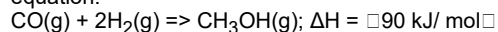


Thermochemistry exercise (2006 VCE)

Methanol can be produced in a reaction between carbon monoxide and hydrogen according to the following equation.



Which one of the following changes would occur when a catalyst is added to an equilibrium mixture of carbon monoxide, hydrogen and methanol?

- A. The value of ΔH would increase.
- B. The amount of methanol would increase.
- C. The temperature of the surroundings would increase.
- D. The rates of both the forward and reverse reactions would increase.

[Solution](#)

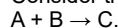
Solution will appear here

Which statement about the behaviour of a catalyst in this reaction is correct?

- A. It decreases the activation energy of the forward reaction only.
- B. It increases the activation energy of the forward reaction only.
- C. It decreases the activation energies of both the forward and back reactions.
- D. It increases the activation energies of both the forward and back reactions.

[Solution](#)

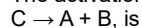
Consider the following information for the reaction



heat of reaction -120 kJ/mol

activation energy $+200 \text{ kJ/mol}$

The activation energy, in kJ/mol , for the reaction



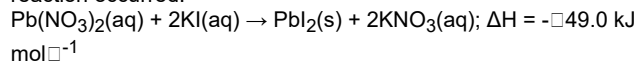
- A. -320
- B. -80
- C. $+80$
- D. $+320$

[Solution](#)

Solution will appear here

The calibration factor of a calorimeter can be determined by performing in the calorimeter a reaction which produces a known quantity of energy, and measuring the rise in temperature.

In one experiment, 50.0 mL of 0.400 M lead nitrate was added to 50.0 mL of 0.760 M potassium iodide in a solution calorimeter encased in a polystyrene insulating jacket. The mixture was stirred continuously and the temperature rose from 18.42°C to 20.50°C as the following reaction occurred.



a. Calculate the amount, in mole, of lead nitrate.

[Solution](#)

b. Calculate the amount, in mole, of potassium iodide.

[Solution](#)

c. Calculate the energy released by the reaction in the calorimeter, in J.

[Solution](#)

d. Calculate, to an appropriate number of significant figures, the calibration factor of the calorimeter and its contents, in $\text{J}^\circ\text{C}^{-1}$.

[Solution](#)

Two errors that might have occurred during this experiment are listed below. For each error, indicate the likely effect on the calculated calorimeter factor by placing a tick in the appropriate box.

Error	Calculated calibration factor too low	No effect on calculated calibration factor	Calculated calibration factor too high
i. The concentration of the lead nitrate solution had been incorrectly recorded and was actually 0.410 M			
ii. The calorimeter was not placed in its polystyrene jacket			

[Solution](#)

Solution will appear here

Give an explanation for your answer to part ii. above.

[Solution](#)