Examination Candidate Number: ____________

Desk Number: ____________

University of York
Department of Biology
B. Sc Stage 3 Degree Examinations 2014-2015

Biology Research Skills
Comprehension and Criticism Paper
for ARTICLE 2
Time allowed: 2.5 hours
Total marks available for this paper: 100

ONLY ANSWER QUESTIONS FOR ONE OF THE RESEARCH ARTICLES.

These questions are for RESEARCH ARTICLE 2 “mTORC1-mediated translational elongation limits intestinal tumour initiation and growth”

● Answer all the questions in the spaces provided on the examination paper

● A copy of Research Article 2 is provided

● The marks available for each question are indicated on the paper

For marker use only:

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page 1 of 10
Answer all questions

1. a) Suggest five keywords (can be very short phrases rather than single words) for the article. The keywords should not replicate words used in the title. (5 marks)

b) List three main scientific reasons for conducting the study. (6 marks)
2. Rapamycin is an inhibitor of mTOR, yet it was thought to be unable to prevent cancer growth in intestinal crypts. Why? (5 marks)

3. a) Explain the techniques used to enable inducible, tissue-specific loss of APC expression in intestinal cells in vivo. You may use a diagram. (6 marks)
b) What are the advantages and disadvantages of using immunohistochemistry (IHC) to detect protein expression as used in Figure 1? (4 marks)

4. a) What is the evidence that Wnt-driven proliferation of crypt cells is dependent on Myc? (5 marks)

b) Why do the authors suggest that the data presented in Figure 1 point to the existence of a “therapeutic window”? (5 marks)
5. a) Why do both treated and non-treated mice show decreased survival rates in Figure 2d compared to 2b? (4 marks)


b) Explain why the conclusions are different for the experiments shown in Figure 2b and d? (3 marks)

c) What is the origin of the oval structure in the centre of the section shown in Figure 2f that the authors referred to as a ‘small non-proliferative lesion’? (3 marks)
d) How can you tell from Figure 2f that the identified structure is indeed non-proliferative? (3 marks)

6. Complete the diagram below with components of the APC dependent signalling paths controlling intestinal crypt proliferation, which can be reconstructed from the paper. Use the connectors given below (arrow or T-line) to mark the signalling effects. Each signalling protein named correctly, each correct position of a signalling protein in the diagram, and each correct connector will earn ½ mark. (10 marks)

the space above this line should be sufficient for your answer
7. a) Describe the techniques used to test translation initiation and elongation, and how these two different phases were differentiated. (10 marks)

b) Why is RNasin (a protein that inhibits RNA degradation) used in the sucrose gradient centrifugation experiments? (2 marks)
8. Critique the use of appropriate controls in the set of experiments shown in Figure 4 a, b and c. Include in your answer two additional controls that could have been used. (9 marks)
9. a) The authors state: “...data suggest that cyclin D3 is translationally regulated...” Explain how this conclusion is reached from Figure 4 d and e, in particular why cyclin D3, rather than the other tested cyclins and CDKs, was suggested. (6 marks)

b) What explanation, other than enhanced translation, could there be for the increase in cyclin D3 protein levels? (2 marks)

c) Suggest an experiment to test your explanation proposed for ‘b’. (3 marks)
10. Briefly state three main conclusions of the paper.
(3 marks each, total of 9 marks)

i) 

ii) 

iii) 

the space above this line should be sufficient for your answer