

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



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 G<sub>0</sub> stage
  - C. The G<sub>0</sub> 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 over 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 G<sub>2</sub> and beginning of the M stages of the cell cycle
  - C. Cyclins and cyclin-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  
xylem parenchyma  
palisade mesophyll  
vascular cambium cell

sclerenchyma cell  
tracheid  
companion cell

collenchyma cell  
sieve-tube element  
vessel element

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)    | III. Pines (Coniferophyta)         |
| II. Ferns (Pteridophyta) | 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<sub>2</sub> carried away from the tissues?  
 A. Directly dissolved in the plasma      B. Attached to the hemoglobin  
 C. As carbonic acid (H<sub>2</sub>CO<sub>3</sub>)      D. As bicarbonate (HCO<sub>3</sub><sup>-</sup>)  
 E. Bound to carbonic anhydrase
40. Which of the areas listed below has the greatest pO<sub>2</sub> (concentration of O<sub>2</sub>)  
 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 of 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 that 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  $\text{Na}^+$  reabsorption
  - D. To aid in neuron reproduction
  - E. To produce myelin sheath around the axon of the neuron
52. When a nerve fires:
- A.  $\text{Na}^+/\text{K}^+$  pumps turn on, allowing  $\text{Na}^+$  to be pumped into the neuron
  - B.  $\text{Na}^+/\text{K}^+$  pumps turn on, allowing  $\text{Na}^+$  to be pumped out of the neuron
  - C. Gated  $\text{Na}^+$  channels open up, allowing  $\text{Na}^+$  to rush into the neuron
  - D. Gated  $\text{Na}^+$  channels open up, allowing  $\text{Na}^+$  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. Thursday, 7 August, 11:00 am, Lecture Center F1
  - B. Friday, 8 August, 11:00 am, Lecture Center F1
  - C. Thursday, 7 August, 11:00 am, Lecture Center F6
  - D. Friday, 8 August, 11:00 am, Lecture Center F6