

**INTERNATIONAL MATHEMATICS AND SCIENCE OLYMPIAD
FOR PRIMARY SCHOOLS (IMSO) 2008
Science Contest in Taiwan , Qualifying Examinations**

Name: _____ School: _____ Grade: _____ ID number: _____

Section A Each question is followed by four answers. Choose the correct answer.

1. What is the principle reason that the air pressure at the top of a mountain is smaller than it is at the bottom?
 - A. the air is cooler at the top of a mountain.
 - B. the weight of all of the air above the top of a mountain is smaller.
 - C. the percentage of oxygen in the air at the top of a mountain is lower.
 - D. the air molecules are closer together at the top of a mountain.

2. A key is placed in a hot oven and warmed to 1000C. As a result
 - A. the hole in the key becomes smaller.
 - B. the key is bent into an arc.
 - C. the key becomes longer.
 - D. All of the above.

3. Choose the correct statement.
 - A. The perceived loudness of a sound depends somewhat on its frequency.
 - B. The frequency of each music note is 10 hertz greater than that of the next lower note.
 - C. The decibel is the standard unit of measure of tone quality.
 - D. None of above.

4. Choose the incorrect statement.
 - A. Melamine ($C_3H_6N_6$) , is found in the milk powder made in China mainland.
 - B. Melamine is a kind of polymer.
 - C. Melamine is used to make plastic dinner plates.
 - D. None of above.

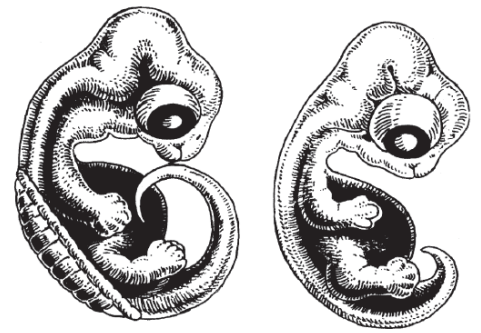
5. The main principle reason of the high resolution functions of the STM (scanning tunneling microscope) is the wave properties of electrons. Choose the correct statement.
 - A. The wavelength of electrons depends on their mass.
 - B. Any particles have the wave properties like electrons.
 - C. Opposite, an electromagnetic wave can not has any particle properties.
 - D. None of above.

6. The primary mirror in a astronomical telescope must be a
 - A. half-silvered mirror.
 - B. convex mirror.
 - C. concave mirror
 - D. plane mirror.

7. An automobile headlight and a dashboard light are used under the same voltage, but the automobile headlight consumes more power because
 - A. its resistance is lower.
 - B. the current is larger.
 - C. it uses energy faster.
 - D. All of above.

8. The drawings below show a turtle embryo and a chicken embryo. Which of the following statements is supported by the similarities between these embryos?

- A. The turtle is more advanced than the chicken.
- B. The chicken has more offspring than the turtle.
- C. The turtle and the chicken are similar as adults.
- D. The chicken and the turtle share a common ancestor.



Turtle

Chicken

9. The complete removal of decomposers from an ecosystem will have the greatest effect on which of the following?

- A. the spread of disease
- B. the availability of water
- C. the recycling of nutrients
- D. the distribution of organisms

10. Which of the following statements best explains why the tilt of Earth on its axis causes summer to be warmer than winter in the Northern Hemisphere?

- A. The warm ocean currents flow from the tropics to the Northern Hemisphere in the summer.
- B. The rays of the Sun strike the Northern Hemisphere more directly in the summer.
- C. The greenhouse effect increases in the Northern Hemisphere in the summer.
- D. The Northern Hemisphere is closer to the Sun in the summer

11. The terms gas exchange, diaphragm, and inhale are most closely associated with which system in the human body?

- A. circulatory
- B. digestive
- C. excretory
- D. respiratory

12. The following diagram shows a caterpillar, mold, and a fern. What do these organisms have in common?



Caterpillar



Mold



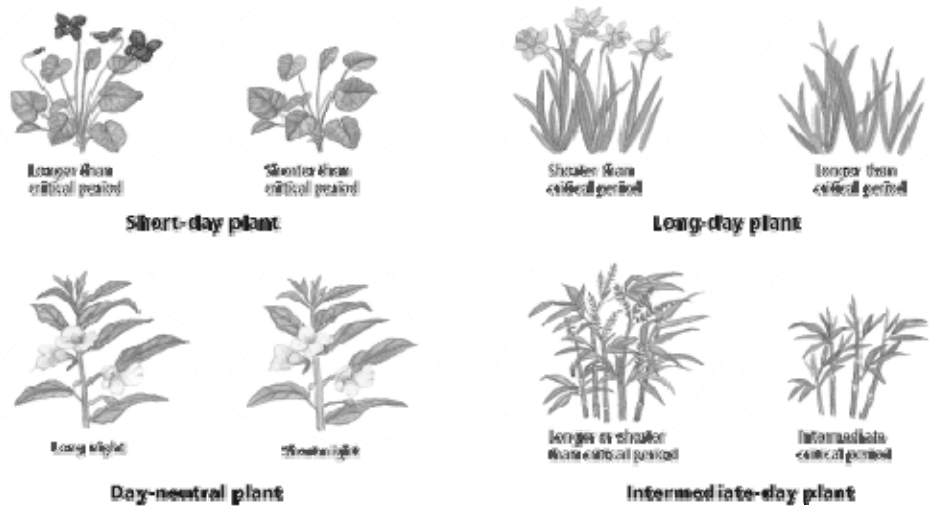
Fern

- A. They are made of cells.
- B. They produce their own food.
- C. They decompose other organisms.
- D. They are disease-causing organisms.

13. Which of the following Earth layers has the greatest density?

- A. crust
- B. mantle
- C. inner core
- D. outer core

14. Which of these plants flower during the summer?



- A. long night
- B. short-day
- C. intermediate-day
- D. long-day

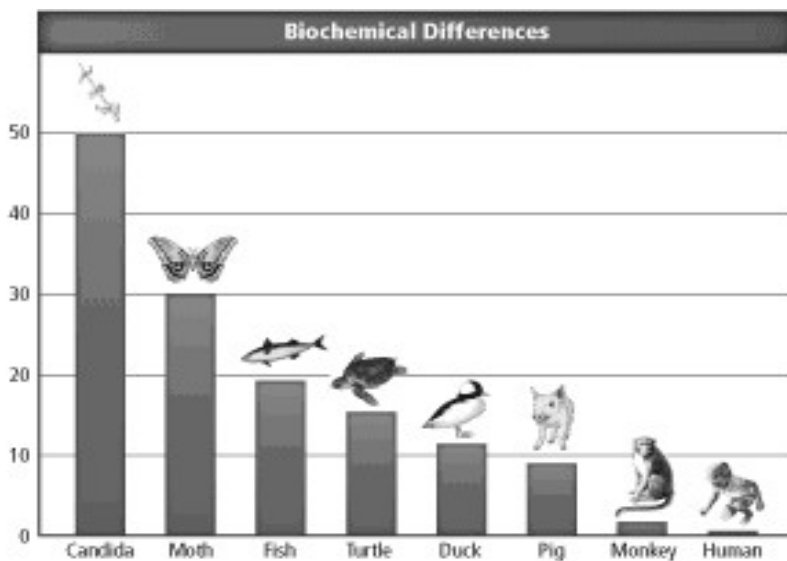
15. Which of the following is a principle of natural selection?

- A. Members of a species are genetically identical.
- B. Variations are acquired during an individual's lifetime and so are not passed to offspring.
- C. Most organisms are infertile or produce nonviable offspring.
- D. Helpful variations allow individuals to survive and reproduce better than members who lack these variations.

16. Base on following graph; what does this graph suggest?

cross axle : Type of Organism

vertical axle: Number of amino acids differences compared to human cytochrome C



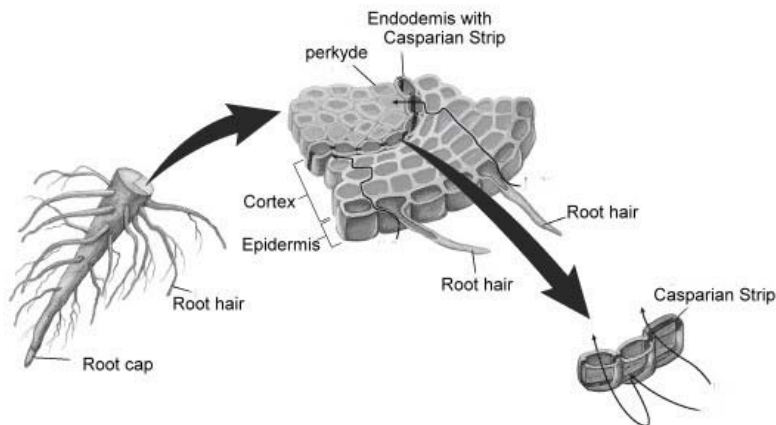
- A. Size of organisms can show evolutionary similarities.
- B. Butterflies and humans are closely related.
- C. Amino acids can show evolutionary similarities.
- D. Monkeys and fish have similar biochemical features.

17. According to this table, what group has suffered the largest percentage loss to extinction?

Estimated Number of Extinctions Since 1600						
Group	Mainland	Island	Ocean	Total	Approximate Number of Species	Percent of Group Extinct
Mammals	30	51	4	85	4000	2.1
Birds	21	92	0	113	9000	1.3
Reptiles	1	20	0	21	6300	0.3
Amphibians	2	0	0	2	4200	0.05
Fish	22	1	0	23	19,100	0.1
Invertebrates	49	48	1	98	1,000,000 +	0.01
Flowering Plants	245	139	0	384	250,000	0.2

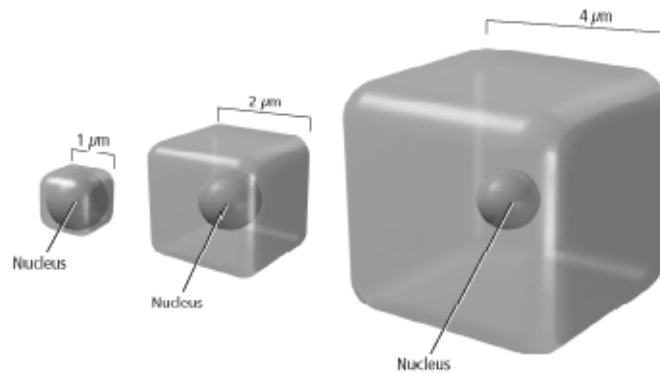
- A. birds
- B. plants
- C. mammals
- D. invertebrates

18. How is this structure (Casparian strip) important to plants?



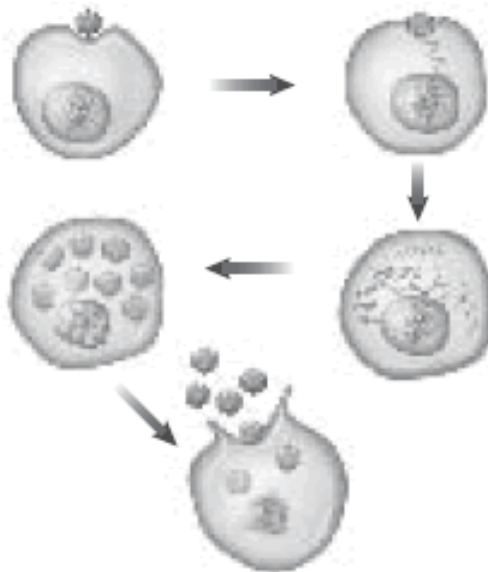
- A. allows absorption of water
- B. prevents water from entering leaves
- C. prevents minerals from absorbing
- D. blocks nutrients

19. Imagine that these are cells. Which cell(s) would most efficiently supply nutrients through its membrane?



- A. smallest
- B. largest
- C. medium size
- D. both smallest and largest

20. What does the bottom image in the diagram represent?



- A. host cell engulfing viruses
- B. new viruses bursting out of a host cell
- C. several viruses attacking a host cell
- D. viral hereditary material entering a host cell

Section B Answer the following questions in the spaces provided. (40 marks)

- The fluid pressure causes a force on each surface of an immersed object. The pressure on the lower surface is greater than the pressure on the upper surface. Consequently, the upward force on the bottom is greater than the downward force on the top. The net upward force is the force.
- When exactly 1 cup of sugar is dissolved in exactly 1 cup of water, is it exactly 2 cup of solution results? Explain it. The answer is
- The lowest temperature is called _____ .

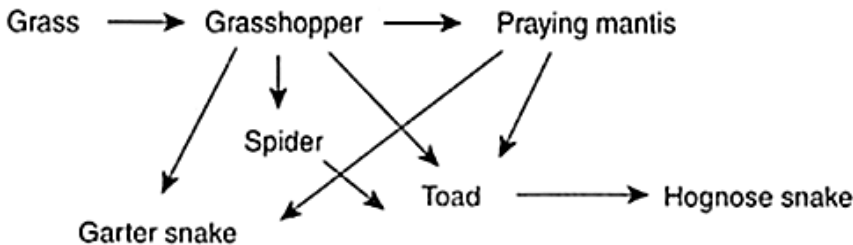
4. As a result of photosynthesis, green plants use the energy of sunlight to convert _____ into _____ ?

5. (1)The chart below lists the organisms that Tamara sorted into two groups based on one physical characteristic.

Group 1	Group 2
alligator	bat
goldfish	deer
snake	mouse
tuna	rabbit

What physical characteristics did Tamara most likely use to sort the organisms into the two groups?
(Hint: number of legs; size of the body; shape of the feet; type of body covering)

(2) Look at the food web below.



Which organism will immediately decrease in population if the grasshopper is taken out? _____.

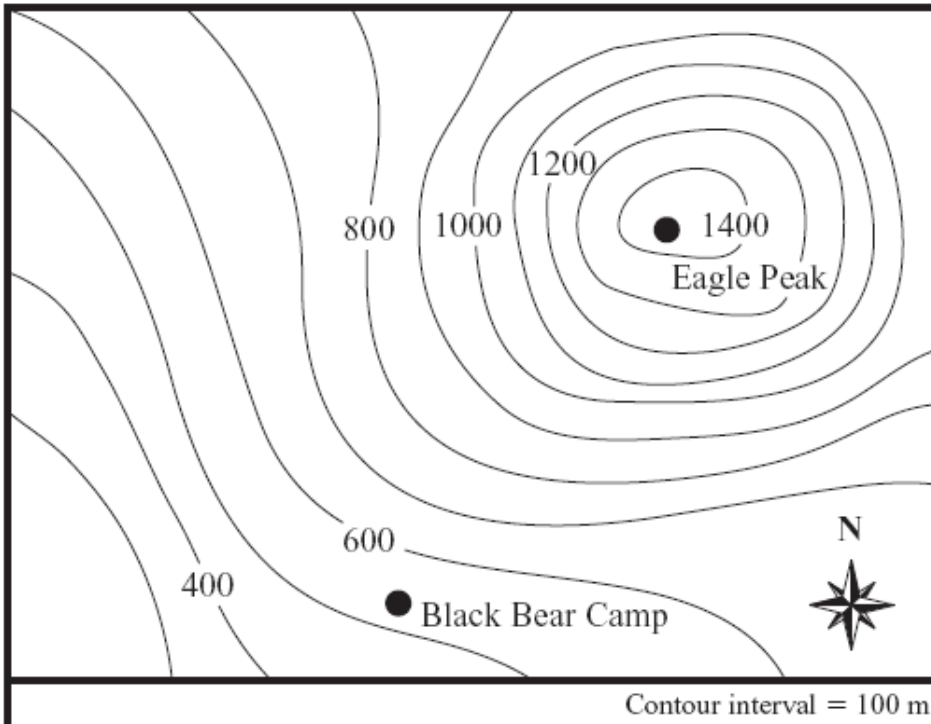
6. Mark collected soil and put it into a glass jar. He added some water, covered it and left it on the table for a few weeks. He noticed that green substance has grown on the wall of the jar. He then wrote, "The soil may contain some algae." Then he placed the green substance under a microscope. He found some microorganisms with chloroplasts. Finally, he compared the shape of the organism with a picture in the book. He found out that some of the organisms are called Chlorella.

Use the following keywords to answer the questions.

- generalization
- method
- calculation
- hypothesis
- conclusion
- observation

Questions:

- a..“The soil may contain some algae.” This statement is best described as _____.
- b.. Then he placed the green substance under a microscope. He found some microorganisms with chloroplasts. This activity is called _____.
- c. He found out that some of the organisms are called Chlorella. This statement is best described as _____.
7. A map with contour lines is shown below. Which of the following is the best estimate of the difference in elevation between Black Bear Camp and Eagle Peak?



8. In what two ways does vascular tissue help seed plants to live on land?

First way :

Second way :

9. List the levels of organization in the human body, Starting with the smallest unit.

a. _____ b.

c. _____ d.

10. Match the part of the flower with their function.

Function	Flower Parts
___ 1. Male reproductive parts	a. petals
___ 2. Protect the developing flower	b. sepals
___ 3. Female reproductive parts	c. stamens
___ 4. Colorful structures that attract insects	d. pistils

Section C

I. Height of Taipei 101 tower

Taipei 101 has been Taiwan’s new landmark and the tallest building on Earth. Most people are interesting in its height. Please design at list three experiments by different methods to measure the height of Taipei 101 tower.

Write procedures are designed for these experiments, and explain.
Write materials are needed used for these experiments.

II. Abbreviations of shape-memory plastics

Shape-memory plastics discovered as the name suggests, shape-memory plastics are able to remember their original form after they have been distorted. We can make some beautiful ornaments such as necklaces by using the shape-memory plastics materials. Draw some pictures on a shape-memory plastic sheet, then heat it by a hot-wind-machine or an oven. Finally, the plastic sheet is abbreviated into a small size and becomes a cute ornament with beautiful drawings. Please design the experiments to measure these size abbreviations by the following materials.



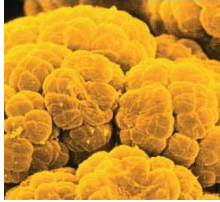

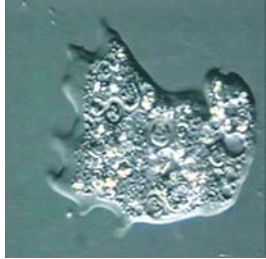





- a ruler,
- a hot-wind-machine,
- some Shape-memory plastic sheets in A4 size,
- drawing pens,
- common paper sheets in A4 size,
- a knife,
- a clipper.

Write the procedures designed for these experiments, and explain.

III.

Individual organisms can be sorted into different kingdoms based on their characteristics. Pictures of ten organisms and a table listing four kingdoms are shown above.

Write the name of each pictured organism under the correct kingdom in the table.

				
Paramecium	Mushroom	Archaea	Fern	Amoeba
				
Spider	Moss	Bacteria	Sea star	Aspergillus

Four Kingdoms of Living Organisms

Animalia	Plantae	Fungi	Protista	None of Four Kingdoms

IV. Objectives:

In this experiment , you will discover how some familiar mammals are classified.

Problem

How does a taxonomic key help you classify living thing?

Skills Focus

Observing, inferring, classifying

Materials

Pencil paper

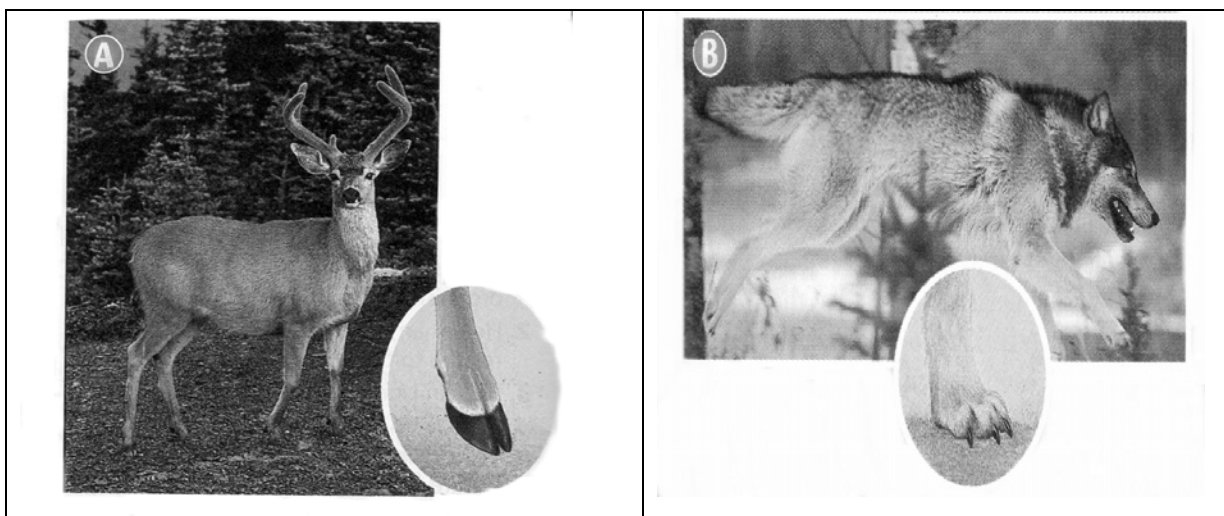
Procedure:

1. Observe the five organisms labeled A through E. All of these organisms belong to the class know as mammals, a group that includes you and many of the animals that are most familiar to you. Each of these mammals belongs to a different order of mammals.
2. Examine the paired statements in the taxonomic key for mammals (Table 1) . Begin at Step 1 to identify the order to which the mammal in photograph A belongs. Because the animal in photograph A does not have five digits or hands with flexible thumbs, go to step 2. Keep following the key until you identify the order of mammal.
3. Use the key to identify the order to which the mammals in Photograph B through E belong.

Question:

1. For each organism in the photograph, name the order of mammals to which it belong?
2. Why is it important that the pair of statements at step 1 be opposites?
3. Could you use this taxonomic key to classify animals that are not mammals? Explain.
4. Could you use this key to classify different types of carnivores, such as foxes, skunks, and walruses? Explain.

Observing:



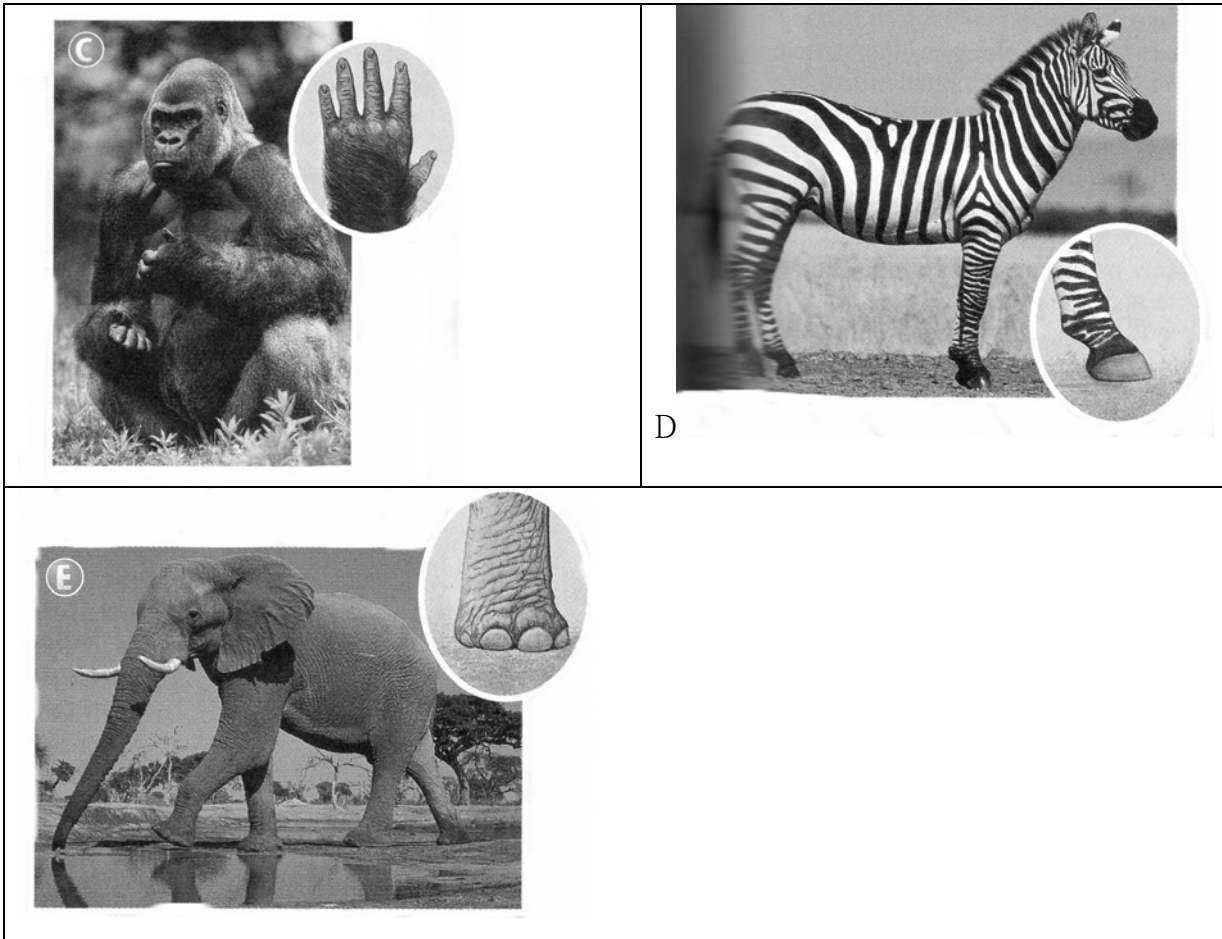


Table 1:

Taxonomic Key for Mammals			
Step 1	1a.	Have five digits on all limbs, and hands with flexible thumbs	Primates
	1b.	Do not have five digits on all limbs, and hands with flexible thumbs	Go to Step 2
Step2	2a.	Have limbs with claws or nails, not hooves	Go to Step 3
	2b.	Have limbs with hooves, not claws or nails	Go to Step 4
Step3	3a.	Have long muscular trunks	Proboscidea
	3b.	Have sharp teeth for biting and tearing flesh	Carnivora
Step4	4a.	Have limbs with an even number of hooved toes	Artiodactyla
	4b.	Have limbs with an odd number of hooved toes	Perissodactyla