

McMaster University
Biology 2B03
Midterm Test 2 Answers

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|-------|-------|-------|
| 1. B | 11. D | 21. C |
| 2. C | 12. A | 22. A |
| 3. C | 13. B | 23. B |
| 4. C | 14. B | 24. A |
| 5. C | 15. C | 25. C |
| 6. B | 16. C | 26. E |
| 7. A | 17. C | 27. A |
| 8. C | 18. D | 28. B |
| 9. E | 19. B | 29. D |
| 10. D | 20. B | 30. D |

SECTION II: SHORT ANSWER QUESTIONS: 15 MARKS

Please answer the following questions in the space provided. Read the questions carefully.

31. (*Total: 5 marks*) The following experiment tells us about the transport of proteins into the ER:

(a) What has happened to the proteins in A and why? (*1 mark*)

Proteins are degraded – exposed to the protease in solution because the membrane was digested by detergent.

(b) What has happened to the proteins in B and why? (*1 mark*)

Proteins are not degraded –not exposed to the protease in solution because they have entered directly from the ribosome into the microsomes

(c) What can you conclude about transport of proteins into the ER? (*1 mark*)

Transport can occur co-translationally

(e) In lecture, we discussed many ways of detecting the proteins in this experiment. Briefly describe one. (*2 marks*)

One of :

Tag GFP with matrix signal and look at cells

Tag GFP (or other cytosolic protein) with matrix signal and look on Western blot for whole proteins.

Look for any ER targeted protein on Western blot to see that it was not degraded.

Antibody to protein in cell.

Pulse chase experiment with radioactive amino acids to label proteins

Name: _____ Student number: _____

32. **(Total: 2 marks)** We discussed a paper that identified GCR2 as a GPCR receptor for abscisic acid (ABA) in plants. The assay used was closing of stomatal pores in response to ABA.

(a) The G-protein, GPA1, associates with GCR2. What response would you expect in the stomatal pores if there is a dominant mutation that produced a constitutively active GPA1? **(1 mark)**

Guard cells would be: _____ always closed _____.

(b) Which nucleotide would be bound to the constitutively active GPA1? **(1 mark)**

The nucleotide is _____ GTP or guanine triphosphate _____.
no marks for guanine or GDP or guanine diphosphate

33. **(Total: 5 marks)** The following signaling pathway regulates vasodilation. Vasodilation is the widening of blood vessel walls that occurs as a result of relaxation of the muscular walls of the vessels. Relaxation is indicated as an endpoint in this signaling pathway. Based upon this figure, answer the following questions:

a) Name the secondary messenger that is regulated by guanylyl cyclase in this pathway. **(1 mark)**

cGMP

b) If ginseng increases nitric oxide, what effect would this have on the secondary messenger (increase/decrease the concentration) and what would be the effect on the blood vessels? **(2 marks)**

increase cGMP ; Relaxation

c) If Viagra has the effect of inhibiting PDE5, what effect would this have on the secondary messenger (increase/decrease) and what would be the effect on the blood vessels? **(2 marks)**

increase cGMP (or maintain cGMP levels) ; Relaxation

34. **(Total: 3 marks)** With persistent stimulation, GPCR activity is frequently regulated during cellular processes. State the three steps in the regulatory process that turns off GPCR function at the cell surface. In particular, be sure to identify the role of clathrin, GPCR kinases, AP2, arrestins, and the endosome.

With persistent stimulation, GPCRs are phosphorylated by GPCR kinases (GRK) and association occurs with arrestins

Arrestins interact with clathrin and clathrin adaptor (AP2)

GPCRs are internalized into endosomes, targeted to lysosomes for degradation or dephosphorylated and recycled back to the cell surface