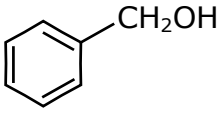
CHEMISTRY
JEE-MAIN (July-Attempt) 22 July
(Shift-2) Paper

SECTION –A

1. Which one of the following compounds does not exhibit resonance ?

(1) $CH_3CH_2CH_2CONH_2$ (2) 

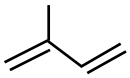
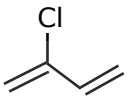
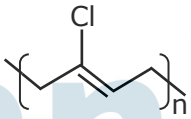
(3) $CH_3CH_2OCH = CH_2$ (4) $CH_3CH_2CH = CHCH_2NH_2$

Sol. **(4)**

$CH_3–CH_2–CH = CH–CH_2–NH_2$

This is non conjugated compound.

2. Match List-I with List-II :

	List – I		**List – II**
(a)	Chloroprene	(i)	
(b)	Neoprene	(ii)	
(c)	Acrylonitrile	(iii)	
(d)	Isoprene	(iv)	$CH_2 = CH – CN$

Choose the correct answer from the options given below :

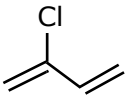
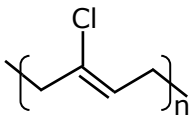
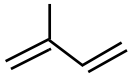
(1) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

(3) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

(4)(a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

Sol. **(2)**

(a)	Chloroprene	(i)	
(b)	Neoprene	(ii)	
(c)	Acrylonitrile	(iii)	$CH_2 = CH – CN$
(d)	Isoprene	(iv)	

3. Which one of the following group-15 hydride is the strongest reducing agent ?

(1) AsH_3 (2) PH_3 (3) BiH_3 (4) SbH_3

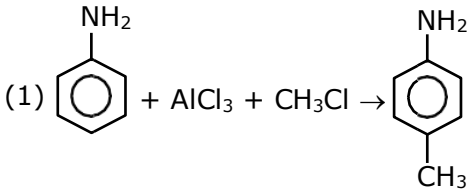
Sol. **(3)**

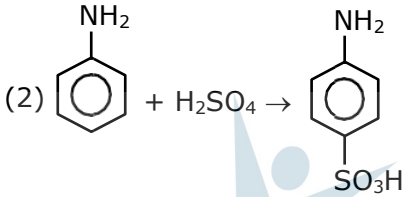
Among 15^{th} group hydrides, BiH_3 is strongest reducing agent.

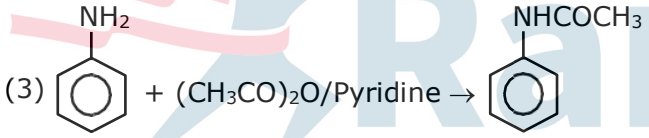
4. Which one of the following 0.06 M aqueous solutions has lowest freezing point ?
(1) $C_6H_{12}O_6$
(2) K_2SO_4
(3) KI
(4) $Al_2(SO_4)_3$

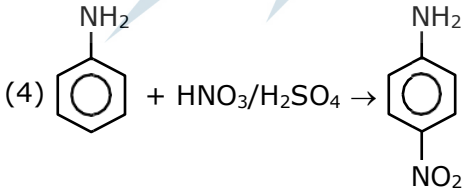
Sol. **(4)**
$\Delta T_f = ik_f \times m$
$\Delta T_f \alpha$ i but F.P α 1/i
Therefore Ans. 4

5. Which one of the following reactions does not occur ?

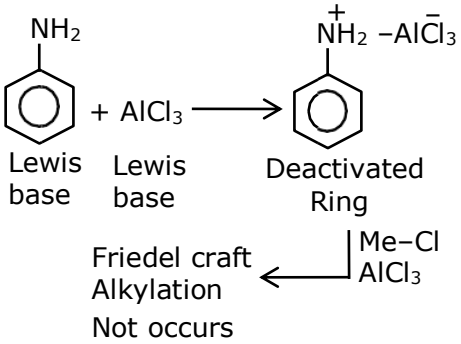
(1) 

(2) 

(3) 

(4) 

Sol. **(1)**



(1)Aniline is lewis base give acid base reaction with $AlCl_3$ and form Anilinium ion
(2)Anilinium ion has strongest deactivated ring so further Friedel craft Alkylation not occurs.

6. Match List-I with List-II :

	List-I (Species)		**List-II** (Hybrid Orbitals)
(a)	SF_4	(i)	sp^3d^2
(b)	IF_5	(ii)	d^2sp^3
(c)	NO_2^+	(iii)	sp^3d
(d)	NH_4^+	(iv)	sp^3
		(v)	sp

Choose the correct answer form the options given below :

(1) (a)-(i), (b)-(ii), (c)-(v) and (d)-(iii)

(2) (a)-(ii), (b)-(i), (c)-(iv) and (d)-(v)

(3) (a)-(iv), (b)-(iii), (c)-(ii) and (d)-(v)

(4)(a)-(iii), (b)-(i), (c)-(v) and (d)-(iv)

Sol. **(4)**

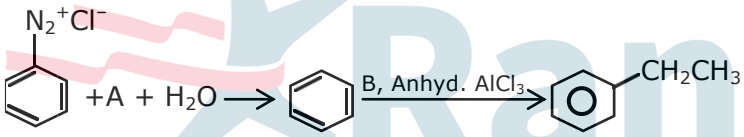
(a) SF_4 – sp^3d hybridisation

(b)IF_5 – sp^3d^2 hybridisation

(c) NO_2^+ – sp hybridisation

(d) NH_4^+ – sp^3 hybridisation

7.



Major Product

In the chemical reaction given above A and B respectively are :

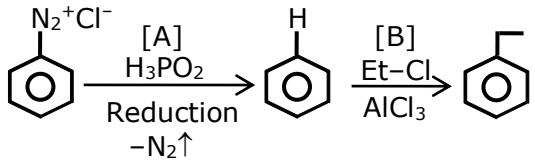
(1) CH_3CH_2OH and H_3PO_2

(2) H_3PO_2 and CH_3CH_2Cl

(3) H_3PO_2 and CH_3CH_2OH

(4) CH_3CH_2Cl and H_3PO_2

Sol. **(2)**



8. The set having ions which are coloured and paramagnetic both is :

(1) Sc^{3+}, V^{5+}, Ti^{4+}

(2) Cu^{2+}, Cr^{3+}, Sc^{+}

(3) Ni^{2+}, Mn^{7+}, Hg^{2+}

(4) Cu^{+}, Zn^{2+}, Mn^{4+}

Sol. **(2)**

$Cu^{2+} : [Ar]3d^9\ 4s^0$

$Cr^{3+} : [Ar]3d^3\ 4s^0$

$Sc^{+} : [Ar]3d^1\ 4s^1$

] All are coloured and paramagnetic due to presence of unpaired e^-

9. When silver nitrate solution is added to potassium iodide solution then the sol produced is :

(1) $AgNO_3/NO_3^-$

(2) AgI/I^-

(3) KI/NO_3^-

(4) AgI/Ag^+

Sol. **(2)**

$$\underset{\text{(drop by drop)}}{AgNO_3(aq.)} + \underset{\text{excess}}{KI(aq.)} \longrightarrow \underset{\text{Sol}}{AgI / I^-}$$

10. Sulphide ion is soft base and its ores are common for metals.

(a) Pb (b) Al (c) Ag (d) Mg

Choose the correct answer from the options given below :

(1) (a) and (c) only

(2) (a) and (b) only

(3) (a) and (d) only

(4) (c) and (d) only

Sol. **(1)**

Pb and Ag commonly exist in the form of sulphide ore like PbS (galena) and Ag_2S (Argentite).

'Al' is mainly found in the form of oxide ore whereas 'Mg' is found in the form of halide ore.

11. The water having more dissolved O_2 is :

(1) boiling water

(2) water at 80°C

(3) polluted water

(4) water at 4°C

Sol. **(4)**

On heating concentration of O_2 in water decreases. So boiling water and water at 80°C having less O_2 concentration. Polluted water also having less O_2 concentration. So water at 4°C having maximum O_2 concentration.

12. Which one of the following molecules does not show stereo isomerism ?

(1) 3, 4-dimethylhex-3-ene

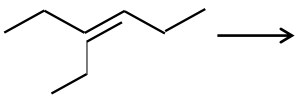
(2) 4-Methylhex-1-ene

(3) 3-Methylhex-1-ene

(4) 3-Ethylhex-3-ene

Sol. **(4)**

3-Ethylhex-3-ene will not show stereo isomerism it's diagram is.



(1) Not show geometrical isomerism

(2) Not show optical isomerism

13. Given below are the statements about diborane.
(a) Diborane is prepared by the oxidation of $NaBH_4$ with I_2.
(b) Each boron atom is in sp^2 hybridized state.
(c) Diborane has one bridged 3 centre-2-electron bond.
(d) Diborane is a planar molecule.
The option with correct statement(s) is :
(1) (c) and (d) only
(2) (c) only
(3) (a) only
(4) (a) and (b) only

Sol. **(3)**
Diborane is prepared by the reaction of $NaBH_4$ with I_2.
$2NaBH_4 + I_2 \rightarrow B_2H_6 + 2NaI + H_2$
In diborane, 'B' is sp^3 hybrid, it is Non-planar and two $3c–2e^-$ bonds are present.

14. Thiamine and pyridoxine are also known respectively as :
(1) Vitamin B_2 and Vitamin E
(2) Vitamin B_1 and Vitamin B_6
(3) Vitamin B_6 and Vitamin B_2
(4) Vitamin E and Vitamin B_2

Sol. **(2)**
Vitamine-B_1 is also known as Thiamine while vitamin B-6 is known as Pyridoxine

15. Match List-I with List-II :

	List-I (Elements)		**List-II** (Properties)
(a)	Ba	(i)	Organic solvent soluble compounds
(b)	Ca	(ii)	Outer electronic configuration $6s^2$
(c)	Li	(iii)	Oxalate insoluble in water
(d)	Na	(iv)	Formation of very strong monoacidic base

Choose the correct answer form the options given below :
(1) (a)-(iv), (b)-(i), (c)-(ii) and (d)-(iii)
(2) (a)-(i), (b)-(iv), (c)-(ii) and (d)-(iii)
(3) (a)-(iii), (b)-(ii), (c)-(iv) and (d)-(i)
(4)(a)-(ii), (b)-(iii), (c)-(i) and (d)-(iv)

Sol. **(4)**
(a)'Ba' having outer electronic configuration $6s^2$.
(b)CaC_2O_4 is water insoluble
(c)'Li' is soluble in organic solvents
(d)NaOH is strong Monoacidic base among given.

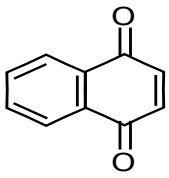
16. Which one of the following statements for D.I. Mendeleeff, is incorrect ?
(1) At the time, he proposed Periodic Table of elements structure of atom was known.
(2) Element with atomic number 101 is named after him.
(3) He invented accurate barometer.
(4) He authored the textbook – Principles of Chemistry.

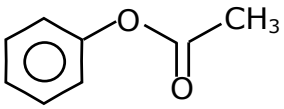
Sol. **(2)**
At the time, he proposed the periodic table but structure of atom was unknown.

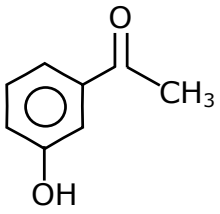
17. Isotope(s) of hydrogen which emits low energy β^- particle with $t_{1/2}$ value > 12 years is/are :
(1) Deuterium
(2) Deuterium and Tritium
(3) Protium
(4) Tritium

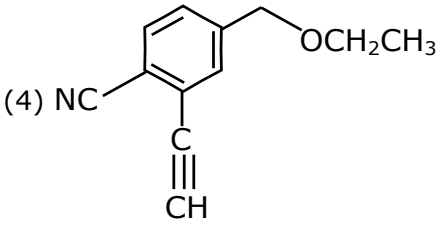
Sol. **(4)**
In case of hydrogen tritium is a radioactive Element.

18. Which one of the following compounds will provide a tertiary alcohol on reaction with excess of CH_3MgBr followed by hydrolysis ?

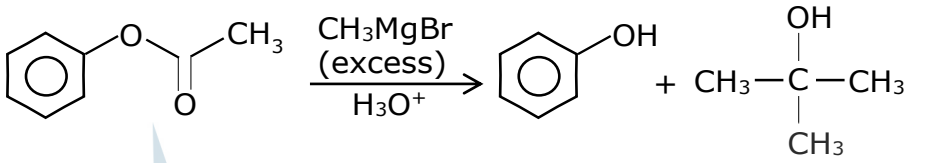
(1) 

(2) 

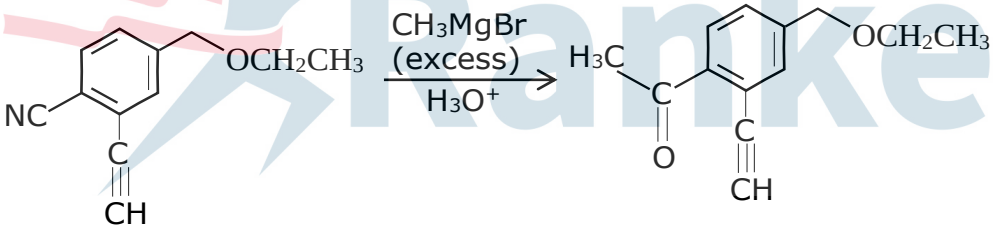
(3) 

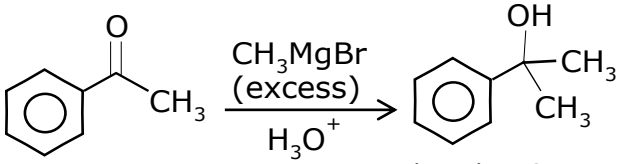
(4) 

Sol. **(2)**

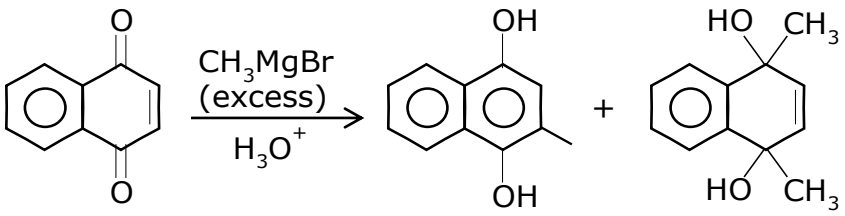


Tertiary alcohol





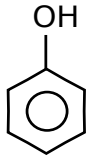
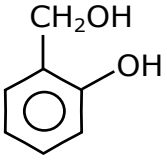
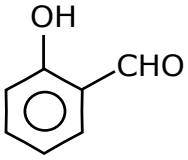
Phenolic –OH group and tertiary Alcohol is present thus two functional groups are present in the product

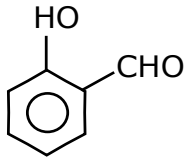
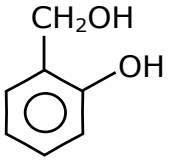
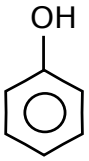


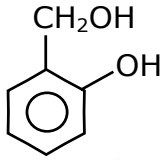
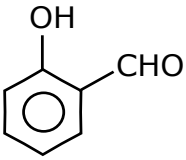
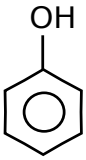
Two 3° alcohol

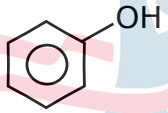
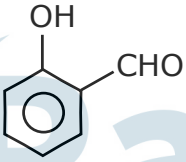
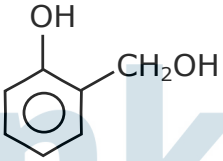
Compound (1), (2), (3) can also gives 3^o-alcohal but most appropriate answer will be (2).

19. An organic compound A (C_6H_6O) gives dark green colouration with ferric chloride. On treatment with $CHCl_3$ and KOH, followed by acidification gives compound B. Compound B can also be obtained from compound C on reaction with pyridinium chlorochromate (PCC). Identify A, B and C.

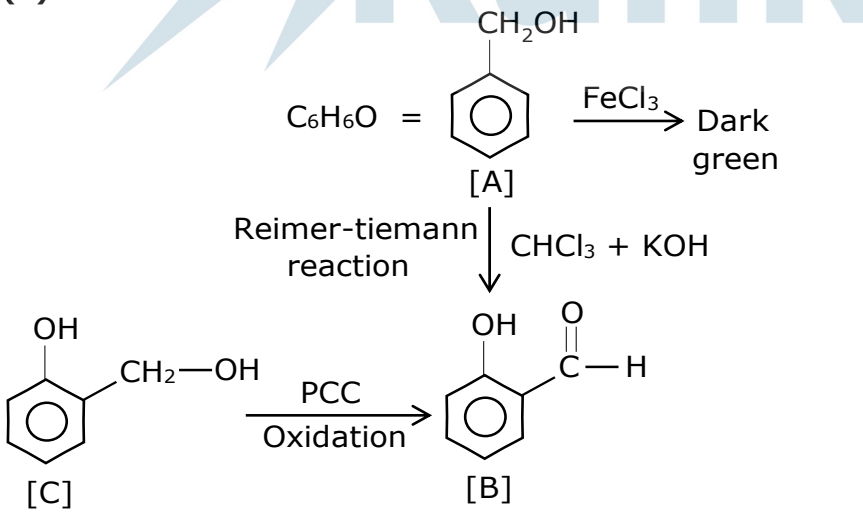
(1) A =  B =  C = 

(2) A =  B =  C = 

(3) A =  B =  C = 

(4) A =  B =  C = 

Sol. **(4)**



20. Which purification technique is used for high boiling organic liquid compound (decomposes near its boiling point) ?

(1) Steam distillation (2) Simple distillation

(3) Fractional distillation (4) Reduced pressure distillation

Sol. **(4)**

Reduced pressure distillation used for the purification of high boiling organic liquids which decomposes at or below their boiling point.

SECTION –B

1. The total number of unpaired electrons present in $[Co(NH_3)_6]Cl_2$ and $[Co(NH_3)_6]Cl_3$ is _____.

Sol. **(1)**

$[Co(NH_3)_6]Cl_2$

Co^{2+} : $[Ar]3d^7 4s^0 4p^0$

For this complex Δ_0< P.E., so pairing of electron does not take place.

$Tzg^6 eg^1$

Total one unpaired electrons are present.

2. Methylation of 10 g of benzene gave 9.2 g of toluene. Calculate the percentage yield of toluene _____. (Nearest integer)

Sol. **(78)**

Moles of C_6H_6 = 10/78

moles of toluene = 10/78

w_t of toluene should be = 10/78 × 92

$$\% \text{ yield} = \frac{9.2}{\frac{10}{78}\times 92}\times 100 = 78\%$$

3. $N_2O_{5(g)} \rightarrow 2NO_{2(g)} + \frac{1}{2}O_{2(g)}$

In the above first order reaction the initial concentration of N_2O_5 is 2.40 × 10^{-2} mol L^{-1} at 318 K. The concentration of N_2O_5 after 1 hour was 1.60 ×10^{-2} mol L^{-1}, The rate constant of the reaction at 318 K is _____ × 10^{-3} min^{-1}. (Nearest integer)

[Given: log 3 = 0.477, log 5 = 0.699]

Sol. **(7)**

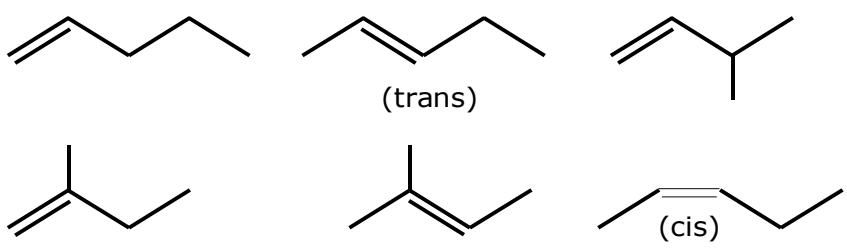
$$k = \frac{2.303}{t}\log\frac{[A_0]}{[A]}$$

$$k = \frac{2.303}{t}\log\frac{[N_2O_5]}{[N_2O_5]}$$

$$= \frac{2.303}{60}\log\frac{2.4}{1.6} = 6.76\times 10^{-3}\ min^{-1} \approx 7\times 10^{-3}\ min^{-1}$$

4. The number of acyclic structural isomers (including geometrical isomers) for pentene are _____.

Sol. **(6)**



5. A copper complex crystallising in a CCP lattice with a cell edge of 0.4518 nm has been revealed by employing X-ray diffraction studies. The density of a copper complex is found to be 7.62 g cm^{-3}. The molar mass of copper complex is _____ g mol^{-1}. (Nearest integer)
[Given : $N_A = 6.022 \times 10^{23}$ mol^{-1}]

Sol. **(106)**

a = 0.4518 nm, d = 7.62 gm/cm^3

a = 0.4518 nm , d = 7.62 gm/cm^3

$d = \frac{z \times M / N_A}{a^3}$ z = 4

$$d\left(\frac{gm}{cc}\right) = \frac{4 \times \frac{M}{N_A}}{(a\,cm)^3}$$

$$7.62 = \frac{4 \times M / 6.022 \times 10^{23}}{(0.4518 \times 10^{-7}\ cm)^3} \Rightarrow M = 105.8\ g/mol$$

6. If the standard molar enthalpy change for combustion of graphite powder is -2.48×10^2 kJ mol^{-1}, the amount of heat generated on combustion of 1g of graphite powder is _____ kJ. (Nearest integer)

Sol. **(21)**

$C_{graphite} + O_{2(g)} \rightarrow CO_{2(g)}$

$\Delta H = -2.48 \times 10^2$

Heat generated = $\frac{2.4 \times 10^2}{12}$ KJ

7. If the concentration of glucose ($C_6H_{12}O_6$) in blood is 0.72 g L^{-1}, the molarity of glucose in blood is _____ $\times 10^{-3}$ M. (Nearest integer)
(Given : Atomic mass of C = 12, H = 1, O = 16 u)

Sol. **(4)**

molarty = moles/volume

$= \frac{0.72}{180} = 4 \times 10^{-3} = M$

8. Number of electrons that Vanadium (Z = 23) has in p-orbitals is equal to _____.

Sol. **(12)**

$_{23}V : 1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$

Number of electrons in p-orbitals is equal to 12.00

9. Value of K_p for the equilibrium reaction $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$ at 288 K is 47.9. The K_C for this reaction at same temperature is _____. (Nearest integer)
(R = 0.083 L bar K^{-1} mol^{-1})

Sol. **(2)**

$K_p = K_C (RT)^1$

$K_C = \frac{K_P}{RT} = \frac{47.9}{0.083 \times 288} = 2$

10. Assume a cell with the following reaction

$Cu_{(s)} + 2Ag^{+}(1 \times 10^{-3}\,M) \rightarrow Cu^{2+}(0.250\,M) + 2\,Ag_{(s)}$

$E^{\Theta}_{Cell} = 2.97V$

E_{cell} for the above reaction is _____V. (Nearest integer)

[Given : log 2.5 = 0.3979, T = 298 K]

Sol. **(3)**

$$E = E^{\circ} - \frac{0.059}{2}\log\frac{[Cu^{+2}]}{[Ag^{+}]^2}$$

$$= 2.97 - \frac{0.059}{2}\log\frac{0.25}{(10^{-3})^2} = 2.81V$$