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# BSc M.Sc. Integrated Course (Chemistry)
## Semester III Examination, 2019
## Paper Title : Heterocyclic and Natural Products Chemistry
## Paper Code : BCH-CC09TH

**Time : Three Hours** **Max Marks : 75**

Q1A. **Select the most appropriate answer in the following questions.** **1x5**

(i) How many nucleotide bases occur in a nucleic acid:
- (a) five
- (b) four
- (c) infinite
- (d) six

(ii) Electrophilic substitution in furan usually occurs at:
- (a) the C(2) atom
- (b) the C(3) atom
- (c) both the C(2) and C(3) atoms
- (d) the O atom

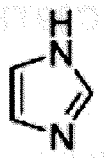
(iii) What is the correct order of reactivity (most reactive first) of pyrrole, furan and thiophene towards electrophiles?
- (a) furan > thiophene > pyrrole
- (b) pyrrole > furan > thiophenes
- (c) thiophene > pyrrole > furan
- (d) furan > pyrrole > thiophenes

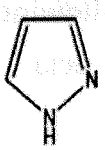
(iv) Which of the following statement is correct?
- (a) Pyridine is a tertiary amine.
- (b) Pyridine is isoelectronic with benzene.
- (c) Pyrrole is a strong base.
- (d) Pyrrole has less aromatic character than furan.

(v) Pyridine undergoes nucleophilic substitution with $NaNH_2$ at 100°C to give which of the following?
- (a) 2-aminopyridine
- (b) 3-aminopyridine
- (c) 2, 5-diaminopyridine
- (d) 3, 5-diaminopyridine

Q1B. (i) Name the following heterocyclic compounds: **1x4**

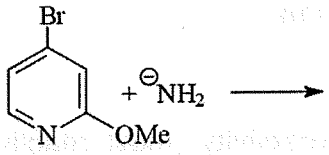
(a) 

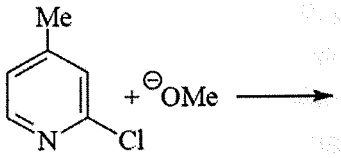
(b) 

(c) 

(d) 

**(ii)** Draw the product in the following reactions **1**

(a) 

(b) 

Q1C. **Describe briefly** **1x5**

(a) What is the difference in the structure between pyrrolidine and piperidine alkaloids?
(b) Name two alkaloids which are acidic in nature but still regarded as alkaloids.
(c) Differentiate between terpenes and terpenoids.
(d) Give an example of an anti-cancer drug which is a terpenoid.
(e) Name the different bases in the nucleotides which make up DNA and RNA.

**Q2. Explain briefly *any three* of the following** **5x3**

(a) Why pyridine undergoes nucleophilic substitution reactions much more readily than benzene.
(b) Why the nucleophilic substitution in pyridine takes place at C-2 and C-4 positions compared to electrophilic substitution at C-3.
(c) Draw all the significantly contributing resonance structures of pyrrole.
(d) What is Fischer indole synthesis. Discuss its mechanism.
(e) Describe the laboratory synthesis of purines.

**Q3. Attempt *any three* of the following:** **5x3**

(a) What are alkaloids? Briefly describe Hegnauer's classification of alkaloids.
(b) Discuss the general structural features of alkaloids.
(c) Sketch one method for the isolation of alkaloids.
(d) Explain Hofmann's degradation of alkaloids.
(e) Write a note on colour tests of alkaloids.

**Q4. Attempt *any three* of the following:** **5x3**

(a) What are terpenoids? Give its classification.
(b) Explain isoprene rule with suitable examples? What is its deviation? Discuss briefly.
(c) Discuss the structure elucidation of citral by spectroscopic methods.
(d) Describe Arens - van Dorp's synthesis of citral.
(e) How is the presence of double bond and tertiary hydroxyl group established in α-terpineol.

**Q5. Explain *any three* of the following:** **5x3**

(a) Structure and functions of nucleic acids
(b) Conversion of pyrimidine to purine with a suitable example
(c) Synthesis and reactions of Adenine or guanine.
(d) Nucleosides and nucleotides.
(e) Structure elucidation of uric acid

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