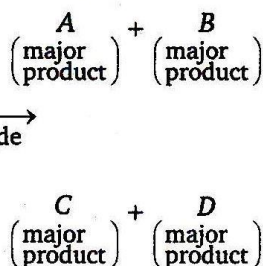
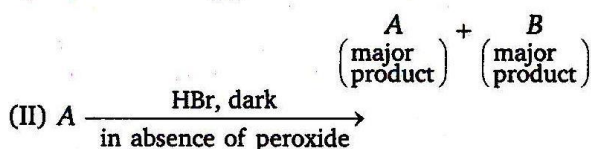
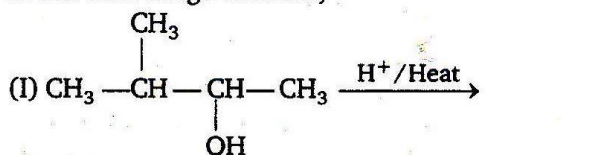
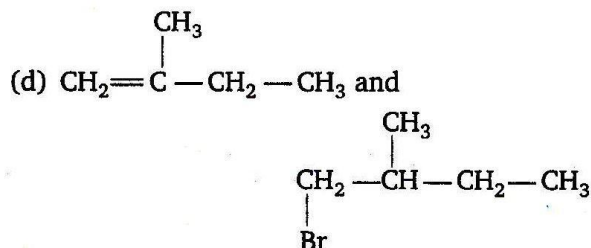
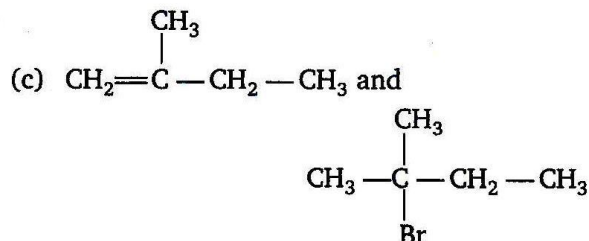
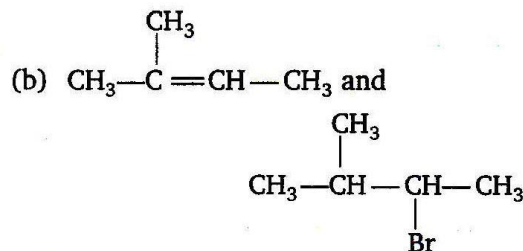
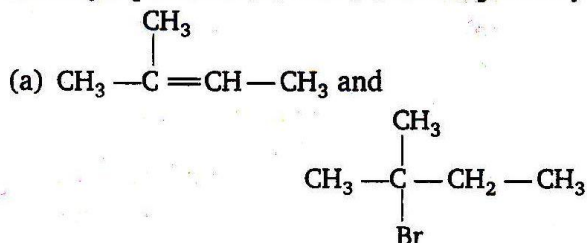


## Chemistry

- Standard electrode potential of three metals X, Y and Z are  $-1.2$  V,  $+0.5$  V and  $-3.0$  V respectively. The reducing power of these metals will be
  - $Y > X > Z$
  - $Z > X > Y$
  - $X > Y > Z$
  - $Y > Z > X$
- Considering the state of hybridisation of carbon atoms, find out the molecule among the following which is linear.
  - $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}_3$
  - $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{C} \equiv \text{CH}$
  - $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$
  - $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3$
- Clemmensen reduction of a ketone is carried out in the presence of which of the following?
  - Zn-Hg with HCl
  - $\text{LiAlH}_4$
  - $\text{H}_2$  and Pt as catalyst
  - Glycol with KOH
- A gaseous mixture was prepared by taking equal moles of CO and  $\text{N}_2$ . If the total pressure of the mixture was found 1 atmosphere, the partial pressure of the nitrogen ( $\text{N}_2$ ) in the mixture is
  - 0.8 atm
  - 0.9 atm
  - 1 atm
  - 0.5 atm
- In the following reactions,



the major products (A) and (C) are respectively



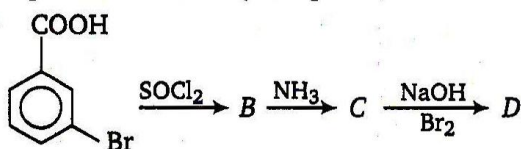
- If  $x$  is amount of adsorbate and  $m$  is amount of adsorbent, which of the following relations is not related to adsorption process?
  - $\frac{x}{m} = f(T)$  at constant  $p$
  - $p = f(T)$  at constant  $\left(\frac{x}{m}\right)$
  - $\frac{x}{m} = p \times T$
  - $\frac{x}{m} = f(p)$  at constant  $T$
- The freezing point depression constant for water is  $-1.86^\circ\text{C m}^{-1}$ . If 5.00 g  $\text{Na}_2\text{SO}_4$  is dissolved in 45.0 g  $\text{H}_2\text{O}$ , the freezing point is changed by  $-3.82^\circ\text{C}$ . Calculate the van't Hoff factor for  $\text{Na}_2\text{SO}_4$ .
  - 2.63
  - 3.11
  - 0.381
  - 2.05
- Which of the two ions from the list given below, have the geometry that is explained by the same hybridisation of orbitals,  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ ,  $\text{NH}_2^-$ ,  $\text{NH}_4^+$ ,  $\text{SCN}^-$ ?
  - $\text{NH}_4^+$  and  $\text{NO}_3^-$
  - $\text{SCN}^-$  and  $\text{NH}_2^-$
  - $\text{NO}_2^-$  and  $\text{NH}_2^-$
  - $\text{NO}_2^-$  and  $\text{NO}_3^-$

9. The  $d$ -electron configurations of  $\text{Cr}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Fe}^{2+}$  and  $\text{Co}^{2+}$  are  $d^4$ ,  $d^5$ ,  $d^6$  and  $d^7$  respectively. Which one of the following will exhibit minimum paramagnetic behaviour?  
(At. no. Cr = 24, Mn = 25, Fe = 26, Co = 27)  
(a)  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$  (b)  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$   
(c)  $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$  (d)  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$
10. For the four successive transition elements (Cr, Mn, Fe and Co), the stability of +2 oxidation state will be there in which of the following order?  
(At. no. Cr = 24, Mn = 25, Fe = 26, Co = 27)  
(a)  $\text{Fe} > \text{Mn} > \text{Co} > \text{Cr}$   
(b)  $\text{Co} > \text{Mn} > \text{Fe} > \text{Cr}$   
(c)  $\text{Cr} > \text{Mn} > \text{Co} > \text{Fe}$   
(d)  $\text{Mn} > \text{Fe} > \text{Cr} > \text{Co}$
11. The van't Hoff factor,  $i$  for a compound which undergoes dissociation in one solvent and association in other solvent is respectively.  
(a) less than one and less than one  
(b) greater than one and less than one  
(c) greater than one and greater than one  
(d) less than one and greater than one
12. Which one of the following statements is not true regarding (+) lactose?  
(a) (+) lactose is a  $\beta$ -glycoside formed by the union of a molecule of D(+) glucose and a molecule of D(+) galactose  
(b) (+) lactose is a reducing sugar and does not exhibit mutarotation  
(c) (+) lactose,  $\text{C}_{12}\text{H}_{22}\text{O}_{11}$  contains 8-O H groups  
(d) On hydrolysis (+) lactose gives equal amount of D(+) glucose and D(+) galactose
13. If the  $E_{\text{cell}}^\circ$  for a given reaction has a negative value then which of the following gives the correct relationships for the values of  $\Delta G^\circ$  and  $K_{\text{eq}}$ ?  
(a)  $\Delta G^\circ < 0$ ;  $K_{\text{eq}} > 1$   
(b)  $\Delta G^\circ < 0$ ;  $K_{\text{eq}} < 1$   
(c)  $\Delta G^\circ > 0$ ;  $K_{\text{eq}} < 1$   
(d)  $\Delta G^\circ > 0$ ;  $K_{\text{eq}} > 1$
14. Which one of the following is employed as antihistamine?  
(a) Diphenyl hydramine  
(b) Norethindrone  
(c) Omeprazole  
(d) Chloramphenicol
15. Which of the following elements is present as the impurity to the maximum extent in the pig iron?  
(a) Carbon (b) Silicon  
(c) Phosphorus (d) Manganese
16. Of the following complex ions, which is diamagnetic in nature?  
(a)  $[\text{Ni}(\text{CN})_4]^{2-}$  (b)  $[\text{CuCl}_4]^{2-}$   
(c)  $[\text{CoF}_6]^{3-}$  (d)  $[\text{NiCl}_4]^{2-}$
17. The electrode potentials for  
 $\text{Cu}^{2+}(\text{aq}) + e^- \longrightarrow \text{Cu}^+(\text{aq})$   
and  $\text{Cu}^+(\text{aq}) + e^- \longrightarrow \text{Cu}(\text{s})$   
are +0.15 V and +0.50 V respectively. The value of  $E_{\text{Cu}^{2+}/\text{Cu}}^\circ$  will be  
(a) 0.325 V (b) 0.650 V  
(c) 0.150 V (d) 0.500 V
18. If the enthalpy change for the transition of liquid water to steam is  $30 \text{ kJ mol}^{-1}$  at  $27^\circ\text{C}$ , the entropy change for the process would be  
(a)  $1.0 \text{ J mol}^{-1}\text{K}^{-1}$   
(b)  $0.1 \text{ J mol}^{-1}\text{K}^{-1}$   
(c)  $100 \text{ J mol}^{-1}\text{K}^{-1}$   
(d)  $10 \text{ J mol}^{-1}\text{K}^{-1}$
19. Which one of the following statements for the order of a reaction is incorrect?  
(a) Order is not influenced by stoichiometric coefficient of the reactants  
(b) Order of reaction is sum of power to the concentration terms of reactants to express the rate of reaction  
(c) Order of reaction is always whole number  
(d) Order can be determined only experimentally
20. The correct order of increasing bond length of C—H, C—O, C—C and C=C is  
(a)  $\text{C—C} < \text{C}=\text{C} < \text{C—O} < \text{C—H}$   
(b)  $\text{C—O} < \text{C—H} < \text{C—C} < \text{C}=\text{C}$   
(c)  $\text{C—H} < \text{C—O} < \text{C—C} < \text{C}=\text{C}$   
(d)  $\text{C—H} < \text{C}=\text{C} < \text{C—O} < \text{C—C}$
21. Which of the following is least likely to behave as Lewis base?  
(a)  $\text{NH}_3$  (b)  $\text{BF}_3$   
(c)  $\text{OH}^-$  (d)  $\text{H}_2\text{O}$
22. Of the following which one is classified as polyester polymer?  
(a) Bakelite (b) Melamine  
(c) Nylon-66 (d) Terylene

23. A buffer solution is prepared in which the concentration of  $\text{NH}_3$  is 0.30 M and the concentration of  $\text{NH}_4^+$  is 0.20 M. If the equilibrium constant,  $K_b$  for  $\text{NH}_3$  equals  $1.8 \times 10^{-5}$ , what is the pH of this solution?

( $\log 2.7 = 0.43$ )

- (a) 9.43 (b) 11.72  
(c) 8.73 (d) 9.08
24. Standard electrode potential for  $\text{Sn}^{4+} / \text{Sn}^{2+}$  couple is +0.15 V and that for the  $\text{Cr}^{3+} / \text{Cr}$  couple is -0.74. These two couples in their standard state are connected to make a cell. The cell potential will be
- (a) + 0.89 V (b) + 0.18 V  
(c) + 1.83 V (d) + 1.199 V
25. In a set of reactions, *m*-bromobenzoic acid gave a product *D*. Identify the product *D*.

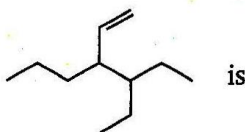


- (a) (b)   
(c) (d)

26. Name the type of the structure of silicate in which one oxygen atom of  $[\text{SiO}_4]^{4-}$  is shared?

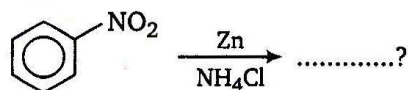
- (a) Sheet silicate  
(b) Pyrosilicate  
(c) Three dimensional silicate  
(d) Linear chain silicate

27. The correct IUPAC name of the compound



- (a) 3-ethyl-4-ethenylheptane  
(b) 3-ethyl-4-propylhex-5-ene  
(c) 3-(1-ethyl propyl) hex-1-ene  
(d) 4-ethyl-3-propylhex-1-ene

28. What is the product obtained in the following reaction?

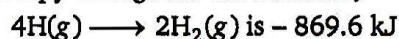


- (a) (b) (c) (d)

29. Which of the following is correct option for free expansion of an ideal gas under adiabatic condition?

- (a)  $q \neq 0, \Delta T = 0, W = 0$   
(b)  $q = 0, \Delta T = 0, W = 0$   
(c)  $q = 0, \Delta T < 0, W \neq 0$   
(d)  $q = 0, \Delta T \neq 0, W = 0$

30. Enthalpy change for the reaction,



The dissociation energy of H—H bond is

- (a) - 869.6 kJ (b) + 434.8 kJ  
(c) + 217.4 kJ (d) - 434.8 kJ

31. Two gases A and B having the same volume diffuse through a porous partition in 20 and 10 seconds respectively. The molecular mass of A is 49 u. Molecular mass of B will be

- (a) 12.25 u (b) 6.50 u  
(c) 25.00 u (d) 50.00 u

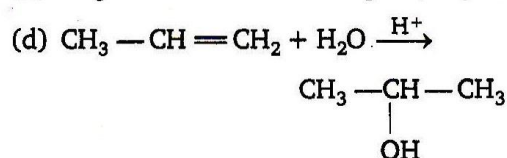
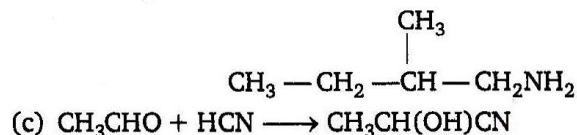
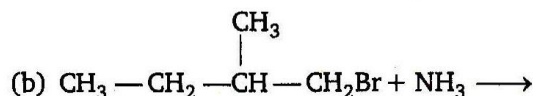
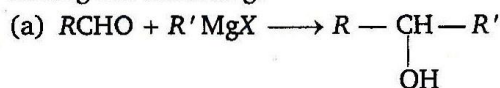
32. The complexes  $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$  and  $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$  are the examples of which type of isomerism?

- (a) Ionisation isomerism  
(b) Co-ordination isomerism  
(c) Geometrical isomerism  
(d) Linkage isomerism

33. Which of the following pairs of metals is purified by van Arkel method?

- (a) Zr and Ti (b) Ag and Au  
(c) Ni and Fe (d) Ga and In

34. Which one is a nucleophilic substitution reaction among the following?



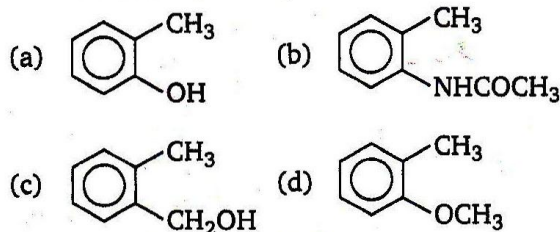
35. Which of the following compounds has the lowest melting point?

- (a)  $\text{CaBr}_2$  (b)  $\text{CaI}_2$   
(c)  $\text{CaF}_2$  (d)  $\text{CaCl}_2$

36. The total number of atomic orbitals in fourth energy level of an atom is

- (a) 16 (b) 32  
(c) 4 (d) 8

37. Which one of the following is most reactive towards electrophilic reagent?



38. By what factor does the average velocity of a gaseous molecule increase when the temperature (in Kelvin) is doubled?

- (a) 2.8 (b) 4.0  
(c) 1.4 (d) 2.0

39. In Duma's method of estimation of nitrogen 0.35 g of an organic compound gave 55 mL of nitrogen collected at 300 K temperature and 715 mm pressure. The percentage composition of nitrogen in the compound would be

- (Aqueous tension at 300 K = 15 mm)  
(a) 16.45 (b) 17.45  
(c) 14.45 (d) 15.45

40. The complex,  $[\text{Pt}(\text{Py})(\text{NH}_3)\text{BrCl}]$  will have how many geometrical isomers?

- (a) 4 (b) 0  
(c) 2 (d) 3

41. Mole fraction of the solute in a 1.00 molal aqueous solution is

- (a) 0.0177 (b) 0.0344  
(c) 1.7700 (d) 0.1770

42. The value of  $\Delta H$  for the reaction  $X_2(g) + 4Y_2(g) \rightleftharpoons 2XY_4(g)$  is less than zero.

- Formation of  $XY_4(g)$  will be favoured at  
(a) low pressure and low temperature  
(b) high temperature and low pressure  
(c) high pressure and low temperature  
(d) high temperature and high pressure

43. The Lassaigne's extract is boiled with conc  $\text{HNO}_3$  while testing for halogens. By doing so it

- (a) helps in the precipitation of  $\text{AgCl}$   
(b) increases the solubility product of  $\text{AgCl}$   
(c) increases the concentration of  $\text{NO}_3^-$  ions  
(d) decomposes  $\text{Na}_2\text{S}$  and  $\text{NaCN}$ , if formed

44. For the reaction  $\text{N}_2(g) + \text{O}_2(g) \rightleftharpoons 2\text{NO}(g)$ , the equilibrium constant is  $K_1$ . The equilibrium constant is  $K_2$  for the reaction  $2\text{NO}(g) + \text{O}_2(g) \rightleftharpoons 2\text{NO}_2(g)$ . What is  $K$  for the reaction  $\text{NO}_2(g) \rightleftharpoons \frac{1}{2}\text{N}_2(g) + \text{O}_2(g)$ ?

- (a)  $1/(4K_1K_2)$  (b)  $[1/K_1K_2]^{1/2}$   
(c)  $1/(K_1K_2)$  (d)  $1/(2K_1K_2)$

45. The energies  $E_1$  and  $E_2$  of two radiations are 25 eV and 50 eV respectively. The relation between their wavelengths i.e.,  $\lambda_1$  and  $\lambda_2$  will be

- (a)  $\lambda_1 = 2\lambda_2$  (b)  $\lambda_1 = 4\lambda_2$   
(c)  $\lambda_1 = \frac{1}{2}\lambda_2$  (d)  $\lambda_1 = \lambda_2$