FE Review

Chemistry

Problem Statements

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Periodic Table

1. The sum of the atomic mass number and the atomic number of an element is 28. If the atomic number is subtracted from the sum of the number of protons and neutrons, this difference is 10. What is the element?

   (A) Ni    (B) Ne    (C) Si    (D) F
2. The number of electrons in a neutral Carbon atom is:

(A) 12   (B) 6   (C) 18   (D) 14
3. Neon (Ne) has chemical properties similar to:

(A) O  (B) H  (C) Kr  (D) N
Balancing Equations

4. Which of the following are balanced?

(A) $3\text{HBrO}_3 + \text{HBr} \rightarrow 2\text{H}_2\text{O} + 2 \text{Br}_2$
(B) $2\text{HBrO}_3 + 4\text{HBr} \rightarrow 3\text{H}_2\text{O} + 3\text{Br}_2$
(C) $\text{HBrO}_3 + 4\text{HBr} \rightarrow 3\text{H}_2\text{O} + \text{Br}_2$
(D) $\text{HBrO}_3 + 5\text{HBr} \rightarrow 3\text{H}_2\text{O} + 3\text{Br}_2$
5. 100mL of NaOH solution neutralizes 60 mL of 0.5 M $\text{H}_2\text{SO}_4$. The concentration of the NaOH solution is:

(A) 0.5  (B) 0.6  (C) 0.7  (D) 0.8
6. What coefficients are needed to balance the following reaction?

\[ \text{___CH4 + ___O2 \rightarrow ___CO2 + ___H2O} \]

(A) 1, 3, 2, 2  (B) 1, 2, 1, 2
(C) 2, 2, 1, 2  (D) 2, 4, 2, 2
Avogadro’s Number

7. The mass in grams of .317 mole of CO₂ is most nearly:

(A) 44  (B) 32  (C) 28  (D) 14
8. The number of molecules in 1 mg of \( \text{H}_2\text{SO}_4 \) is most nearly:

(A) \( 6.2 \times 10^{14} \)  
(B) \( 6.2 \times 10^{16} \)  
(C) \( 6.2 \times 10^{18} \)  
(D) \( 6.2 \times 10^{20} \)  
(E) \( 6.2 \times 10^{23} \)
Acids and Bases

9. When a solution with a pH of 9 is changed to a solution with a pH of 11, the concentration of hydrogen ions [H+] is changed by a factor of:

(A) 0.01   (B) 0.1   (C) 1   (D) 100
10. A solution of hydrochloric acid has a pH of 4. The number of hydrogen ions in 1.7 mL of this solution is:

(A) $10^{16}$  (B) $10^{17}$  (C) $10^{18}$  (D) $10^{19}$
11. A 0.01 M HCl solution has a pH of:

(A) 5          (B) 4          (C) 3          (D) 2
Electrochemistry

12. In electrolysis cations migrate to the cathode. These ions migrate to the other electrode:

(A) $[H^+]$  
(B) ancations  
(C) bions  
(D) anions
13. Which of the following is **NOT** an oxidation-reduction reaction:

(A) $2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3$
(B) $\text{CO}_2 + \text{C} \rightarrow 2\text{CO}$
(C) $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
(D) $\text{Fe} + \text{S} \rightarrow \text{FeS}$
14. When a substance is undergoing reduction:

(A) It always looses an oxygen atom
(B) It always gains an oxygen atom
(C) It always looses electrons
(D) It always gains electrons
15. If we want to neutralize 8 grams of NaOH dissolved in 2L of water, we need 1 L of HCl solution with a normality of:

(A) 0.2    (B) 0.3    (C) 0.4    (D) 0.5
16. 2 L of an ideal gas at a pressure of 3 atm has a temperature of 45°C. What will the volume of gas in L if it is heated to 145°C and the pressure is maintained at 3 atm?:

(A) 2.6  (B) 4.5  (C) 6.4  (D) 8.5
17. Given the following reaction:
\[ 2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 4\text{CO}_2 + 6\text{H}_2\text{O} \]

How many liters of \( \text{CO}_2 \) is produced (at standard temperature and pressure) for each gram-mole of \( \text{C}_2\text{H}_6 \)?

(A) 44.8       (B) 89.6       (C) 22.4       (D) 11.2
18. What is the volume, in liters, of 1 mole of CO$_2$ at 500$^0$K and 1 atm of pressure?

(A) 41       (B) 51       (C) 61       (D) 71
19. A mixture of 4 kg of nitrogen ($N_2$), 2 kg of oxygen ($O_2$) and 1 kg of chlorine ($Cl_2$), what is the mole fraction of the nitrogen gas?

(A) 0.45    (B) 0.55    (C) 0.65    (D) 0.75
Equilibrium Constant

20. The equilibrium constant \[ K = \frac{[C]^3[D]^2}{[A][B]^4} \] describes which of the following reactions:

(A) \( 3C + 2D \leftrightarrow A + 4B \)
(B) \( A + 4B \leftrightarrow 3C + 2D \)
(C) \( B_4 + A \leftrightarrow C + D \)
(D) \( C_3 + D_2 \leftrightarrow A + B_4 \)