BIOS 100 - Summer, 2008 **Name:**
Exam III, 6 Aug, 2008
Michael Muller, Instructor **TA:**

This exam consists of 54 questions spread like butter over eight pages. Please check to see that all the pages are present before you begin. Use a #2 pencil and bubble in all answers. **The final exam is Friday, 8 August, in Lecture Center F6.** Don't forget that, or you'll end up wandering around, lonely and lost! Your score will be posted on the UIC Blackboard site as soon as they are in. Good Luck!

1. Which of the following statements (A-D) about operons is FALSE? If statements A-D are true, then choose E.
   A. Operons are only found in prokaryotes - they are not found in eukaryotes
   B. Operons may be either inducible or repressible
   C. Operons are organizations of genes all under one control
   D. Operons typically have a repressor protein which is a DNA-binding protein
   E. All of the above statements are TRUE

2. What would happen to the *lac* operon if the repressor protein was mutated so that it could never bind to lactose?
   A. The *lac* operon would be permanently turned off
   B. The *lac* operon would be permanently turned on
   C. The activity of the *lac* operon would be under the control of glucose concentration
   D. The *lac* operon could be turned on or off, but it could never be as active as it would be in a cell without the mutation
   E. None of the above

3. What would happen to the *lac* operon if the repressor protein was mutated so that it could never bind to the operator?
   A. The *lac* operon would be permanently turned off
   B. The *lac* operon would be permanently turned on
   C. The activity of the *lac* operon would be under the control of glucose concentration
   D. The *lac* operon could be turned on or off, but it could never be as active as it would be in a cell without the mutation
   E. None of the above

4. What would happen to the *lac* operon if the CAP protein was mutated so that it could never bind to cAMP?
   A. The *lac* operon would be permanently turned off
   B. The *lac* operon would be permanently turned on
   C. The activity of the *lac* operon would be under the control of glucose concentration
   D. The *lac* operon could be turned on or off, but it could never be as active as it would be in a cell without the mutation
   E. None of the above

5. In a bacterium, if the concentration of glucose is high, the concentration of cAMP will most likely be high.
   A. True **B. False**

6. Which of the following is NOT and example of post-transcriptional gene regulation in eukaryotes?
   A. Removal of introns
   B. Addition of a 3' poly-A tail
   C. Transport of the immature mRNA out of the nucleus
   D. Addtion of a 5' Guanine Cap
   E. All fo the above are post-transcriptional gene regulations found in eukaryotes

7. What would you assume about a protein with a leucine zipper?
   A. It is an enzyme
   B. It is an integral protein
   C. It is a DNA-binding protein
   D. It is an antigen
   E. B & D

8. What would happen to a cell that was mutated so that its TFIID could never bind to the TATA box?
   A. Gene transcription would be unaffected
   B. Gene transcription would be more difficult, but genes could still be turned on or off
   C. Gene transcription of certain regulatory genes would be affected, but the majority of gene transcription would be unaffected
   D. Gene transcription of all genes would be shut down and the cell would soon die
   E. None of the above

9. The removal of the C-chain in insulin is an example of:
   A. Chromosome remodeling
   B. Transcriptional control
   C. Post-Transcriptional control
   D. Translational control
   E. Post-Translational control

10. What is the function of transcription enhancers?
   A. They are the binding site of TFIID
   B. They help transcription factors bind to DNA
   C. They help RNA polymerase bind to the promoter
   D. They help the mRNA bind to the ribosome
   E. None of the above

11. Which of the following diagrams is of a 2n=8 Cell in Metaphase I of Meiosis?

A. B. **C.** D. E.

12. All normal human somatic cells have 2n=46 chromosomes
   A. True
   B. False

13. Which of the following statements (A-D) about regulation of the cell cycle are FALSE. If statements A-D are true, then choose E
    A. There are numerous checkpoints throughout the cell cycle. The cell cycle will stop at these points until certain conditions are met
    B. If the cell does not receive the appropriate signals to enter the S-stage of the cell cycle, it will enter the G0 stage
    C. The G0 stage is a non-dividing stage
    D. The cell will enter the M stage only when there is a sufficient concentration of MPF
    E. All of the above statements about regulation of the cell cycle are TRUE

14. During which stage of meiosis does crossing over occur?
    A. Prophase I B. Prophase II C. Metaphase I D. Metaphase II
    E. Anaphase I

15. During which stage of meiosis do the homologous chromosomes separate?
    A. Metaphase I B. Metaphase II **C. Anaphase I** D. Anaphase II
    E. Telophase I

16. What is the product of meiosis
    A. Two genetically identical cells B. Two genetically unique cells
    C. Four genetically identical cells **D. Four genetically unique cells**
    E. None of the above

17. What is a non-disjunction?
    A. It is what happens when chromosomes fail to cross over
    B. It is what happens when crossing over switches parts of non- homologous chromosomes
    C. It is what happens when unequal portions of chromosomes are swapped during crossing over
    D. It is what happens when crossing only occurs between homologous chromosomes
    E. It is what happens when chromosomes fail to separate properly during meiosis I or II

18. Which of the following statements (A-D) about cyclins and associated molecules is FALSE? If statements A-D are true, then choose E.
    A. Cyclin-dependent kinase (CDK) levels are constant throughout the cell cycle
    B. Cyclin levels are highest at the end of G2 and beginning of the M stages of the cell cycle
    C. Cyclins and cylclin-dependent kinases (CDK's) combine to form maturation promotion complexes (MPF)
    D. MPF promotes mitosis and initiates processes to destroy cyclins
    E. All of the above statements are TRUE.

19. Which of the following cells are produced by a vascular cambium?
    A. Apical meristem B. Primary xylem **C. Secondary xylem**
    D. Root cap E. Pericycle

Use the list of cells below to answer questions 20 - 21

parenchyma cell	sclerenchyma cell	collenchyma cell
xylem parenchyma	tracheid	sieve-tube element
palisade mesophyll	companion cell	vessel element
vascular cambium cell		

20. How many of the cells in the above list are dead at functional maturity?
A. Two **B. Three** C. Four D. Five E. Six

21. How many of the cells in the list above are utilized to physically support the plant?
A. Two B. Three **C. Four** D. Five E. Six

22. All of the following are found in monocots except:
A. Vascular bundles B. Primary xylem C. Ground tissue
D. Vascular cambium E. Root caps

23. What is the function of the pericycle?
A. Formation of the root cap
B. Location of cells that can take over for the root apical meristem should it become damaged
C. Branch root formation
D. Regulation of water entry into the xylem
E. None of the above

24. The drawing below is of what structure?

A. Monocot root
B. Monocot stem
C. Dicot root
D. Herbaceous dicot stem
E. Woody dicot stem

25. In a plant, which cells do the bulk of the transport of photosynthate?
A. Xylem parenchyma B. Tracheids & Vessels
C. Sieve-tube elements D. Companion cells
E. A & B

26. Which type of plant has the most active vascular cambium?
A. Monocots B. Herbaceous dicots **C. Woody dicots**

27. Where does meiosis occur in a fern?
A. Archegonia B. Antheridia **C. Sporangia** D. Ovary
E. A & B

28. Which of the following characteristics are NOT unique to angiosperms?
A. Fruits B. Double fertilization C. Flowers **D. Seeds**

29. What color of flower would you expect to NOT be fertilized by butterflies?
A. Red B. Yellow C. White D. Blue E. Purple

Use the key below to answer questions 30-34

I. Mosses (Bryophyta)
II. Ferns (Pteridophyta)
III. Pines (Confierophyta)
IV. Flowering Plants (Angiosperms)

30. These plants have the sporophyte as the dominant stage in the life cycle:
A. I only B. IV only C. III, IV **D. II, III, IV** E. I, II, III, IV

31. Meiosis occurs in these plants :
A. I only B. IV only C. III, IV D. II, III, IV **E. I, II, III, IV**

32. Double fertilization occurs in these plants:
A. I only **B. IV only** C. III, IV D. II, III, IV E. I, II, III, IV

33. Seeds are produced in these plants:
A. I only B. IV only **C. III, IV** D. II, III, IV E. I, II, III, IV

34. Spores are produced in these plants:
A. I only B. II only **C. I, II** D. I, II, III E. III, IV

35. A fruit is a ripened:
A. Egg sac B. Ovule **C. Ovary** D. Pistil E. Anther

36. These blood vessels have the thickest walls
A. Arteries B. Arterioles C. Capillaries D. Venules E. Veins

37. The greatest loss of blood pressure occurs in these vessels
A. Arteries **B. Arterioles** C. Capillaries D. Venules E. Veins

38. The majority of gas exchange occurs here:
A. Arteries B. Arterioles **C. Capillaries** D. Venules E. Veins

39. How is the majority of CO_2 carried away from the tissues?
A. Directly dissolved in the plasma
B. Attached to the hemoglobin
C. As carbonic acid (H_2CO_3)
D. As bicarbonate (HCO_3^-)
E. Bound to carbonic anhydrase

40. Which of the areas listed below has the greatest pO_2 (concentration of O_2)
A. The interstitial tissues
B. The blood in the venules
C. The blood in the right ventricle
D. The blood in the left ventricle
E. The blood entering the alveolar capillaries

41. Which of the following statements (A-D) about bile is FALSE? If statements A-D are true, then choose E.

A. The gall bladder produces and stores bile
B. Bile is an amphipathic molecule
C. Bile emulsifies fats
D. The actions of bile make it easier for lipases to break down glycerides
E. All of the above statements about bile are TRUE

42. In which of the following organs does mechanical digestion take place?

A. Mouth
B. Stomach
C. Mouth and Stomach
D. Mouth, Stomach, Small Intestine
E. Mouth, Stomach, Small Intestine, Large Intestine

43. Why is the inner surface of the small intestine covered with villi and microvilli?

A. To better produce mucus to prevent damage of the wall from stomach acid
B. To filter food particles entering the small intestine
C. To better absorb nutrients
D. The villi and microvilli provide a better environment for the intestinal *E. coli*
E. None of the above

44. Which of the following cells listed below secretes chemicals to both stimulate production of macrophages and neutrophils as well as attract cells involved in the immune system to the affected area?

A. Mast cells
B. Macrophages
C. Erythrocytes
D. Neutrophils
E. None of the above

45. Which of the following statements (A-D) about an cell-mediated immune response is FALSE? If statements A-D are true, then choose E.

A. A macrophage can engulf a pathogen and then become an antigen-presenting cell
B. Activation of a virgin or memory helper T cell is through contact with an antigen-presenting cell
C. One of the two signals necessary for activation of a virgin or memory cytotoxic T Cell is by direct contact with the pathogen
D. One of the two signals necessary for activation of a virgin or memory cytotoxic T Cell is given by an effector Helper T Cell
E. All of the above statements about a cell-mediated immune response are TRUE

46. Which of the following statements (A-D) about reabsorption in the Loop of Henle is FALSE? If statements A-D are true, then choose E.

A. As the Loop of Henle permeates deeper into the medulla of the kidney, external salt concentrations increase
B. The walls of both the ascending and descending portions of the Loop of Henle are permeable to water
C. Salts are actively transported out of the filtrate in the ascending portion of the Loop of Henle
D. The vasa recta surrounds the Loop of Henle and reabsorbs water and salts into the blood
E. All of the above statements about the Loop of Henle are TRUE.

47. A person is trapped in the desert and their body becomes dehydrated. How would their body react to this?
    A. The body releases ADH, making the walls of the collecting duct permeable to water
    B. The body releases ADH, making the walls of the collecting duct impermeable to water
    C. The body releases aldosterone, making the walls of the collecting duct permeable to water
    D. The body releases aldosterone, making the walls o the collecting duct impermeable to water

48. How does an immunization work?
    A. You are injected with active cultures. Your body fights them off, and then you are immune to the pathogen
    B. You are injected with dead or deactivated pathogens. Your body thinks it is being invaded, so it has an immune response. You then become immune to the pathogen
    C. You are injected with antibodies from another person which grants you immunity to the pathogen
    D. You are injected with antigen-presenting cells the contain the antigens of the pathogen, which sets off an immune response and grants you immunity to the pathogen

49. Which of the following statements (A-D) about the hormone activity is FALSE? If statements A-D are true, then choose E.
    A. Hormones are typically dispersed throughout the body via the circulatory system
    B. A given hormone will have the same effect in all target cells.
    C. Protein hormones must bind to a receptor to generate an effect
    D. Some cellular responses require two or more hormones to generate the response
    E. All of the above statements are TRUE

50. A neuron at rest:
    A. Is electrically neutral
    B. Is positive on the inside relative to the outside
    C. Is negative on the inside relative to the outside
    D. Can be either positive or negative on the inside relative to the outside depending on the type of neuron

51. What is the function of a Schwann cell?
    A. To produce neurotransmitters
    B. To aid in neuron axon growth
    C. To aid in Na+ reabsorption
    D. To aid in neuron reproduction
    E. To produce myelin sheath around the axon of the neuron

52. When a nerve fires:
    A. Na+/K+ pumps turn on, allowing Na+ to be pumped into the neruon
    B. Na+/K+ pumps turn on, allowing Na+ to be pumped out of the neruon
    C. Gated Na+ channels open up, allowing Na+ to rush into the neuron
    D. Gated Na+ channels open up, allowing Na+ to rush out of the neuron
    E. None of the above

53. Which of the following areas of the brain is responsible for the majority of the coordination of movement?

A. The hypothalamus. **B. The cerebellum** C. The cerebral cortex
D. The medulla E. The pons

54. When and where is the final exam (hint: see the instructions on page 1 of the exam)?

A. Thrusday, 7 August, 11:00 am, Lecture Center F1
B. Friday, 8 August, 11:00 am, Lecture Center F1
C. Thrusday, 7 August, 11:00 am, Lecture Center F6
D. Friday, 8 August, 11:00 am, Lecture Center F6