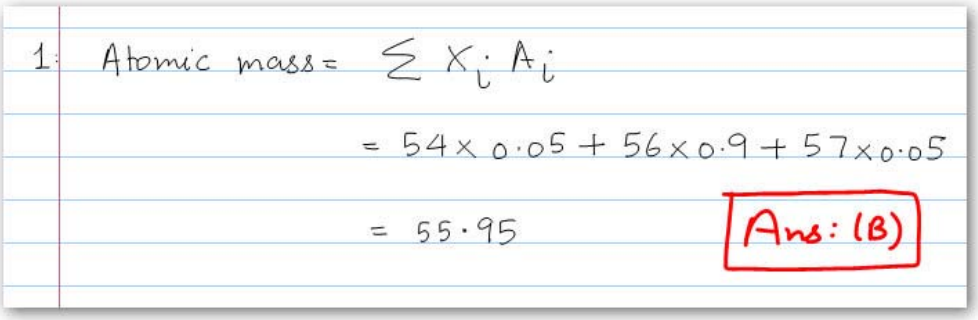
IITJEE 2009

Paper 1 Code (0)

Chemistry

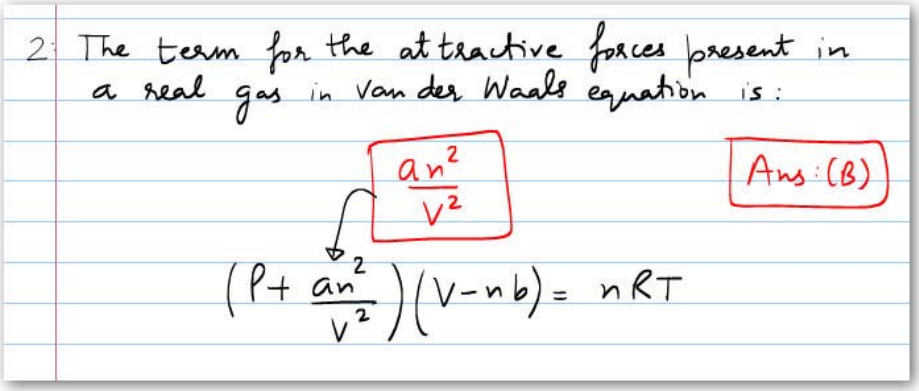
1. Given that the abundances of isotopes ^{54}Fe, ^{56}Fe and ^{57}Fe are 5%, 90% and 5%, respectively, the atomic mass of Fe is

(A) 55.85 (B) 55.95 (C) 55.75 (D) 56.05



2. The term that corrects for the attractive forces present in a real gas in the van der Waals equation is

(A) nb (B) $\frac{an^2}{V^2}$ (C) $-\frac{an^2}{V^2}$ (D) $-nb$



3. Among the electrolytes Na_2SO_4, $CaCl_2$, $Al_2(SO_4)_3$ and NH_4Cl, the most effective coagulating agent for Sb_2S_3 sol is

(A) Na_2SO_4 (B) $CaCl_2$ (C) $Al_2(SO_4)_3$ (D) NH_4Cl

3: Sb_2S_3 is a $-$ively Charged sol. To Coagulate it most effectively, charge on Cation should be maximum. Thus, Al^{3+} in $Al_2(SO_4)$ will be most effective.

Ans: (C)

$1.0 \times 10^{-}$ atm. The mole fraction of N_2 ... air dissolved in 10 moles of water at 298 K and 5 atm pressure is

(A) 4.0×10^{-4} (B) 4.0×10^{-5} (C) 5.0×10^{-4} (D) 4.0×10^{-6}

4: Henry's law: $p_{\text{Partial Pressure of } N_2} = p_H \cdot (x_{N_2})_{\text{in sol}^n}$

$5 \times 0.8 = 10^5 \times x_{N_2 \text{ in sol}^n}$

p_{Total} (x_{N_2}) in air

$\Rightarrow x_{N_2} = 4 \times 10^{-5} = \dfrac{n_{N_2}}{n_{N_2} + n_{O_2}} \simeq \dfrac{n_{N_2}}{n_{O_2}}$

$\Rightarrow n_{N_2} = 4 \times 10^{-4}$

Ans: (A)

5. The reaction of P_4 with **X** leads selectively to P_4O_6. The **X** is

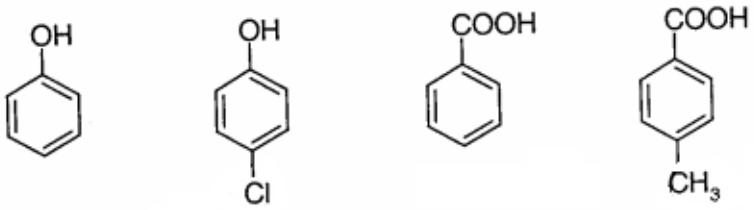
(A) Dry O_2 (B) A mixture of O_2 and N_2

(C) Moist O_2 (D) O_2 in the presence of aqueous NaOH

5: $P_4 + O_2 \longrightarrow P_4O_6$
(Limited O_2 from air)

Ans: (B)

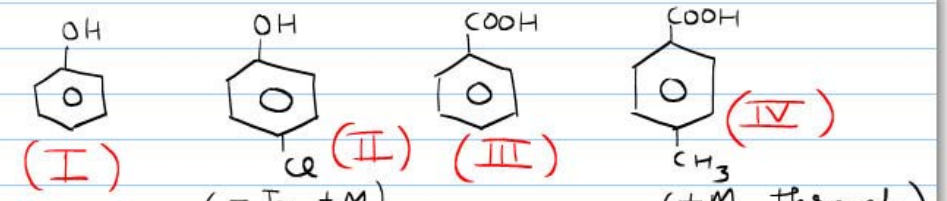
6. The correct acidity order of the following is



(I) (II) (III) (IV)

(A) (III) > (IV) > (II) > (I)
(B) (IV) > (III) > (I) > (II)
(C) (III) > (II) > (I) > (IV)
(D) (II) > (III) > (IV) > (I)

6:



(−I, +M) ≃ Weak deactivating

(+M through Hyperconjugation)

* −COOH is more acidic than phenols.

⇒ III > IV > II > I

Ans: (A)

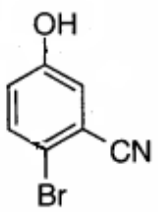
7. Among cellulose, poly(vinyl chloride), nylon and natural rubber, the polymer in which the intermolecular force of attraction is weakest is

(A) Nylon
(B) Poly(vinyl chloride)
(C) Cellulose
(D) Natural Rubber

7: Natural rubber is a polymer of isoprene.
Nylon, Cellulose & PVC contains functional groups.

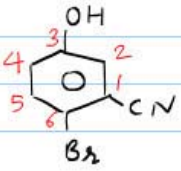
Ans: (D)

8. The IUPAC name of the following compound is



(A) 4-Bromo-3-cyanophenol
(B) 2-Bromo-5-hydroxybenzonitrile
(C) 2-Cyano-4-hydroxybromobenzene
(D) 6-Bromo-3-hydroxybenzonitrile

8:



Clearly, the IUPAC name is:

6-Bromo-3-hydroxybenzonitrile

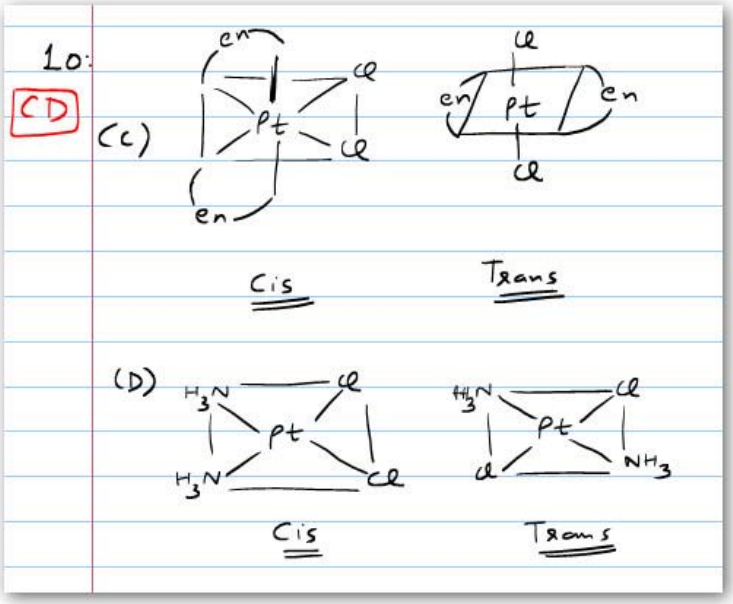
Ans: (D)

9. The correct statement(s) regarding defects in solids is(are)
(A) Frenkel defect is usually favoured by a very small difference in the sizes of cation and anion
(B) Frenkel defect is a dislocation defect
(C) Trapping of an electron in the lattice leads to the formation of F-center
(D) Schottky defects have no effect on the physical properties of solids

10. The compound(s) that exhibit(s) geometrical isomerism is(are)

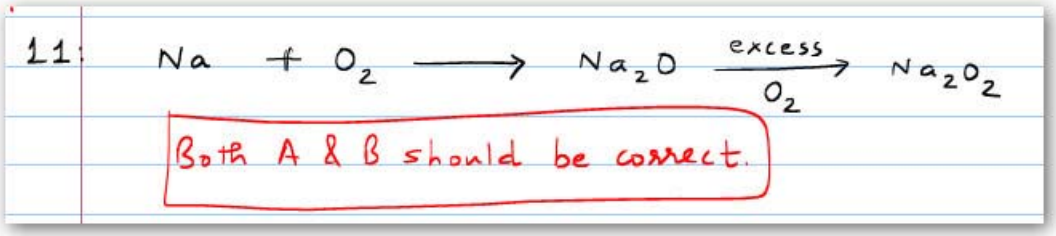
(A) $[Pt(en)Cl_2]$ (B) $[Pt(en)_2]Cl_2$

(C) $[Pt(en)_2Cl_2]Cl_2$ (D) $[Pt(NH_3)_2Cl_2]$



11. The compound(s) formed upon combustion of sodium metal in excess air is(are)

(A) Na_2O_2 (B) Na_2O (C) NaO_2 (D) NaOH



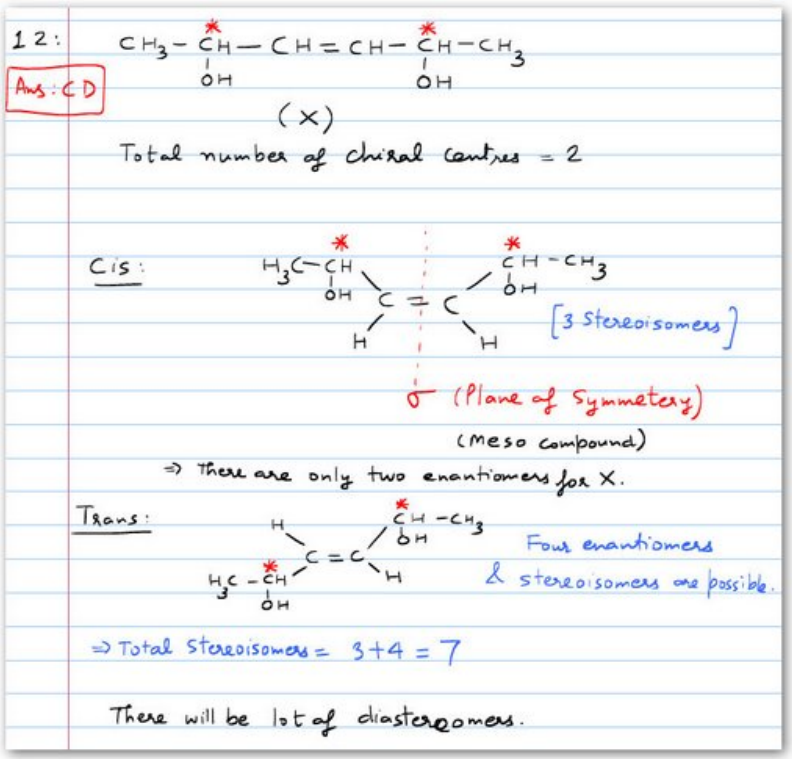
12. The correct statement(s) about the compound $H_3C(HO)HC-CH=CH-CH(OH)CH_3$ (**X**) is(are)

(A) The total number of stereoisomers possible for **X** is 6

(B) The total number of diastereomers possible for **X** is 3

(C) If the stereochemistry about the double bond in **X** is *trans*, the number of enantiomers possible for **X** is 4

(D) If the stereochemistry about the double bond in **X** is *cis*, the number of enantiomers possible for **X** is 2



Paragraph for Question Nos. 13 to 15

p-Amino-*N*,*N*-dimethylaniline is added to a strongly acidic solution of **X**. The resulting solution is treated with a few drops of aqueous solution of **Y** to yield blue coloration due to the formation of methylene blue. Treatment of the aqueous solution of **Y** with the reagent potassium hexacyanoferrate(II) leads to the formation of an intense blue precipitate. The precipitate dissolves on excess addition of the reagent. Similarly, treatment of the solution of **Y** with the solution of potassium hexacyanoferrate(III) leads to a brown coloration due to the formation of **Z**.

13. The compound **X** is

(A) $NaNO_3$ (B) NaCl (C) Na_2SO_4 (D) Na_2S

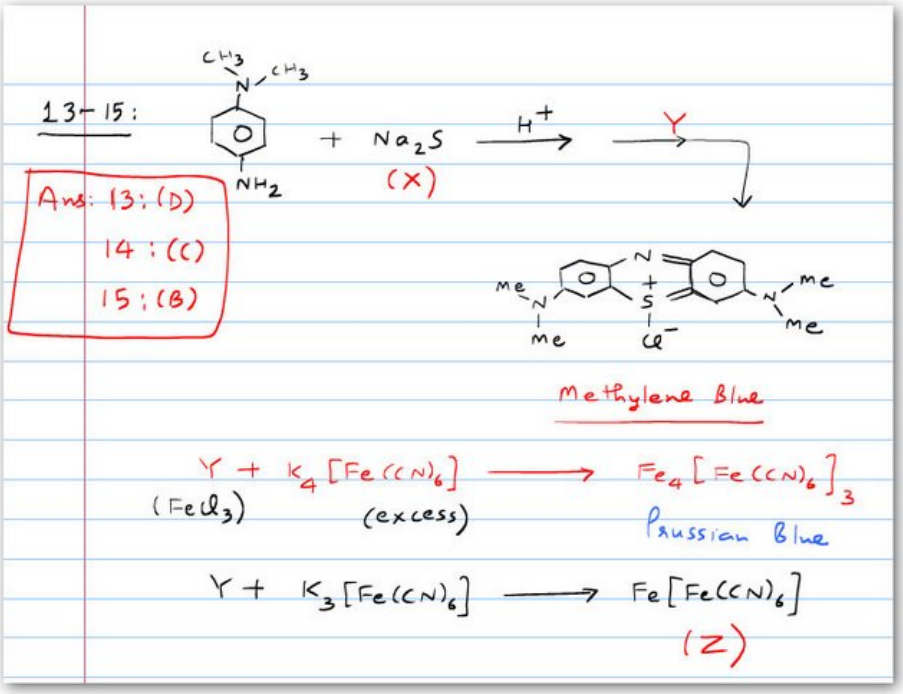
14. The compound **Y** is

(A) $MgCl_2$ (B) $FeCl_2$ (C) $FeCl_3$ (D) $ZnCl_2$

15. The compound **Z** is

(A) $Mg_2[Fe(CN)_6]$ (B) $Fe[Fe(CN)_6]$

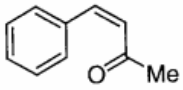
(C) $Fe_4[Fe(CN)_6]_3$ (D) $K_2Zn_3[Fe(CN)_6]_2$

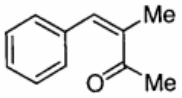


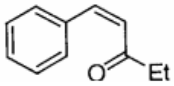
A carbonyl compound **P**, which gives positive iodoform test, undergoes reaction with MeMgBr followed by dehydration to give an olefin **Q**. Ozonolysis of **Q** leads to a dicarbonyl compound **R**, which undergoes intramolecular aldol reaction to give predominantly **S**.

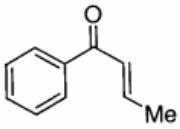
$$\mathbf{P} \xrightarrow[2.\ H^+, H_2O \\ 3.\ H_2SO_4, \Delta]{1.\ MeMgBr} \mathbf{Q} \xrightarrow[2.\ Zn, H_2O]{1.\ O_3} \mathbf{R} \xrightarrow[2.\ \Delta]{1.\ OH^-} \mathbf{S}$$

16. The structure of the carbonyl compound **P** is

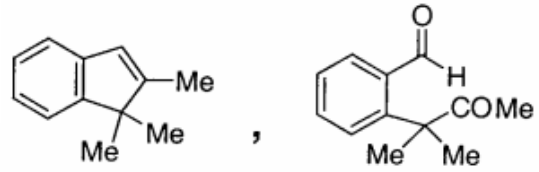
(A) 

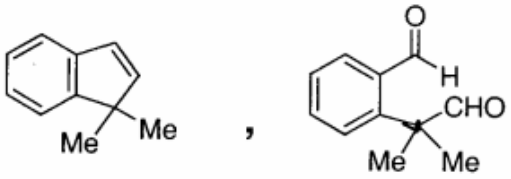
(B) 

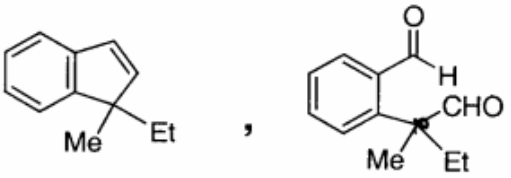
(C) 

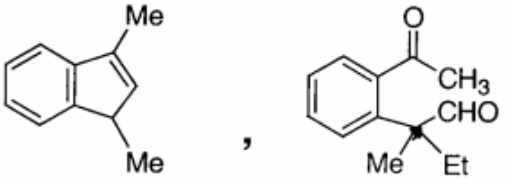
(D) 

17. The structures of the products **Q** and **R**, respectively, are

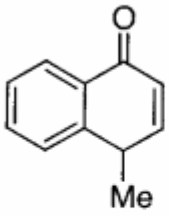


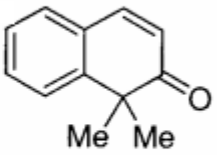
(B) 

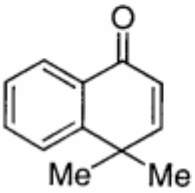
(C) 

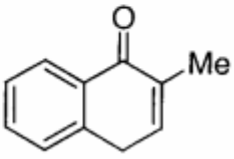
(D) 

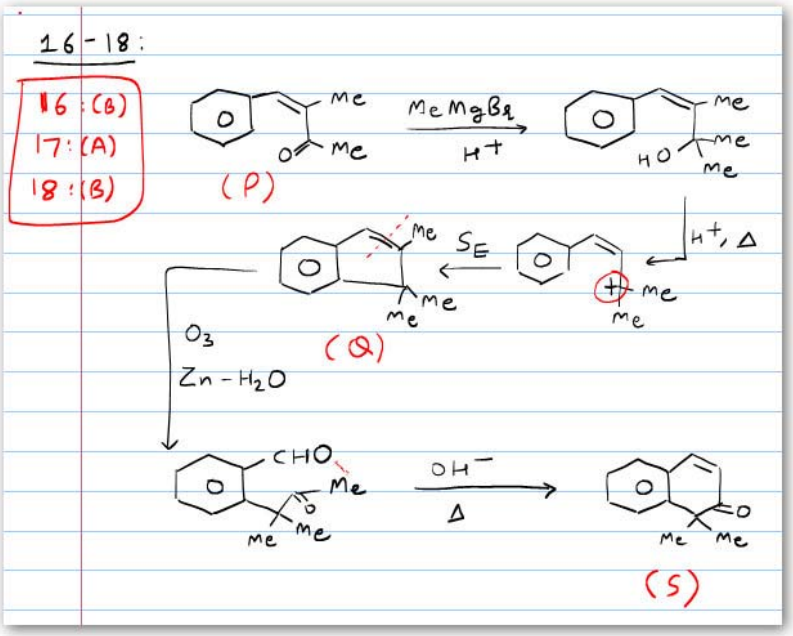
18. The structure of the product **S** is

(A) 

(B) 

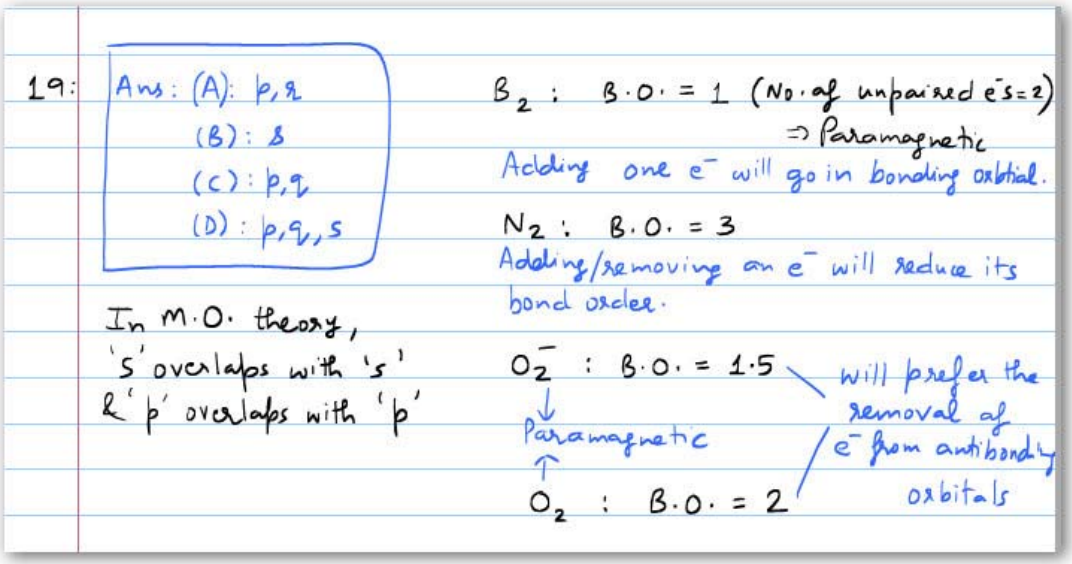
(C) 

(D) 



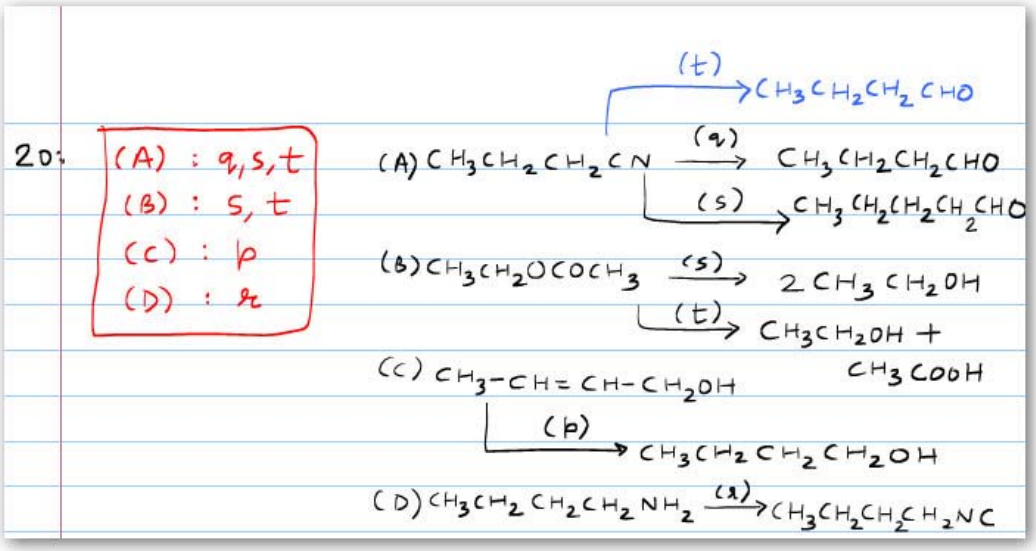
19. Match each of the diatomic molecules in **Column I** with its property/properties in **Column II**.

Column I	**Column II**
(A) B_2	(p) Paramagnetic
(B) N_2	(q) Undergoes oxidation
(C) O_2^-	(r) Undergoes reduction
(D) O_2	(s) Bond order ≥ 2
	(t) Mixing of 's' and 'p' orbitals



20. Match each of the compounds in **Column I** with its characteristic reaction(s) in **Column II**.

Column I	**Column II**
(A) $CH_3CH_2CH_2CN$	(p) Reduction with $Pd-C/H_2$
(B) $CH_3CH_2OCOCH_3$	(q) Reduction with $SnCl_2/HCl$
(C) $CH_3-CH=CH-CH_2OH$	(r) Development of foul smell on treatment with chloroform and alcoholic KOH
(D) $CH_3CH_2CH_2CH_2NH_2$	(s) Reduction with diisobutylaluminium hydride (DIBAL-H)
	(t) Alkaline hydrolysis


20.
(A) : q, s, t
(B) : s, t
(C) : p
(D) : r
(A) $CH_3CH_2CH_2CN$
(q) $CH_3CH_2CH_2CHO$
(s) $CH_3CH_2CH_2CH_2CHO$
(t) $CH_3CH_2CH_2CHO$
(B) $CH_3CH_2OCOCH_3$
(s) $2\,CH_3CH_2OH$
(t) $CH_3CH_2OH + CH_3COOH$
(C) $CH_3-CH=CH-CH_2OH$
(p) $CH_3CH_2CH_2CH_2OH$
(D) $CH_3CH_2CH_2CH_2NH_2$
(r) $CH_3CH_2CH_2CH_2NC$