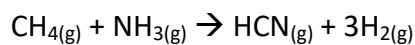


Bond Energy and the Types of Reactions

Bell Ringer Activity – Teacher Edition

The reaction for the production of hydrogen cyanide is as follows:



Bond	Bond Energy (kJ mol ⁻¹)
C—H	414
N—H	391
H—H	436
C≡C	860

Calculate the energy change in the following reaction using the bond data from the table above.

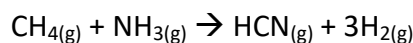
1. Draw the chemical reaction.

2. Calculate the enthalpy change for the reaction

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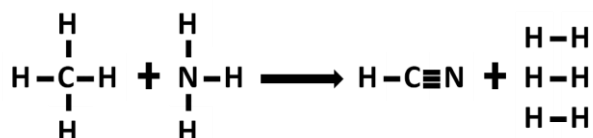
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1. Draw the chemical reaction.



2. Calculate the enthalpy change for the reaction

Bonds broken:

$$\text{CH}_3 \quad 4 \text{ mol} \times \text{C}-\text{H} \quad 4 \times 414 \text{ kJ mol}^{-1} = 1656 \text{ kJ}$$

$$\text{NH}_3 \quad 3 \text{ mol} \times \text{N}-\text{H} \quad 3 \times 391 \text{ kJ mol}^{-1} = 1173 \text{ kJ}$$

Total energy required for the reaction:

$$1656 + 1173 = 2829 \text{ kJ}$$

Bonds formed:

$$\text{HCN} \quad 1 \text{ mol} \times \text{H}-\text{C} \quad 1 \times 414 \text{ kJ mol}^{-1} = 414 \text{ kJ}$$

$$1 \text{ mol} \times \text{C}\equiv\text{C} \quad 1 \times 860 \text{ kJ mol}^{-1} = 860 \text{ kJ}$$

$$3 \text{ mol} \times \text{H}-\text{H} \quad 3 \times 436 \text{ kJ mol}^{-1} = 1308 \text{ kJ}$$

Total energy released from the reaction:

$$414 + 860 + 1308 = 2582 \text{ kJ}$$

Energy change =

$$2829 - 2582 = 247 \text{ kJ mol}^{-1}$$