

BIOLOGY 205
Midterm II - 27 Feb 2012
(100 points total)

Name _____

Multiple choice questions – 3 points each (please circle the letter of single best answer).

1. Ribosomes are a collection of:
 - A. small proteins that function in translation
 - B. proteins and rRNAs that function in translation
 - C. proteins and tRNAs that function in transcription
 - D. proteins and mRNAs that function in translation
 - E. mRNAs and tRNAs that function in translation

2. Which of the following correctly ranks the structures in order of **size**, from *smallest* to *largest*?
 - A. nucleotide → codon → gene → chromosome
 - B. chromosome → gene → codon → nucleotide
 - C. nucleotide → chromosome → gene → codon
 - D. gene → chromosome → codon → nucleotide
 - E. chromosome → codon → gene → nucleotide

3. The Hershey-Chase blender experiment, in which T2 bacteriophage were grown in the presence of radioactive precursors, showing which of the following?
 - A. DNA, and not protein, is the hereditary material in this virus.
 - B. Protein, and not DNA, is not the hereditary material in this virus.
 - C. DNA, and not protein, is the hereditary material in this bacterium.
 - D. Protein, and not DNA, is not the hereditary material in this bacterium.
 - E. Just because bacteriophage are viruses doesn't mean they have hereditary material.

4. Consider the structure and function of the chromosome, which of the following is NOT involved during the organization of chromatin material?
 - A. Histones
 - B. Mesosomes
 - C. Cohesins & condensins
 - D. Nucleosomes
 - E. Looped domains

5. The molecular biological method that takes advantage of dideoxynucleotides (aka ddNTPs)?
 - A. PCR
 - B. RFLP
 - C. sequencing
 - D. cloning
 - E. hybridization

6. During the cell cycle, the levels cyclin-Cdk complexes are controlled by?
- A. phosphorylation and dephosphorylation rxns
 - B. correct folding by a chaperonin
 - C. growth factors and hormones
 - D. cyclin-Cdk complexes are “constitutive” or expressed all the time
 - E. ubiquitylation of cyclin and targeted destruction in proteosomes
7. An organism has 30% guanine in its DNA. What percent of adenine is in its DNA??
- A. 90%
 - B. 60%
 - C. 30%
 - D. 20%
 - E. 15%
8. During Mitosis, which stage is characterized by the chromosomes pulling apart and the sister chromatids having a chevron or V-shaped structure?
- A. Prophase
 - B. Prometaphase
 - C. Metaphase
 - D. Anaphase
 - E. Telophase
9. Which type of mutation has the potential to be the most detrimental, i.e., the highest chance to be lethal to the next generation?
- A. silent
 - B. missense
 - C. early nonsense
 - D. late nonsense
 - E. inversion
10. When eucaryotic DNA is hybridized with mature (i.e., processed) mRNA, the hybrid molecules contain loops of single-stranded DNA. These regions of DNA are called:
- A. retroviruses
 - B. exons
 - C. UTRs
 - D. introns
 - E. transposons

11. (12 points) Match the term on the left with the stage of mitosis on the right. There is at least one answer for every term on the left - perhaps more than one! You will want to use every letter on the right once. (1 point each with one free miss).

_____	prophase	A. nuclear lamina gets polymerized via dephosphorylated of lamins
_____	prometaphase	B. nuclear lamina gets depolymerized via phosphorylation of lamins
_____	metaphase	C. microtubules begin to capture kinetochore proteins
_____	anaphase	D. phragmoplast guides formation of cell wall
_____	telophase	E. centrosomes replicate
_____	cytokinesis	F. equal tension on the kinetochore of each sister chromatid at this stage
_____	interphase	G. sister chromatids pulled to cell poles
		H. condensins associate with chromosomes
		I. kinetochore proteins associate with centrosomes
		J. microtubules organize around centrosomes in a MTOC
		K. chromosomes are aligned between spindle apparatus
		L. cohesins undergo proteolysis
		M. contractile ring causes cleavage furrow

12. (3 points) What are the three types of **microtubules** that make up the mitotic spindle during metaphase?

13. (10 points) Match the single best answer (enzyme) with the corresponding statement regarding DNA replication. The choices may be used once, more than once, or not at all (1 point each).

Your choices are:

1. Synthetase
2. Primase
3. Helicase

4. DNA Polymerase III
5. DNA Polymerase I
6. Ligase

_____	Joins tRNA with an amino acid	_____	Replaces RNA with DNA
_____	Unwinds double helix	_____	Critical that it does NOT mutate
_____	Forms short segments of RNA	_____	Forms Okazaki fragments
_____	Connects short segments of DNA	_____	Functions as a rotary motor
_____	Able to proofread in 3' to 5' direction	_____	Required more often on lagging-strand

Short answer – Number of points in parentheses.

14. (9 points) What are three specific mechanisms (AND when these occur) for introducing genetic variation from one generation to the next in sexually reproducing organisms?

Process

Stage in cell cycle when this occurs (be specific)

15. (6 points) What do multicellular genomes spend a larger proportion of their sequences on (in terms of enhanced complexity)?

16. (9 points) What are the primary steps involved with RNA processing in a eucaryotic cell, also what happens to the UTR during this process?

17. (6 points) What are three different types of covalent modifications that are also considered **posttranslational events** which are possible with a newly synthesized protein?

18. (6 points) Consider the Meselson and Stahl experiment regarding bacteria with heavy ^{15}N DNA grown in light ^{14}N media. (A) Upon CsCl density gradient ultracentrifugation of the first generation DNA, which **model(s)** of DNA replication is/are supported **if** the resulting DNA is both *heavy* and *light* in density? (B) Which **model(s)** of DNA replication is/are supported after the second generation **if** the resulting DNA is both *intermediate* and *light* in density?

19. (9 points) Briefly describe the structure and function of **three** different cellular systems that combine proteins along with necessary RNAs to *catalyze* covalent bond formation and/or hydrolysis reactions (i.e., function as ribozymes)?

20. **Extra Credit (6 points max)** What is the *ploidy* level and how many *sister chromatids* are there in your own cells during (hint - you normally have 23 pairs of chromosomes):

	<u><i>ploidy</i></u>	<u><i># of sister chromatids</i></u>
Anaphase I?	_____	_____
Anaphase II?	_____	_____
Just after telophase II? (i.e., includes cytokinesis)	_____	_____