

SECTION 1 GENERAL MATHEMATICAL SKILLS

The questions in this Section check your grasp of two general skills that will be drawn on repeatedly throughout S342:

- 1 The manipulation of the values of physical quantities, given data presented in graphical form; and
- 2 The manipulation of expressions containing logarithms or exponentials.

Sections 1 and 2 of the AV Booklet, and the accompanying tape sequences (bands 1 and 2 on audiocassette 1) are designed to provide guidance in these areas.

Q1.1 to Q1.3 These questions refer to the plot of $1/y$ against $1/x$ shown in Figure 1.1.

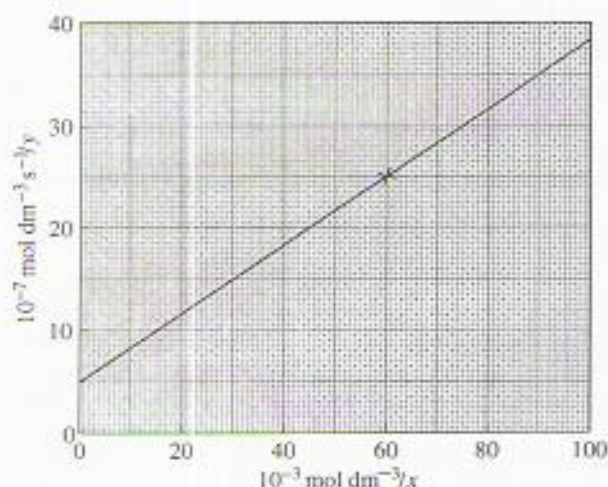


Figure 1.1 Plot of $1/y$ against $1/x$ for use with questions Q1.1 to Q1.3.

Q1.1 What is the value of $1/y$ at the point marked by the cross in Figure 1.1? Select from the key the value that is closest to your answer.

KEY for Q1.1

- A $2.5 \times 10^{-7} \text{ mol dm}^{-3} \text{ s}^{-1}$
- B $2.5 \times 10^{-6} \text{ mol dm}^{-3} \text{ s}^{-1}$
- C $2.5 \times 10^6 \text{ mol dm}^{-3} \text{ s}^{-1}$
- D $2.5 \times 10^6 \text{ mol}^{-1} \text{ dm}^3 \text{ s}$
- E $2.5 \times 10^7 \text{ mol}^{-1} \text{ dm}^3 \text{ s}$
- F $2.5 \times 10^8 \text{ mol}^{-1} \text{ dm}^3 \text{ s}$

Q1.2 According to Figure 1.1, what is the value of y at the point where $1/x = 0$? Select from the key the value that is closest to your answer.

KEY for Q1.2

- A $5 \times 10^{-7} \text{ mol dm}^{-3} \text{ s}^{-1}$
- B $2 \times 10^{-7} \text{ mol dm}^{-3} \text{ s}^{-1}$
- C $2 \times 10^{-8} \text{ mol dm}^{-3} \text{ s}^{-1}$
- D $5 \times 10^7 \text{ mol}^{-1} \text{ dm}^3 \text{ s}$
- E $2 \times 10^7 \text{ mol}^{-1} \text{ dm}^3 \text{ s}$
- F $2 \times 10^8 \text{ mol}^{-1} \text{ dm}^3 \text{ s}$

Q1.3 What is the slope of the line in Figure 1.1? Select from the key the value that is closest to your answer.

KEY for Q1.3

- A $3 \times 10^{-3} \text{ s}^{-1}$
- B $3 \times 10^{-4} \text{ s}^{-1}$
- C $3 \times 10^{-5} \text{ s}^{-1}$
- D $3 \times 10^3 \text{ s}^{-1}$
- E $3 \times 10^4 \text{ s}^{-1}$
- F $3 \times 10^3 \text{ s}$
- G $3 \times 10^4 \text{ s}$
- H $3 \times 10^5 \text{ s}$

Q1.4 This question is concerned with two physical quantities, x and y , that are related by the following expression:

$$y = Ae^{-(B/x)} \quad (1.1)$$

where A and B are constants. When the quantity x increases from an initial value, $x_1 = 300$, to a second value, $x_2 = 310$, the quantity y doubles in value; that is, $(y_2/y_1) = 2$. What is the value of the constant B in equation 1.1? Select from the key the value that is closest to your answer.

KEY for Q1.4

- A 7.4×10^{-5}
- B 2.2×10^{-4}
- C 6.9
- D 20
- E 6.5×10^3
- F 18.7×10^3

SECTION 2 BLOCKS 1 AND 2 (TMA 01)

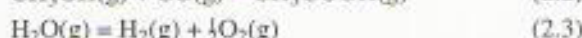
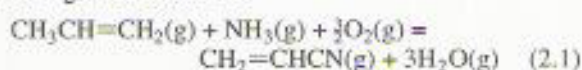
The questions in Parts A–C of this Section are designed to help you to revise your understanding of chemical thermodynamics, as introduced in the Second Level Inorganic Chemistry Course (S247), and developed further in Block 1 of S342. Parts D and E cover some of the important concepts and ideas discussed in Block 2. Working through the questions in Part D will also give you valuable practice in applying general types of analysis to specific examples, and should help to develop your problem-solving skills.

PART A

The questions in Part A test Objectives 1–3 of Block 1.

In answering the questions in Part A you will need to use thermodynamic data from the S342 Data Book. Where necessary, you may assume that ΔH_m^\ominus and ΔS_m^\ominus for the reactions of interest do not vary with temperature.

Q2.1 to Q2.6 These questions are concerned with the following three reactions:



For each of these questions, select your answer from the key for Q2.1 to Q2.6.

KEY for Q2.1 to Q2.6

- A None of the reactions
- B Reaction 2.1 alone
- C Reaction 2.2 alone
- D Reaction 2.3 alone
- E Reactions 2.1 and 2.2 alone
- F Reactions 2.1 and 2.3 alone
- G Reactions 2.2 and 2.3 alone
- H All three reactions