

Name: _____

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Date: _____

Regents Review



Calculations in Chemistry (with or WITHOUT the reference tables ☹)

- 1) Read each question and determine if the formula required is on your reference tables or not.
- 2) Show the correct numerical set-up and solve each problem. You should have units in your answer.

<p>1. How much heat is required to turn 15 grams of ice into liquid at 0°C?</p> $q = mH_f$ $q = (15\text{g})(334\text{J/g})$ $q = 3371.21\text{ J}$	<p>2. Convert 25°C to Kelvin.</p> $K = C + 273$ $K = 25 + 273$ $= 298\text{ k}$
<p>3. Instead of raising your hand and asking what to round to for question #4 → How many significant figures are in...</p> <p>★ 0.4 L = <u>1</u></p> <p>5.2 atm = <u>2</u></p> <p>2.14 L = <u>3</u></p> <p>Your answer should have <u>1</u> sig figs!</p>	<p>4. An aerosol can contains 0.4L of gas at a pressure of 5.2 atm. If the gas is sprayed into a container with a volume of 2.14 L, what will be the new pressure?</p> $(5.2\text{ atm} \times 0.4\text{L}) = (2.14\text{L} \times X\text{ atm})$ $x = 0.97\text{ atm}$
<p>5. What is the percent by mass of oxygen in $\text{Al}(\text{NO}_3)_3$?</p> $\text{gfm} = 214\text{ g/mol}$ $(144\text{ g O} / 213\text{ g/mol}) \times 100$ $= 67.6\% \text{ O}$	<p>6. a. Convert 12,000 Joules to kJ.</p> $12,000 / 1000 = 12\text{ kJ}$ <p>b. Write 12,000 J in scientific notation.</p> <p>★ 1.2×10^4</p>
<p>7. How much heat is required to turn 5 grams of water into steam at 100°C?</p> $q = mH_v$ $q = (5\text{g})(2260\text{J/g})$ $q = 11,300\text{ J}$	<p>8. How many grams of NaOH are in 1.5 moles of NaOH?</p> $1.5\text{ mol} \times 40\text{g/mol}$ $= 60\text{ g NaOH}$
<p>9. A 25ml solution of 0.5M NaOH is titrated until neutralized into a 50 ml sample of HCl. What is the molarity of the HCl?</p> $M_a V_a = M_b V_b$ $(0.5\text{M} \times 25\text{mL}) = (x\text{ M} \times 50\text{mL})$ $M_b = 0.25\text{M}$	<p>10. If 2.5 liters of solution contains 5 moles of dissolved solute, what is its molarity?</p> $M = \text{mol/L}$ $M = 5\text{mol}/2.5\text{L}$ $= 2\text{ M}$

$$\text{gfm} = 36.5 \text{ g/mol}$$

11. What is the concentration of a solution, in parts per million, if 0.02 gram of NaCl is dissolved in a 1000 gram solution?

$$\text{ppm} = (\text{mass solute}/\text{mass solution}) \times 1,000,000$$

$$\begin{aligned} \text{ppm} &= (0.02\text{g}/1000\text{g}) \times 1,000,000 \\ &= 20 \text{ ppm} \end{aligned}$$

12. If 12 grams of concentrated hydrochloric acid are dissolved in 1 L of water, what is the molarity of the solution?

$$12\text{g}/36.5\text{g/mol} = 0.027 \text{ mol}$$

$$M = \text{mol/L}$$

$$M = 0.027\text{mol}/1\text{L} = 0.027\text{M}$$

13. A student measures the mass of a sample to be 5.51 grams. The actual mass of the sample is known to be 5.30 grams. Calculate the percent error.

formula on table T

$$\begin{aligned} & (5.51 - 5.30 / 5.30) \times 100 \\ & = 3.96\% \end{aligned}$$

14. Cyclohexane has an empirical formula of CH₂. If the molar mass of the molecule is 84g/mol, what is its molecular formula?



$$\text{gfm CH}_2 = 14 \text{ g/mol}$$

$$84/14 = 6$$

$$\text{CH}_2 \times 6 = \text{C}_6\text{H}_{12}$$

15. Copper has 2 naturally occurring isotopes: Cu-63 has a mass of 62.93 and a relative abundance of 69.17%, and Cu-65 has a mass of 64.93 and a relative abundance of 30.83%. Calculate the atomic mass of copper.



$$(\text{mass } \times \%) + (\text{mass } \times \%) \dots / 100$$

$$\begin{aligned} & = (62.93 \times 69.17\%) + (64.93 \times 30.83\%) / 100 \\ & = 63.55 \text{ g} \end{aligned}$$

16. A hydrated salt has a mass of 9.0 grams. The salt is heated to a constant mass of 6.3 grams. What is the % mass of water in the hydrate?

$$9.0 - 6.3 = 2.7\text{g water only}$$

$$(2.7 \text{ g water}/9.0 \text{ g hydrate}) \times 100 = 30\% \text{ water}$$

17. If 1 gram of water absorbs 2000 Joules of heat at 25°C, what is the final temperature?

$$q = mc\Delta T$$

$$2000\text{J} = (1\text{g})(4.18)(x)$$

$$x = 478.47 \text{ deg C}$$

$$\text{delta T} = T_f - T_i$$

$$478.47 = T_f - 25$$

$$T_f = 503.47 \text{ deg C}$$

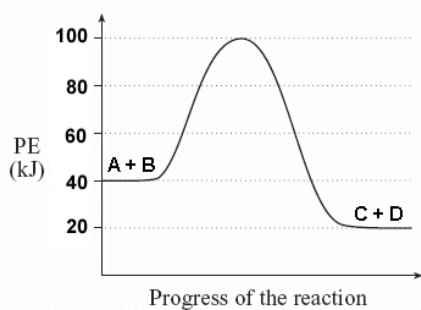
18. What is the density of CO gas if 0.196 g occupies a volume of 100. ml?

$$d = m/v$$

$$d = 0.196\text{g}/100$$

$$d = 0.00196 \text{ g/mL}$$

19. Calculate the heat of reaction (ΔH) for the reaction $A + B \rightarrow C + D$.



$$20 - 40$$

$$= -20 \text{ kJ}$$

20. If 1.0 gram of cesium-137 decays over a period of 90 years, how much cesium-137 will remain unchanged? (Need to use Table N, but no calculation formulas for half-life are given on the Reference Tables)



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