

Biol 319, Cell Biology

Sample Exam

Name: _____

I. Part I. Multiple choice. In the questions below, check any and all choices that apply. There may be more than one correct item in each question, so consider each choice carefully and check *all* items you've decided are correct. 4 points for each question.

1. Which of the following statements about nucleoli is true?

- nucleoli are membrane-bounded structures present in the nucleus
- a single nucleolus always corresponds to a single nucleolar organizer region (NOR)
- in animals and plants, the disappearance of nucleoli during mitosis is correlated with the cessation of ribosome synthesis
- the DNA of nucleoli encodes the cells tRNA genes

2. In eukaryotic cells,

- RNA polymerase may sometimes be found attached to an mRNA that also has ribosomes attached on it
- All mRNA have a 5' cap
- Enhancers always lie upstream of the transcriptional start point
- The initiator tRNA bearing methionine is the only aminoacyl tRNA that can bind directly to the P site of the large ribosomal subunit

II. Part II. Short answers. Variable points.

1. Study the statements in the column on the left, and mark the appropriate column(s) on the right to indicate the phase of the cell cycle for which the statement is true.

- | | <u>G1</u> | <u>G2</u> | <u>S</u> | <u>M</u> |
|--|-----------|-----------|----------|----------|
| 1. Amount of nuclear DNA doubles during | | | | |
| 2. Primary cell wall of plant cells forms in | | | | |
| 3. Chromosomes present in diffuse, extended form during | | | | |
| 4. Mitotic cyclin is at its lowest level in | | | | |
| 5. A Cdk protein is present in cell during | | | | |
| 6. Cells that will never divide again are likely to be arrested in | | | | |

2. Complete the statements below to provide one or two sentence explanations for the following observations, or phenomena. (3 points each).

a. Based on electrophoretic analysis, many of the proteins of the nuclear envelope are found to be identical to those found in the ER. This is because _____

b. DNA polymerases have a very low error rate (1 mistake per 10^7 nucleotides copied). In contrast, primases incorporate very many more incorrect nucleotides. The cell can tolerate the higher error rate of primases because _____

c. One would not expect to find spliceosomes in bacterial cells because _____

d. Treatment of nuclei with the nonionic detergent Triton X-100 dissolves away the nuclear membrane but leaves an otherwise intact nucleus. In the absence of the membranes, the nuclear structure is held together by _____

e. Although the nucleotide base uracil can basepair with adenine, and is found in RNA, it is not a normal component of DNA. The absence of uracil in the cell's hereditary material is likely to benefit the organism because _____

3. Lymphocytes (white blood cells) are highly differentiated cells; when exposed to an antigen such as a foreign protein, these cells undergo rapid proliferation to increase cell number. Describe one mechanism through which daughter cells maintain the differentiated state of the parent cell by retaining cell memory.