Chemistry 161a – Fall 2018 **Chapter 5 Quiz**

+3/3

Name: Ciara Ostrander

Ammonium nitrate, the main component of fertilizers, is produced from the reaction of nitric acid and ammonia. The chemical equation for this synthesis is given below.

$$HNO_3\,(aq) + NH_3\,(g) \rightarrow NH_4NO_3\,(s)$$

Using the following table of standard enthalpies of formations at 25 °C:

1. Calculate the change in enthalpy for this process.
2. Indicate if this an exothermic or an endothermic process.

Substance	ΔH_f° (kJ/mol)
$HNO_3\,(aq)$	−206.6
$NH_3\,(g)$	−46.1
$NH_4NO_3\,(s)$	−365.6

① $\frac{1\,\text{mol}(-365.6\,\text{kJ})}{1\,\text{mol}} - \left[\frac{1\,\text{mol}(-46.1\,\text{kJ})}{1\,\text{mol}} + \frac{1\,\text{mol}(-206.6\,\text{kJ})}{1\,\text{mol}}\right] = -112.9\,\text{kJ}$

② This is an exothermic process because the $\Delta H < 0$.

3/3

Name: Natalia Reyes Becerra

Ammonium nitrate, the main component of fertilizers, is produced from the reaction of nitric acid and ammonia. The chemical equation for this synthesis is given below.

$$HNO_3\,(aq) + NH_3\,(g) \rightarrow NH_4NO_3\,(s)$$

Using the following table of standard enthalpies of formations at 25 °C:

1. Calculate the change in enthalpy for this process.
2. Indicate if this an exothermic or an endothermic process.

Substance	ΔH_f° (kJ/mol)
$HNO_3\,(aq)$	–206.6
$NH_3\,(g)$	–46.1
$NH_4NO_3\,(s)$	–365.6

1. $\Delta H_{rxn} = (1\,mol)\left(-365.6\,\frac{kJ}{mol}\right) - (1\,mol)\left(-46.1\,\frac{kJ}{mol}\right) - (1\,mol)\left(-206.6\,\frac{kJ}{mol}\right)$

$\Delta H_{rxn} = \boxed{-112.9\,kJ}$

2. Exothermic

Chemistry 161a – Fall 2018 **Chapter 5 Quiz**

$\times \frac{3}{3}$

Name: Jonara Jiménez

Ammonium nitrate, the main component of fertilizers, is produced from the reaction of nitric acid and ammonia. The chemical equation for this synthesis is given below.

N-2
H-4
O-3

$$\_\ HNO_3\ (aq) + \_\ NH_3\ (g) \rightarrow \_\ NH_4NO_3\ (s)$$

Using the following table of standard enthalpies of formations at 25 °C:

1. Calculate the change in enthalpy for this process.
2. Indicate if this an exothermic or an endothermic process.

Substance	ΔH_f° (kJ/mol)
$HNO_3\ (aq)$	–206.6
$NH_3\ (g)$	–46.1
$NH_4NO_3\ (s)$	–365.6

1.) $\Delta H =$

Reactants

$1(-206.6\ kJ/mol) + 1(-46.1\ kJ/mol) = -252.7\ kJ$

Products

$1mol(-365.4\ kJ/mol) = -365.4\ kJ$

$\Delta H^\circ_{rxn} = -365.4\ kJ + (+252.7\ kJ) = \boxed{-112.9\ kJ}$

2.) This is an exothermic process.

$x \frac{3}{3}$

Name: Afia Kuraga

Ammonium nitrate, the main component of fertilizers, is produced from the reaction of nitric acid and ammonia. The chemical equation for this synthesis is given below.

$$HNO_3\,(aq) + NH_3\,(g) \rightarrow NH_4NO_3\,(s)$$

Using the following table of standard enthalpies of formations at 25 °C:

1. Calculate the change in enthalpy for this process.
2. Indicate if this an exothermic or an endothermic process.

Substance	ΔH_f° (kJ/mol)
$HNO_3\,(aq)$	–206.6
$NH_3\,(g)$	–46.1
$NH_4NO_3\,(s)$	–365.6

$\Delta H^\circ_{rxn} = \sum n_{products} \Delta H_f^\circ{}_{products} - \sum n_{reactants} \Delta H_f^\circ{}_{reactants}$

~~$= (1\,mol\,HNO_3)(-206\,\frac{kJ}{mol}) + (1\,mol\,NH$~~

$= (1\,mol\,NH_4NO_3)(-365.6\,\frac{kJ}{mol}) - [(1\,mol\,HNO_3)(-206.6\,\frac{kJ}{mol}) + (1\,mol\,NH_3)(-46.1\,\frac{kJ}{mol})]$

$\Delta H^\circ_{rxn} = -365.6\,kJ - (-252.7\,kJ)$

$\Delta H^\circ_{rxn} = -112.9\,kJ$

This is an exothermic process because ΔH°_{rxn} is negative.