S-784 Roll No. ……..

CHE–553

Natural Products, Heterocylic and Spectroscopy

M. Sc. CHEMISTRY (MSCCH–12/13/16/17)

Second Year, Examination, 2018

Time : 3 Hours **Max. Marks : 80**

Note : This paper is of **eighty (80)** marks containing **three (03)** Sections A, B and C. Attempt the questions contained in these Sections according to the detailed instructions given therein.

Section–A

(Long Answer Type Questions)

Note : Section 'A' contains four (04) long answer type questions of nineteen (19) marks each. Learners are required to answer *two* (02) questions only.

1. Discuss the synthesis of reserpine. 19

2. Describe in brief : $4\frac{3}{4}$ each

   (a) Why ^{13}C is less sensitive than ^{1}H NMR ?

   (b) Discuss the ring synthesis of coumarins.

   (c) Explain why it is that the ^{31}P NMR spectrum of phosphine consists of a 1 : 3 : 3 : 1 quartet, whereas the ^{1}H NMR spectrums consists of a 1 : 1 doublet.

   (d) Synthesis of isoquilonene and its uses.

3. What is FT-NMR ? What information do we get from the following NMR experiments ? $4\frac{3}{4}$ each

   (a) COSY test

   (b) NOE

   (c) HSQC

   (d) TOCSY

4. Write short notes on the following : $4\frac{3}{4}$ each

   (a) Metabolism of proteins

   (b) ORD

   (c) Classification of heterocyclic compounds with structures

   (d) Prostaglandins

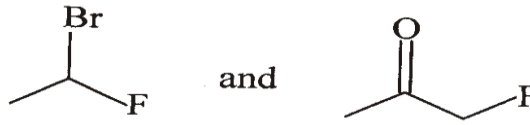
Section–B

(Short Answer Type Questions)

Note : Section 'B' contains eight (08) short answer type questions of eight (8) marks each. Learners are required to answer *four* (04) questions only.

1. What are PGE_2 and $PGE_{2\alpha}$? Discuss with structures and functions.
2. What is Kreb's cycle ? Discuss its physiological importance.
3. What are alkaloids ? Discuss their properties and categorization.
4. Discuss magnetic behaviour of carbon. How this element is useful for structural elucidation by using NMR experiments ? Explain in brief some of the experiments.

5. How do enzymes differ from catalyst ? Discuss the mode of action of enzymes.
6. Write short notes on the following : 4 each
   (i) 4-membered heterocylic compounds
   (ii) Rotenoids
7. Discuss synthesis and uses of the following : 4 each
   (i) Pyrazine
   (ii) Piperidine
8. (i) Are the diazines more or less reactive towards C-electrophilic substitution than pyridine ? 4
   (ii) Predict the ^{1}H and ^{19}F NMR spectra of : 4



Section–C
(Objective Type Questions)

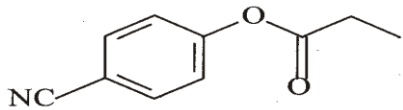
Note : Section 'C' contains ten (10) objective type questions of one (01) mark each. All the questions of this section are compulsory.

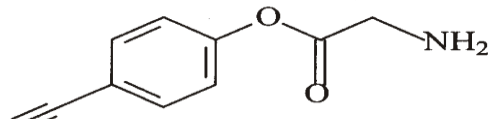
Choose correct options in answer :

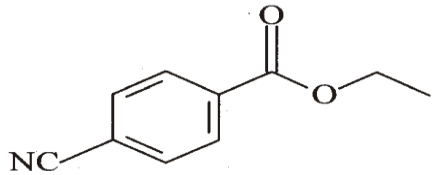
1. Inadequate experiment in NMR is :
   (i) $^{1}H - {}^{1}H$ correlation spectroscopy
   (ii) $^{13}C - {}^{13}C$ correlation spectroscopy
   (iii) $^{1}H - {}^{13}C$ correlation spectroscopy
   (iv) Both (i) and (ii)

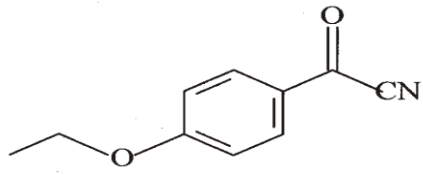
2. Alkaloids in plants are synthesized through :
   (i) Sikimic acid pathway
   (ii) Photosynthesis
   (iii) MVA-Pathway
   (iv) Photodegradation
3. What is the 13C resonance frequency on a 600 MHz NMR spectrometer ?
   (i) 600 MHz
   (ii) 92 MHz
   (iii) 60 MHz
   (iv) 150 MHz
4. An organic compound gives the following spectral data :

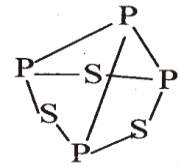
   IR : 2210 cm^{-1}, $^{1}HNMR$: δ (ppm) 1.4 (*t*, J = 701 Hz, 3H), 4.4(*q*, J = 7.1 Hz, 2H). 7.7(*d*, J = 7.0 Hz, 2H), 8.2 (*d*, J = 7.0 Hz, 2H), $^{13}CNMR$: δ (ppm) 16, 62, 118, 119, 125, 126, 127, 168. The compounds is :

(i) 

(ii) 

(iii) 

(iv) 

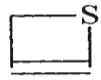
5. No. of ^{31}P NMR signal in  will be :

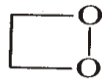
(i) One
(ii) Four
(iii) Two
(iv) Three

6. The NMR recording time for ^{13}C NMR is much higher than ^{1}H NMR because of :
(i) Less sensitivity and low relaxation
(ii) More sensitivity and higher relaxation
(iii) Less sensitivity and higher relaxation
(iv) More sensitivity and low relaxation

7. The IUPAC name of xantine is :
(i) 2, 4-dihydroxypurine
(ii) 1, 3-dihydroxypurine
(iii) 2, 3-dihydroxypurine
(iv) 3, 5-dihydroxypurine

8. Which of the followng is not a four-membered heterocylic compound ?

(i) 

(ii) 

(iii) 

(iv) 

9. Which is not a terpenoid ?
   (i) Labdane
   (ii) Azadiractin
   (iii) Reserpine
   (iv) Squalene

10. The enzyme responsible for the conversion of pyruvate to acetyl Co-A is :
   (i) Pyruvate dehydrogenase
   (ii) Pyruvate hydrogenase
   (iii) Pyruvate dehydrogenase complex
   (iv) Pyruvate hydrogenase complex