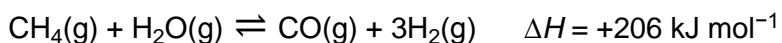


- 1 Hydrogen is produced by the reaction of methane with steam. The reaction mixture reaches a state of dynamic equilibrium.



Some enthalpy data is given in the table.

Bond	C–H	O–H	H–H	C≡H
Bond enthalpy / kJ mol ⁻¹	413	463	436	To be calculated

Use the information in the table and the stated enthalpy change to calculate the missing bond enthalpy.

- A 234
- B 1064
- C 1476
- D 1936

(Total 1 mark)

- 2 In which one of the following reactions is the standard enthalpy change equal to the standard enthalpy of formation of lithium fluoride?

- A $\text{Li}(\text{g}) + \text{F}(\text{g}) \rightarrow \text{LiF}(\text{s})$
- B $\text{Li}^+(\text{g}) + \text{F}^-(\text{g}) \rightarrow \text{LiF}(\text{s})$
- C $\text{Li}^+(\text{aq}) + \text{F}^-(\text{g}) \rightarrow \text{LiF}(\text{s})$
- D $\text{Li}(\text{s}) + \frac{1}{2}\text{F}_2(\text{g}) \rightarrow \text{LiF}(\text{s})$

(Total 1 mark)

3

This question is about the reaction given below.



Enthalpy data for the reacting species are given in the table below.

Substance	CO(g)	H ₂ O(g)	CO ₂ (g)	H ₂ (g)
$\Delta H_f^\ominus / \text{kJ mol}^{-1}$	-110	-242	-394	0

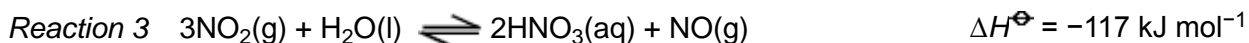
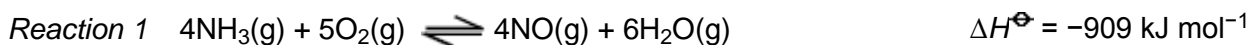
The standard enthalpy change for this reaction of carbon monoxide and steam is

- A +42 kJ mol⁻¹
- B -42 kJ mol⁻¹
- C +262 kJ mol⁻¹
- D -262 kJ mol⁻¹

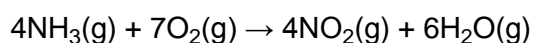
(Total 1 mark)

4

The data below refer to the industrial production of nitric acid from ammonia.



The direct oxidation of ammonia to nitrogen dioxide can be represented by the equation



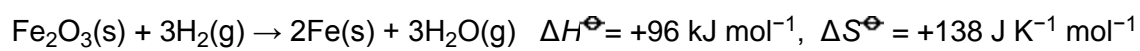
for which the standard enthalpy change, in kJ mol⁻¹, is

- A -1139
- B -1024
- C -794
- D -679

(Total 1 mark)

5

Using the information below, answer this question.



	Fe₂O₃(s)	H₂(g)	Fe(s)
$\Delta H_f^\ominus / \text{kJ mol}^{-1}$	-822.0	0	0
$\Delta S^\ominus / \text{J K}^{-1} \text{ mol}^{-1}$	90.0	131.0	27.0

The standard enthalpy of formation of steam is

- A +286 kJ mol⁻¹
- B +242 kJ mol⁻¹
- C -242 kJ mol⁻¹
- D -286 kJ mol⁻¹

(Total 1 mark)

Mark schemes

1 B

[1]

2 D

[1]

3 B

[1]

4 A

[1]

5 C

[1]