

Useful constants and other information:

$R = 0.0821 \text{ L}\cdot\text{atm}/\text{K}\cdot\text{mole}$ $R = 8.314 \text{ J}/\text{K}\cdot\text{mole}$ $h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$

Specific heat of $\text{H}_2\text{O}(\text{l}) = 4.314 \text{ J}/\text{g}\cdot^\circ\text{C}$ $1 \text{ cal} = 4.184 \text{ J}$

PART I.

1. The name of the element corresponding to the symbol Sn is _____.
2. The name of the element corresponding to the symbol K is _____.
3. The name of the element corresponding to the symbol F is _____.
4. The formula for the calcium phosphate is _____.
5. The formula of iron (III) hypochlorite is _____.
6. The formula of magnesium sulfate is _____.
7. The name for the compound P_4O_{10} is _____.
8. The name for the compound CuI_2 is _____.
9. The symbol for an isotope of a neutral atom which has 75 neutrons and 75 electrons is _____.
10. The isotope symbol $^{90}\text{Sr}^{2+}$ represents an atomic ion with _____ protons, _____ electrons and _____ neutrons.
11. Provide the coefficients needed to make the following a balanced chemical equation:
_____ $\text{CH}_3\text{NH}_2(\text{g})$ + _____ $\text{O}_2(\text{g})$ _____ $\text{CO}_2(\text{s})$ + _____ $\text{N}_2(\text{g})$ + _____ $\text{H}_2\text{O}(\text{g})$
12. The number 1.05672 has _____ significant figures.
13. The number 15782 would be expressed in scientific notation as _____ and has _____ significant figures
14. The number 0.005683 would be expressed in scientific notation as _____ and has _____ significant figures.

PART II.

- Given that 1 lb is equivalent to 454 g and 1 inch is equivalent to 2.43 cm, convert a density of 3.5 kg/dm³ to pounds per cubic feet (lb/ft³).
- Calculate the atomic weight (average atomic mass) of boron. Boron comes in two naturally occurring isotopes: ¹⁰B (10.013 amu, 19.78% abundance) and ¹¹B (11.009 amu, 80.22% abundance)
- a) Calculate the molecular weight of NO and b) determine the number of grams of N that are in NO per gram of O.
- Calculate the empirical formula for a compound that contains the following percents by mass: 31.9% potassium, 28.9% chlorine and 39.2% oxygen.
- For the balanced equation below, how many grams of hydrogen gas will be produced if 24.0 g of CaH₂ is reacted in excess water?



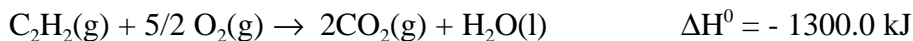
- For the balanced equation below, name the limiting reactant and determine the theoretical yield of Cu (in grams) if 50.0 g CuO is reacted with 6.00 g of NH₃ gas.
- $$3 \text{CuO}(\text{s}) + 2 \text{NH}_3(\text{g}) \rightarrow 3 \text{Cu}(\text{s}) + \text{N}_2(\text{g}) + 3 \text{H}_2\text{O}(\text{g})$$
- For the conditions listed in question 6 above, what would be the percent yield if 15.3 grams were the actual amount of Cu produced in the reaction.
 - A balloon is filled to a volume of 5.0 x 10² mL at a temperature of 20.0°C and a pressure of 710 torr. If the balloon is then cooled to a temperature of 100K at the same pressure, what is the new volume of the balloon?
 - Calculate the density of ammonia gas (NH₃) at 27°C and 635 torr.
 - Oxygen gas can be produced in small quantities from the decomposition of potassium chlorate (shown below):



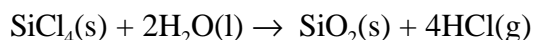
If 3.7 g of KClO₃ is reacted, what will the volume of gas be collected over water at 27°C and 735 torr? At 27°C, the vapor pressure of water is 26.7 torr.

- The diffusion rate of an unknown gas is measured to be 31.50 mL/min. Under identical conditions, the diffusion rate of O₂ gas is found to be 30.50 mL/min. What is the molecular weight of the unknown gas?
- A 28.3 g sample of nickel metal, at a temperature of 99.8°C is dropped into 150.0 g of water with a temperature of 23.5°C. The final temperature of the metal and water is 25.0°C. Calculate the specific heat of the nickel metal.

13. Given the following data, calculate ΔH^0 for the reaction, $2\text{C}(\text{s}) + \text{H}_2(\text{g}) \rightarrow \text{C}_2\text{H}_2(\text{g})$.



14. Using the values of ΔH_f^0 shown below, calculate ΔH^0 for the reaction:



<u>Compound</u>	<u>ΔH_f^0</u>
SiCl ₄	-687 kJ
H ₂ O	-286 kJ
SiO ₂	-911 kJ
HCl	-92 kJ

15. A bag of potato chips (total mass = 56 g) contains 19 g of fat, 28 g of carbohydrate and 5 g of protein. Calculate the total calorie content of the bag of potato chips. (fuel values are: fat = 38 J/g, carbohydrate = 17 J/g, protein = 17 J/g)
16. The laser in a compact disk player uses a wavelength of 780 nm. What is the frequency of this light and what is the energy of a single photon emitted from this laser?
17. Give the full electronic configuration for the following neutral atoms: Si; Te