

Multiple Choices

1. Joule (J) = $\frac{1}{2} m v^2 \Rightarrow \text{kg m}^2/\text{s}^2 = \text{J}$
- A) $\text{kg} \cdot \text{m}^{-1} \cdot \text{s}^{-2}$ B) $\text{kg} \cdot \text{m}^{-2} \cdot \text{s}^{-2}$ C) $\text{kg} \cdot \text{m} \cdot \text{s}^{-2}$ **D) $\text{kg} \cdot \text{m}^2 \cdot \text{s}^{-2}$**
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2. By balancing the following equation: $\text{CaCO}_3 + n \text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$, the value of n should be:
- A) 1 **B) 2** C) 3 D) 4
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3. Number of CO_2 molecules in 52 g is: $\text{mol} = \frac{52}{44} = 1.1818 \text{ mol}$ $\text{no. molec.} = 1.1818 \times 6.022 \times 10^{23} = 7.12 \times 10^{23} \text{ molecule}$
- A) 7.11×10^{23}** B) 1.42×10^{24} C) 3.56×10^{23} D) 4.02×10^{23}
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4. The empirical formula of a compound that contains C, H, O (70.6% C, 5.9% H) $\text{O} = 23.5$ is:
- $\text{C } 70.6/12 = 5.88 \rightarrow 1.47$
 $\text{H } 5.9/1 = 5.9 \rightarrow 1.47$
 $\text{O } 23.5/16 = 1.47 \rightarrow 1$
- A) $\text{C}_8\text{H}_8\text{O}_2$ B) $\text{C}_4\text{H}_6\text{O}_2$ C) $\text{C}_4\text{H}_4\text{O}_2$ **D) $\text{C}_4\text{H}_4\text{O}$**
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5. An element "X" combines with oxygen to form XO_2 . If 13.4 g of this element combines with 7.8 g of O_2 , therefore the molar mass of X is: $\text{X} + \text{O}_2 \rightarrow \text{XO}_2$
- $1 \text{ mol X} \rightarrow 1 \text{ mol O}_2$
 $\text{mol O}_2 = \frac{7.8}{32} = 0.244 \text{ mol}$
 $0.244 = \frac{13.4}{\text{Mol X}} \Rightarrow \text{Mol X} = 54.9$
- A) 83.45 **B) 54.97** C) 47.20 D) 37.50
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6. For the following equation: $(2 \text{FeCl}_3 + 3 \text{H}_2\text{S} \rightarrow 6 \text{HCl} + \text{Fe}_2\text{S}_3)$ If 90.0 g of FeCl_3 reacts with 52.0 g of H_2S , then the remaining mass (in grams) of the excess compound is:
- $\frac{2 \text{FeCl}_3}{90/162.15} = 0.555$ $\frac{3 \text{H}_2\text{S}}{52/34} = 1.529$
 $2 \text{ mol} \rightarrow 3 \text{ mol}$
 $0.555 \rightarrow \text{X}$
 $\text{X} = 0.8325 \text{ mol}$
 $1.529 - 0.8325 = 0.6965$
 $0.6965 \times 34 = 23.68 \text{ g remaining mass}$
- A) 33.25 **B) 23.64** C) 25.21 D) 24.76
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7. The molality "m" of an aqueous solution of sugar ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) is 1.62 molal, then the mole fraction of sugar is:
- $m = \frac{1.62 \text{ mol}}{1 \text{ kg H}_2\text{O}}$ $\text{so } \frac{1000 \text{ g}}{18} = 55.55 \text{ mol H}_2\text{O}$
 1.62 mol sugar
 $\text{X}_{\text{sugar}} = \frac{1.62}{1.62 + 55.55} = 0.0283$
- A) 0.0391 **B) 0.0283** C) 0.0841 D) 0.0428
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8. When 5.0 g of KClO_3 is heated ($2 \text{KClO}_3 \rightarrow 2 \text{KCl} + 3 \text{O}_2$), 1.5 g of O_2 is produced. the percent yield is:
- $\text{mol KClO}_3 = \frac{5}{122.55} = 0.041$ $\frac{\text{mol O}_2}{3} = \frac{0.041}{2} \Rightarrow \text{mol O}_2 = 0.0615$
 $\text{mass O}_2 = 0.0615 \times 32 = 1.968 \text{ g}$
 $\% \text{ yield} = \frac{1.5}{1.968} \times 100 = 76.6\%$
- A) 70.6 % B) 90.1 % **C) 76.6 %** D) 80.0 %
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9. The volume of water (in mL) should be added to 400 mL of 0.250 M HCl solution to dilute it to exactly 0.100 M is:
- $M_1 V_1 = M_2 V_2$
 $0.25 \times 400 = 0.1 \times (400 + V)$
 $V = \frac{0.25 \times 400}{0.1} - 400 = 600 \text{ mL}$
- A) 400 B) 500 **C) 600** D) 700

10. The mass (in g) of 71.9 mL of water vapor at 0.4 atm and 665°C is: $n = \frac{PV}{RT} = \frac{0.4 \times 0.0719}{0.082 \times 938} = 0.000374$
 $\text{mass} = 0.000374 \times 18 = 0.0067$
 A) 0.003 B) 0.700 C) 0.070 D) 0.007

11. The mass (in g) of KClO_3 needed to produce 29.5 L of O_2 at 127°C and 760 torr = 1 atm is:
 $(2 \text{KClO}_3 \rightarrow 2 \text{KCl} + 3 \text{O}_2)$
 $n_{\text{O}_2} = \frac{PV}{RT} = \frac{1 \times 29.5}{0.082 \times 400} = 0.899 \text{ mol}$
 $n_{\text{KClO}_3} = \frac{2}{3} \times 0.899 = 0.599 \text{ mol}$
 $\text{mass KClO}_3 = 0.599 \times 122.55 = 73.38 \text{ g}$
 A) 12.2 B) 14.6 C) 73.38 D) 24.4

12. If helium (He) effuses at a rate of 4.0 mol/min, then the rate of effusion of oxygen (O_2) (in mol/min) is
 $\frac{r_{\text{He}}}{r_{\text{O}_2}} = \sqrt{\frac{M_{\text{O}_2}}{M_{\text{He}}}} \Rightarrow \frac{4}{r_{\text{O}_2}} = \sqrt{\frac{32}{4}}$
 $r_{\text{O}_2} = 1.41 \text{ mol/min}$
 A) 0.20 B) 1.41 C) 8.0 D) 2.0

13. The lowest density of hydrogen gas at 1 atm will be at: $\uparrow T \rightarrow \downarrow d$ $d = \frac{PM_{\text{M}}}{RT}$
 A) 273 K B) 273 °C C) -10 °C D) 100 °C

14. If the root mean square speed of a gas $u_{\text{r.m.s}} = 681.6 \text{ ms}^{-1}$ at 25°C, the gas is: $u = \sqrt{\frac{3RT}{M}}$
 $(681.6)^2 = \frac{3 \times 8.314 \times 298}{M}$
 $M = 0.015998 \text{ kg/mol} = 16 \text{ g/mol}$
 A) CO_2 B) H_2 C) O_2 D) CH_4

15. Deviation from the ideal gas behavior is greater at:
 A) Low temperature and high pressure.
 B) High temperature and high pressure.
 C) High temperature and low pressure.
 D) Low temperature and low pressure.