A volcano erupted, spewing red lava across the Arizona desert. It smothered and burned the nearby desert plants. The type of ecological succession starting with bare rock is P__________ succession. Eventually the rock will be broken down into soil by lichen and B____________, then grasses will grow, then shrubs, and finally trees. For now though, the dark black lava rock rests beside the lighter colored desert soil.

There are many types of organisms that live in this desert biome. There is a little brown mouse called a pocket mouse. A pocket mouse by itself is considered an organism, a group of pocket mice are a P____________, and if you include the insects and hawks as well it forms the C____________. If you also include abiotic things like water and lava rock, it is called an E______________.

Plants like cacti introduce energy into the desert ecosystem. Because of this, plants are considered Pr_____________. They create energy in the process of Ph____________________________. They use sunlight and what little water they can get, and create ATP in the light ______________ reaction. They also create glucose out of CO2 in the light ______________ reaction. The insects that eat the plants are considered P___________ C_____________. The pocket mouse that eats the insects is a S____________ C_______________, and a hawk that eats pocket mice are T____________ C_______________.

The pocket mouse is low on the F________ C________. They are consumed by P______________ like hawks.

Draw a food chain including a plant, insect, pocket mouse, and hawk. Be sure the arrow always points towards the predator.

One of the female pocket mice carried a very special egg cell inside her ovary. This egg cell had a unique change in its DNA, also called a Mu_____________. After G1 phase, the DNA was duplicated in _______ phase. The DNA was unzipped by the enzyme H______________ into two strands, and the enzyme P____________ added complementary N____________ onto each strand. Every time it came across a C, polymerase added the complementary letter__________, and every time it came across A, it added ___________, and vice versa.

Complete the original strand with complementary nucleotides (use A,T,G,C): TGGGCGTGTGCXCG
The polymerase made a random mutation the DNA in one particular gene called MC1R which is a gene responsible for fur color in mice, bears, and cats. The mutation replaced one nucleotide, a S__________ mutation.

**Complete the complementary DNA strand of the new mutant DNA:**
TGGACGTGTCCG

Compare the two DNA strands to find which letter was substituted in the mutation

Original strand: TGGGCGTGTCCG

Mutant strand: TGGACGTGTCCG

_________ changed to __________

The MC1R gene is located on chromosome 16. Mice have two of every chromosome, meaning they are D_______________. They have two chromosome 16s, two chromosome 1s, two chromosome 2s, two chromosome 3s, etc.

**Critical thinking:** Mice have 40 diploid chromosomes. What is the haploid number? __________

Gametes like egg cells are produced in the process of M________________, not mitosis. The original cell goes through ______ rounds of division, producing ______ daughter cells.

The mutant egg combined with a sperm cell to produce a zygote, and eventually a baby mouse. Because of the mutation, the newborn mouse’s chromosomes were Dd for the MC1R gene. One chromosome had the D allele, and the other chromosome had the d allele. Chromosomes that are similar but not identical are called H________________ chromosomes. They have the same genes at the same location, or L___________. The two Dd variations of the gene are called A______________.

The mouse was H__________zygous for that particular trait.

The MC1R gene is a blueprint for a protein. The central dogma of biology is DNA → __________ → Protein.

The first process that goes from DNA to RNA is called T__________cription. The RNA copy of the gene was made by the enzyme P________________. This type of RNA is called ____________ RNA, because it carries a message. RNA is similar to DNA, but instead of a T is has a ________.

**Transcribe the DNA letters to make mRNA (Use G,C,U,A):**
TGGACGTGTCCG

The mRNA left the nucleus and floated to the organelle that makes proteins, the R________________. The process of making a protein from mRNA is called T________________ because you are starting with one language and ending with another. The mRNA was read three letters at a time. Three letters on mRNA are called C___________. Another type of RNA brought amino acids over to the ribosome. That type of RNA is called T________________ RNA. It matched up to the three letters on mRNA and dropped off its amino acid. The entire string of amino acids is called a P______________.
Use a codon chart to Translate the mRNA to amino acids:
ACCUGCACAGGC

What is the name of the new amino acid in the mutated protein?

After leaving the ribosome, the mutant protein floated through the fluid of the cell called the C__________. It then went to the organelle that transports things within the cell, the E_________ R___________. It was then transported to the organelle that transports things outside the cell, the G___________. The protein was expelled out of the cell in a large bubble in a process known as Ex__________________.

The protein was a type of protein that does work modifying other molecules. We call this type of protein an E_________________. It grabs pigment molecules and combines them together to make a dark fur pigment. The pigment is the S________________, and the location on the protein where the pigment is made is called the A__________ S________________. The protein went to work creating millions of pigment molecules that made the mouse’s fur completely black.

Sketch a picture and label the Enzyme, Substrate, and Active Site

The dark mouse thrived on the lava rock because its dark fur blended in perfectly. It was able to find a lot of food to eat because there wasn’t much competition from other mice. The mouse would eat small insects, digesting the protein polymers into A_________ monomers. The mouse would eat acorns with oily lipids, breaking them down into F_________ A___________. The mouse would also eat nearby plants, breaking down the C__________________ polymers into glucose monomers.

The glucose would enter the mouse’s cells and be broken down to produce the important energy molecule A_______. The glucose would first enter the cells’ cytoplasm and be broken in half in the process of G_________________. The two halves left over are called P_____________. This would produce a net gain of_____ ATP. The halves would then enter the powerhouse of the cell, the M_________________. The K________ cycle would produce _____ ATP, and the ETC would produce _____ ATP. This entire process produced a grand total of _____ ATP, and is called Cellular R________________.
The dark mouse met a brown fur mouse and had offspring.

**Critical thinking:** The dark MC1R allele is a dominant gene. **Draw** a punnet square of the Dd dark mouse with a dd light mouse to predict what their offspring will look like:

The percentage of dark offspring is ________%
The percentage of light offspring is ________%

The dark furred baby mice grew larger over time as their cells multiplied in the process of mitosis.

**Draw** and **Label** the four phases of mitosis:

When the hawks looked for pocket mice to eat, they found the light brown mice on the lava rock easily, so only the dark fur mice survived and passed on their genes to the next generation. This process of non-random survival is N_____________ S_____________________. The organisms with the best adaptations survive, also known as Survival of the F_________________.
After several generations, the population of mice on the lava rock all had dark fur. The change of DNA over time is known as E_________________.