

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- March-April 2017

B.Tech. Dual Degree Xth Semester /M.Tech.II Semester

COURSE CODE: 14M11BT215

MAX. MARKS: 25

COURSE NAME: Metabolic engineering

COURSE CREDITS: 03

MAX. TIME: 1.5 Hrs

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q1. Does Shikimic acid pathway exist in humans? Justify your answer. (2 marks)

Q2. What are alkaloids and how do they differentiate from terpenoids? (2 marks)

Q3. List the class and precursors for the following alkaloids: (2 marks)

Anabasine, Scopolamine, Camptothecin, Morphine

Q4. A research group wants to increase the *in vivo* production of artemisinin and picroside-I in *Artemisia annua* and *Picrorhiza kurroa*, respectively. For this, they have over-expressed 1-deoxy-D-xylulose-5-phosphate synthase enzyme in *A. annua* and hydroxymethylglutaryl-CoA reductase in *P. kurroa*. Upon analysis of artemisinin and picroside-I contents, unfortunately, they did not get significant increase. Further, they supplied isopentenyl pyrophosphate in tissue culture conditions (in the media containing flasks) and studied their influence on the artemisinin and picroside-I contents in *A. annua* and *P. kurroa*, respectively. Interestingly, artemisinin content in *A. annua* was increased but picroside-I content did not show significant enhancement. A) Explain the possible reasons for failure of the experiment? B) Design a strategy to increase the contents of artemisinin and picroside-I in *Artemisia annua* and *Picrorhiza kurroa*, respectively. (5 marks)

Q5. Explain the following in brief. (9 marks)

- Metabolic versatility of Acetyl COA
- Allosteric enzymes in metabolic pathways
- Principle of soft ionization and their modes

Q6. Explain how essential amino acids can be produced by metabolic network alteration of microorganism. Also explain the significance of auxotrophy, feedback inhibition and feedback repression in the yield of the specific amino acid. (5 marks)