IIT-JEE-Chemistry-Paper1-2007

Paper 1

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1. The species having bond order different from that in CO is

(A) NO^-

(B) NO^+

(C) CN^-

(D) N^2

2. Among the following, the paramagnetic compound is

(A) Na_2O_2

(B) O_3

(C) N_2O

(D) KO_2

3. Extraction of zinc from zinc blende is achieved by

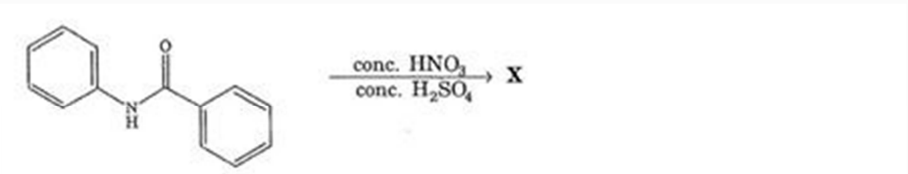
(A) electrolytic reduction

(B) roasting followed by reduction with carbon

(C) roasting followed by reduction with another meal

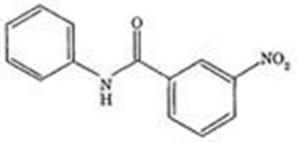
(D) roasting followed by self-reduction

4. In the following reaction,

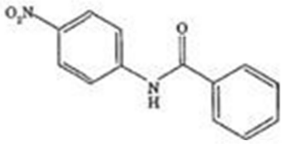


The structure of the major product 'X' is

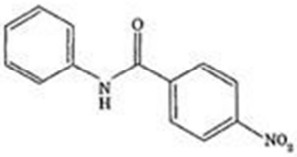
(A)



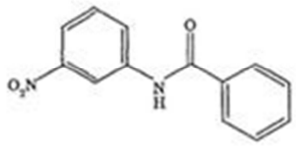
(B)



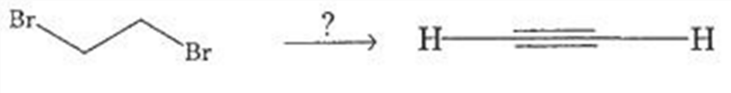
(C)



(D)



5. The reagent(s) for the following conversion,



is/are

(A) alcoholic KOH

(B) alcoholic KOH followed by $NaNH_2$

(C) aqueous KOH followed by $NaNH_2$

(D) Zn/CH_3OH

6. The number of structural isomers for C_6H_{14} is

(A) 3

(B) 4

(C) 5

(D) 6

7. The percentage of p-character in the orbitals forming P-P bonds in P_4 is

(A) 25

(B) 33

(C) 50

(D) 75

8. When 20g of naphthoic acid ($C_{11}H_8O_2$) is dissolved in 50 g of benzene (K_f = 1.72 K kg mol^{-1}), a freezing point depression of 2K is observed. The van't Hoff factor (i) is

(A) 0.5

(B) 1

(C) 2

(D) 3

9. The value of $\log_{10}K$ for a reaction A B is

(Given : D_r = -54.07 kJ mol^{-1}, D_r = 10 JK^{-1} mol^{-1} and R = 8.314 JK^{-1} mol^{-1}; 2.303 × 8.314 × 298 = 5705)

(A) 5

(B) 10

(C) 95

(D) 100

10. STATEMENT-1

Boron always forms covalent bond

Because

STATEMENT-2

The small size of B^{3+} favours formation of covalent bond.

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

(B) Statement-1 is True, Staement-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

In water, orthoboric acid behaves as a weak monobasic acid.

Because

STATEMENT-2

In water, orthoboric acid acts as a proton donor.

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

(B) Statement-1 is True, Staement-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

p-Hydroxybenzoic acid has a lower boiling point than o-hydroxybenzoic acid.

Because

STATEMENT-2

o-Hydroxybenzoic acid has intramolecular hydrogen bonding.

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

(B) Statement-1 is True, Staement-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

Micelles are formed by surfactant molecules above the critical miceller concentration (CMC).

Because

STATEMENT-2

The conductivity of a solution having surfactant molecules decreases sharply at the CMC.

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

(B) Statement-1 is True, Staement-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

14. Argon is used in arc welding because of its

(A) low reactivity with metal

(B) ability to lower the melting point of metal

(C) flammability

(D) high calorific value

15. The structure of XeO_3 is

(A) linear

(B) planar

(C) pyramidal

(D) T-shaped

16. XeF_4 and XeF_6 are expected to be

(A) oxidizing

(B) reducing

(C) unreactive

(D) strongly basic

Paragraph

Chemical reactions involve interaction of atoms and molecules. A large number of atoms/molecules (approximately 6.023×10^{23}) are present in a few grams of any chemical compound varying with their atomic/molecular masses. To handle such large numbers conveniently, the mole concept was introduced. This concept has implications in diverse areas such as analytical chemistry, biochemistry, electrochemistry and radiochemistry. The following example illustrates a typical case, involving chemical/electrochemical reaction, which requires a clear understanding of the mole concept.

A 4.0 molar aqueous solution of NaCI is prepared and 500 mL of this solution is electrolysed. This leads to the evolution of chlorine gas at one of the electrodes (atomic mass: Na = 23, Hg = 200; 1 Faraday = 96500 coulombs).

17. The total number of moles of chlorine gas evolved is

(A) 0.5

(B) 1.0

(C) 2.0

(D) 3.0

18. If the cathode is a Hg electrode, the maximum weight (g) of amalgam formed from this solution is

(A) 200

(B) 225

(C) 400

(D) 446

19. The total charge (coulombs required for complete electrolysis is

(A) 24125

(B) 48250

(C) 96500

(D) 19300

20. Match the complexes in Column I with their properties listed in Column II.

Column I		**Column II**	
(A)	$[Co(NH_3)_4(H_2O)_2]CI_2$	(p)	geometrical isomers
(B)	$[Pt(NH_3)_2CI_2]$	(q)	paramagnetic
(C)	$[Co(H_2O)_5CI]CI$	(r)	diamagnetic
(D)	$[Ni(H_2O)_6]CI_2$	(s)	metal ion with +2 oxidation state

21. Match the chemical substances in Column I with type of polymers/type of bonds in Column II.

Column I		**Column II**	
(A)	Cellulose	(p)	Natural polymers
(B)	Nylon-6, 6	(q)	Synthetic polymer
(C)	Protein	(r)	Amide linkage
(D)	Sucrose	(s)	Glycoside linkage

22. match gases under specified conditions listed in Column I with the properties/laws in Column II.

Column I		**Column II**	
(A)	Hydrogen gas (P-200 atm, T=273 K)	(p)	Compressibility factor ¹ 1
(B)	Hydrogen gas (P ~ 0, T=273 K)	(q)	Attractive forces are dominant
(C)	CO_2 (P = 1 atm, T = 273 K)	(r)	PV = nRT
(D)	Real gas with very large molar volume	(s)	P(V - nb) = nRT