 - 9) \left| x^3 - 6x^2 + 11x - 6 \right| + \frac{x}{1 + |x|}$ , then the set of points at which the function  $f(x)$  is not differentiable is
- A)  $\{-2, 2, 1, 3\}$

B)  $\{-2, 0, 3\}$

C)  $\{-2, 2, 0\}$

D)  $\{1, 2\}$
41.  $f(x) = \begin{cases} b \sin^{-1}\left(\frac{x+c}{2}\right), & -\frac{1}{2} < x < 0 \\ \frac{1}{2} & \text{at } x = 0 \\ \frac{e^{\frac{ax}{2}} - 1}{x} & 0 < x < \frac{1}{2} \end{cases}$  If  $f(x)$  is differentiable at  $x=0$  and  $|c| < \frac{1}{2}$  then
- A)  $a = 1$  and  $64b^2 + c^2 = 4$

B)  $a = 0$  and  $64b^2 + c^2 = 2$

C)  $a = 2$  and  $64b^2 + c^2 = 1$

D)  $a = 3$  and  $64b^2 + c^2 = 3$


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42. If  $f(x) = \sqrt{x+2} + \sqrt{2x-4} + \sqrt{x-2} + \sqrt{2x-4}$  then  $f(x)$  is differentiable on
- A)  $(-\infty, \infty)$       B)  $[2, \infty) - \{4\}$       C)  $[2, \infty)$       D)  $(0, \infty)$

## SECTION – II

## (ONE OR MORE CORRECT ANSWER TYPE)

- This section contains **SIX** (06) questions.
- Each question has **FOUR** options. **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**:

<b>Full Marks</b>	: +4 If only (all) the correct option(s) is(are) chosen;
<b>Partial Marks</b>	: +3 If all the four options are correct but ONLY three options are chosen;
<b>Partial Marks</b>	: +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;
<b>Partial Marks</b>	: +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;
<b>Zero Marks</b>	: 0 If none of the options is chosen (i.e. the question is unanswered);
<b>Negative Marks</b>	: -2 In all other cases

43. Let  $f: \left[-\frac{1}{3}, 3\right] \rightarrow R$  and  $g: \left[-\frac{1}{3}, 3\right] \rightarrow R$  be function defined by  $f(x) = [x^2 - 4]$  and  $g(x) = |x-2|f(x) + |3x-5|f(x)$ , Where  $[y]$  denotes the greatest integer less than or equal to  $y$  for  $y \in R$ . Then

- A)  $f$  is discontinuous exactly at eight points in  $\left[-\frac{1}{3}, 3\right]$
- B)  $f$  is discontinuous exactly at nine points in  $\left[-\frac{1}{3}, 3\right]$
- C)  $g$  is NOT differentiable exactly at ten points in  $\left[-\frac{1}{3}, 3\right]$
- D)  $g$  is NOT differentiable exactly at nine points in  $\left[-\frac{1}{3}, 3\right]$
44. If  $f(x) = \begin{cases} x^2 (\text{sgn}[x]) + \{x\}, & 0 \leq x < 2 \\ \sin x + |x-3|, & 2 \leq x < 4 \end{cases}$  Where  $[.]$  and  $\{.\}$  represents the greatest integer and the fractional part function, respectively
- A)  $f(x)$  is differentiable at  $x=1$
- B)  $f(x)$  is continuous but non differentiable at  $x=1$
- C)  $f(x)$  is non differentiable at  $x=2$
- D)  $f(x)$  is discontinuous at  $x=2$



45. Let  $f: R \rightarrow R$  be a function such that  $f(x+y) = f(x) + f(y), \forall x, y \in R$ .  
If  $f(x)$  is differentiable at  $x=0$ , then  
A)  $f(x)$  is differentiable only in a finite interval containing zero  
B)  $f(x)$  is continuous  $\forall x \in R$   
C)  $f'(x)$  is continuous  $\forall x \in R$   
D)  $f(x)$  is differentiable except at finitely many points
46. If  $f(x) = \min\{\sqrt{4-x^2}, 1, |x|\}$ , and  $g(x) = \max\{\sqrt{4-x^2}, 1, |x|\}$  the number of points, where  $f(x)$  and  $g(x)$  are not differentiable in  $x \in [-2, 2]$  are  $m$  and  $n$  respectively, then  
A)  $m+n=9$       B)  $|m-n|=5$       C)  $m+n=7$       D)  $|m-n|=3$
47. The function  $f(x) = ||e^x - 1| - 1|$  is  
A) Continuous for all  $x$       B) Differentiable for all  $x$   
C) Not continuous at  $x=0, \ln 2$       D) Not differentiable at  $x = \ln 2$
48. Let  $[x]$  be the greatest integer less than or equal to  $x$ . Then, at which of the following point(s) the function  $f(x) = x \cos(\pi(x + [x]))$  is discontinuous?  
A)  $x = -1$       B)  $x = 0$       C)  $x = 2$       D)  $x = 1$

**SECTION – III**  
**(NUMERICAL VALUE TYPE)**

- This section contains **SIX (06)** questions. The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. **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** : +4 **If ONLY** the correct numerical value is entered;  
**Zero Marks** : 0 In all other cases

49.  $f(x) = \frac{x}{1 + (\ln x)(\ln x) \dots \infty} \forall x \in [1, 3]$  is non-differentiable at  $x = k$ . then the value of  $[k^2]$  is (where  $[.]$  Represents the greatest integer function)
50. Let  $f: R \rightarrow R$  and  $g: R \rightarrow R$  be respectively given by  $f(x) = |x| + 1$  and  $g(x) = x^2 + 1$ .  
Define  $h: R \rightarrow R$  by  $h(x) = \begin{cases} \max\{f(x), g(x)\}, & \text{if } x \leq 0 \\ \min\{f(x), g(x)\}, & \text{if } x > 0 \end{cases}$   
Then number of points at which  $h(x)$  is not differentiable is \_\_\_\_\_

51. A function  $f$  is defined on  $[-3,3]$  as  $f(x) = \begin{cases} \min\{|x|, 2 - x^2\}, & -2 \leq x \leq 2 \\ \lfloor |x| \rfloor, & 2 < |x| \leq 3 \end{cases}$

Where  $[x]$  denotes the greatest integer  $\leq x$ . the number of points, where  $f$  is not differentiable in  $(-3,3)$  is \_\_\_\_

52. The number of points where  $f: \mathbb{R} \rightarrow \mathbb{R}$   $f(x) = \max\{(1-x), (1+x), 2\}$  is not differentiable

53. Let  $[t]$  denote the greatest integer  $\leq t$ . The number of points where the function

$f(x) = [x] \left| x^2 - 1 \right| + \sin\left(\frac{\pi}{[x] + 3}\right) - [x + 1], x \in (-2, 2)$  is not continuous is \_\_\_\_

54. Let  $f(x) = x \left\lfloor \frac{x}{2} \right\rfloor$  for  $-10 < x < 10$ , where  $[t]$  denotes the greatest integer function. Then the number of points of discontinuity of  $f$  is equal \_\_\_\_





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