Molecular Biology 6

- iClicker 27A
- Gene / Allele
  - PTC Example
- Viruses
  - Life-cycle
- iClicker 27B

- Due in Lab this week
  - No lab next week (Thanksgiving)

- Register your iClicker!

Bio 111 Extra Credit

Article Approval Due Date: Dec 2nd (Wed) by 5PM. You must email or deliver a copy of your chosen article for my approval. If your article is not submitted by this date for any reason, it will not be accepted.

Final Due Date: Dec. 7th (Monday, day of Exam III), hand in reports in class by 12 noon; they will not be accepted late for any reason.

Extra Credit Amount: 0-10 points added to one exam (you may not exceed 100 points on the selected exam).

Formatting:

- Name and lab section number
- Clearly state the number of the exam you wish the extra credit to be applied towards
- 12 pt font, 2-3 pages double-spaced, margins 1 inch or less
- Must include a figure (not bigger than ½ a page); may be hand-drawn
- Attach the article to your report

Assignment:

Choose a recent **article** that is related to a **lecture topic** covered on the exam you selected, **summarize the article (~1/2 page)**, **summarize the relevant lecture material (~1-2 pages)**, and **discuss how the article is related to the lecture material (~1/2 page)**. The article may not be more than 2 years old, and must come from a trustworthy source (Time, New York Times, Boston Globe, Scientific America, Nature, etc.). You must also include a figure that will serve as an example from the lecture material that you have summarized, but you may not use my figures or examples from lecture.

Brief Example (you may not use this example):

Imuteb is a drug designed to treat leukemia patients, however some patients stop responding to the drug after a few years. It has recently been discovered that the leukemia in these patients acquire a new mutation that results in an alternative splice variant of the gene Imuteb targets, rendering the protein immune to the drug's affect.

A report that scores full points would include:

- A deeper summary of the article than what I have provided
- Detailed explanations of splicing and mutations, from lecture and/or your textbook
- A figure describing alternative splicing
- Discuss how the lecture relates to the article, for example discuss how the mutation lead to a different splice variant, and how that affects the protein structure and function

Grading Rubric

Article Content (2 pts)
0 pts – not enough explanation of article, leaves too many questions unanswered about article
1 pt – basic summary of article
2 pts – detailed summary of key points in article

Lecture Content (2 pts)
0 pts – not enough explanation of article, leaves too many questions unanswered about article
1 pt – basic summary of lecture
2 pts – detailed summary of key points in lecture

Discussion (2 pts)
0 pts – not enough explanation of article, leaves too many questions unanswered about article
1 pt – basic summary of lecture and minimal discussion of relevance to article
2 pts – detailed summary of key points in lecture and discusses relevance to article

Figure (1 pt)
0 pt – does not relate to discussion, incorrect
1 pt – provides information that relates article to lecture material

Clarity/Organization (2 pts)
0 pts – never sure what you are trying to say
1 pt – basic understanding of the discussion and connections of lecture to article, does not flow
2 pts – clear understanding of your discussion points and connections of lecture to article, points flow well

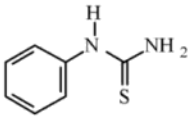
Mechanics (1pt)
0 pts – many errors in spelling, punctuation, sentence structure
1 pt – proper use of grammar

Notes:

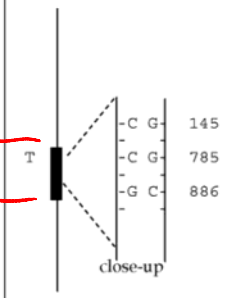
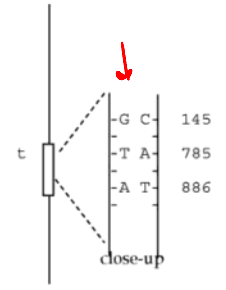
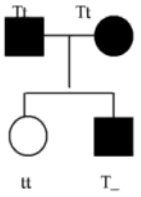
- **There will be NO re-grading of extra credit, and all decisions regarding points are FINAL.**
- Failure to adhere to formatting or assignment guidelines may result in zero points.
- You may choose Exam III.
- As a reminder, these are the topics for each exam
  - Exam I – Genetics
  - Exam II – Chemistry and Biochemistry
  - Exam III – Molecular and Cellular Biology

Bio 111: Putting it All Together - tasting PTC

- Phenyl-thio-carbamide (PTC) is a molecule with the structure shown at the right:



- Some people find that PTC has a strong bitter taste; others find that it has no taste at all.
- The DNA sequence of the gene that codes for the ability to taste PTC has recently been determined. This gene is found on chromosome 7. The researchers found three different alleles; two of these are the most common in most human populations. These two alleles differ at three different amino acids; all the other amino acids are the same in both alleles.
- The gene encodes a protein 333 amino acids long; this protein's sequence is very similar to that of another protein that is known to be a taste receptor protein. Taste receptor proteins allow sensory cells in the tongue to detect and respond to particular molecules. It is therefore likely that this gene encodes a taste receptor protein.

Type of analysis	T allele	t allele	Notes
Genetics: contribution to phenotype	Can taste PTC (dominant) "taster"	Cannot taste PTC (recessive) "non-taster"	TT - taster tt - non-taster Tt - taster
Biochemistry: protein structure & function	Produces functional taste receptor protein: H_3N^+-met$_1$-leu$_2$-...-pro$_{49}$-...-ala$_{262}$-...-val$_{296}$-...cys$_{333}$-COO^- (...pro$_{49}$...ala$_{262}$...val$_{296}$...)	Produces **non**-functional taste receptor protein: H_3N^+-met$_1$-leu$_2$-...-ala$_{49}$-...-val$_{262}$-...-ile$_{296}$-...cys$_{333}$-COO^- (...ala$_{49}$...val$_{262}$...ile$_{296}$...)	TT - 100% normal receptor tt - 0% normal receptor Tt - 50% normal receptor: enough to be able to taste PTC
Molecular Biology: DNA	5'..CCA..GCT..GTC..3' 3'..GGT..CGA..CAG..5'	5'..GCA..GTT..ATC..3' 3'..CGT..CAA..TAG..5'	
Genetics & Molecular Biology	 Chromosome 7	 Chromosome 7	

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phenotype

dom. bc tasting is "doing something"

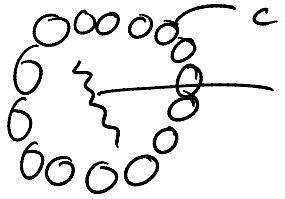
PTC tasting gene

Viruses – parasites of living cells → they cannot replicate without a living host

– host's ribosomes, RNA polymerase, etc... are "dumb" → they can't tell the difference between host & virus DNA/RNA

– host-specific (most of the time)
H1N1 is not an example of host-specificity

minimal virus



capsid : protein ("shell")

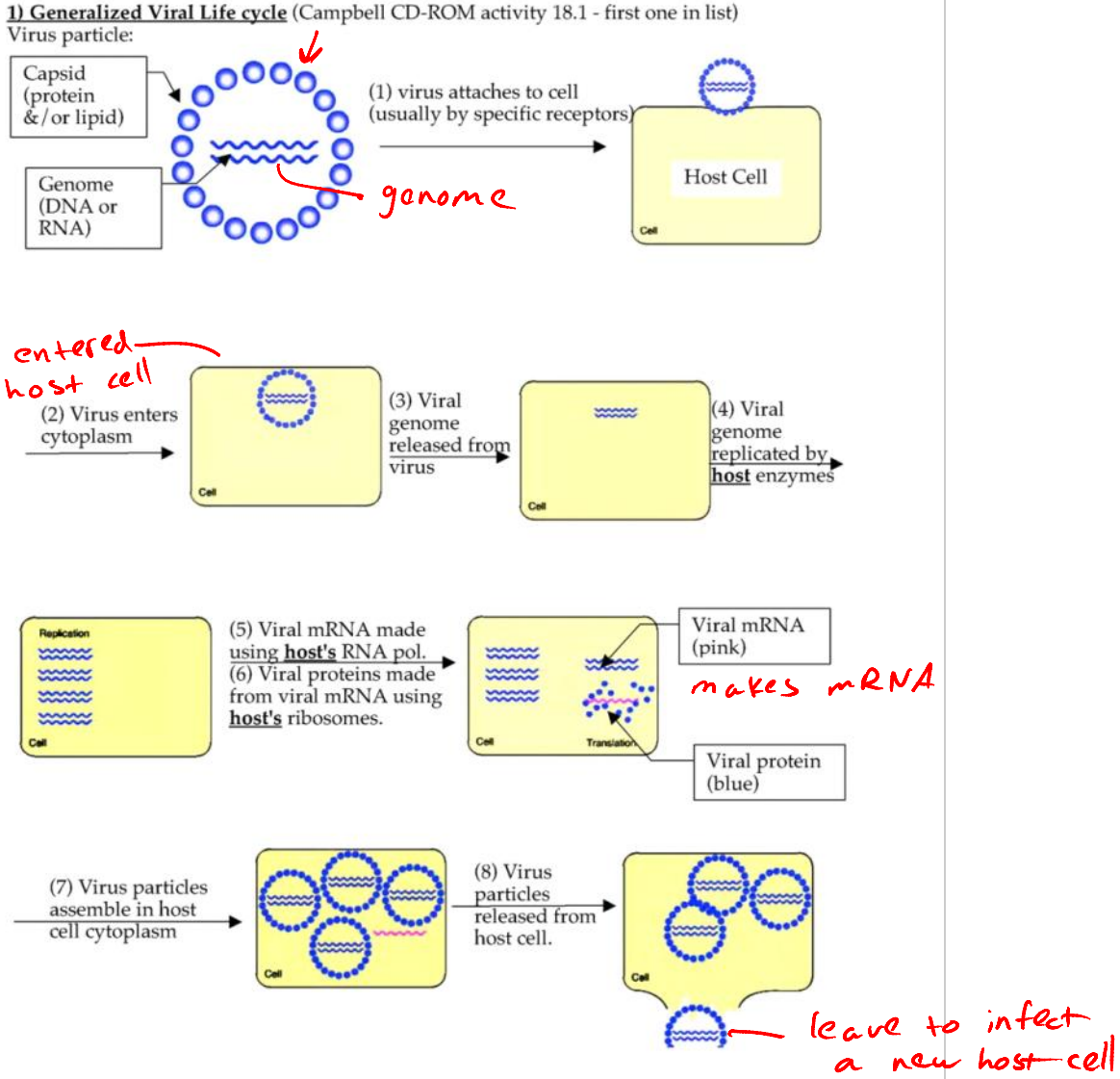
genome : DNA or RNA
same structure as in humans

viral life cycle – virus turns it's host cell into a virus making factory

1. virus binds to protein on surface of a host cell
2. virus infects its genome into the host cell
3. viral proteins made by host's ribosomes & viral genome is copied by host enzymes
4. virus assembles its capsid & leaves the cell or burst the host cell

Bio 111 Viruses & HIV

1) Generalized Viral Life cycle (Campbell CD-ROM activity 18.1 - first one in list)



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Minimal viral genome

1. genes for capsid protein
2. genes for replicating genome if viral genome is RNA
3. genes for proteins to release virus from host
4. genes for proteins to suppress host's genes (optional)

Viral Genomes

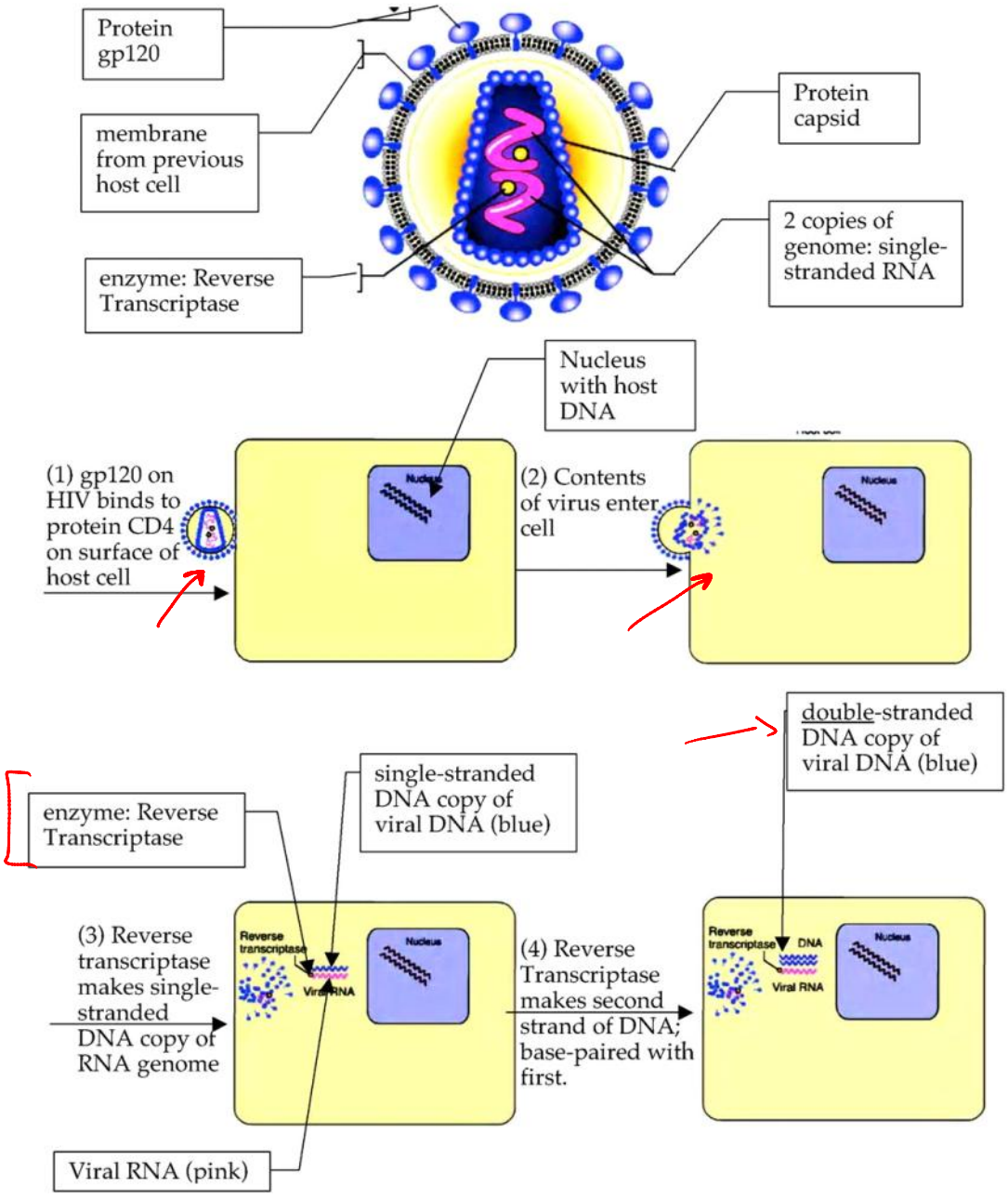
virus	genome size	genome type
small pox	~ 200 kb	double-stranded DNA
rhinovirus (common cold)	7 kb	single-stranded RNA
Hepatitus B (liver disease)	3.3 kb	single-stranded DNA
rotavirus (infant diarrhea)	10 "chromosomes" each ~ 1000 bp	double-stranded RNA

Retrovirus (HIV)

single-stranded RNA genome
- makes DNA copy of it's RNA genome ("retro")
- inserts DNA copy into the host genome
  ∴ virus is passed to daughter cells

2) HIV (a retrovirus) Life cycle (Campbell CD-ROM activity 18.1 - fourth one in list)

- an HIV particle:



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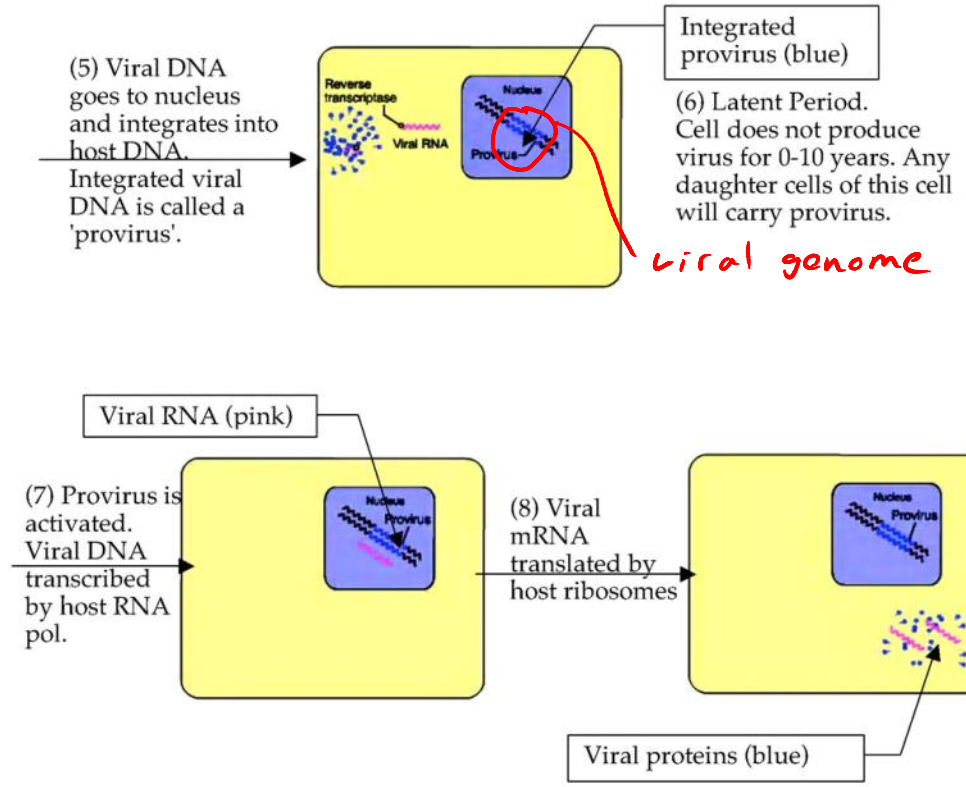

(11) Virus particle must mature before it can infect cells. Enzyme encoded by viral RNA, HIV protease, must process viral proteins to make the particle active.