AIPMT – 2014 TEST PAPER WITH SOLUTIONS
(HELD ON SUNDAY 04th MAY, 2014)

46. What is the maximum number of orbitals that can be identified with the following quantum numbers?
$n = 3, \ell = 1, m_\ell = 0$
(1) 1 (2) 2 (3) 3 (4) 4

Ans. **(1)**

Sol. $n = 3, \ell = 1, m = 0$
Orbital is $3p_z$.

47. Calculate the energy in joule corresponding to light of wavelength 45 nm :
(Planck's constant $h = 6.63 \times 10^{-34}$ Js; speed of light $c = 3 \times 10^8$ ms^{-1})
(1) 6.67×10^{15} (2) 6.67×10^{11}
(3) 4.42×10^{-15} (4) 4.42×10^{-18}

Ans. **(4)**

Sol. $E = \frac{hc}{\lambda} = \frac{6.63\times10^{-34}\times3\times10^{8}}{45\times10^{-9}}$

$E = 4.42 \times 10^{-18}$ J

48. Equal masses of H_2,O_2 and methane have been taken in a container of volume V at temeprature 27°C in identical conditions. The ratio of the volumes of gases H_2 : O_2 : methane would be :
(1) 8 : 16 : 1 (2) 16 : 8 : 1
(3) 16 : 1 : 2 (4) 8 : 1 : 2

Ans. **(3)**

Sol. According to Avogadro's hypothesis volume ∝ moles

$$n_{H_2} = \frac{w}{2}$$

$$n_{O_2} = \frac{w}{32}$$

$$n_{CH_4} = \frac{w}{16}$$

So, ratio is $\frac{w}{2} : \frac{w}{32} : \frac{w}{16}$

= 16 : 1 : 2

49. If a is the length of the side of a cube, the distance between the body centered atom and one corner atom in the cube will be :
(1) $\frac{2}{\sqrt{3}}a$ (2) $\frac{4}{\sqrt{3}}a$
(3) $\frac{\sqrt{3}}{4}a$ (4) $\frac{\sqrt{3}}{2}a$

Ans. **(4)**

Sol. The distance between the body centred atom and one corner atom is $\frac{\sqrt{3}a}{2}$

50. Which property of colloids is **not** dependent on the charge on colloidal particles ?
(1) Coagulation (2) Electrophoresis
(3) Electro - osmosis (4) Tynadall effect

Ans. **(4)**

Sol. Tyndall effect is optical property.

51. Which of the following salts will give highest pH in water ?
(1) KCl (2) NaCl (3) Na_2CO_3 (4) $CuSO_4$

Ans. **(3)**

Sol. Na_2CO_3 will give highest pH in water because it is salt of strong base and weak acid

52. Of the following 0.10m aqueous solutions, which one will exhibit the largest freezing point depression?
(1) KCl (2) $C_6H_{12}O_6$
(3) $Al_2(SO_4)_3$ (4) K_2SO_4

Ans. **(3)**

Sol. Depression in freezing point ∝ vant Hoff's factor
(i) for $Al_2(SO_4)_3 \rightarrow$ i = 5

53. When 22.4 litres of H_2(g) is mixed with 11.2 litres of Cl_2(g), each at S.T.P., the moles of HCl (g) formed is equal to :-
(1) 1 mol of HCl (g)
(2) 2 mol of HCl (g)
(3) 0.5 mol of HCl (g)
(4) 1.5 mol of HCl (g)

Ans. **(1)**

Sol. $n_{H_2} = \frac{V(L)}{22.4L} = \frac{22.4}{22.4} = 1$

$n_{Cl_2} = \frac{11.2}{22.4} = 0.5$ mole

	$H_{2(g)}$	+ $Cl_{2(g)}$	$\rightarrow$ $2HCl_{(g)}$
initially -	1mole	0.5 mole	0
after reaction	(1-0.5)		0.5×2
	=0.5 mole	0	= 1 mole

54. When 0.1 mol MnO_4^{2-} is oxidised the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is :-

(1) 96500 C (2) 2×96500 C

(3) 9650 C (4) 96.50 C

Ans. (3)

Sol. $\overset{+6}{Mn}O_4^{-2} \rightarrow \overset{+7}{Mn}O_4^- + e^-$

0.1 mole 0.1 mole

charge required = 0.1 F = 0.1×96500

= 9650 C

55. Using the Gibbs energy change, $\Delta G^\circ = +63.3$kJ, for the following raction,

$Ag_2CO_3 \rightleftharpoons 2Ag+ (aq) + CO_3^{2-} (aq)$

the K_{sp} of Ag_2CO_3(s) in water at 25°C is :-

(R = 8.314 J K^{-1} mol^{-1})

(1) 3.2×10^{-26} (2) 8.0×10^{-12}

(3) 2.9×10^{-3} (4) 7.9×10^{-2}

Ans. (2)

Sol. $\Delta G^\circ = -2.303\ RT \log K_{sp}$

$63.3 \times 1000 = -2.303 \times 8.314 \times 298 \log Ksp$

$\log Ksp = -11.09$

$Ksp = 10^{-11.09} = 8 \times 10^{-12}$

56. The weight of silver (at wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of O_2 at STP will be :-

(1) 5.4 g (2) 10.8 g (3) 54.9 g (4) 108.0 g

Ans. (4)

Sol. According to faraday's 2nd law

$$\frac{w_{Ag}}{E_{Ag}} = \frac{w_{O_2}}{E_{O_2}}$$

$$\frac{w_{Ag}}{108} = \frac{\left(\frac{5600}{22400}\right) \times 32}{8}$$

$\therefore\ w_{Ag} = 108g$

57. Which of the following statements is correct for the spontaneous adsorption of a gas ?

(1) ΔS is negative and, therefore, ΔH should be highly positive

(2) ΔS is negative and therefore, ΔH should be highly negative

(3) ΔS is positive and, therefore, ΔH should be negative

(4) ΔS is positive and, therefore, ΔH should also be highly positive

Ans. (2)

Sol. During adsorption entropy decreases, so $\Delta S < 0$.

$\Delta G = \Delta H - T\Delta S$

For spontaneous adsorption $\Delta G < 0$ so ΔH should be highly negative.

58. For the reaction :

$X_2O_4(\ell) \longrightarrow 2XO_2(g)$

$\Delta U = 2.1$ k cal, $\Delta S = 20$ cal K^{-1} at 300 K

Hence ΔG is :-

(1) 2.7 k cal

(2) – 2.7 k cal

(3) 9.3 k cal

(4) – 9.3 k cal

Ans. (4)

Sol. According to Le-Chatelier's Principle

→ In exothermic reactions low temperature favours the forward reaction

→ On increasing pressure equilibrium shifts towards less number of moles.

59. For a given exothermic reaction, K_p and K'_P are the equilibrium constants at temperatures T_1 and T_2, respectively. Assuming that heat of reaction is constant in temperature range between T_1 and T_2, it is readily observed that :-

(1) $K_p > K'_P$ (2) $K_p < K'_P$

(3) $K_p = K'_P$ (4) $K_p = \frac{1}{K'_P}$

Ans. (2)

Sol. $X_2O_4\ (\ell) \rightarrow 2\ XO_2(g)$; $\Delta n_g = 2 - 0 = 2$

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

$$= 2.1 + 2 \times \frac{2}{1000} \times 300$$

$\Delta H = 3.3$ kcal

$\Delta G = \Delta H - T.\Delta S$

$$= 3.3 - 300 \times \frac{20}{1000};\ \Delta G = -2.7\ Kcal$$

60. Which of the following orders of ionic radii is correctly represented ?

(1) $H^- > H^+ > H$ (2) $Na^+ > F^- > O^{2-}$

(3) $F^- > O^{2-} > Na^+$ (4) $Al^{3+} > Mg^{2+} > N^{3-}$

Ans. (1)

Sol. In exothermic reactions on increasing temperature value of K_p decreases.

So, $K_p > K_p'$

61. 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much ?
(At. wt. Mg = 24 ; O = 16)
(1) Mg, 0.16 g (2) O_2, 0.16 g
(3) Mg, 0.44 g (4) O_2, 0.28 g

Ans. (B)

62. The pair of compounds that can exist together is:-
(1) Mg, 0.16 g (2) O_2, 0.16 g
(3) Mg, 0.44 g (4) O_2, 0.28 g

Ans. (1)

Sol. $n_{Mg} = \frac{1}{24}$ mole, $n_{O_2} = \frac{0.56}{32}$ moles

$$Mg(s) + \frac{1}{2}O_2(g) \rightarrow MgO(s)$$

Initially	$\frac{1}{24}$ mole	$\frac{0.56}{32}$ mole	
	0.0416 mole	0.0175 mole	0
after reaction	$(0.0416 - 2 \times 0.0175)$ 0.0066 mole	0	2×0.0175 mole

$\therefore$ mass of Mg = $0.0066 \times 24g = 0.16$ g

63. The pair of compounds that can exist together is:-
(1) $FeCl_3$, $SnCl_2$ (2) $HgCl_2$, $SnCl_2$
(3) $FeCl_2$, $SnCl_2$ (4) $FeCl_3$, KI

Ans. (3)

Sol. Both are reducing agent

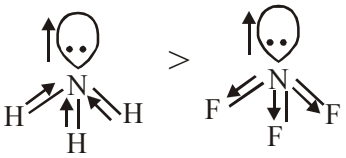
64. Be^{2+} is isoelectronic with which of the following ions ?
(1) H^+ (2) Li^+
(3) Na^+ (4) Mg^{2+}

Ans. (2)

Sol. Li^+, Be^{+2} & Li^+ both have 2 electron.

65. Which of the following molecules has the maximum dipolement ?
(1) CO_2 (2) CH_4
(3) NH_3 (4) NF_3

Ans. (3)

Sol.  >

μ = 1.4 D 0.23 D

66. Which one of the following species has plane triangular shape ?
(1) N_3^- (2) NO_3^-
(3) NO_2^- (4) CO_2

Ans. (2)

Sol. NO_3^- has sp^2 hybridisation i.e. why has planar shape.

67. Acidity of diprotic acids in aqueous solutions increases in the order :-
(1) $H_2S < H_2Se < H_2Te$
(2) $H_2Se < H_2S < H_2Te$
(3) $H_2Te < H_2S < H_2Se$
(4) $H_2Se < H_2Te < H_2S$

Ans. (1)

Sol. On moving down the group bond length increases so liberation tendency of H will be more.

68. (a) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$
(b) $H_2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$
Role of hydrogen peroxide in the above reactions is respectively -
(1) Oxidizing in (a) and reducing in (b)
(2) Reducing in (a) and oxidizing in (b)
(3) Reducing in (a) and (b)
(4) Oxidizing in (a) and (b)

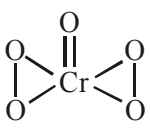
Ans. (3)

69. Artificial sweetner which is stable under cold conditions only is :-
(1) Saccharine (2) Sucralose
(3) Aspartame (4) Alitame

Ans. (3)

70. In acidic medium, H_2O_2 changes $Cr_2O_7^{-2}$ to CrO_5 which has two (–O–O) bonds. Oxidation state of Cr in CrO_5 is :-
(1) + 5 (2) + 3
(3) + 6 (4) – 10

Ans. (3)

Sol.  CrO_5 has 2 peroxy linkage.

71. The reaction of aqueous $KMnO_4$ with H_2O_2 in acidic conditions gives :-
(1) Mn^{4+} and O_2 (2) Mn^{2+} and O_2
(3) Mn^{2+} and O_3 (4) Mn^{4+} and MnO_2

Ans. (2)

Sol. $KMnO_4$ is a strong oxidising agent & wll oxidise H_2O_2 to O_2.

72. Among the following complexes the one which shows Zero crystal field stabilization energy (CFSE):-
(1) $[Mn(H_2O)_6]^{3+}$ (2) $[Fe(H_2O)_6]^{3+}$
(3) $[Co(H_2O)_6]^{2+}$ (4) $[Co(H_2O)_6]^{3+}$

Ans. (2)

Sol. Due to d^5 configuration and H_2O is a weak ligand.

73. Magnetic moment 2.83 BM is given by which of the following ions ?
(At. nos. Ti = 22, Cr = 24, Mn = 25, Ni = 28):-
(1) Ti^{3+} (2) Ni^{2+} (3) Cr^{3+} (4) Mn^{2+}

Ans. (2)

Sol. Ni^{+2} has two unpaired electron.

74. Which of the following complexes is :-
(1) mer-$[Co(NH_3)_3Cl_3]$ (2) cis-$[PtCl_2(NH_3)_2]$
(3) cis-$K_2[PtCl_2Br_2]$ (4) Na_2CoCl_4

Ans. (2)

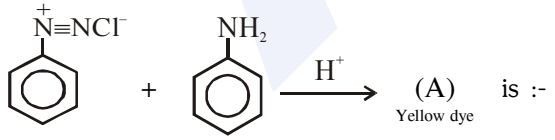
Sol. Cis-platin is used as an anticancer unit.

75. Reason of lanthanoid contraction is :-
(1) Negligible screening effect of 'f' orbitals
(2) Increasing nuclear charge
(3) Decreasing nuclear charge
(4) Decreasing screening effect

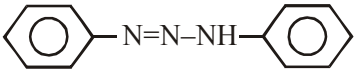
Ans. (1)

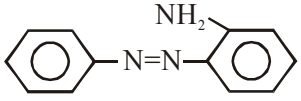
Sol. Due to poor shielding of f-orbitals nucleus will exert a strong attraction. Cauces lanthanoid contraction.

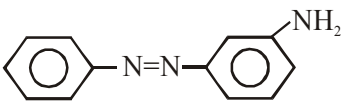
76. In the following reaction, the product (A)

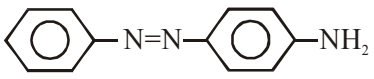


is :-

(1) 

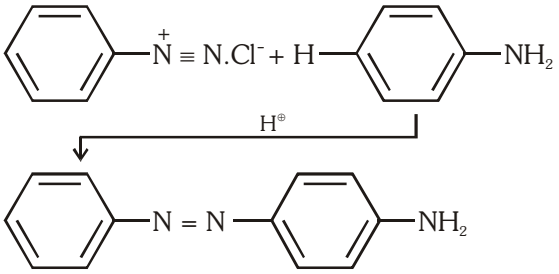
(2) 

(3) 

(4) 

Ans. (4)

Sol. This is an example of electrophilic substrittituion reaction [coupling reaction]



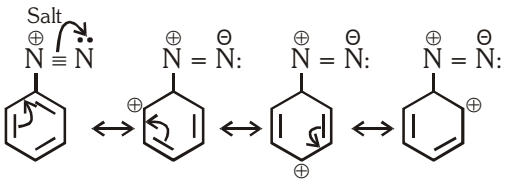
p-Aninoazobenzene
(yellow dye)
$+Cl^{\ominus} + H_2O$

77. Which of the following will be most stable diazonium salt $RN_2^+X^-$?

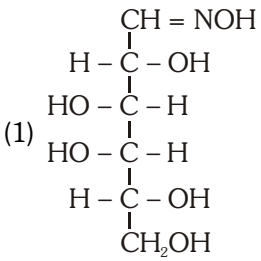
(1) $CH_3N_2^+X^-$ (2) $C_6H_5N_2^+X^-$
(3) $CH_3CH_2N_2^+X^-$ (4) $C_6H_5CH_2N_2^+X^-$

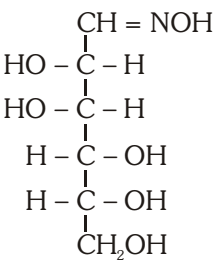
Ans. (2)

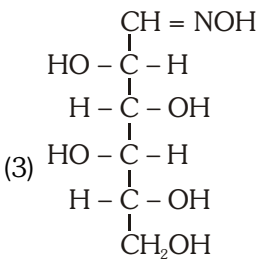
Sol. Primary aliphatic amines form highly unstable alkyldiazonium salts. Primary aromatic amines form arene diazonium salts which are stable for a short time in solution at low temperature (273 – 278 K). The stability of arenediazonium can be explained on the basis of resonance.

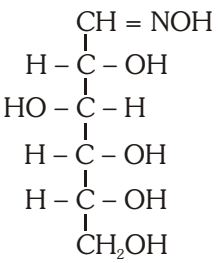


78. D (+) glucose reacts with hydroxylamine and yields an oxime. The structure of the oxime would be :

(1) 

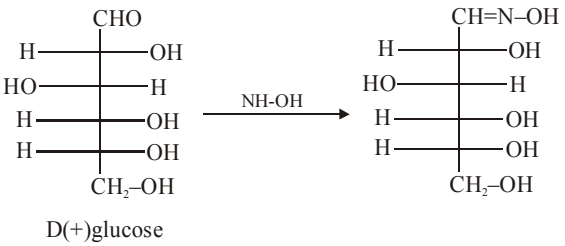
(2) 

(3) 

(4) 

Ans. (4)

Sol. Glucose reacts with hydroxyl amine to form an oxime.



D(+)glucose

79. Which of the following hormones is produced under the condition of stress which stimulates glycogenolysis in the liver of human beings?

(1) Thyroxin

(2) Insulin

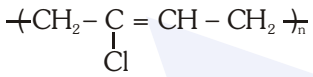
(3) Adrenaline

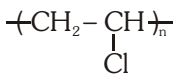
(4) Estradiol

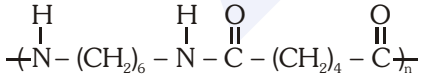
Ans. (3)

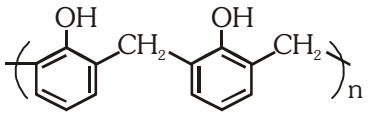
Sol. Adrenaline commonly known as fight or flight hormone, it is produced by the adrenal glands after receving a message from the brain that a stressful situation has presented itself.

80. Which one of the following is an example of a thermosetting polymer?

(1) 

(2) 

(3) 

(4) 

Ans. (4)

Sol. Thermosetting polymers are cross linked or heavily branched molecules, which on heating undergo extensive cross linking in moulds and again become in fusible. Most common examples are bakelite.

81. Which of the following organic compounds polymerizes to form the polyester Dacron?

(1) Propylene and para HO – (C_6H_4) – OH

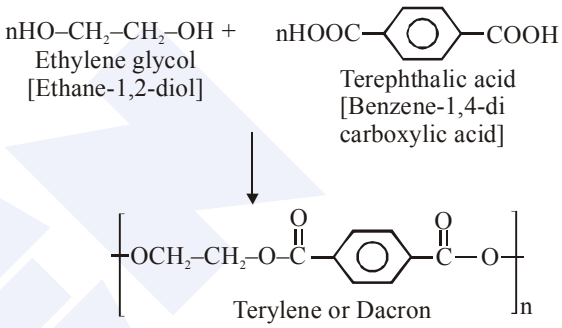
(2) Benzoic acid an ethanol

(3) Terephthalic acid and ethylene glycol

(4) Benzoic acid and para HO – (C_6H_4) – OH

Ans. (3)

Sol. Dacron or terylene is the best known example of polyesters. It is manufactured by heating a mixture of ethylene glycol and terephthalic acid at 420 to 460 K in the presence of zinc acetate-antimaony trioxide catalyst.



82. Which of the following is not a common component of Photochemical Smog?

(1) Ozone (2) Acrolein

(3) Peroxyacetyl nitrate (4) Chlorofluorocarbons

Ans. (4)

Sol. The common components of photochemical smog are ozone, nitric oxide, ocrolein, for malde nyde and peroxyacehyl nitrate (PAN).

Hence (FC is not common component of photochemical smog.

83. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1 M H_2SO_4. The percentage of nitrogen in the soil is :

(1) 37.33 (2) 45.33

(3) 35.33 (4) 43.33

Ans. (1)

Sol. $\because$ M $\times$ V (ml) = m mol

10 m mol H_2SO_4 = 20 m mol of NH_3

$[H_2SO_4 + 2NH_3 \rightarrow (NH_4)_2SO_4]$

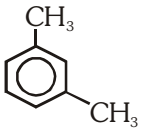
1 mol NH_3 contains 14 g nitrogen

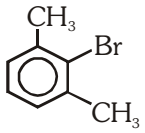
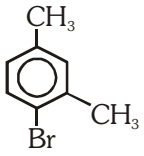
20×10^{-3} mol NH_3 contains $14 \times 20 \times 10^{-3}$ nitrogen

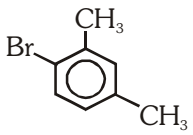
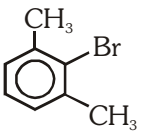
0.75 g of sample contains

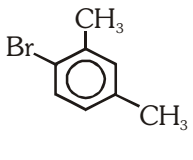
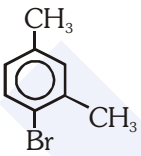
$$\% \text{ Nitrogen} = \frac{14 \times 20 \times 10^{-3}}{0.75} \times 100 = 37.33\%$$

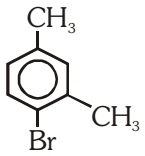
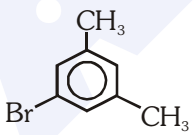
84. What products are formed when the following compounds is treated with Br_2 in the presence of $FeBr_3$?



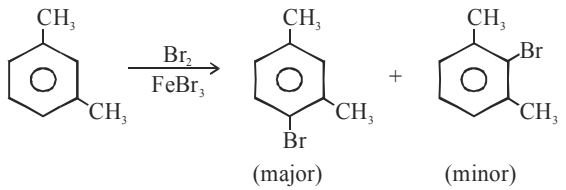
(1)  and 

(2)  and 

(3)  and 

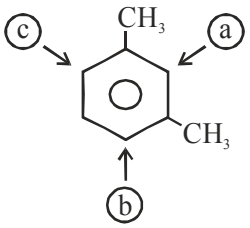
(4)  and 

Ans. (1,2)

Sol. 

(major) (minor)

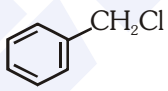
In the above compound 1,3-Dimethylbenzene, sites for the attacking electrophile are



attack of electrophile on sites (b) & (c) results in same compound as product.

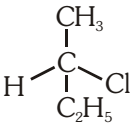
Although tendency of electrophile to attack on site (a) is very less due to high steric hinderance so respective product is favoured with very very less amount.

85. Which of the following compounds will undergo racemisation when solution of KOH hydrolyses?

(i) 

(ii) $CH_3CH_2CH_2Cl$

(iii) 

(iv) 

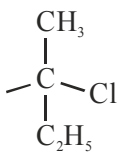
(1) (i) and (ii)

(2) (ii) and (iv)

(3) (iii) and (iv)

(4) (i) and (iv)

Ans. (B)

Sol. Only compound (iv)  results in formation of racemic product due to chirality.

86. Among the following sets of reactants which one produces anisole?

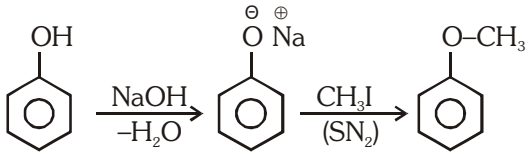
(1) CH_3CHO ; RMgX

(2) C_6H_5OH ; NaOH ; CH_3I

(3) C_6H_5OH ; neutral $FeCl_3$

(4) $C_6H_5 - CH_3$; CH_3COCl; $AlCl_3$

Ans. (2)

Sol. 

87. Which of the following will not be soluble in sodium hydrogen carbonate?

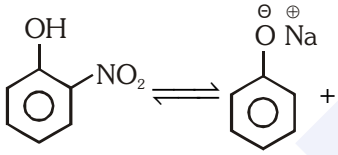
(1) 2, 4, 6-trinitrophenol

(2) Benzoic acid

(3) o-Nitrophenol

(4) Benzenesulphonic acid

Ans. (3)

Sol. 

+ H_2Co_3 carbonic acid

while 2.4.6-Trinitro phenot, benzoic acid and benzene sulphonic acid are sobuble in $NaHO_3$.

OR

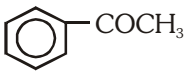
Acid + $NaHCO_3$ → salt + H_2Co_3

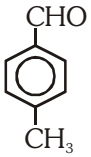
Reaction is possible in forward direction if acid is more acidic then H_2Co_3.

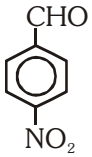
O-nitrophenol is less acidic than H_2Co_3, hence does not soluble in sodium hydrogen carbonate.

88. Which one is most reactive towards Nucleophilic addition reaction?

(1) 

(2) 

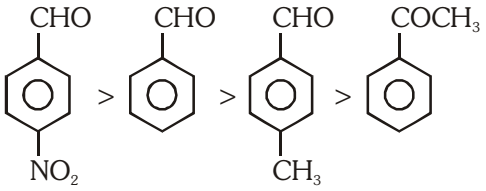
(3) 

(4) 

Ans. (4)

Sol. Reactivity of carbonyl compounds towards NAR depends on steric and electronic effects.

NAR reactivity :



–M of $–NO_2$

increase (+)ve charge on sp^2c of 

89. Identify Z in the sequence of reactions:

$CH_3CH_2CH = CH_1 \xrightarrow{HBr/H_2O_2} Y \xrightarrow{C_2H_5ONa} Z$

(1) $CH_3 - (CH_2)_3 - O - CH_2CH_3$

(2) $(CH_3)_2)CH_2 - O - CH_2CH_3$

(3) $CH_3(CH_2)_4 - O - CH_3$

(4) $CH_3CH_2 - CH(CH_3) - O - CH_2CH_3$

Ans. (1)

Sol. $CH_3–CH_2CH=CH_2 \xrightarrow[\text{(Peroxide effect)}]{HBr/H_2O_2}$

$CH_3–CH_2–CH_2–CH_2$ (y), Br

↓

$CH_3–(CH_2)_3–O–CH_2–CH_3$ (z)

90. Which of the following organic compounds has same hybridization as its combustion product (CO_2)?

(1) Ethane (2) Ethyne

(3) Ethene (4) Ethanol

Ans. (2)

Sol. $C_2H_2 + \frac{5}{2}O_2 \longrightarrow 2CO_2 + H_2O$

Both HC≡CH & CO_2 has same hybridisation of carbon atom. (sp).