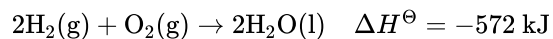

HL Paper 1

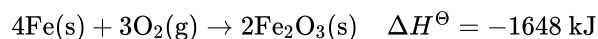
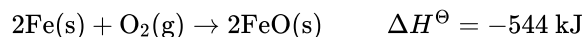
Given the enthalpy change for the reaction below:



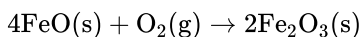
which statement is correct?

- A. The standard enthalpy change of combustion of $\text{H}_2(\text{g})$ is -286 kJ mol^{-1} .
 - B. The standard enthalpy change of combustion of $\text{H}_2(\text{g})$ is $+286 \text{ kJ mol}^{-1}$.
 - C. The standard enthalpy change of formation of $\text{H}_2\text{O}(\text{l})$ is -572 kJ mol^{-1} .
 - D. The standard enthalpy change of formation of $\text{H}_2\text{O}(\text{l})$ is $+572 \text{ kJ mol}^{-1}$.
-

Consider the two reactions involving iron and oxygen.

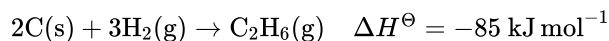
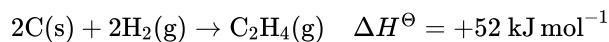


What is the enthalpy change, in kJ, for the reaction below?

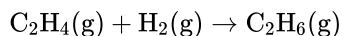


- A. $-1648 - 2(-544)$
 - B. $-544 - (-1648)$
 - C. $-1648 - 544$
 - D. $-1648 - 2(544)$
-

Enthalpy changes of reaction are provided for the following reactions.



What is the enthalpy change, in kJ mol^{-1} , for the reaction between ethene and hydrogen?



- A. -137
 - B. -33
 - C. $+33$
 - D. $+137$
-

The enthalpy change for the dissolution of NH_4NO_3 is $+26 \text{ kJ mol}^{-1}$ at 25°C . Which statement about this reaction is correct?

- A. The reaction is exothermic and the solubility decreases at higher temperature.
 - B. The reaction is exothermic and the solubility increases at higher temperature.
 - C. The reaction is endothermic and the solubility decreases at higher temperature.
 - D. The reaction is endothermic and the solubility increases at higher temperature.
-

Which equation represents the standard enthalpy of formation of liquid methanol?

- A. $\text{C}(\text{g}) + 2\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{CH}_3\text{OH}(\text{l})$
 - B. $\text{C}(\text{g}) + 4\text{H}(\text{g}) + \text{O}(\text{g}) \rightarrow \text{CH}_3\text{OH}(\text{l})$
 - C. $\text{C}(\text{s}) + 4\text{H}(\text{g}) + \text{O}(\text{g}) \rightarrow \text{CH}_3\text{OH}(\text{l})$
 - D. $\text{C}(\text{s}) + 2\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{CH}_3\text{OH}(\text{l})$
-

Which reaction has an enthalpy change equal to the standard enthalpy change of combustion?

- A. $\text{C}_3\text{H}_8(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{g})$
 - B. $\text{C}_3\text{H}_8(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{l})$
 - C. $2\text{C}_4\text{H}_{10}(\text{g}) + 13\text{O}_2(\text{g}) \rightarrow 8\text{CO}_2(\text{g}) + 10\text{H}_2\text{O}(\text{l})$
 - D. $\text{C}_5\text{H}_{12}(\text{g}) + 8\text{O}_2(\text{g}) \rightarrow 5\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{g})$
-

Which process is endothermic?

- A. $2\text{C}_4\text{H}_{10}(\text{g}) + 13\text{O}_2(\text{g}) \rightarrow 8\text{CO}_2(\text{g}) + 10\text{H}_2\text{O}(\text{g})$
 - B. $\text{Na}(\text{g}) \rightarrow \text{Na}^+(\text{g}) + \text{e}^-$
 - C. $\text{H}_2\text{SO}_4(\text{aq}) + 2\text{KOH}(\text{aq}) \rightarrow \text{K}_2\text{SO}_4(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
 - D. $\text{NH}_3(\text{g}) \rightarrow \text{NH}_3(\text{l})$
-

Which equation represents the bond enthalpy for the H-Br bond in hydrogen bromide?

- A. $\text{HBr}(\text{g}) \rightarrow \text{H}(\text{g}) + \text{Br}(\text{g})$
- B. $\text{HBr}(\text{g}) \rightarrow \text{H}(\text{g}) + \text{Br}(\text{l})$
- C. $\text{HBr}(\text{g}) \rightarrow \text{H}(\text{g}) + \frac{1}{2}\text{Br}_2(\text{l})$
- D. $\text{HBr}(\text{g}) \rightarrow \text{H}(\text{g}) + \frac{1}{2}\text{Br}_2(\text{g})$

The same amount of heat energy is added to 1.00 g of each substance.

Substance	Specific heat capacity / $\text{J g}^{-1} \text{K}^{-1}$
Copper	0.39
Aluminium	0.90
Sodium chloride	0.90
Water	4.18

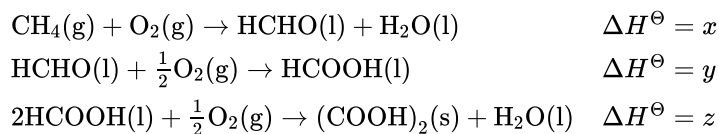
Which statement is correct if all the substances are at the same temperature before the heat energy is added?

- A. Copper will reach the highest temperature.
- B. Water will reach the highest temperature.
- C. All four substances will reach the same temperature.
- D. Aluminium will reach a higher temperature than sodium chloride.

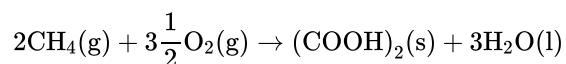
1.0 g of sodium hydroxide, NaOH, was added to 99.0 g of water. The temperature of the solution increased from 18.0 °C to 20.5 °C. The specific heat capacity of the solution is $4.18 \text{ J g}^{-1} \text{K}^{-1}$. Which expression gives the heat evolved in kJ mol^{-1} ?

- A. $\frac{2.5 \times 100.0 \times 4.18 \times 1000}{40.0}$
- B. $\frac{2.5 \times 100.0 \times 4.18}{1000 \times 40.0}$
- C. $\frac{2.5 \times 100.0 \times 4.18 \times 40.0}{1000}$
- D. $\frac{2.5 \times 1.0 \times 4.18 \times 40.0}{1000}$

Consider the equations below.



What is the enthalpy change of the reaction below?



- A. $x + y + z$
- B. $2x + y + z$
- C. $2x + 2y + z$
- D. $2x + 2y + 2z$

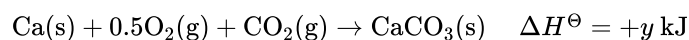
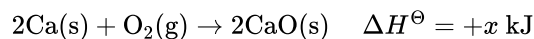
Which processes are exothermic?

- I. $\text{CH}_3\text{CH}_2\text{CH}_3(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{g})$
- II. $\text{Cl}_2(\text{g}) \rightarrow 2\text{Cl}(\text{g})$
- III. $\text{CH}_3\text{CH}_2\text{COOH}(\text{aq}) + \text{NaOH}(\text{aq}) \rightarrow \text{CH}_3\text{CH}_2\text{COONa}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III
-

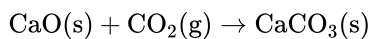
Which equation represents the standard enthalpy change of formation, ΔH_f^\ominus , of tetrachloromethane?

- A. $\text{C}(\text{g}) + 4\text{Cl}(\text{g}) \rightarrow \text{CCl}_4(\text{g})$
- B. $\text{C}(\text{s}) + 4\text{Cl}(\text{g}) \rightarrow \text{CCl}_4(\text{l})$
- C. $\text{C}(\text{g}) + 2\text{Cl}_2(\text{g}) \rightarrow \text{CCl}_4(\text{g})$
- D. $\text{C}(\text{s}) + 2\text{Cl}_2(\text{g}) \rightarrow \text{CCl}_4(\text{l})$
-

Consider the following two equations.



What is ΔH^\ominus , in kJ, for the following reaction?

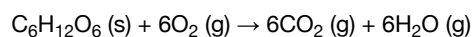


- A. $y - 0.5x$
- B. $y - x$
- C. $0.5 - y$
- D. $x - y$
-

Which ionic compound has the most endothermic lattice enthalpy?

- A. Sodium chloride
- B. Sodium oxide
- C. Magnesium chloride
- D. Magnesium oxide
-

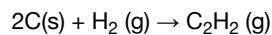
The combustion of glucose is exothermic and occurs according to the following equation:



Which is correct for this reaction?

	ΔH^\ominus	ΔS^\ominus	Spontaneous/ non-spontaneous
A.	negative	positive	spontaneous
B.	negative	positive	non-spontaneous
C.	positive	negative	spontaneous
D.	positive	positive	non-spontaneous

The equation for the formation of ethyne is:



What is the enthalpy change, in kJ, for this reaction using the enthalpy of combustion data below?

Reaction	$\Delta H^\ominus / \text{kJ}$
$\text{C}(\text{s}) + \text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g})$	-394
$2\text{H}_2 (\text{g}) + \text{O}_2 (\text{g}) \rightarrow 2\text{H}_2\text{O} (\text{l})$	-572
$2\text{C}_2\text{H}_2 (\text{g}) + 5\text{O}_2 (\text{g}) \rightarrow 4\text{CO}_2 (\text{g}) + 2\text{H}_2\text{O} (\text{l})$	-2602

A. $2 \times (-394) + \frac{1}{2} (-572) - \frac{1}{2} (-2602)$

B. $2 \times (-394) + (-572) - (-2602)$

C. $2 \times (-394) + \frac{1}{2} (-572) + \frac{1}{2} (-2602)$

D. $2 \times (-394) + (-572) + (-2602)$