Exam #1 BSC 2011 2004 Fall

NAME **KEY – correct answers in bold** **FORM A**

Before you begin, please write your name and social security number on the computerized score sheet. Mark in the corresponding bubbles under these. Fill in the Form (A or B), instructor (Winn), and course (BCS 2011-02) lines.
Select the best answer to each question: ONLY ANSWERS RECORDED ON THE COMPUTERIZED SCORE SHEET WILL BE GRADED

1. A cell in G1 of the cell cycle does not initiate M phase because
   a. It contains too little of the appropriate cdk
   b. It has not yet replicated its DNA
   c. The concentration of the appropriate cyclin is too low
   d. MPF is present but not active
   e. It contains too much MPF

2. Holtfretter's work showing that dissociated cells of a gastrula can reaggregate and resegregate shows that
   a. One cell can recognize another cell
   b. Morphogens are required for cell communication
   c. The pattern of gastrulation depends on the amount of yolk in the egg
   d. One type of cell can influence the developmental fate of others
   e. Differentiated cells cannot give rise to undifferentiated cells

3. Which is NOT true
   a. All Eukaryotes are multicellular
   b. Prokaryotes have less non-coding (untranscribed) DNA than Eukaryotes
   c. Only Eukaryotes have chromatin
   d. Transcription and translation can occur simultaneously in Prokaryotes
   e. Only Eukaryotes have a nucleus

4. Which of the following results supported the hypothesis of nuclear differentiation
   a. The reaggregation of cells in the gastrula
   b. The production of two tails in flies with mutant bicoid genes
   c. The regeneration of a carrot plant from a single root cell
   d. Fusion of cells of cells in G1 and M phase of the cell cycle
   e. None of the above

5. Which of the following is available for transcription
   a. Barr bodies (the "extra" X-chromosome in mammals)
   b. Chromosomes during prophase of mitosis
   c. Highly methylated DNA
   d. Centromeres
   e. The euchromatic puffs of polytene chromosomes

6. The primary difference between Positive and Negative control of gene expression is
   a. the effect of the signal molecule on the regulatory protein
   b. whether the regulatory protein is produced in an active or inactive form
   c. the metabolic processes involving the products of the structural genes
   d. the effect of the active regulatory protein on transcription
   e. the affinity of the operator for binding RNA polymerase

7. Which of the following is NOT true of the cleavage stage of development
   a. It insures equal division of the egg cytoplasm components
   b. It occurs without any growth in size of the embryo
   c. The pattern of cell divisions differs between flies and sea urchins
   d. Cell division proceeds very rapidly
   e. It can be initiated without fertilization

8. The main purpose of chromosome movement during mitosis is
   a. To make space for cytokinesis to occur after nuclear division
   b. To organize the microtubules of the spindle
   c. To insure complete duplication of all chromosomes
   d. To insure equal division of the chromosomes between daughter cells
   e. To initiate G1 in the resulting daughter cells

9. Which of the following is present in female gametes but not in male gametes
   a. Plasma membrane
   b. Chromosomes
   c. Acrosome
   d. Vitelline membrane
   e. Mitochondria

10. Which of the following is required for transcription to proceed in Eukaryotes
   a. Control elements
   b. Transcription factors
   c. Histone acetylaton
   d. Enhancer sequences
   e. Signal molecules

11. Which of the following is NOT true of gastrulation in amphibians
   a. It results in the shrinking of the blastocoel
   b. It results in formation of the primitive gut
   c. It contributes to determining cell fate
   d. It begins with cell movement
   e. All are true

12. Which of the following is a mechanism of regulation of gene expression that prevents transcription

a. DNA methylation
b. Anti-codon specificity
c. Differential exon splicing
d. Metabolic regulation
e. Differential transport across the nuclear membrane

13. Which of the following is not true of the mRNA transcript of the bicoid gene in Drosophila

a. It produces a morphogen gradient
b. It establishes an axis of symmetry in the embryo
c. It is translated to produce a transcription factor
d. It induces the formation of the neural tube
e. It is not uniformly distributed in the egg

14. Which of the following is consistent with the operon model

a. A signal molecule must be present for transcription to proceed
b. A co-repressor allows an inactive regulatory protein to bind to the promoter
c. Active regulatory proteins bind to RNA polymerase to stop transcription
d. RNA polymerase must bind to the promoter to initiate transcription
e. None of these is true

15. Which of the following is NOT true of the cell cycle

a. Cells must pass through one stage to initiate the next phase
b. Cells can remain in one stage until they die
c. Some cells never complete the cycle
d. Cells in G2 contain more DNA than cells in G1
e. Substances in the cytoplasm can cause cells to progress to the next phase

16. Which of the following is NOT true of the hormone thyroxin

a. It only affects cells with appropriate receptors
b. Injection into a young tadpole induces early metamorphosis
c. It acts only on cells near the site where it is produced
d. It is produced in the thyroid gland
e. It can coordinate developmental changes in different tissues

17. Which of the following is NOT directly involved in translation

a. Messenger RNA
b. Initiation factors
c. RNA polymerase
d. Transfer RNA
e. Ribosomes

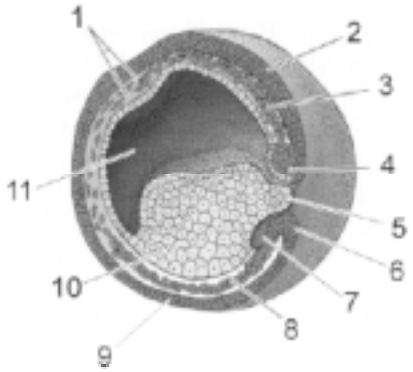
18. The role of non-kinetochore microtubules in mitosis is

a. To organize the activity of the centromere
b. To push the ends of the cell apart
c. To move chromosomes to appropriate locations
d. To pinch the cytoplasm into two separate cells
e. None of the above

19. Which of the following does NOT illustrate the effects of the egg cytoplasm on development

a. Establishment of the anterior – posterior body axis in frogs
b. Establishment of the dorso-ventral body axis in frogs
c. The formation of the neural tube
d. Absence of totipotency in the cells of 8-cell Protostome embryos
e. The location of initiation of gastrulation in the frog

In the diagram of gastrulation



20. Which number indicates the germ layer
from which the central nervous system will form

A. 1 **B**. 2 C. 3 D. 8 E. none of the above

21. Which number indicates the primitive gut of the embryo

A. 1 B. 3 C. 5 D. 10 **E**. 11

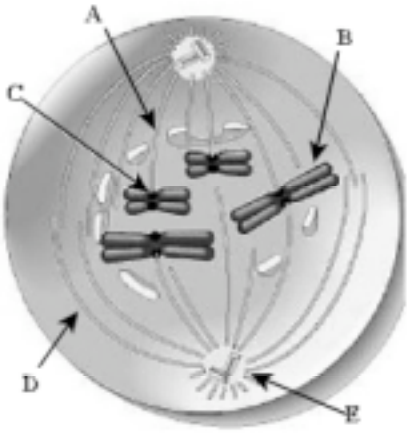
22. Which number shows the location of the dorsal lip of the blastopore

A. 2 **B**. 4 C. 5 D. 6 E. 11

23. Which number indicates the blastocoel

A. 1 B. 3 C. 5 D. 11 **E**. none of the above

In the diagram of the cell undergoing division:



24. What phase of division is pictured
    a. Late Interphase
    b. Mid prophase
    c. Late metaphase
    d. Late anaphase
    e. Early telophase

25. What is the name of the structure labeled C
    a. Centrosome
    b. Centriole
    c. Kinetochore
    d. Aster
    e. Microtublue

26. Which letter indicates a non-kinetochore microtubule
    A B C **D** E

27. Which gives the correct order of events in fertilization and early development in the sea urchin

1. fusion of egg and sperm nuclei **2**. first cleavage division **3**. the cortical reaction
4. acrosomal reaction and egg depolarization **5**. onset of new DNA synthesis

a. 1 4 3 2 5
b. 3 4 5 1 2
c. 4 3 1 5 2
d. 3 4 1 5 2
e. 4 1 3 2 5

28. Which of the following gives the correct downstream (direction of transcription) order of elements in an operon
    a. structural genes, operator, promoter
    b. promoter, structural genes, operator

c. promoter, operator, structural genes
d. structural gene, operator, promoter, structural gene
e. none of the above

29. Which of the following is NOT typical of a male sea urchin gamete
    a. a long tail
    b. large stores of mRNA
    c. ability to track chemical gradients
    d. a nucleus
    e. mitochondria

30. Which of the following is NOT involved in a post-transcriptional mechanism of control of gene expression
    a. Differential intron removal
    b. Addition of methyl guanosine cap
    c. Control of transport across the nuclear membrane
    d. Histone acetylation
    e. Control of mRNA lifetime

Using the list below, indicate what each of the following molecules consists of

A. protein
B. RNA
C. DNA
D. None of the above

31. transcription factor **A**
32. anticodon **B**
33. operator **C**