# Hess's Law Worksheet Practice

1. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:
    $PCl_5(g) \rightarrow PCl_3(g) + Cl_2(g)$
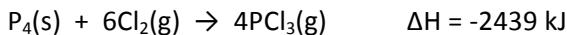
    $P_4(s) + 6Cl_2(g) \rightarrow 4PCl_3(g)$ ΔH = -2439 kJ
    $4PCl_5(g) \rightarrow P_4(s) + 10Cl_2(g)$ ΔH = 3438 kJ
    Answer = 249.8 kJ

2. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:
    $2CO_2(g) + H_2O(g) \rightarrow C_2H_2(g) + 5/2O_2(g)$
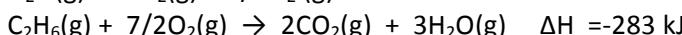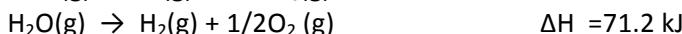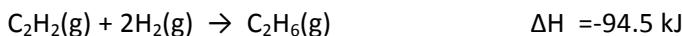
    $C_2H_2(g) + 2H_2(g) \rightarrow C_2H_6(g)$ ΔH =-94.5 kJ
    $H_2O(g) \rightarrow H_2(g) + 1/2O_2 (g)$ ΔH =71.2 kJ
 $C_2H_6(g) + 7/2O_2(g) \rightarrow 2CO_2(g) + 3H_2O(g)$ ΔH =-283 kJ
    Answer = 235 kJ

3. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:
    $N_2H_4(l) + H_2(g) \rightarrow 2NH_3(g)$
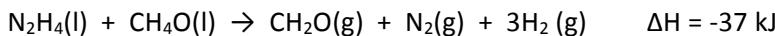
    $N_2H_4(l) + CH_4O(l) \rightarrow CH_2O(g) + N_2(g) + 3H_2 (g)$ ΔH = -37 kJ
    $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ ΔH = -46 kJ
 $CH_4O(l) \rightarrow CH_2O(g) + H_2(g)$ ΔH = -65 kJ
    Answer = -18 kJ

4. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:
    $H_2SO_4(l) \rightarrow SO_3(g) + H_2O(g)$
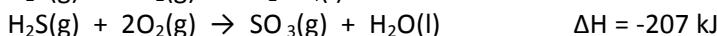
    $H_2S(g) + 2O_2(g) \rightarrow H_2SO_4(l)$ ΔH = -235.5 kJ
    $H_2S(g) + 2O_2(g) \rightarrow SO_3(g) + H_2O(l)$ ΔH = -207 kJ
 $H_2O(l) \rightarrow H_2O(g)$ ΔH = 44 kJ
    Answer = 72 kJ

5. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:
    $2C_2H_4O(l) + 2H_2O(l) \rightarrow 2C_2H_6O(l) + O_2(g)$
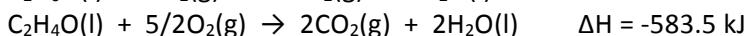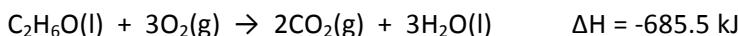
    $C_2H_6O(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$ ΔH = -685.5 kJ
    $C_2H_4O(l) + 5/2O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$ ΔH = -583.5 kJ
    Answer = 204.0 kJ

6. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:
    $N_2(g) + 2O_2(g) \rightarrow 2NO_2(g)$
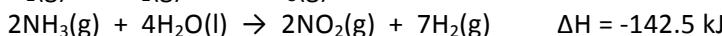
    $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ ΔH = -115 kJ
    $2NH_3(g) + 4H_2O(l) \rightarrow 2NO_2(g) + 7H_2(g)$ ΔH = -142.5 kJ
    $H_2O(l) \rightarrow H_2(g) + 1/2O_2(g)$ ΔH = -43.7 kJ
   Answer = -83 kJ

7. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$CO_2(g) \rightarrow C(s) + O_2(g)$
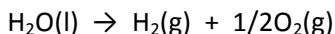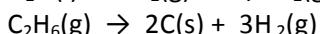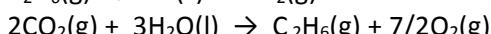
$H_2O(l) \rightarrow H_2(g) + 1/2O_2(g)$	ΔH = 643 kJ
$C_2H_6(g) \rightarrow 2C(s) + 3H_2(g)$	ΔH = 190.6 kJ
$2CO_2(g) + 3H_2O(l) \rightarrow C_2H_6(g) + 7/2O_2(g)$	ΔH = 3511.1 kJ

Answer = 886 kJ

8. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$N_2H_4(l) + CH_4O(l) \rightarrow CH_2O(g) + N_2(g) + 3H_2(g)$
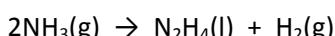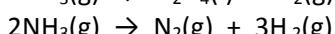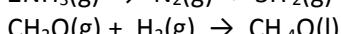
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$2NH_3(g) \rightarrow N_2H_4(l) + H_2(g)$	ΔH = 22.5 kJ
$2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$	ΔH = 57.5 kJ
$CH_2O(g) + H_2(g) \rightarrow CH_4O(l)$	ΔH = 81.2 kJ

Answer = -46.2 kJ

9. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$1/2H_2(g) + 1/2Cl_2(g) \rightarrow HCl(g)$
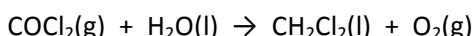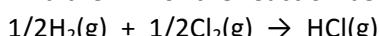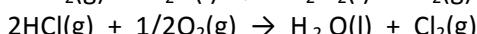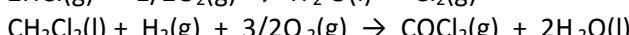
$COCl_2(g) + H_2O(l) \rightarrow CH_2Cl_2(l) + O_2(g)$	ΔH = 47.5 kJ
$2HCl(g) + 1/2O_2(g) \rightarrow H_2O(l) + Cl_2(g)$	ΔH = 105 kJ
$CH_2Cl_2(l) + H_2(g) + 3/2O_2(g) \rightarrow COCl_2(g) + 2H_2O(l)$	ΔH = -402.5 kJ

Answer = -230 kJ

10. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$C_2H_2(g) + 5/2O_2(g) \rightarrow 2CO_2(g) + H_2O(g)$
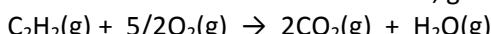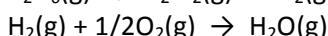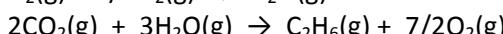
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$C_2H_6(g) \rightarrow C_2H_2(g) + 2H_2(g)$	ΔH = 283.5 kJ
$H_2(g) + 1/2O_2(g) \rightarrow H_2O(g)$	ΔH = -213.7 kJ
$2CO_2(g) + 3H_2O(g) \rightarrow C_2H_6(g) + 7/2O_2(g)$	ΔH = 849 kJ

Answer = -705 kJ

11. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$HCl(g) + NaNO_2(s) \rightarrow HNO_2(l) + NaCl(s)$
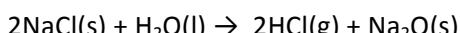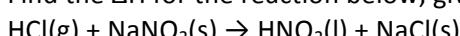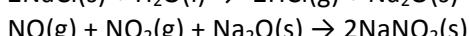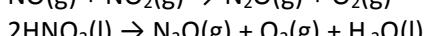
$2NaCl(s) + H_2O(l) \rightarrow 2HCl(g) + Na_2O(s)$	ΔH = 507 kJ
$NO(g) + NO_2(g) + Na_2O(s) \rightarrow 2NaNO_2(s)$	ΔH = -427 kJ
$NO(g) + NO_2(g) \rightarrow N_2O(g) + O_2(g)$	ΔH = -43 kJ
$2HNO_2(l) \rightarrow N_2O(g) + O_2(g) + H_2O(l)$	ΔH = 34 kJ

Answer = -78 kJ

12. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$Zn(s) + 1/8S_8(s) + 2O_2(g) \rightarrow ZnSO_4(s)$
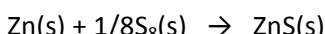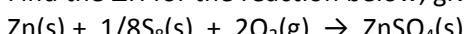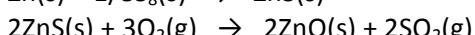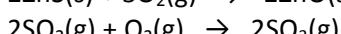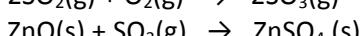
$Zn(s) + 1/8S_8(s) \rightarrow ZnS(s)$	ΔH = -183.92 kJ
$2ZnS(s) + 3O_2(g) \rightarrow 2ZnO(s) + 2SO_2(g)$	ΔH = -927.54 kJ
$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$	ΔH = -196.04 kJ
$ZnO(s) + SO_3(g) \rightarrow ZnSO_4(s)$	ΔH = -230.32 kJ

Answer = -976.03 kJ