International Advanced Research Centre for Powder Metallurgy and New Materials ARCI

Notations :

1.Options shown in green color and with ✔ icon are correct.

2.Options shown in red color and with ✖ icon are incorrect.

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Scientist B SRF JRF Chemical Sciences

PART A

Question Number : 1 Question Id : 8616631001 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

In the spinel structure, oxide ions are cubical close packed whereas $\frac{1}{4}^{th}$ of tetrahedral voids are occupied by A^{2+} cations and ½ of octahedral voids are occupied by B^{3+} cations. The general formula of the compound having spinel structure is

Options :

1. ✖ AB_2O_4

2. ✖ $A_2B_4O_2$

3. ✖ $A_4B_2O_2$

4. ✔ $A_2B_2O_4$

Question Number : 2 Question Id : 8616631002 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Match the following metalloproteins with their metal active sites

i) Methane monooxygenase	A) Cu
ii) Nitrogenase	B) Fe
iii) Plastocyanin	C) Mn
iv) Catalase	D) Mo

Options :

1. ✔ i –B ii-D iii-A iv-C

2. ✖ i –A ii-D iii-B iv-C

3. ✖ i –B ii-C iii-D iv-C

4. ✖ i –D ii-B iii-C iv-A

Question Number : 3 Question Id : 8616631003 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The following pairs are the compound formulae to its application as a catalyst or catalyst precursor in the stated process. Which pair is incorrect?

Options :

1. ✖ cis-$[Rh(CO)_2I_2]^-$; Monsanto acetic acid synthesis

2. ✖ $RhCl(PPh_3)_3$; alkene hydrogenation

3. ✔ $HRh(PPh_3)_3$; asymmetric hydrogenation

4. ✖ $HCo(CO)_4$; hydroformylation of alkenes

Question Number : 4 Question Id : 8616631004 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The emission of beta particles is from

Options :

1. ✖ the valence shell of an atom

2. ✖ the inner shell of an atom

3. ✖ the nucleus due to nuclear conversion of proton to neutron and electron

4. ✔ the nucleus due to nuclear conversion of neutron to proton and electron

Question Number : 5 Question Id : 8616631005 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Which of the following statements is NOT correct?

Options :

1. ✖ The stability constant of $[Co(NH_3)_6]^{3+}$ is larger than that of $[Co(NH_3)_6]^{2+}$

2. ✖ The cyano complexes are far more stable than those formed by halide ions

3. ✔ The stability of halide complexes of Co^{2+} follows the order $I^- < Br^- < Cl^-$

4. ✖ The stability constant of $[Cu(NH_3)_4]^{2+}$ is larger than that of $[Cd(NH_3)_6]^{2+}$

Question Number : 6 Question Id : 8616631006 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

What is the ground term of the configurations of Cr^{3+}?

Options :

1. ✖ ^2F

2. ✖ ^2G

3. ✖ ^4P

4. ✔ ^4F

Question Number : 7 Question Id : 8616631007 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Which of the following statements regarding nitrous oxide is not correct?

Options :

1. ✖ Nitrous oxide is a liner molecule with the arrangement of atoms as NNO.

2. ✖ Nitrous oxide is reduced to nitrogen when passed over the copper.

3. ✔ Nitrous oxide is a bent molecule with the arrangement of atoms as NON.

4. ✖ Nitrous oxide supports the combustion of phosphorous and sulphur.

Question Number : 8 Question Id : 8616631008 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

When chlorine reacts with cold and dilute solutions of sodium hydroxide, the products obtained are

Options :

1. ✔ Cl^-+ClO^-

2. ✖ $Cl^-+ClO_2^-$

3. ✖ $Cl^-+ClO_3^-$

4. ✖ $Cl^-+ClO_4^-$

Question Number : 9 Question Id : 8616631009 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Which of the following statements best describes the electronic spectra of lanthanides?

Options :

1. ✖ Absorptions due to 4f-4f transitions are, in theory, forbidden, but nonetheless give rise to intense colours

2. ✔ Absorptions due to 4f-4f transitions are sharp; those assigned to 4f-5d transitions are broad

3. ✖ Absorptions due to 4f-4f transitions are broad; those assigned to 4f-5d transitions are sharp

4. ✖ Ce^{3+} and Yb^{3+} are coloured and show exceptionally strong absorption in the visible region because of 4f-5d transitions

Question Number : 10 Question Id : 8616631010 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Which of the following functions is(are) eigen function(s)?

(i) Sin(3x), (ii) 6cos(4x), (iii) $5x^2$

Options :

1. ✔ (i), (ii)

2. ✖ (i), (iii)

3. ✖ (ii), (iii)

4. ✖ (i), (ii), (iii)

Question Number : 11 Question Id : 8616631011 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The lowest energy ground state term for Be is

Options :

1. ✔ $^1S_0$

2. ✖ $^3P_0$

3. ✖ $^4S_{3/2}$

4. ✖ None

Question Number : 12 Question Id : 8616631012 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The pair of symmetry point groups that are associated with only polar molecules is

Options :

1. ✖ C_{3v}, C_{2h}

2. ✔ C_{2v}, $C_{\infty v}$

3. ✖ D_{2h}, T_d

4. ✖ C_{2v}, $D_{\infty h}$

Question Number : 13 Question Id : 8616631013 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Which of the following molecules can show pure rotational spectra?

H_2O, CO_2, BF_3, HCl, C_6H_6

Options :

1. ✔ H_2O, HCl

2. ✖ H_2O, BF_3

3. ✖ BF_3, C_6H_6

4. ✖ HCl, CO_2

Question Number : 14 Question Id : 8616631014 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The selection rule of the translational energy levels in the Raman spectrum is ΔJ is equal to

Options :

1. ✔ ±2

2. ✖ ±1

3. ✖ +1

4. ✖ +2

Question Number : 15 Question Id : 8616631015 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

When half a mole of an ideal gas expands isothermally and reversibly at 298 K from a volume of 10 L to a volume of 20 L, the change in the entropy of the gas is
(Note: Gas constant, R = 8.3145 $JK^{-1}mol^{-1}$)

Options :

1. ✖ 11.53 $J\,K^{-1}$

2. ✔ 2.88 $J\,K^{-1}$

3. ✖ 4.16 $J\,K^{-1}$

4. ✖ 5.77 $J\,K^{-1}$

Question Number : 16 Question Id : 8616631016 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option

Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

If the reaction $SO_2Cl_2 \rightleftharpoons SO_2 + Cl_2$ is a first order gas reaction with the rate constant of 2.2 $\times 10^{-5}\ s^{-1}$ at 320°C, the percentage of SO_2Cl_2 decomposed on heating this gas for 90 minutes is

Options :

1. ✔ 11.27

2. ✖ 5.16

3. ✖ 5.64

4. ✖ 10.32

Question Number : 17 Question Id : 8616631017 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The Brunauer-Emmet-Teller (BET) theory was based on

Options :

1. ✖ Double layer adsorption

2. ✖ Single layer adsorption

3. ✔ Multilayer adsorption

4. ✖ None

Question Number : 18 Question Id : 8616631018 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Which is the internal standard used for running the NMR spectra of water-soluble compounds in deuterium oxide solvent?

Options :

1. ✖ Tetramethyl silane

2. ✖ Trimethylsilyl chloride

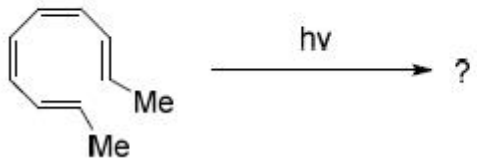
3. ✖ Trimethyl silanol

4. ✔ Sodium salt of 3-(trimethylsilyl)propane sulphonate

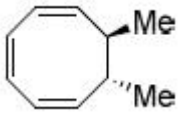
Question Number : 19 Question Id : 8616631019 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

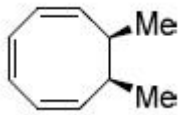
Correct Marks : 3 Wrong Marks : 1

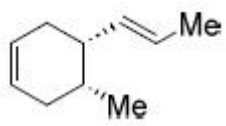
The product formed in the following photochemical reaction is

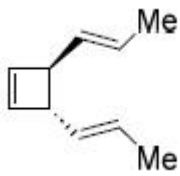


Options :

1. ✖ 

2. ✔ 

3. ✖ 

4. ✖ 

Question Number : 20 Question Id : 8616631020 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The pKa of benzoic acid is 4.19 and the Hammett σ_m value for Cl is 0.37. The pKa of 3,5-dichlorobenzoic acid is

Options :

1. ✖ 0.37

2. ✖ 7.27

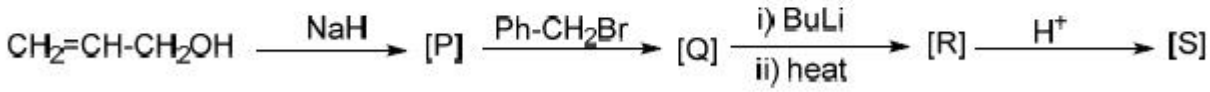
3. ✖ 3.82

4. ✔ 3.45

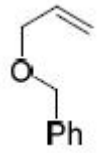
Question Number : 21 Question Id : 8616631021 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

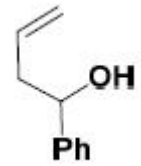
Correct Marks : 3 Wrong Marks : 1

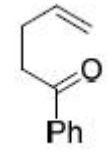
In the following reaction sequence, the final product [S] formed is:

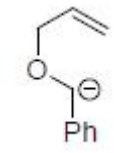


Options :

1. ✖ 

2. ✔ 

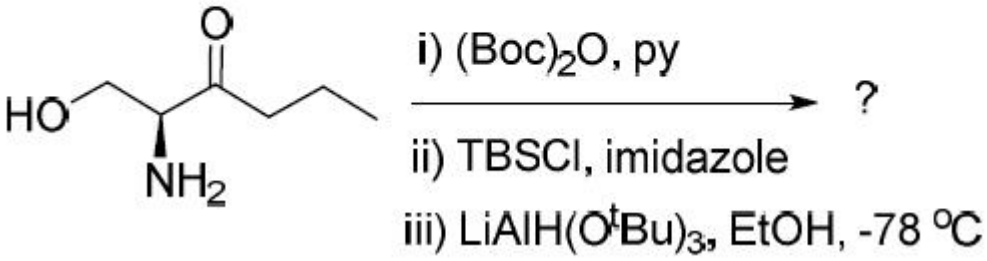
3. ✖ 

4. ✖ 

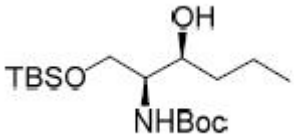
Question Number : 22 Question Id : 8616631022 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

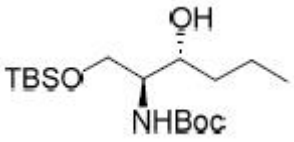
Correct Marks : 3 Wrong Marks : 1

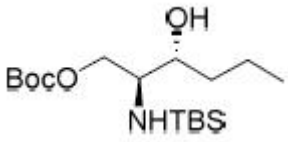
The major product formed in the following reaction is

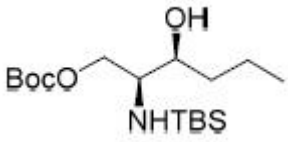


Options :

1. ✖ 

2. ✔ 

3. ✖ 

4. ✖ 

Question Number : 23 Question Id : 8616631023 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The common matrices used in MALDI applications are

Options :

1. ✖ Benzoic acid, Malic acid, Tartaric acid and Pivaloic acid

2. ✔ Sinapinic acid, Nicotinic acid, Dithranol and Picolinic acid

3. ✖ Glycerol, Thioglycerol, Dithiothreitol and 3-Nitrobenzyl alcohol

4. ✖ Glucose, Maltose, Fumaric acid, 4-hydroxy benzoic acid

Question Number : 24 Question Id : 8616631024 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

General molecular formula of sesquiterpenes is

Options :

1. ✖ $C_{20}H_{32}$

2. ✖ $C_{10}H_{16}$

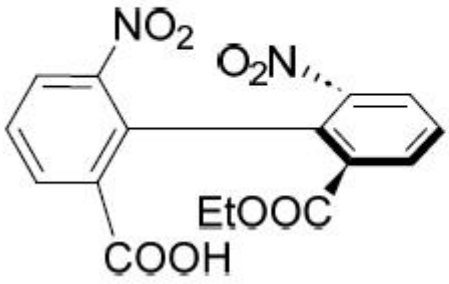
3. ✔ $C_{15}H_{24}$

4. ✖ $C_{40}H_{64}$

Question Number : 25 Question Id : 8616631025 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Which among the following statement is correct about the following molecule?



Options :

1. ✖ It is a dissymmetric molecule without an asymmetric carbon atom; it doesn't have inversion center, plane of symmetry, center of symmetry and rotational axis of symmetry.

2. ✖ It is an asymmetric molecule with an asymmetric carbon atom; it has inversion center, plane of symmetry, center of symmetry and rotational axis of symmetry

3. ✔ It is an asymmetric molecule without an asymmetric carbon atom; it doesn't have inversion center, plane of symmetry, center of symmetry and rotational axis of symmetry.

4. ✖ It is a dissymmetric molecule with an asymmetric carbon atom; it doesn't have inversion center, plane of symmetry, center of symmetry and has rotational axis of symmetry.

Question Number : 26 Question Id : 8616631026 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The hydroformylation reaction of alkenes in the presence of phosphine-modified catalyst works at lower pressure than $HCo(CO)_4$ because

Options :

1. ✖ it decreases the thermal stability of the catalyst

2. ✖ hydridic nature of H decreases

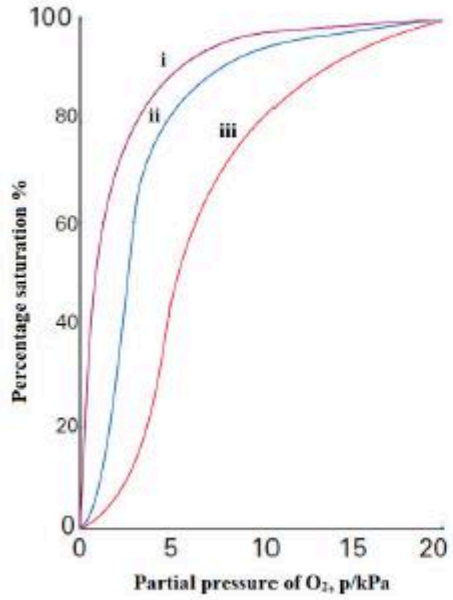
3. ✔ it increases the thermal stability of the catalyst

4. ✖ the back bonding from the metal to the rest of the CO groups decreases

Question Number : 27 Question Id : 8616631027 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The following plot represent oxygen binding curves for myoglobin and haemoglobin



Pick the correct option that represents all the curves in the plot (i, ii and iiii)

Options :

1. ✖ i –oxygen binding curve for haemoglobin, ii- cooperative effect in haemoglobin, iii- oxygen binding with haemoglobin at lower pH

2. ✖ i –oxygen binding curve for myoglobin, ii-cooperative effect in haemoglobin, iii- oxygen binding with haemoglobin at higher pH

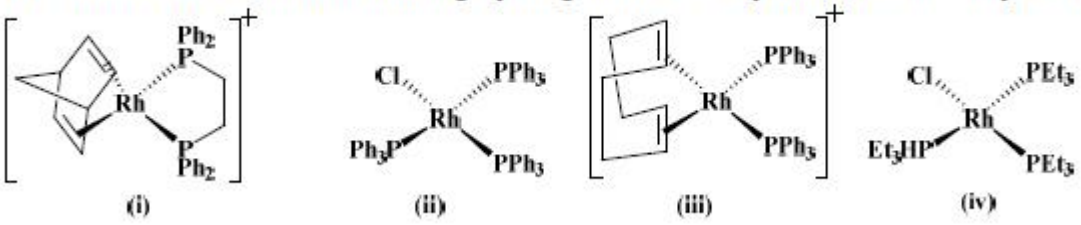
3. ✖ i –oxygen binding curve for myoglobin, ii-cooperative effect in myoglobin, iii- represent oxygen binding with haemoglobin at lower pH

4. ✔ i –oxygen binding curve for myoglobin, ii-cooperative effect in haemoglobin, iii- oxygen binding with haemoglobin at lower pH

Question Number : 28 Question Id : 8616631028 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The correct order of the following hydrogenation catalysts for their catalytic activity



Options :

1. ✖ i>ii>iii>iv

2. ✖ iv<i<ii<iii

3. ✔ iv<ii<iii<i

4. ✖ iii>i>iv>ii

Question Number : 29 Question Id : 8616631029 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The energy change in the fusion reaction of deuterium

$^{2}_{1}H + {}^{2}_{1}H \rightarrow {}^{3}_{2}H + {}^{1}_{0}n$

(Atomic masses of $^{2}_{1}H$, $^{3}_{2}He$ and $^{1}_{0}n$ are 2.0141, 3.0160 and 1.0086)

Options :

1. ✔ -80.43 MeV

2. ✖ 80.43 MeV

3. ✖ 8.043 MeV

4. ✖ -8.043 MeV

Question Number : 30 Question Id : 8616631030 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The reaction of Co(II) salt under bubbling air with ammonium carbonate yields A which upon reaction with HCl gives violet colored complex B. Predict A and B.

Options :

1. ✔ A: $[Co(CO_3)(NH_3)_4]^+$ B: *cis*-$[CoCl_2(NH_3)_4]Cl$

2. ✖ A: $[Co(CO_3)(NH_3)_4]$ B: *trans*-$[CoCl_2(NH_3)_4]$

3. ✖ A: $[Co(CO_3)(NH_3)_4]^+$ B: *trans*-$[CoCl_2(NH_3)_4]Cl$

4. ✖ A: $[Co(CO_3)(NH_3)_4]$ B: *cis*-$[CoCl_2(NH_3)_4]Cl$

Question Number : 31 Question Id : 8616631031 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The observed rate constant for the following reaction is 1.5×10^4 $dm^3mol^{-1}s^{-1}$ and the equilibrium constant is 2.6×10^5. The rate constant for self-exchange reactions of Ru and Co complexes are 8.2×10^2 and 40 $dm^3mol^{-1}s^{-1}$ respectively.

$[Ru(NH_3)_6]^{2+} + [Co(Phen)_3]^{3+} \longrightarrow [Ru(NH_3)_6]^{3+} + [Co(Phen)_3]^{2+}$

Calculate the rate constant for the reaction

Options :

1. ✔ 9.2×10^4 dm^3 mol^{-1} s^{-1}

2. ✖ 10.2×10^5 dm^3 mol^{-1} s^{-1}

3. ✖ 8.2×10^5 dm^3 mol^{-1} s^{-1}

4. ✖ 6.2×10^4 dm^3 mol^{-1} s^{-1}

Question Number : 32 Question Id : 8616631032 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Suggest classifications and likely structures for the following:

(i) $[B_9H_9]^{2-}$ (ii) B_6H_{10} (iii) B_4H_{10}

Options :

1. ✖ i) closo and pentagonal pyramid ii) nido and tricapped trigonal prism iii) arachno and two edge-fused triangles

2. ✖ i) closo and two edge-fused triangles ii) nido and pentagonal pyramid iii) arachno and tricapped trigonal prism

3. ✖ i) nido and two edge-fused triangles ii) closo and pentagonal pyramid iii) arachno and tricapped trigonal prism

4. ✔ i) closo and tricapped trigonal prism ii) nido and pentagonal pyramid iii) arachno and two edge-fused triangles

Question Number : 33 Question Id : 8616631033 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Predict the actinides formed in the following reactions

i) $^{235}_{92}U$ (2n, β) →

ii) $^{238}_{92}U$ (n, 2β) →

iii) $^{239}_{94}Pu$ (2n, β) →

Options :

1. ✔ i) $^{237}_{93}Np$, ii) $^{239}_{94}Pu$ and iii) $^{241}_{95}Am$

2. ✖ i) $^{239}_{94}Pu$, ii) $^{237}_{93}Np$ and iii) $^{241}_{95}Am$

3. ✖ i) $^{239}_{94}Pu$, ii) $^{241}_{95}Am$ and iii) $^{237}_{93}Np$

4. ✖ i) $^{237}_{93}Np$, ii) $^{241}_{95}Am$ and iii)$^{239}_{94}Pu$

Question Number : 34 Question Id : 8616631034 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

If an electron of mass 9.1×10^{-31} kg is moving with a velocity of kinetic energy of 10 eV, the corresponding wavelength of the electron is

(1eV = 1.6×10^{-19} J; h = 6.62×10^{-34} J s)

Options :

1. ✔ 3.87×10^{-10} m

2. ✖ 1.23×10^{-9} m

3. ✖ 1.53×10^{-12} m

4. ✖ 1.06×10^{-34} m

Question Number : 35 Question Id : 8616631035 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The energy difference between two levels (n) for a particle of mass "m" in a box of length "L" is

Options :

1. ✖ $(2n)\frac{h^2}{8mL^2}$

2. ✖ $(n)\frac{h^2}{8mL^2}$

3. ✖ $(n+1)\frac{h^2}{8mL^2}$

4. ✔ $(2n+1)\frac{h^2}{8mL^2}$

Question Number : 36 Question Id : 8616631036 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The point group of *fac*-tribromotrichloroferrate(II) ion

Options :

1. ✔ C_{3v}

2. ✖ C_{2v}

3. ✖ D_{2h}

4. ✖ D_{3h}

Question Number : 37 Question Id : 8616631037 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

If a molecule possesses z-axis as the principal axis of rotation, the 3×3 matrix representation of $S_{n(z)}$ symmetry operation is

Options :

1. ✔ $\begin{bmatrix} cos\theta & sin\theta & 0 \\ -sin\theta & cos\theta & 0 \\ 0 & 0 & -1 \end{bmatrix}$

2. ✖ $\begin{bmatrix} sin\theta & sin\theta & 0 \\ -sin\theta & cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$

3. ✖ $\begin{bmatrix} cos\theta & cos\theta & 0 \\ -sin\theta & cos\theta & 0 \\ 0 & 0 & -1 \end{bmatrix}$

4. ✖ $\begin{bmatrix} 0 & 0 & 0 \\ -sin\theta & cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Question Number : 38 Question Id : 8616631038 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The vibrational frequency and anharmonicity constant of an alkali halide are 400 cm^{-1} and 0.0050 respectively. The positions (in cm^{-1}) of its fundamental mode and second overtone are respectively

Options :

1. ✖ 404,788

2. ✖ 396, 788

3. ✔ 396, 1176

4. ✖ 404, 1176

Question Number : 39 Question Id : 8616631039 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Possible term symbol(s) of the excited states of Na atom (atomic no. 11) is/are

Options :

1. ✖ $^1S_0$ and $^1P_1$

2. ✖ $^1P_0$ and $^3P_1$

3. ✔ $^2P_{3/2}$ and $^2P_{1/2}$

4. ✖ $^2S_{1/2}$

Question Number : 40 Question Id : 8616631040 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The K_{sp} of AgCl at 25°C is 1.0×10^{-10}. The molar solubility of AgCl is

Options :

1. ✔ 1.0×10^{-5} M

2. ✖ 0.5×10^{-10} M

3. ✖ 0.5×10^{-5} M

4. ✖ 1.0×10^{-10} M

Question Number : 41 Question Id : 8616631041 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

When one mole of an ideal gas expands from 5 to 1 bar at 298 K, then the work done for a reversible expansion, and for an expansion against a constant external pressure of 1 bar, respectively are

(Gas constant: 8.3145 $JK^{-1}mol^{-1}$)

Options :

1. ✔ -3998 J; -1982 J

2. ✖ -799.6 J; -396.4 J

3. ✖ -396.4 J; -799.6 J

4. ✖ -1982 J; -3998 J

Question Number : 42 Question Id : 8616631042 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Which of the following is NOT the characteristic of physisorption?

Options :

1. ✖ It is not specific in nature

2. ✖ It arises because of van der Waals forces

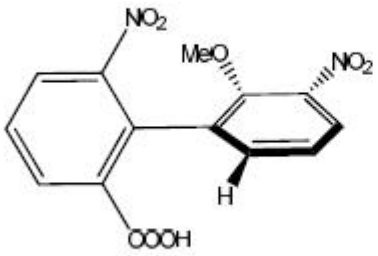
3. ✖ It results into multi-molecular layers on adsorbent surface under high pressure

4. ✔ Enthalpy of adsorption is high compared to chemisorption

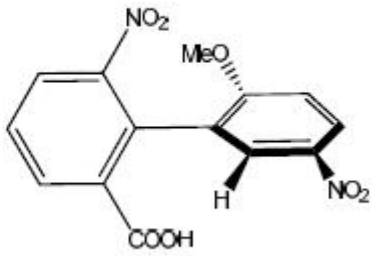
Question Number : 43 Question Id : 8616631043 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Which is the correct statement about the following two molecules 'I' and 'II' ?



(I)



(II)

Options :

1. ✖ Rate of racemization of the compound 'I' and 'II' is same

2. ✔ Rate of racemization of the compound 'I' is much lower than that of the 'II'

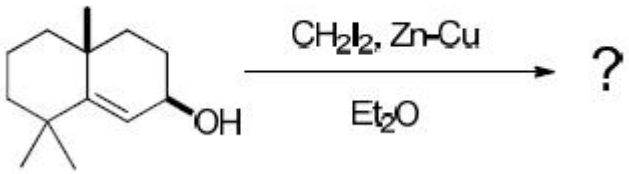
3. ✖ Rate of racemization of the compound 'II' is much lower than that of the 'I'

4. ✖ Both are not configurational isomers

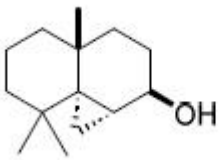
Question Number : 44 Question Id : 8616631044 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

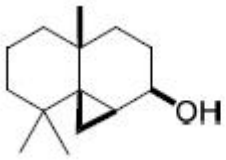
Correct Marks : 3 Wrong Marks : 1

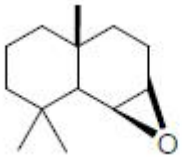
The following chemical reaction involves

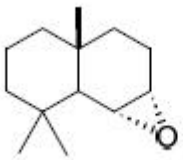


Options :

1. ✖ Product =  Intermediate: carbenoid

2. ✔ Product =  Intermediate: carbenoid

3. ✖ Product =  Intermediate: cabocation

4. ✖ Product =  Intermediate: carbanion

Question Number : 45 Question Id : 8616631045 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Which among the following statements is incorrect?

Options :

1. ✖ trans-decalin is 11.4 kJ/mole less energetic than cis-decalin

2. ✔ cis-decalin has 5-gauche butane interactions

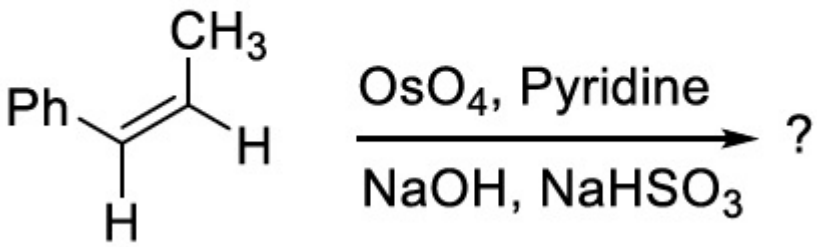
3. ✖ trans-(e,e)-1,2-dimethylcyclohexane is more stable than cis-(a,e)-1,2-dimethylcyclohexane

4. ✖ Gauche form of ethylene chlorohydrin is more preferred conformation

Question Number : 46 Question Id : 8616631046 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The product formed in the following reaction is



Options :

1. ✔ a racemic modification

2. ✖ a meso compound

3. ✖ only one enantiomer

4. ✖ a ketone

Question Number : 47 Question Id : 8616631047 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

An unknown substance shows a molecular ion peak at m/z 170 with a relative intensity of 100. The [M+1] peak has an intensity of 13.2, and the [M+2] peak has an intensity of 1.00. What is the molecular formula of the unknown substance?

Options :

1. ✖ $C_{12}H_{12}N$

2. ✖ $C_{11}H_{22}O$

3. ✖ $C_{10}H_{20}NO$

4. ✔ $C_{12}H_{10}O$

Question Number : 48 Question Id : 8616631048 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Glucose on reduction with Na-Hg gives

Options :

1. ✖ Erythritol

2. ✖ Xylitol

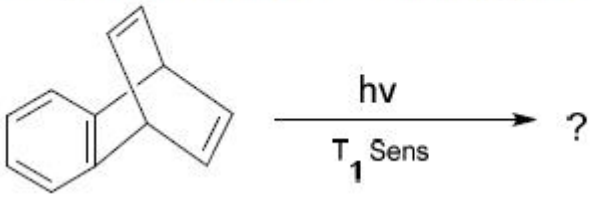
3. ✔ Sorbitol

4. ✖ Maltitol

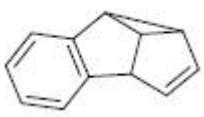
Question Number : 49 Question Id : 8616631049 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

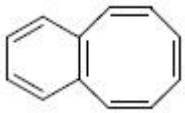
Correct Marks : 3 Wrong Marks : 1

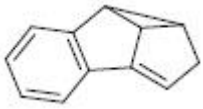
The product formed in the following photochemical reaction is

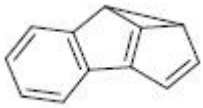


Options :

1. ✔ 

2. ✖ 

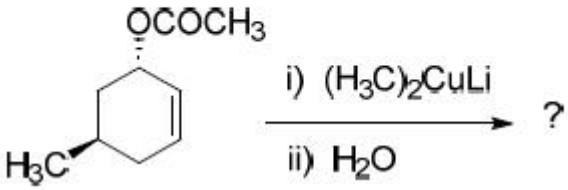
3. ✖ 

4. ✖ 

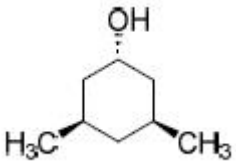
Question Number : 50 Question Id : 8616631050 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

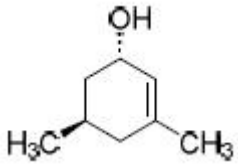
Correct Marks : 3 Wrong Marks : 1

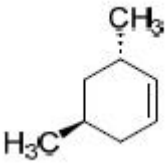
The product formed in the following reaction is:

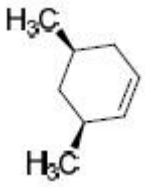


Options :

1. ✖ 

2. ✖ 

3. ✖ 

4. ✔ 

Question Number : 51 Question Id : 8616631051 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The density of Schottky defects in a certain sample of sodium chloride is 5×10^{11} per m^3 at 25°C. If the observed interionic (Na^+ and Cl^-) distance is 2.82 Angstroms. The average energy (in eV) required to create one Schottky defect is

Options :

1. ✖ 1.527 eV

2. ✖ 1.276 eV

3. ✔ 1.971 eV

4. ✖ 1.628 eV

Question Number : 52 Question Id : 8616631052 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The powder X-ray diffractogram of $SrTiO_3$ when recorded by using copper source that emit X-rays with a wavelength, λ=1.5406 Å showed peaks at 2θ values of 22.72, 39.90 and 57.71 in addition to other peaks. Assign the miller indices by considering primitive cubic system for the above-mentioned peaks respectively.

Options :

1. ✖ 100, 110 and 111

2. ✔ 100, 110 and 211

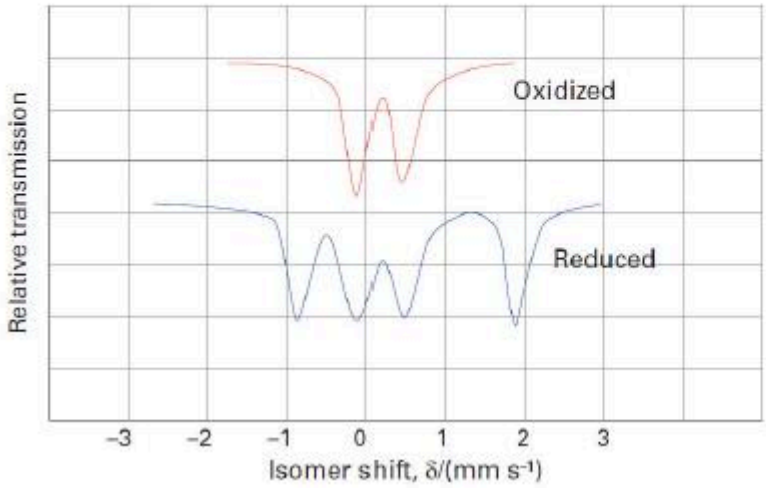
3. ✖ 100, 211 and 110

4. ✖ 100, 111 and 110

Question Number : 53 Question Id : 8616631053 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The figure shows Mossbauer spectra of a ferredoxin from chloroplasts at 77K, Predict the spin states of the two Fe centres in both the forms and electron delocalization at this temperature.



Options :

1. ✔ In oxidized form the total spin of the cluster is S=0, reduced form it is S=1/2 and electron added is localized on one Fe centre.

2. ✖ In oxidized form the total spin of the cluster is S=5/2, reduced form it is S=1/2 and electron added is delocalized on both Fe centres.

3. ✖ In oxidized form the total spin of the cluster is S=5/2, reduced form it is S=2 and electron added is delocalized on both Fe centres.

4. ✖ In oxidized form the total spin of the cluster is S=5/2, reduced form it is S=1/2 and electron added is localized on one Fe centre.

Question Number : 54 Question Id : 8616631054 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Compare the bond angles (C-C-M) and C=C stretching frequencies of

i) $[Pt(CO)_3(C_2H_4)]^{2+}$, ii) $[Pt(PPh_3)_3(C_2H_4)]^{2+}$ and iii) $[Pt(Cl)_3(C_2H_4)]^-$.

Options :

1. ✖ Bond angle: i<ii<iii and C=C Stretching Frequency: i>ii>iii

2. ✖ Bond angle: i>ii>iii and C=C Stretching Frequency: i>ii>iii

3. ✔ Bond angle: i>iii>ii and C=C Stretching Frequency: i>iii>ii

4. ✖ Bond angle: iii>ii>i and C=C Stretching Frequency: i<ii<iii

Question Number : 55 Question Id : 8616631055 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

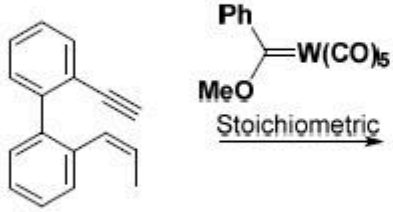
Correct Marks : 3 Wrong Marks : 1

Choose the correct option for the products formed in the following ring closing metathesis reactions.

i)

1

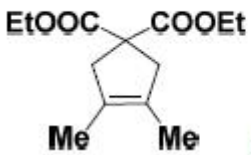
ii)



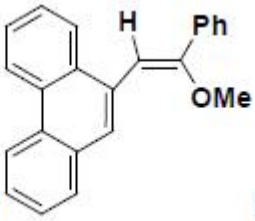
iii)

Options :

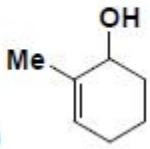
1. ✖ i)

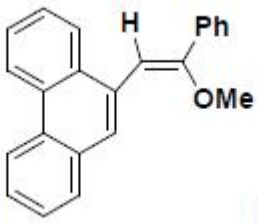
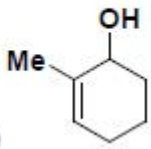


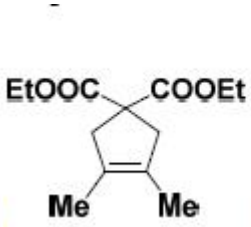
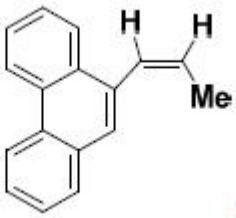
ii)

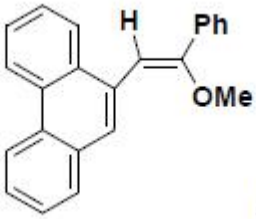


iii)



2. ✖ i) No product ii)  iii) 

3. ✖ i)  ii)  iii) No product

4. ✔ i) No product ii)  iii) No product

Question Number : 56 Question Id : 8616631056 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

What is the mass (in grams) of $^{235}_{92}U$ required to produce the same amount energy as given by burning 10 tons of coal during nuclear fission? (Given that heat of combustion of coal is 8 kcal g^{-1}, 1 cal = 4J and $^{235}_{92}U$ releases 200 MeV of energy per fission)

Options :

1. ✖ 4.5

2. ✔ 3.9

3. ✖ 4.2

4. ✖ 3.6

Question Number : 57 Question Id : 8616631057 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Aqueous solutions of $[V(H_2O)_6]^{3+}$ show two absorption bands at E_1 and E_2 assigned to the $^3T_{2g} \leftarrow {}^3T_{1g}$ and $^3T_{1g} \leftarrow {}^3T_{1g}$ transitions respectively with Δ_{oct}=18,560 cm^{-1}. Estimate values of Racah parameter (B), E_1 and E_2 for $[V(H_2O)_6]^{3+}$. Tanabe-Sugano diagram of $[V(H_2O)_6]^{3+}$ gives $\Delta_{oct}/B = 29$ for the $(E_2/B)/E_1/B) = 1.49$.

Options :

1. ✖ B = 600 cm^{-1}, E_1=17,220 cm^{-1} and E_2=25,500 cm^{-1}

2. ✖ B = 640 cm^{-1}, E_1=17,220 cm^{-1} and E_2=25,500 cm^{-1}

3. ✔ B = 640 cm^{-1}, E_1=17,216 cm^{-1} and E_2=25,600 cm^{-1}

4. ✖ B = 600 cm^{-1}, E_1=17,216 cm^{-1} and E_2=25,600 cm^{-1}

Question Number : 58 Question Id : 8616631058 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Volumes of activation (ΔV in cm^3 mol^{-1}) for water exchange reactions in the first-row transition elements are V^{2+}=-4.1, Mn^{2+}=-5.4, Fe^{2+}=+3.7, Co^{2+}=+6.1 and Ni^{2+}=+7.2. The data suggest that

Options :

1. ✔ The change ΔV from negative to positive values indicates a change from associative to dissociative mechanism, and suggests that bond making becomes less important

2. ✖ The change ΔV from negative to positive values indicates a change from dissociative to associative mechanism, and suggests that bond making becomes less important

3. ✖ The change ΔV from negative to positive values indicates a change from associative to dissociative mechanism, and suggests that bond breaking becomes less important

4. ✖ No effect of ΔV changes on reaction mechanism

Question Number : 59 Question Id : 8616631059 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Statement 1: The substitution reaction of *cis*-$[CoCl(en)_2A]^+$ with H_2O gives *cis*-substituted product whereas the reaction with *trans*-$[CoCl(en)_2A]^+$ gives mixture of cis and trans products.

Statement 2: The reaction of *cis*-$[CoCl(en)_2A]^+$ with H_2O goes via square-based pyramidal species whereas in case of *trans*-$[CoCl(en)_2A]^+$ it goes via trigonal bipyramidal species.

Statement 3: The reaction of *cis*-$[CoCl(en)_2A]^+$ with H_2O goes via via trigonal bipyramidal species whereas in case of *trans*-$[CoCl(en)_2A]^+$ it goes via square-based pyramidal species.

Statement 4: The reaction of *trans*-$[CoCl(en)_2A]^+$ with H_2O gives a mixture of cis and trans products when A=[NCS]-.

Pick the correct option that represents above statements

Options :

1. ✖ Statement 1 is true and statement 3 supports the statement 1

2. ✖ Statement 1 is false and statement 3 supports the statement 1

3. ✔ Statements 1 and 4 are true and statement 2 support the statement 1

4. ✖ All the statements are false

Question Number : 60 Question Id : 8616631060 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

A hydrated metallic salt A, light green in colour, gives a white anhydrous residue B after being heated gradually. B is soluble in water and it's aqueous solution reacts with NO to give a dark brown compound C. B on strong heating gives a brown residue and a mixture of two gases E and F. The gaseous mixture, when passed through acidified permanganate, discharges the pink colour and when passed through acidified $BaCl_2$ solution, gives white precipitate. Identify A, B, C, D, E and F.

Options :

1. ✔ A-$FeSO_4.7H_2O$, B-$FeSO_4$, C-$[Fe(H_2O)_5NO]SO_4$, D-Fe_2O_3, E-NO_2 and F-NO_3

2. ✖ A-$FeSO_4.7H_2O$, B-$FeSO_4$, C-$[Fe(H_2O)_5NO]SO_4$, D-Fe_2O_3, E-SO_2 and F-SO_3

3. ✖ A- $FeSO_4$, B- $FeSO_4.7H_2O$, C-$[Fe(H_2O)_5NO]SO_4$, D-Fe_2O_3, E-NO_2 and F-NO_3

4. ✖ A- $FeSO_4$, B- $FeSO_4.7H_2O$, C-$[Fe(H_2O)_5NO]SO_4$, D-Fe_2O_3, E-SO_3 and F-SO_2

Question Number : 61 Question Id : 8616631061 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

If a photon of wavelength "λ" has an equivalent momentum of h/λ, the recoil velocity of a free Mossbauer nucleus of mass 1.67×10^{-25} kg (i.e., atomic wt. 100) when emitting a γ-ray of 0.1 nm wavelength and the Doppler shift of the γ-ray frequency to an outside observer respectively are

(Note: Planck's constant, $h = 6.62 \times 10^{-34}$ $J.m^2\ s^{-1}$)

Options :

1. ✔ $39.68\ ms^{-1}$; $3.97 \times 10^{11}\ s^{-1}$

2. ✖ $79.36\ ms^{-1}$; $7.94 \times 10^{11}\ s^{-1}$

3. ✖ $19.84\ ms^{-1}$; $1.98 \times 10^{11}\ s^{-1}$

4. ✖ $13.23\ ms^{-1}$; $1.32 \times 10^{11}\ s^{-1}$

Question Number : 62 Question Id : 8616631062 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

In the presence of a quencher, the intensity of emission of a chromophore ($\tau_0 = 5.2$ ns) was reduced from 4200 cps to 2100 cps at 25°C and 1800 cps at 10°C. If the equilibrium concentrations of the fluorophore and quencher are 10^{-6} M and 10^{-4} M, what is the initial concentration of the fluorophore?

Options :

1. ✖ 1×10^{-6} M

2. ✔ 2×10^{-6} M

3. ✖ 4×10^{-6} M

4. ✖ 0.5×10^{-6} M

Question Number : 63 Question Id : 8616631063 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The number of lines expected in the ESR spectrum of $^{\bullet}NH_2$ if the hyperfine coupling constant, $a_N = 2(a_H)$ and the intensity distribution respectively are

(I value of $^{14}N = 1$, H = ½)

Options :

1. ✔ 7, 1:2:2:2:2:2:1

2. ✖ 9, 1:2:1:1:2:1:1:2:1

3. ✖ 3, 1:2:1

4. ✖ 5, 1:2:3:2:1

Question Number : 64 Question Id : 8616631064 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

An electron of mass 9.1×10^{-31} kg moves in the first Bohr orbit with a speed of 2×10^{6} ms^{-1}. If the moment is measured with an accuracy of 1%, the uncertainty in the position is

(Note: Planck's constant, $h = 6.62 \times 10^{-34}$ $kgm^2s^{-1} = 6.62 \times 10^{-34}$ J.s)

Options :

1. ✖ 3.7×10^{-25} m

2. ✖ 18×10^{-25} m

3. ✔ 3.7×10^{-8} m

4. ✖ 18×10^{-27} m

Question Number : 65 Question Id : 8616631065 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

If a particle in a one-dimensional box of length "L" has the wave function $\Psi_n = \sin\frac{n\pi x}{L}$, the normalization factor is

Options :

1. ✖ $\frac{L}{2}$

2. ✖ $\frac{2}{L}$

3. ✔ $\sqrt{\frac{2}{L}}$

4. ✖ $\sqrt{\frac{L}{2}}$

Question Number : 66 Question Id : 8616631066 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

$Fe(CO)_3(PPh_3)_2$ exhibits trigonal bipyramidal geometry. One of its most probable isomers shows only one Fe-CO infrared stretching at 1883 cm^{-1}. The point groups of the isomers and the isomer with only one Fe-CO infrared stretching is

Options :

1. ✖ D_{2h}, C_s, C_{2v}; the point group of isomer is C_2v

2. ✖ C_{2h}, C_i, C_{2v}; the point group of isomer is C_{2h}

3. ✔ D_{3h}, C_s, C_{2v}; point group of isomer is D_{3h}

4. ✖ C_{3v}, C_s, C_{4v}; point group of isomer is C_s

Question Number : 67 Question Id : 8616631067 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option

Orientation : Vertical
Correct Marks : 3 Wrong Marks : 1

BCl_3 belongs to D_{3h} point group and exhibits three IR bands at 995, 480, 244 cm^{-1}, and the raman bands at 995,471, and 244 cm^{-1}. If Γ_{vib}: $A_1'+2E'+A_2''$, identify the frequency of A_1' mode.

D_{3h}	E	$2C_3$	$3C_2'$	σ_h	$2S_3$	$3\sigma_v$		
A_1'	1	1	1	1	1	1		x^2+y^2, z^2
A_2'	1	1	-1	1	1	-1	R_z	
E'	2	-1	0	2	-1	0	(x, y)	(x^2-y^2, xy)
A_1''	1	1	1	-1	-1	-1		
A_2''	1	1	-1	-1	-1	1	z	
E''	2	-1	0	-2	1	0	(R_x, R_y)	(xz, yz)

Options :

1. ✖ 995 cm^{-1}

2. ✖ 244 cm^{-1}

3. ✖ 480 cm^{-1}

4. ✔ 471 cm^{-1}

Question Number : 68 Question Id : 8616631068 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical
Correct Marks : 3 Wrong Marks : 1

The trace (or character) of S_3^2 matrix is

Options :

1. ✔ 0

2. ✖ 1

3. ✖ -1

4. ✖ $\frac{1}{2}$

Question Number : 69 Question Id : 8616631069 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The ratio of the number of molecules, N_j in a sample of HI at 300 K in the rotational state J = 5 and J = 0 is ($h = 6.626 \times 10^{-34}$ Js; $I = 4.31 \times 10^{-47}$ kgm^2; $k_B = 1.38 \times 10^{-23}$ JK^{-1})

Options :

1. ✖ 11.0

2. ✔ 4.29

3. ✖ 3.82

4. ✖ 1.0

Question Number : 70 Question Id : 8616631070 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

If the fundamental infrared stretching frequency of free, unbound carbon monoxide (CO) occurs at 2143 cm^{-1} and its first overtone at 4260 cm^{-1}, the harmonic frequency (ν_e) and anharmonicity constant (x_e) respectively are

Options :

1. ✖ 542.3 cm^{-1}, 0.004

2. ✖ 1085 cm^{-1}, 0.003

3. ✖ 4338 cm^{-1}, 0.012

4. ✔ 2169 cm^{-1}, 0.006

Question Number : 71 Question Id : 8616631071 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

If the cell SCE‖$Ag(CN)_2^-$ (7.50×10^{-3} M), CN^- (0.0250 M) | Ag develops a potential of -0.625 V, the formation constant K_f for $Ag(CN)_2^-$ i.e., $Ag^+ + 2CN^- \rightleftharpoons Ag(CN)_2^-$ is ($E^0_{SCE} = 0.244$; $E^0_{Ag^+/Ag} = +0.799$ V)

Options :

1. ✔ $1.0 \times 10^{21}\ M^{-2}$

2. ✖ $6.3 \times 10^{17}\ M^{-2}$

3. ✖ $1.2 \times 10^{4}\ M^{-2}$

4. ✖ $3.0 \times 10^{22}\ M^{-2}$

Question Number : 72 Question Id : 8616631072 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

A mixture of CO(g), H_2(g), and CH_3OH(g) at 500 K with P_{CO} = 10 bar, P_{H_2} = 1 bar, and P_{CH_3OH} = 0.1 bar is passed over a catalyst. Can more methanol be formed? $\Delta_r G^\circ = 21.21$ kJ mol^{-1}; R = 8.314 $JK^{-1}\ mol^{-1}$.

Options :

1. ✖ Yes, the reaction is spontaneous

2. ✔ No, the reaction is not spontaneous

3. ✖ Cannot be determined

4. ✖ None of the options are correct

Question Number : 73 Question Id : 8616631073 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The pH of a solution whose potential at 25°C measured with a hydrogen electrode at an atmospheric pressure of 1.012 atm is -0.324 V (relative to the NHE) is

($R = 8.314\ JK^{-1}mol^{-1}$; $F = 96485\ Cmol^{-1}$)

Options :

1. ✔ 5.47

2. ✖ 3.24

3. ✖ 2.96

4. ✖ 0.00

Question Number : 74 Question Id : 8616631074 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

A reaction goes through the following steps.

$$A + B \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} 2C \quad \text{(fast)}$$

$$A + C \xrightarrow{k_2} D \quad \text{(slow)}$$

Assuming that steady-state approximation can be applied to **C**, on increasing the concentration of **A** by three times, the rate of production of **D** will increase by

(assume $k_2[A] << k_{-1}[C]$)

Options :

1. ✔ 5.2 times

2. ✖ 1.25 times

3. ✖ 2.6 times

4. ✖ 2.5 times

Question Number : 75 Question Id : 8616631075 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

NO_2 required for a reaction is produced by the decomposition of N_2O_5 in CCl_4 as shown below:

$2N_2O_5\ (g) \rightarrow 4NO_2\ (g) + O_2$

If the initial concentration of N_2O_5 is 2.00 $molL^{-1}$ and it is 1.75 $molL^{-1}$ after 30 minutes. The rate of formation of NO_2 is

Options :

1. ✖ 8.33×10^{-2} M min^{-1}

2. ✔ 1.66×10^{-2} M min^{-1}

3. ✖ 2.08×10^{-3} M min^{-1}

4. ✖ 4.17×10^{-3} M min^{-1}

Question Number : 76 Question Id : 8616631076 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

If the adsorption of a gas on a solid surface follows the Langmuir isotherm and at a pressure of 200 Ps, 50% of the surface is covered with the gas, the surface coverage at a pressure of 350 Pa will be

Options :

1. ✔ 0.6364

2. ✖ 1.750

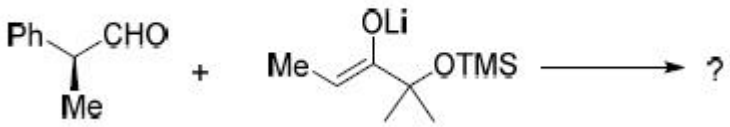
3. ✖ 0.318

4. ✖ 0.005

Question Number : 77 Question Id : 8616631077 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

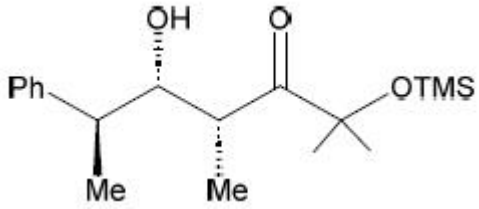
Correct Marks : 3 Wrong Marks : 1

The major product formed in the following reaction is

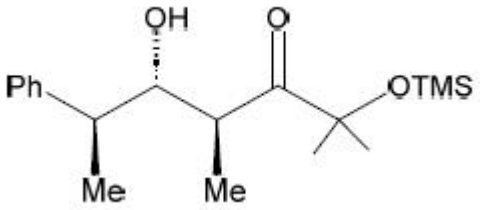


Options :

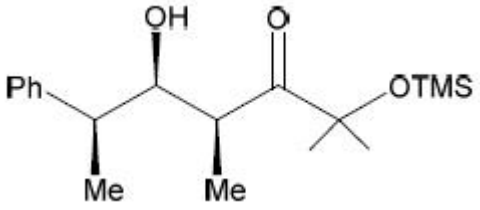
1. ✖



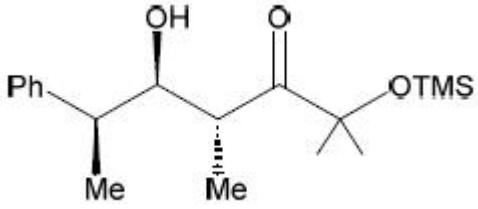
2. ✖



3. ✔



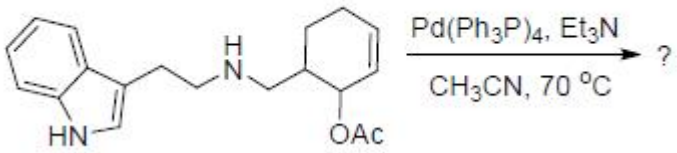
4. ✖



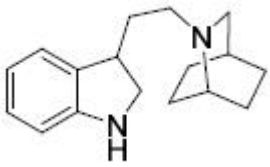
Question Number : 78 Question Id : 8616631078 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

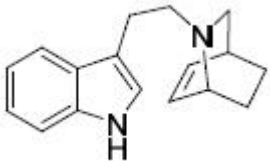
Correct Marks : 3 Wrong Marks : 1

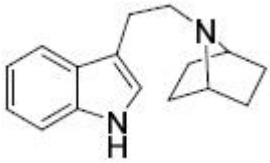
The product formed in the following reaction is

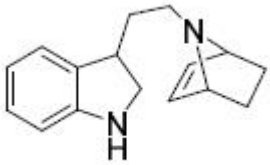


Options :

1. ✖ 

2. ✔ 

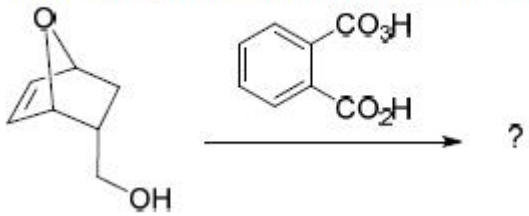
3. ✖ 

4. ✖ 

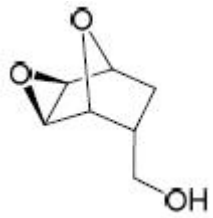
Question Number : 79 Question Id : 8616631079 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

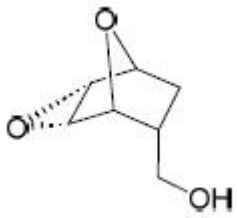
Correct Marks : 3 Wrong Marks : 1

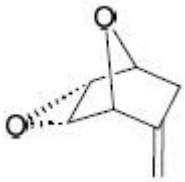
The major product formed in the following reaction is:

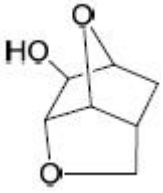


Options :

1. ✖ 

2. ✖ 

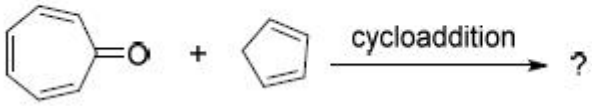
3. ✖ 

4. ✔ 

Question Number : 80 Question Id : 8616631080 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The major product formed in the following cycloaddition reaction is



Options :

1. ✔ 

2. ✖ 

3. ✖ 

4. ✖ 

Question Number : 81 Question Id : 8616631081 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The suitable reagent and condition for the following reaction is:

Options :

1. ✖ DIBALH, -70 °C; H_2O, H^+

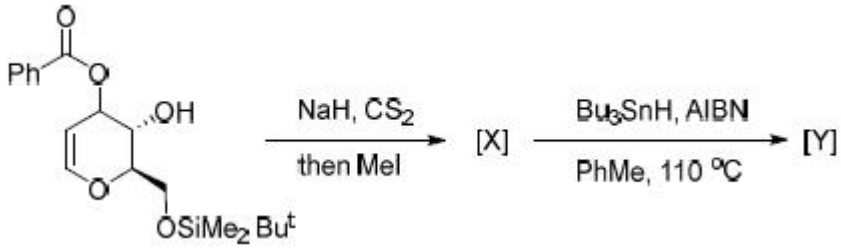
2. ✔ $LiAlH_4$, THF, 0 °C

3. ✖ H_2, Pd/C, 0 °C

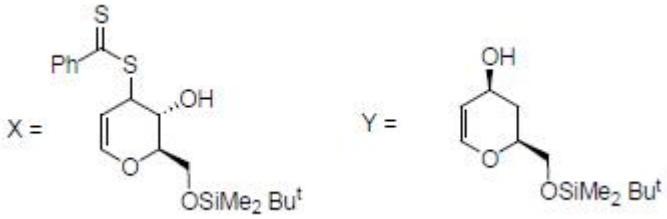
4. ✖ BH_3/THF

Question Number : 82 Question Id : 8616631082 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

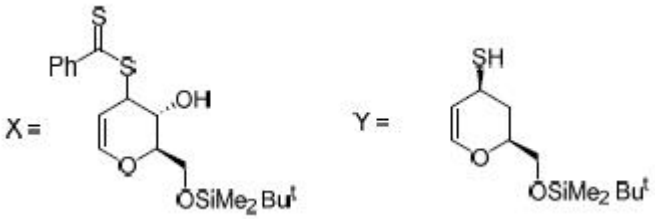
Correct Marks : 3 Wrong Marks : 1



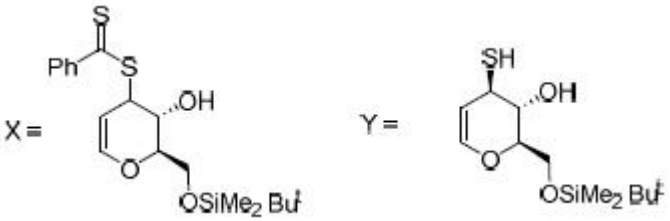
Options :

1. ✖ 

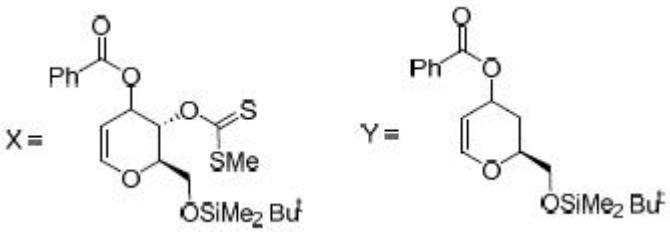
2. ✖



3. ✖



4. ✔



Question Number : 83 Question Id : 8616631083 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

An organic compound with molecular formula $C_8H_{10}O$ has given the following spectral data.

UV-λ_{max}: 303 (nm) ($\Sigma = 7924$)

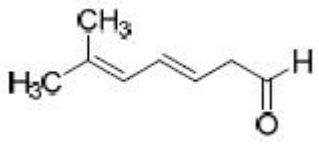
IR: (KBr, cm^{-1}): 3032 (m), 1724 (s), 1608 (m), 1441 (m), 1358 (m)

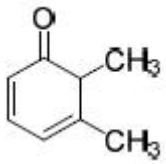
^1H NMR ($CDCl_3$, δ_{ppm}): 1.5 (s, 6H), 4.1 (d, $J = 4.9$ Hz, 1H)
4.2 (t, $J = 4.9$ Hz, 1H), 4.3 (t, $J = 4.9$ Hz, 1H)
4.5 (d, $J = 4.9$ Hz, 1H)

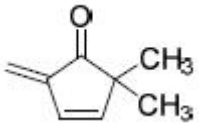
What could be the structure of the compound?

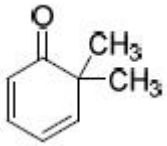
Options :

1. ✖



2. ✖ 

3. ✖ 

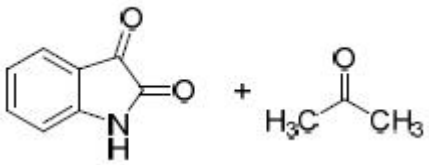
4. ✔ 

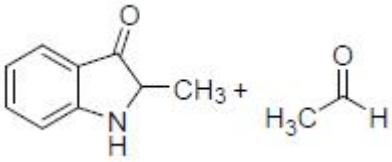
Question Number : 84 Question Id : 8616631084 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

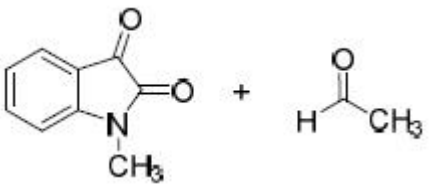
Correct Marks : 3 Wrong Marks : 1

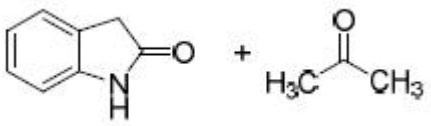
The starting material in the Pfitzinger synthesis of 2-methylquinoline

Options :

1. ✔ 

2. ✖ 

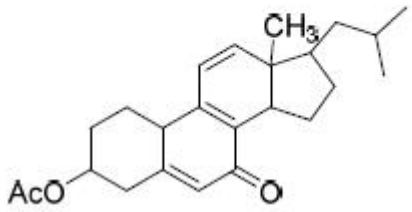
3. ✖ 

4. ✖ 

Question Number : 85 Question Id : 8616631085 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option

Orientation : Vertical
Correct Marks : 3 Wrong Marks : 1

The λ_{max} of the following molecule is:



Options :

1. ✖ 285 nm

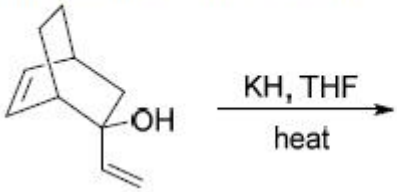
2. ✖ 300 nm

3. ✔ 329 nm

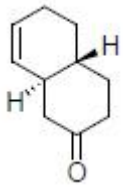
4. ✖ 317 nm

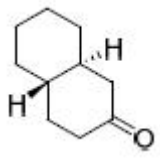
Question Number : 86 Question Id : 8616631086 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical
Correct Marks : 3 Wrong Marks : 1

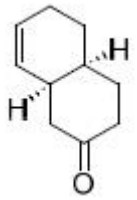
The product formed in the following reaction is:

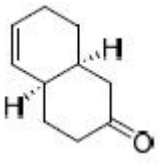


Options :

1. ✔ 

2. ✖ 

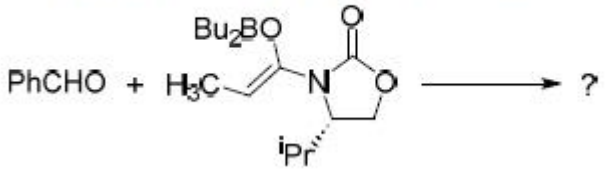
3. ✖ 

4. ✖ 

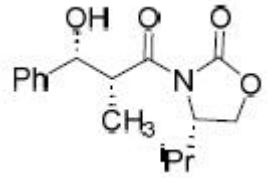
Question Number : 87 Question Id : 8616631087 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

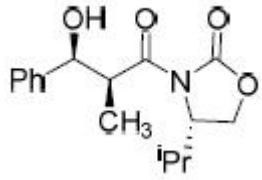
Correct Marks : 3 Wrong Marks : 1

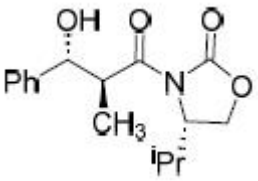
The major product formed in the following reaction is:

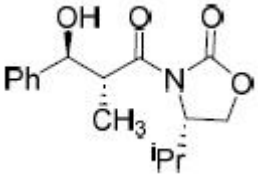


Options :

1. ✖ 

2. ✔ 

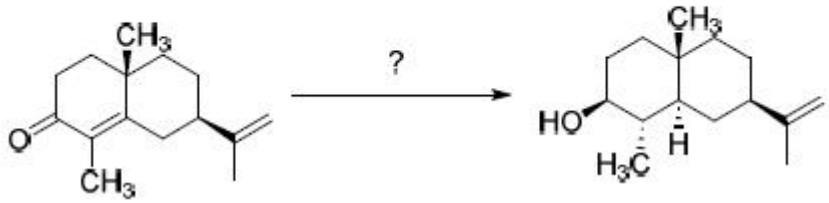
3. ✖ 

4. ✖ 

Question Number : 88 Question Id : 8616631088 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

The suitable reaction condition for the following reaction is:



Options :

1. ✖ H_2, Pd-C, EtOH

2. ✔ Li, NH_3 (liq), EtOH

3. ✖ DIBAL-H, THF, -70 °C

4. ✖ $NaBH_4$, MeOH, 0 °C to room temperature

Question Number : 89 Question Id : 8616631089 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

If a molecule contains one bromine atom and two chlorine atoms, what will be the relative intensities of molecular ions?

Options :

1. ✖ [M] : [M+2] : [M+4] : [M+6]
9 : 7 : 15 : 3

2. ✔ [M] : [M+2] : [M+4] : [M+6]
9 : 15 : 7 : 1

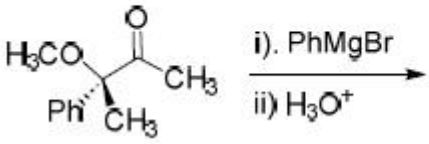
3. ✖ [M] : [M+2] : [M+4] : [M+6]
3 : 7 : 5 : 1

4. ✖ [M] : [M+2] : [M+4] : [M+6]
9 : 15 : 7 : 3

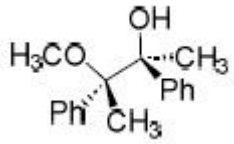
Question Number : 90 Question Id : 8616631090 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

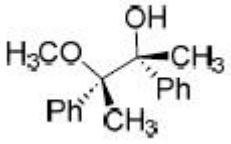
Correct Marks : 3 Wrong Marks : 1

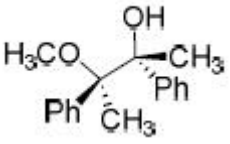
The major diastereomer formed in the following asymmetric synthesis is

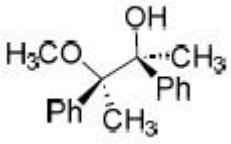


Options :

1. ✔ 

2. ✖ 

3. ✖ 

4. ✖ 

Question Number : 91 Question Id : 8616631091 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

In the question below given four statements followed by three Conclusions number I, II and III. You have to take the given statements to be true even if they seem to be at variance from commonly known facts. Read all the conclusions and then decide which of the given conclusions logically follows from the given statements desire gardening commonly known facts.

Statements: Some plates are spoons.
All spoons are forks.
All forks are bowls.
Some bowls are utensils.

Conclusions: I. Some plates are bowls.
II. All spoons are bowls.
III. Some forks are utensils.

Options :

1. ✖ Only I follows

2. ✖ Only II follows

3. ✖ Only I and III follow

4. ✔ Only I and II follow

Question Number : 92 Question Id : 8616631092 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

From the given answer figures, select the one in which the question figure is hidden/embedded.

Question Figure:

Options :

1. 

2. 

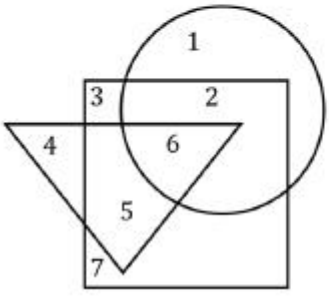
3. 

4. 

Question Number : 93 Question Id : 8616631093 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

When a survey was made regarding the preferences in the watching of TV channel, a few said that they watch only ZEE TV channel, the others liked only Sun TV channel, while others Asianet TV channel. A small percentage said that they watch all the three TV channels. In the figure given below the circle indicates the Asianet TV channel, the square Z TV and the triangle the Sun TV channel. Which number in the figure indicates the fact that some people watch all the three TV channels?



Options :

1. ✖ 2

2. ✖ 5

3. ✔ 6

4. ✖ 3

Question Number : 94 Question Id : 8616631094 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

If 27 March, 1995 was a Mon day, then what days of the week was 1 November, 1995?

Options :

1. ✖ Monday

2. ✖ Sunday

3. ✖ Tuesday

4. ✔ Wednesday

Question Number : 95 Question Id : 8616631095 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Ashok started walking towards South. After walking 50 metres he took a right turn and walked 30 metres. He then took a right turn and walked 100 metres. He again took a right turn and walked 30 metres and stopped. How far and in which direction was he from the starting point?

Options :

1. ✖ 50 metres South

2. ✖ 150 metres North

3. ✖ 180 metres East

4. ✔ 50 metres North

Question Number : 96 Question Id : 8616631096 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

In a certain code language 'ROUTINE' is written as 'VMRGFLI'. How will be 'CRUELTY' written in that code language?

Options :

1. ✖ VPVCZRL

2. ✖ VPCVZRL

3. ✖ WPCVZRL

4. ✔ BGOVFIX

Question Number : 97 Question Id : 8616631097 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Thirty-six vehicles are parked in a parking lot in a single row. After the first car, there is one scooter. After the second car, there are two scooters. After the third car, there are three scooters and so on. Work out the number of scooters in the second half of the row.

Options :

1. ✖ 10

2. ✖ 12

3. ✔ 15

4. ✖ 17

Question Number : 98 Question Id : 8616631098 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

In the following number series, a wrong number is given. Find out that wrong number.
10, 11, 24, 75, 303, 1525,9156

Options :

1. ✖ 24

2. ✖ 1525

3. ✖ 75

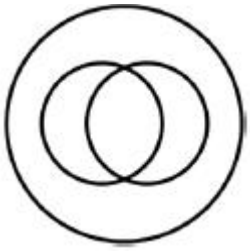
4. ✔ 303

Question Number : 99 Question Id : 8616631099 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

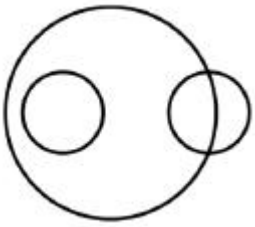
Correct Marks : 3 Wrong Marks : 1

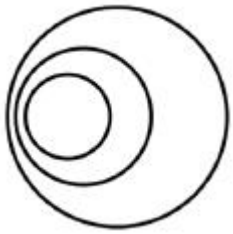
Which of the following figures represents the relation between 'Sparrows', 'Birds' and 'Crows'?

Options :

1. ✖ 

2. ✔ 

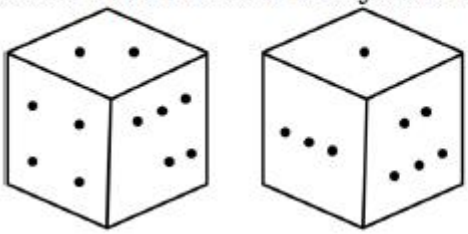
3. ✖ 

4. ✖ 

Question Number : 100 Question Id : 8616631100 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Calculator : Normal Option Orientation : Vertical

Correct Marks : 3 Wrong Marks : 1

Study the two different positions of a cube given below with dots from 1 to 6 marked on its faces. Find out how many dots are there on the face opposite to that containing 4 dots.



Options :

1. ✖ 1

2. ✖ 2

3. ✔ 3

4. ✖ 5