

Honors Midterm Review

Chapter 1

Temperature conversions: $F = 9/5 C + 32$; $C = 5/9 (F-32)$; $K = C + 273.15$

Density= Mass/Volume

Density question:

An object has a mass of 480 lb and a volume of 275 cm³. What is its density in g/mL?

Answer: 790 g/mL

Dimensional analysis question:

Convert 11.3km/s to mi/hr

Answer: 25,300 mi/hr

Classification of matter question:

Classify: blood, brass, water, milk, unpolluted air, concrete

Answer: HO, HO, C, HO, HO, HE

Metric system question:

What is 35 microliters expressed in centiliters?

Answer: 3.5×10^{-3} cL

Chapter 2

Atomic mass question:

Silicon has three naturally occurring isotopes. Find the atomic mass.

Isotope	Mass (amu)	Abundance (%)
²⁸ Si	27.976927	92.23
²⁹ Si	28.976495	4.67
³⁰ Si	29.973770	3.10

Answer: 28.08 amu

Metalloids: B, Si, Ge, As, Sb, Te, At

Molecular/Empirical Formula question:

What is the empirical formula of C₄H₈O₂?

Answer: C₂H₄O

Diatomic molecules: H₂, N₂, O₂, F₂, Cl₂, Br₂, I₂

Chapter 3

Molecular weight question:

What is the molecular weight of sodium chromate?

Answer: Na₂CrO₄, 161.98 amu

Percent composition question:

What is the percent composition of oxygen in zinc phosphite?

Answer 27.11%

Avogadro's number: 6.02×10^{23}

Empirical and Molecular formula question:

A compound is 29.17% N, 4.20 % H, and 66.63% O. Its molar mass is 96 g/mol. Find the molecular formula.

Answer: N₂H₄O₄

Basic Stoichiometry question:

Nitrogen and hydrogen synthesize into ammonia. How many grams of nitrogen are needed to make 235 g of ammonia?

Answer: 193 g N₂

Advanced Stoichiometry question:

A mixture of 82.49 g of aluminum is mixed with 117.65 g of oxygen.

A) They react to form aluminum oxide. How many grams of product form?

Answer: 155.9 g Al_2O_3

B) How many grams of excess reactant is left over?

Answer: 44.27 g O_2

Percent yield question:

If a mixture of 75.3 g of P_4 and 38.7 g oxygen produce 43.3 g of tetraphosphorus hexaoxide, what is the percent yield for the reaction?

Answer: 48.9%

Chapter 4

Strong electrolyte: complete disassociation in water

Weak electrolyte: partial disassociation in water

Nonelectrolyte: no disassociation in water

Solubility question:

Which of the following are insoluble in water: MgBr_2 , SrCO_3 , BaS , PbI_2

Answer: SrCO_3 and PbI_2

Net ionic equation question:

What is the net ionic equation for the reaction between sodium carbonate and zinc sulfate?

Answer: $\text{Zn}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{ZnCO}_3(\text{s})$

Spectator ions question:

What are the spectator ions in the reaction between nitric acid and lithium hydroxide?

Answer: $\text{Li}^+(\text{aq})$ and $\text{NO}_3^-(\text{aq})$

Electrolyte behavior question:

Classify each of the following: HNO_3 , HF , $\text{Ba}(\text{OH})_2$, $\text{C}_4\text{H}_8\text{O}$

Answer: SE, WE, SE, NE

Neutralization questions:

What are the products of a reaction between an acid and a base hydroxide?

Answer: salt and water

What gas is produced in a neutralization reaction when the base is a sulfide?

Answer: hydrogen sulfide

What gas is produced in a neutralization reaction when the base is a carbonate?

Answer: carbon dioxide

Oxidation number questions:

What is the oxidation number of phosphorus in $\text{Na}_5\text{P}_3\text{O}_{10}$?

Answer: +5

What is the oxidation number of chlorine in perchloric acid?

Answer: +7

What is the oxidation number of carbon in aluminum carbonate?

Answer: +4

Electron transfer question:

How many electrons are transferred in the following redox reaction?

$4\text{NH}_3 + 5\text{O}_2 \rightarrow 4\text{NO} + 6\text{H}_2\text{O}$

Answer: $20e^-$

Molarity = moles of solute/ Liters of solution

Molarity questions:

Calculate the mass of solute needed to prepare 1.575 L of 0.00250 M sodium chlorate?

Answer 0.419 g NaClO_3

How many moles of ions are released when 1.6 mol of ammonium phosphate are dissolved in water?

Answer: 6.4 mol

How many sodium ions are present in 325 mL of 0.850 M sodium sulfate?

Answer 3.33×10^{23} ions

Dilution formula: $M_1V_1 = M_2V_2$

Dilution questions:

What is the final volume of a solution prepared by diluting 25 mL of 8.25 M sodium hydroxide to 2.40 M?

Answer: 86 mL

Calculate the molarity of a solution prepared by diluting 165 mL of 0.688 M calcium chloride to 925.0 mL.

Answer: 0.123 M

Solution Stoichiometry questions:

How many milliliters of 1.58 M HCl are needed to react completely with 23.2 g of NaHCO_3 ? $\text{HCl} + \text{NaHCO}_3 \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$

Answer: 175 mL

38.0 mL of 0.500 M copper (II) chloride is mixed with 42.0 mL of 0.600 M ammonium sulfide. A) How many grams of precipitate form?

Answer: 1.82 g CuS

B) How many grams of excess reactant are left over?

Answer: 0.42 g $(\text{NH}_4)_2\text{S}$

Chapter 5

Kinetic Energy:

Calculate the kinetic energy of a 150 pound object moving at 12 mph.

Answer: 980 J

Internal Energy:

Calculate the internal energy of a balloon that is heated by adding 500 J heat. The balloon expands doing 325 J of work.

Answer: +175 J

Enthalpy of Reaction:

Potassium chlorate decomposes into potassium chloride and oxygen, releasing 89.4 kJ of heat. Find the change in enthalpy of the reaction that forms 53.8 grams of the chlorate.

Answer: +19.6 kJ