ANIMAL RESEARCH: PART 1, ECOLOGY AND GENERAL FACTS
(understanding the prompts)

1. List the *classification* of your animal, from phylum to species.
1. This is not a difficult prompt. Look up the classification (or taxonomy) of your animal. You will find this on many websites.

2. Provide a *detailed* description of the characteristics of your animal's *body*.
   (your description should be detailed enough so that a person can fully imagine the animal without seeing a picture.)
2. Go to several websites and get all the details of your animal's body and physical features. Tell us all the details. Assume we know nothing about your animal's body.

3. State the *geographic distribution* of your animal. (that's where it lives on a map)
3. Go to several websites in order to pinpoint the distribution. Describe its distribution. Don't download any maps yet; that will be done later.

4. Provide a *detailed* description of the characteristics of your animal's *habitat*.
   (your description should be detailed enough so that a person can fully imagine the habitat without seeing a picture.)
4. First, find out the name of your animal's habitat. Then google the name of this habitat and learn all about it. Go to several websites that describe this habitat.

5. Give a *detailed* description of your animal's natural *diet* in the *wild*.
5. Don't be satisfied with a short description. After you learn what your animal eats, learn more about this food in detail. Remember, this prompt is for the diet in the wild, not the zoo.

6. Describe a *food web* in which your animal participates in the wild. Your food web must include the following minimum requirements:
   a) at least four trophic levels (trophic levels: producer, primary consumer, secondary consumer, top-level consumer, decomposer)
   b) producers, consumers and decomposers (producers are plants & photosynthesizers / consumers are herbivorous animals and predators that eat the herbivores / decomposers eat & break down any dead organism)
   c) at least ten organisms (ten is minimum; be SPECIFIC! ; don't just list "grasshopper" or "plant" ; what SPECIES of grasshopper? What SPECIES of plant?)
   (you must also draw a food web that shows all the organisms and trophic levels; do this by going to "insert" and then "drawing".

7. Describe how *biotic* and *abiotic* factors play a role in your animal's survival.
7. Biotic = living; Abiotic = non-living. Both factors can help (or harm) your animal's survival. Find several factors for each.

8. List the organisms (excluding humans) which provide the main *competition* for your animal in the wild and describe this competition in detail.
8. Animals compete for all kinds of resources such as food, living space, water, etc. Find out what animals compete with your animal in the wild and give specific examples. (remember, no human competitors here)

9. Describe the *evolutionary history* of your animal over geologic time and draw a branching diagram to represent this.
   (begin your animal's evolutionary history at an appropriate taxonomic level, such as order, family or genus)
9. First, you must learn what a branching diagram is, and how it can be used to explain the evolutionary history of an organism. A branching diagram is also known as a "cladogram" or "phylogenetic tree". Here are some websites with examples of branching diagrams:
   http://www.bio.miami.edu/dana/dox/equus_evolution.html (horse evolution)
   https://www.trilobites.info/triloclass.htm (trilobite evolution)
   Learn about the evolutionary history of your animal and express it as a branching diagram. Draw this branching diagram by inserting a drawing into your notes. Include pictures and lines in your branching diagram. Don't start your branching diagram too high up the scale of classification (such as phylum). Instead, start your branching diagram at a lower level of classification (such as order, family or genus)

10. Describe what your animal's *environment* was like when it first appeared in the *fossil record*. Include biotic and abiotic elements in your description. (reference your animal's fossil record at an appropriate taxonomic level, such as family or genus)
10. In the previous prompt, you learned about earlier organisms that your animal evolved from. In this prompt, you want to explain what the environment was like in those earlier times. What biotic (living) factors were in the environment back then? What abiotic (non-living) factors were in the environment back then?

ANIMAL RESEARCH: PART 2, ADAPTATIONS

(understanding the prompts)

1. Describe in detail how your animal's *senses* are adapted for survival.

1. Be specific and provide detail! For example, if your animal has special smelling senses, explain why these senses are so unique. Give as much detail as possible. Don't just write: "my animal has a good sense of smell". That doesn't explain anything! Find out what makes these senses so good. Try to explain it on a cellular level, for instance.

2. Describe in detail how your animal is adapted for *moving* through its environment.

2. You wouldn't just write: "my animal can swim fast". That explains nothing. How are your animal's fins, tail, legs, arms, etc. specially designed for speed? How is the musculature special? These are only a few suggestions. There are many ways your animal's body may be designed for movement, and speed might not even be important at all. Stealthy, slow movement is also an adaptation, for example.

3. Describe in detail how your animal is adapted for obtaining and digesting *food* in its environment.

3. "Obtaining" food is the same as "getting" food. All animals, herbivores or carnivores, are specially designed to deal with food. Hands, legs, claws, teeth, stomach, intestine, etc. are just a few examples. Be specific and describe the adaptations your animal has.

4. Describe in detail how your animal is adapted for *competition* for resources within its environment.
(keep in mind that your animal competes with its own species as well as with other species)

4. All animals must compete, even the herbivores. Competition might be physical in some way, but it doesn't have to be. Colors or odors can also signal to other animals that a resource is "taken".

5. Describe in detail how your animal is adapted to be *protected* from biotic and abiotic factors in its environment.

5. Biotic = living Abiotic = non-living Here are just a few examples: perhaps your animal's fur or hair protects it from the weather (an abiotic factor). Perhaps your animal is cryptic (camouflage) in some way. Your animal may have a special behavior that protects it from the environment.

6. Describe in detail how your animal is adapted for maintaining *homeostasis*. (homeostasis can be maintained by your animal's *physical features* or *behaviors*)

6. First, make sure you know what homeostasis is. There are many ways your animal can maintain homeostasis. Find several ways. Don't be satisfied with just one or two examples. Any method of keeping a steady and stable internal condition is an example of homeostasis. There might be something special about your animal's body that helps it maintain homeostasis. Also, your animal might have a special behavior that helps it maintain homeostasis. The ability to maintain homeostasis can be explained at the cellular level as well.

7. Describe in detail how a particular *body system* of your animal is uniquely adapted for survival.

7. All of the animals at the zoo have at least one unique body system. Describe it in detail. It could be muscle, bone, circulation, digestion, nerves, etc.

ANIMAL RESEARCH: PART 3, REPRODUCTION
(understanding the prompts)

1. General reproductive facts: These are easy!
   a) gestation or incubation? b) clutch or litter size? c) frequency of birthing? d) time of year?
   e) oviparous, ovoviviparous or viviparous? Look up all of these words first and find out what they mean. Then do the research.

2. Describe in detail the ***physical*** traits your animal has which help it reproduce successfully.
   (make sure to differentiate between ***male*** and ***female*** in your notes)
2. You should be able to get many notes for this prompt. There are all kinds of physical reasons that your animal can reproduce successfully. Find out about its reproductive system. Find out about how its body is designed specially for reproduction. Also, find out this information for both male and female.

3. Describe in detail the ***behavioral*** traits your animal has which help it reproduce successfully.
   (make sure to differentiate between ***male*** and ***female*** in your notes)
3. This is just like prompt #2, except it's all about how your animal behaves to reproduce successfully. Both male and female must do many things to reproduce successfully. For instance, they must attract each other, they must copulate, they usually take care of the offspring in some way, etc. You should be able to find out lots of information here as well.

4. Describe in detail how your animal's offspring ***grows*** and ***develops***, from fertilized egg to sexual maturity.
4. Get as much information as you can for every stage of growth and development. Find out about the zygote, embryo, fetus, newborn, juvenile, young adult, mature adult. Remember, growth is different than development, so make sure you learn about both at each stage.

5. Describe in detail how your animal's offspring are ***adapted*** to survive while growing and developing. (make sure to differentiate between physical traits and behavioral traits)
5. This prompt is similar to prompt #4, except you must explain all the unique adaptations your animal has to survive while it's trying to grow and develop. Life is very tough for young animals. Predators are always trying to eat them. Many young starve if the environment doesn't have enough resources. What is special about your young animal's body (physical adaptations) or your young animal's actions (behavioral adaptations) that help it survive to adulthood?

6. Describe in detail how your animal's ***environment*** affects its reproductive success. (make sure to differentiate between ***biotic*** and ***abiotic*** factors)
6. Environments can change. The weather can change, resources can change, numbers of predators can change, etc. All of these changes add up to a change in reproductive success for your animal. Sometimes, because of the environment, many babies are born because everything is just right. Other times, factors are tough, and less babies are born or less babies survive. Sometimes, adults mate more frequently or less frequently because of the changing environment. Find out about all these environmental changes and how they affect your animal's reproduction. Remember, biotic = living abiotic = non-living.

7. Describe in detail how zookeepers successfully ***breed*** your animal in captivity.
7. Zookeepers must learn about conditions in the wild that favor reproduction, and then try to simulate these conditions at the zoo in order to get your captive animal to breed and reproduce. Depending on the animal, zookeepers may have to carefully simulate temperature, daylight, humidity, etc. Adult animals can sometimes be very stubborn and not want to mate at the zoo because of the captive environment. Zookeepers try to simulate the natural environment as much as they are able. Learn about these efforts that the zookeeper must use in order to captive-breed your animal.

ANIMAL RESEARCH: PART 4, HUMAN INTERACTIONS
(understanding the prompts)

1. Give specific detailed examples of how humans have made *conservation efforts* to maintain the *biodiversity* in your animal's habitat.
1. Any time humans make conservation efforts for your animal, they are trying to help protect the animal or its habitat (usually it's both). An environment with good biodiversity is a healthy environment. "Bio" refers to "life". "Diversity" refers to many different natural resources and natural factors which help your animal. Biodiversity tends to decrease as humans interfere with your animal's habitat. For instance, humans may change the amount of prey, predators or plants in your animal's habitat. If the biodiversity decreases in your animal's habitat, your animal's population usually suffers. If humans restore the biodiversity of your animal's habitat, it will usually produce a positive effect for your animal's population in the wild.

2. Give specific detailed examples of how humans have used your animal as a *resource* of any kind. (keep in mind that there are many ways an animal can be used as a "resource")
2. This is one of your easier prompts. Virtually any animal is used by humans as a resource in some way. Sometimes, that resource is food, clothing, medicine, folklore, etc. Maybe your animal is even kept as a pet for entertainment or education . . .
Be specific when describing how humans use your animal as a resource. Give examples and provide plenty of detail.

3. Describe in detail how human activities affect the *stability* (or *instability*) of your animal's habitat.
3. This is most likely your easiest prompt, so provide lots of detail. Almost all habitats around the world are declining because of human population growth and human consumption of natural resources. But it's not all bad news. Many efforts to reverse habitat destruction are now being attempted by humans to protect the habitats for wildlife. Research these efforts as well.

4. Describe in detail any *genetic information* that humans have discovered about your animal. Also explain why this genetic information would be relevant to humans.
4. Certain genes of your animal have been studied because they are important to humans. These genes can be important for a variety of reasons. Some animals produce substances that humans use in the medical field. These substances are genetically controlled by the animal. The genetic diversity of your animal is also important to humans because of breeding and conservation efforts. If your animal doesn't have enough genetic diversity (different alleles for various traits), it can cause problems when breeding your animal in the zoo or trying to restore your animal's population in the wild. All of this information is relevant to humans.

5. Describe in detail how *changes* in your animal's *habitat* have affected its *population* over time. Include charts or graphs to illustrate these changes.
5. This prompt is related to prompt #3. In prompt #3, you found out how your animal's habitat has been changed by human activity. In this prompt, you need to explain how your animal's population has changed as a result of this habitat change. It's likely that your animal's population has decreased because of habitat loss. Learn about this population decrease and get information that reflects these changes over time. Insert charts or graphs of these changes into this document by going to "insert" and then clicking on "drawing". Don't forget that humans may have also made conservation efforts to restore your animal's habitat, which in turn may have increased the population of your animal in the wild. Discuss these changes as well and insert any charts or graphs into your drawing.

6. Make a detailed prediction of what would happen to your animal's *habitat* if its *population* changed.
(include biotic and abiotic factors in your prediction; be sure to reference *other* studies to support your prediction)
6. The condition of your animal's habitat definitely affects your animal's population, but your animal's population can also affect the condition of your animal's habitat. For instance, an herbivore's population can be kept in check by predators. However, if predators are absent because of changes, an herbivore's population might increase. An increase in herbivores would also mean an increase in grazing of plants in the habitat. By overgrazing, soil can erode drastically because plants are less abundant to hold the soil. All of these things are interconnected, and you need to find out how the "dots" are connected in your animal's habitat. Additionally, you need to make a prediction about what would happen to your animal's habitat if its population changed. Make logical predictions, and base your predictions on the evidence you find in your research. Don't just make wild guesses.

7. Describe in detail how *zookeepers* must modify your animal's *enclosure* to reflect its habitat in the wild. Explain in detail why these modifications are important for your animal at the zoo.
7. First, get information about how your animal is kept in the zoo. Modern zoos have made great strides. They don't just put animals in tiny cages to amuse the public any more. Zookeepers make great efforts to keep the animals physically and psychologically healthy. Additionally, zookeepers have learned that by building good enclosures that mimic the animal's wild habitat, breeding efforts are more successful. "Stereotypic" behaviors of animals are not as common in zoos today as they once were, which is a good thing. Find out what "stereotypic" animal behaviors are and how good enclosures at the zoo reduce these behaviors.