

2012 USABO Semifinal Exam Answers

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|-------|----------|----------|
| 1. D | 42. C | 83. A |
| 2. E | 43. A | 84. AC |
| 3. B | 44. C | 85. C |
| 4. B | 45. A | 86. B |
| 5. C | 46. A | 87. A |
| 6. A | 47. A | 88. B |
| 7. D | 48. C | 89. A |
| 8. C | 49. E | 90. A |
| 9. D | 50. D | 91. A |
| 10. E | 51. B | 92. C |
| 11. E | 52. A | 93. D |
| 12. A | 53. E | 94. B |
| 13. C | 54. C | 95. C |
| 14. B | 55. B | 96. ACD |
| 15. D | 56. E | 97. B |
| 16. B | 57. B | 98. C |
| 17. B | 58. C | 99. B |
| 18. E | 59. D | 100. ACD |
| 19. C | 60. D | 101. A |
| 20. E | 61. C | 102. D |
| 21. D | 62. D | 103. A |
| 22. C | 63. A | 104. CE |
| 23. B | 64. A | 105. DE |
| 24. E | 65. B | 106. C |
| 25. C | 66. A | 107. C |
| 26. A | 67. D | 108. B |
| 27. C | 68. E | 109. E |
| 28. E | 69. C | 110. D |
| 29. D | 70. A | 111. E |
| 30. B | 71. E | 112. D |
| 31. E | 72. D | 113. A |
| 32. D | 73. ACDE | 114. D |
| 33. A | 74. E | 115. A |
| 34. E | 75. AE | 116. B |
| 35. A | 76. AD | 117. B |
| 36. D | 77. E | 118. B |
| 37. D | 78. AC | 119. E |
| 38. B | 79. AB | 120. D |
| 39. D | 80. D | |
| 40. C | 81. B | |
| 41. D | 82. C | |

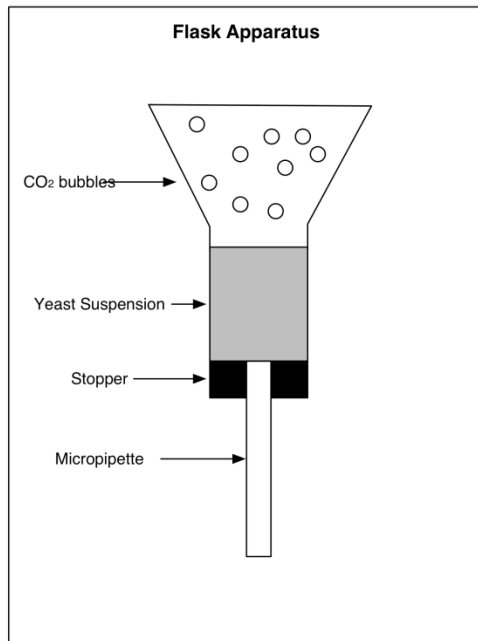
PART C

Student Name _____ Student ID# _____

Part C should be returned in its entirety with each student's scantron. Place all answers to Part C, Questions 1 and 2, on these two pages. Additional sheets of paper may be used, if necessary. Be sure that each page has the Student's Name and the Student's ID#. Please staple all pages together.

2012 USABO Semifinal Part C

1. The diagram shows an apparatus made by a student to investigate the effect of temperature on the activity of ethanol fermentation of yeast. The conical flask contains 2.5 g yeast suspended in 2% sucrose solution. The meniscus moves down the glass tube (5 mL micropipette) during fermentation.



The data shown below were collected at regular time intervals to assess the amount of suspension (mL) pushed in the glass tube due to CO₂ accumulation

| Time (min) | 4°C | 10°C | 20°C | 35°C | 55°C |
|------------|-----|------|-----------|-----------|------|
| 1 | 0 | 0.2 | 0.4 | 0.7 | 0 |
| 2 | 0 | 1.0 | 1.3 | 1.2 | 0.1 |
| 3 | 0.1 | 1.9 | 2.2 | 2.8 | 0.2 |
| 4 | 0.2 | 3.1 | 3.3 | 4.4 | 0.3 |
| 5 | 0.3 | 4.0 | NO RESULT | NO RESULT | 0.4 |

- A. Estimate the average rate of CO₂ production (mL CO₂/min) for the yeast suspension at 20°C using the values obtained in the period between 2 and 4 minutes.

1 ml/min

- B. Estimate the specific rate of CO₂ generation [millimoles CO₂/(min·g)] at 20°C.

0.017 – 0.018 mmoles CO₂/min·g

- C. What would be the specific rate of ethanol accumulation [millimoles CH₃CH₂OH/(min·g)], if the fermentation reaction follows the equation C₆H₁₂O₆ → 2C₂H₅OH + 2CO₂?

0.017 – 0.018 mmoles CH₃OH /min·g

Partial points should be given if the student identifies that the answer to B and C will be the same, even if they don't get the numbers right (or calculate any numbers at all).

2. Complete the following table about hormones.

| Hormone | Endocrine Gland | Chemical Class | Regulated By |
|------------------------------|---------------------------|----------------|-----------------------|
| Progesterone | Ovaries | Steroid | FSH and LH |
| Thyroid-stimulating hormone | Anterior pituitary gland | Glycoprotein | Hypothalamic hormones |
| Luteinizing hormone | Anterior pituitary | Glycoprotein | Hypothalamic hormones |
| Follicle-stimulating hormone | Anterior pituitary gland | Glycoprotein | Hypothalamic hormones |
| Calcitonin | Thyroid gland | Peptide | Blood calcium level |
| Prolactin | Anterior pituitary gland | Protein | Hypothalamic hormones |
| Antidiuretic hormone | Posterior pituitary gland | Peptide | Water/salt balance |

We hope to see you as a Finalist!!