

# Protein Modeling - Division C Answer Sheet

University of Texas-Austin Regional Competition

February 22, 2020



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**Team Number:** \_\_\_\_\_

**Team Name:** \_\_\_\_\_

**Exam Points:** \_\_\_\_\_/210      **Computer Exploration Points:** \_\_\_\_\_/123

**Rank:** \_\_\_\_\_

## Instructions and Clarifications:

- You have **50** minutes to finish this exam and the computer exploration of protein structure. This packet contains **60%** of the overall score.
  - The **Exam** is comprised of Section **I and II**. The exam accounts for **30%** of the overall score.
  - The **Computer Exploration** is comprised of Section **III**. The computer exploration accounts for **30%** of the overall score.
- Each **participant** may bring **one** 8.5" x 11" sheet of paper that may be in a sheet protector or laminated that contain information without any annotations or labels affixed along with writing utensils for each participant.
- Anything written on the exam packet will **not** be graded. Only the **answer sheet** will be graded.
- Write your team number on every page of the answer sheet.
- Tiebreakers are labeled as **TB#**. There are **five** tiebreakers in this exam.
- If you have any questions or comments about this exam, feel free to email me at [velasco.scienceolympiad@gmail.com](mailto:velasco.scienceolympiad@gmail.com). **Happy testing!**

# I. Protein Biochemistry

**Multiple Choice: No partial credit** will be given for multiple select questions. Each question is worth **two** points. **(30)**

- |              |                           |               |
|--------------|---------------------------|---------------|
| 1. (2) _____ | 6. (2) _____              | 11. (2) _____ |
| 2. (2) _____ | 7. (2) _____              | 12. (2) _____ |
| 3. (2) _____ | 8. (2) _____              | 13. (2) _____ |
| 4. (2) _____ | 9. (2) _____              | 14. (2) _____ |
| 5. (2) _____ | 10. (2) _____ <b>TB#1</b> | 15. (2) _____ |

**Diagram-based Questions:** Answer the questions below referring to the diagram or ideas behind the diagram. Complete sentences are **not** required for this section. **(70)**

16.

- a. (1) \_\_\_\_\_
- b. (3)

\_\_\_\_\_  
\_\_\_\_\_

- c. (2) \_\_\_\_\_
- d. (2) \_\_\_\_\_
- e. (3) **TB#2** \_\_\_\_\_

17.

- a. (1) \_\_\_\_\_
- b. (2) \_\_\_\_\_
- c. (2) \_\_\_\_\_
- d. (2) \_\_\_\_\_
- e. (1) \_\_\_\_\_

18.

- a. (1) \_\_\_\_\_
- b. (1) \_\_\_\_\_
- c. (2) \_\_\_\_\_
- d. (4) \_\_\_\_\_
- e. (2) \_\_\_\_\_

19.

- a. (3) \_\_\_\_\_
- b. (2) \_\_\_\_\_
- c. (2) \_\_\_\_\_
- d. (2) \_\_\_\_\_
- e. (2) \_\_\_\_\_

20.

- |              |              |              |
|--------------|--------------|--------------|
| A. (2) _____ | F. (2) _____ | K. (2) _____ |
| B. (2) _____ | G. (2) _____ | L. (2) _____ |
| C. (2) _____ | H. (2) _____ | M. (2) _____ |
| D. (2) _____ | I. (2) _____ | N. (2) _____ |
| E. (2) _____ | J. (2) _____ | O. (2) _____ |

## II. DNA/RNA Structure and CRISPR-Cas Systems

**Multiple Choice:** Choose the most appropriate response for each question. Each question is worth two points. **(30)**

- |               |                           |               |
|---------------|---------------------------|---------------|
| 21. (2) _____ | 26. (2) _____             | 31. (2) _____ |
| 22. (2) _____ | 27. (2) _____             | 32. (2) _____ |
| 23. (2) _____ | 28. (2) _____             | 33. (2) _____ |
| 24. (2) _____ | 29. (2) _____ <b>TB#3</b> | 34. (2) _____ |
| 25. (2) _____ | 30. (2) _____             | 35. (2) _____ |

**Short Answer:** The point values are indicated by the number in the parentheses. Complete sentences are **not** required for this section. **(62)**

- 36.
- a. (1) \_\_\_\_\_
  - b. (1) \_\_\_\_\_
  - c. (2) \_\_\_\_\_
  - d. (2) \_\_\_\_\_
  - e. (4) \_\_\_\_\_
37. **TB#4**
- a. (2) \_\_\_\_\_
  - b. (2) \_\_\_\_\_
  - c. (2) \_\_\_\_\_
  - d. (4) \_\_\_\_\_
  - e. (2) \_\_\_\_\_
- 38.
- a. (10)  
\_\_\_\_\_  
\_\_\_\_\_
  - (5) \_\_\_\_\_
  - b. (5) \_\_\_\_\_

39.

a. (1) \_\_\_\_\_

b. (3) \_\_\_\_\_

c. (6) \_\_\_\_\_

d. (8)

\_\_\_\_\_

\_\_\_\_\_

e. (2) \_\_\_\_\_

**Diagram-based Questions:** Answer the questions referring to **Figure 2.1** or ideas behind **Figure 2.1**. Complete sentences are **not** required for this section. **(18)**

40.

A. \_\_\_\_\_

D. \_\_\_\_\_

B. \_\_\_\_\_

E. \_\_\_\_\_

C. \_\_\_\_\_

F. \_\_\_\_\_

### III. Computer Exploration - Jmol

**Directions:** Answer these questions in the most concise and specific way possible. The point values for each question are addressed in the parentheses. **(123) TB#5**

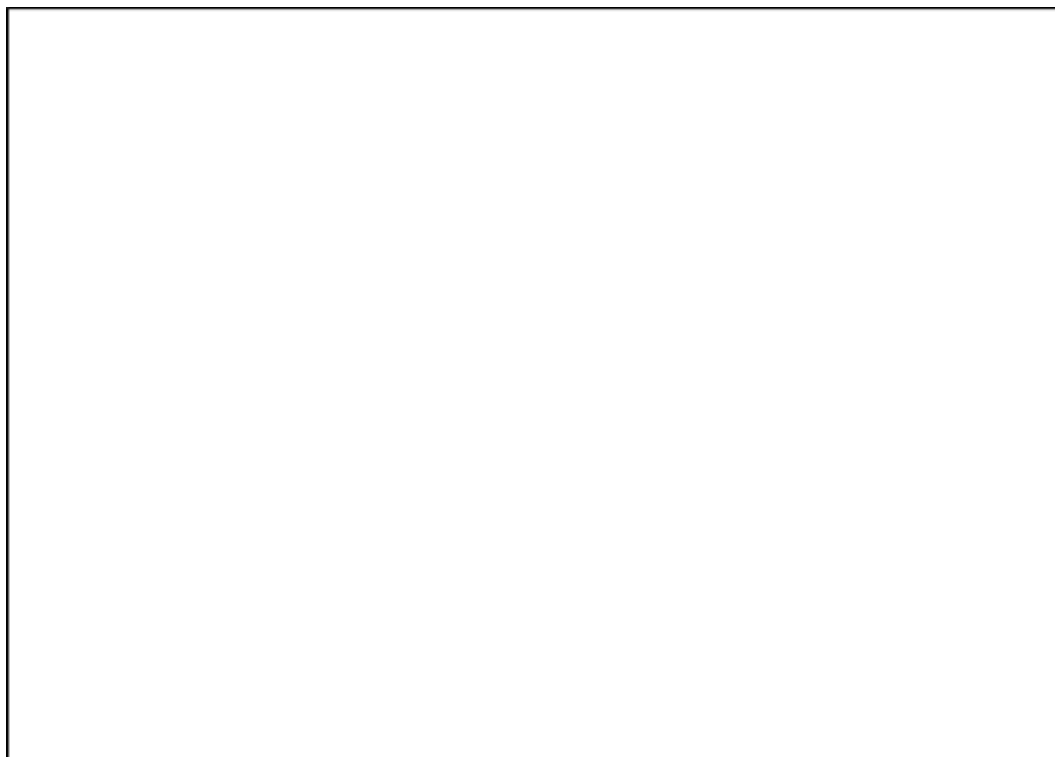
41.

- a. (1) \_\_\_\_\_
- b. (3) \_\_\_\_\_
- c. (3) \_\_\_\_\_
- d. (2) \_\_\_\_\_
- e. (2) \_\_\_\_\_

42.

- a. (2) \_\_\_\_\_
- b. (2) \_\_\_\_\_
- c. (8) \_\_\_\_\_

d.



43.

- a. (1) \_\_\_\_\_
- b. (2) \_\_\_\_\_
- c. (2) \_\_\_\_\_
- d. (2) \_\_\_\_\_
- e. (2) \_\_\_\_\_

44.

- a. (1) \_\_\_\_\_
- b. (4) \_\_\_\_\_
- c. (10) \_\_\_\_\_
- d. (2) \_\_\_\_\_
- e. (2) \_\_\_\_\_

45.

- a. (2) \_\_\_\_\_
- b. (8)  
\_\_\_\_\_  
\_\_\_\_\_
- c. (2) \_\_\_\_\_
- d. (2) \_\_\_\_\_
- e. (2) \_\_\_\_\_

46.

- a. (2) \_\_\_\_\_
- b. (2) \_\_\_\_\_
- c. (2) \_\_\_\_\_
- d. (2) \_\_\_\_\_
- e. (2) \_\_\_\_\_

47.

- a. (2) \_\_\_\_\_
- b. (2) \_\_\_\_\_
- c. (2) \_\_\_\_\_
- d. (2) \_\_\_\_\_
- e. (2) \_\_\_\_\_

48. (2) \_\_\_\_\_

49. (2) \_\_\_\_\_

50.

a. (2) \_\_\_\_\_

b. (2) \_\_\_\_\_

c. (2) \_\_\_\_\_

d. (2) \_\_\_\_\_

e. (2) \_\_\_\_\_