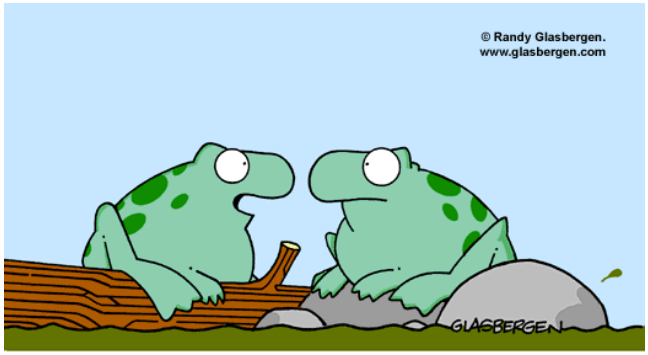
Discovery Stations

As a group you will move from station to station. At each station you will need to read the directions and complete the activity. If you finish the activity early you may talk quietly with your group. Do not disturb or interact with other groups.

Station #1: What is Biology?



"Looks aren't everything. It's what's inside you that really matters. A biology teacher told me that."

Write what you believe biology is and then discuss in your groups:

I believe biology is _____

_____

_____

My group concluded that biology is_____

_____

_____

What I expect to get out of biology class this year is_____

_____

_____

My goals for biology are _____

_____

_____

Station 2: Reading Activity: When Knowledge and Ethics Collide

Scientists can change an organism's genes. Should they?

Our ability to change living things grows as we learn more about life. But sometimes biotechnology makes us question whether we should change organisms just because we can. Maybe the technology is dangerous or maybe it challenges our values. Consider the greenish pig in the photo. A gene from a fluorescent jellyfish was added to its genome by genetic engineering. Genetic engineering holds great promise for medicine. But how and when should we alter an organism's genes?

What is Bioethics?

A short answer is that bioethics is the study of the moral questions that are raised as a result of biology research and its applications. But what do questions of ethics have to do with biology? It might seem better to leave questions about values in a philosophy or social studies class. However, today's cutting-edge research often prompts discussions about some of our most basic values. In the end, you might find that biology class is the best place to consider any number of ethical questions.

Ethical questions require all of us to make decisions about "the right thing to do." Often, the right thing to do is very clear. The decision benefits ourselves, our families, and our society, and it follows the accepted values of society. However, many times a decision about an ethical issue is not so obvious. It is in these cases when strong feelings on different sides of an ethical question can produce conflicts—in ourselves, our families, and our society. Can we rely upon biology, or any other scientific field, for our decisions?

For better or for worse, science can only provide us with information. The knowledge that comes from scientific research is very useful, and often necessary, in helping people arrive at decisions, but science only provides part of the answer to ethical questions. All of the advances in science have given us the ability to do many wondrous things. But bioethics asks us to question whether we should actually do all of those things.

We can add new genes to an organism's DNA. We can clone animals. We can extend human life expectancies. We can test people for genetic diseases. But should we, as a society, do all of these things? And who should decide whether we use all of our technological advances? Should these decisions be left to researchers? to universities? to corporations? Should the government make laws to cover bioethical issues? In the end, any decision based on a bioethical question will likely come down to a combination of scientific knowledge, personal values, and law.

Bioethics and Society

Many bioethics issues place an individual's right to privacy against the right of a company to conduct business, against the need of a community to have access to health information, or against the need of scientists to share research. In March of 2000, for example, Iceland's government sold the genetic and medical records of its 275,000 citizens to a Swiss drug manufacturer for $200 million. The money helped Iceland's economy, and any medications or tests for genetic diseases that result from the medical records will be provided for free to all Icelanders.

However, the government's actions could also be considered to be very troubling. Even though the citizens were given the option to not be included in the database, were the Icelanders' rights to privacy over their genetic records violated? Does anyone other than the individual have the right to be given access to this very personal information?

Health insurance applicants are screened for preexisting conditions, such as HIV. If a condition is found, companies might offer insurance to a person at a higher cost. Should insurance companies be allowed to do genetic screening to detect whether people have genes that might increase their risk of developing cancer or alcoholism? If not, should healthy people have to pay more to make up for higher costs the company has to pay for people who refuse to be screened? From the company's point of view, its responsibility is to make a profit for its shareholders. With genetic testing, the company can protect itself from potentially large costs. As you can see, a company's policy based on its ethics may differ from what others see as ethical.

Science alone cannot answer bioethics questions. When these questions arise, we all need to weigh the issues for ourselves. As biotechnology continues to advance, you will face new bioethics questions throughout your lifetime. Will you be ready?

Questions to Consider – Write answers in a complete sentence.

1. Should scientists do all of the things that technology has made it possible for them to do?

2. Who should decide how biotechnology is used?

3. Should scientific knowledge and personal beliefs play equal or unequal roles in decisions about biotechnology?

Station #3: Science Vocabulary

Use the list above to guess the meaning of each of the following terms:

1. Hydrology:

2. Cytology:

3. Protozoa:

4. Epidermis:

6. Cytoskeleton:

7. Abiotic:

8. Dermatitis:

9. Hypodermic:

11. Endocytosis:

12. Insecticide:

13. Anaerobic:

14. Bilateral:

15. Endotherm:

16. Subspecies:

17. Arthropod:

18. Micrometer:

19. Hypothermia:

20. Bilateral:

Now create your own scientific vocabulary words. Write the word and the meaning of each vocabulary term you create.

21._____

22. _____

23. _____

24. _____

25. _____

Station #4: Mystery Eggs

Mystery Eggs: How many nails are inside?

On the desk are plastic eggs filled with nails. It is your job to pick an egg and make an educated guess about how many nails are inside. You are going to need to take data and make observations before you make your educated guess.

Egg Color:_____

Observations (use your senses)	Data (numbers and measurements)

How many nails do you think are in your egg? _____

Using your observations and data to explain why you believe this many nails are in your egg. Write your answer using complete sentences.

Station #4: Living versus Nonliving

The Martian and the Car

Marty Martian was sent to Earth by the Martian government to find life. While on Earth, Marty captured a car and brought it back to Mars. He thought he'd found a good example of life on Earth. The Martian government does not believe that the car Marty brought back is alive. Marty must stand trial for failing to perform his Martian duties.

At the trail, Marty spoke in his defense. "I first saw these life forms rolling along roads in great numbers. They were giving off thick clouds of poisonous waste as they moved. They seemed to exhibit herding behavior, as many of the cars moved in the same direction. They appeared to have a great deal of energy, some of them moved faster than 60 kilometers per hour. When one of these life forms stopped or slowed down, the others behind it responded. They slowed down and gave off a reddish light from the back, and sometimes they would make honking noises. I observed that they would stop to feed on a liquid substance."

Take the part of Marty's defense attorney and make a good case for the car's being alive. Then be the prosecutor and show that the car is a nonliving thing. List as many reasons as you can.

Defense Attorney

1. _____
2. _____
3. _____
4. _____
5. _____

Prosecutor

1. _____
2. _____
3. _____
4. _____
5. _____

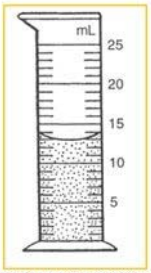
Station 6: Volume of Liquids

Count Your Drops

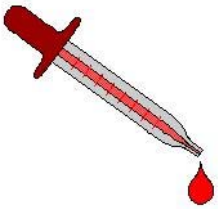
1. Take a guess – how many drops of water in one milliliter of water? _____

2. Tools you will need: :

BEAKER



GRADUATED CYLINDER



PIPETTE

*Note, to measure volume with a graduated cylinder, you should take the reading at the lowest point in the curve.

What amount of liquid is in the graduated cylinder pictured? _____

How much liquid can your graduated cylinder measure? _____

How much liquid can your beaker measure? _____

3. To determine the number of drops it takes to make a milliliter, fill you cylinder to 10 ml of water. Carefully add drops using the pipette until you reach 11 ml. Repeat this process 3 times in order to calculate an average.

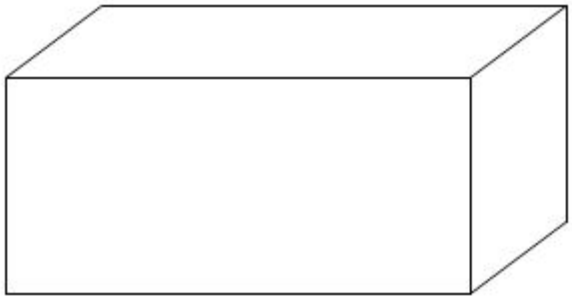
Trial 1	Trial 2	Trial 3	Average

Station 7: Volumes of solids

The Volume of Solid Objects

1. Solid objects have a volume also (basically the amount of space the object takes up). Volume can be measured in two ways.

   For symmetrical objects, volume is simply LENGTH x WIDTH x HEIGHT
   Use a metric ruler to measure the box below and determine its volume (measure in cm)



The volume of the box is: _____

2. For oddly shaped objects, using a water displacement technique can determine the volume. Find the volume of 3 marbles by filling a graduated cylinder to 10 ml. Drop the marbles in and see how much the water rises – this is the volume of the marbles.

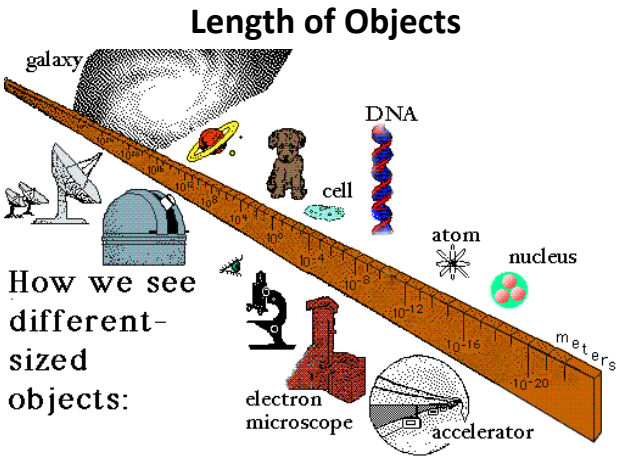
   Complete the table below.

A) Volume of Water before adding marbles	B) Volume of Water after adding marbles	Calculate (B minus A) Volume of all 3 marbles

Now determine the volume of a single marble by dividing your total (above) by 3. _____

Try dropping a single marble into the graduated cylinder. What is its volume? _____

Station 8: Measuring Length



1. The three units of length you will be most familiar with are: millimeters, centimeters, and meters. Use a meter stick to determine:

   How many mm in a cm _____ How man cm in a m _____

   Kilometers are used to measure long distances. How many meters in kilometer? _____

2. Use a meter stick or ruler to fill out the table below. (Grayed boxes need not be completed)

	In millimeters	In centimeters	In Meters
Height of lab table			
Length of lab table			
Length of notebook			
Your height			
Height of graduated cylinder			
Length of pipette			
Length of your shoe			

3. Which measurement is the largest? Circle your answer for each pair

a) 14 mm or 1 cm
b) 334 m or 1 km
c) 1 m or 990 cm
d) 145 m or 145 km
e) 3.4 cm or 30 mm
f) 10 km or 1000 cm

4. Circle the BEST metric unit for each.

a) The length of an eyelash [mm cm m km]
b) The height of a flagpole [mm cm m km]
c) The length of your arm [mm cm m km]
d) The distance between Chicago and St Louis [mm cm m km]