3. Buffelgrass, an invasive grass species in southwestern desert ecosystems, is threatening the saguaro cactus, a keystone species in these ecosystems. Buffelgrass is drought-tolerant and can survive wildfires. However, the dry buffelgrass also acts as fuel for wildfires, causing the fires to be more severe. Older saguaro cacti can survive wildfires; however, many of the young cacti cannot.

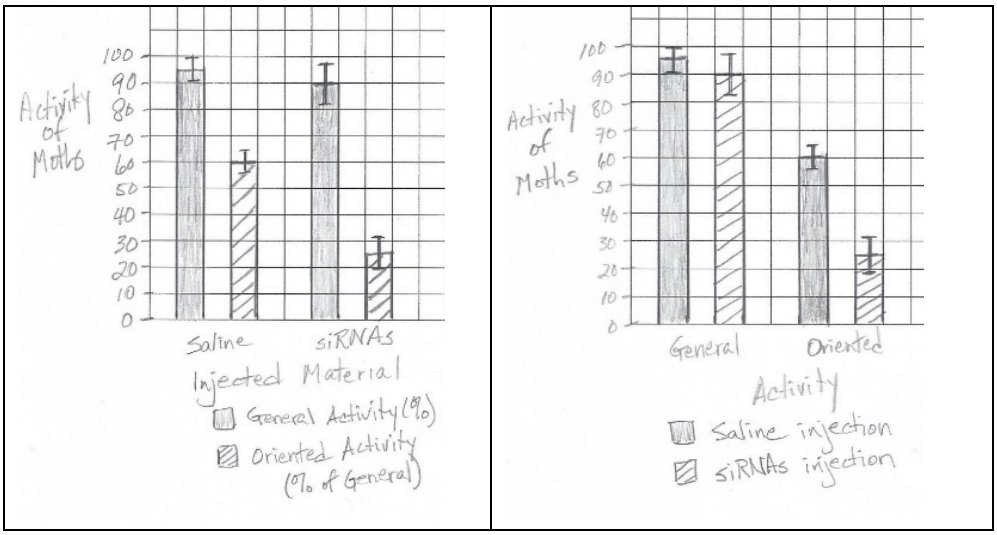
Scientists conducted an experiment to determine whether they could control the abundance of the buffelgrass population. The scientists identified several native grass species that, when grown with buffelgrass, might reduce the abundance of buffelgrass. They grew buffelgrass in the presence of several different native grass species in greenhouses, in either nondrought (watered every 3 days) or drought (watered every 9 days) conditions. After twelve weeks, they measured the height and dry weight of the buffelgrass in each treatment group.

A. **Describe** the effect that removing a keystone species will have on an ecosystem.

B. **Identify** a control group the scientists should include in their experiment.

C. **State** the null hypothesis of the experiment in which buffelgrass is grown in the presence of native grass species.

D. Scientists have found that the population growth rates of native grasses are much slower than the population growth rate of buffelgrass following a wildfire. The scientists claim that wildfires will therefore increase the abundance of buffelgrass plants in the ecosystem. Based on the information given, **justify** the scientists' claim.

A	Many receptors are embedded in the plasma membrane. **Describe** the polarity of the portion of the receptor that is inside the membrane. Examples of acceptable responses may include the following: • (The portion of the receptor inside the membrane) is nonpolar. • (The portion of the receptor inside the membrane) is hydrophobic.	**Point A1**
B	(i) Using the template in the space provided for your response, **construct** an appropriate type of graph that represents the data in Table 1. Your graph should be appropriately plotted and labeled. • Data are represented in a bar/modified bar graph. • Examples of acceptable responses may include the following: 	**Point B1**
	(i) Using the template in the space provided for your response, **construct** an appropriate type of graph that represents the data in Table 1. Your graph should be appropriately plotted and labeled. • Data and error bars are accurately plotted.	**Point B2**
	(i) Using the template in the space provided for your response, **construct** an appropriate type of graph that represents the data in Table 1. Your graph should be appropriately plotted and labeled. • Graph is appropriately labeled.	**Point B3**
	(ii) Based on the data in Table 1, **determine** the type of activity that was affected by inhibiting the expression of the DopEcR receptor. • Oriented activity (was affected).	**Point B4**

Question 3: Scientific Investigation — 4 points

Buffelgrass, an invasive grass species in southwestern desert ecosystems, is threatening the saguaro cactus, a keystone species in these ecosystems. Buffelgrass is drought-tolerant and can survive wildfires. However, the dry buffelgrass also acts as fuel for wildfires, causing the fires to be more severe. Older saguaro cacti can survive wildfires; however, many of the young cacti cannot.

Scientists conducted an experiment to determine whether they could control the abundance of the buffelgrass population. The scientists identified several native grass species that, when grown with buffelgrass, might reduce the abundance of buffelgrass. They grew buffelgrass in the presence of several different native grass species in greenhouses, in either nondrought (watered every 3 days) or drought (watered every 9 days) conditions. After twelve weeks, they measured the height and dry weight of the buffelgrass in each treatment group.

A	**Describe** the effect that removing a keystone species will have on an ecosystem. Examples of acceptable responses may include the following: • (Removal of a keystone species) reduces biodiversity/diversity/resilience (of the ecosystem). • (Removal of a keystone species) will cause the ecosystem to collapse.	**1 point**
B	**Identify** a control group the scientists should include in their experiment. Examples of acceptable responses may include the following: • (A treatment group with) only buffelgrass planted • (A treatment group with) no native grass species	**1 point**
C	**State** the null hypothesis of the experiment in which buffelgrass is grown in the presence of native grass species. Examples of acceptable responses may include the following: • There will be no difference in/effect on the abundance/dry weight/height/size of buffelgrass (when grown alone as compared with) when grown with native plants. • There will be no difference in/effect on the abundance/dry weight/height/size of buffelgrass grown in drought and nondrought conditions.	**1 point**
D	Scientists have found that the population growth rates of native grasses are much slower than the population growth rate of buffelgrass following a wildfire. The scientists claim that wildfires will therefore increase the abundance of buffelgrass plants in the ecosystem. Based on the information given, **justify** the scientists' claim. Examples of acceptable responses may include the following: • (With fewer native plant species after a wildfire) buffelgrass will have less competition/no competition (for resources). • (With fewer native plant species after a wildfire) buffelgrass will have more resources (for growth, development, and reproduction).	**1 point**