

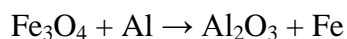
**Exam 2016**  
***Inorganic Chemistry***  
**Test no.1**

*Each item has only one correct answer. Choose the correct answer among options given by marking one letter:*

1. Early spacecraft developed by the National Aeronautics and Space Administration for its manned missions used capsules that had a pure oxygen atmosphere (100% O<sub>2</sub>). This practice was stopped when a spark from an electrical short in the wiring inside the capsule of the Apollo1 (Apollo/Saturn 204, AS-204) spacecraft ignited its contents (Friday, 27 January 1967). The resulting explosion and fire killed the U.S. three astronauts (Gus Grissom, Ed White and Roger Chaffee) on board within minutes. The disaster occurred because organic compounds are highly flammable in a pure oxygen atmosphere.

*What chemical step could has been taken to prevent this disaster?*

- a. Using a mixture of 20% O<sub>2</sub> and an inert gas such as N<sub>2</sub> or He;
  - b. Using a mixture of 90% O<sub>2</sub> and 10% HCl(g);
  - c. Using a mixture of 90% O<sub>2</sub> and 10% CO.
2. Between the two atoms of O<sub>2</sub> molecule is formed:
- a. a nonpolar covalent bond;
  - b. an ionic bond;
  - c. a polar covalent bond.
3. What is the electron configuration of Na?
- a. 1s<sup>2</sup>2s<sup>2</sup>
  - b. 1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>
  - c. 1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>3s<sup>1</sup>
4. When the following equation is balanced and written with the smallest whole number coefficients, what is the coefficient of Al?

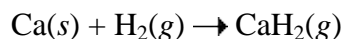


- a. 2
- b. 3
- c. 8

5. What is the oxidation state of Cr in  $\text{K}_2\text{CrO}_4$ ?

- a. -6
- b. -2
- c. +6

6. Identify the reducing agent in the following reaction:



- a.  $\text{Ca}(s)$ ;
- b.  $\text{H}_2(g)$
- c.  $\text{CaH}_2(g)$

7. What volume  $V_1$  of a 0.8 M NaOH solution should be taken and what volume of water ( $V_a$ ) should be added in order to obtain 100 mL of 0.5 M NaOH final solution?

- a.  $V_1 = 35 \text{ mL}$ ;  $V_a = 65 \text{ mL}$ ;
- b.  $V_1 = 62.5 \text{ mL}$ ;  $V_a = 37.5 \text{ mL}$ ;
- c.  $V_1 = 37.5 \text{ mL}$ ;  $V_a = 62.5 \text{ mL}$ .

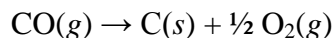
8. The pH of a solution whose concentration of the hydronium ions ( $\text{H}_3\text{O}^+$ ) is  $10^{-8.3} \text{ M}$ , is:

- a. 5.7;
- b. -8.3;
- c. 8.3.

9. Water presents unusual properties (high viscosity, high surface tension, high boiling point, high dielectric constant, etc.) because:

- a. it is a liquid at normal temperature;
- b. it contains oxygen;
- c. it has associated molecules through hydrogen bonds.

10. The heat of combustion of  $\text{C}(s)$  is  $-394 \text{ kJ/mol}$  and that of  $\text{CO}(g)$  is  $-111 \text{ kJ/mol}$ . What is the enthalpy change for the reaction below?



- a. 505 kJ
- b. 283 kJ
- c. -283 kJ

11. If the expression of a reaction rate is:  $v = k \cdot [A]^2 \cdot [B]$ , the rate constant  $k$  is expressed in the units:

- a.  $\text{mol}^{-1} \cdot \text{L} \cdot \text{s}^{-1}$ ;
- b.  $\text{s}^{-1}$ ;
- c.  $\text{mol}^{-2} \cdot \text{L}^2 \cdot \text{s}^{-1}$ .

12. In the gaseous state,  $\text{PCl}_5$  can decompose at  $250^\circ\text{C}$  according to:



What effect would a decrease in  $\text{Cl}_2$  concentration have on the equilibrium position?

- a. the reaction will proceed to the right;
- b. no effect;
- c. the reaction will proceed to the left.

Realised by,  
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