National Exams

04-BS-12, ORGANIC CHEMISTRY
May 2011

3 hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions.

2. Candidates may use a Casio or Sharp approved calculator.

3. **This is a Closed Book Exam. However, candidates are permitted to bring one aid sheet written on both sides.**

4. **ANSWER ALL FIVE (5) QUESTIONS.**

No. 1 (10 marks total)

(a) (5 marks) Which molecule has a zero dipole moment? (A) SO_2; (B) CO_2; (C) CO; (D) $CHCl_3$; (E) None of these.

(b) (5 marks) Which molecule would have a dipole moment greater than zero? (A) $BeCl_3$; (B) BCl_3; (C) CO_2; (D) H_2O; (E) CCl_4

No. 2 (10 marks total)

(a) (4 marks) What are the four basic types of organic reactions?

(b) (3 marks) A substance that can donate a lone pair of electrons is a _____ according to _____ theory.

(c) (3 marks) When drawing reaction mechanisms, chemists generally use curved arrows. The curved arrow begins with _____ and points toward _____.

No. 3 (10 marks total)

(a) (**2 marks**) In a dehydration reaction, the leaving group is _____

(b) (**2 marks**) Structures that differ only in the position of the electrons are called _____.

(c) (**3 marks**) There are three types of polyenes (i.e. molecules containing two or more double bonds). They are: _____.

(d) (**3 marks**) The Diels-Alder reaction is a cyclo-addition between a conjugated _____ and a _____.

No. 4 (12 marks total, 4 marks each)

(i) Differentiate between *polymorphism* and *isomerism*.

(ii) What is the difference between configuration and conformation in relation to polymer chains?

(iii) Explain briefly why the tendency of a polymer to crystallize decreases with increasing molecular weight.

No. 5 (12 marks total)

(3 marks each)

Decide whether the molecular weight of a polymer that is synthesized by addition polymerization is relatively high, medium, or relatively low for the following situations:

(i) Rapid initiation, slow propagation, and rapid termination.

(ii) Slow initiation, rapid propagation, and slow termination.

(iii)Rapid initiation, rapid propagation, and slow termination.

(iv)Slow initiation, slow propagation, and rapid termination.