

Name: \_\_\_\_\_

Period: \_\_\_\_\_

## Cloning

1. Getting started: What do you already know about cloning? Where have you heard about it, or seen references to it? What do you want to know more about?

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2. Watch the clips from *The Boys from Brazil*...

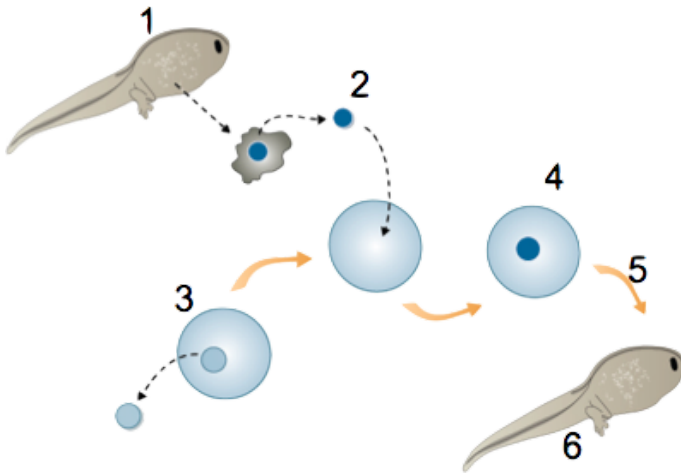
Using some sequencing language: *First, Next, second, third, finally...*, try to re-create the biologist's explanation of how cloning works...

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3. How to clone a frog



1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

NOW, USE SEQUENCING LANGUAGE AND THE TERMS ABOVE TO EXPLAIN HOW TO CLONE A FROG:

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#### 4. Now watch and read the lyrics to *I Want a Clone*

##### **Chorus**

*I want a clone, I don't want to be alone  
I want to talk to a younger me on the phone  
I want to sing harmony with another me in the same key.  
I want a new companion who's the closest of kin,  
A 50 year younger identical twin  
I'm going to the cloning lab to make myself a copy of me*

Back in '62 Sir John Gurdon took the nucleus from a body cell of an adult frog,  
Poked it in a egg cell that had its nucleus removed--this fused cell grew to be a pollywog,  
That pollywog was a clone of the adult -- the first scientifically created animal clone  
And 50 years later, the Nobel Prize committee made a million dollar call to Mister Gurdon's home.

We've all seen clones before, identical twins are clones, two separate people with the same DNA  
Or if you've ever made a cutting from a plant you've done some cloning, but not quite in Mr. Gurdon's way,  
He took a single cell from the body of an adult, and from it made a being, genetically the same,  
A brand new approach to animal reproduction, a huge shift from Mother Nature's game.

So if I want a clone I'm heading over to the lab where they'll extract a nucleus from a somatic cell  
That's any cell that's not for sex it could be bone or gut or muscle or my epidermal cells could do as well.  
'Cause all these cells despite their different look and feel possess all of the genes required to make a new you or me,  
And this idea that's key to cloning underlies the principle that all cells have genetic equivalency

##### **CHORUS**

Next I'll get an egg cell, which I can't of course provide, and we need to ensure it has no genes inside,  
Cause my clone's a clone of me I want fidelity and nothing besides.  
One way we can enucleate the egg is to irradiate it shine some u.v. light on it which ruins the DNA in it  
Now put my nucleus in it so that the DNA in it is mine and only my genes that to my new clone I will transmit

And now electric zap provide so that this cell starts to divide no longer just my zygote clone it starts to be an embryo  
It needs a place to grow so to a surrogate mom it'll go  
And nine months later, my clone's new life begins, though half a century apart identical twin  
We'll be on Letterman and Leno and we'll fly to San Francisco, and everywhere we go we'll be the center of the show,

##### **CHORUS**

If this sounds like just a story, remember all the glory  
Ian Wilmut got in '96 for cloning the sheep Dolly,  
And then another volley, genetically modified Polly,  
Every single cell she had contained a human gene oh golly!

In years that followed camels, deer and ferrets mice, and cows and hogs  
Pet owners have paid \$50K to clone their cats and dogs  
And even Rhesus Monkeys which are primates just like we are  
It's completely doable you see the technique's come so far.

But now I'm here inside the lab I'm starting to think "maybe not,"  
My clone of course would be a person not my minion or a robot,  
And what if my genes don't activate correctly and there's problems and  
Instead of singing harmony a sick bed's where my clone will be

And I'll be there right by his side, sick with regret not feeling pride,  
My narcissistic grandiosity had got the best of me,  
My self-absorbed preoccupation with genetic duplication  
Simply has no place in a world with 7 billion population!

##### **Modified Chorus**

*I don't need a clone, it's okay to be alone,  
When I need someone I'll talk to a friend on the phone  
I want to sing harmony with the people who I find around me  
Come back soon when I follow this lesson,  
With a song about regenerative medicine  
A way that we can clone that brings some benefit to humanity*

And just a tiny preview of the kind of things we might consider  
Imagine if for some reason, you needed a new liver,  
Instead of finding donors and running the risk of rejection  
We clone your cells and grow you a liver that suits you to perfection.

##### **CHORUS**

## 5. Understanding the Science: THE ORIGINS OF DOLLY, THE FIRST CLONED MAMMAL

**Scottish Blackface**  
(1. Egg Cell Donor)

**Finn-Dorset**  
(2. Nuclear Donor)

**Scottish Blackface** and **Finn-Dorset**: two different breeds of sheep.

**enucleation**: removing the nucleus from a cell

**mammary cells**: breast tissue cells

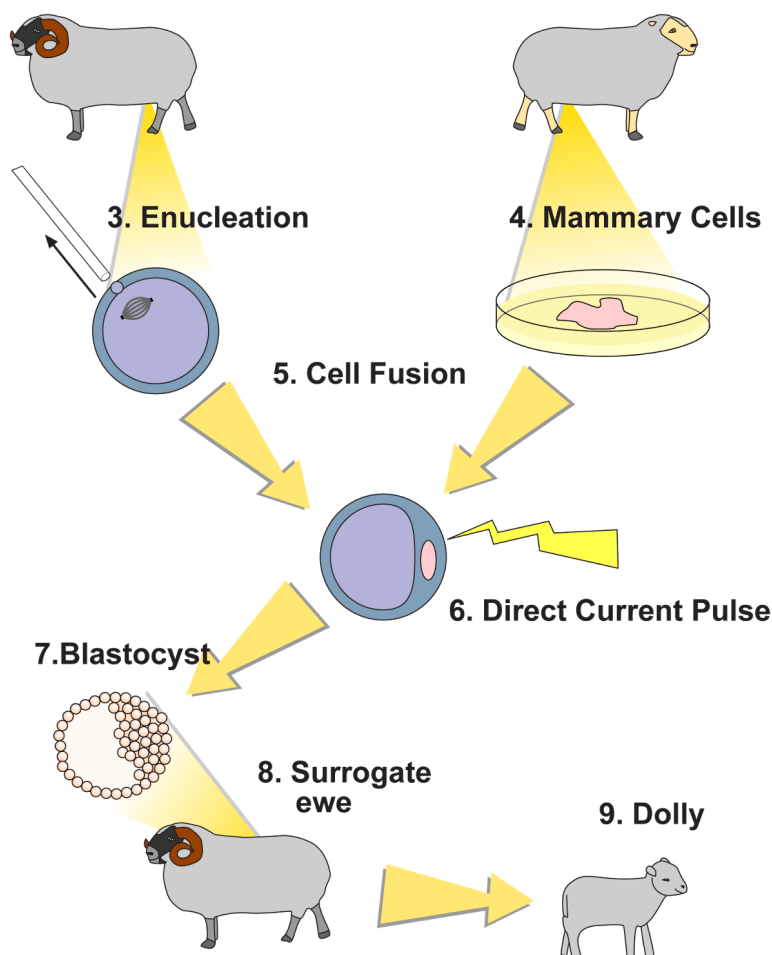
**cell fusion**: combining different cells

**blastocyst**: a very early embryo

**surrogate ewe**: The sheep who carries an embryo that's *not* related to her.

**ewe**: female sheep

If you wanted to clone a sheep, how would you do it? Use appropriate sequencing words in your response (*first, next, initially, finally, eventually, meanwhile, during, subsequently, etc.*)




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6. If you wanted to clone your dog, how would you do it? Use appropriate sequencing and content words in your response (*first, next, initially, finally, eventually, meanwhile, during, subsequently, etc.*)

7. Find, in the lyrics (or in your own knowledge), some examples of natural clones.

8. Are *all* twins clones? Why or why not?

9. Cloning" can be defined as "making an exact copy." How does cloning apply to your own cells?

10. "Ethical" means "morally good or correct." The Nazis were German Nationalists who controlled Germany from 1933 to 1945. Led by Adolph Hitler, they committed some of the worst crimes in history, including the murder of over 6,000,000 Jews. In the novel, *Boys from Brazil*, a Nazi doctor successfully clones Hitler. By 1960, in this novel, about 10 teenage Hitler-clones are growing up in various countries around the world. A Jewish Nationalist wants to murder all of these teenage boys, claiming that the world cannot risk another Hitler. Is this a reasonable argument? Are these clones of Hitler actually Hitler? How would you respond to the argument that these boys should be killed?

*Proposition and  
Support words*

- I think/I believe
- One reason that
- My (his/her) opinion
- My (his/her) idea
- In my opinion
- My point of view  
claim, statement

11. In my song, I mention that a woman paid \$50,000 to clone her dog. Is that ethical? Use the proposition and support language above?

12. Would it ever be ethical to clone a cow that's being raised for meat? What about corn that's been genetically engineered for some particular purpose?

*Proposition and  
Support words*

- I think/I believe
- One reason that
- My (his/her) opinion
- My (his/her) idea
- In my opinion