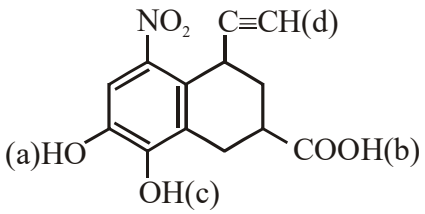
JEE MAIN SEP 2020 (MEMORY BASED) | 2ND SEP SHIFT-2

Note: The answers are based on memory based questions which may be incomplete and incorrect.

1. Decreasing order of acidic strength of following groups is.



(1) a > b > c > d (2) b > c > a > d (3) b > c > d > a (4) b > d > a > c

Ans. (2)

Sol. Carboxylic acid are most acidic followed by phenol and then alkyne

2. Possible no. of subshells for which n = 4 & m = –2 are :

(1) 2 (2) 4 (3) 8 (4) 16

Ans. (1)

Sol. If n = 4

Then possible no. of subshells = 4

Possible values of subshells $\Rightarrow l = 0, 1, 2, 3$

but m = -2 can only possible for $l = 2, 3$

So possible no. of subshells = 2

3. Three element of 3rd period x, y, z such that the oxide of x is acidic, y is amphoteric and z is basic, the order of atomic number of three elements is :

(1) y > x > z (2) x > y > z (3) z > x > y (4) x > z > y

Ans (2)

On moving left to right in a period. Acidic character of oxides is increase and atomic number also increases.

3rd period element oxides.

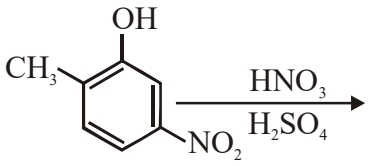
$\underbrace{Na_2O \quad MgO}_{\text{Basic}} \quad \underbrace{Al_2O_3}_{\text{Amphoteric}} \quad \underbrace{SiO_2 \quad P_2O_5 \quad Cl_2O_7}_{\text{Acidic}}$

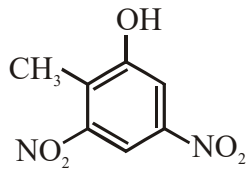
So Z have minimum Atomic No

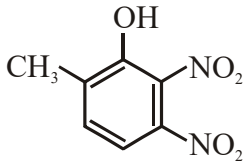
& X have maxima Atomic No

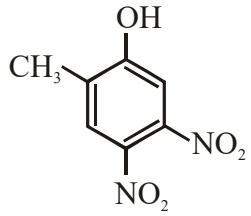
So correct order is x > y > z

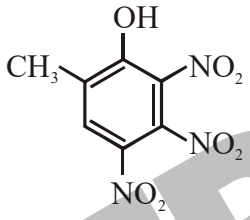
4.



(1) 

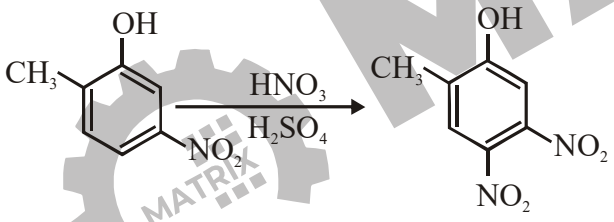
(2) 

(3) 

(4) 

Ans. (3)

Sol. This is electrophilic aromatic substitution reaction in which strong + R effect of OH directs the incoming electrophile.



5. Elements A and B do not form solid bicarbonate and show similar properties but reacts with N_2 to give nitrides. Which of the following can be A and B ?

(1) Ca, Na (2) Rb, Na (3) Ca, Cs (4) Li, Mg

Ans. (4)

Sol. Li and Mg bicarbonates do not exist as solid form. But react with N_2 to give nitrides.

$$6Li + N_2 \xrightarrow{\Delta} 2Li_3N, \quad 3Mg + N_2 \xrightarrow{\Delta} Mg_3N_2$$

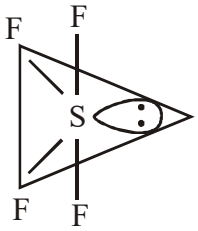
6. The electron pair geometry of SF_6 is octahedral then what will be the electron pair geometry of SF_4 :

(1) square planar (2) pyramidal

(3) trigonal bipyramidal (4) trigonal planar

Ans. (3)

Sol. $SF_4 \Rightarrow$ hybridisation is sp^3d and structure or electron pair geometry [including the lone pairs] is trigonal bipyramidal



7. Structure of XeF_5^- and XeO_3F_2 respectively are :

(1) Pentagonal planar, trigonal bipyramidal

(2) Octahdral and Square pyramidal

(3) Trigonal bipyramidal, pentagonal planar

(4) Trigonal bipyramidal, trigonal bipyramidal

Ans. (1)

Sol. (i) XeF_5^- St. No. = (5 + 2) = 7

So hybridisation is = sp^3d^3

and structure is pentagonal planar.

(ii) XeO_3F_2 St. No. = 5

So hybridisation is = sp^3d

and structure is trigonal bipyramidal.

8. $\text{Sucrose} \xrightarrow{\text{Hydrolysis}} \text{A} + \text{B} \xrightarrow[\text{Reagent}]{\text{Seliwanoff}}$

Which colour is obtained after above reaction ?

(1) Red (2) Violet (3) Blue (4) Black

Ans. (1)

Sol. Seliwanoff reagent $\rightarrow$ [Resorchinol + Conc. HCl]

When a solution of ketohexose is heated with Seliwanoff's reagent, a red colour is developed. The test is given by ketohexoses and sucrose only but not by any aldose, lactose and maltose.

9. For the reaction

$2A + B \longrightarrow C$

Following experimental data are collected.

Exp. No.	A $\left[\frac{\text{Mole}}{\text{lit}}\right]$	B $\left[\frac{\text{Mole}}{\text{lit}}\right]$	Rate [mole/Lit sec]
1	0.1	0.1	6×10^{-3}
2	0.2	0.1	1.2×10^{-2}
3	0.1	0.2	2.4×10^{-2}
4	X	0.2	7.2×10^{-2}
5	0.3	Y	2.88×10^{-1}

Find X and Y

(1) 0.2, 0.3 (2) 0.3, 0.4 (3) 0.4, 0.3 (4) 0.3, 0.2

Ans. (2)

Sol. Rate = $k[A]^a [B]^b$

from Exp (1) & (2)

with respect to A order is 1

so a = 1

from Exp (1) & (3)

with respect to B order is 2

so b = 2

$r = k[A]^1 [B]^2$

in exp. 1

$6 \times 10^{-3} = k[0.1]^1 [0.1]^2$ .....(i)

in exp. 3

$7.2 \times 10^{-2} = k[X] [0.2]^2$ .....(ii)

divide (i) / (ii)

$$\frac{1}{12} = \frac{0.1}{X\times4}$$

X = 0.3

from exp. 3

$2.4 \times 10^{-2} = k[0.1] [0.2]^2$

from exp. 5

$2.88 \times 10^{-1} = k[0.3]\,[Y]^2$

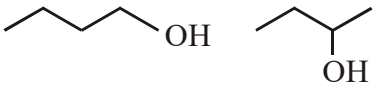
$$\frac{1}{12} = \frac{1}{3}\,\frac{4\times10^{-2}}{Y^2}$$

$Y = 0.4$

10. Two acyclic compounds A & B having same molecular formula C_3H_6O react with CH_3MgBr and give C and D respectively. Use following information for C and D.

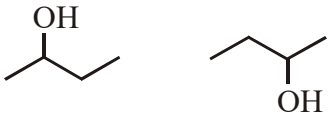
	C	**D**
Iodoform Test	–ve	+ve
Lucas Test	Instant	after 5-minutes.
	+ve Test	

Identify structure of C and D are respectively.

(1) 

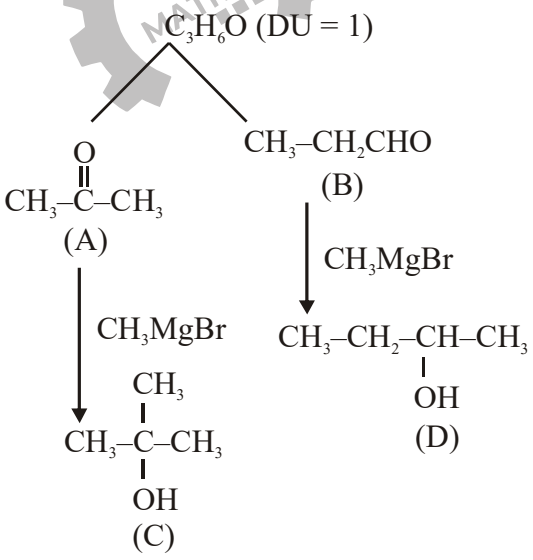
(2) 

(3) 

(4) 

Ans. (2)

Sol.



	3° alcohol	2° alcohol
Iodoform Test	–ve	+ve
Lucas Test	Immediate	after 5-10 minutes.
	[C]	[D]

11. Choose the correct statement when a gas is adsorbed on a metal surface.

(1) ΔH becomes less negative with progress of reaction.

(2) With progress of reaction the strength of residual forces increases.

(3) Extent of adsorption is less for NH_3 than N_2

(4) Equilibrium concentration of adsorbate increases with increase in temperature.

Ans. (1)

Sol. (1) When gas is adsorbed on metal surface.

ΔH become less negative with progress of reaction.

(3) Gas with greater value of critical temperature (T_c) adsorbed more. As $T_c(NH_3) > T_c(N_2)$

So NH_3 adsorbed more than N_2.

12. Which of the following can't show isomerism ?

(1) $[Ni(NH_3)_2Cl_2]$ (2) $[Ni(en)_3]^{+2}$

(3) $[Pt(NH_3)_2Cl_2]$ (4) $[Ni(NH_3)_4(Cl)_2]$

Ans. (1)

Sol.

(1) $[Ni(HN_3)_2Cl_2]$ is tetrahedral, do not show isomerism.

(2) $[Ni(en)_3]^{+2}$ is octahedral, show optical isomerism.

(3) $[Pt(NH_3)_2Cl_2]$ is square planar, show geometrical isomerism.

(4) $[Ni(NH_3)_4(Cl)_2]$ is octahedral, show geometrical isomerism.

13. If you spill a chemical toilet cleaning liquid on your hand, your first aid would be :

(1) aqueous NH_3 (2) $NaHCO_3$

(2) aqueous NaOH (4) Vinegar

Ans. (2)

Sol. Chemical toilet cleaning liquid contains acid and hence the first aid would be a weak base like $NaHCO_3$.

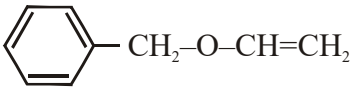
14. If a mango shrinks when kept in concentrate salt solution, then which of the following process take place ?

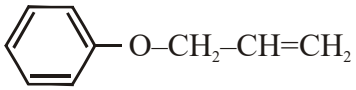
(1) diffusion (2) dialysis (3) osmosis (4) reverse osmosis

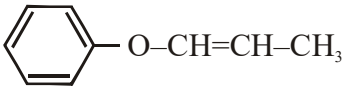
Ans. (3)

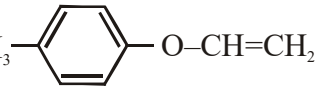
Sol. When mango kept in concentrate salt solution then solvent (water) flow from mango to concentrate solution that's why mango shrinks this is called. "Osmosis"

15. A compound 'A' having molecular formula $C_9H_{10}O$ reacts with HI and produces two compounds B and C. B gives yellow ppt with $AgNO_3$ and C shows positive iodoform test after tautomerisation. Identify the structure of A.

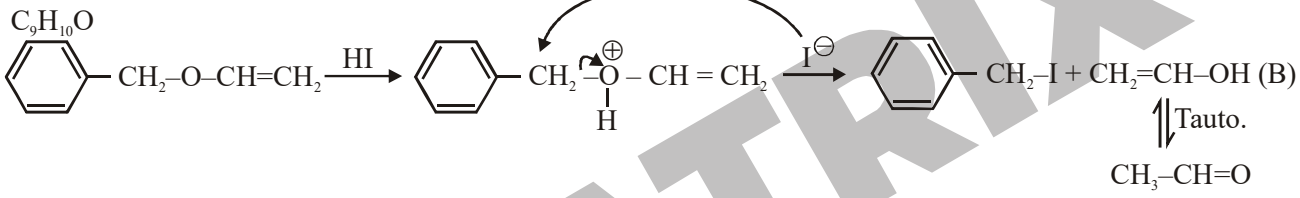
(1) 

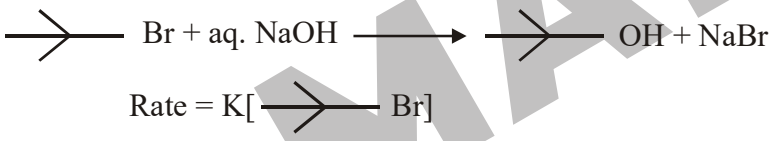
(2) 

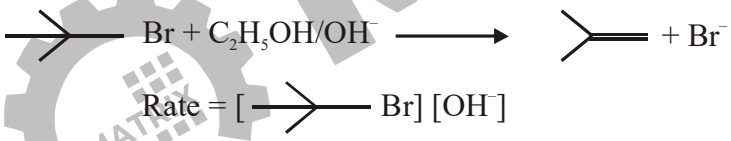
(3) 

(4) 

Ans. (1)

Sol. 

16. (I) 

(II) 

Correct statement regarding these two reaction I and II is.

(1) Rate of I reaction remain unchanged if concentration of OH^- is increased.

(2) Rate of II reaction remain unchanged if concentration of OH^- is increased.

(3) Rate of both reactions become double if concentration of OH^- becomes double.

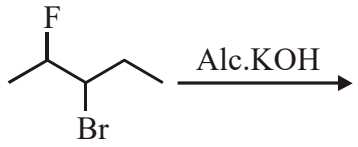
(4) Rate of both reactions donot depend upon concentration of OH^-.

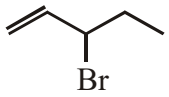
Ans. (1)

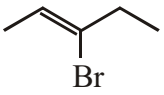
Sol. First reaction is S_N1 in which rate depends on conc. of alkyl halide and does not depend on conc. of nucleophile.

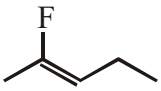
Second reaction is E2 reaction in which rate depends on conc. of base as well as conc. of alkyl halide.

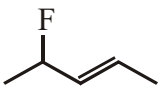
17.



(1) 

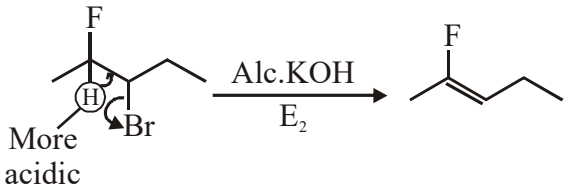
(2) 

(3) 

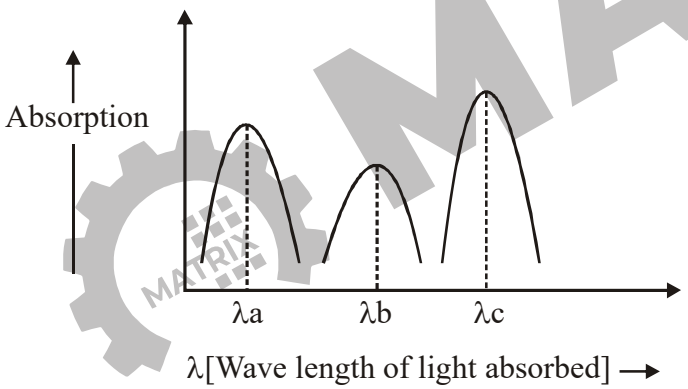
(4) 

Ans. (3)

Sol. More acidic H is below F and more stable alkene is formed.



18. Simplified absorption spectrum of three complexes (i), (ii), (iii) of M^{n+} ion are provided below. Their λ_{max} values are marked as A, B and C respectively. The correct match between the complexes and their λ_{max} values is :



Sample	**Compound**
(i)	$[M(NH_3)_6]^{n+}$
(ii)	$[MF_6]^{-6+n}$
(iii)	$[M(NCS)_6]^{-6+n}$

Which of the following is correct match ?

(1) (i) –λa; (ii) – λb; (iii) – λc (2) (i) –λb; (ii) – λc; (iii) – λa

(3) (i) –λa; (ii) – λc; (iii) – λb (4) None of these

Ans. (3)

Sol. Stronger the ligand greater is splitting of d orbitals and smaller will be wave length of light absorbed.

the splitting power of ligands is $NH_3 > NC\overline{S} > F^-$

So order of wave length of light absorbed is $\lambda_{NH_3} < \lambda_{NC\overline{S}} < \lambda_F$

19. Cast iron is used for the production of :

(1) wrought iron, steel (2) wrought iron, pig iron, steel

(3) pig iron, wrought iron (4) pig iron, steel

Ans. (1)

Sol. Blast furnace $\xrightarrow{\text{C–Reduction}}$ PIG Iron $\xrightarrow{\text{Cooling}}$ CAST Iron $\xrightarrow{\text{oxidation}}$ WROUGHT Iron $\xrightarrow[\text{Fe + Mn + C}]{\text{Alloy of}}$ STEEL

20. Match the following, proportionality with distance according to their interaction energy.

Species Interaction	**Interaction Energy Proportionality**
(i) ion - ion	(a) $\propto \frac{1}{r}$
(ii) Dipole-dipole	(b) $\propto \frac{1}{r^2}$
(iii) London dispersion	(c) $\propto \frac{1}{r^3}$
	(d) $\propto \frac{1}{r^6}$

Which of the following is correct match ?

(1) i - a, ii - c, iii - d (2) i - a, ii - b, iii - c (3) i - b, ii - c, iii - d (4) i - c, ii - b, iii - a

Ans. (1)

Sol. (i) ion-ion interaction energy is inversely proportional to the distance between ions $\left(\frac{1}{r}\right)$.

(ii) dipole-dipole interaction energy is inversely proportional to the third power of r $\left(\frac{1}{r^3}\right)$

(iii) The interaction energy of London force is inversely proportional to sixth power of distance between two interaction particles $\left(\frac{1}{r^6}\right)$

21. Let the oxidation state of the transition element of compound $K_2Cr_2O_7$, $KMnO_4$ and K_2FeO_4 be X, Y and Z respectively, calculate X + Y + Z.

Ans. 19.00

Sol.

	Compound	Oxidation state of transition element.
(i)	$K_2Cr_2O_7$	X = + 6
(ii)	$KMnO_4$	Y = + 7
(iii)	K_2FeO_4	Z = +6

so (X + Y + Z) = 19

22. In a saturated acyclic compound the mass ratio of C : H is 4 : 1 and C : O is 3 : 4. Find moles of O_2 required to react with 2 moles compound to give CO_2 and water.

Ans. 05.00

Sol. Mass ratio of C : H is 4 : 1 $\Rightarrow$ 12 : 3

& C : O is 3 : 4 $\Rightarrow$ 12 : 16

	mass	mole	mole ratio
so C	12	1	1
H	3	3	3
O	16	1	1

Empirical formula $\Rightarrow CH_3O$

as compound is saturated acyclic

D.U = 0

so molecular formula is $C_2H_6O_2$.

$$C_2H_6O_2 + \frac{5}{2}O_2(g) \longrightarrow 2CO_2(g) + 3H_2O(g)$$

mole 2 mole 5 mole

so required moles of O_2 is $\Rightarrow$ 5

23. Heat of combustion of ethanol to give CO_2 and water at constant pressure and 27ºC is –327 kcal. How much

heat is evolved in (cal) in combustion at constant volume at 27° C ?

Ans. (326400)

Sol. $C_2H_5OH(l) + 3O_2(g) \rightarrow 2O_2(g) + 3H_2O(l)$.

$\Delta H_{Combustion} = -327$ Kcal

$\Delta H = \Delta U + \Delta n_g RT$

$\Delta H = -327 \times 10^3$ $\Delta n_g = -1$

$-327 \times 10^3 = \Delta U - 1 \times 2 \times 300$

$\Delta U = -326400$ cal

So heat evolved as constant volume is 326400 cal.

24. For cell reaction

$2Cu^+ \rightarrow Cu + Cu^{2+}$

Find $l$nk = ...

Where k is equilibrium constant.

Given (i) $Cu^+ + e^- \rightarrow Cu$ $E^o = 0.52$ V

(ii) $Cu^{+2} + e^- \rightarrow Cu^{+1}$ $E^o = 0.16$ V

$\left(\frac{RT}{F} = 0.025\right)$

Ans. 14.4

Sol. $E^\circ_{cell} = E^\circ_{Cu^+/Cu} - E^\circ_{Cu^{2+}/Cu^{+1}}$

$= 0.52 - 0.16$

$= 0.36$ V

$\Delta G^o = -n F E^o_{cell} = - RT\, l\text{n}\, K_{eq}$

$$l\,\text{n}\,K_{eq} = \frac{nF}{RT}E^\circ_{cell} \qquad (n = 1)$$

$$l\text{n}\,K_{eq} = \frac{0.36}{.025}$$

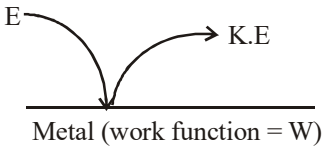
$= 14.4$

25. A metal having work function = 4.41×10^{-19} J is subjected to a light having wavelength 300 nm, then maximum kinetic energy of the emitted photoelectron is .....$\times 10^{-21}$ J.

(Given h = 6.63×10^{-34} JS and C = 3×10^{8} m/sec).

Ans. 222.00

Sol.



$E = W + (K.E)_{max}$

$$\frac{hC}{\lambda} = 4.41\times10^{-19} + (K.E)_{max}$$

$$\frac{6.63\times10^{-34}\times3\times10^{8}}{300\times10^{-9}} = 4.41\times10^{-19} + (K.E)_{max}$$

So, $(K.E)_{max} = 6.63 \times 10^{-19} - 4.41 \times 10^{-19}$

$= 2.22 \times 10^{-19}$

$= 222 \times 10^{-21}$ J