

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Semester 2 Examinations 2011

Module Title: Organic Chemistry

Module Code: CHEO 6001

School : Science

Programme Title: BSc. in Analytical & Pharmaceutical Chemistry – Stage 1.
 BSc. in Analytical Chemistry with Quality Assurance – Stage 1.
 BEng in Chemical & Biopharmaceutical Engineering-Stage 1.

Programme Code: SCHEM_7_Y1
 SCQUA_8_Y1
 ECPEN_8_Y1

External Examiner(s): Dr. G. Keaveney.

Internal Examiner(s): Mr. D. Spicer.

Instructions: Answer **FOUR** questions in total

Duration: 2 Hours

Sitting: Summer 2011

Requirements for this examination: Mathematical Tables.

Note to Candidates: Please check the Programme Title and the Module Title to ensure that you have received the correct examination paper.

If in doubt please contact an Invigilator.

1. (a) Discuss a theory which explains the structure of benzene. (8 marks)
(b) Why are alkenes more reactive towards electrophiles than benzene? (8 marks)
(c) Outline the role of FeCl_3 in the halogenation of benzene. (9 marks)

2. (a) How many different isomers of dimethylcyclopentane exist? Differentiate, in your answer, between the constitutional and the configurational isomers? (15 marks)
(b) State the Cahn-Ingold-Prelog Sequence Rules and clearly draw a structure for pent-2-ene which is in the Z form. Explain your reasoning. (10 marks)

3. (a) An organic compound gave the following analysis: 81.8% C, 6.1% H, and 12.% O.
Its relative molecular mass was determined to be 528.

Calculate (i) the empirical formula (7 marks)
and (ii) the molecular formula for the compound. (3 marks)

- (b) Write the balanced chemical equation for the reaction of ethane with oxygen. (6 marks)

(c) What volume of CO_2 , at STP, will be evolved when 1 Kg of ethane is completely combusted in an oxygen rich vessel. (9 marks)

4. (a) In general, why are aldehydes more reactive with nucleophiles than ketones? (9 marks)

(b) Write an (i) addition, (ii) condensation, (iii) oxidation and a (iv) reduction reaction for ethanal. (16 marks)

5. (a) Why is chloroethanoic acid a stronger acid than ethanoic acid? (9 marks)
(b) How are polyamides and polyesters synthesised? (8 marks)
(c) What is a saponification reaction? (8 marks)
6. (a) Draw a 3-D structure of the R form of 2-bromobutane. (9 marks)
(b) How is the optical activity (optical rotatory power) of a compound measured?
(8 marks)
(c) Explain why a molecule containing chiral sites can be achiral i.e. (symmetrical).
(8 marks)