# NTA JOINT CSIR UGC NET December 2025 18th Dec 202

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| Application No | [redacted] |
| Candidate Name | |
| Roll No. | |
| Test Date | |
| Test Time | |
| Subject | |

Section : PART-A

**Q.1** What is the minimum number of pourings required to transfer exactly 6L of water from a 12L fully filled container to an 8L empty container when a 5L empty container is also available to use?

1. 4
2. 5
3. 6
4. 7

**Options** 1. 1

2. 2

3. 3

4. 4

Question Type : **MCQ**
Question ID : **916710558**
Option 1 ID : **9167102229**
Option 2 ID : **9167102230**
Option 3 ID : **9167102231**
Option 4 ID : **9167102232**
Status : **Not Answered**
Chosen Option : --

Q.2 In a class, 40% and 20% students passed in Mathematics and Physics, respectively, and 10% students passed in both subjects. What is the probability of a randomly selected student to have passed in Physics if the student already passed in Mathematics?

1. 1/2
2. 1/20
3. 1/4
4. 2/25

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710557**
Option 1 ID : **9167102225**
Option 2 ID : **9167102226**
Option 3 ID : **9167102227**
Option 4 ID : **9167102228**
Status : **Not Answered**
Chosen Option : --

Q.3 The geometric mean of 100 observations is 25. If each observation is multiplied by 4, what will be the new geometric mean?

1. 100
2. 50
3. 25
4. $(25\times4)^{1/2}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710563**
Option 1 ID : **9167102249**
Option 2 ID : **9167102250**
Option 3 ID : **9167102251**
Option 4 ID : **9167102252**
Status : **Not Answered**
Chosen Option : --

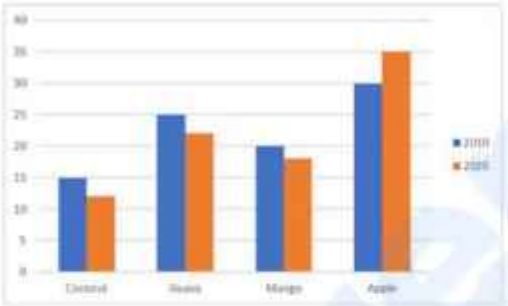
Q.4 A lady bought some apples, each costing Rs. 25, and some bananas each costing Rs 6, for a total of Rs. 378. In how many ways could she have chosen the numbers of apples and bananas?

1. 1
2. 2
3. 3
4. 4

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710566**
Option 1 ID : **9167102261**
Option 2 ID : **9167102262**
Option 3 ID : **9167102263**
Option 4 ID : **9167102264**
Status : **Not Answered**
Chosen Option : --

Q.5 The numbers (in millions) of coconut, guava, mango and apple trees in a region in 2010 and 2020 are shown in the following figure.



The maximum relative change in numbers was for

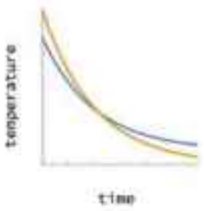
1. coconut trees
2. guava trees
3. mango trees
4. apple trees

Options 1. 1
2. 2
3. 3
4. 4

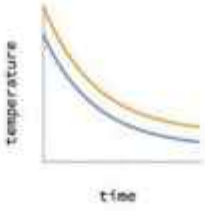
Question Type : **MCQ**
Question ID : **916710573**
Option 1 ID : **9167102289**
Option 2 ID : **9167102290**
Option 3 ID : **9167102291**
Option 4 ID : **9167102292**
Status : **Not Answered**
Chosen Option : --

Q.6 Two identical metal bars are heated to different temperatures and allowed to cool in the same surroundings. Which one of the following figures correctly shows their cooling curves?

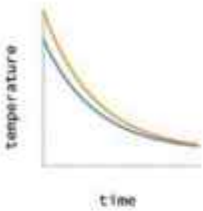
A



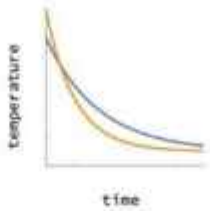

B




C




D

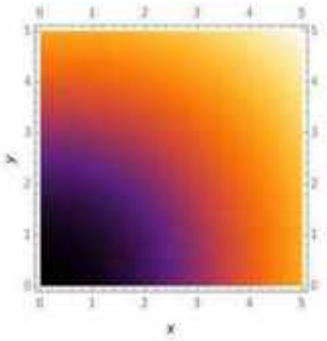



1. A
2. B
3. C
4. D

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710565**
Option 1 ID : **9167102257**
Option 2 ID : **9167102258**
Option 3 ID : **9167102259**
Option 4 ID : **9167102260**
Status : **Not Answered**
Chosen Option : --

Q.7 The following plot shows temperature as a function of $x$ and $y$. Along which path is the temperature change minimum?



1. x = constant or y = constant
2. $\frac{y}{x^2}$ = constant
3. $y^2 + x^2$ = constant
4. y x = constant

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710568**
Option 1 ID : **9167102269**
Option 2 ID : **9167102270**
Option 3 ID : **9167102271**
Option 4 ID : **9167102272**
Status : **Not Answered**
Chosen Option : --

Q.8 The value of $1 + (\frac{1}{2^1} + \frac{1}{3}) + (\frac{1}{2^2} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7}) + \ldots + (\frac{1}{2^8} + \cdots + \frac{1}{1023})$ lies between

1. 2 and 10
2. 11 and 20
3. 21 and 30
4. 31 and 40

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710562**
Option 1 ID : **9167102245**
Option 2 ID : **9167102246**
Option 3 ID : **9167102247**
Option 4 ID : **9167102248**
Status : **Not Answered**
Chosen Option : --

Q.9 Alloy A is formed by mixing iron (Fe) and nickel (Ni) in the ratio 3:4, while alloy B is formed by mixing Fe and Ni in the ratio 9:5. If equal quantities of alloys A and B are melted together to form a new alloy C, what will be the ratio of Fe to Ni in the alloy C?

1. 4:3
2. 5:3
3. 15:13
4. 13:9

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710570**
Option 1 ID : **9167102277**
Option 2 ID : **9167102278**
Option 3 ID : **9167102279**
Option 4 ID : **9167102280**
Status : **Not Answered**
Chosen Option : --

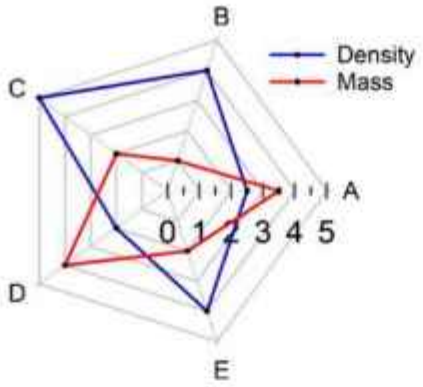
Q.10 In an exam, questions of three difficulty levels hard, medium, and easy fetch respectively 7, 3, and 2 marks if correct and 0 if incorrect. Three students got 30 marks each but in three different ways, though the total number of questions correctly answered by each student was the same. Then what could be the total number of questions correctly answered by each of these students?

1. 12
2. 10
3. 9
4. 6

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710561**
Option 1 ID : **9167102241**
Option 2 ID : **9167102242**
Option 3 ID : **9167102243**
Option 4 ID : **9167102244**
Status : **Not Answered**
Chosen Option : --

Q.11 The following figure shows densities and masses of five objects (A to E).




The object with the largest volume is ____.

1. A
2. B
3. D
4. E

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710556**
Option 1 ID : **9167102221**
Option 2 ID : **9167102222**
Option 3 ID : **9167102223**
Option 4 ID : **9167102224**
Status : **Not Answered**
Chosen Option : --

Q.12 In a community, some artists are teachers, no teacher is a painter, all painters are artists, and all teachers are professionals. Then it can be definitely asserted that

1. no painter is a professional
2. all artists are professionals
3. no professionals are teachers
4. some artists are professionals

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710567**
Option 1 ID : **9167102265**
Option 2 ID : **9167102266**
Option 3 ID : **9167102267**
Option 4 ID : **9167102268**
Status : **Not Answered**
Chosen Option : --

Q.13 Three periodic events repeat every 24 seconds, 54 seconds, and 56 seconds. If they coincide at 10:20:00, when will they next coincide?

1. 10:35:12
2. 10:45:20
3. 10:45:12
4. 10:35:20

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710575**
Option 1 ID : **9167102297**
Option 2 ID : **9167102298**
Option 3 ID : **9167102299**
Option 4 ID : **9167102300**
Status : **Not Answered**
Chosen Option : --

Q.14 Some, but not all, faces of a six-faced cubical fair die are painted red (R) and the remaining green (G); and the die is thrown until red faces come up on top 4 times. Consider the following sequences of colours listed left to right as they appear on the top.

A: **GRRRR**
B: **GRGRRR**
Which one of the following is true?

1. A is more probable than B
2. B is more probable than A
3. Both have the same probability
4. Whether A or B is more probable depends upon how many faces are painted green

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710572**
Option 1 ID : **9167102285**
Option 2 ID : **9167102286**
Option 3 ID : **9167102287**
Option 4 ID : **9167102288**
Status : **Not Answered**
Chosen Option : --

Q.15 Suppose $a_1, a_2, \ldots, a_{300}$ are integers such that $a_{i-1} + a_i + a_{i+1} = 2025$ for all $i = 2,3, \ldots, 299$.

If $a_3 = -5$, $a_9 = 37$, then the value of $a_{106}$ is

1. 1993
2. 37
3. $-5$
4. 2030

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710559**
Option 1 ID : **9167102233**
Option 2 ID : **9167102234**
Option 3 ID : **9167102235**
Option 4 ID : **9167102236**
Status : **Not Answered**
Chosen Option : --

Q.16 Which among the following cities can be said most appropriately to bear the same relation to *Tamil Nadu* that **Pune** bears to *Maharashtra*; **Surat** to *Gujarat* and **Asansol** to *West Bengal*?

1. **Tirupati**
2. **Mysore**
3. **Chennai**
4. **Coimbatore**

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710564**
Option 1 ID : **9167102253**
Option 2 ID : **9167102254**
Option 3 ID : **9167102255**
Option 4 ID : **9167102256**
Status : **Not Answered**
Chosen Option : --

Q.17 A recent survey suggests that the total fertility rate in a country has fallen below 2.1, the population replacement ratio. This necessarily implies that the

1. infant mortality rate has increased reducing the net fertility ratio.
2. total population will decline.
3. population of young people is going to increase with a faster rate in the long run if the same status continues.
4. proportion of elderly people is going to decrease in the long run if the same status continues.

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710560**
Option 1 ID : **9167102237**
Option 2 ID : **9167102238**
Option 3 ID : **9167102239**
Option 4 ID : **9167102240**
Status : **Not Answered**
Chosen Option : --

Q.18 The minimum height of a plane vertical mirror that will allow a 6-feet tall person to see himself fully in it

1. depends on the distance between the person and the mirror
2. is 3 feet
3. is 4.5 feet
4. is 6 feet

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710571**
Option 1 ID : **9167102281**
Option 2 ID : **9167102282**
Option 3 ID : **9167102283**
Option 4 ID : **9167102284**
Status : **Not Answered**
Chosen Option : --

Q.19 Five students graduated from a college, not all in the same year, after each has studied for four years. If batchmates Jiten and Anwar were between Ramesh and Prakash but senior to Sam while Ramesh had left the college before Jiten took admission, then it is certain that

1. Anwar was the most senior
2. Ramesh was the most senior
3. Sam was the most junior
4. Prakash was the most junior

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710574**
Option 1 ID : **9167102293**
Option 2 ID : **9167102294**
Option 3 ID : **9167102295**
Option 4 ID : **9167102296**
Status : **Not Answered**
Chosen Option : --

Q.20 How many 5-digit numbers can be formed from the digits 0, 2, 3, 4, 6, 7 and 9, using each at most once, which are divisible by 5?

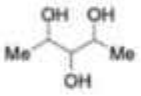
1. 120
2. 240
3. 360
4. 720

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710569**
Option 1 ID : **9167102273**
Option 2 ID : **9167102274**
Option 3 ID : **9167102275**
Option 4 ID : **9167102276**
Status : **Not Answered**
Chosen Option : --

Section : PART-B

Q.21 The number of optically active stereoisomers for the following compound is

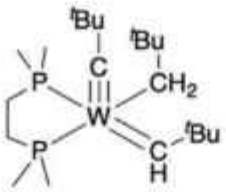



1. 2
2. 4
3. 6
4. 8

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710591**
Option 1 ID : **9167102361**
Option 2 ID : **9167102362**
Option 3 ID : **9167102363**
Option 4 ID : **9167102364**
Status : **Answered**
Chosen Option : **2**

Q.22 The correct option of bond lengths (Å) of the metal-alkylidene and metal-alkylidyne, respectively, and the corresponding $^{13}C$ NMR chemical shifts (ppm) of the complex below



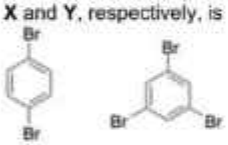

is

1. 1.78, 1.94 and 296, 256
2. 1.94, 1.78 and 256, 296
3. 1.94, 1.78 and 296, 256
4. 1.78, 1.94 and 256, 296

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710582**
Option 1 ID : **9167102325**
Option 2 ID : **9167102326**
Option 3 ID : **9167102327**
Option 4 ID : **9167102328**
Status : **Answered**
Chosen Option : **2**

Q.23 The relative intensity of molecular ion peaks in the mass spectra of compounds **X** and **Y**, respectively, is




**X** **Y**

1. 9:6:1 and 1:2:2:1
2. 1:2:1 and 1:2:2:1
3. 9:6:1 and 1:3:3:1
4. 1:2:1 and 1:3:3:1

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710598**
Option 1 ID : **9167102389**
Option 2 ID : **9167102390**
Option 3 ID : **9167102391**
Option 4 ID : **9167102392**
Status : **Answered**
Chosen Option : **3**

Q.24 The reaction NOT falling under the category of acid–base reaction is

1. $HClO_4 + CH_3CN \rightarrow [CH_3CNH]^+[ClO_4]^-$
2. $NOF + ClF_3 \rightarrow [NO]^+[ClF_4]^-$
3. $XeO_3 + OH^- \rightarrow [HXeO_4]^-$
4. $Pt + XeF_4 \rightarrow PtF_4 + Xe$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710578**
Option 1 ID : **9167102309**
Option 2 ID : **9167102310**
Option 3 ID : **9167102311**
Option 4 ID : **9167102312**
Status : **Answered**
Chosen Option : **4**

Q.25 The correct sequence of increasing O–O bond length in the following species is

1. $[O_2]^+$, $O_2F_2$, $H_2O_2$, $[O_2]^{2-}$
2. $O_2F_2$, $[O_2]^+$, $H_2O_2$, $[O_2]^{2-}$
3. $O_2F_2$, $[O_2]^+$, $[O_2]^{2-}$, $H_2O_2$
4. $[O_2]^+$, $H_2O_2$, $O_2F_2$, $[O_2]^{2-}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710577**
Option 1 ID : **9167102305**
Option 2 ID : **9167102306**
Option 3 ID : **9167102307**
Option 4 ID : **9167102308**
Status : **Answered**
Chosen Option : **1**

Q.26 For the wavefunction, $\psi(x) = A\,exp\left(-\frac{x^4}{a^4} + ikx\right)$, the ratio of probability density at $x = a$ to that at $x = 2a$ is
[Given: $-\infty \leq x \leq \infty$]

1. $e^6$
2. $e^2$
3. 2
4. $e^{30}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710615**
Option 1 ID : **9167102457**
Option 2 ID : **9167102458**
Option 3 ID : **9167102459**
Option 4 ID : **9167102460**
Status : **Not Answered**
Chosen Option : --

Q.27 The point groups of $[Re_2Cl_8]^{2-}$ and *trans*–$[Co(en)_2Cl_2]^+$, respectively, are

1. $D_{4h}$ and $D_2$
2. $D_{4d}$ and $D_2$
3. $D_{4h}$ and $D_{2h}$
4. $D_{4d}$ and $D_{2h}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710580**
Option 1 ID : **9167102317**
Option 2 ID : **9167102318**
Option 3 ID : **9167102319**
Option 4 ID : **9167102320**
Status : **Answered**
Chosen Option : **3**

Q.28 The option with the correct fragments that are isolobal with "S" atom

A. $CpCo(CO)$
B. $CpFe(CO)_2$
C. $Cr(CO)_5$
D. $CH_3^+$

is

1. A, B, and C only
2. A, C, and D only
3. B, C, and D only
4. A, B, and D only

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710584**
Option 1 ID : **9167102333**
Option 2 ID : **9167102334**
Option 3 ID : **9167102335**
Option 4 ID : **9167102336**
Status : **Answered**
Chosen Option : **2**

Q.29 The correct order of the relative rates of solvolysis for the following compounds in 80% aqueous ethanol at 25 °C is


A B C

1. **A > B > C**
2. **B > C > A**
3. **C > A > B**
4. **C > B > A**

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710589**
Option 1 ID : **9167102353**
Option 2 ID : **9167102354**
Option 3 ID : **9167102355**
Option 4 ID : **9167102356**
Status : **Answered**
Chosen Option : **3**

Q.30 Consider the following statements regarding the extraction and separation of lanthanoids from Monazite

A. Monazite is primarily $PO_4^{3-}$ salt of Ln
B. Monazite contains Th along with Ln
C. $Ln^{3+}$ ions are separated by using ion-exchange columns
D. $Ln^{3+}$ ions are eluted from the column by using an aqueous acidic solution of $H_4EDTA$

The option with all correct statements is

1. A, B, and D only
2. B, C, and D only
3. A, C, and D only
4. A, B, and C only

**Options** 1. 1

2. 2

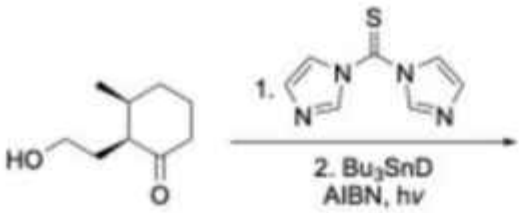
3. 3

4. 4

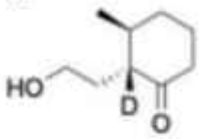
Question Type : **MCQ**
Question ID : **916710581**
Option 1 ID : **9167102321**
Option 2 ID : **9167102322**
Option 3 ID : **9167102323**
Option 4 ID : **9167102324**
Status : **Not Answered**
Chosen Option : --

Q.31

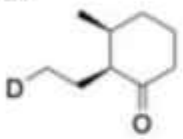
The major product formed in the following reaction is



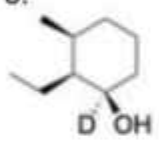

1.



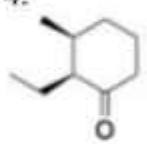

2.




3.




4.




Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710593**
Option 1 ID : **9167102369**
Option 2 ID : **9167102370**
Option 3 ID : **9167102371**
Option 4 ID : **9167102372**
Status : **Answered**
Chosen Option : **2**

Q.32

$C_3^2 i$ is equivalent to

1. $S_6$
2. $S_6^5$
3. $C_6^5$
4. $C_6$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710607**
Option 1 ID : **9167102425**
Option 2 ID : **9167102426**
Option 3 ID : **9167102427**
Option 4 ID : **9167102428**
Status : **Not Answered**
Chosen Option : **--**

Q.33

The structure that corresponds to (1*S*,2*R*,4*S*)-4-isopropyl-2-methylcyclohexanol is

1.



2.



3.



4.



Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710592**
Option 1 ID : **9167102365**
Option 2 ID : **9167102366**
Option 3 ID : **9167102367**
Option 4 ID : **9167102368**
Status : **Answered**
Chosen Option : **2**

Q.34 n moles of a perfect monatomic gas with volume $V_1$ undergoes an adiabatic free expansion to a final volume $V_2 = 5V_1$. The change in entropy (in J $K^{-1}$ $mol^{-1}$) of the gas is
[Given R = 8.314 J $K^{-1}$ $mol^{-1}$]

1. 0
2. 13.38
3. 1.61
4. 8.31

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710609**
Option 1 ID : **9167102433**
Option 2 ID : **9167102434**
Option 3 ID : **9167102435**
Option 4 ID : **9167102436**
Status : **Answered**
Chosen Option : **2**

Q.35 The expression for fractional surface coverage ($\theta_A$) for the dissociative adsorption, $A_2(g) \rightarrow 2A(surface)$, in the presence of an inhibitor I ($I(g) \rightarrow I(surface)$) competing for the same site, is
[Given: $K_A$ and $K_I$ are equilibrium constants for adsorption of $A_2(g)$ and I (g), respectively; $p_i$ is the partial pressure of the $i^{th}$ gas]

1. $\frac{K_A^{1/2} p_{A_2}^{1/2}}{\left(1+K_A^{1/2} p_{A_2}^{1/2}\right)(1+K_I p_I)}$
2. $\frac{K_A^{1/2} p_{A_2}^{1/2} K_I p_I}{\left(1+K_A^{1/2} p_{A_2}^{1/2}\right)(1+K_I p_I)}$
3. $\frac{K_A^{1/2} p_{A_2}^{1/2}}{\left(1+K_A^{1/2} p_{A_2}^{1/2}+K_I p_I\right)}$
4. $\frac{K_A^{1/2} p_{A_2}^{1/2} K_I p_I}{\left(1+K_A^{1/2} p_{A_2}^{1/2}+K_I p_I\right)}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710613**
Option 1 ID : **9167102449**
Option 2 ID : **9167102450**
Option 3 ID : **9167102451**
Option 4 ID : **9167102452**
Status : **Answered**
Chosen Option : **2**

Q.36 Among the following, the amino acid residue in histone that gets acetylated is

1. Alanine
2. Glycine
3. Phenylalanine
4. Lysine

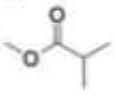
Options 1. 1
2. 2
3. 3
4. 4

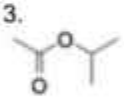
Question Type : **MCQ**
Question ID : **916710602**
Option 1 ID : **9167102405**
Option 2 ID : **9167102406**
Option 3 ID : **9167102407**
Option 4 ID : **9167102408**
Status : **Not Answered**
Chosen Option : **--**

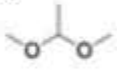
Q.37 The compound that would give the following data is

$^1$H NMR: $\delta$2.43 (m, 1H), 2.10 (s, 3H), 0.95 (d, $J$ = 7 Hz, 6H) ppm.

1.


2.


3.


4.


Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710597**
Option 1 ID : **9167102385**
Option 2 ID : **9167102386**
Option 3 ID : **9167102387**
Option 4 ID : **9167102388**
Status : **Answered**
Chosen Option : **1**

Q.38 The rate ($v$) of the reaction $A + 2B \rightarrow P$ is given by

$$v = k[A][B]$$

If initial concentrations of A and B are 2 mM and 4 mM, respectively, and $k = 0.01\ mol^{-1}\ L\ s^{-1}$, the half-life (in s) of A is

1. $2.5 \times 10^4$
2. $5.0 \times 10^4$
3. $2.5 \times 10^5$
4. $5.0 \times 10^5$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710612**
Option 1 ID : **9167102445**
Option 2 ID : **9167102446**
Option 3 ID : **9167102447**
Option 4 ID : **9167102448**
Status : **Answered**
Chosen Option : **2**

Q.39 The correct reagent(s) to effect the following transformation is(are)


A. $Pd/C, H_2$ (1 atm)
B. $NaBH_4, ZnCl_2$
C. $LiAlH_4$
D. $BH_3 \cdot Me_2S$

1. Only A
2. Only B and C
3. Only B, C and D
4. Only A, B and D

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710590**
Option 1 ID : **9167102357**
Option 2 ID : **9167102358**
Option 3 ID : **9167102359**
Option 4 ID : **9167102360**
Status : **Answered**
Chosen Option : **3**

Q.40 The metals present in the active sites of particulate and soluble methane monooxygenases (abbreviated as pMMO and sMMO respectively) that are produced by methane–metabolizing bacteria, respectively, are

1. Cu and Ni
2. Fe and Ni
3. Mn and Fe
4. Cu and Fe

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710586**
Option 1 ID : **9167102341**
Option 2 ID : **9167102342**
Option 3 ID : **9167102343**
Option 4 ID : **9167102344**
Status : **Answered**
Chosen Option : **3**

Q.41 $\psi(x_1, x_2)$ represents the wavefunction for a two-particle system, where $x_i$ is the combined space and spin coordinates of the $i$-th particle. The correct anti-symmetric wavefunction is

1. $\psi(x_1, x_2) = (x_1^2 - x_2^2)e^{-(x_1^2+x_2^2)}$
2. $\psi(x_1, x_2) = (x_1^2 + x_2^2)e^{-(x_1^2-x_2^2)}$
3. $\psi(x_1, x_2) = (x_1 - x_2)^2 e^{-(x_1^2+x_2^2)}$
4. $\psi(x_1, x_2) = (x_1 + x_2)^2 e^{-(x_1^2-x_2^2)}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710605**
Option 1 ID : **9167102417**
Option 2 ID : **9167102418**
Option 3 ID : **9167102419**
Option 4 ID : **9167102420**
Status : **Not Answered**
Chosen Option : **--**

Q.42 The peak of an absorption spectrum of a molecule is observed at 21,000 $cm^{-1}$. [Given: $k_B = 8.62 \times 10^{-5}$ eV $K^{-1}$; energy corresponding to $\lambda$ (nm) = (1240/$\lambda$) eV]

The correct statement is

1. It is a vibrational transition and the energy required is ~100 times the thermal energy at 25 °C.
2. It is an electronic transition and the energy required is ~100 times the thermal energy at 25 °C.
3. It is a vibrational transition and the energy required is ~200 times the thermal energy at 25 °C.
4. It is an electronic transition and the energy required is ~200 times the thermal energy at 25 °C.

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710608**
Option 1 ID : **9167102429**
Option 2 ID : **9167102430**
Option 3 ID : **9167102431**
Option 4 ID : **9167102432**
Status : **Not Answered**
Chosen Option : **--**

Q.43 The P–O stretching frequency of phosphoryl compounds follows the order

1. $F_3PO > Cl_3PO > Me_3PO > Ph_3PO$
2. $F_3PO > Cl_3PO > Ph_3PO > Me_3PO$
3. $Me_3PO > Ph_3PO > Cl_3PO > F_3PO$
4. $Ph_3PO > Me_3PO > F_3PO > Cl_3PO$

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710579**
Option 1 ID : **9167102313**
Option 2 ID : **9167102314**
Option 3 ID : **9167102315**
Option 4 ID : **9167102316**
Status : **Answered**
Chosen Option : **2**

Q.44

Consider the following statements:

A. Schottky defects decrease the density of the crystal
B. Schottky defects create vacancy pair(s)
C. Alkali metal halides exhibit Frenkel defect

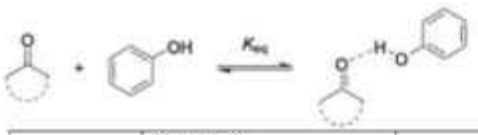
The option containing correct statement(s) is

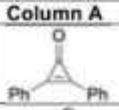
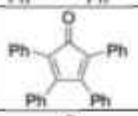
1. Only A
2. Both A and B
3. Both B and C
4. Both A and C

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710614**
Option 1 ID : **9167102453**
Option 2 ID : **9167102454**
Option 3 ID : **9167102455**
Option 4 ID : **9167102456**
Status : **Answered**
Chosen Option : **2**

Q.45 The correct match for the ketones in **Column A** with the $K_{eq}$ values in **Column B** for their H-bonding with phenol (as shown below) is



| | Column A | | Column B |
|---|---|---|---|
| P |  | i. | 6.2 |
| Q |  | ii. | 31.2 |
| R |  | iii. | 83.2 |

1. **P – i; Q – ii, R – iii**
2. **P – iii; Q – i, R – ii**
3. **P – iii; Q – ii, R – i**
4. **P – ii; Q – i, R – iii**

**Options** 1. 1

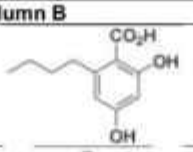
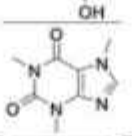
2. 2

3. 3

4. 4

Question Type : **MCQ**
Question ID : **916710600**
Option 1 ID : **9167102397**
Option 2 ID : **9167102398**
Option 3 ID : **9167102399**
Option 4 ID : **9167102400**
Status : **Answered**
Chosen Option : **4**

Q.46 The correct match of class of natural products in **Column A** with the compounds in **Column B** is

| | Column A | | Column B |
|---|---|---|---|
| P | alkaloid | i. |  |
| Q | terpenoid | ii. |  |
| R | polyketide | iii. |  |

1. **P – i; Q – iii, R – ii**
2. **P – ii; Q – i, R – iii**
3. **P – ii; Q – iii, R – i**
4. **P – iii; Q – ii, R – i**

**Options** 1. 1

2. 2

3. 3

4. 4

Question Type : **MCQ**
Question ID : **916710601**
Option 1 ID : **9167102401**
Option 2 ID : **9167102402**
Option 3 ID : **9167102403**
Option 4 ID : **9167102404**
Status : **Answered**
Chosen Option : **1**

Q.47 The approximate ground-state energy of He-isoelectronic series is given by $E(Z) = -Z^2 + \frac{5}{8}Z - 0.1576 + \frac{0.0867}{Z}$. According to Valence Bond Theory, the expression for binding energy of $H_2$ from $H^-$ and $H^+$ $(H_2 \rightarrow H^- + H^+)$ can be approximated to
[Given: $J$, $K$, and $S$ represent Coulomb, exchange and overlap integrals, respectively. Energies are expressed in atomic unit]

1. $0.5239 - \frac{J+K}{1-S^2}$
2. $0.4761 + \frac{J-K}{1-S^2}$
3. $0.4761 - \frac{J+K}{1+S^2}$
4. $0.5239 + \frac{J+K}{1+S^2}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710606**
Option 1 ID : **9167102421**
Option 2 ID : **9167102422**
Option 3 ID : **9167102423**
Option 4 ID : **9167102424**
Status : **Not Answered**
Chosen Option : --

Q.48 For a hermitian operator $\hat{A}$, consider the following statements.

I. $\hat{A}$ has real eigenvalues
II. $<\hat{A}>$, with respect to any arbitrary state, is **always** $\geq 0$
III. $<\hat{A}^2>$, with respect to any arbitrary state, is **always** $\geq 0$
IV. $\hat{A}$ **always** commutes with another hermitian operator

The correct **complete** set of options is

1. I only
2. I, II and III
3. I, II, III, IV
4. I and III only

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710603**
Option 1 ID : **9167102409**
Option 2 ID : **9167102410**
Option 3 ID : **9167102411**
Option 4 ID : **9167102412**
Status : **Not Answered**
Chosen Option : --

Q.49 Among the following, the INCORRECT statement regarding ionization energy is

1. It decreases as the size of the atom increases
2. It increases with increase in nuclear charge
3. It increases continuously from B to F across the second period
4. The ionization energy is higher for electrons in orbitals with greater penetration

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710576**
Option 1 ID : **9167102301**
Option 2 ID : **9167102302**
Option 3 ID : **9167102303**
Option 4 ID : **9167102304**
Status : **Answered**
Chosen Option : **2**

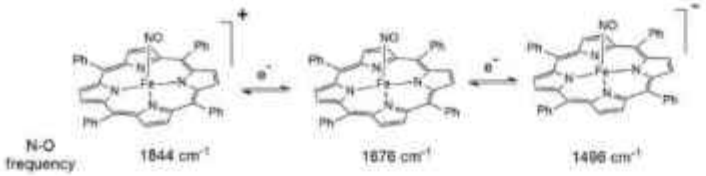
Q.50 The correct statement about the bond angles of $^{\bullet}CF_3$ and $^{\bullet}CH_3$ is

1. $^{\bullet}CF_3 < ^{\bullet}CH_3$ due to $n \rightarrow \sigma^*$ interaction in $^{\bullet}CF_3$
2. $^{\bullet}CF_3 > ^{\bullet}CH_3$ due to $n \rightarrow \sigma^*$ interaction in $^{\bullet}CF_3$
3. $^{\bullet}CF_3 < ^{\bullet}CH_3$ due to bond pair-bond pair repulsion in $^{\bullet}CF_3$
4. $^{\bullet}CF_3 > ^{\bullet}CH_3$ due to bond pair-bond pair repulsion in $^{\bullet}CF_3$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710594**
Option 1 ID : **9167102373**
Option 2 ID : **9167102374**
Option 3 ID : **9167102375**
Option 4 ID : **9167102376**
Status : **Answered**
Chosen Option : **1**

Q.51 For the reaction sequence given below, the correct statement for the doubly reduced species (showing N-O frequency of 1496 $cm^{-1}$)




is

1. The Fe-NO bond length remains unaffected upon reduction
2. There is no back-bonding interaction between iron and NO
3. The reduction is predominantly localized on the NO ligand
4. The reduction is fully localized on the metal

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710587**
Option 1 ID : **9167102345**
Option 2 ID : **9167102346**
Option 3 ID : **9167102347**
Option 4 ID : **9167102348**
Status : **Answered**
Chosen Option : **4**

Q.52 An element $^{27}_{13}\mathbf{A}$ is bombarded with two α−particles to give **B** with the emission of a neutron. The element **B** is

1. $^{30}_{15}\mathbf{B}$
2. $^{35}_{17}\mathbf{B}$
3. $^{34}_{17}\mathbf{B}$
4. $^{32}_{16}\mathbf{B}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710588**
Option 1 ID : **9167102349**
Option 2 ID : **9167102350**
Option 3 ID : **9167102351**
Option 4 ID : **9167102352**
Status : **Answered**
Chosen Option : **3**

Q.53 Consider the following statements about $H_2S$ generation using Kipp's apparatus

A. The reagents used are FeS and dil. $H_2SO_4$
B. The reagents used are FeS and conc. $HNO_3$
C. $H_2S$ can be prepared intermittently (on-demand)
D. Kipp's apparatus consists of three chambers

The option with the correct statements is

1. B, C and D only
2. A and D only
3. A, C and D only
4. B and C only

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710585**
Option 1 ID : **9167102337**
Option 2 ID : **9167102338**
Option 3 ID : **9167102339**
Option 4 ID : **9167102340**
Status : **Answered**
Chosen Option : **3**

Q.54 The degeneracy of a state with energy $\frac{27\,h^2}{8mL^2}$, for a particle confined in a 3D cubic box of length $L$, is

1. 1
2. 2
3. 4
4. 3

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710604**
Option 1 ID : **9167102413**
Option 2 ID : **9167102414**
Option 3 ID : **9167102415**
Option 4 ID : **9167102416**
Status : **Answered**
Chosen Option : **3**

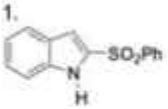
Q.55 The partition function of two indistinguishable noninteracting particles, where one or both can occupy any of the two available energy levels 0 and $\epsilon$ is

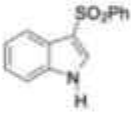
1. $1+e^{-\epsilon/k_BT}+e^{-2\epsilon/k_BT}$
2. $2+e^{-\epsilon/k_BT}+e^{-2\epsilon/k_BT}$
3. $1+2\,e^{-\epsilon/k_BT}+e^{-2\epsilon/k_BT}$
4. $1+e^{-\epsilon/k_BT}+2\,e^{-2\epsilon/k_BT}$

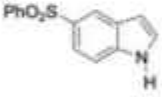
**Options** 1. 1
2. 2
3. 3
4. 4

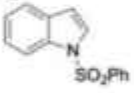
Question Type : **MCQ**
Question ID : **916710610**
Option 1 ID : **9167102437**
Option 2 ID : **9167102438**
Option 3 ID : **9167102439**
Option 4 ID : **9167102440**
Status : **Answered**
Chosen Option : **4**

Q.56 The major product formed in the reaction of indole with $NaNH_2$ and $PhSO_2Cl$ is

1.



2.



3.



4.



**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710595**
Option 1 ID : **9167102377**
Option 2 ID : **9167102378**
Option 3 ID : **9167102379**
Option 4 ID : **9167102380**
Status : **Answered**
Chosen Option : **4**

Q.57 The correct sequence of steps involved in the biosynthesis of $\alpha$-pinene from linalyl pyrophosphate is


A. six-membered ring formation with loss of pyrophosphate (OPP)
B. four-membered ring formation
C. loss of $H^+$

1. A, B, C
2. A, C, B
3. B, C, A
4. B, A, C

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710596**
Option 1 ID : **9167102381**
Option 2 ID : **9167102382**
Option 3 ID : **9167102383**
Option 4 ID : **9167102384**
Status : **Answered**
Chosen Option : **1**

Q.58 The relative reactivity of alkenes for the cobalt-catalyzed hydroformylation reaction follows the order

1. 
2. 
3. 
4. 

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710583**
Option 1 ID : **9167102329**
Option 2 ID : **9167102330**
Option 3 ID : **9167102331**
Option 4 ID : **9167102332**
Status : **Answered**
Chosen Option : **4**

Q.59 In the standard state at 25 °C, upon reversing the electrodes of the following electrochemical cells, Ag(s) will be deposited on the cathode of

| Cell | Anode | Cathode |
|---|---|---|
| A | $AgBr/Ag,\ Br^-$ | $AgCl/Ag,\ Cl^-$ |
| B | $AgBr/Ag,\ Br^-$ | $AgI/Ag,\ I^-$ |
| C | $AgCl/Ag,\ Cl^-$ | $AgI/Ag,\ I^-$ |

[Given, at 25 °C, $E^0$ (in V) = +0.22 $(AgCl/Ag, Cl^-)$; +0.07 $(AgBr/Ag, Br^-)$; −0.15 $(AgI/Ag, I^-)$]

1. A
2. B and C
3. C, but not B
4. A, B and C

**Options** 1. 1

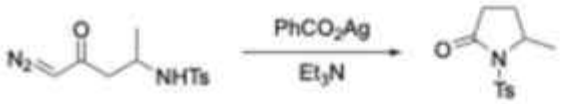
2. 2

3. 3

4. 4

Question Type : **MCQ**
Question ID : **916710611**
Option 1 ID : **9167102441**
Option 2 ID : **9167102442**
Option 3 ID : **9167102443**
Option 4 ID : **9167102444**
Status : **Not Answered**
Chosen Option : --

Q.60 The intermediates involved in the following transformation are




**A**. carbocation; **B**. carbanion; **C**. carbene; **D**. ketene

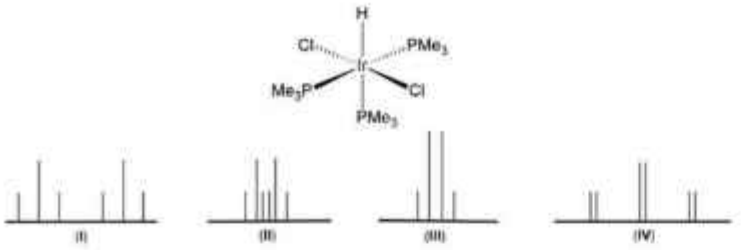
1. **B** and **C**
2. **C** and **D**
3. **A** and **C**
4. **B** and **D**

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710599**
Option 1 ID : **9167102393**
Option 2 ID : **9167102394**
Option 3 ID : **9167102395**
Option 4 ID : **9167102396**
Status : **Answered**
Chosen Option : **2**

Section : PART-C

Q.61 The $^1H$ NMR spectral pattern in the hydride region for the given compound,
[Given, $^{31}P$: I = ½, 100%; $^1H$: I = ½, 99.98%]







is

1. IV
2. I
3. III
4. II

**Options** 1. 1

2. 2

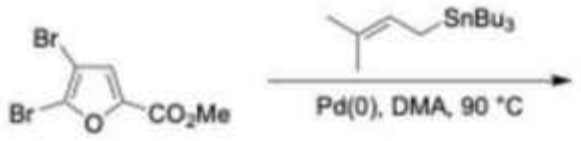
3. 3

4. 4

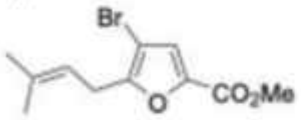
Question Type : **MCQ**
Question ID : **916710635**
Option 1 ID : **9167102537**
Option 2 ID : **9167102538**
Option 3 ID : **9167102539**
Option 4 ID : **9167102540**
Status : **Not Answered**
Chosen Option : --

Q.62

The major product formed in the following reaction is




1.

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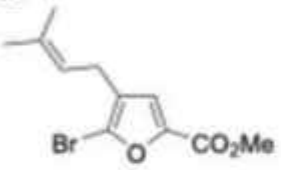
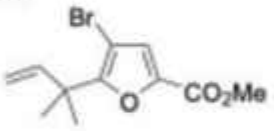
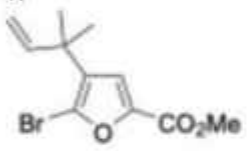



3.




4.




Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710650**
Option 1 ID : **9167102597**
Option 2 ID : **9167102598**
Option 3 ID : **9167102599**
Option 4 ID : **9167102600**
Status : **Answered**
Chosen Option : **1**

Q.63 The calculated magnetic moment in B.M. unit of a tetrahedral transition metal complex is
[Given, free ion term $^4F_{9/2}$, 10 Dq = 3200 $cm^{-1}$ and $|\lambda| = 200\ cm^{-1}$]

1. 2.90
2. 3.38
3. 4.35
4. 4.83

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710623**
Option 1 ID : **9167102489**
Option 2 ID : **9167102490**
Option 3 ID : **9167102491**
Option 4 ID : **9167102492**
Status : **Answered**
Chosen Option : **2**

Q.64 The Hamiltonian of a two-dimensional quantum harmonic oscillator is

$$H = \frac{p_1^2}{2m} + \frac{p_2^2}{2m} + \frac{1}{2}m\omega^2x^2 + 2m\omega^2y^2,$$

where $m$ and $\omega$ are positive constants. The degeneracy of the level with energy $E = \frac{15}{2}\hbar\omega$ is

1. 5
2. 6
3. 7
4. 8

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710657**
Option 1 ID : **9167102625**
Option 2 ID : **9167102626**
Option 3 ID : **9167102627**
Option 4 ID : **9167102628**
Status : **Answered**
Chosen Option : **2**

Q.65 A metal can exist in two different crystalline forms: face centered cubic (*fcc*) lattice and body centered cubic (*bcc*) lattice with unit cell edge lengths of 2 Å and 4 Å, respectively. The ratio of the density of the *fcc* lattice to that of the *bcc* lattice is

1. 2
2. 8
3. 4
4. 16

**Options** 1. 1

2. 2

3. 3

4. 4

Question Type : **MCQ**
Question ID : **916710672**
Option 1 ID : **9167102685**
Option 2 ID : **9167102686**
Option 3 ID : **9167102687**
Option 4 ID : **9167102688**
Status : **Answered**
Chosen Option : **2**

Q.66 Column I contains inner transition elements and Column II includes ores, structural property and application.

| Column I | | Column II | |
|---|---|---|---|
| a. | Th | i. | Pitchblende |
| b. | U | ii. | BCC structure in its metallic form |
| c. | Eu | iii. | Laser |
| d. | Nd | iv. | Monazite |

The option with the correct match is

1. (a–ii), (b–iv), (c–iii), (d–i)
2. (a–iv), (b–i), (c–ii), (d–iii)
3. (a–i), (b–iv), (c–ii), (d–iii)
4. (a–iv), (b–i), (c–iii), (d–ii)

**Options** 1. 1

2. 2

3. 3

4. 4

Question Type : **MCQ**
Question ID : **916710625**
Option 1 ID : **9167102497**
Option 2 ID : **9167102498**
Option 3 ID : **9167102499**
Option 4 ID : **9167102500**
Status : **Not Answered**
Chosen Option : **--**

Q.67 The correct reagent to effect the following reaction is

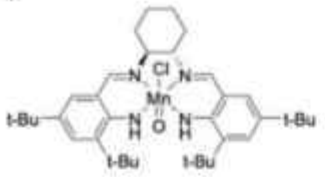

1. TBAF
2. Pd/C, $H_2$
3. PTSA, MeOH
4. $Hg(ClO_4)_2$, $CaCO_3$

**Options** 1. 1
2. 2
3. 3
4. 4

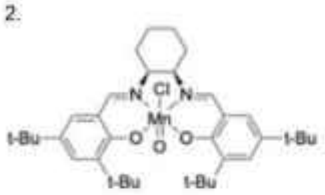
Question Type : **MCQ**
Question ID : **916710648**
Option 1 ID : **9167102589**
Option 2 ID : **9167102590**
Option 3 ID : **9167102591**
Option 4 ID : **9167102592**
Status : **Answered**
Chosen Option : **4**

Q.68 The structure of active catalyst involved in Jacobsen asymmetric epoxidation is

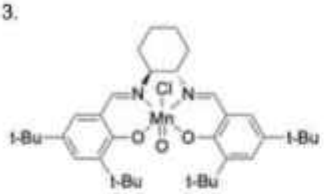
1.



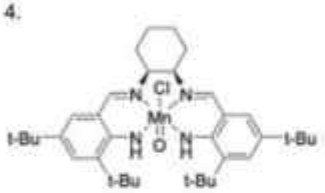

2.




3.




4.




**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710642**
Option 1 ID : **9167102565**
Option 2 ID : **9167102566**
Option 3 ID : **9167102567**
Option 4 ID : **9167102568**
Status : **Answered**
Chosen Option : **2**

Q.69 The total number of isomers including pair(s) of enantiomers for the octahedral complex with the general formula $Ma_2b_2cd$ is

1. 6 including 1 pair
2. 6 including 2 pairs
3. 8 including 1 pair
4. 8 including 2 pairs

**Options** 1. 1

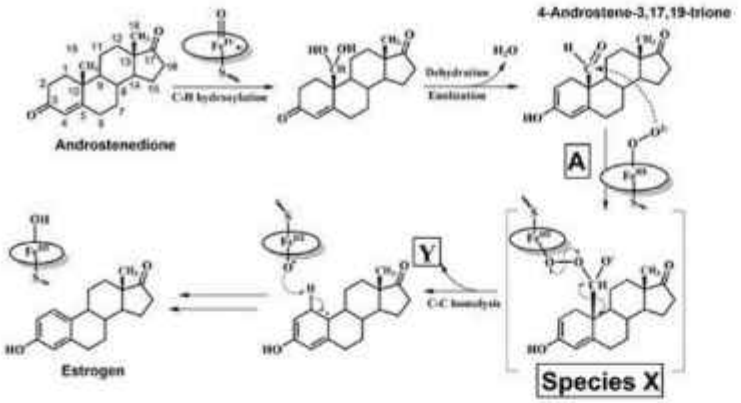
2. 2

3. 3

4. 4

Question Type : **MCQ**
Question ID : **916710622**
Option 1 ID : **9167102485**
Option 2 ID : **9167102486**
Option 3 ID : **9167102487**
Option 4 ID : **9167102488**
Status : **Answered**
Chosen Option : **4**

Q.70 The synthesis of Estrogen from Androstenedione in humans is catalyzed by aromatase which is a cytochrome P450 enzyme. In the reaction mechanism described below, the missing reaction step **A**, description of the intermediate **species X**, and chemical species **Y**, respectively, are

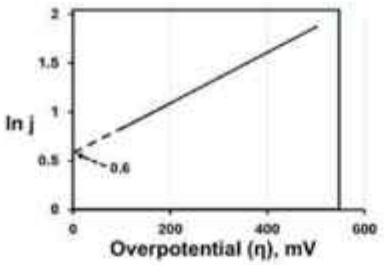



1. Electrophilic attack, peroxide, and $CO_2$
2. Nucleophilic attack, peroxyhemiacetal, and $CO_2$
3. Nucleophilic attack, peroxyhemiacetal, and $HCOO^-$
4. Electrophilic attack, peroxide, and $HCOO^-$

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710632**
Option 1 ID : **9167102525**
Option 2 ID : **9167102526**
Option 3 ID : **9167102527**
Option 4 ID : **9167102528**
Status : **Answered**
Chosen Option : **3**

Q.71 The following figure shows a plot of **ln j** versus **η** for the platinum electrode of area 1 $cm^2$ in contact with an aqueous solution of $Fe^{3+}$ ($10^{-3}$ M) and $Fe^{2+}$ ($10^{-3}$ M) at 300 K. Here **j** and **η** represent current (in mA) and overpotential (in mV), respectively.




The charge transfer resistance (in Ω) for this system is closest to

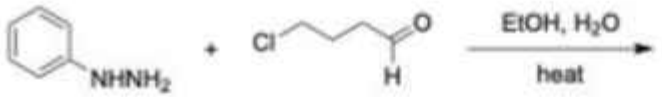
1. 1.36
2. 4.91
3. 14.2
4. 49.1

**Options** 1. 1
2. 2
3. 3
4. 4

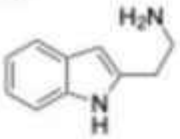
Question Type : **MCQ**
Question ID : **916710668**
Option 1 ID : **9167102669**
Option 2 ID : **9167102670**
Option 3 ID : **9167102671**
Option 4 ID : **9167102672**
Status : **Not Answered**
Chosen Option : --

Q.72

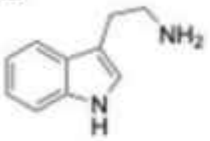
The major product formed in the following reaction is



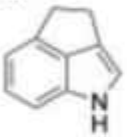

1.



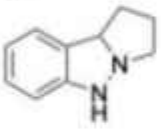

2.




3.




4.




**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710637**
Option 1 ID : **9167102545**
Option 2 ID : **9167102546**
Option 3 ID : **9167102547**
Option 4 ID : **9167102548**
Status : **Not Answered**
Chosen Option : **--**

Q.73 A nonlinear polyatomic molecule belongs to $D_{2d}$ point group. The character table of the point group is given below.

| $D_{2d}$ | $E$ | $2S_4$ | $C_2$ | $2C_2'$ | $2\sigma_d$ |
|---|---|---|---|---|---|
| $A_1$ | 1 | 1 | 1 | 1 | 1 |
| $A_2$ | 1 | 1 | 1 | −1 | −1 |
| $B_1$ | 1 | −1 | 1 | 1 | −1 |
| $B_2$ | 1 | −1 | 1 | −1 | 1 |
| E | 2 | 0 | −2 | 0 | 0 |

The symmetry of one of the normal modes is E. The symmetry of the second excited state of this mode in terms of the irreducible representations of the point group of the molecule is

1. $2A_1+2B_2$
2. $2A_1+B_1+B_2$
3. $A_2+2B_1+B_2$
4. $A_1+A_2+B_1+B_2$

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710661**
Option 1 ID : **9167102641**
Option 2 ID : **9167102642**
Option 3 ID : **9167102643**
Option 4 ID : **9167102644**
Status : **Not Answered**
Chosen Option : **--**

Q.74 An enzyme (E) catalyzes the conversion of a substrate (S) to product (P) according to the following mechanism

$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_2} ES' \xrightarrow{k_3} E + P$$

Applying steady state approximation to $ES$ and $ES'$, the expression for the rate of reaction is

[ $[E]_0$ and $[S]_0$ are initial concentration of enzyme and substrate, respectively and $[S]_0 \gg [E]_0$ ]

1. $k_3[E]_0[S]_0$
2. $\frac{k_1k_2[E]_0[S]_0}{(k_{-1}+k_2)+k_1[S]_0}$
3. $\frac{k_1k_2[E]_0[S]_0}{(k_{-1}+k_2)+k_1\left(1+\frac{k_2}{k_3}\right)[S]_0}$
4. $\frac{k_1k_2[E]_0[S]_0}{(k_{-1}+k_2)+k_2\left(1+\frac{k_1}{k_2}\right)[S]_0}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710669**
Option 1 ID : **9167102673**
Option 2 ID : **9167102674**
Option 3 ID : **9167102675**
Option 4 ID : **9167102676**
Status : **Not Answered**
Chosen Option : **--**

Q.75 The correct order of $\nu_{C-S}$ (in $cm^{-1}$) and $\nu_{C-N}$ (in $cm^{-1}$) in *trans*–[Pd(AsPh$_3$)$_2$(**N**CS)$_2$] (**A**) and *trans*–[Pd(AsPh$_3$)$_2$(**S**CN)$_2$] (**B**) is

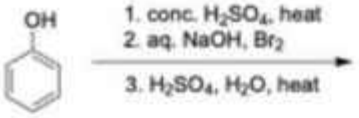
1. $\nu_{C-S}$ in **A** < $\nu_{C-S}$ in **B** ; $\nu_{C-N}$ in **A** < $\nu_{C-N}$ in **B**
2. $\nu_{C-S}$ in **A** ≈ $\nu_{C-S}$ in **B** ; $\nu_{C-N}$ in **A** ≈ $\nu_{C-N}$ in **B**
3. $\nu_{C-S}$ in **B** < $\nu_{C-S}$ in **A** ; $\nu_{C-N}$ in **A** < $\nu_{C-N}$ in **B**
4. $\nu_{C-S}$ in **B** < $\nu_{C-S}$ in **A** ; $\nu_{C-N}$ in **B** < $\nu_{C-N}$ in **A**

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710627**
Option 1 ID : **9167102505**
Option 2 ID : **9167102506**
Option 3 ID : **9167102507**
Option 4 ID : **9167102508**
Status : **Marked For Review**
Chosen Option : **4**

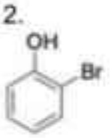
Q.76

The major product formed in the following reaction sequence is

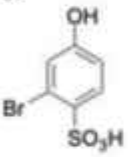



1.

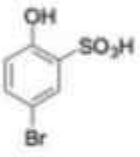

2.




3.




4.




**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710639**
Option 1 ID : **9167102553**
Option 2 ID : **9167102554**
Option 3 ID : **9167102555**
Option 4 ID : **9167102556**
Status : **Answered**
Chosen Option : **2**

Q.77 The correct sequence of reagents to effect the following transformation is


1. $PhLi$; $Me_2NH/Et_2O$; $(EtCO)_2O$/pyridine
2. $PhLi$; $(EtCO)_2O$/pyridine; $Me_2NH/Et_2O$
3. $Me_2NH/Et_2O$; $PhLi$; $(EtCO)_2O$/pyridine
4. $Me_2NH/Et_2O$; $(EtCO)_2O$/pyridine; $PhLi$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710645**
Option 1 ID : **9167102577**
Option 2 ID : **9167102578**
Option 3 ID : **9167102579**
Option 4 ID : **9167102580**
Status : **Answered**
Chosen Option : **3**

Q.78 The observed frequencies of first and third overtones of a gaseous diatomic molecule are $1050\ cm^{-1}$ and $2068\ cm^{-1}$, respectively. The magnitude of (dimensionless) anharmonicity constant is closest to

1. $3.5 \times 10^{-3}$
2. $5.5 \times 10^{-3}$
3. $7.5 \times 10^{-3}$
4. $9.5 \times 10^{-3}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710662**
Option 1 ID : **9167102645**
Option 2 ID : **9167102646**
Option 3 ID : **9167102647**
Option 4 ID : **9167102648**
Status : **Not Answered**
Chosen Option : **--**

**Q.79** The mean molar volume ($V_m$) of a binary solution of liquid A and liquid B is given by

$$V_m = a + bx + c(x - 0.5)^2$$

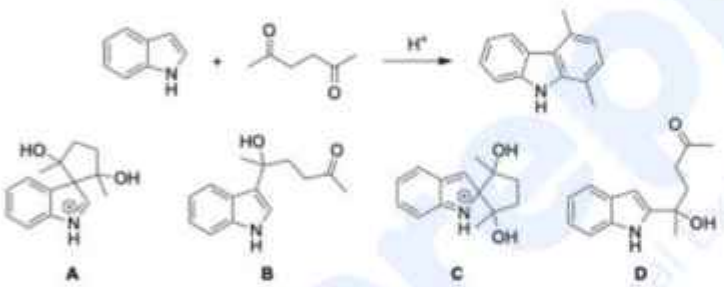
where $x$ is the mole fraction of liquid B and $a$, $b$ and $c$ are constants. The partial molar volume of A is given by

1. $b + 2cx - c$
2. $a + cx^2 - \frac{c}{4}$
3. $a - cx^2 + \frac{c}{4}$
4. $b + cx^2 - ax$

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710665**
Option 1 ID : **9167102657**
Option 2 ID : **9167102658**
Option 3 ID : **9167102659**
Option 4 ID : **9167102660**
Status : **Not Answered**
Chosen Option : **--**

**Q.80** The intermediates involved in the following transformation are

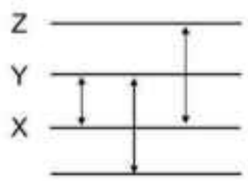



1. **A** and **B**
2. **C** and **D**
3. **B** and **D**
4. **A** and **C**

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710651**
Option 1 ID : **9167102601**
Option 2 ID : **9167102602**
Option 3 ID : **9167102603**
Option 4 ID : **9167102604**
Status : **Answered**
Chosen Option : **1**

Q.81 The allowed electronic transitions among four different atomic energy levels are indicated in the diagram below.




Given that the lowest energy state is a $^3P$ state, a possible set of correct energy levels (X, Y and Z) is

1. $X=^3D_1$, $Y=^3P_1$ and $Z=^3D_2$
2. $X=^3P_1$, $Y=^3D_1$ and $Z=^3D_2$
3. $X=^3P_2$, $Y=^3D_1$ and $Z=^3P_1$
4. $X=^3P_1$, $Y=^3P_2$ and $Z=^3D_1$

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710659**
Option 1 ID : **9167102633**
Option 2 ID : **9167102634**
Option 3 ID : **9167102635**
Option 4 ID : **9167102636**
Status : **Not Answered**
Chosen Option : **--**

Q.82 The correct order of rate for the following isotope exchange reaction
$[M(CN)_6]^{3-} + 6\ ^{14}CN^- \rightarrow [M(^{14}CN)_6]^{3-} + 6\ CN^-$
(where, M = Cr, Mn, and Fe)

is

1. Fe > Mn > Cr
2. Mn > Fe > Cr
3. Fe > Cr > Mn
4. Cr > Mn > Fe

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710617**
Option 1 ID : **9167102465**
Option 2 ID : **9167102466**
Option 3 ID : **9167102467**
Option 4 ID : **9167102468**
Status : **Answered**
Chosen Option : **2**

Q.83 Consider the following statements related to the glass transition temperature ($T_g$) of a polymer.

A. $T_g$ of the polymer increases with its molecular weight
B. $T_g$ of the polymer increases upon addition of a plasticizer
C. $T_g$ of the polymer is always lower than its melting temperature ($T_m$)

The correct complete set of options is

1. A and B
2. A and C
3. B and C
4. A, B and C

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710673**
Option 1 ID : **9167102689**
Option 2 ID : **9167102690**
Option 3 ID : **9167102691**
Option 4 ID : **9167102692**
Status : **Not Answered**
Chosen Option : --

Q.84 Consider the following statements about hemerythrin

A. Non-heme binuclear iron centers linked by two bridging carboxylate groups
B. Heme protein coordinated by amino acid side chains
C. Coordination of $O_2$ occurs at only one of the Fe atoms
D. Identical active site is found in methane monooxygenase, acid phosphatases, and some ribonucleotide reductases

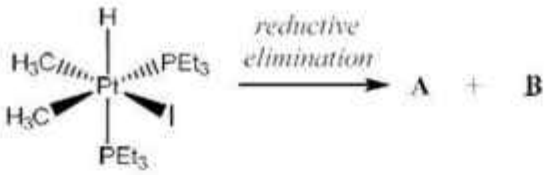
The option with all correct statements is

1. A, C, and D only
2. B and D only
3. B, C, and D only
4. A and C only

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710631**
Option 1 ID : **9167102521**
Option 2 ID : **9167102522**
Option 3 ID : **9167102523**
Option 4 ID : **9167102524**
Status : **Not Answered**
Chosen Option : --

Q.85 Consider the following reaction.




The **most likely** products **A** and **B**, respectively, are

1.  and $CH_4$
2.  and $H_3C—CH_3$
3.  and $CH_3I$
4.  and HI

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710626**
Option 1 ID : **9167102501**
Option 2 ID : **9167102502**
Option 3 ID : **9167102503**
Option 4 ID : **9167102504**
Status : **Answered**
Chosen Option : **2**

Q.86 Consider the following outer-sphere electron transfer reaction:
$MnO_4^- + [Fe(CN)_6]^{4-} \rightarrow MnO_4^{2-} + [Fe(CN)_6]^{3-}$

[Given at 25 °C, $E^0$ for $MnO_4^-/MnO_4^{2-}$ = 0.56 V, $[Fe(CN)_6]^{3-}/[Fe(CN)_6]^{4-}$ = 0.36 V; Self-exchange rate constant, $k_{11}$ for Mn complex = 3600 $M^{-1}s^{-1}$, Self-exchange rate constant, $k_{22}$ for Fe complex = 300 $M^{-1}s^{-1}$, assume correction factor, $f_{12}$ = 1]

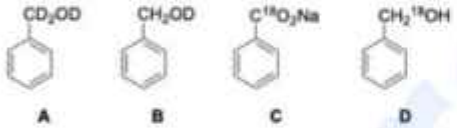
The cross-exchange rate constant ($k_{12}$, $M^{-1}s^{-1}$) for the given reaction is

1. $1.8 \times 10^3$
2. $4.8 \times 10^6$
3. $5.1 \times 10^4$
4. $2.5 \times 10^5$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710624**
Option 1 ID : **9167102493**
Option 2 ID : **9167102494**
Option 3 ID : **9167102495**
Option 4 ID : **9167102496**
Status : **Answered**
Chosen Option : **2**

Q.87 The Cannizzaro reaction of benzaldehyde with NaOH was carried out independently in i) $D_2O$ and ii) $H_2{}^{18}O$. The major isotopically labelled products obtained in these reactions are




1. **A**, **B**, **D** only
2. **B**, **C**, **D** only
3. **A**, **D** only
4. **B**, **C** only

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710638**
Option 1 ID : **9167102549**
Option 2 ID : **9167102550**
Option 3 ID : **9167102551**
Option 4 ID : **9167102552**
Status : **Answered**
Chosen Option : **4**

Q.88

The structures of $[B_5H_{11}]$, $[C_2B_{10}H_{12}]$ and $[B_{11}H_{14}]^-$, respectively, are

1. nido, arachno, closo
2. nido, closo, arachno
3. arachno, closo, nido
4. arachno, nido, closo

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710629**
Option 1 ID : **9167102513**
Option 2 ID : **9167102514**
Option 3 ID : **9167102515**
Option 4 ID : **9167102516**
Status : **Answered**
Chosen Option : **3**

Q.89

Consider the following statements for ozone molecule.

A. It is Raman-active
B. It is IR-active
C. It belongs to $C_{2h}$ point group
D. It is a diamagnetic molecule

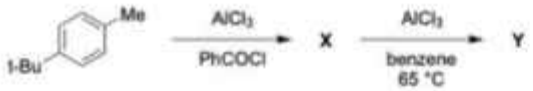
The option with the correct statements is

1. A, B, and C only
2. A, B, and D only
3. A, C, and D only
4. B, C, and D only

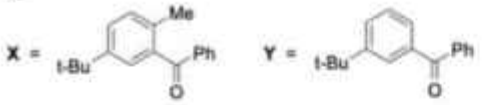
Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710616**
Option 1 ID : **9167102461**
Option 2 ID : **9167102462**
Option 3 ID : **9167102463**
Option 4 ID : **9167102464**
Status : **Not Attempted and Marked For Review**
Chosen Option : **--**

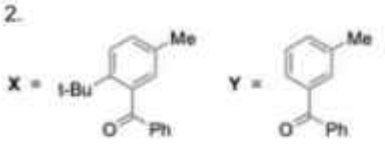
Q.90 The major products **X** and **Y** formed in the following reaction sequence are



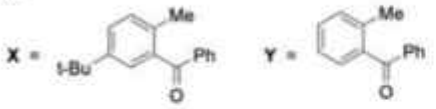

1.



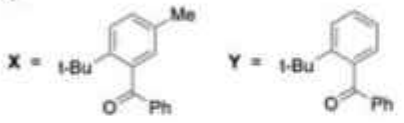

2.




3.




4.



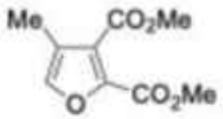

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710647**
Option 1 ID : **9167102585**
Option 2 ID : **9167102586**
Option 3 ID : **9167102587**
Option 4 ID : **9167102588**
Status : **Answered**
Chosen Option : **3**

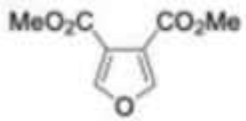
Q.91

The major product formed in the following reaction is

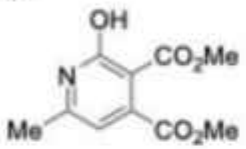

1.



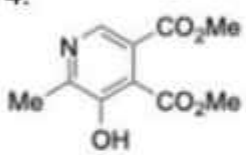

2.




3.




4.




**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710640**
Option 1 ID : **9167102557**
Option 2 ID : **9167102558**
Option 3 ID : **9167102559**
Option 4 ID : **9167102560**
Status : **Not Answered**
Chosen Option : **--**

Q.92 The average energy of an ensemble of noninteracting particles is $1000\ k_BT$ at a temperature $T$. Each particle can have energy of either $0$ or $k_BT$. The number of particles in the ensemble is closest to

[$k_B$: Boltzmann constant]

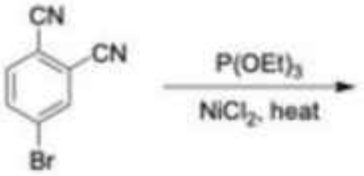
1. 1738
2. 3718
3. 7183
4. 8731

**Options** 1. 1
2. 2
3. 3
4. 4

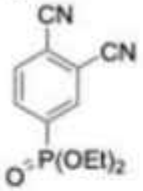
Question Type : **MCQ**
Question ID : **916710667**
Option 1 ID : **9167102665**
Option 2 ID : **9167102666**
Option 3 ID : **9167102667**
Option 4 ID : **9167102668**
Status : **Not Answered**
Chosen Option : **--**

Q.93

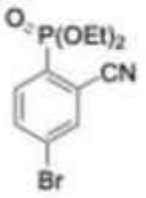
The major product formed in the following reaction is



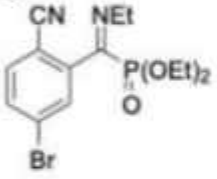

1.



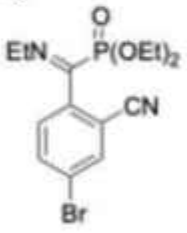

2.




3.




4.

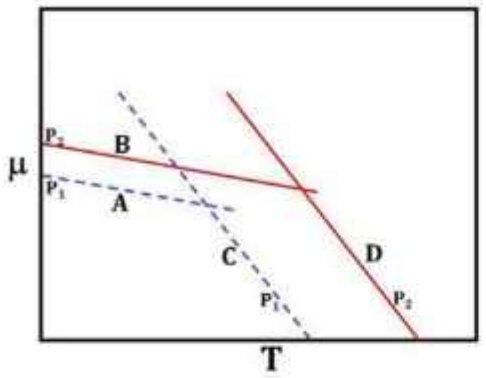



Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710653**
Option 1 ID : **9167102609**
Option 2 ID : **9167102610**

Option 3 ID : 916710[illegible]
Option 4 ID : 916710[illegible]
Status : Not Answered
Chosen Option : --

Q.94 The following figure shows the variation of chemical potential ($\mu$) of a pure substance in its liquid or solid form with temperature, when the pressure is increased from $P_1$ *to* $P_2$. The lines **A, B, C, D** shown in the figure are at constant pressure $P_1$ *or* $P_2$.




The correct option about the information shown in this figure is

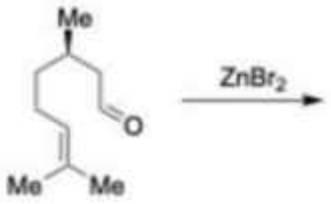
1. **A** is for ice and **C** is for liquid water; $S_m(C) = \left(\frac{\partial \mu_C}{\partial p}\right)_T$
2. **A** and **B** are for an organic liquid; $V_m(B) = -\left(\frac{\partial \mu_B}{\partial T}\right)_p$
3. **A** and **B** are for ice; $S_m(B) = -\left(\frac{\partial \mu_B}{\partial T}\right)_p$
4. **A** is for solid and **C** is for liquid form of an organic substance; $S_m(A) = -\left(\frac{\partial \mu_A}{\partial T}\right)_p$

**Options** 1. 1
2. 2
3. 3
4. 4

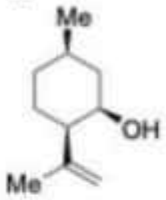
Question Type : **MCQ**
Question ID : **916710666**
Option 1 ID : **9167102661**
Option 2 ID : **9167102662**
Option 3 ID : **9167102663**
Option 4 ID : **9167102664**
Status : **Not Answered**
Chosen Option : --

Q.95

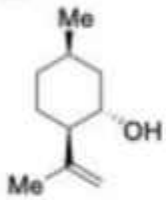
The major product formed in the following reaction is



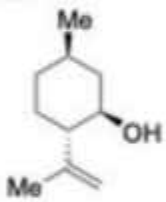

1.



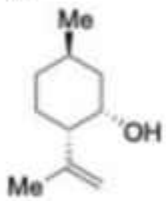

2.




3.




4.

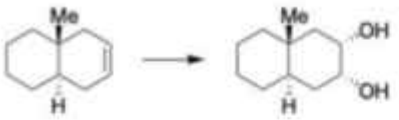



Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710655**

Option 1 ID : 916710[illegible]
Option 2 ID : 916710[illegible]
Option 3 ID : 916710[illegible]19
Option 4 ID : 9167102620
Status : **Answered**
Chosen Option : **3**

**Q.96** The correct set of reagents to effect the following transformation is




1. $OsO_4$, NMO
2. i. $I_2$, AgOAc, $H_2O$; ii. NaOH, $H_2O$
3. i. $I_2$, AgOBz; ii. NaOH, $H_2O$
4. $OsO_4$, $NaIO_4$

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710636**
Option 1 ID : **9167102541**
Option 2 ID : **9167102542**
Option 3 ID : **9167102543**
Option 4 ID : **9167102544**
Status : **Answered**
Chosen Option : **1**

**Q.97** 0.5 M solution (A) of a substance transmits 10% of the incident light. Another solution (B) of the same substance under identical experimental conditions transmits 1% of the incident light. The concentration (in M) of the substance in the solution B is

1. 8
2. 10
3. 1
4. 5

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710675**
Option 1 ID : **9167102697**
Option 2 ID : **9167102698**
Option 3 ID : **9167102699**
Option 4 ID : **9167102700**
Status : **Answered**
Chosen Option : **3**

Q.98

The energy (in units of $\frac{h^2}{8mL^2}$) of the ground state of a system of six noninteracting electrons, confined in a 3-dimensional box with lengths $L$, $L/2$ and $L/4$, is

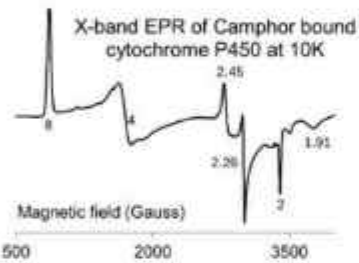
1. 74
2. 126
3. 156
4. 148

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710656**
Option 1 ID : **9167102621**
Option 2 ID : **9167102622**
Option 3 ID : **9167102623**
Option 4 ID : **9167102624**
Status : **Not Answered**
Chosen Option : --

Q.99

The X-band EPR spectrum of camphor-bound cytochrome P450 at 10 K shows a mixture of high-spin and low-spin ferric species.




The correct set of g-values for the high-spin and low-spin species, respectively, are

1. High-spin: 8, 4, 2 and low-spin: 2.45, 2.26, 1.91
2. High-spin: 8, 4, 2.26 and low-spin: 2.45, 2, 1.91
3. High-spin: 8, 2.45, 2.26 and low-spin: 4, 2, 1.91
4. High-spin: 4, 2.45, 2.26 and low-spin: 8, 2, 1.91

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710634**
Option 1 ID : **9167102533**
Option 2 ID : **9167102534**
Option 3 ID : **9167102535**
Option 4 ID : **9167102536**
Status : **Not Answered**
Chosen Option : --

**Q.100** Given below are enzymes (column I), the metal in their active sites (column II) and the class of reactions they catalyze (column III)

| Column I | Column II | Column III |
|---|---|---|
| a. Catalase | p. Copper | i. Hydrolysis reaction |
| b. Urease | q. Copper and iron | ii. Decomposition reaction |
| c. Cytochrome *c* oxidase | r. Iron | iii. Phenol to quinone |
| d. Laccase | s. Nickel | iv. Oxygen to water |

The option with the correct match is

1. (a–q–ii), (b–s–i), (c–p–iv), (d–r–iii)
2. (a–q–iii), (b–r–iv), (c–s–i), (d–p–ii)
3. (a–r–iv), (b–p–iii), (c–q–i), (d–s–ii)
4. (a–r–ii), (b–s–i), (c–q–iv), (d–p–iii)

**Options** 1. 1

2. 2

3. 3

4. 4

Question Type : **MCQ**
Question ID : **916710633**
Option 1 ID : **9167102529**
Option 2 ID : **9167102530**
Option 3 ID : **9167102531**
Option 4 ID : **9167102532**
Status : **Answered**
Chosen Option : **4**

**Q.101** The $^1$H NMR of mixture of ethyl iodide and bromoform gives three signals at $\delta$ 6.80, 3.20 and 1.85 ppm with integration of 1, 3, 4.5, respectively. The molar ratio of ethyl iodide and bromoform is

1. 3 : 1
2. 1.5 : 1
3. 1 : 3
4. 1 : 1.5

**Options** 1. 1

2. 2

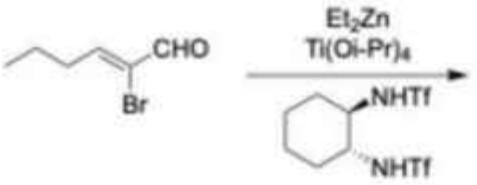
3. 3

4. 4

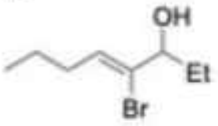
Question Type : **MCQ**
Question ID : **916710641**
Option 1 ID : **9167102561**
Option 2 ID : **9167102562**
Option 3 ID : **9167102563**
Option 4 ID : **9167102564**
Status : **Not Answered**
Chosen Option : **--**

Q.102

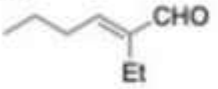
The major product formed in the following reaction is



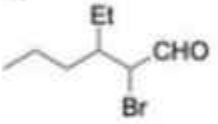

1.



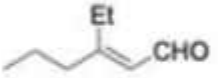

2.




3.




4.




**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710654**
Option 1 ID : **9167102613**
Option 2 ID : **9167102614**
Option 3 ID : **9167102615**
Option 4 ID : **9167102616**
Status : **Not Answered**
Chosen Option : **--**

Q.103 Given below are the oxohalide ions (column I) and their bond lengths (column II) and bond angles (column III).

| Column I Oxohalide ion | Column II X–O (pm) | Column III O–X–O angle (°) |
|---|---|---|
| a. $ClO_3^-$ | p. 165 | i. 100 |
| b. $BrO_3^-$ | q. 149 | ii. 107 |
| c. $IO_3^-$ | r. 181 | iii. 104 |

The option with the correct match is

1. (a–r–ii), (b–p–i), (c–q–iii)
2. (a–q–i), (b–r–iii), (c–p–ii)
3. (a–r–iii), (b–q–i), (c–p–ii)
4. (a–q–ii), (b–p–iii), (c–r–i)

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710618**
Option 1 ID : **9167102469**
Option 2 ID : **9167102470**
Option 3 ID : **9167102471**
Option 4 ID : **9167102472**
Status : **Answered**
Chosen Option : **4**

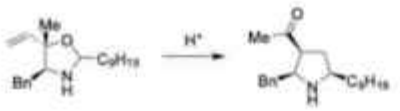
Q.104 Given the trial wavefunction $\phi(x) = ae^{-\alpha x^2} + be^{-\beta|x|}$ for the system having potential $V(x) = \frac{1}{2}m\omega^2x^2$, the variationally optimized ground-state energy of the system is obtained with the parameters

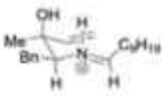
1. $a = 1,\ b = 0$
2. $a = 1/\sqrt{2},\ b = 1/\sqrt{2}$
3. $a = 0,\ b = 1$
4. $a = 1,\ b = 1$

Options 1. 1
2. 2
3. 3
4. 4

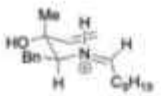
Question Type : **MCQ**
Question ID : **916710658**
Option 1 ID : **9167102629**
Option 2 ID : **9167102630**
Option 3 ID : **9167102631**
Option 4 ID : **9167102632**
Status : **Not Answered**
Chosen Option : **--**

Q.105 The intermediates involved in the following reaction are

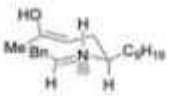




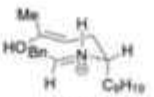
I



II



III



IV

1. I and IV
2. II and III
3. I and III
4. II and IV

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710646**
Option 1 ID : **9167102581**
Option 2 ID : **9167102582**
Option 3 ID : **9167102583**
Option 4 ID : **9167102584**
Status : **Not Answered**
Chosen Option : --

Q.106 The table below contains the following compounds with their characteristics

| Compounds | Oxidation state of phosphorus | Number of acidic hydrogens |
|---|---|---|
| a. Hypophosphoric acid | p. 5 | i. 2 |
| b. Pyrophosphorous acid | q. 1 | ii. 3 |
| c. Hypophosphorous acid | r. 4 | iii. 4 |
| d. Orthophosphoric acid | s. 3 | iv. 1 |

The option with the correct match is

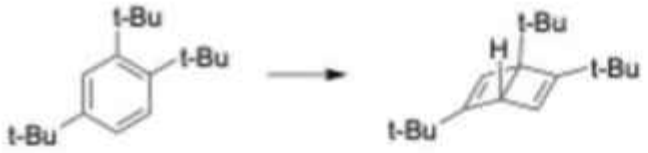
1. (a–r–iii), (b–s–i), (c–q–iv), (d–p–ii)
2. (a–s–ii), (b–r–iii), (c–q–iv), (d–p–i)
3. (a–p–ii), (b–r–iv), (c–q–i), (d–s–iii)
4. (a–r–iii), (b–s–ii), (c–q–iv), (d–p–i)

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710621**
Option 1 ID : **9167102481**
Option 2 ID : **9167102482**
Option 3 ID : **9167102483**
Option 4 ID : **9167102484**
Status : **Not Answered**
Chosen Option : **--**

Q.107

The following electrocyclic ring closing reaction is




A. 4 $e^-$ conrotatory ring closure
B. 4 $e^-$ disrotatory ring closure
C. allowed under thermal conditions
D. allowed under photochemical conditions

1. A and C
2. A and D
3. B and C
4. B and D

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710643**
Option 1 ID : **9167102569**
Option 2 ID : **9167102570**
Option 3 ID : **9167102571**
Option 4 ID : **9167102572**
Status : **Answered**
Chosen Option : **4**

Q.108 The symmetry labels of three normal modes of water are $\Gamma_1 = A_1$, $\Gamma_2 = A_1$ and $\Gamma_3 = B_2$. The polarization of light required for overtone [(0,0,0) to (0,0,3)] and combination [(0,0,0) to (1,0,1)] transitions, respectively, are

[The symmetry of the dipole moment operators $\mu_x$, $\mu_y$ and $\mu_z$, respectively, are $\Gamma_{\mu_x} = B_1$, $\Gamma_{\mu_y} = B_2$ and $\Gamma_{\mu_z} = A_1$]

1. z and z
2. y and x
3. x and y
4. y and y

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710663**
Option 1 ID : **9167102649**
Option 2 ID : **9167102650**
Option 3 ID : **9167102651**
Option 4 ID : **9167102652**
Status : **Not Answered**
Chosen Option : --

Q.109 The **Raschig** reaction, involving partial oxidation of $NH_3$ with NaOCl, produces **P**, which upon treatment with $KIO_3$ and HCl, forms KCl, water, compounds **Q** and **R**. The compounds **P**, **Q**, and **R**, respectively, are

1. $NCl_3$, $Cl_2$, $I_2$
2. $N_2H_4$, $N_2$, ICl
3. $N_2H_4$, $O_2$, $I_2$
4. $NCl_3$, $N_2$, ICl

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710620**
Option 1 ID : **9167102477**
Option 2 ID : **9167102478**
Option 3 ID : **9167102479**
Option 4 ID : **9167102480**
Status : **Not Answered**
Chosen Option : --

Q.110 The maximum work available from combustion of 1.0 mol of methane gas at 298 K is 810 kJ $mol^{-1}$, and energy available as heat at constant pressure, at 298 K, is 890 kJ $mol^{-1}$.

$\Delta S^{\circ}$ (in J $K^{-1}$ $mol^{-1}$) for this combustion process is closest to

[Assume ideal gas behaviour; Gas constant R = 8.31 J $K^{-1}$ $mol^{-1}$]

1. $-268$
2. $-252$
3. $-204$
4. $-2718$

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710664**
Option 1 ID : **9167102653**
Option 2 ID : **9167102654**
Option 3 ID : **9167102655**
Option 4 ID : **9167102656**
Status : **Not Answered**
Chosen Option : **--**

Q.111 Match the physical methods in Column I with the best suited information in Column II and III

| Column I | Column II | Column III |
|---|---|---|
| a. Electron Paramagnetic Resonance spectroscopy | p. Radio frequency | i. nature of $O_2$ bound to haemoglobin |
| b. Nuclear Magnetic Resonance spectroscopy | q. Force constant | ii. d-block metals with odd number of unpaired electrons |
| c. Resonance Raman spectroscopy | r. Microwave | iii. fluxionality in organometallic compounds |

1. (a-r-ii), (b-p-iii), (c-q-i)
2. (a-p-iii), (b-r-ii), (c-q-i)
3. (a-r-ii), (b-q-iii), (c-p-i)
4. (a-r-i), (b-q-iii), (c-p-ii)

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710630**
Option 1 ID : **9167102517**
Option 2 ID : **9167102518**
Option 3 ID : **9167102519**
Option 4 ID : **9167102520**
Status : **Answered**
Chosen Option : **1**

Q.112 The catalytic intermediate species involved in the **Wacker** process are

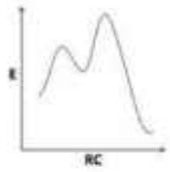
1. Pd–vinyl alcohol, Pd–β–hydroxyethyl, Pd–ethylene
2. Pd–β–hydroxyethyl, Pd–vinyl alcohol, Pd–acyl
3. Pd–dioxygen, Pd–β–hydroxyethyl, Pd–ethylene
4. Pd–β–hydroxyethyl, Pd–vinyl alcohol, Pd–dioxygen

**Options** 1. 1
2. 2
3. 3
4. 4

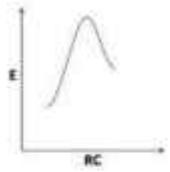
Question Type : **MCQ**
Question ID : **916710628**
Option 1 ID : **9167102509**
Option 2 ID : **9167102510**
Option 3 ID : **9167102511**
Option 4 ID : **9167102512**
Status : **Not Answered**
Chosen Option : --

Q.113 The energy profile diagram that corresponds to the following reaction is

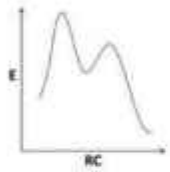

1.



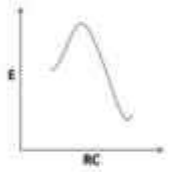

2.




3.



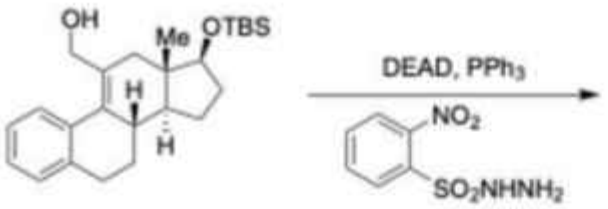

4.



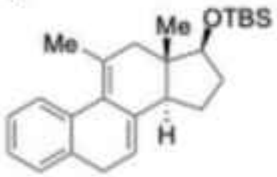

**Options** 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710644**
Option 1 ID : **9167102573**
Option 2 ID : **9167102574**
Option 3 ID : **9167102575**
Option 4 ID : **9167102576**
Status : **Not Answered**
Chosen Option : **--**

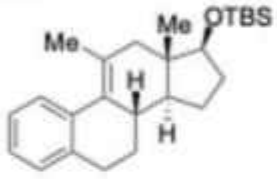
Q.114 The major product formed in the following reaction is



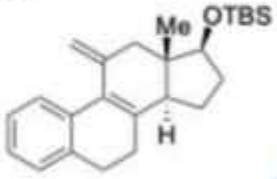

1.



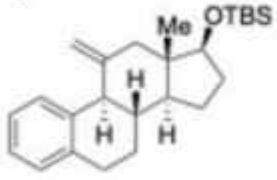

2.




3.




4.

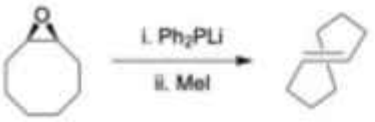



Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710649**
Option 1 ID : **9167102593**
Option 2 ID : **9167102594**

Option 3 ID : 916710[illegible]
Option 4 ID : 916710[illegible]
Status : Not Answered
Chosen Option : --

Q.115 In the following reaction, formation of the alkene occurs through




1. a *cis* intermediate undergoing an *anti*-elimination
2. a *trans* intermediate undergoing an *anti*-elimination
3. a *cis* intermediate undergoing a *syn*-elimination
4. a *trans* intermediate undergoing a *syn*-elimination

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710652**
Option 1 ID : **9167102605**
Option 2 ID : **9167102606**
Option 3 ID : **9167102607**
Option 4 ID : **9167102608**
Status : **Not Answered**
Chosen Option : --

Q.116 A graph of surface tension of an aqueous solution of a surfactant as a function of concentration gives a slope $\left[\frac{d\gamma}{d\ln(c/c^{\circ})}\right]$ of $-4.8 \times 10^{-3}$ N m$^{-1}$ at 289 K. The area (in Å$^2$) occupied by each surfactant molecule at the surface is closest to

[$c^{\circ}$ = 1 mol L$^{-1}$]

1. 41
2. 62
3. 83
4. 104

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710671**
Option 1 ID : **9167102681**
Option 2 ID : **9167102682**
Option 3 ID : **9167102683**
Option 4 ID : **9167102684**
Status : **Not Answered**
Chosen Option : --

Q.117 The energies, $E_{\pm}$ (in atomic units) of bonding (+) and antibonding (−) MOs of $H_2^+$, obtained by linear combination of 1s orbitals of H-atoms (utilizing variation principle), are

$[J = \langle 1s_A \left| -\frac{1}{r_B} \right| 1s_A \rangle + \frac{1}{R},\ K = \langle 1s_A \left| -\frac{1}{r_A} \right| 1s_B \rangle + \frac{S}{R},\ S = \langle 1s_A | 1s_B \rangle,$ R is internuclear distance]

1. $-1 - J \pm K$
2. $-\frac{1}{2} - \frac{J \pm K}{1 \pm S}$
3. $-1 + \frac{J \pm K}{1 \pm S}$
4. $-\frac{1}{2} + \frac{J \pm K}{1 \pm S}$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710660**
Option 1 ID : **9167102637**
Option 2 ID : **9167102638**
Option 3 ID : **9167102639**
Option 4 ID : **9167102640**
Status : **Not Answered**
Chosen Option : --

Q.118 Consider the following gas phase reaction:

$$A + B \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} A^* + B$$
$$A^* \xrightarrow{k_2} C$$

Considering $[A]_0$ and $[B]_0$ to be moderate and using steady state approximation, the correct option for the overall order of the reaction is

1. 1st order, when $k_{-1} >> k_2$
2. zero order, when $k_{-1} >> k_2$
3. zero order, when $k_{-1} << k_2$
4. 1st order, when $k_{-1} << k_2$

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710670**
Option 1 ID : **9167102677**
Option 2 ID : **9167102678**
Option 3 ID : **9167102679**
Option 4 ID : **9167102680**
Status : **Not Attempted and Marked For Review**
Chosen Option : --

Q.119 The correct sequence of reagent addition for the qualitative analysis of $Pb^{2+}$, $Cd^{2+}$, $Sr^{2+}$ and $Ni^{2+}$ ions in an aqueous solution of a mixture of their nitrate-containing salts, is

1. (i) HCl (aq.) (ii) $H_2S$ (acidic) (iii) $H_2S$ (basic) (iv) $(NH_4)_2CO_3$ (aq.)
2. (i) $H_2S$ (acidic) (ii) $H_2S$ (basic) (iii) HCl (aq.) (iv) $(NH_4)_2CO_3$ (aq.)
3. (i) $(NH_4)_2CO_3$ (aq.) (ii) $H_2S$ (acidic) (iii) $H_2S$ (basic) (iv) HCl (aq.)
4. (i) HCl (aq.) (ii) $H_2S$ (basic) (iii) $H_2S$ (acidic) (iv) $(NH_4)_2CO_3$ (aq.)

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710619**
Option 1 ID : **9167102473**
Option 2 ID : **9167102474**
Option 3 ID : **9167102475**
Option 4 ID : **9167102476**
Status : **Not Answered**
Chosen Option : --

Q.120 After 5 measurements, the length of an object is $20 \pm 1$ cm (mean $\pm$ standard error). The number of measurements needed to achieve a standard error of 0.25 cm is

1. 10
2. 20
3. 40
4. 80

Options 1. 1
2. 2
3. 3
4. 4

Question Type : **MCQ**
Question ID : **916710674**
Option 1 ID : **9167102693**
Option 2 ID : **9167102694**
Option 3 ID : **9167102695**
Option 4 ID : **9167102696**
Status : **Not Answered**
Chosen Option : --