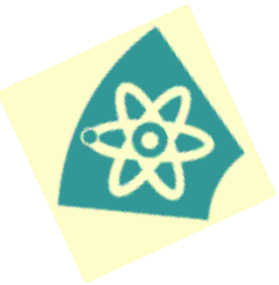
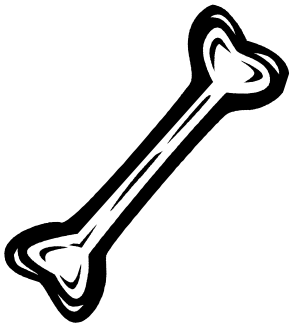


Radioactive Carbon Dating Lab



Background

Carbon 14?!

A stable carbon atom contains equal number of protons, neutrons, and electrons. However, atoms can also become unstable. Changing the number of neutrons in the nucleus of an atom will sometimes cause it to become unstable or "radioactive". We call these atoms radioactive isotopes. When an atom becomes unstable, it wants to eventually become stable again! In order to do this, it must go through some changes. Carbon 14 is an example of this. Carbon 14 is a radioactive isotope which has 6 protons and 8 neutrons (Its atomic weight is 14). Over time, these atoms become stable again by turning one of their neutrons into a proton, transforming an unstable carbon atom into a stable nitrogen atom with 7 protons and 7 neutrons.

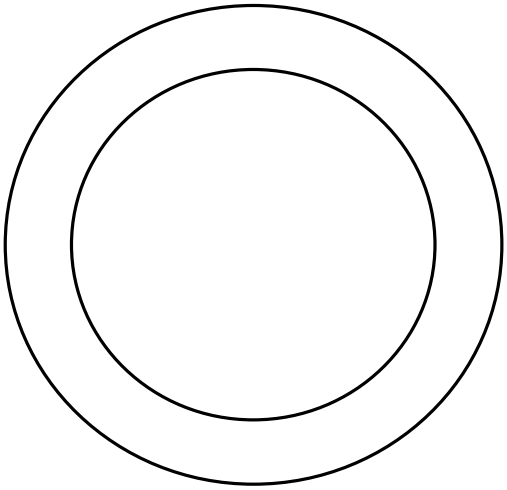
Quickly draw a carbon 14 atom and a stable nitrogen atom in the space below

Element:_____

# of Protons:_____

# of Neutrons:_____

# of Electrons:_____

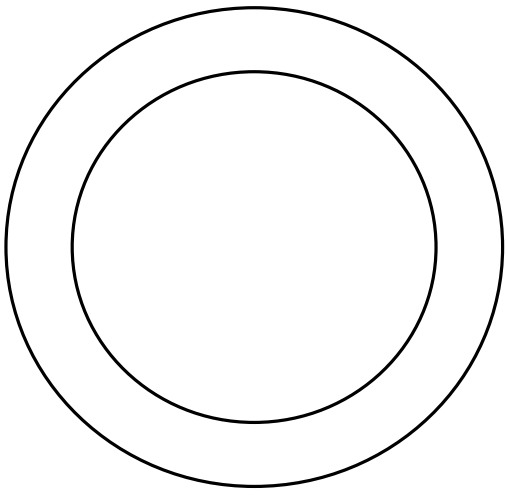


Element:_____

# of Protons:_____

# of Neutrons:_____

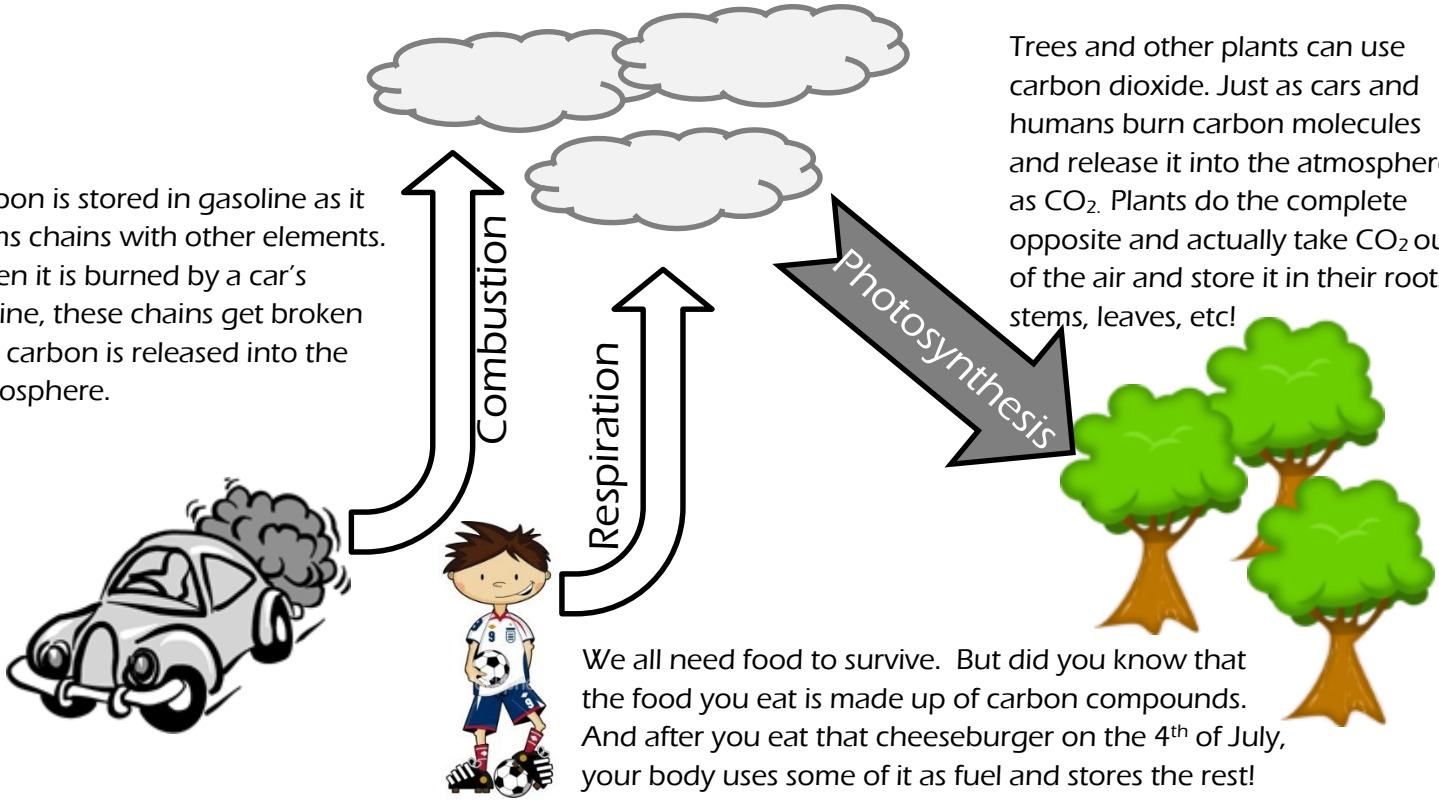
# of Electrons:_____



How does carbon get in our bodies?

Carbon is everywhere. It manages to find its way into just about everything around us! In fact, all living things are made up carbon compounds(carbon mixed with other elements). The food we eat contains carbon. The air around us contains carbon. If there were no carbon, you, this classroom, even the pencil you are probably using wouldn't exist.

Similar to water being recycled through constant processes such as evaporation, condensation, and precipitation, carbon is also recycled, except through processes such as photosynthesis, respiration, and combustion.



Radioactive Carbon Dating?

One method that scientists use to identify the age of a particular artifact is through the process of carbon dating. Because an unstable atom decays over time, some of the atoms inside an artifact might not look the same a few thousand years later. By identifying the amount of carbon 14 left over in an artifact, let's say a tool made from an animal bone; scientists can make an educated estimation of an artifacts age. This can be extremely helpful in determining whether something is a 1000 years old or 40,000 years old!

Materials

- 100 Skittles
- 1 plastic cup
- 2 plates (1 marked with a “U” 1 marked with a “D”)
- Data table and graph

Procedures

Put exactly 100 Skittles into a cup. Put your hand over the cup and shake the Skittles.

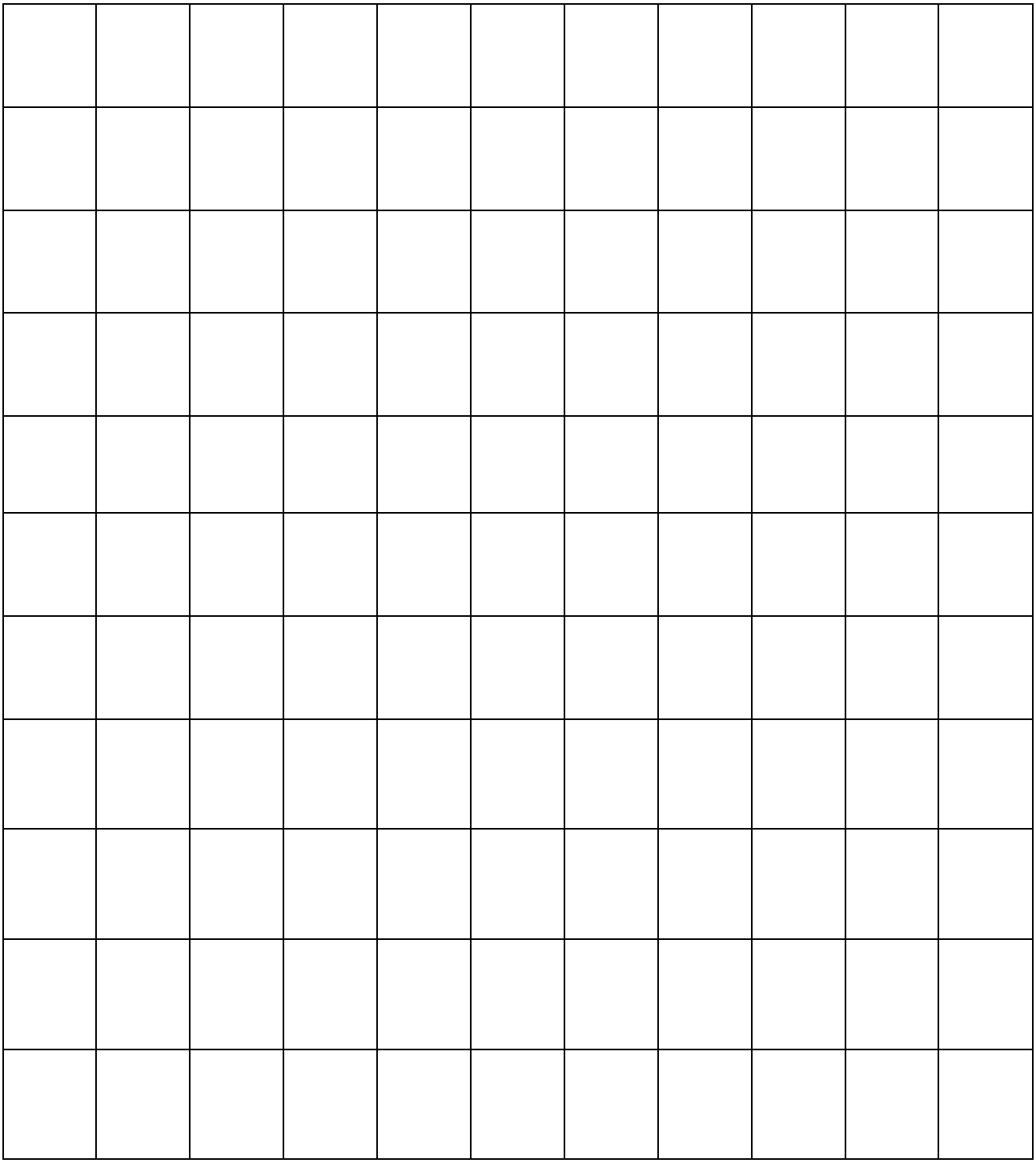
1. **CAREFULLY**, shake, then pour the Skittles in your cup out on to the plate marked **“U”.**
2. Pick out any of the Skittles that are right-side up or “showing the S” and place them on the plate marked with a **“D”.** These Skittles have now **“decayed”.**
3. Count the number of Skittles remaining on **plate “U”** and record that number in “group value” row
4. After Skittles are counted and recorded, put the remaining Skittles on **plate “U” BACK** into your cup.
5. Repeat steps 1- 5 TEN times

Results

Trial	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Group										
Class										

Class Average Work:

Radioactive Decay of Skittles



Reflection

1. Which of the two sets of data better represents the decay of a Skittle? The individual or the class? Explain.

_____

_____

_____

_____

2. You come into the next class and pick up Eric and Lisa's cup. The cup has 27 Skittles left in it. By referring to YOUR graph and without asking Eric or Lisa, which trial would you guess the group was on? Explain why.

_____

_____

_____

3. What are some similarities and differences between the graph you made and the graph displaying the half-life of a carbon-14 atom.

Similarities

Differences

4. You are an archeologist and on your archeological dig you come across a several small bones, which appear to be used for sewing. You take the bones back to your lab and discover that there is only about 12% of the original carbon-14 remaining. Using the decay of carbon-14 graph, how old would you predict the artifact to be?

_____

_____

_____

5. Scientists often only use carbon dating for artifacts they believe to be 50,000 or younger, by looking at your graph, why do you think that is? After you answer, talk briefly with your group members and think about what scientists could do to accurately date artifacts 50,000 years old or older.

_____

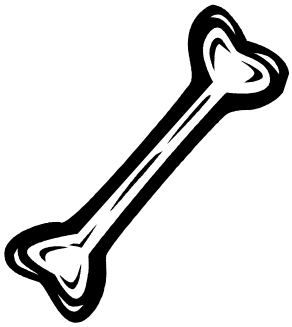
_____

_____

_____

_____

Radioactive Carbon Dating Lab



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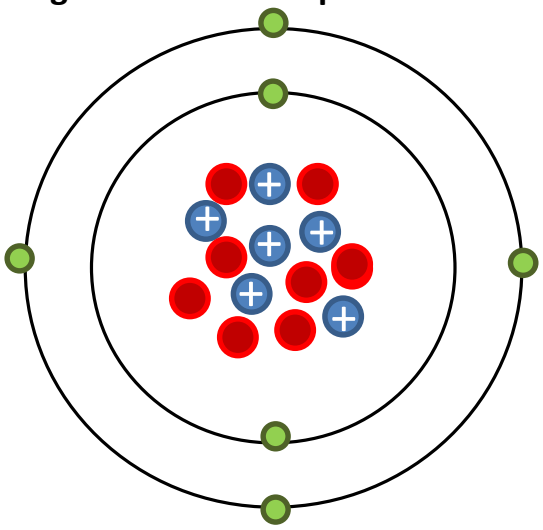
Quickly draw a carbon 14 atom and a stable nitrogen atom in the space below

Element: Carbon 14

# of Protons: 6

# of Neutrons: 8

# of Electrons: 6

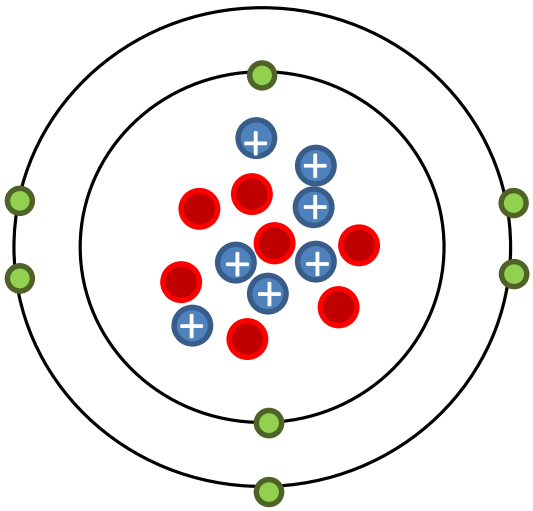


Element: Carbon 14

# of Protons: 7

# of Neutrons: 7

# of Electrons: 7



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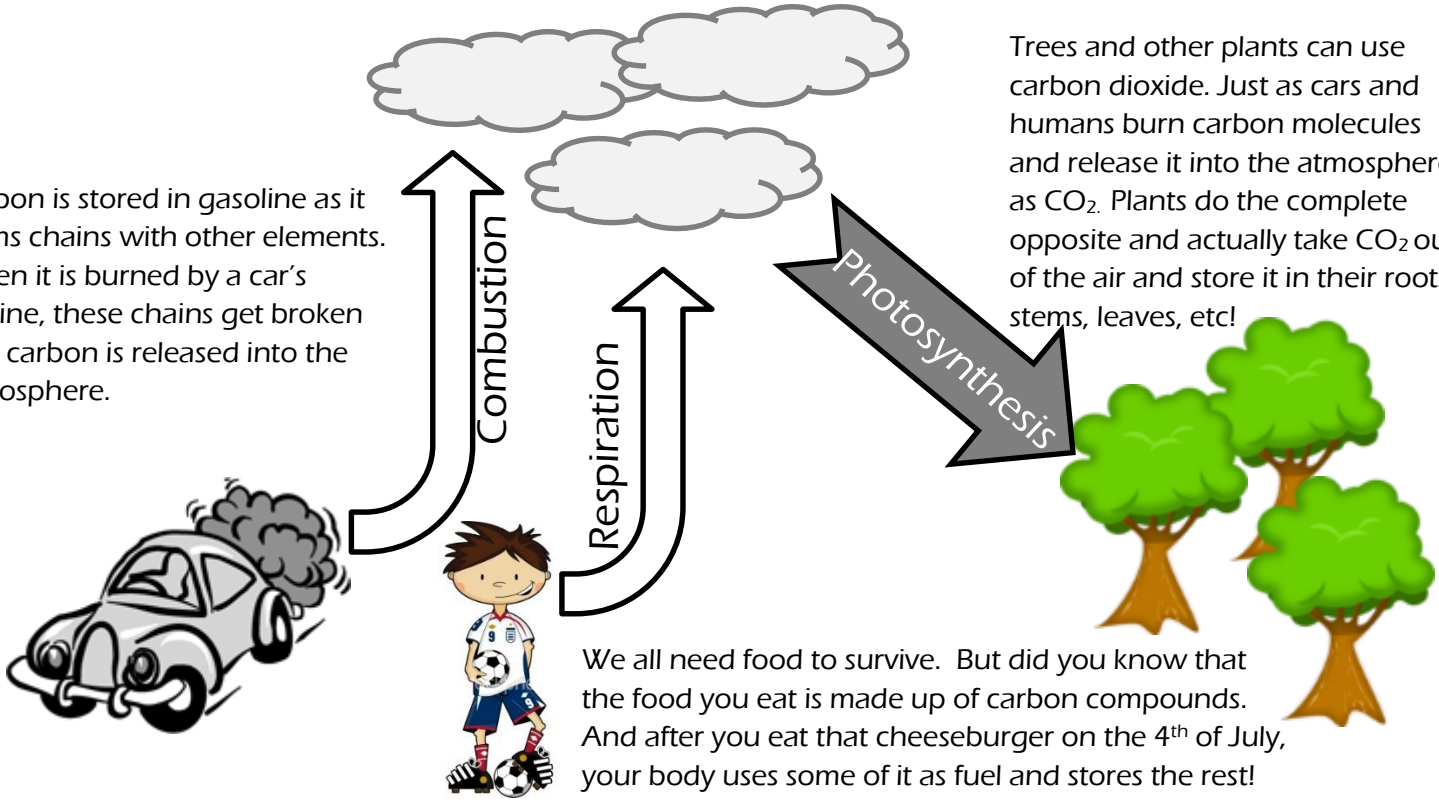

Radioactive Carbon Dating?

One method that scientists use to identify the age of a particular artifact is through the process of carbon dating. Because an unstable atom decays over time, some of the atoms inside an artifact might not look the same a few thousand years later. By identifying the amount of carbon 14 left over in an artifact, let's say a tool made from an animal bone; scientists can make an educated estimation of an artifacts age. This can be extremely helpful in determining whether something is a 1000 years old or 40,000 years old!

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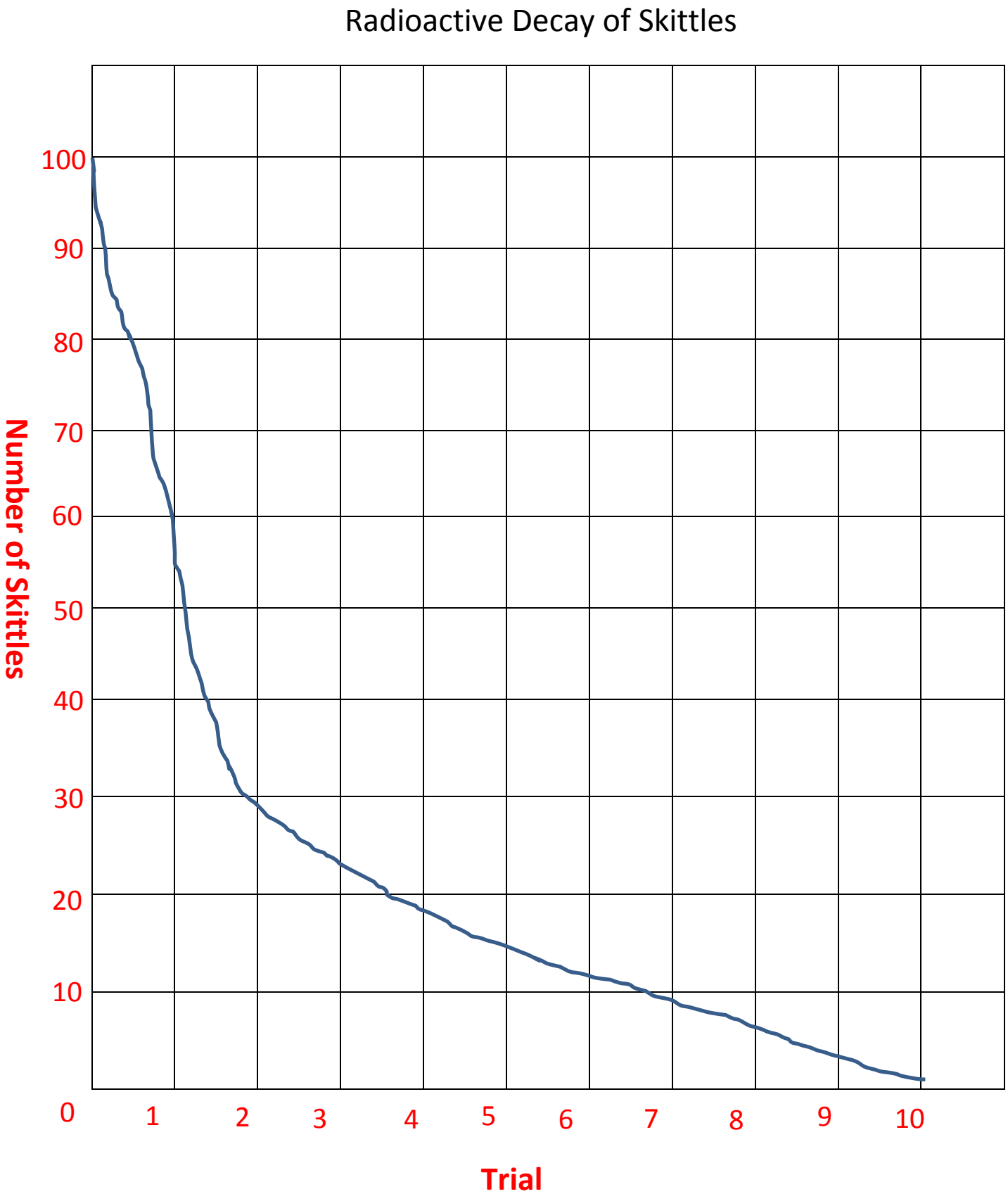
9. After Skittles are counted and recorded, put the remaining Skittles on **plate “U” BACK** into your cup.
10. Repeat steps 1- 5 TEN times

Results

Results will vary class to class, should be close to half after each trial

Trial	1	2	3	4	5	6	7	8	9	10
Group										
Class										

Class Average Work:


Radioactive Decay of Skittles
Number of Skittles
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
Trial

Reflection

1. Which of the two sets of data better represents the decay of a Skittle? The individual or the class? Explain.

Class. When performing an experiment performing more trials or tests will produce more accurate and reliable results

2. You come into the next class and pick up Eric and Lisa's cup. The cup has 27 Skittles left in it. By referring to <u>YOUR</u> graph and without asking Eric or Lisa, which trial would you guess the group was on? Explain why.

Should be trial 2.

3. What are some similarities and differences between the graph you made and the graph displaying the half-life of a carbon-14 atom.

<u>Similarities</u>

- Similar trend line
- Similar results

<u>Differences</u>

- Title
- Axis titles and values

4. You are an archeologist and on your archeological dig you come across a several small bones, which appear to be used for sewing. You take the bones back to your lab and discover that there is only about 12% of the original carbon-14 remaining. Using the decay of carbon-14 graph, how old would you predict the artifact to be?

Use decay of Carbon 14 handout

5. Scientists often only use carbon dating for artifacts they believe to be 50,000 or younger, by looking at your graph, why do you think that is? After you answer, talk briefly with your group members and think about what scientists could do to accurately date artifacts 50,000 years old or older.

At about 50,000 years, there is hardly enough carbon 14 remaining to identify whether the artifact is 50,000 old or 100,000 years old. For artifacts that are older than 50,000 years old, archeologists use the same process but with elements which have longer half-lives (like potassium and uranium)