WLHS / Biology / Oppelt

Name_____
Date_____Per_____

BIOTECHNOLOGY WEBQUEST!

INTRODUCTION:

Science involving the understanding and use of DNA has evolved at a revolutionary pace. From the point in which Watson and Crick announced the fundamental double helical structure of DNA, great advances have been made in the application and understanding of this remarkable molecule for all walks of life. Projects such as the **Human Genome**, **transgenic organisms**, **cloning**, **genetically modified foods**, and **crime solving** are just some very common and state-of-the art applications of DNA technology today. But with anything new there are ethical/moral, societal, and political questions to be thought over.

In this activity you will visit 4 webpages and explore some of these exciting and ever-changing topics. Please answer the questions in each section as you work through the webquest / interactive activities.

A) Gel electrophoresis and DNA fingerprinting

http://www.pbslearningmedia.org/asset/tdc02_int_creatednafp2/

As you work through the simulation, read the information in each step and answer the following questions.

1) What is the function of a **restriction enzyme**? What determines the sites where a restriction enzyme works?

Responsible to cut DNA molecules at certain locations.
The code within the DNA & the code within the enzyme determine the site.

2) What is **electrophoresis**? Why / how does it allow scientists to separate pieces of DNA?

Using an electrical current to move molecules (pieces of DNA)
DNA has a negative charge = moves towards the positive end in the gel = spreads out the DNA

3) Why do you have to add radioactive probe DNA? Without the probes, would the DNA show up on the x-ray film? Radioactive probes allow DNA fragments to show up on X-ray film. It attaches to DNA at certain sequences.

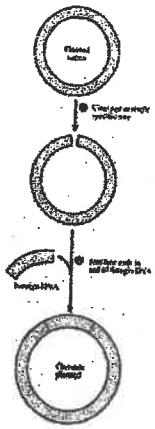
4) Which suspect committed the crime? What did you notice about her DNA?

Honey. Her saliva DNA matched the DNA fingerprint at the scene of the crime.

5) Based on the evidence, could any of the other suspects have committed the crime? Why or why not?

No. Honey's DNA sequence is unique to her.

B) Transgenic organisms http://www.pbs.org/wgbh/harvest/engineer/



**Work through the interactive and answer the questions below.

1) List three examples of plant foods / crops we humans have altered in some way.
Cucumbers, carrots, tomatoes, wheat

2) How did humans **first** alter crops? What method are scientists using **today** to change crops? Keeping seeds from the best crops & cross pollinating plants to get the desired traits.
Today genes are directly inserted into chromosomes.

**Click on "Transgenic Manipulation." Complete this activity. Read the descriptions of each step as you complete them.

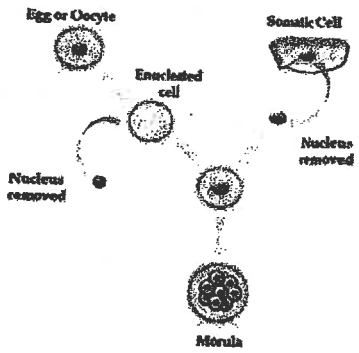
3) What is a **vector**? Why do you think it is possible to take DNA from one organism and successfully put it into another organism?
Vector = short piece of DNA used to deliver foreign DNA to another cell.
Yes. The DNA is capable of replicating on its own when inside a bacterial cell. The DNA will be incorporated into the bacterial DNA.

4) What kind of tomato plant resulted from this experiment? How did you know the plant was resistant to the caterpillar? Tomato plant resistant to herbicide + targeted pest.
The caterpillar died after eating the plant.

C) Cloning http://learn.genetics.utah.edu/

*Click on "Cloning", then on "Click and Clone" to launch the interactive. Work through the interactive and answer the questions below.

1) What two cells do you need to isolate to clone a mouse? Did these cells come from the same mouse or different mice? Somatic cell and egg cell.
Cells from 2 different mice. Somatic from Mimi; egg from Megdo



2) What is **enucleation**? What are the blunt and sharp pipettes used for?
Removal of the nucleus from a cell. The blunt pipette is to hold the egg in place; the sharp pipette is to suck out the nucleus.

3) What needs to happen to the new DNA **before** the process can continue?
The new DNA needs to be programed to adjust in the egg cell.

4) What is the name for a ball of 16 cells? Where do you put this ball of cells after you have grown it?
Morula. It is implanted into the womb.

5) What color fur did the baby mouse have? Which mouse's DNA was it identical to?
Brown. Identical to Mimi

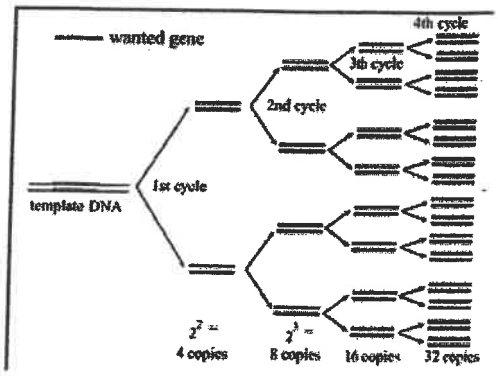
6) Did this really happen? If so, when and at which university?
Yes. 1998 @ University of Hawaii

D) PCR

http://learn.genetics.utah.edu/content/labs/pcr/

****Work through the interactive and answer the questions below.**

1) What does PCR stand for, and what do we use it for? What are some applications of PCR that are used every day? Polymerase Chain Reaction is used to make multiple copies of a specific DNA segment. (molecular photocopying)
It is used to diagnose disease, identify bacteria, viruses,



2) Roughly how many base pairs are in the human genome?

3 billion

3) What are some sources for the DNA needed to perform PCR? (HINT: Which body tissues might be used to isolate DNA from?)
a small sample from blood, skin, saliva or hair follicles

4) Define these terms and describe the role each plays in PCR.

Term	Definition	Role in PCR
Primer	Man-made pieces of DNA with specific nucleotide sequence.	2 primers match to a segment of DNA to copy it. PCR can only add onto existing piece of DNA.
Nucleotides	Building blocks of DNA molecules.	Added as free floating nucleotides which are attached to ends of the primers by DNA polymerase.
DNA polymerase	Naturally occuring proteins (enzyme) which read the code.	Copies a cell's DNA before it divides in 2.

5) How does the thermal cycler work? (Summarize the steps of heating and cooling, including which temperatures are reached, and for what purpose…in other words, what happens at the molecular level during each temperature phase?)
Heat to 95°C = DNA separates
Cool to 50°C = primers added and bond to DNA
Heat to 72°C = DNA Polymerase locates primer and attaches complementary nucleotides. This is done until the desired fragment is produced.

6) How many cycles were needed to make over a billion copies of the desired DNA sequence?

Over 30 cycles.