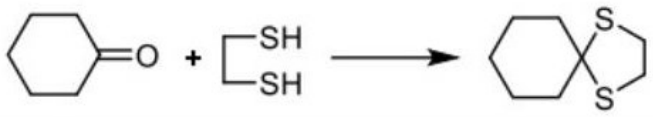
**English**

1.

A suitable catalyst for bringing out the transformation given below is




(A) $BF_3.Et_2O$

(B) NaOEt

(C) Tungsten lamp

(D) Dibenzoyl peroxide

**Correct Option(s): A**

**English**

2.

Among the carbocation given below


(A) (B) (C)

(A) A is homoaromatic, B is antiaromatic and C is aromatic

(B) A is aromatic, B is antiaromatic and C is homoaromatic

(C) A is antiaromatic, B is aromatic and C is homoaromatic

(D) A is homoaromatic, B is aromatic and C is antiaromatic

**Correct Option(s): A**

**English**

3.

Addition of $BH_3$ to a carbon-carbon double bond is

(A) Anti-Markovinikov syn addition

(B) Anti-Markovinikov anti addition

(C) Markovinikov syn addition

(D) Markovinikov anti addition

**Correct Option(s): C**

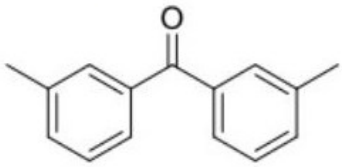
**English**

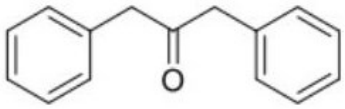
4.

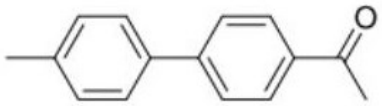
An organic compound having molecular formula $C_{15}H_{14}O$ exhibited the following $^{1}H$ and $^{13}C$ NMR spectra data

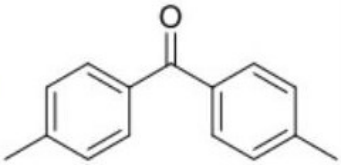
$^{1}H$ NMR : δ 2.4(s), 7.2(d, $J$ = 8 Hz), 7.7 (d, $J$ = 8 Hz)

$^{13}C$ NMR : δ 21.0,129.0,130.0,136.0,141.0,190.0

(A) 

(B) 

(C) 

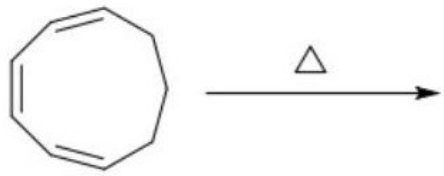
(D) 

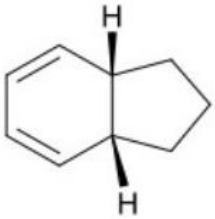
**Correct Option(s): D**

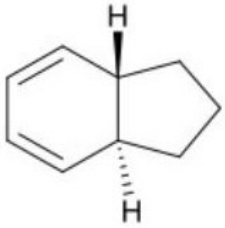
**English**

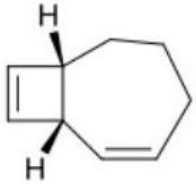
5.

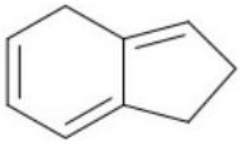
The major product formed in the following concerted reaction is




(A) 


(B) 


(C) 

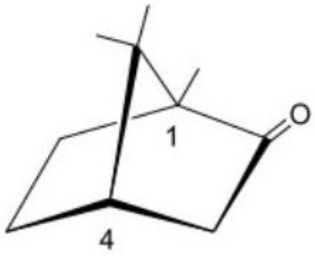

(D) 

**Correct Option(s): A**

**English**

6.

The absolute configuration at the two chiral centres of (-)–camphor is




(A) 1R,4R

(B) 1R,4S

(C) 1S,4R

(D) 1S,4S

**Correct Option(s): D**

**English**

7.

Among the following, an example of a "Green Synthesis" is

(A) Synthesis of malachite green

(B) Friedel-craft's acylation of anisole with $Ac_2O$/anhydrous $AlCl_3$

(C) Jones oxidation of benzyl alcohol to benzoic acid

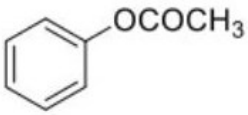
(D) Diels-Alder reaction of furan and maleic acid in water

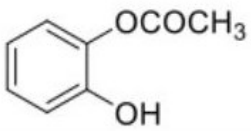
**Correct Option(s): D**

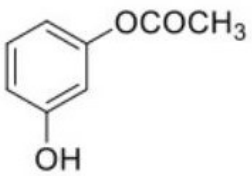
**English**

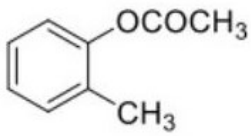
8.

Among the following esters, the one that undergoes acid hydrolysis fastest is

(A) 


(B) 


(C) 

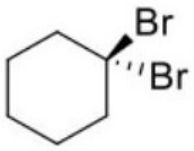

(D) 

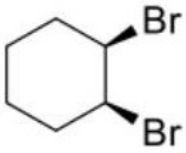

**Correct Option(s): B**

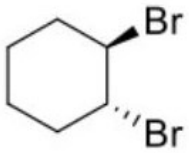
**English**

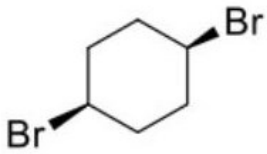
9.

Among the following dibromocyclohexanes, the one that reacts fastest with sodium iodide to give cyclohexene is……

(A) 


(B) 


(C) 


(D) 


**Correct Option(s): C**

**English**

10.

The gauche conformation ($\varphi = 60°$) of n-butane possess

(A) plane of symmetry; and is achiral

(B) $C_2$ axis of symmetry; and is chiral

(C) centre of symmetry; and is achiral

(D) Plane of symmetry; and is chiral

**Correct Option(s): B**

**English**

11.

An AX system gave 4 lines at 4.72, 4.6, 1.12 and 1.0 ppm away from the TMS using an nmr spectrometer operating at 100 MHz. What are the value of $J_{AX}$ (in Hz) and $\delta_{AX}$ (in ppm), respectively.

(A) 12 and 3.6

(B) 6 and 3.6

(C) 12 and 2.86

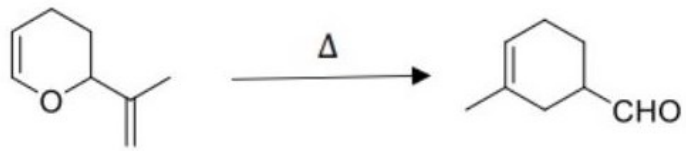
(D) 6 and 2.86

**Correct Option(s): A**

**English**

12.

The following reaction proceeds through a




(A) 1,3-sigmatropic rearrangement

(B) 2,3-sigmatropic rearrangement

(C) 3,3-sigmatropic rearrangement

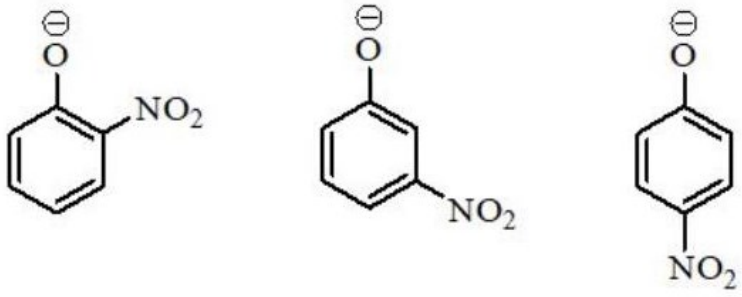
(D) 3,5-sigmatropic rearrangement

**Correct Option(s): C**

**English**

13.

The correct order of basicity for the following anions is




(I) (II) (III)

(A) II>III>I

(B) I>II>III

(C) II>I>III

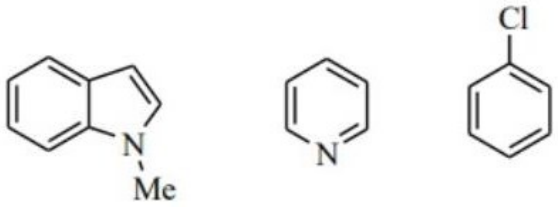
(D) III>II>I

**Correct Option(s): C**

**English**

14.

The correct order for the rates of electrophilic aromatic substitution of the following compound is




(I) (II) (III)

(A) I>II>III

(B) II>I>III

(C) III>II>I

(D) I>III>II

**Correct Option(s): D**

**English**

15.

Amongst organolithium (A), Grignard (B) and organoaluminium (C) compounds, those react with $SiCl_4$ to give compound containing Si-C bond are

(A) A and B

(B) B and C

(C) A and C

(D) A, B and C

**Correct Option(s): D**

**English**

16.

The groups present in vertical line of the Fisher projection are------

(A) near

(B) away

(C) out of plane

(D) away & out of plane

**Correct Option(s): D**

**English**

17.

The conversion of cyclohexanone oxime to caprolactum in presence of acid can be termed as

(A) Beckmann rearrangement

(B) Hoffmann rearrangement

(C) Curtius rearrangement

(D) Favorski rearrangement

**Correct Option(s): A**

**English**

18.

Which of the following spectroscopic techniques will be useful to distinguish between M-SCN and M-NCS binding modes ?

(A) NMR

(B) IR

(C) EPR

(D) Mass

**Correct Option(s): B**

**English**

19.

$[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$ complex ions are

(A) Both diamagnetic

(B) Both paramagnetic

(C) Diamagnetic and paramagnetic respectively

(D) Antiferromagnetic and diamagnetic respectively

**Correct Option(s): C**

**English**

20.

In the EPR spectrum of tetragonal Cu(II) complex, when $g_{\parallel} > g_{\perp} > g_e$ the unpaired Electron resides in the orbital

(A) $d_{xy}$

(B) $d_{x^2-y^2}$

(C) $d_{z^2}$

(D) $d_{xy}$

**Correct Option(s): B**

**English**

21.

The absorption at $\lambda_{max}$ 279 nm ($\varepsilon = 15$) in the UV spectrum of acetone is due to

(A) $\pi - \pi^*$ transition

(B) $n - \pi^*$ transition

(C) $\sigma - \sigma^*$ transition

(D) $n - \sigma^*$ transition

**Correct Option(s): B**

**English**

22.

The term symbol for the ground state of nitrogen atoms is

(A) $^3P_0$

(B) $^4P_{3/2}$

(C) $^1P_1$

(D) $^4S_{3/2}$

**Correct Option(s): D**

**English**

23.

The electronic spectrum of $[CrF_6]^{3-}$ shows three bands at 14,900 $cm^{-1}$, 22,400 $cm^{-1}$ and 34,800 $cm^{-1}$ The value of $\Delta_o$ in this case is

(A) 5,500 $cm^{-1}$

(B) 14,900 $cm^{-1}$

(C) 22,400 $cm^{-1}$

(D) 34,800 $cm^{-1}$

**Correct Option(s): B**

**English**

24.

The STYX code of $B_4H_{10}$ is

(A) 4120

(B) 4220

(C) 4012

(D) 3203

**Correct Option(s): C**

**English**

25.

The true statement about base hydrolysis of $[Co(NH_3)_5Cl]^{2+}$ is

(A) It is a first order reaction

(B) The rate determining step involves the dissociation of chloride in $[Co(NH_3)_4(NH_2)Cl]^+$

(C) The rate is independent of the concentration of the base

(D) The rate determining step involves the abstraction of a proton from $[Co(NH_3)_5Cl]^{2+}$

**Correct Option(s): B**

**English**

26.

The cluster having arachno type structure is

(A) $[Os_5(CO)_{16}]$

(B) $[Os_3(CO)_{12}]$

(C) $[Ir_4(CO)_{12}]$

(D) $[Rh_6(CO)_{16}]$

**Correct Option(s): B**

**English**

27.

The total number of fine and hyperfine EPR lines expected for octahedral high-spin Mn(II) complexes are _____ respectively (I=5/2 for Mn)

(A) 3 and 30

(B) 5 and 33

(C) 5 and 30

(D) 4 and 24

**Correct Option(s): C**

**English**

28.

A crystal having lattice parameter a=b≠ $c$ $\propto = \beta = \gamma = 90$ belong to the_____ crystal system.

(A) Monoclinic

(B) Orthorhombic

(C) Rhombohedral

(D) Tetragonal

**Correct Option(s): D**

**English**

29.

Calculate CFSE value for $d^4$ in tetrahedral field

(A) $-0.6\Delta_t$

(B) $-0.4\Delta_t$

(C) $-0.36\Delta_t$

(D) $-1.6\Delta_t$

**Correct Option(s): B**

**English**

30.

Amongst the following, the complex ion that would show strong Jahn-Teller distortion is

(A) $[Cr(H_2O)_6]^{2+}$

(B) $[Ti(H_2O)_6]^{3+}$

(C) $[Co(H_2O)_6]^{2+}$

(D) $[Fe(H_2O)_6]^{2+}$

**Correct Option(s): A**

**English**

31.

Which of the following electronic configurations gives kinetically inert octahedral complexes?

(A) $t^6_{2g}e^0g$

(B) $t^3_{2g}e^1g$

(C) $t^5_{2g}e^0g$

(D) $t^6_{2g}e^4g$

**Correct Option(s): A**

**English**

32.

Consider the following statements for octahedral complexes, (1) $[CrF_6]^{3-}$

(2) $[Cr(ox)_3]^{3-}$ (3) $[Cr(en)_3]^{3+}$:

(a) Their d-d transitions are at 14900, 17500 and 21800$cm^{-1}$, respectively
(b) Their spin-only magnetic moments are same
(c) Two of them have optical isomers
(d) All of them show Jahn-Teller distortion

The correct statements are

(A) a, b and c

(B) a, c and d

(C) b, c and d

(D) b and d

**Correct Option(s): A**

**English**

33.

---------- enzyme catalyzes the biosynthesis of melanin for vertebrate pigmentation.

(A) Galactose oxidase

(B) catalase

(C) SOD

(D) Tyrosinase

**Correct Option(s): D**

**English**

34.

At room temperature, which molecule has the maximum rotational entropy ?

(A) $H_2$

(B) $O_2$

(C) $D_2$

(D) $N_2$

**Correct Option(s): B**

**English**

35.

Among the following, the **CORRECT** statement is

(A) The number of irreducible representations is equal to classes of symmetry operations

(B) The number of irreducible representations is equal to the order of the symmetry point Group

(C) The irreducible representation contained in any point group are always of one Dimension

(D) A symmetry point group may not contain a totally symmetric irreducible Representation

**Correct Option(s): A**

**English**

36.

For the vibrational Raman spectrum of a homonuclear diatomic molecule, the selection rule under harmonic approximation is

(A) $\Delta v = 0$ only

(B) $\Delta v = \pm 1$ only

(C) $\Delta v = \pm 2$ only

(D) $\Delta v = 0, \pm 1$ only

**Correct Option(s): B**

**English**

37.

How many atoms are there in an element packed in a fcc structure

(A) 1

(B) 2

(C) 4

(D) 8

**Correct Option(s): C**

**English**

38.

"Phosphorescence" is represented as

(A) $T_1 \longrightarrow S_0 + hv$

(B) $T_1 \longrightarrow S_0 + \Delta$

(C) $S_1 \longrightarrow S_0 + hv$

(D) $S_1 \longrightarrow T_1 + \Delta$

**Correct Option(s): A**

**English**

39.

The aggregation of surfactant molecules is known as

(A) micelles

(B) Clusters

(C) Gel

(D) Colloid

**Correct Option(s): A**

**English**

40.

A radioisotope $^{41}Ar$ initially decays at the rate of 34, 500 disintegrations/minute, but decay rate falls to 21, 500 disintegrations/minute after 75 minutes. The $t_{1/2}$ for $^{41}Ar$ is:

(A) 90 minutes

(B) 110 minutes

(C) 180 minutes

(D) 220 minutes

**Correct Option(s): B**

**English**

41.

The correct thermodynamics relation among the following is

(A) $\left(\frac{\partial U}{\partial V}\right)_S = -P$

(B) $\left(\frac{\partial H}{\partial V}\right)_S = -P$

(C) $\left(\frac{\partial G}{\partial V}\right)_S = -P$

(D) $\left(\frac{\partial A}{\partial V}\right)_S = -S$

**Correct Option(s): A**

**English**

42.

A reaction contains a mixture of $N_2$, $H_2$ and $NH_3$ in equilibrium ($K_p = 3.75\ atm^{-2}$). If sufficient He is introduced into the reactor to double the total pressure, the value of $K_p$ at the new equilibrium would be

(A) $0.94\ atm^{-2}$

(B) $3.75\ atm^{-2}$

(C) $7.50\ atm^{-2}$

(D) $15.00\ atm^{-2}$

**Correct Option(s): B**

**English**

43.

A compound of M and X atoms has a cubic unit cell. M atoms are at the corn body centre position and Z atoms are at face centre positions of the cube. The formula of the compound is

(A) MX

(B) 3

(C) $M_3X_2$

(D) $M_2X_3$

**Correct Option(s): D**

**English**

44.

Work (w) involved in isothermal reversible expansion from $V_i$ to $V_f$ of n moles of an ideal gas is

(A) $w = -nRT \ln (V_f/V_i)$

(B) $w = nRT \ln (V_f/V_i)$

(C) $w = -nRT (V_f/V_i)$

(D) $w = -nRT \log (V_f/V_i)$

**Correct Option(s): A**

**English**

45.

Number of rotational symmetry axes for triclinic crystal system is

(A) 4

(B) 3

(C) 1

(D) 0

**Correct Option(s): D**

**English**

46.

The number of configurations in the most probable state, according to Boltzmann formula, is

(A) $e^{S/K_B}$

(B) $e^{-S/K_B}$

(C) $e^{-E/T\,K_B}$

(D) $e^{-\Delta G/T\,K_B}$

**Correct Option(s): A**

**English**

47.

The point group symmetry $CH_2 = C = CH_2$ is

(A) $D_2h$

(B) $C_2h$

(C) $C_2v$

(D) $D_2d$

**Correct Option(s): D**

**English**

48.

In the expression, $\hat{A}f(x) = cf(x)$, 'c' is called as

(A) Eigen function

(B) Eigen value

(C) Constant

(D) Concentration

**Correct Option(s): B**

**English**

49.

A first order reaction requires 24 months for the concentration of the reactant to be reduced to 12.5 % of its original value. What will be its half-life?

(A) 12 months

(B) 6 months

(C) 3 months

(D) 8 months

**Correct Option(s): B**

**English**

50.

The standard reduction potentials at 298 K for single electrodes are given below:

| Electrode | Electrode Potential (volt) |
|---|---|
| $Mg^{2+}/Mg$ | -2.34 |
| $Zn^{2+}/Zn$ | -0.76 |
| $Fe^{2+}/Fe$ | -0.44 |

From this we can infer that

(A) Zn can reduce both $Mg^{2+}$ and $Fe^{2+}$

(B) Fe can reduce both $Mg^{2+}$ and $Zn^{2+}$

(C) Mg can reduce both $Zn^{2+}$ and $Fe^{2+}$

(D) Mg can reduce $Zn^{2+}$ but not $Fe^{2+}$

**Correct Option(s): C**