

7 The boiling point of water, H_2O , is higher than that of hydrogen sulfide, H_2S .

Which statement explains this difference in boiling points?

- A** The bond energy of O–H is greater than the bond energy of S–H.
- B** The intermolecular forces in H_2O are weaker than the intermolecular forces in H_2S .
- C** The S–H bond in H_2S is longer than the O–H bond in H_2O .
- D** There is significant intermolecular hydrogen bonding in H_2O but **not** in H_2S .

3 The alkanes are a homologous series of organic molecules. Alkanes are generally unreactive and are commonly used as fuels.

(a) Define homologous series.

.....
..... [2]

(b) Give two reasons to explain the general unreactivity of alkanes.

1
2 [2]

(c) Alkanes with low relative molecular mass, M_r , are more useful than those found in heavier crude oil fractions.

Name the process that is used to obtain alkanes with low M_r from heavier crude oil fractions.

..... [1]

(d) Hexane, C_6H_{14} , has four structural isomers.

Fig. 3.1 shows hexane and two of its structural isomers.

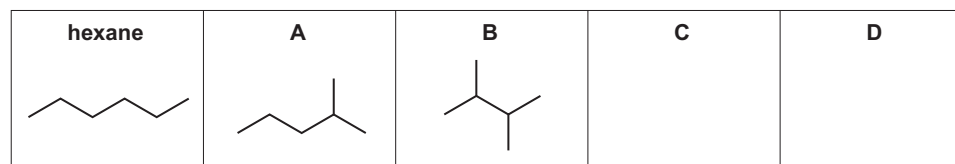


Fig. 3.1

(i) Complete Fig. 3.1 by drawing structures for **C** and **D**, the other two structural isomers of hexane. [2]

(ii) **A**, **B** and hexane have different boiling points.

Arrange **A**, **B** and hexane in order of increasing boiling point.

Explain your answer.

lowest < < highest
.....
.....
.....

- (e) Hexane can be converted into compounds **E** and **F** at high temperature and pressure. Fig. 3.2 shows the reaction scheme involving hexane, **E** and **F**.

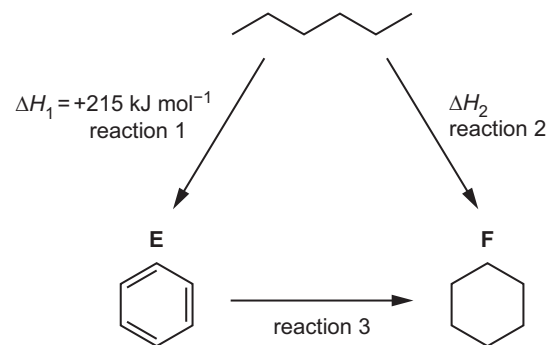


Fig. 3.2

- (i) Identify a suitable reagent for reaction 3.

..... [1]

- (ii) Use the data in Fig. 3.2 and in Table 3.1 to calculate the enthalpy change of reaction 2, ΔH_2 .

Table 3.1

compound	enthalpy change of formation, $\Delta H_f / \text{kJ mol}^{-1}$
	-156
	+48

$\Delta H_2 = \text{..... kJ mol}^{-1}$ [2]

- (iii) Write an equation for the complete combustion of hexane.

..... [1]