

Chemistry – Master Level Self-Assessment Test

Thank you for your interest in the Master Chemistry on-line class. As a pre-requisite for this class, you should be familiar with some of the concepts used in the problems below. Ideally, see if you can solve more than 50% of the problems below to be sure you have some foundation to build upon in this class.

1. How many oxygen atoms are in 225g O₂?
(A) 4.23×10^{24}
(B) 6.84×10^{24}
(C) 8.47×10^{24}
(D) 1.69×10^{25}
2. Which of these elements has the greatest electronegativity?
(A) Br
(B) N
(C) O
(D) S
3. Which element has an outer electron configuration of s² p⁴?
(A) Ca
(B) Cr
(C) Ge
(D) Se
4. The ionization of benzoic acid is represented by this equation:
$$\text{C}_6\text{H}_5\text{COOH}_{(\text{aq})} \rightarrow \text{H}^+_{(\text{aq})} + \text{C}_6\text{H}_5\text{COO}^-_{(\text{aq})}$$

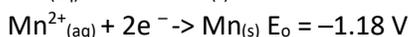
If a 0.045 M solution of benzoic acid has an [H⁺] = 1.7×10^{-3} , what is the K_a of benzoic acid?
(A) 7.7×10^{-5}
(B) 6.4×10^{-5}
(C) 3.8×10^{-2}
(D) 8.4×10^{-1}
5. The value of which property decreases with an increase in the strength of intermolecular forces?
(A) viscosity
(B) boiling point
(C) surface tension
(D) vapor pressure
6. $\text{C}_6\text{H}_5\text{OH}_{(\text{aq})} + \text{CN}^-_{(\text{aq})} \rightarrow \text{HCN}_{(\text{aq})} + \text{C}_6\text{H}_5\text{O}^-_{(\text{aq})}$
The equilibrium constant for this reaction is less than 1. What is the strongest base in this system?
(A) C₆H₅OH_(aq)

- (B) $\text{CN}^-_{(\text{aq})}$
- (C) $\text{HCN}_{(\text{aq})}$
- (D) $\text{C}_6\text{H}_5\text{O}^-_{(\text{aq})}$

7. The specific heats of several metals are given in the table. If the same number of Joules were applied to the same mass of each metal, which metal would show the greatest temperature change?

Specific Heat, $\text{J}\cdot\text{g}^{-1}\cdot^\circ\text{C}^{-1}$	
Al	0.900
Au	0.129
Cu	0.385
Hg	0.139

- (A) Al
 - (B) Au
 - (C) Cu
 - (D) Hg
8. What process occurs at the anode of a voltaic cell utilizing these two half-reactions?



- (A) $\text{Al}_{(\text{s})} \rightarrow \text{Al}^{3+}_{(\text{aq})} + 3\text{e}^-$
 - (B) $\text{Al}^{3+}_{(\text{aq})} + 3\text{e}^- \rightarrow \text{Al}_{(\text{s})}$
 - (C) $\text{Mn}_{(\text{s})} \rightarrow \text{Mn}^{2+}_{(\text{aq})} + 2\text{e}^-$
 - (D) $\text{Mn}^{2+}_{(\text{aq})} + 2\text{e}^- \rightarrow \text{Mn}_{(\text{s})}$
9. Which class of compounds consists exclusively of saturated hydrocarbons?
- (A) alkanes
 - (B) alkenes
 - (C) alkynes
 - (D) aromatics
10. The nitrite ion, NO_2^- , may be represented by two major resonance forms. The lengths of the nitrogen-to-oxygen bonds in this ion are expected to be
- (A) the same as the length of nitrogen-to-oxygen double bonds.
 - (B) the same as the length of nitrogen-to-oxygen triple bonds.
 - (C) between the lengths of a nitrogen-to-oxygen single bond and a nitrogen-to-oxygen double bond.
 - (D) between the lengths of a nitrogen-to-oxygen double bond and a nitrogen-to-oxygen triple bond.

Answers:

1. C
2. C
3. D
4. B
5. D
6. D
7. B
8. A
9. A
10. C