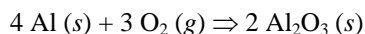


## Sample Questions for the Chemistry Placement Test

The chemistry placement test is used to assess your present level of general chemistry knowledge in addition to your mathematical skills. You will be provided scratch paper (you cannot write on the test itself) and the Periodic Table of the Elements, and you will be allowed to use a calculator. You will have 45 minutes to answer 44 multiple choice questions, with the following sample questions intended only as a guideline:

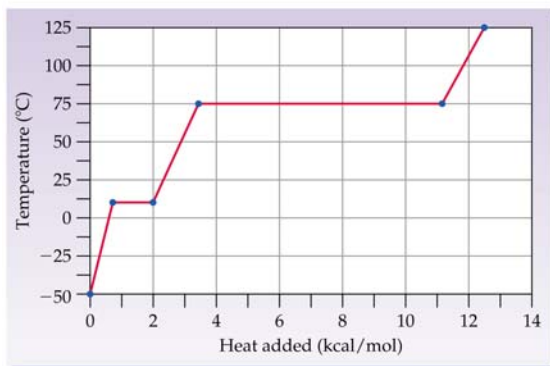
- If the formula for potassium chlorate is  $\text{KClO}_3$  and the formula for magnesium fluoride is  $\text{MgF}_2$ , then what is the formula for magnesium chlorate?  
(a)  $\text{MgClO}_3$       (b)  $\text{Mg}_2\text{ClO}_3$       (c)  $\text{Mg}(\text{ClO}_3)_2$       (d)  $\text{Mg}_2(\text{ClO}_3)_3$
- From the periodic table, what is the atomic number of aluminum?  
(a) 26.98      (b) 13      (c) 18      (d) 39.95
- Which one of the following elements does not exist as a diatomic molecule in nature?  
(a) hydrogen      (b) nitrogen      (c) fluorine      (d) neon

For questions 4. and 5., consider the following reaction:



- The reaction can be classified as which one of the following types?  
(a) precipitation      (b) decomposition      (c) synthesis      (d) double displacement
- How many moles of  $\text{Al}_2\text{O}_3$  can be produced from the reaction of 10.0 g of Al and 19.0 g of  $\text{O}_2$ ?  
(a) 0.581 mol      (b) 0.371 mol      (c) 0.185 mol      (d) 0.396 mol
- What volume of 12.0 M HCl is required to make 75.0 mL of 3.50 M HCl?  
(a) 21.9 mL      (b) 0.560 mL      (c) 257 mL      (d) 75.0 mL
- A fish tank holds 1.029  $\text{yd}^3$  of water. What is this volume in cubic meters given that 1 m = 1.093 yd?  
(a) 1.062  $\text{m}^3$       (b) 0.9414  $\text{m}^3$       (c) 1.125  $\text{m}^3$       (d) 0.7881  $\text{m}^3$
- Which one of the following is a strong acid?  
(a)  $\text{HNO}_3$       (b)  $\text{CaSO}_4$       (c)  $\text{NH}_3$       (d)  $\text{NaOH}$

For questions 9. and 10., consider the following heating curve of a hypothetical substance:



- What is the boiling point of the substance?  
(a)  $0^\circ\text{C}$       (c)  $12^\circ\text{C}$   
(b)  $-50^\circ\text{C}$       (d)  $75^\circ\text{C}$
- What state of matter is the substance at  $50^\circ\text{C}$ ?  
(a) gas      (c) solid  
(b) liquid      (d) not enough information

## Answers

1. (c)      2. (b)      3. (d)      4. (c)      5. (c)      6. (a)      7. (d)      8. (a)      9. (d)      10. (b)

## Chemistry Diagnostic Test Sample Questions

Competency areas: Compounds and elements; states of matter; reactions of matter; structure of matter; periodic properties; solutions; qualitative kinetics and thermodynamics; lab skills, mathematical skills. A Periodic Table is provided with the exam.

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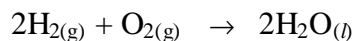
1. The correct formula for aluminum nitrate is

- (a)  $\text{Al}_3\text{N}_2$       (b)  $\text{Al}_3(\text{NO}_3)$       (c)  $\text{Al}(\text{NO}_2)_3$       (d)  $\text{Al}(\text{NO}_3)_3$
- 

2. A substance releases heat when it changes from

- (a) liquid to solid  
(b) solid to gas  
(c) liquid to gas  
(d) solid to liquid
- 

3. Given the balanced equation:



How many grams of  $\text{H}_2\text{O}$  are formed if 9.00 mol  $\text{H}_{2(g)}$  reacts completely with an excess of  $\text{O}_{2(g)}$ ? The molar mass of  $\text{H}_2\text{O}$  is 18.0g/mol.

- (a) 18.0g      (b) 36.0g      (c) 81.0g      (d) 162g
- 

4. Which element has exactly five electrons in the highest principal energy level (the outer shell)?

- (a) Se      (b) Ba      (c) P      (d) Ge
-

5. Which element is a metal?
- (a) Se (atomic number = 34)
  - (b) Co (atomic number = 27)
  - (c) C (atomic number = 6)
  - (d) Br (atomic number = 35)
- 

6. What volume of 1.5M NaOH is needed to provide 0.75 mol of NaOH?
- (a) 500L
  - (b) 5.0 L
  - (c) 500 mL
  - (d) 0.75 L
- 

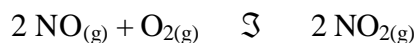
7. For a chemical reaction it is usually found that the reaction rate is faster at higher temperature. The rate increases because
- (a) the concentrations of reactants increase
  - (b) more reactants collide with energy equal to or greater than the activation energy
  - (c) the concentrations of products increase
  - (d) the volume expands and there is more room for new compounds (products) to form
- 

8. Which answer is closest to the true value of the expression:  
 $(9.1 \times 10^4)(1.1 \times 10^{-5})(\log 10^{-13})(1000)$
- (a) 1.3
  - (b) 13000
  - (c) -13000
  - (d)  $1.3 \times 10^{-11}$
-

9. Which substance does not obey the Lewis octet rule?

- (a) N<sub>2</sub>      (b) NO      (c) CF<sub>4</sub>      (d) Ar
- 

10. For the reaction at equilibrium:



which change will increase the amount of NO<sub>2(g)</sub>?

- (a) remove NO gas  
(b) add NO gas  
(c) add a catalyst  
(d) remove O<sub>2</sub> gas
- 

11. For the reaction



the expression for the equilibrium constant, K, is

- (a)  $\frac{[\text{CO}_2][\text{H}_2\text{O}]}{[\text{C}_6\text{H}_6][\text{O}_2]}$   
(b)  $\frac{[\text{CO}_2]^{12}[\text{H}_2\text{O}]^6}{[\text{C}_6\text{H}_6]^2[\text{O}_2]^{15}}$   
(c)  $\frac{[\text{C}_6\text{H}_6][\text{O}_2]}{[\text{CO}_2][\text{H}_2\text{O}]}$   
(d)  $\frac{[12\text{CO}_2][6\text{H}_2\text{O}]}{[2\text{C}_6\text{H}_6][15\text{O}_2]}$
- 

answers: 1d; 2a; 3d; 4c; 5b; 6c; 7b; 8c; 9b; 10b; 11b