

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)  $\text{SO}_2$ ; (B)  $\text{CO}_2$ ; (C)  $\text{CO}$ ; (D)  $\text{CHCl}_3$ ; (E) None of these.

(b) (5 marks) Which molecule would have a dipole moment greater than zero? (A)  $\text{BeCl}_3$ ; (B)  $\text{BCl}_3$ ; (C)  $\text{CO}_2$ ; (D)  $\text{H}_2\text{O}$ ; (E)  $\text{CCl}_4$

**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.