

**EXAM: GASES, SOLUTIONS and CHEMICAL REACTIONS**

Name:

Group:

- 1** A tank contains a solution of sulfuric 40%. The density of that solution is 1.31 g/mL
- a) Calculate the concentration in g/L (1 POINT)
  - b) Calculate the molarity of the solution (0.8 POINTS)
  - c) Calculate the number of molecules of solute in 200 mL (0.7 POINTS)
- ESTIMATED TIME: 15 min  
2.5 POINTS

Atomic weights: S=32; O=16; H=1

$$N_A = 6.02 \times 10^{23}$$

- 2** In a container there is a sodium hydroxide solution 8 M. Calculate the volume of this first solution if we want to get a final solution 600 mL 50 g/L by dilution (adding water).
- ESTIMATED TIME: 15 min  
2.5 POINTS

Atomic weights: Na=23; O=16; H=1

- 3** We want to burn 200 g of methane gas.
- Write the balanced chemical equation and the table of proportions (1 POINT)
  - Calculate the volume of oxygen gas we need at P=800 mmHg and T=27 °C (1.5 POINTS)
- ESTIMATED TIME: 5 min  
2.5 POINTS

Atomic weights: O=16; H=1; C=12 ;  $R = 0.082 \frac{\text{atm.L}}{\text{K.mol}}$ 

- 4** The following unbalanced reaction is called the thermite reaction. It releases tremendous amounts of energy and is sometimes used to generate heat:
- $$\text{Al} + \text{Fe}_3\text{O}_4 \rightarrow \text{Fe} + \text{Al}_2\text{O}_3 \text{ (unbalanced)}$$
- If the masses of reactants are 200 g Al and 700 g Fe<sub>3</sub>O<sub>4</sub>
- a) Write the balanced chemical equation (0.5 POINTS)
  - b) Determine the limiting reactant (1 POINT)
  - c) Calculate the amount of iron formed in grams (0.5 POINTS)
  - d) Calculate the amount of the reactant in excess (in grams) (0.5 POINTS)
- ESTIMATED TIME: 15 min  
2.5 POINTS

Atomic weights: Al=27; O=16; Fe=55.8