Course and assignment number:

Tutor Marked Assignment

S205 TMA 06

Make sure you know how to complete and send in your TMA and PT3 form: detailed instructions are given in *Completing TMA and CMA forms* in your *Student Handbook*.

Covering: **Books 9–11**

Cut-off date:
Friday 22 August 2003

Note that this assignment is not substitutable.

This assignment is made up of five questions. For each question, the following Table indicates:

- when you should attempt the question;
- the percentage of the total marks for this assignment allocated to the question; and
- the box number on the Assignment Form in which your tutor will indicate the marks that you obtain for the question.

Question number	*When to attempt it*	*Percentage of total marks*	*Box No. on Assignment Form*
1	after completing Book 9	33	1
2	after completing Book 9	20	2
3	after completing Book 9	22	3
4	after completing Book 10 Part 1	12	4
5	after completing Book 10 Part 1	13	5

Question 1

This question carries 33 per cent of the marks for this assignment, and tests Learning Outcomes 1, 13, 18, and 19 of Book 9 and Learning Outcome 3 of Book 11.

Prepare a one-minute lecture on the topic 'Hydrides across the Periodic Table'. This is a broad topic, so you should *not* try to cover everything. Aspects you may want to consider should include: structure of the hydrides, bonding in hydrides, second-row anomalies, reasons for trends.

You are allowed to use one A4 overhead.

You should submit a sketch for the overhead, the written script of your lecture, *and* a recording of the talk, either as a tape recording or as an audio file on floppy disk. If for any reason you do not find it possible to record your lecture, you should submit the written script only, and your tutor will record it for you. Your overhead is only expected to be a sketch of what you would use in a talk, and is *not* expected to be in its final form; that is, do *not* spend time producing a work of art.

Your talk will be judged against the following criteria:

- length (*5 marks*); the talk must be 60 ± 10 seconds long to gain the full allocation
- chemistry content (*13 marks*)
- clarity (*5 marks*)
- logical development (*5 marks*)
- overhead (*5 marks*)

Question 2

This question carries 20 per cent of the marks for this assignment, and tests Learning Outcomes 1 and 9 of Book 9.

In the elemental forms of phosphorus and arsenic, each atom forms three single bonds; white phosphorus, in particular, consists of P_4 molecules within which the phosphorus atoms are bound in this way. Nitrogen, however, which is in the same Group of the Periodic Table, consists of diatomic molecules that are held together by an N≡N triple bond.

(a) (*10 marks*) Use the bond enthalpy terms and thermodynamic data in the S205 *Data Book* to estimate a value of $\Delta H_f^{\ominus}(N_4, g)$. This quantity is the standard enthalpy of formation of a hypothetical form of nitrogen gas that consists of N_4 molecules akin to those of P_4 in Figure 11.2 of Book 9. *You should draw a thermodynamic cycle to support your calculation.*

(b) (*6 marks*) Is your estimated value consistent with the non-existence of $N_4(g)$ at room temperature? Give your reasoning.

(c) (*4 marks*) Discuss briefly how the relative sizes of the bond enthalpy terms that are involved in your calculation are responsible for the instability of $N_4(g)$.