Quantitative 2 – Gases, solutions & atom economy

Reading – page 46-49

Knowledge

1. What volume does 1 mole of a gas occupy at room temperature and pressure?

2. What is the equation linking concentration, mass and volume?

3. What is the equation linking mass, moles and formula mass?

4. What is 'Atom Economy'?

5. What is 'yield'?

6. What is 'theoretical yield'?

7. What is the symbol for a reversible reaction?

8. How do you convert cm^3 into dm^3?

Application

1. What is the formula for calculating atom economy?

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2. Calculate the atom economy in these reactions used in the chemical industry. Give all answers to 2 sig figs.

a) $CaCO_3 \rightarrow CaO + CO_2$ to produce CaO

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b) $Cl_2 + 2NaOH \rightarrow NaClO + NaCl + H_2O$ to produce NaClO

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c) $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$ to produce $CuSO_4$

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3. What volume is occupied by these gases at room temperature and pressure:

a) 3.5 moles of O_2

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b) 4g of H_2

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c) 3.55g of Cl_2

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d) 0.002g of He

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4. What volume of chlorine is needed to produce 4.68g sodium chloride?

$2Na + Cl_2 \rightarrow 2NaCl$

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5. Give two reasons that percentage yield is always less than 100%

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6. A student wanted to make 11.0 g of copper chloride.

The equation for the reaction is:

$$CuCO_3 + 2HCl \rightarrow CuCl_2 + H_2O + CO_2$$

Calculate the mass of copper carbonate the student should react with dilute hydrochloric acid to make 11.0 g of copper chloride.

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Mass of copper carbonate = _____ g

(c) The percentage yield of copper chloride was 79.1 %.

Calculate the mass of copper chloride the student actually produced.

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Actual mass of copper chloride produced = _____ g

7 a) What mass of $CuSO_4$ would you need to weigh out to make a 1 M solution?

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b) What volume of water would you need to dissolve it in?

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c) If you measured out $20cm^3$ of this solution, what mass of $CuSO_4$ would it contain?

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