BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

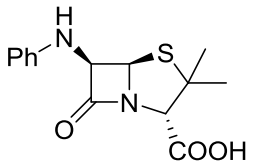
First Semester 2023-24 Comprehensive Examination (Close Book)

Course No: **CHEM F335** Course Title: **Organic Chemistry and Drug Design**

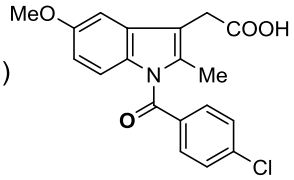
Max. Marks: **40** **Date:** 12-12-2023 Time: 90 min

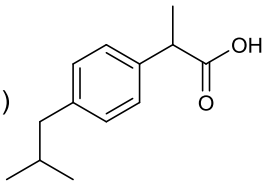
Q1 (a) Using Penicillin G, prepare 3-methylated cephalosporin **5**

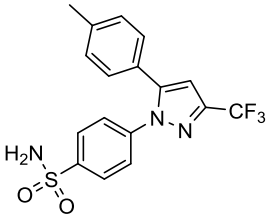
(b) It is believed that pencillin antibiotics are biosynthesized from amino acid precursors. Identify the two amino acids that are most likely utilized during the biosynthesis of penicillin antibiotics. **4**



(c) Structures of three therapeutic agents are given below that are known to exhibit anti-inflammatory properties. Write name and mode of action for each drug. **6**

(i) 

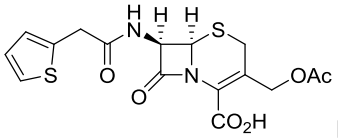
(ii) 

(iii) 

Q 2. (a) Write the biological targets for the following six drug molecules **6**

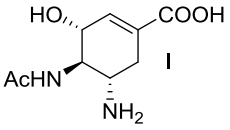
Drug	Drug target
Aciclovir	
Rilpivirine	
Saquinovir	
Penicillin	
Oseltamivir	
Methotrexate	

(b) Design an orally active drug **P** by the structural modifications of cephalosporin **M**. The drug **P** expected to possess activity similar to cephalosporin **M** **4**

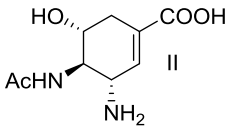


M

(c) Which one of the following two isomeric acids (I & II) likely to show better neuraminidase inhibition activity and why? **4**

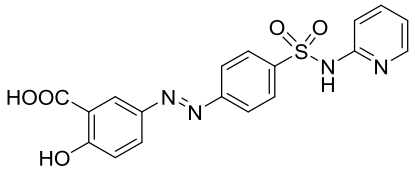


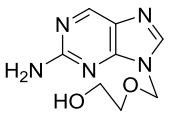
I

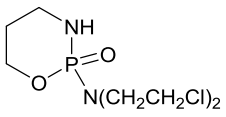


II

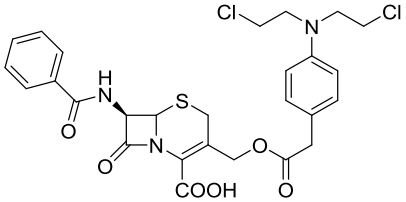
(d) Write the structures of metabolites for the given drug molecules **4**

(i) 

(ii) 

(iii) 

(e) Draw a mechanism for the activation of following conjugate. **4**



(f) Write the structure of dipeptide substrate of HIV protease. **3**

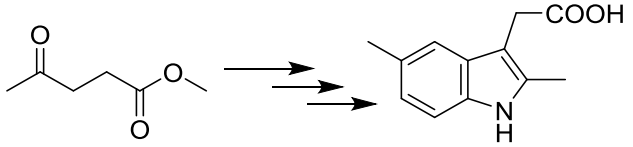
BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

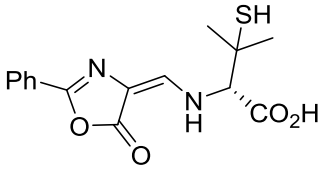
First Semester 2023-24 Comprehensive Examination (Open Book)

Course No: **CHEM F335** Course Title: **Organic Chemistry and Drug Design**

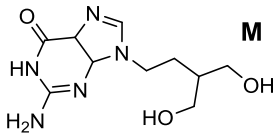
Max. Marks: **40** **Date:** 12-12-2023 Time: 90 min

Q 1 (a) Write all the synthetic steps involved in the preparation of following compounds **6**

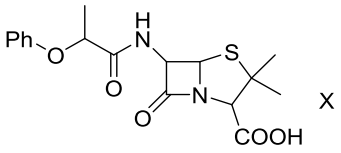
(i) 

(ii) 

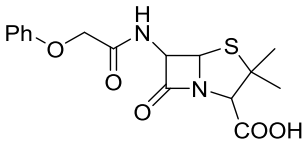
(b) What are the draw backs of DNA polymerase inhibitor **M.** Make necessary structural modifications in M in order to identify a better drug candidate. **6**



Q2. (a) A study by Hansch on the activity of penicillins (X and Y) against a strain of Staphylococus aureus in mice gave the *in vitro* relationship logI/C = -0.445 π + 5.673(n=20, s= 0.191. r = 0.909); based on this relationship identify the more active penicillin (X or Y) with brief justification. Which penicillin (X or Y) is more resistant to metabolism? **6**



X

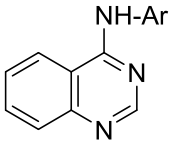


Y

(b) Write the structure of a normal substrate of dihydropteroate synthetase and design its competitive and reversible inhibitor **B**. Also, plot a Lineweaver-Burk plot for the inhibiton of dihydropteroate synthetase by **B**. **6**

(c) Why Sulphathiazole is not toxic to human? **4**

(d) Design a metabolically stable anticancer drug based on following core structure and mention its target. **4**



(e) Salicylic acid is one of the oldest analgesics known. However, its use can cause gastric irritation and bleeding. Design a safer drug using Salicylic acid and briefly explain its reduced toxicity. **4**

(f) Phenols are antiseptics. Hansch analysis carried out on a series of phenols) with the general structure para-R-C6H4-OH (**A**) yielded the Hansch equation: Log 1/C = 1.5 π – 0.2 σ + 2.3 (n = 23, s = 0.13, r = 0.87). Using Craig-plot, predict the structures of the analogues of compound **A** that would be likely to have a high antiseptic activity. **4**