

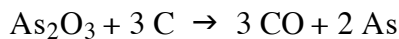
## Fundamentals of Engineering Exam - General Chemistry Review

- All of the following are oxidation-reduction reactions EXCEPT:
  - $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
  - $\text{CO}_2 + \text{C} \rightarrow 2 \text{CO}$
  - $\text{Fe} + \text{S} \rightarrow \text{FeS}$
  - $2 \text{SO}_2 + \text{O}_2 \rightarrow 2 \text{SO}_3$
  
- To determine the chemical formula of a compound, one needs to know all of the following EXCEPT the:
  - atomic weights of the elements in the compound
  - density of the compound
  - molecular weight of the compound
  - elements that compose the compound
  
- The element tin has eight different stable isotopes. The atomic nuclei of all eight isotopes have the same:
  - binding energy
  - number of neutrons
  - mass
  - number of protons
  
- The photoelectric effect refers to a process in which:
  - a quantum of energy is converted into a photon
  - electrons release light from a metal target
  - an electron is converted into two photons
  - light releases electrons from a target metal
  
- When the pressure of a constant mass of an ideal gas is doubled and the absolute temperature is halved, the volume is:
  - quartered
  - halved
  - quadrupled
  - doubled
  
- The volume (L) of 1 mol of  $\text{H}_2\text{O}$  at 546 K and 1.00 atm pressure is most nearly:
  - 11.2
  - 14.9
  - 22.4
  - 44.8

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7. Consider the equation:



Atomic weights may be taken as 75 for arsenic, 16 for oxygen, and 12 for carbon.

According to the equation above, the reaction of one standard gram-mole of  $\text{As}_2\text{O}_3$  with carbon will result in the formation of:

- A) 1 gram-mole of As
- B) 28 grams of CO
- C) 150 grams of As
- D) a greater amount by weight of CO than As

8. If 60 mL of NaOH solution neutralizes 40 mL of 0.50 M  $\text{H}_2\text{SO}_4$ , the concentration of NaOH solution is most nearly:

- A) 0.80 M
- B) 0.67 M
- C) 0.45 M
- D) 0.33 M

9. The atomic weights of sodium, oxygen, and hydrogen are 23, 16, and 1, respectively. To neutralize 4 grams of NaOH dissolved in 1 L of water requires 1 L of:

- A) 0.001 normal HCl solution
- B) 0.01 normal HCl solution
- C) 0.1 normal HCl solution
- D) 1.0 normal HCl solution

10. Consider the following equation

$$K = \frac{[C]^2[D]^2}{[A]^4[B]}$$

The equation above is the formulation of the chemical equilibrium constant equation for which of the following reactions?

- A)  $\text{C}_2 + \text{D}_2 \rightarrow \text{A}_4 + \text{B}$
- B)  $4 \text{A} + \text{B} \rightarrow 2 \text{C} + 2 \text{D}$
- C)  $4 \text{C} + 2 \text{D} \rightarrow 2 \text{A} + \text{B}$
- D)  $\text{A}_4 + \text{B} \rightarrow \text{C}_2 + \text{D}_2$

11. Pure water is boiling in an open pan at atmospheric pressure. Salt at a temperature equal to that of the boiling water is added. Immediately after the salt dissolves, which of the following will most likely occur?

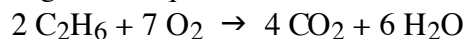
- A) The boiling ceases.
- B) The temperature of the solution drops by  $10^\circ\text{C}$ .
- C) The water ionizes.
- D) The entire mass becomes solid.

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12. The statement that equal volumes of all gases under the same conditions of temperature and pressure contain very nearly the same number of molecules is known as

- A) Avogadro's law
- B) Boyle's law
- C) Dalton's law
- D) Gay-Lussac's law

13. Ethane burns according to the equation



What volume of  $\text{CO}_2$ , measured at standard temperature and pressure, is formed for each gram-mole of  $\text{C}_2\text{H}_6$  burned?

- A) 22.4 liters
- B) 44.8 liters
- C) 88.0 liters
- D) 89.6 liters

14. The valence (oxidation state) of manganese in potassium permanganate,  $\text{KMnO}_4$ , is

- A) +3
- B) +4
- C) +5
- D) +7

15. In electrolysis, the anions migrate to the anode. Which of the following ions migrate to the other electrode?

- A) Acidic ions
- B) Basic ions
- C) Neutral ions
- D) Cations

16. Which of the following elements would **NOT** be expected to form a positive ion?

- A) Lithium (Li)
- B) Sulfur (S)
- C) Magnesium (Mg)
- D) Tantalum (Ta)