BSc Stage 3 Degree Examinations 2018-9

Department:
BIOLOGY

Title of Exam:
Comprehension & Criticism: Article 2

Time Allowed:
2.5 hours

Marking Scheme:
Total marks available for this paper: 80

ONLY ANSWER QUESTIONS FOR ONE OF THE RESEARCH ARTICLES.

These questions are for Article 2 “Shared strategies for β-lactam catabolism in the soil microbiome”.

Instructions:
Answer all questions in the spaces provided on the examination paper

For marker use only:

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DO NOT WRITE ON THIS BOOKLET BEFORE THE EXAM BEGINS
DO NOT TURN OVER THIS PAGE UNTIL INSTRUCTED TO DO SO BY AN INVIGILATOR
Question 1
The paper is concerned with the catabolism of β-lactams. Define catabolism. (3 marks)

Question 2
Outline the key findings presented in Figure 1 of the paper. (5 marks)

Question 3
Summarise the evidence for the proposed enzymatic degradation of penicillin in
(i) isolate ABC07 (14 marks)
(ii) isolate ABC02 (5 marks)
Question 4
Whilst strain ABC07 can use penicillin as a carbon source to support growth, it is unable to grow using the penicillin-derivative ampicillin. Why is this? (4 marks)
Question 5
Explain the methodological basis for measurement of benzylpenicilloic acid used in this paper. (5 marks)

Question 6
With reference to Figure 4 part b, explain the shape of the Put1 curve (red). (5 marks)

What does the difference in curve shape between Put1 (red) and penicillin amidase (blue) signify? (2 marks)
Question 7
Explain the principle by which penicillin amidase activity was measured by change in pH. (5 marks)

Question 8
Following expression of Put1 in E. coli, the authors reported no growth on penicillin, and only very modest growth on benzylpenicilloic acid. Why do you think this might be? (4 marks)

The space above the line should be sufficient for your answer
Question 9
Expression of the put genes is highly induced by penicillin. Suggest experimental strategies you could use to:

(i) identify the regulatory protein responsible for this induction  
and (ii) investigate the mechanism of the regulatory protein’s action.  

(5 marks)  
(5 marks)
Question 10
Why might this paper be of sufficiently wide interest to the scientific community to be published in a high ranking journal? (9 marks)

Question 11
You are planning to develop a new research strategy with this paper as the starting point. What do you think you could do next? Your proposal should be distinct from your answer to question 9. (9 marks)
The space above the line should be sufficient for your answer