Grading of problem set #1

Lecture “Interactions of Proteins and Nucleic Acids: Biophysical Concepts and Theoretical Descriptions (BPC2024)”

Winter Term 2024/2025 | Prof. Dr. Karsten Rippe

Web page: https://malone.bioquant.uni-heidelberg.de/teaching/BPC\_lectures/BPC\_1+2.html

Grading rubric (per question)

**12.0: Excellent**

* Complete, correct methodology
* Clear reasoning
* Independent analysis demonstrated
* Proper units
* **Note 1 to the grader**: Be lenient on minor calculation errors
* **Note 2 to the grader**: Give full points for correct calculations even if explanations are brief

**9-11.75: Very Good**

* Minor gaps or errors
* Good reasoning shown
* Some improvements possible
* Mostly independent work

**6-8.75: Good**

* Significant gaps present
* Basic understanding shown
* Major improvements needed
* Partial independence

**3-5.75: Fair**

* Major conceptual errors
* Some correct elements
* Substantial revision needed
* Limited independent thought

**0-2.75: Insufficient**

* Missing or minimal correct content
* Major misunderstandings
* No demonstrated understanding
* No independent analysis

**Common Point Deductions**

* Missing units: -0.5 per instance
* Unexplained assumptions: -0.5 per instance
* Calculation errors: -0.25 to -1 depending on impact
* Missing references: -0.5 per required citation
* Unclear reasoning: -1 to -2 per section

Distribution of points between question parts for problem set #1

**Question 1 (12 points total):**

a) 6 points - Most work-intensive part with 5 different interaction calculations for 2 distances each

b) 3 points - Straightforward analysis of sensitivity based on exponents

c) 3 points - Basic understanding of dielectric effects and physical mechanism

**Question 2 (12 points total):**

a) 5 points - Multiple approaches required (statistical mechanics, equipartition)

b) 4 points - Complex estimation requiring physical reasoning and literature values

c) 3 points - Straightforward calculation with clear methodology

**Question 3 (12 points total):**

a) 5 points - Complex analysis requiring multiple factors and biological mechanisms

b) 4 points - Detailed calculations and literature comparisons for three organisms

c) 3 points - Discussion of complexity factors and mechanisms

**Specific grading criteria problem set #1**

1. General Principles Used:

**- Important**: Focus and emphasis on demonstrating understanding over perfect execution

- Full points can be awarded despite solutions not being perfect

- Clear reasoning more important than exact numerical results

- Each question part has a fixed maximum point value (Question distribution: 12 + 12 + 12 = 36 total points)

2. Question 1 (12 points):

- a) 6 points: Complete calculations with clear methodology

- b) 3 points: Understanding of r-dependence sensitivity

- c) 3 points: Understanding of dielectric effects (-0.5 points if magnitude of effect not specified)

3. Question 2 (12 points):

- a) 5 points: Derivation of thermal energy average value

- b) 4 points: Reasonable ΔG estimation with justification

- c) 3 points: Correct calculation of work in kBT units

4. Question 3 (12 points):

- a) 5 points: Approach for estimating TF numbers with biological reasoning

- b) 4 points: Comparison with literature values and analysis

- c) 3 points: Discussion of complexity factors

5. Standard Deductions:

- Missing units: Did not strictly apply -0.5 per instance as specified in rubric

- Unclear reasoning: Typically -0.5 to -1 point depending on severity

- Missing quantification of effects: -0.5 points (specifically for Q1c)

- Incomplete explanations: -0.5 to -1 point

Format of student problem set #1 grading

**[Student Name] ([File Reference])**

Total: XX/36

1. Molecular Interactions: XX/12
* a) X/6 - Brief justification for score
* b) X/3 - Brief justification for score
* c) X/3 - Brief justification for score
1. Thermal Energy & Motors: XX/12
* a) X/5 - Brief justification for score
* b) X/4 - Brief justification for score
* c) X/3 - Brief justification for score
1. Gene Regulation: XX/12
* a) X/5 - Brief justification for score
* b) X/4 - Brief justification for score
* c) X/3 - Brief justification for score

Specific feedback:

3-5 bullet points highlighting:

* Major strengths
* Areas for improvement
* Notable aspects of the work
* Quality of presentation
* Use of references/literature