NATURAL SCIENCES TRIPOS Part XX

XXXday XXth May 20XX X.XX to XX.XX

CHEMISTRY X: PAPER X

*Insert rubric here, in italics*

Where a question is divided into sections, the *approximate* division of marks between sections is indicated at the end of the question.

Linear graph paper is available if required.

The following is for Part IB, II and II – Part IA is different

A Periodic Table, the structures of the amino acids and nucleotide bases, the values of physical constants, character tables and selected mathematical formulae will be found in the data book provided.

Write on ONE side of the paper only.

The answers to each question should be returned separately.

A separate cover sheet for each question should be completed.

The basic style is **exam style** which is 12 point Times New Roman, 18 pt spacing, left justified, 0.75 cm tab stops. All the other styles are dependent on this.

The style **bold** is identical to exam style except that the text is in bold. The style **bold 14** is the same, but with 14 pt characters.

The style **hang** is used for indented paragraphs, but is other wise identical to **exam style**. This is what **hang** looks like:

(a) What is the nature of Chemistry? Illustrate your answer with several examples taken from different areas of the subject.

The style **equation** is used for equations, chemical equilibria *etc*. It is like **exam style** exact that the line spacing is not fixed, but will expand automatically to accommodate a taller equation. This style has two tab stops: a centred tab in the middle, which is used to place the equation in the middle of the line, and a right tab at the far right which can be used for equation numbers. The style includes 6 pts of space above and below the equation.

Here is an example of the **equation** style

 [1]

The style **picture** is used for pictures, ChemDraw diagrams *etc*. It is identical to **equation** except that it includes 10 pts of space above and below.

The style **Heading 1** is like **exam style**, but with bold text and 3 pts of space above and below. **Heading 2** is like **exam style**, but with italic text. The page numbers are in style **Page Number** and the footer is in style **Footer**.

Page numbers appear at the top of the page, except on the first page. All odd pages (except page 1) have [TURN OVER at their bottom right hand corner. The page margins are as requested by the Publications Section.

# SECTION A

## I5 Molecules to materials

1

Answer all parts of the question

(a) Why does **A** form a strong 1:1 complex with carboxylic acids (RCOOH) in CHCl3 but not in water?



19

Answer ***both*** parts of the question

(a) Outline the derivation of the following equation for the deflection angle  as a function of the impact parameter *b* and energy ** for classical scattering of a particle by a potential V(*R*):

 [1]

(b) For classical scattering by a potential *V*(*R*) = *c*/*R*2, where *c* > 0 is a constant, use the equation in part (i) to derive expressions for the impact parameter dependence of:

[END OF PAPER]