

BIOS 100, Cells and Organisms
Exam III, 7 November, 2007
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Name:

This exam consists of 53 simple questions gratuitously dispersed over the following seven pages. Last exam I gave you bonus points for bubbling in your last name first, and everyone got them. Woohoo! I was truly happy with this (can you tell, I don't give out my woohos lightly). Now we're going to just assume you can do this... but if you don't, you'll be penalized your extra credit points, so don't blow it... Good luck

1. Which of the following statements (A-D) about restriction endonucleases is FALSE? If statements A-D are true, then choose E.
 - A. Restriction endonucleases are naturally occurring enzymes found in bacteria
 - B. Restriction endonucleases cut DNA at specific nucleotide sequences
 - C. Most restriction sites are not pallindromes
 - D. Restriction endoucleases typically leave sticky ends when they cut DNA
 - E. All of the above statements are TRUE.

2. Put the steps to creating a cDNA library that contains the human growth hormone gene in the proper order
 - I. Use reverse transcriptase to synthesize a cDNA from each mRNA
 - II. Introduce recombinant plasmids into *E. coli* cells. Grow cells in the presence of an antibiotic - those cells which took in a plasmid will be resistant and then grow
 - III. Isolate mRNAs from cells in pituitary gland
 - IV. Attach restriction endonuclease recognition site to ends of each cDNA
 - V. Cut cDNAs and plasmids with restriction endonucleases - remaining sticky ends join by complementary base pairing and then ligate cDNA & plasmids with ligase

A. III, II, IV, V, I B. III, I, IV, V, II C. III, IV, V, I, II D. I, III, V, IV, II

3. Whose your daddy? Given the gel below to determine who the father is

Mother

Offspring

Potential Father A

Potential Father B

Potential Father C

4. Why is the use of *Taq* polymerase so important in PCR?
 - A. *Taq* polymerase is a DNA polymerase that can function in the extreme temperature conditions of PCR
 - B. *Taq* polymerase is a DNA polymerase that can function in the extreme acidic conditions of PCR
 - C. *Taq* polymerase is a DNA polymerase that can function in the extreme basic conditions of PCR
 - D. *Taq* polymerase is a DNA polymerase that can function in the extreme voltage potential of PCR
 - E. None of the above

5. What is a plasmid?
 - A. A piece of DNA containing an antibiotic resistance gene
 - B. A circular ring of DNA which typically contains supplemental DNA in bacteria
 - C. A piece of DNA containing a restriction site
 - D. A portion of the main circular loop of naked DNA found in bacteria
 - E. A protist that can cause diarrhea

6. How are dideoxynucleoside triphosphates (ddNTP) used in the Sanger method of DNA sequencing?
 - A. They lack a phosphate group, so they cannot be attached to a growing DNA chain
 - B. They lack a 3' OH group so they terminate DNA replication
 - C. They glow different colors under ultraviolet light so they can be used to light up each base
 - D. They are not recognized by DNA polymerase III and terminate replication
 - E. None of the above

Use the diagrams below to answer questions 7-9 about a $2n=8$ cell

A

B

C

D

7. Which of the above cells is in metaphase II of meiosis?
8. Which of the above cells is in metaphase of mitosis?
9. Which of the above cells is in metaphase I of meiosis?

10. When do the homologous chromosomes separate during meiosis?
 - A. Metaphase I
 - B. Anaphase I
 - C. Metaphase II
 - D. Anaphase II

Use the key below to answer questions 11 - 14

A. G0 B. G1 C. G2 D. S E. M

11. The chromosomes are doubled during the entire length of which stage of the cell cycle?
12. When a cell does not need to divide, it will enter into this non-dividing stage of the cell cycle
13. During which stage of the cell cycle are cyclins destroyed?
14. Topoisomerase is most active during this stage of the cell cycle

15. The product of mitosis is:
 - A. Two genetically identical cells
 - B. Two genetically unique cells
 - C. Four genetically identical cells
 - D. Four genetically unique cells

16. Which of the following statements (A-D) about MPF is FALSE? If statements A-D are true, then choose E.
 - A. MPF is an aggregation of a CDK and a cyclin
 - B. MPF complexes are formed at the G2 checkpoint
 - C. MPF levels are greatest during the M phase of Mitosis
 - D. MPF initiates a process which destroys cyclins, thus ending mitosis
 - E. All of the above statements are TRUE

17. Tumor suppressor genes:
 - A. Are genes which will become tumors
 - B. Are genes which actively destroy tumors
 - C. Are genes which speed up the rate of cell division
 - D. Are genes which slow down the rate of cell division
 - E. None of the above

18. Which of the following statements (A-D) about non-disjunctions is FALSE? If statements A-D are true, then choose E.
 - A. Non-disjunctions result when chromosomes do not separate properly during meiosis
 - B. Non-disjunctions can occur in both Anaphase I and Anaphase II of meiosis
 - C. Most fertilizations of human gametes with non-disjunctions are fatal - however, some are not
 - D. Down Syndrome is the result of a non-disjunction
 - E. All of the above statements about non-disjunctions are TRUE

19. What is the function of crossing over?
 - A. To increase genetic diversity in the gametes
 - B. To ensure proper separation during Anaphase I
 - C. To ensure that the tetrads do not separate during Prophase I and Metaphase I
 - D. To reduce the rate of non-disjunction
 - E. None of the above

20. A dislodged heart cell floating now in the blood will undergo mitosis and most likely form a tumor due to release from contact inhibition
 - A. True
 - B. False

21. All of the following characteristics are typical of dicots except:
- A. Floral parts in multiples of 4's and 5's
 - B. Fibrous root system
 - C. Secondary growth
 - D. Net venation in leaves
 - E. Vascular cambium present
22. The diagram to the right is an example of a
- A. Monocot root
 - B. Dicot root
 - C. Monocot stem
 - D. Herbaceous dicot stem
 - E. Woody dicot stem

Use the key below to answer questions 23-26

- I. Collenchyma
- II. Parenchyma
- III. Sclerenchyma.
- IV. Sieve-tube elements and companion cells
- V. Tracheids and vessels

23. This is the most common type of living cell in a xylem ray
- A. I
 - B. II
 - C. III
 - D. IV
 - E. V
24. This/these cells function to support the plant
- A. I & III
 - B. I, II, III
 - C. I, III, V
 - D. I, II, III, IV
 - E. I, II
25. This/these cells are living at functional maturity:
- A. I only
 - B. I, II
 - C. I, II, III
 - D. I, II, IV
 - E. I, II, V
26. This/these cells are involved in translocation
- A. I
 - B. II
 - C. III
 - D. IV
 - E. V
27. The leaf mesophyll and the root cortex are examples of plant _____ tissue
- A. Dermal
 - B. Ground
 - C. Vascular
28. Branch roots originate from the:
- A. vascular tissue
 - B. pericycle
 - C. endodermis
 - D. cortex
29. Which of the following statements (A-D) about the vascular cambium is FALSE. If statements A-D are true, then choose E.
- A. Vascular cambia are only found in dicots
 - B. Vascular cambia in herbaceous monocots are only active in the vascular bundles - it is active in the parenchyma in between each vascular bundle
 - C. Xylem formed by a vascular cambium is known as secondary xylem
 - D. In a woody dicot, the vascular cambium produces xylem to the inside and phloem to the outside
 - E. All of the above statements about the vascular cambium are TRUE

30. How many of the below tissues are meristematic?
- | | | | |
|----------------------|--------------------|------------|--------------|
| root apical meristem | root cortex | endodermis | pericycle |
| axillary bud | sieve tube element | xylem ray | sclerenchyma |
| vascular cambium | quiescent center | | |

A. Two B. Three C. Four D. Five E. Six

31. Where is the Casparian strip located?

A. Root epidermis B. Root cortex C. Endodermis
D. Pericycle E. Root xylem

32. All of the following are functions of the root except:

A. Plant anchorage B. Sexual reproduction
C. Water and mineral absorption D. Food storage

Use the key below to answer questions 33 to 38

I. Mosses (Bryophyta) III. Pines (Coniferophyta)
II. Ferns (Pteridophyta) IV. Flowering plants (Angiosperms)

33. This/these plants have vascular tissue:

A. I only B. IV only C. III, IV D. II, III, IV E. I, II, III, IV

34. This/these plants have seeds:

A. I only B. IV only C. III, IV D. II, III, IV E. I, II, III, IV

35. This/these plants produce spores:

A. I only B. II only C. I, II D. III, IV E. I, II, III

36. The sporophyte is the dominant stage of the life cycle in this/these plants:

A. I only B. IV only C. III, IV D. II, III, IV E. I, II, III, IV

37. Meiosis occurs in this/these plants:

A. I only B. IV only C. III, IV D. II, III, IV E. I, II, III, IV

38. Sperm have to swim on the forest floor to ensure fertilization in this/these plants

A. I only B. II only C. I, II D. III, IV E. I, II, III

39. A fruit is a ripened _____

A. Egg sac B. Ovule C. Ovary D. Anther E. Flower

40. Where does meiosis occur in an angiosperm?

A. Anther B. Egg sac C. Nectary D. A & B E. A & C

41. In a moss, the egg is produced in the:

A. Archegonia B. Antheridia C. Sporangia D. Egg sac

42. What structure is primarily responsible for competition amongst the pollen tubes in a flower?
 A. Stigma B. Style C. Ovary D. Ovule E. Egg sac
43. There are chemical signals which guide the sperm to the egg and which helps to prevent inbreeding in many plant species
 A. True B. False
44. Which of the following structures is incorrectly matched with its function?
 A. Nectaries- food production for visiting pollinators
 B. Ovule - matures to produce the seed
 C. Stigma - production of pollen grains
 D. Petals - identification of the flower by animals (advertising)
 E. All of the above structures are matched with their function
45. Which of the following statements (A-D) about seed plants is FALSE? If statements A-D are true, then choose E.
 A. All seed plants produce pollen
 B. All seed plants have ovaries
 C. Viable seeds consist of a seed coat, and embryo, and food for the embryo
 D. Double fertilization is seen in flowering plants but not in pine trees
 E. All of the above statements about seed plants are TRUE
46. Flowers pollinated by birds are typically:
 A. Red B. Yellow C. White D. Blue E. C & D
47. What is the function of the Casparian Strip?
 A. Protect the root from pathogens B. Photosynthesis
 C. Formation of branch roots D. Regulate water entry into the xylem
 E. None of the above
48. What area typically has the greatest total water potential (Ψ_w)?
 A. The soil around the roots B. The root tissue
 C. The stem tissue D. The leaf tissue
 E. The air
49. Which solution has the greatest Ψ_s (solute water potential)
 A. Pure water B. 0.25 M lactose C. 0.5 M sucrose
 D. 0.5 M NaCl E. C & D
50. Two solutions are under the water potential conditions illustrated on the left. Which way will water move?
 A. Solution A to B
 B. Solution B to A
 C. No net movement of water

51. All of the following are adaptations that you would expect to find in plants growing in the desert except:
- A. Leaves with white hairs
 - B. Thick cuticles
 - C. Leaves reduced to spines
 - D. Succulent leaves
 - E. All of the above are plant desert adaptations
52. During translocation, where is the solute water potential (Ψ_s) the lowest?
- A. At the source
 - B. At the sink
 - C. In between the source and the sink
53. Which of the following is true for translocation of the phloem?
- A. It is always from the leaves to the roots during the day
 - B. It is always from source to sink during the day
 - C. It is always from the roots to the leaves during the night
 - D. It is always from the sink to the source during the night
 - E. None of the above