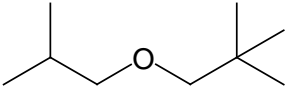
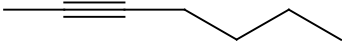
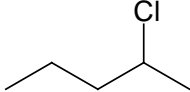
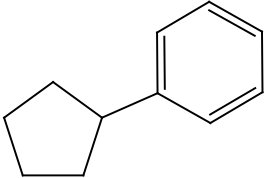
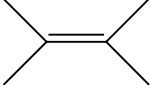


Problem Set # 2, November 2017

- 16.** What weight of hydrogen would have to be carried by a hiker to generate 350 kJ of heat in order to bring 1.00 L of water from 4°C to 100°C?
 (a) 1.42 g (b) 0.00284 g (c) 2.84 g (d) 2.84 kg (e) 0.118 g
- 17.** An analyst dissolved 20.0 g of a protein in enough water to make 1.00 L of solution at 25°C. A commercial osmometer determined the osmotic pressure was 0.011 atm. What is the approximate molecular mass of the protein?
 (a) 445 g/mol (b) 4.50×10^6 g/mol (c) 3730 g/mol (d) 111 g/mol (e) 44500 g/mol
- 18.** When cooking pasta, some people add table salt (NaCl) to shorten the cooking time. Calculate the elevation of the normal boiling point of water when 8.0 g of salt is dissolved in 4.0 kg of water ($K_b = 0.51$ K/kg).
 (a) 0.017 K (b) 100.017 K (c) 0.069 K (d) 100.069 K (e) 99.931 K
- 19.** The organic product of cyclohexene reacting with molecular hydrogen in the presence of a catalyst can be described as
 (a) an alkane
 (b) a cycloalkane
 (c) a cycloalkene
 (d) an alcohol
 (e) a polymer
- 20.** Which of the following compounds or mixtures would give a basic aqueous solution?
 (a) NaHSO₄ (b) NaBr (c) NH₄Cl (d) KCN (e) 0.001 M CH₃COONa + 1.0 M CH₃COOH
- 21.** Which of the following organic molecules can exist as two enantiomers?
 (i)  (ii)  (iii) 
 (iv)  (v) 
- (a) ii, iii, v (b) iii, iv, v (c) ii, iii (d) i only (e) iii only
- 22.** If a 50.0 L cylinder of xenon at 25°C contains 200.0 mol, what is the real pressure in the cylinder in Torr? ($a = 4.194$ L²·atm/mol²; $b = 5.105 \times 10^{-2}$ L/mol).
 (a) 8.20×10^2 Torr (b) 4.24×10^4 Torr (c) 5.66×10^6 Torr (d) 1.19×10^6 Torr (e) 7.43×10^4 Torr

23. What is the pH of a 0.010 M solution of HCN ($K_a = 4.9 \times 10^{-10}$)?
(a) 11.31 (b) 5.65 (c) 8.35 (d) 2.00 (e) 4.65
24. Which of the following is true for a galvanic cell?
(a) reduction occurs at the cathode, labeled with a minus sign (-)
(b) oxidation occurs at the cathode, labeled with a plus sign (+)
(c) oxidation occurs at the anode, labeled with a plus sign (+)
(d) oxidation occurs at the anode, labeled with a minus sign (-)
(e) oxidation occurs at the cathode, labeled with a minus sign (-)
25. The heat of fusion for benzene is 10.59 kJ/mol, and its freezing point is 5.6°C. What is the entropy change in the surroundings when benzene freezes?
(a) -38.01 J/mol·K
(b) +38.01 J/mol·K
(c) -1.89 kJ/mol·K
(d) +1.89 kJ/mol·K
(e) entropy of the surroundings is always constant
26. Which of the following expressions would not have its equilibrium position appreciably affected by a change in container volume?
(a) $\text{NH}_3(\text{g}) + \text{HCl}(\text{g}) \rightleftharpoons \text{NH}_4\text{Cl}(\text{s})$
(b) $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$
(c) $\text{C}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{CO}(\text{g}) + \text{H}_2(\text{g})$
(d) $2\text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$
(e) $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$
27. Which of the following indicators can best be used to indicate the half-equivalence point of a 25.00 mL solution of 0.1 M HF ($K_a = 3.5 \times 10^{-4}$) titrated with 0.247 M NaOH?
(a) methyl red ($\text{pK}_{\text{in}} = 5.0$)
(b) methyl orange ($\text{pK}_{\text{in}} = 3.4$)
(c) thymol blue ($\text{pK}_{\text{in}} = 8.9$)
(d) phenolphthalein ($\text{pK}_{\text{in}} = 9.4$)
(e) bromothymol blue ($\text{pK}_{\text{in}} = 7.1$)
28. How many litres of oxygen are consumed at 25°C and 1.00 atm when 4.00 mL of butane (C_4H_{10}) is burned? ($\rho_{\text{butane}} = 0.578 \text{ g/mL}$).
(a) 6.33 L (b) 642 L (c) 11.1 L (d) 19.2 L (e) 2.96 L
29. Which of the following is not crystalline?
(a) iron (b) aluminium oxide (c) quartz (d) glass (e) table salt
30. How many stereoisomers exist for the molecule 2-bromo-3,4-dichloropentane?
(a) 0 (b) 2 (c) 4 (d) 8 (e) 16