

Useful Information

Gas constant $R = 8.314 \text{ J/mol-K}$

Planck's constant $h = 6.626 \times 10^{-34} \text{ J-s}$

Mass of electron $m_e = 9.108 \times 10^{-31} \text{ kg}$

1 Mark Questions

- Which one of the following elements has the largest atomic radius?
(a) Be (b) C
(c) N (d) F
- The valence electronic configuration of Cr atom (atomic number 24) in its ground state is
(a) $4s^1 3d^5$ (b) $3d^5 4s^1$
(c) $4s^2 3d^4$ (d) $3d^4 4s^2$
- The phosphorus atom in the molecule PF_3 is in the state of hybridisation
(a) sp^2 (b) sp^3
(c) p^3 (d) dsp
- The ionic compounds MgO and CaO have the same crystal structure except that the interionic distances are 2.10 \AA and 2.40 \AA respectively. The ratio of the lattice energies, $U(\text{MgO}) / U(\text{CaO})$ is
(a) 0.766 (b) 0.875
(c) 1.143 (d) 1.306
- The quantities K_c and K_p are the concentration equilibrium constant and the pressure equilibrium constant for a reaction in gas phase. Which of the following relationships holds good, if there is no change in the number of moles due to the reaction?
(a) $K_p = K_c$ (b) $K_p > K_c$
(c) $K_p < K_c$ (d) $K_p = \frac{1}{2} K_c$
- Let p_1 and p_2 be the vapour pressure of water at 372 K and 374 K respectively. Then
(a) $p_1 > p_2$ (b) $p_1 = p_2$
(c) $p_1 < p_2$ (d) $p_1 = 2p_2$
- Which one of the following alcohols will react most easily with HBr to corresponding bromide?
(a) CH_3OH
(b) $(\text{CH}_3)_3\text{COH}$
(c) $\text{CH}_3\text{CH}_2\text{OH}$
(d) $(\text{CH}_3)_2\text{CHOH}$
- During the nitration of benzene with concentrated $\text{HNO}_3\text{-H}_2\text{SO}_4$, the nitrating species is
(a) HNO_2 (b) NO_2
(c) NO_2^+ (d) NO_3^-
- Which one of the following species is not isoelectronic with N_2 ?
(a) CN^- (b) NO
(c) CO (d) CS
- One of the given elements combines with hydrogen to yield an electron deficient hydride. Identify it.
(a) Be (b) C
(c) N (d) O
- The oxidation state of Ba in BaO_2 is
(a) zero (b) +1
(c) +2 (d) +4
- One of the species given below is a Lewis acid. Which one is it?
(a) I (b) I^-
(c) I_3^- (d) I_2
- Identify the most stable species from the following divalent halides.
(a) CCl_2 (b) GeCl_2
(c) SnCl_2 (d) PbCl_2

14. Which of the following ligands causes the maximum crystal field splitting while forming a complex with Fe^{2+} ion?

- (a) H_2O (b) NH_3
(c) CN^- (d) Cl^-

15. The formal oxidation state of Ni in $\text{Ni}(\text{CO})_4$ is

- (a) zero (b) +1
(c) +2 (d) +4

16. The largest ionisation energy is found with

- (a) alkali metals (b) alkaline earth metals
(c) halogens (d) inert gases

17. In Planck's hypothesis $E = h\nu$, E is the energy of

- (a) a photon (b) a hydrogen atom
(c) one electron (d) one H_2 molecule

18. The most widely applicable condition for spontaneity of processes is

- (a) $(\Delta E)_{S,V} \leq 0$ (b) $(\Delta S)_{E,V} \geq 0$
(c) $(\Delta A)_{T,V} \leq 0$ (d) $(\Delta G)_{T,P} \leq 0$

19. The unit of the rate constant for a second order process is

- (a) mol/L-s (b) s^{-1}
(c) L/mol-s (d) mol/L

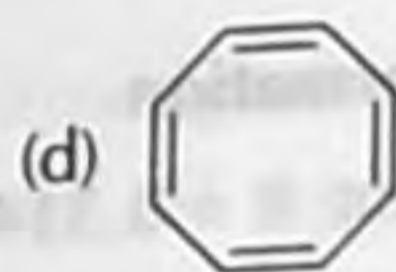
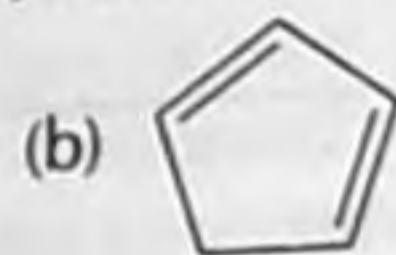
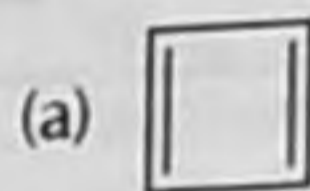
20. The major product obtained from the reaction of 2-methyl-2-butene with 50% H_2SO_4 in water is

- (a) 2-methyl-2-butanol
(b) 3-methyl-2-butanol
(c) 3-methyl-1-butanol
(d) 2-methyl-1-butanol

21. The correct decreasing order of nucleophilic character of the following species is

- (a) $\text{H}_2\text{O} > \text{Cl}^- > \text{NH}_3 > \text{OH}^-$
(b) $\text{NH}_3 > \text{H}_2\text{O} > \text{Cl}^- > \text{OH}^-$
(c) $\text{OH}^- > \text{Cl}^- > \text{NH}_3 > \text{H}_2\text{O}$
(d) $\text{Cl}^- > \text{OH}^- > \text{H}_2\text{O} > \text{NH}_3$

22. Which of the following species is aromatic?



23. The reaction of 1-octyne with $\text{HgSO}_4 \cdot \text{H}_2\text{SO}_4 \cdot \text{H}_2\text{O}$ will give

- (a) octan-1-one (b) octan-2-one
(c) octan-3-one (d) octan-4-one

24. The correct order of decreasing rate of dehydrohalogenation of alkyl halides is

- (a) $\text{RBr} > \text{RI} > \text{RCl} > \text{RF}$
(b) $\text{RI} > \text{RBr} > \text{RCl} > \text{RF}$
(c) $\text{RI} > \text{RBr} > \text{RF} > \text{RCl}$
(d) $\text{RI} > \text{RF} > \text{RBr} > \text{RCl}$

25. The reaction of sodium phenoxide with CO_2 at high temperature and pressure followed by acidification gives

- (a) *p*-hydroxy benzoic acid
(b) *m*-hydroxy benzoic acid
(c) *o*-hydroxy benzoic acid
(d) *p*-hydroxy sodium benzoate