IIT-JEE-Chemistry-Paper 2 -2008

Paper II

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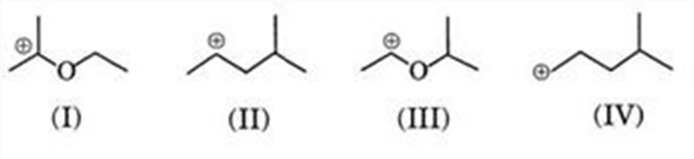
1. The correct stability order for the following species is



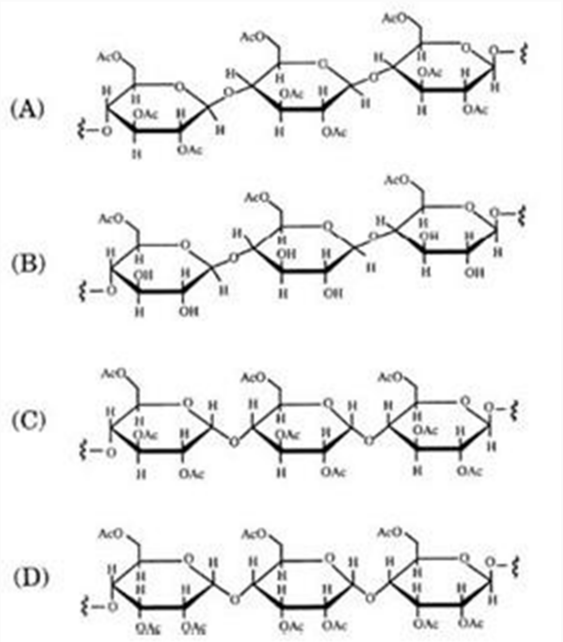
(A) (II) > (IV) > (I) > (III)

(B) (I) > (II) > (III) > (IV)

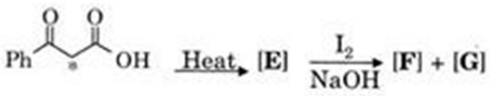
(C) (II) > (I) > (IV) > (III)

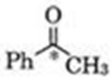
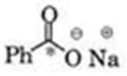
(D) (I) > (III) > (II) > (IV)

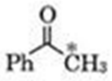
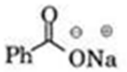
2. Cellulose upon acetylation with excess acetic anhydride/H_2SO_4 (catalytic) gives cellulose triacetate whose structure is

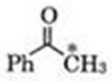


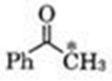
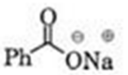
3. In the following reaction sequence, the correct structures of E, F and G are



(A) **E** =  **F** =  **G** = CHI_3

(B) **E** =  **F** =  **G** = CHI_3

(C) **E** =  **F** =  **G** = $\overset{*}{C}HI_3$

(D) **E** =  **F** =  **G** = $\overset{*}{C}H_3I$

4. Among the following, the coloured compound is

(A) CuCI

(B) $K_3\,[Cu(CN)_4]$

(C) CuF_2

(D) $[Cu(CH_3CN)_4]BF_4$

5. Both $[Ni(CO)_4]$ and $[Ni(CN)_4]^{2-}$ are diamagnetic. The hybridization of nickel in these complexes, respectively, are

(A) sp^3, sp^3

(B) sp^3, dsp^2

(C) dsp^2, sp^3

(D) dsp^2, dsp^3

6. The IUPAC name of $[Ni(NH_3)_4]\,[NiCI_4]$ is

(A) Tetrachloronickel (II) - tetraamminenickel (II)

(B) Tetraamminenickel (II) - tetrachloronickel (II)

(C) Tetraamminenickel (II) - tetrachloronickelate (II)

(D) Tetrachloronickel (II) - tetraaminenickelate (0)

7. Electrolysis of dilute aqueous NaCI solution was carried out by passing 10 milli ampere current. The time required to liberate 0.01 mol of H_2 gas at the cathode is (1 Faraday = 96500 C mol^{-1})

(A) 9.65×10^4 sec

(B) 19.3×10^4 sec

(C) 28.95×10^4 sec

(D) 38.6×10^4 sec

8. Among the following, the surfactant will form micelles in aqueous solution at the lowest molar concentration at ambient conditions is

(A) $CH_3(CH_2)_{15}N^+(CH_3)_3Br^-$

(B) $CH_3(CH_2)_{11}OS\ Na^+$

(C) $CH_3(CH_2)_5COO^-Na^+$

(D) $CH_3(CH_2)_{11}N^+(CH_3)_3Br^-$

9. Solubility product constants (K_{sp}) of salts of types MX, MX_2 and M_3X at temperature 'T' are 4.0×10^{-8}, 3.2×10^{-14} and 2.7×10^{-15}, respectively. Solubilities (mol dm^{-3}) of the salts temperature 'T' are in the order

(A) $MX > MX_2 > M_3X$

(B) $M_3X > MX_2 > MX$

(C) $MX_2 > M_3X > MX$

(D) $MX > M_3X > MX_2$

10. STATEMENT-1 : Aniline on reaction with $NaNO_2$/HCI at 0^oC followed by coupling with β-naphthol gives a dark blue coloured precipitate.

and

STATEMENT-2 : The colour of the compound formed in the reaction of aniline with $NaNO_2$/HCI at 0^oC followed by coupling with b-naphthol is due to the extended conjugation.

(A) Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for statement-1.

(B) Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for statement-1.

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

11. STATEMENT-1 : $[Fe(H_2O)_5NO]SO_4$ is paramagnetic.

and

STATEMENT-2 : The Fe in $[Fe(H_2O)_5NO]SO_4$ has three unpaired electrons.

(A) Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for statement-1.

(B) Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for statement-1.

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

12. STATEMENT-1 : The geometrical isomers of the complex $[M(NH_3)_4CI_2]$ are optically inactive.

and

STATEMENT-2 : both geometrical isomers of the complex $[M(NH_3)_4CI_2]$ possess axis of symmetry.

(A) Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for statement-1.

(B) Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for statement-1.

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

13. STATEMENT-1 : There is a natural asymmetry between converting work to heat and converting heat to work.

and

STATEMENT-2 : No process is possible in which the sole result is the absorption of heat from a reservoir and its complete conversion into work.

(A) Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for statement-1.

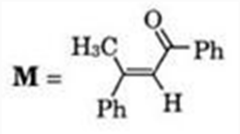
(B) Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for statement-1.

(C) Statement-1 is True, Statement-2 is False

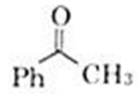
(D) Statement-1 is False, Statement-2 is True

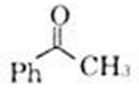
Paragraph

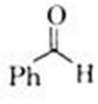
A tertiary school H upon acid catalysed dehydration gives a product I. Ozonolysis of I leads to compounds J and K. Compound J upon reaction with KOH gives benzyl alcohol and a compound L, whereas K on reaction with KOH gives only M.

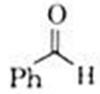
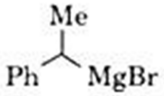


14. Compound H is formed by the reaction is

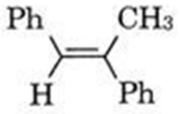
(A)  + PhMgBr

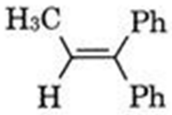
(B)  + $PhCH_2MgBr$

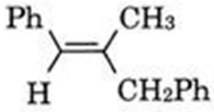
(C)  + $PhCH_2MgBr$

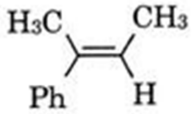
(D)  + 

15. The structure of compound I is

(A) 

(B) 

(C) 

(D) 

16. The structures of compounds J, K and L, respectively, are

(A) $PhCOCH_3$, $PhCH_2COCH_3$ and $PhCH_2COO^-K^+$

(B) PhCHO, PhCHO and $PhCOO^-K^+$

(C) $PhCOCH$, $PhCH_2CHO$ and $CH_3COO^-K^+$

(D) $PhCHO$, $PhCOCH_3$ and $PhCOO^-K^+$

Paragraph

In hexagonal systems of crystals, a frequently encountered arrangement of atoms is described as a hexagonal prism. Here, the top and bottom of the cell are regular hexagons and three atoms are sandwiched in between them. A space-filling model of this structure, called hexagonal close-packed (HCP), is constituted of a sphere on a flat surface surrounded in the same plane by six identical spheres as closely as possible. Three spheres are then placed over the first layer so that they touch each other and represent the second layer. Each one of these three spheres touches three spheres of the bottom layer. Finally, the second layer is covered with a third layer that is identical to the bottom layer in relative position. Assume radius of every sphere to be 'r'.

17. The number of atoms in this HCP unit cell is

(A) 4

(B) 6

(C) 12

(D) 17

18. The volume of this HCP unit cell is

(A) $24\sqrt{2}\ r^3$

(B) $16\sqrt{2}\ r^3$

(C) $12\sqrt{2}\ r^3$

(D) $64/3\sqrt{3}\ r^3$

19. The empty space in this HCP unit cell is

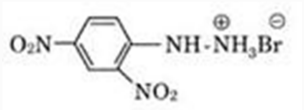
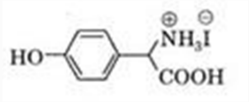
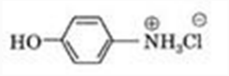
(A) 74%

(B) 47.6%

(C) 32%

(D) 26%

20. Match the compounds in Column I with their characteristics test(s)/ reactions(s) given in Column II.

Column I		**Column II**	
(A)	$H_2N\text{-}NH_3CI$	(p)	Sodium fusion extract of the compound gives Prussian blue colour with $FeSO_4$
(B)		(q)	Gives positive $FeCI_3$ test
(C)		(r)	Gives white precipitate with $AgNO_3$
(D)		(s)	Reacts with aldehydes to form the corresponding hydrazone derivatve.

21. Match the conversions in Column I with the type(s) of reaction(s) given in column II.

Column I		**Column II**	
(A)	PbS --> PbO	(p)	Roasting
(B)	$CaCO_3$ --> CaO	(q)	Calcinations
(C)	ZnS --> Zn	(r)	Carbon reduction
(D)	Cu_2S --> Cu	(s)	Self reduction

22. Match the entries in Column I with the correctly related quantum number(s) in Column II.

Column I		**Column II**	
(A)	Prbitals angular momentum of the electron in a hydrogen-like atomic orbital	(p)	Principal quantum number
(B)	A hydrogen-like one-electron wave function obeying Pauli principle	(q)	Azimuthal quantum number
(C)	Shape, size and orientation of hydrogen-like atomic orbitals	(r)	Magnetic quantum number
(D)	Probability density of electron at the nucleus in hydrogen-like atom	(s)	Electron spring quantum number