This is an example 'public exam' for those who are interested. It's the version that students would receive one week prior to the exam.

We'll highlight a few things with these footnotes, and there is a 'final version' colored in peach available if you want to see and compare this with what students are given and fill out in the actual exam.

Exam 2 Name:_____

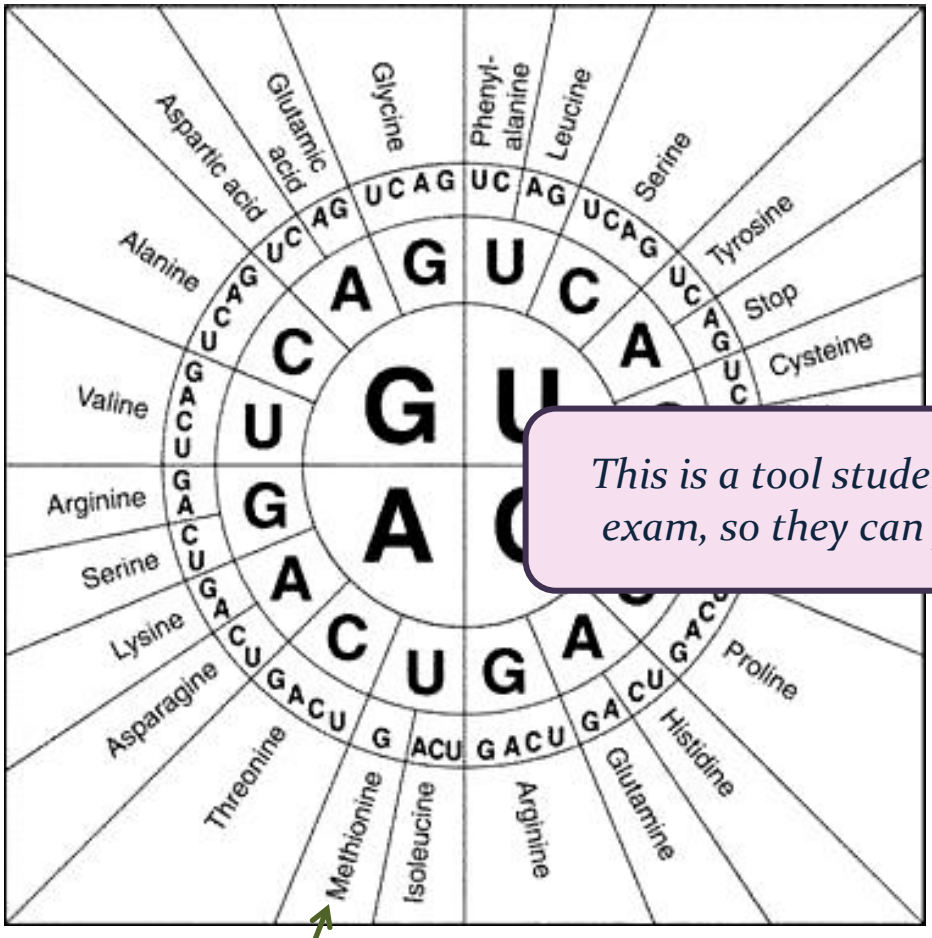
DO NOT OPEN EXAM UNTIL DIRECTED TO DO SO

- Make sure you have 4 pages of questions and six pages total. Print your name and information on all pages.
- Please use a pen. Pen is much easier to read, even with extensive crossing-out. Pencil-written exams are acceptable, but may not receive full credit on regrade requests.
- When asked, provide concise and clearly written answers. We may deduct points if you do not fully answer the question or if your answer is too vague or too confusing for us to follow.
- Extra information, if incorrect, will lose points.
- Limit your answers to the space provided. If you need extra space, use the bottom of the last page. Indicate "on last page" where necessary.

Page	Points Awarded
2	_____ out of 19 points
3	_____ out of 20 points
4	_____ out of 21 points
5	_____ out of 20 points
Total	_____ out of 80 points

This cover page has a lot of meta-information that students generally don't have time for during the exam. Reading it prior helps raise questions and helps students to feel they understand the process.

Codon Table:



This is a tool students will use during the exam, so they can practice with it prior.

Note: The most common start codon is Methionine.

Total: ____

Exam 2 Name:_____

/11 1) *Analyze the three mutated sequences below, and then place them in likely order of Most to Least functional protein produced. Changes from wildtype have been bolded/underlined where possible for clarity.*

The entire wildtype mRNA sequence:

5′-CCGUGAUGCCAGUCAGCAGCUCGGUGAAAUGACUUCCCUAUC-3′

Sequence D:

5′-CCGUGAUGC**AAC**UCAGCAGCUCGGUGAAAUGACUUCCCUA**G**C-3′

Sequence E:

5′-.....[SEQUENCE.WITHHELD].....-3′

Sequence F:

5′-.....[SEQUENCE.WITHHELD].....-3′

Most likely protein to be functional like the wildtype: ___

Least likely protein to be functional like the wildtype: ___

Explain your reasoning for your choice of most functional protein in 2-3 sentences, maximum.
For full points, you should directly compare it to the other versions.

Withheld parts of questions will be filled in on the final version. Students can generate practice problems by creatively filling these.

/8 2) Imagine a very small single-celled organism whose nucleus contains exactly one copy of each protein needed for DNA replication. This nucleus also contains 2 relatively small, linear chromosomes that each have 2 origins of replication. If the single copy of *[protein name withheld]* was destroyed, what will be the fate of the cell?

Describe what will happen to DNA replication and why in 2-3 sentences, max.

Anything in green is something that was edited (either for scientific reasons, or for readability) based on student feedback. Color-coding means that students don't need to scour the entire document repeatedly.

Total: ____

Exam 2 Name:_____

For questions 3a-d, mutations impact transcription in a prokaryotic organism. Combine what you know about mutations and what you know about transcription to answer each question.

/5 3a) Within the termination sequence of Gene Z, the sequence of the coding strand in the DNA was 5'CGACAGTCG3' but has been changed to the sequence *[withheld]*. What is the likely impact on transcription of this gene, and why? *Explain in 1-2 sentences, max.*

#3A gives the question but not all of the facts.

This one gives the full scenario but not the question.

/5 3b) Gene G and Gene H are positioned such that there is a single change that is in both the promoter for Gene G and the coding region of Gene H. That change is from `5'ACTT3'` to `5'GCTG3'`.

[Question withheld]. Explain in 1-2 sentences, max.

`3'TGAA5'` to `3'CGAC5'`

/5 3c) A deletion of 6 codons in the coding region of the gene encoding the sigma protein causes a change in the protein such that *[information about the mutant version of sigma withheld]*. What impact will this have on the transcription of genes in this organism? *Explain why in 1-2 sentences, max.*

Including point values helps to underline which topics are most or least valued by the instructor.

/5 3d) Rank the following in likely order from most to least total transcription in the cell.

Total: _____

Exam 2 Name:_____

A: The 1407-codon gene that encodes RNA polymerase has a *[withheld]* mutation in the 32nd codon.

B: Gene X has a single basepair change mutation 22 bases upstream of the +1.

C: An insertion into a gene *[detail withheld]* happens in the middle of the coding region.

D: *[mutation withheld]*

___ *Most transcription* ___ *2nd most transcription* ___ *3rd most transcription* ___ *Least Transcription*

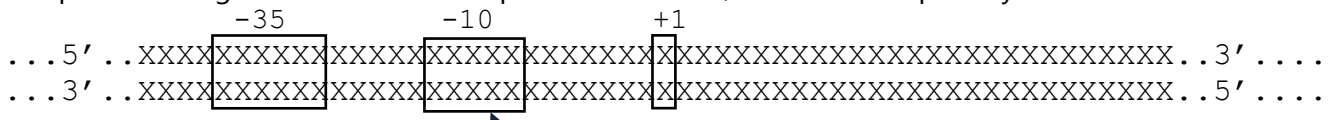
Answering this one requires students to encode their answer, which can be confusing and lead to lost points even if they know it well. Pre-releasing the code decreases these problems, which can allow easier-to-grade formatting!

Total: _____

Exam 2 Name:_____

Note: For the full version of the exam, the sequence will be filled in and other diagram details may change.

/10 4) Below is a portion of double stranded DNA from a bacterial chromosome.
The promoter region and the +1 base pair are indicated, as well as the polarity of the two DNA strands.



Using the codon table on Page 1, translate the protein sequence from this gene.
Be sure to include the N- and C-termini. You can abbreviate amino acids using the 3-letter code, but you don't have to.

The hardest ones are effective fodder for group study.

5a-b: Given its central importance to life on earth, you can imagine that scientists would be interested in developing an artificial replacement for the ribosome as a necessary element of creating artificial life. Answer these two hypothetical questions about the development of a ribosome-like replacement machine.

/5 5a) Imagine that scientists have achieved a breakthrough: Their artificial molecule is able to successfully *[details withheld].* In their attempts to build a perfect ribosome replacement, what else do the scientists still need to develop in their molecule? *Explain in 1-2 sentences or a short, clear list.*

This preview version is a chance to reinforce meta-exam messages given in class, like this one.

/6 5b) Imagine that the scientists were able to make a ribosome-like replacement that could *[withheld]* but which was not able to *[withheld]. Create a diagram using images and a few words that makes clear what would happen and what would be the product(s) of this artificial ribosome.*

Note: On Exam 1, grading was very flexible in terms of writing vs. diagram. For this question, only diagrams are acceptable. Diagrams can have a few words as labels, but should not include longer explanations. The purpose of this is to push you to demonstrate your understanding of mechanistic details that are more obvious in diagram form than in text.

Total: ____

Exam 2 Name:_____

Use the diagram on Page 6 to answer Questions 6a-d as best you can. This hypothetical organism and set of questions is intended to test what you've learned in Bio200 in a new and challenging way. The explicit answers are not in any textbook, as this is a hypothetical organism meant to challenge your conceptual understanding.

/6 6a) How is Cell B able to *[withheld]*? Explain as completely as you can in 2-3 sentences.

Complicated, thought-provoking hypothetical that students need time to discuss and analyze

/5 6b) The  and  transporters can both transport a wide variety of proteins. However, they are very different in that *[details about these two transporters withheld]*. How does *[molecule withheld]* get to *[area withheld]. Explain in 2-3 sentences, max.*

/5 6c) You do a few more experiments, and you find that at least in some individuals of this species that the transporter shown as  is able to move *[molecule name withheld]* between Cells A/D and B/C. Do you think this transporter would have the same ability to move this molecule if *[structural change withheld]*? *Explain why or why not in 1-2 sentences, max.*

This entire question is withheld, but students are alerted to the importance of this topic. New users of the public exam method often start with previewing only the format and a few questions (10-20%) of the exam, which is a good way (for students and instrutors alike) to ease in.

/4 6d) *[Question(s) about amino-acyl tRNA synthetases withheld]*

Total: ____

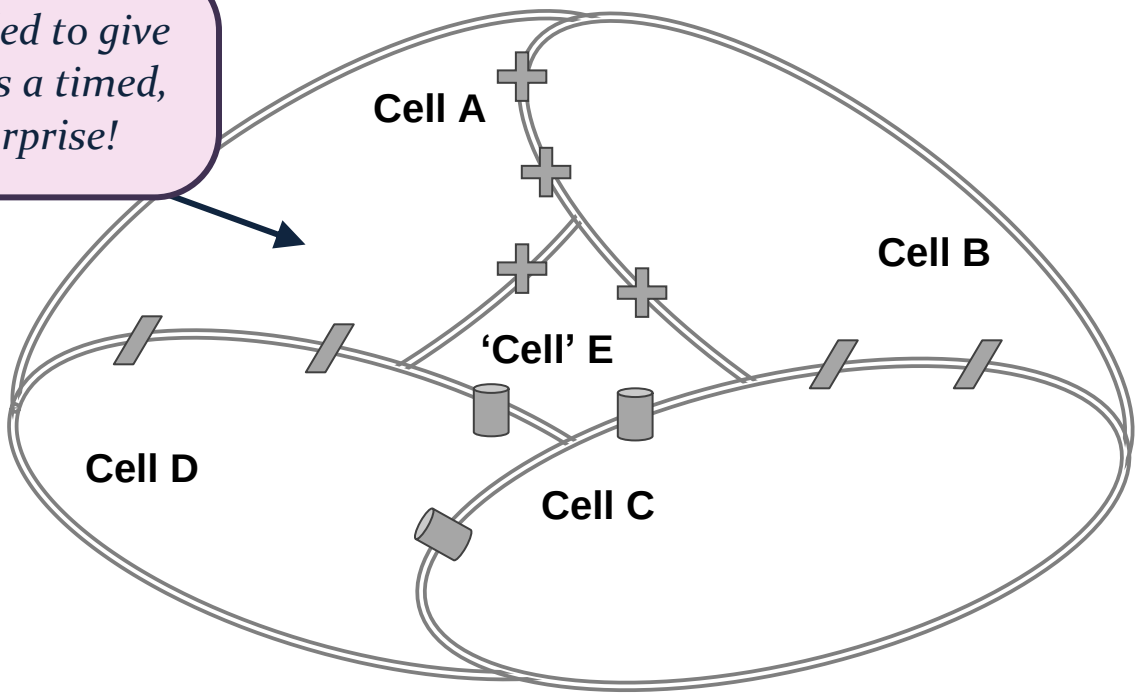
Exam 2 Name:_____

This diagram is relevant to questions 6a-d.
Shown below is a complete organism with an unusual cellular architecture. This species has four cells and an internal enclosed space ('Cell' E) that is completely enclosed and acts like a fifth cell. Each cell is separated from the outside world and from other cells by a single lipid bilayer. For the purposes of this question, you can assume that molecules that would normally pass through a bilayer very slowly do not get through rapidly enough to help the organism survive (in other words, the organism uses some other mechanism besides passive diffusion of very impermeable molecules).

A few important items to note:
Cells A and B contain no ribosomes, but they do contain proteins, RNA and DNA.
Cells C and D contain no RNA polymerase, but they do contain ribosomes, proteins and DNA.
'Cell' E contains no DNA, ribosomes, or RNA but does contain proteins.

All three types of transport proteins in this organism are shown (as  or  or ).

Far too detailed to give to students as a timed, in-class surprise!



Many examples and much more written about the public exam method here:
facultyclub.coursehero.com/assessment/benjamin-wiggins/

Total: _____