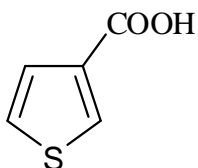


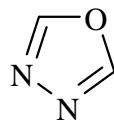
**Section A: This section contains ONE COMPULSORY question**

**Question 1 (30 marks)**

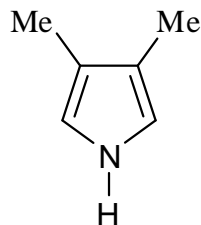
- a. Suggest the Hantzsch-Widman name for compounds a-f shown below: (6 marks)



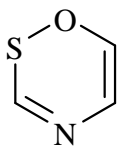
a



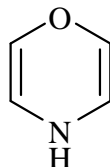
b



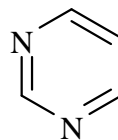
c



d



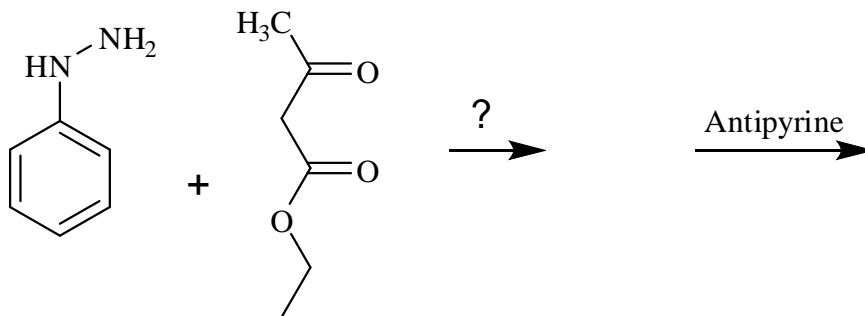
e



f

b.

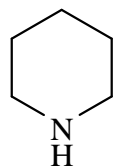
- c. Draw the chemical structures for each of the following trivial names: (4 marks)  
a. Thiophene    b. Piperazine    c. Morpholine    d. pyrrole
- d. What structural feature do the following stems that follow prefixes indicate in the nomenclature of heterocycles: (6 marks)  
a. -ir    b. -et    c. -oc    d. -ol
- e. Name five sulfonamides that are still in use as medicine. (2.5 marks)
- f. Name five pharmaceuticals that contain the pyridine ring and what they treat. (2.5 marks)
- g. State three natural heterocyclic compounds and their use in either medicine or agriculture. (3 marks)
- h. Draw the structures of the oxygen containing heterocycles namely furanose and pyranose. (2 marks)
- i. Antipyrine is a pyrazole analgesic and an antipyretic like aspirin. It can be obtained via the Knorr's synthesis as outlined below. Write the intermediate and the product missing in the scheme. (4 marks)



**Section B: This section contains FOUR questions. Answer ONLY TWO questions.**

**Question 2 (20 marks)**

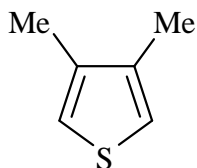
- a. Describe and Illustrate the Hofmann exhaustive methylation process for the identification of cyclic amines using piperidine as an example. (10 marks)



- b. Name three classes of alkaloids and give an example for each. (3 marks)
- c. Name two common porphyrins and their associated uses in the living system. (4 marks)
- d. Draw the structures of three bases of nucleic acids denoted by the letters **C**, **T** and **U**. (3 marks)

**Question 3 (20 marks)**

- a. Briefly describe the Paal-Knorr Synthesis of Pyrroles and illustrate how the method can be used for the synthesis of 3,4-dimethylthiophene. (8 marks)

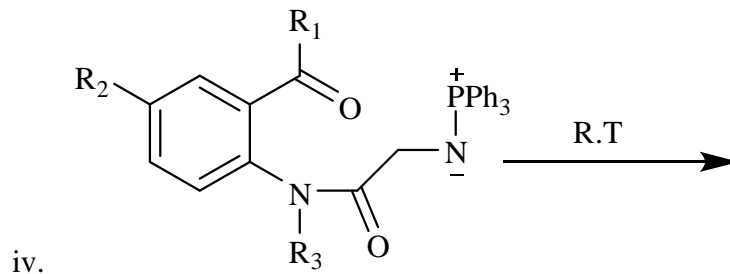
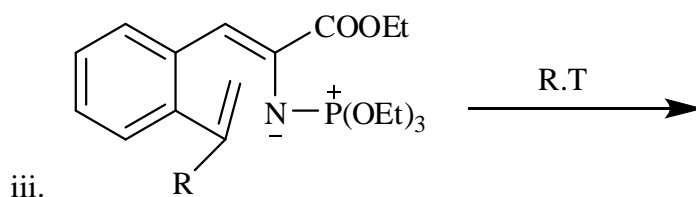
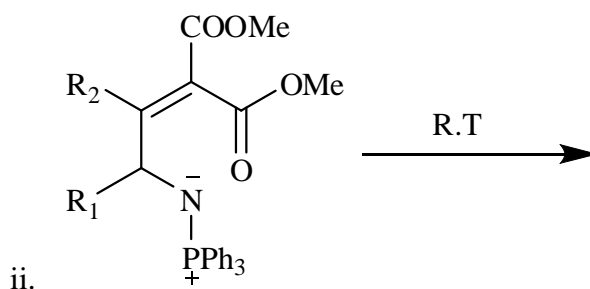
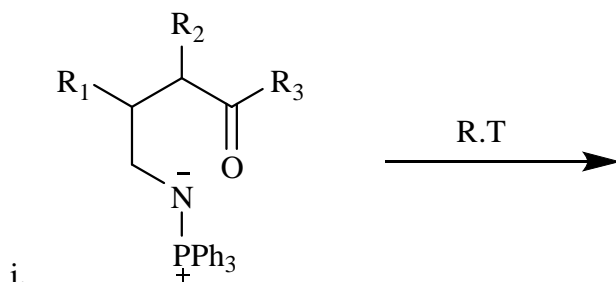


- b. Few heterocycles are known in nature where sulfur is the sole heteroatom in the ring. Draw the structure of two such compounds of thiophene derivatives. (4 marks)

- c. What are the names of the five nucleosides that form the monomeric building blocks found in living systems? Draw the structures of their nucleobases. (5 marks)
- d. Oxygen containing heterocycles may be cataloged as derivatives of Furan, pyran and benzofuran ring systems. Name an example for each. (3 marks)

### Question 4 (20 marks)

- a. Predict the products of the following Aza-Wittig reactions: (8 marks)

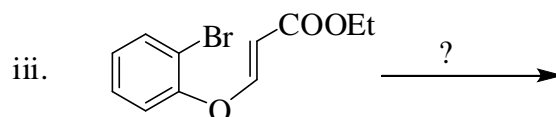
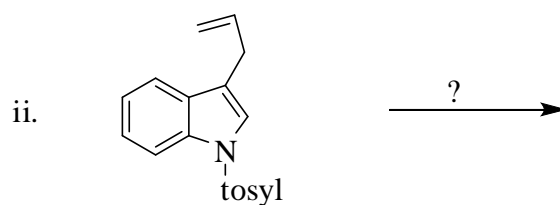
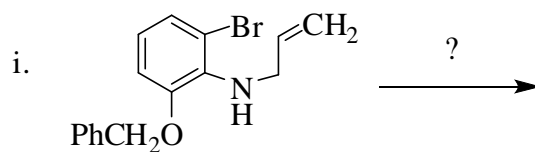


- b. Name four vitamins in which heterocycles are incorporated in them. (4 Marks)
- c. State the name of a chroman based heterocyclic derivative found in vegetable oils. (2 marks)
- d. The only phosphorus-containing ring system found in nature is a cyclic derivative of phosphoric acid.
- i. State its name (1 mark)

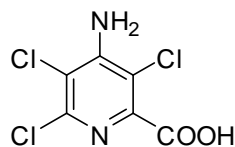
- ii. Give the name of its phosphoric cyclic ring system (2 marks)
- iii. Outline its activity in humans (3 marks)

### Question 5 (20 marks)

- a. Outline using a scheme the synthesis of a 1,3-thiazole from a bromoketone and a thioamide. (6 marks)
- b. Give the products and reagents/reaction conditions for the following Heck intramolecular cyclization reactions: (6 marks)



- c. Name three pyrimidine based agrochemicals. (3 marks)
- d. Picloram (**a**) is a pyridine based herbicide that selectively kills broad leaf weeds. Outline its synthesis starting from compound the 2-methylpyridine given below. (5 marks)



**a**

-END-