Using the Scientific Method in Agriculture

Scenario 1

You are raising hogs for market, and your veterinarian recommends that you switch the type of feed given to the mature hogs. The vet is concerned that the present feed is too high in protein. While a high protein diet is recommended for young, growing hogs, food too high in protein can cause kidney problems in the adult animals. You switch feed and notice that the weights of your mature animals drop. You want healthy animals with maximum weight, but you do not know how to solve the problem. You design an experiment that would help you solve this problem. You think that the higher protein ration is the best way to maintain your weight gain. You have 40 hogs and you divide them into two groups. To one group, you feed the high protein feed, to the other, you feed the lower protein ration. All 40 hogs were farrowed within 10 days of each other. They are all about the same weight when you begin this experiment. Each group of 20 hogs is in the same size pen in the same barn. You weigh all hogs before the experiment, place them on feed for 3 weeks and weigh the hogs again.

1. **Problem: Pigs are not getting enough protein**
2. **Hypothesis: Increasing the protein will increase the weight gain**
3. **Independent Variable: Feed Ration**
4. **Dependent Variable: Weight Gain**
5. **Treatments: One group will get the high diet on will get the lower diet**
6. **Trials: Two groups fro three weeks**
7. **Constants: Pen size, water, time etc…**

1. Monosaccharide, Disaccharides and Polysaccharides are all examples of:
    a. Carbohydrates
    b. Proteins
    c. Lipids
    d. Glycogens
2. Potatoes are an example of :
    a. Lipids
    b. Carcinogens
    c. Carbohydrates
    d. Proteins
3. The master copy of a organism is called:
    a. RPA
    b. PHD
    c. DNA
    d. RNA
4. Electrons have a _____ charge.
    a. Negative
    b. Positive
    c. Neutral
    d. None of the above.

5. Neutrons have a _____ charge.

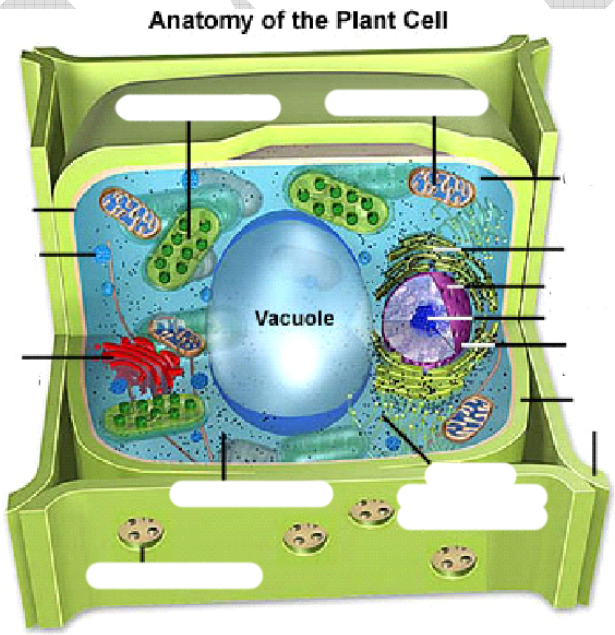
a. Positive
b. Negative
c. Neutral
d. None of the above

6. Protons have a _____ charge.
   a. Positive
   b. Negative
   c. Neutral
   d. None of the above
7. A __Monosaccharide_____ is a simple sugar, contains $C_6H_{12}O_6$ and is also known as Glucose, and Fructose.

8. A _____Disaccharides_____ is a double sugar that contains two rings. Also known as Sucrose and Lactose.

9. A ____Polysacharides_____is a complex carbohydrate made up of rings of sugars. Some examples are starch and cellulose.

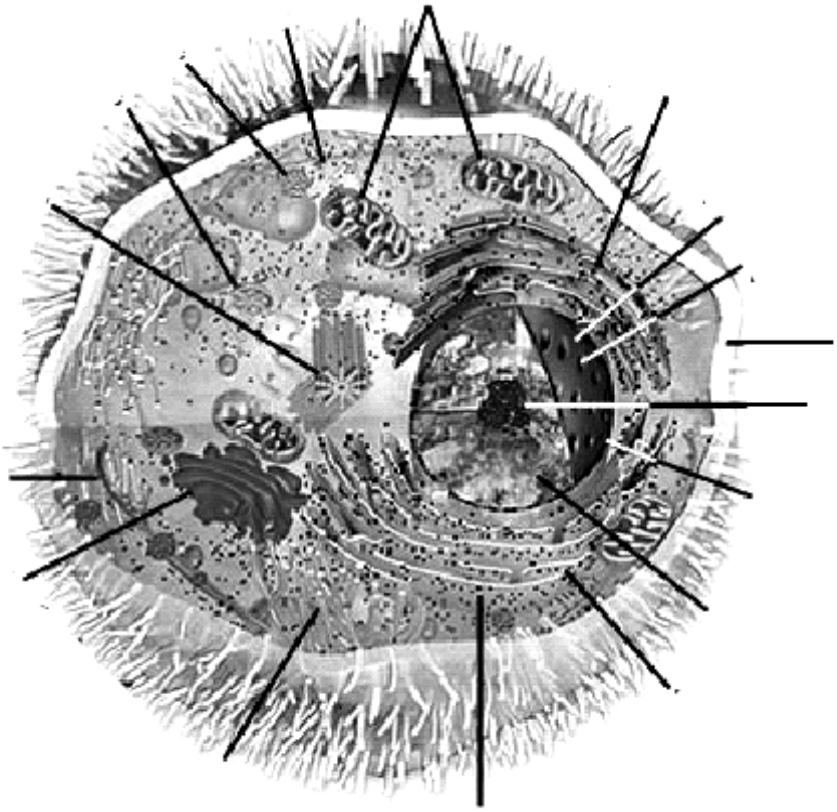
10. A ___Lipids_____is a fatty molecule used to store energy. They do not dissolve in water, and contain less oxygen then carbohydrates.



Locate the following Structures:

Cytoplasm	Ribosomes	Vacuole	Mitochondria
Golgi Apparatus	Endoplasmic Reticulum	Nucleus	Nucleolus
Cell Wall	Chloroplasts		

Anatomy of the Animal Cell



Locate the following Structures

Cytoplasm	Ribosomes	Vacuole	Mitochondria
Golgi Apparatus	Endoplasmic Reticulum	Nucleus	Nucleolus
Plasma Membrane	Centriole	Lysosome	

11. What gives the plant it's green color? – Chloroplasts and Chlorophyll

12. What are the five levels of cellular organization, give examples?
    Cells, Tissue, organs, organ system, organisms

13. Describe the process of photosynthesis?
    $CO_2 + H_2O + SUN = Glucose + Oxygen$

14. What is the end product of photosynthesis?
    Glucose + Oxygen
15. What gives plants their shape and structure?
    Turgor Preassure in the Vacuole

16. You are an extension agent hired by Utah State University to study Crop Production. You receive a phone call from two producers located in Farmington, Utah. They have a few questions about their crops. Farmer #1 is having great success with his alfalfa; farmer #2's alfalfa is wilting. Farmer #1 is located in the river bottoms and he is having good success. Farmer #2 is located on the bench, and he is having problems harvesting his crops, due to wilting. You take sample and bring them back to the lab. You look at the alfalfa cells from both farmers under the microscope and see that farmer #2 does not have a large vacuole, it is rather small. Farmer #1 has a large vacuole in the cell.
    a. What is the function called when plants use their vacuole to create pressure?
        Turgor Preassure

    b. What function is taking place in farmer #1's crop?
        Vacuole in filling up in the cell – god turgor pressure

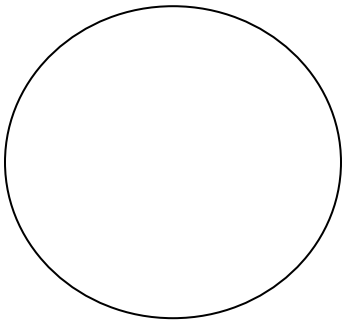
    c. What function is taking place in farmer #2's crop?
        Vacuole in not filling up with water – bad turgor pressure

    d. How can farmer #2's situation be fixed?
        Increase the water

17. Draw and label each part of the chromosome below.

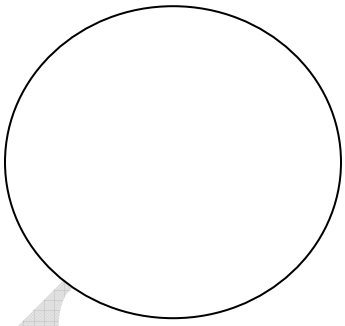
18. Draw and label each phase of mitosis.

Stage 1: ____Prophase_____



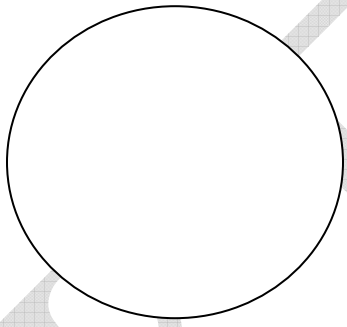
a. _____
b. _____
c. _____
d. _____

Stage 2: _____Metaphase_____



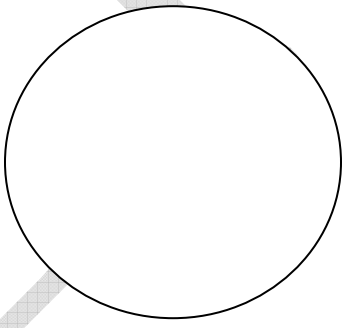
a. _____
b. _____

Stage 3: _____Anaphase_____



a. _____
b. _____

Stage 4: ____Telophase_____



a. _____
b. _____
c. _____
d. _____

19. What is the end product of mitosis?
Genetically Identical Cells

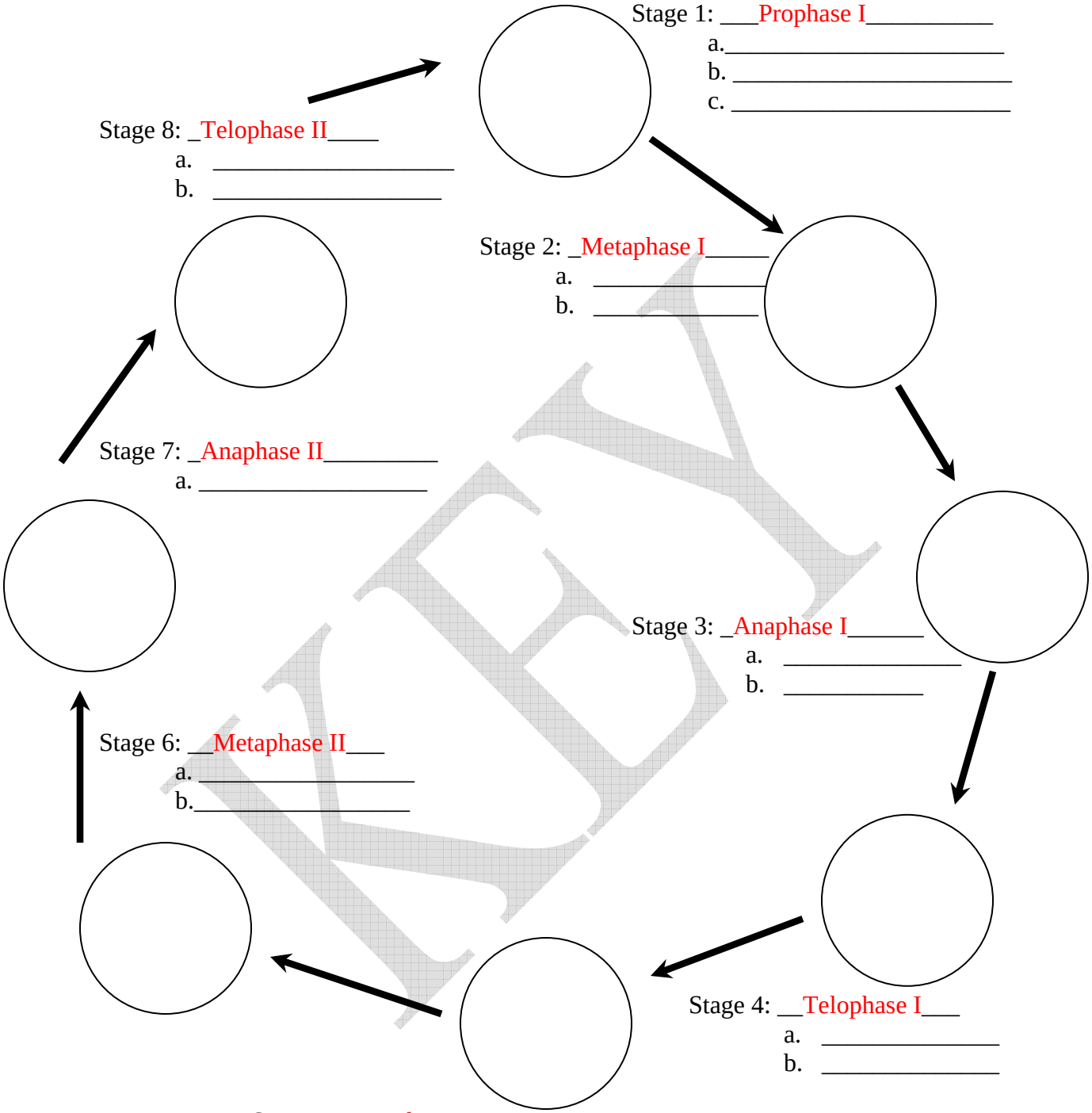
20. How is it different from meiosis?
Meiosis are reproductive cells with half the genetic material

21. What is Cytokinesis?
It is how the cells split after division

22. How does it differ in plants from animals?
Plants build a cell wall
Animals' pinch off

23. What are some examples of animal cells that undergo mitosis?
Hair cells, skin cells, etc…

24. Draw and label each part of meiosis on the pictures below.



Stage 1: ___Prophase I_____
a._____
b. _____
c. _____

Stage 2: _Metaphase I_____
a. _____
b. _____

Stage 3: _Anaphase I_____
a. _____
b. _____

Stage 4: __Telophase I___
a. _____
b. _____

Stage: 5__Prophase II_____
a. _____

Stage 6: __Metaphase II___
a. _____
b._____

Stage 7: _Anaphase II_____
a. _____

Stage 8: _Telophase II____
a. _____
b. _____

25. Define the following:
    a. Traits: Characteristics passed on to offspring
    b. Heredity: Traits being passed on to offspring
    c. Genetics: The study of how traits are passed on.
    d. Alleles: Each organism has a copy of each trait
    e. Dominant: Trait that shows up ¾ on the time
    f. Recessive: Trait that shows up ¼ of the time.
    g. Homozygous: BB or bb
    h. Heterozygous: Bb or Tt
    i. Genotype: The genetic make up of an individual
    j. Phenotype: How the individual looks
    k. DNA: Deoxyribonucleic Acid

26. Who was the first known person to figure out the basic genetics?
    Gregor Mendel

27. List some examples of basic traits that were used in the pea plant experiments?
    Height, Color, Shape, etc…

28. Matching:

I.__c__ P-1 Generation	a. The offspring from the parent generation or (P1)
II. __a_ F-1 Generation	b. The offspring of the F1 generation.
III. _b_ F-2 Generation	c. The original parent generation.

29. Use the punnet square on the following answers. Each question need to have the punnet square showing the offspring, the phenotype, genotype and whether it is homozygous or heterozygous.

    a. Tall pea plant (TT) x Short pea plant (tt)

    b. White rabbit (bb) x Black rabbit (Bb)

    c. Red hair (rr) x Brown hair (RR)

30. Use the punnet square to determine the ***sex linked traits***.
    a. White eyed fly (X^rY) x Red eyed fly (X^RX^R)

    b. Now, take a male fly from above and cross it with a female fly from above and determine what the phenotype and genotype the offspring will be?

    c. Bald cat (X^hY) x Cat with hair (X^HX^H)

    d. Now, take a male cat from above and cross it with a female cat from above and determine what the phenotype and genotype the offspring will be?

31. Use the punnet square to determine the ***incomplete dominance*** of the offspring?
    a. Red carnations (RR) x White carnations (R'R')

    b. Now take two offspring from the carnations above and cross them together. Determine the genotype and phenotype of the offspring?

    c. Orange snapdragons (OO) x White snapdragons (O'O')

    d. Now take two offspring from the snapdragons above and cross them together. Determine the genotype and phenotype of the offspring?

32. Use the punnet square to determine the *co- dominance* of the offspring? What is the genotype and phenotype?

a. Black Chicken (F^BF^B) x (White Chicken (F^WF^W).

b. White shorthorn (F^WF^W) x Red Shorthorn (F^RF^R)

33. What are environmental influences, and how do they affect genetics?

Nutrition, climate, etc…

34. What do the initials DNA stand for?

Deoxyribonucleic acid

35. Copy the following DNA sequences?

Example:

A- ***T*** T- ***A*** T- ***A*** G- ***C*** A- ***T*** C- ***G***	T- C- T- A- T- G-	A- A- T- C- G- T-	C- T- G- A- C- T-
C- T- G- T- T- T-	A- A- T- G- G- A-	C- T- G- T- A- C-	A- T- G- C- C- T-

36. Explain how DNA replicates?

The ribosome reads and copies the DNA above and creates messenger RNA

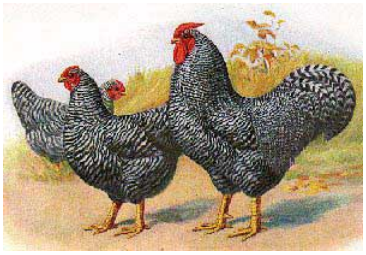
37. List all 7 classifications of organisms? (Hint – Kings play chess….)

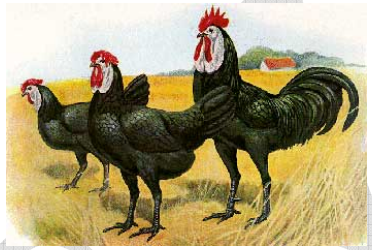
Kingdom, Phylum, Class, Order, Family, Genus, Species

38. List the five kingdoms of living things?

Plant, Animal, Fungi, Monera, Protista

39. Make a Dichotomous Key for the chickens.



40. _e___ Carries water and nutrients up the plant.
41. _c___ White and smell fresh
42. _a___ Anchor the plant to the soil
43. _d___ Place where the leaf attaches to the stem.
44. _k___ Carries nutrients down the plant.
45. _h___ Thick underground stem.
46. _j___ Horizontal Stem that lies above the surface.
47. _b__ Has only one leaf on the petiole.
48. _f___ Parallel leaf veins
49. _gg_ Leaf layer responsible for photosynthesis

A. Roots
B. Simple Leaf
C. Healthy Roots
D. Node
E. Xylem
F. Monocot
G. Palisade Mesophyll
H. Rhizome
J. Stolon
K. Phloem
L. Dicot

50. The _____ are the holes in the leaf that allow gas exchange.
    a. Holes
    b. Gas
    c. Stomata
    d. Cuticle
51. _____ is an example of a modified stem?
    a. Apple
    b. Corn
    c. Corm
    d. Pineapple
52. _____ are short flattened stems with several fleshy layers.
    a. Apple
    b. Corm
    c. Bulb
    d. Strawberry

53. _____ collect sunlight and make energy.
    a. Roots
    b. Stems
    c. Leaves
    d. Flowers
54. _____ open and close the stomata for gas exchange.
    a. Stomata
    b. Potato
    c. Root
    d. Guard Cells
55. Which of the following is the function of pollen?
    a. Feed
    b. Reproduction
    c. Honey
    d. None
56. The tubes that carry water and minerals from the roots *up* to where photosynthesis will occur are called ___Xylem_____.

57. The tubes that carry sugar and water down from where they are produced to where they will be used or stored are called ___Phloem_____.

58. Describe the 4 ways that pollen can be transported to other flowers?
    Animal, Wind, Water, Insects

59. What is the formula for photosynthesis?
    $CO_2 + H_2O + SUN = GLUCOSE + OXYGEN$

60. T or F Carbon 16 dating is used to date the fossils and determine a time of death.

61. T or F Older fossils are found in the upper layers of the sedimentary rocks

62. T or F DDT is a pesticide that was found to be harmful to the environment

63. T or F Vestigial organs are an example of indirect evidences of evolution

64. T or F Charles Darwin traveled to the Galapagos Islands and studied evolution

65. T or F A Species is a group of individuals that looks similar and are not capable of producing fertile offspring.

66. T or F A mutation is a sudden change in genetic material

67. T or F All organisms have a “inner-need” to evolve

68. T or F Stabilizing selection is one type of natural selection

69. T or F The bell curve is a way to predict the bell theory

All of the following are types of natural selection except:

a. Stabilizing
b. Fertilizing
c. Directional
d. Disruptive
e. Sexual

70. A large dinosaur track in the mud would be considered a:

a. Petrified bone
b. Imprint
c. Mold
d. Preserved in tar

71. Which of the following were not a part of Lamarck's Theorys

a. Inner need to change
b. Inheritance of acquired characteristics
c. Bats need fruit
d. It was disproved

72. Living thing increase geometrically, that is 2,4,8,16, etc…, this is considered _____ selection.

a. Modern
b. Natural
c. Isolation
d. Geometrical

73. All of the members of the same species that live in the same area and the same time period are called:

a. Groupies
b. Speciation
c. Populations
d. Hippies

74. Individuals with the average form and have the advantage are what type of natural selection?

a. Stabilizing
b. Directional
c. Disruptive
d. Sexual

75. Individuals with one of the extreme forms and has the advantage would be

a. Stabilizing
b. Directional
c. Disruptive
d. Sexual

76. Individuals with either of the extreme forms have the advantage
    a. Stabilizing
    b. Directional
    c. Disruptive
    d. Sexual

77. Preferential choice of a mate based on the presence of a specific trait
    a. Stabilizing
    b. Directional
    c. Disruptive
    d. Sexual

78. __c__ A simple way of showing what eats what.
79. __g_ An organism which feeds on other animals for its food energy
80. __l__ The ability to do work.
81. _____ Shows the amount of available energy at each level of a food web.
82. __j__ Green plants which change sunlight into food energy.
83. __d__ A number of interconnecting food chains.
84. __h__ All of the living communities of an area, along with the non-living parts of their environment.
85. __e__ The manufacturing of food from carbon dioxide and water in the presence of sunlight

A. ATP
B. Ecology
C. Food Chain
D. Food Web
E. Photosythesis
F. Primary Consumers
G. Secondary Consumers
H. Ecosystem
J. Producers
K. Respiration
L. Energy

_g_89. Cerebrum
_f_90. Heart
_h_91. Kidneys
_e_92. Lungs
_j_93. Ovaries
_h_94. Pituitary Gland
_a_95. Red Marrow
_c_96. Rumen
_b 98. Smooth muscle

A. Skeletal System
B. Muscular System
C. Digestive System
D. Pathway System
E. Respiratory System
F. Circulatory System
G. Nervous System
H. Endocrine System
I. Excretory System
J. Reproductive System
K. Urinary System

99. (4) An example of muscle that is INVOLUNTARY is _____.
    a. cardiac

b. smooth
c. skeletal
d. urinary

.

100 . (4) Smooth muscle is found in the _____.

a. quadriceps (thigh muscle)
b. intestines
c. heart
d. biceps (arm muscle)

101. (4) Which of the following is a monogastric animal?

a. cow
b. sheep
c. pig
d. elk

102. (4) Which of the following is a ruminant animal?

a. cow
b. pig
c. horse
d. human

103. (4) A horse has a _____ digestive system.

a. simple monogastric
b. monogastric with a funcitonal cecum
c. ruminant
d. polygastric

104. (4) The abiltiy to bring food in from the small intestines to the bloodstream is called _____.

a. uptake
b. conversion
c. absorption
d. ingestion

105. (4) Blood flows away from the heart in _____.

a. capillaries
b. veins
c. arteries
d. venules

106. (4) _____ blood cells fight infection while _____ blood cells carry oxygen.

a. red/white

b. large/small
c. white/red
d. small/large

111. (4) Placing semen into the female reproductive tract by means other than natural mating is:

a. artificial insemination
b. cloning
c. superovulation
d. embryo transfer

112. (4) The reproductive glands where eggs are produced are the _____.

a. ovaries
b. testes
c. cowper's
d. pituitary

113. (4) The reproductive glands where sperm is produced are the _____.

a. ovaries
b. testes
c. cowper's
d. pituitary

112. (4)Removing fertilized eggs from one cow and placing them into another is called:

a. artificial insemination
b. cloning
c. superovulation
d. embryo transfer

113. (4) A cell formed by the union of the egg and sperm nuclei is a _____.

a. embryo
b. fetus
c. clone
d. zygote