

# NATIONAL GEOGRAPHIC EXPEDITIONS

SOL REVIEW

Cryptozoology is the investigation of undiscovered organisms. A National Geographic photographer was investigating some sightings of the elusive Florida Skunk ape. The skunk ape is similar to big foot except the story stems from a gorilla like organism that lives in the Florida everglades and due to the decay of organic material he smells like a skunk. He managed to take several photos before he was attacked.



The scientific community is all a buzz. Your mission is to identify the biological nature of this creature. You will observe and make inferences about its **cell structure, classification, genetic identity, and place in a food web**. Isn't it amazing that you have learned all about how to do these things this year in biology???

Name: \_\_\_\_\_

## Part 1: Quick Vocabulary Review

A. One goal will be to identify to which KINGDOM the Skunk Ape belongs. List ALL SIX kingdoms of life below.

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B. Write the definition of each important word, and give an example of a KINGDOM that could be described in that way. *Notice that the words are paired—if you can remember the definition of one, the other should be related!*

1a. Prokaryote \_\_\_\_\_ Example \_\_\_\_\_

1b. Eukaryote \_\_\_\_\_ Example \_\_\_\_\_

2a. Unicellular \_\_\_\_\_ Example \_\_\_\_\_

2b. Multicellular \_\_\_\_\_ Example \_\_\_\_\_

3a. Autotrophic \_\_\_\_\_ Example \_\_\_\_\_

3b. Heterotrophic \_\_\_\_\_ Example \_\_\_\_\_

C. With the help of a textbook or information packet, complete the table below to compare and contrast the features of plant, animal, and bacterial cells.

<b><i>Cell part</i></b>	<b><i>Function</i></b>	<b><i>Present in plants?</i></b>	<b><i>Present in animals?</i></b>	<b><i>Present in bacteria?</i></b>
<i>Cell membrane</i>	<i>“Gatekeeper” of any cell, allows materials to pass in or out</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Cell wall</i>	<i>Provides structural support and protection in some cell types</i>	_____	_____	<i>Yes</i>
<i>DNA</i>		_____	_____	<i>Yes</i>
<i>Nucleus</i>		_____	_____	_____
<i>Chloroplast</i>		_____	_____	<i>Some</i>
<i>Mitochondria</i>		_____	_____	_____
<i>Cytoplasm</i>	<i>Jelly-like, supportive watery solution of all cells</i>	_____	_____	_____
<i>Ribosomes</i>		<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Endoplasmic reticulum</i>	<i>Internal “assembly lines” of protein manufacture (eukaryotes only)</i>	_____	_____	_____
<i>Golgi Bodies</i>	<i>Sites of protein packaging and shipment around the cell and out of the cell (eukaryotes only)</i>	_____	_____	_____

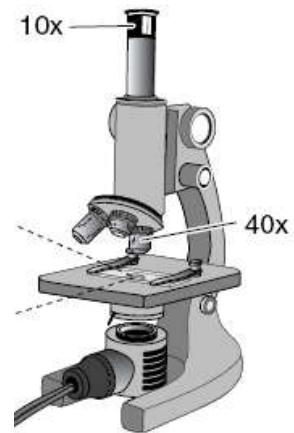
*What are the features of cells that ALL living things share? (hint: there are 4)*

## Part 2: Analysis of the cellular material

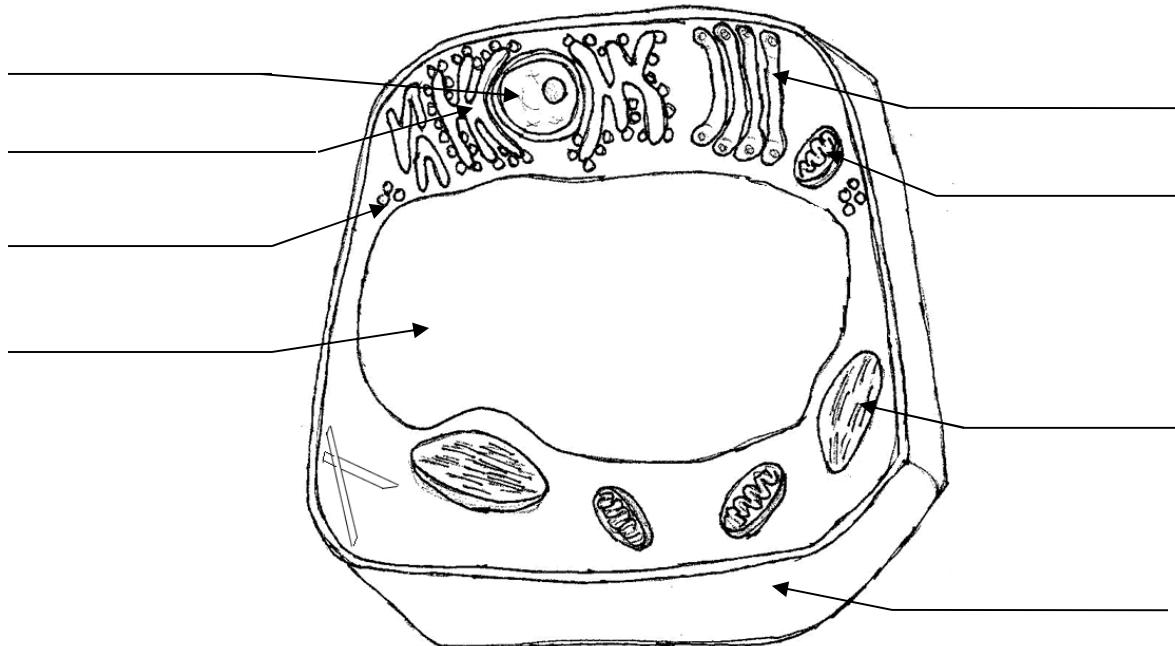
A. The scientists observed the material under a microscope (seen at right).

1. What is the total magnification under high power? \_\_\_\_\_ X

2. How did you arrive at that number? (Show your work for the question above)



B. Below is a drawing of some of the cellular evidence. Label each structure from the word bank at right.



- Cell wall
- Nucleus
- Endoplasmic reticulum
- Ribosomes
- Golgi Bodies
- Mitochondria
- Chloroplast
- Vacuole

1. In which structure labeled above would the DNA be found? \_\_\_\_\_

2. In which structure is excess water and nutrients stored? \_\_\_\_\_

3. On which structure do many ribosomes seem to attach to? \_\_\_\_\_

4. Is this cellular evidence from a prokaryote or eukaryote, and how do you know? \_\_\_\_\_

\_\_\_\_\_

5. Is this cellular evidence from a heterotrophic or autotrophic organism, and how do you know? \_\_\_\_\_

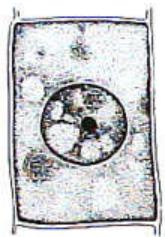
\_\_\_\_\_

6. Based on your above answers and the chart on the previous page, is this cellular material from a plant, animal, or bacteria? What cell parts help you decide this? \_\_\_\_\_

\_\_\_\_\_

**C. In one mass of the collected cells, many looked slightly different from one another. Certain cells seemed to be in various stages of the same process.**

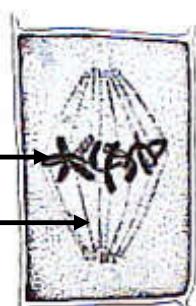
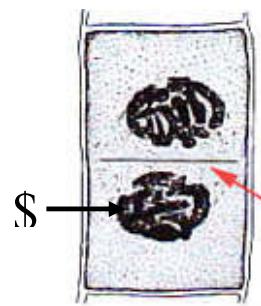
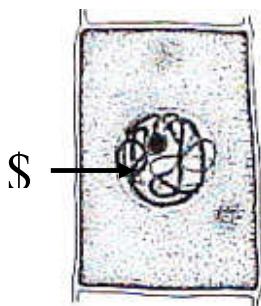
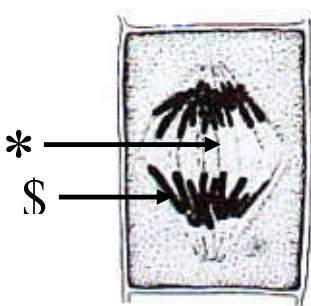
1. Most of the cells in the same (~90%) looked more or less like the cell shown at right. What stage of cell cycle is this called? \_\_\_\_\_



2. What is going on in this part of the cell cycle?

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3. The scientists concluded that the other 10% of cells (shown below in no particular order) were in the **cell division** part of the cell cycle. What is the name of this process? \_\_\_\_\_



4. Above, label each stage of this process.

5. Above, place a number next to each stage indicating whether it comes 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, or 4<sup>th</sup> in the process.

6. What are the structures called (labeled with a '\$') that are being pulled around the cell during this process? \_\_\_\_\_

7. The structures called spindle fibers are labeled with a \*. What is their function in this process?

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8. Why is it very important that this process occurs without any errors? Be specific! ("Because it would die" is not a good enough answer.)

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**D. To determine if the cell functions similarly to other cells it was placed in a salt solution. The cell seemed to shrink as water moved out of the cell.**

1. Where is salt more highly concentrated? **inside cell** or **outside cell**

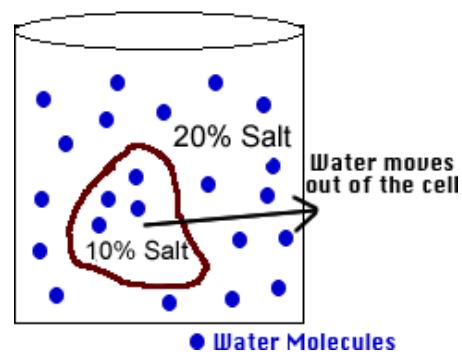
2. Where is water more highly concentrated? **inside cell** or **outside cell**

3. Water is moving from where it is \_\_\_\_\_ concentrated to where it is \_\_\_\_\_ concentrated. This is an example of \_\_\_\_\_.

4. When water is moving across a membrane, this is called \_\_\_\_\_.

5. Salt cannot cross the cell membrane because the cell membrane is semi-\_\_\_\_\_.

6. In what type of solution would this same cell **increase** in size? In what solution would it stay the same size?



## Part 3: Analysis of the genetic material

- A. The contents of the nuclei of some cells were extracted. A diagram of one of the recovered organic compounds is displayed at right.

1. What is this organic compound called? \_\_\_\_\_

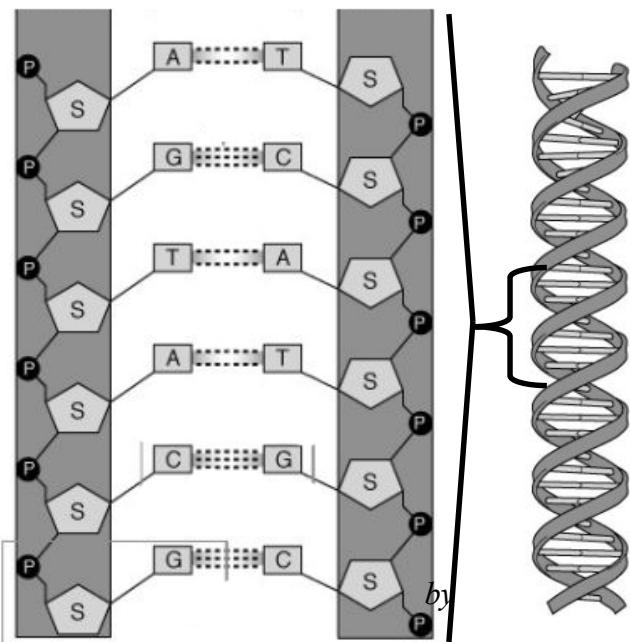
2. How would you describe the shape of the molecule?  
\_\_\_\_\_

3. What is the building block of this molecule called? (Circle an example).  
\_\_\_\_\_

4. What three parts make up each building block?  
\_\_\_\_\_

5. Which bases always go together?  
\_\_\_\_\_

6. What kind of bond is found between the bases? (represented by the dotted line between each base).  
\_\_\_\_\_

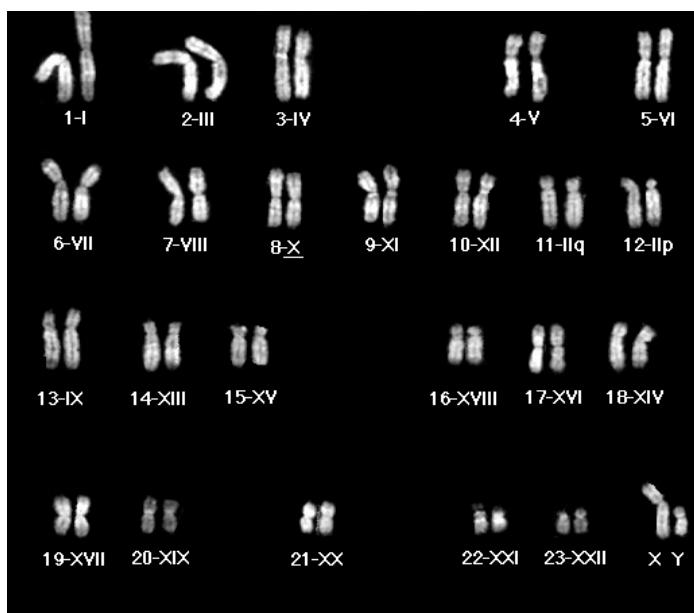


- B. In order to gather further information, a Karyotype was prepared. It is shown at right.

1. A karyotype like this one shows the paired chromosomes of an organism. According to the karyotype, how many chromosome pairs are there in each body cell? \_\_\_\_\_

2. How many TOTAL chromosomes are there in each body cell? \_\_\_\_\_

3. Based on your above answers, do you think this karyotype belongs to a human? Why or why not?  
\_\_\_\_\_



4. The very last pair of chromosomes show whether the organism is male or female. What sex is it \_\_\_\_\_?

5. Does this organism have an mono-somic or tri-somic chromosomal disorders (like Down's Syndrome)? How can you tell from the karyotype?  
\_\_\_\_\_

6. If this represents the chromosomes in a typical muscle cell of this species, how many chromosomes should be in a:

a. Nerve cell? \_\_\_\_\_ b. Skin cell? \_\_\_\_\_ c. Sperm cell? \_\_\_\_\_ d. Egg cell? \_\_\_\_\_

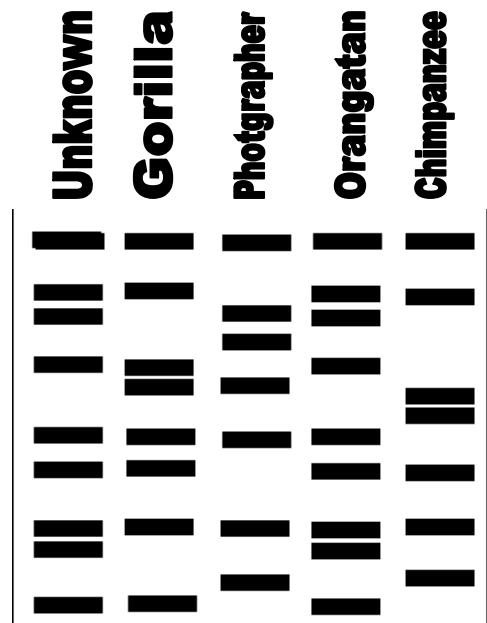
7. The sex cells (sperm and eggs) are also called \_\_\_\_\_. What special type of cell division creates them?  
\_\_\_\_\_

C. To further identify the unknown organism (far left) a DNA fingerprint was constructed comparing it to other known primates.

1. The bars in this diagram represent sample segments of DNA. How else could this sort of DNA comparison be used (think Maury Povich)?

2. What primate species is the **most** genetically similar to the unknown organism? How do you know?

3. What primate species is the **least** genetically similar to the unknown organism? How do you know?



D. With further genetic analysis, scientists discover the sequence of bases for a particular gene fragment of the unknown organism. Transcribe and Translate the DNA fragment to identify the amino acid sequence for the fragment.

1. (The bases have been broken up for you already in groups of 3 called \_\_\_\_\_.)

DNA: T A C | A T G | G A T | C T T | C A T | G G C | C A A | A T C | C G

mRNA: \_\_\_\_\_

Amino Acid Sequence: - - - - - - - -

Compare the Amino acid sequence above to the sequence for the same gene of the following organisms.

#### Gorilla

- Start-Tyrosine-Arginine-Glutamic acid-Valine-Valine-Stop

#### Chimpanzee

- Start-Tyrosine-Valine-Glutamic acid-Histidine-Valine-Proline-Stop

#### Orangutan

- Start-Tyrosine-Leucine-Glutamic acid-Valine-Proline-Valine-Stop

#### Human

- Start-Alanine-Valine-Glutamic acid-Histidine-Valine-Proline-Stop

2. Which one matches the Amino acid sequence of the Unknown?

3. Why would a similar amino acid sequence indicate indicate a genetic relationship between two organisms?

		Second Base				Third Base
		U	C	A	G	Third Base
First Base	U	Phe	Ser	Tyr	Cys	U
	U	Phe	Ser	Tyr	Cys	C
	C	Leu	Ser	Stop	Stop	A
	C	Leu	Ser	Stop	Trp	G
First Base	C	Leu	Pro	His	Arg	U
	C	Leu	Pro	His	Arg	C
	A	Leu	Pro	Gln	Arg	A
	A	Leu	Pro	Gln	Arg	G
First Base	A	Ile	Thr	Asn	Ser	U
	A	Ile	Thr	Asn	Ser	C
	A	Ile	Thr	Lys	Arg	A
	A	Met	Thr	Lys	Arg	G
First Base	G	Val	Ala	Asp	Gly	U
	G	Val	Ala	Asp	Gly	C
	G	Val	Ala	Glu	Gly	A
	G	Val	Ala	Glu	Gly	G

## Part 4: Classification of the Skunk Ape

A. Identifying the Classification of Skunk Ape—use the classification table to answer the following questions.

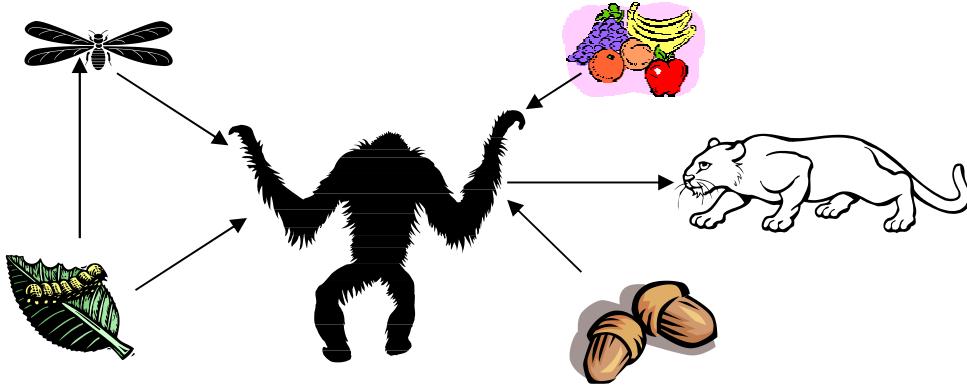
1. First, complete the table by writing in the taxonomic groups in the correct order. One has been done.

Common name	Orangutan	Gorilla	Human	Chimpanzee
a.	Animalia	Animalia	Animalia	Animalia
b.	Chordata	Chordata	Chordata	Chordata
c.	Mammalia	Mammalia	Mammalia	Mammalia
d.	Primata	Primata	Primata	Primata
e.	Hominidae	Hominidae	Hominidae	Hominidae
f.	Pongo	Gorilla	Homo	Pan
<b>g. Species</b>	<i>pygmaeus</i>	<i>gorilla</i>	<i>sapiens</i>	<i>troglodytes</i>

2. To which kingdom do **all** of the above organisms belong? \_\_\_\_\_
3. What is the most specific (smallest) taxonomic group to which **all** of the organisms belong? \_\_\_\_\_
4. Based on your work from the previous page, to which animal in the table is the Skunk Ape most similar? \_\_\_\_\_
5. If it belongs to the **same genus** as this animal, in which genus would it be? \_\_\_\_\_
6. If the Skunk Ape is the **same species** as this animal, what would be its scientific name (using binomial nomenclature)? \_\_\_\_\_

## Part 5: Feeding Relationships of the Skunk Ape

A. Below is a hypothetical Skunk Ape food web. Use it to answer the following questions.



1. What do the arrows represent in this sort of diagram? \_\_\_\_\_
2. Which organisms in the food web are autotrophs (or producers)? \_\_\_\_\_
3. Which organisms in the food web are heterotrophs (or consumers)? \_\_\_\_\_
4. Which of the consumers is a strict **herbivore**? \_\_\_\_\_ Which of the consumers is a strict **carnivore**? \_\_\_\_\_ Which of the consumers is an **omnivore**? \_\_\_\_\_

**B. Answer the following questions about energy flow in the cells of organisms.**

1. Which cell organelle allows some producers to capture energy of the sun? \_\_\_\_\_
2. What is this process called that transfers light energy to chemical (food) energy? \_\_\_\_\_
3. What two other raw ingredients to plants and other producers need to make food? \_\_\_\_\_
4. What cell organelle do eukaryotes use to capture energy from the breakdown of food? \_\_\_\_\_
5. This process of energy capture from food is called cellular respiration. Besides food (glucose), what gaseous reactant is needed for this process? \_\_\_\_\_ What gas is produced? \_\_\_\_\_

## Part 6: Analysis of the Skunk Ape Breeding Program

A. Scientist manage to capture an albino skunk ape (orangutan). They mate it with an orangutan in a zoo which is orange-brown. The babies that are born are all orange brown.

1. Based on this observation, is the albino trait **dominant** or **recessive**? How do you know?
2. The alleles for coat color in Skunk Apes are C and c. Based on your answer from number 1, which color trait belongs to which allele?  
 $C =$  \_\_\_\_\_       $c =$  \_\_\_\_\_

3. Based on your answer from number 2, what would be the **phenotypes** for each of the genotypes below?

$$CC = \text{_____} \quad Cc = \text{_____} \quad cc = \text{_____}$$

4. What is the best description of the **genotype** of the captured Skunk Ape?

Homozygous Dominant

Homozygous recessive

Heterozygous

5. If two of the orange-brown babies are mated what is the chance of having an albino orangutan? (Draw a punnett square to help)