00:00:00.000 --> 00:00:14.640
Today, the main purpose of this, we've been doing adaptations in the classroom, right?

00:00:14.640 --> 00:00:17.840
I did put the vocab and everything up so you see it.

00:00:17.840 --> 00:00:22.200
The big thing today is what happens when an environment, remember how we said survival

00:00:22.200 --> 00:00:23.520
of the fittest?

00:00:23.520 --> 00:00:28.440
Is being able to survive with an adaptation in a particular environment.

00:00:28.440 --> 00:00:30.000
Well today, what we're going to be concentrating on.

00:00:30.000 --> 00:00:35.000
is what happens to an organism if the environment actually changes.

00:00:35.000 --> 00:00:39.000
So we're going to be talking about, these things are called peppered moths.

00:00:39.000 --> 00:00:42.500
And if you notice the peppered moths, do we all remember the mice from yesterday?

00:00:42.500 --> 00:00:44.000
The video that I played?

00:00:44.000 --> 00:00:46.500
Remember how they had the dark mouse and the brown mouse?

00:00:46.500 --> 00:00:48.000
Because the environment changed.

00:00:48.000 --> 00:00:49.500
What was it that flowed across the desert?

00:00:49.500 --> 00:00:51.000
What changed the color of the desert?

00:00:51.000 --> 00:00:53.000
The lava rocks.

00:00:53.000 --> 00:00:56.000
The lava rocks flowed, right?

00:00:56.000 --> 00:00:59.000
Well, this is a change in the environment also.

00:00:59.000 --> 00:01:00.000
If you notice, just like...

00:01:00.000 --> 00:01:02.640
Unlike the mice, we have two different colors, correct?

00:01:02.640 --> 00:01:05.480
We have dark ones and we have light ones.

00:01:05.480 --> 00:01:09.680
Now I will tell you this, the original one was the light colored one, but for some reason

00:01:09.680 --> 00:01:11.520
the environment changed.

00:01:11.520 --> 00:01:16.120
Today you get to figure out what changed in the environment and how in the world did the

00:01:16.120 --> 00:01:19.280
moths turn into a totally different color, okay?

00:01:19.280 --> 00:01:23.360
So go ahead and go to the first page.

00:01:23.360 --> 00:01:27.879
Your ICAM for today is not going to engage in an argument from evidence to explain how

00:01:27.879 --> 00:01:30.000
a given adaptation.

00:01:30.000 --> 00:01:34.440
the probability of reproductive success in the population of moths. So we're

00:01:34.440 --> 00:01:39.199
dealing with the moths today just like we played with the mice yesterday. A very

00:01:39.199 --> 00:01:42.239
special moth. I'm going to be showing you a quick little video about the moth and

00:01:42.239 --> 00:01:46.440
at that point you're going to be working together with a partner to answer the

00:01:46.440 --> 00:01:50.120
questions that follow up. Are we ready?

00:02:00.000 --> 00:02:06.639
It looks 30 years. It's that period of huge transition and what did they say happened? What happened? What did they say British?

00:02:06.639 --> 00:02:08.640
What did anybody kiss that?

00:02:09.279 --> 00:02:11.479
Industrial Revolution what happened during the Industrial Revolution?

00:02:12.600 --> 00:02:14.680
the industrial stuff the factories

00:02:15.319 --> 00:02:18.440
People wanted products they figured out how to build factories to make them

00:02:18.440 --> 00:02:23.399
the only problem is they had no like environmental protection agency back then and all of the

00:02:23.639 --> 00:02:28.520
Ash and debris and stuff like that started dumping out in the atmosphere. Okay, so let's see what else happens

00:02:30.000 --> 00:02:34.000
evolutionary biologist, Dr. Iyik Sakirin.

00:02:34.000 --> 00:02:40.000
The first black worm was recorded in Great Manchester in 1848,

00:02:40.000 --> 00:02:46.000
but by the turn of the century, which is to say around 1900,

00:02:46.000 --> 00:02:54.000
mostly all of this type was gone from the north-western industrial regions of Great Britain,

00:02:54.000 --> 00:02:58.000
and they had been entirely replaced by this form.

00:02:58.000 --> 00:03:00.000
The black insects thrived.

00:03:00.000 --> 00:03:04.559
blending in with sooty tree bark to avoid alien predators.

00:03:04.559 --> 00:03:07.760
Saki and his team found a jumping gene mutation

00:03:07.760 --> 00:03:10.119
to be responsible for the change.

00:03:10.119 --> 00:03:10.960
The mutation...

00:03:10.960 --> 00:03:12.319
Now, if I go to Britain today,

00:03:12.319 --> 00:03:14.880
do you think it's still polluted like it is then?

00:03:14.880 --> 00:03:17.719
No, because you had the Environmental Protection Agency acts,

00:03:17.719 --> 00:03:20.399
you had the Clean Air Acts, you had all kinds of acts.

00:03:20.399 --> 00:03:22.559
So we went from a white moth to a dark moth,

00:03:22.559 --> 00:03:24.840
all because of the pollution.

00:03:24.840 --> 00:03:27.280
What do you think we have the majority of today?

00:03:27.280 --> 00:03:29.079
The dark moths or the light moths?

00:03:29.079 --> 00:03:30.479
Light.

00:03:30.000 --> 00:03:31.279
Why would we have more light?

00:03:31.279 --> 00:03:35.159
Because the ash and the debris went away.

00:03:35.159 --> 00:03:38.159
All right, so she says the ash and the debris all went away.

00:03:38.159 --> 00:03:39.439
So let's find out.

00:03:39.439 --> 00:03:45.039
After the UK government passed Clean Air Act in 1956 and 1963,

00:03:45.039 --> 00:03:47.319
the gradual lightening of the environment

00:03:47.319 --> 00:03:48.479
saw the blackout.

00:03:48.479 --> 00:03:52.239
And there was that Clean Air Act, 1963.

00:03:52.239 --> 00:03:56.040
Zachary says the findings offer a complete example of evolution

00:03:56.040 --> 00:03:57.719
by natural selection.

00:03:57.719 --> 00:03:59.719
All right, ladies and gentlemen, with your table,

00:03:59.719 --> 00:04:01.280
party.

00:04:00.000 --> 00:04:03.000
I need you going through the questions with each other,

00:04:03.000 --> 00:04:04.000
help each other get the answers.

00:04:04.000 --> 00:04:05.000
Got it?

00:04:15.000 --> 00:04:17.000
So what two-color moths do we have?

00:04:17.000 --> 00:04:18.000
Black and white.

00:04:18.000 --> 00:04:20.000
Black and white.

00:04:20.000 --> 00:04:23.000
Which one was naturally found in nature?

00:04:23.000 --> 00:04:24.000
The white one?

00:04:24.000 --> 00:04:26.000
Which color?

00:04:26.000 --> 00:04:27.000
The white one.

00:04:27.000 --> 00:04:28.000
The white one was natural.

00:04:28.000 --> 00:04:29.000
Okay.

00:04:29.000 --> 00:04:30.000
Which moth...

00:04:30.000 --> 00:04:34.440
a hundred years ago, before the Industrial Revolution, would have a harder time hiding.

00:04:34.440 --> 00:04:41.840
The dark one? Why? There wasn't pollution, so what color do you think the trees were?

00:04:41.840 --> 00:04:47.040
Why? They have, yeah, they're birch. They have all that, like, stuff all around.

00:04:47.040 --> 00:04:51.799
Okay, good job. Number four, which moth benefited from the pollution? So they're dumping out

00:04:51.799 --> 00:04:57.000
all this ash, all this debris, all this soot, and it's coating on top of the trees. So what

00:04:57.000 --> 00:05:00.000
color moth do you think is actually benefiting from the pollution?

00:05:00.000 --> 00:05:01.000
The black one or the white one?

00:05:01.000 --> 00:05:02.000
The black one.

00:05:02.000 --> 00:05:03.000
The black one.

00:05:03.000 --> 00:05:04.000
Because look at the fridge.

00:05:04.000 --> 00:05:05.000
Oh, yeah.

00:05:05.000 --> 00:05:06.000
Yeah.

00:05:06.000 --> 00:05:07.000
Imagine the trees are all this color.

00:05:07.000 --> 00:05:08.000
So the black one?

00:05:08.000 --> 00:05:09.000
The black one.

00:05:09.000 --> 00:05:10.000
He could blend in.

00:05:10.000 --> 00:05:11.000
Camouflage.

00:05:11.000 --> 00:05:12.000
He could hide.

00:05:12.000 --> 00:05:13.000
We all pretty much done?

00:05:13.000 --> 00:05:14.000
All right.

00:05:14.000 --> 00:05:15.000
Here we go.

00:05:15.000 --> 00:05:17.000
Let me get this set up.

00:05:17.000 --> 00:05:21.000
Rachel, what two colors of moths were naturally found in nature?

00:05:21.000 --> 00:05:22.000
Black and white.

00:05:22.000 --> 00:05:23.000
Black and white.

00:05:23.000 --> 00:05:24.000
That's it.

00:05:24.000 --> 00:05:29.000
Jocelyn, which moth benefited from the pollution?

00:05:30.000 --> 00:05:34.400
The dark one. The dark moth. Why, Jocelyn?

00:05:34.400 --> 00:05:38.699
Because it disguised them because it was dark and couldn't look high.

00:05:38.699 --> 00:05:41.699
Good job. It disguised them.

00:05:43.699 --> 00:05:47.700
Oh, sorry. Disguised them.

00:05:47.700 --> 00:05:52.200
Okay. What process do scientists call the ability to adapt to an environment?

00:05:52.200 --> 00:05:53.700
That was probably the hardest one there.

00:05:53.700 --> 00:05:56.200
Harley. What is it called?

00:05:56.200 --> 00:05:59.200
Natural selection.

00:05:59.200 --> 00:06:00.200
Natural selection.

00:06:00.000 --> 00:06:07.599
And remember, we talked about with survival of the fittest, it does not have to be the

00:06:07.599 --> 00:06:10.520
best, the strongest, the quickest, the smartest.

00:06:10.520 --> 00:06:13.000
It's just a trait that helps them survive.

00:06:13.000 --> 00:06:16.920
So when the environment started changing and the trees got dark, that little mutation where

00:06:16.920 --> 00:06:19.479
I'm a dark moth totally worked.

00:06:19.479 --> 00:06:22.260
White moth was having trouble at least in the cities.

00:06:22.260 --> 00:06:27.000
So it says down at the bottom, scientists have observed natural selection in action

00:06:27.000 --> 00:06:30.040
in multiple types of animals, plants, and microorganisms.

00:06:30.000 --> 00:06:33.000
Today, we're just going to analyze one.

00:06:33.000 --> 00:06:38.000
What we did yesterday was the rock pocket mice.

00:06:38.000 --> 00:06:42.000
Sorry, rock pocket mice.

00:06:42.000 --> 00:06:46.000
And I believe it was, I forget who said it.

00:06:46.000 --> 00:06:50.000
I think it was Kyler said, the lava flow from yesterday

00:06:50.000 --> 00:06:55.000
with those rock pocket mice, all of a sudden now the brown desert turned what color?

00:06:55.000 --> 00:06:56.000
Black.

00:06:56.000 --> 00:06:59.000
It wasn't a good time to be a brown mouse running around.

00:06:59.000 --> 00:07:00.000
You step on the...

00:07:00.000 --> 00:07:03.839
the dark lava, and every predator there can see you.

00:07:03.839 --> 00:07:05.000
Okay, flip it over.

00:07:08.079 --> 00:07:10.779
Both of these photos show two major forms

00:07:10.779 --> 00:07:11.800
of the peppered moth.

00:07:11.800 --> 00:07:14.039
One more time, just to remind you,

00:07:14.039 --> 00:07:16.000
it is the same species.

00:07:16.000 --> 00:07:17.979
They can reproduce.

00:07:17.979 --> 00:07:21.760
This one just has a mutation turning it dark, okay?

00:07:21.760 --> 00:07:23.819
Can you find the speckled form of the peppered moth

00:07:23.819 --> 00:07:27.000
on the lichen-covered tree trunk shown below?

00:07:27.000 --> 00:07:28.079
Okay, so let's take a look at it.

00:07:28.079 --> 00:07:29.879
Your picture's not as clear as mine.

00:07:30.000 --> 00:07:32.000
So I'll zoom in on it.

00:07:32.960 --> 00:07:36.539
There is a light moth and a dark moth setting on this tree.

00:07:37.179 --> 00:07:39.840
Again, yours because of the coffee machine, it doesn't look that good.

00:07:39.840 --> 00:07:42.720
I know. Can we clearly see the dark moth?

00:07:43.300 --> 00:07:46.180
Yeah. By the way, all those little flakes are called lichen.

00:07:46.180 --> 00:07:48.260
It naturally grows on the tree.

00:07:48.260 --> 00:07:51.139
What was happening during the pollution in the Industrial Revolution

00:07:51.520 --> 00:07:54.059
is the lichen itself was being killed off.

00:07:54.360 --> 00:07:58.700
And when it was killed off underneath that lichen is a dark trunk tree.

00:07:58.700 --> 00:07:59.639
OK.

00:08:00.000 --> 00:08:04.539
see it's a little bit harder does anybody see the speckle moth yep right

00:08:04.539 --> 00:08:11.220
here you see the little triangle perfect camouflage but he is adapted for this

00:08:11.220 --> 00:08:15.779
environment take away the lichen and all of a sudden now he would not look so

00:08:15.779 --> 00:08:23.459
great setting on a dark tree all right so it says here's a big deal ready this

00:08:23.459 --> 00:08:27.100
is happening in the cities why would it be happening in the cities where they

00:08:27.100 --> 00:08:29.760
building the factories

00:08:30.000 --> 00:08:34.000
They're not out in country farmland, and we're going to build a factory right there in your field.

00:08:34.000 --> 00:08:37.000
So in the cities, you're having all this pollution.

00:08:37.000 --> 00:08:41.000
So it says in rural areas, what in the world is rural?

00:08:41.000 --> 00:08:44.000
What does rural mean?

00:08:44.000 --> 00:08:46.000
City or country?

00:08:46.000 --> 00:08:47.000
Country.

00:08:47.000 --> 00:08:48.000
Country.

00:08:48.000 --> 00:08:53.000
Okay, so we're going to just put this note for you out of the city.

00:08:53.000 --> 00:08:59.000
A lot of you would think of it as the countryside.

00:08:59.000 --> 00:09:00.000
Who has a lot of money.

00:09:00.000 --> 00:09:07.800
population, the city or the countryside? City. Okay, so areas with little air

00:09:07.800 --> 00:09:13.720
pollution, many tree trunks were covered with lichen. In industrial areas, also in

00:09:13.720 --> 00:09:18.159
the city where they're doing it, with heavy air pollution, most tree trunks

00:09:18.159 --> 00:09:23.399
were dark. So just to make it clear one more time, what's really happening, the

00:09:23.399 --> 00:09:29.159
tree itself is not really being bothered by the pollution. What's really happening

00:09:29.159 --> 00:09:32.159
is the

00:09:30.000 --> 00:09:37.440
The lichen, the lichen is dying out and underneath the lichen is my dark tree trunk, okay?

00:09:37.440 --> 00:09:42.680
All right, now here's what I want you to do working together with a partner, are you ready?

00:09:42.680 --> 00:09:47.680
I want you to take a look at this graph and try to figure out what in the world are they

00:09:47.680 --> 00:09:48.680
talking about.

00:09:48.680 --> 00:09:51.120
Do we got that?

00:09:51.120 --> 00:09:52.120
What are they talking about?

00:09:52.120 --> 00:09:53.920
What is the data telling me?

00:09:53.920 --> 00:09:55.319
What are they trying to depict here?

00:09:55.319 --> 00:09:59.159
Okay, go ahead and work with a partner and discuss it.

00:09:59.159 --> 00:10:00.159
What do we call this right here?

00:10:00.000 --> 00:10:08.279
in 1850? It was an increase. What do they call it? The Industrial what? Revolution.

00:10:08.279 --> 00:10:14.880
And what did they pass about right here? The Clean Air Act. So now all of a sudden the

00:10:14.880 --> 00:10:22.799
lichen starts growing back. So it increased, stayed really increased, and

00:10:22.799 --> 00:10:29.479
then decreased. So what do you think happened right here? 1850. There was a lot

00:10:29.479 --> 00:10:31.879
of population.

00:10:30.000 --> 00:10:34.000
about what revolution did they go through when they started building all the factories?

00:10:34.000 --> 00:10:38.000
Do you remember what it was called?

00:10:38.000 --> 00:10:42.000
The Industrial Revolution.

00:10:42.000 --> 00:10:46.000
Because everybody wanted products, so they started building factory after factory after factory.

00:10:46.000 --> 00:10:50.000
If right there is when the Industrial Revolution happened, what do you think they're dumping out into the atmo
sphere?

00:10:50.000 --> 00:10:54.000
What comes out of the factory?

00:10:54.000 --> 00:10:58.000
Smoke. Smoke. And then what do you think they passed

00:10:58.000 --> 00:11:00.000

about right here? Why did it start dropping off?

00:11:00.000 --> 00:11:02.000
Do you remember what that was called?

00:11:02.000 --> 00:11:05.000
Do you remember what it was called?

00:11:05.000 --> 00:11:06.000
What happened right here?

00:11:06.000 --> 00:11:08.000
Why did it start going down?

00:11:08.000 --> 00:11:10.000
Oh, because they, um...

00:11:10.000 --> 00:11:12.000
What did they pass at that time?

00:11:12.000 --> 00:11:14.000
They had smoke coming out.

00:11:14.000 --> 00:11:16.000
Like the Clean Air Act.

00:11:16.000 --> 00:11:18.000
The Clean Air Act. You're right. The Clean Air Act.

00:11:18.000 --> 00:11:21.000
So about right here, they passed the Clean Air Act.

00:11:21.000 --> 00:11:24.000
1963, I believe it was.

00:11:24.000 --> 00:11:26.000
Okay, look up here real quick.

00:11:26.000 --> 00:11:29.000
What in the world is this graph even showing me?

00:11:29.000 --> 00:11:30.000
Why would it be...?

00:11:30.000 --> 00:11:35.940
flatlined here then suddenly skyrocket stay high and then boom drop off what do

00:11:35.940 --> 00:11:46.799
you think go uh-huh when the dark moss were like around okay where would the

00:11:46.799 --> 00:11:53.139
dark moss start increasing here or here around right there right here okay what

00:11:53.139 --> 00:11:57.420
do you think happened right there 1850 why would suddenly the dark moss

00:11:57.420 --> 00:12:01.979
population just skyrocket there was

00:12:00.000 --> 00:12:03.839
pollution during the 1850s. Okay there was no pollution leading up to here and

00:12:03.839 --> 00:12:07.119
then what happened right there? Pollution started. And what do we call

00:12:07.119 --> 00:12:12.479
that revolution? Do you remember what it was called? Helper. What is it called? The

00:12:12.479 --> 00:12:16.520
Industrial Revolution happened. They started building all the factories. So

00:12:16.520 --> 00:12:21.479
here's what I want you to put on your paper. Are we ready? Right here. 1850.

00:12:21.479 --> 00:12:29.600
Industrial Revolution. Now just to be

00:12:30.000 --> 00:12:34.880
clear with this? This occurred in the cities. It is not occurring in the

00:12:34.880 --> 00:12:38.640
countryside because in the countryside, the rural areas, they don't have the high

00:12:38.640 --> 00:12:44.800
pollution. The lichen is still growing. So if this is where the Industrial

00:12:44.800 --> 00:12:47.639

Revolution happened and all of a sudden the tree trunks are turning dark

00:12:47.639 --> 00:12:52.440
because the lichen is dying off and the population of the dark moss skyrockets,

00:12:52.440 --> 00:12:59.079
why did it drop right here? Why did it go down? Ava, why did it go down? They passed

00:12:59.079 --> 00:13:02.080
the Clean Air Act.

00:13:00.000 --> 00:13:06.000
So about right here, they passed the Clean Air Act.

00:13:08.000 --> 00:13:10.000
My pen's dragging today.

00:13:12.000 --> 00:13:15.000
So if they passed the Clean Air Act, what happened to the pollution?

00:13:16.000 --> 00:13:17.000
It went down.

00:13:17.000 --> 00:13:19.000
It went down. What started regrowing on the tree?

00:13:20.000 --> 00:13:23.000
Lichen, because it doesn't have to deal with all the pollution anymore.

00:13:23.000 --> 00:13:30.000
Okay, this graph and this graph, this one is showing percent of peppered moss that went down.

00:13:30.000 --> 00:13:34.079
were dark. This one's showing the alleles. Do you remember how the allele is one

00:13:34.079 --> 00:13:38.479
letter, right? The allele is one letter. What do you think to be a dark moth is?

00:13:38.479 --> 00:13:41.800
Do you think it's going to be a capital D or a little d? Which one is dominant?

00:13:41.800 --> 00:13:49.479
Capital D. Capital D. So every one of these moths are either capital D capital D

00:13:49.479 --> 00:13:55.920
or capital D lowercase d. What about the white ones? What would it have to be?

00:13:55.920 --> 00:14:01.959
What would their genotype be? Little d, little d. Would it have to be?

00:14:00.000 --> 00:14:06.800
if dark is dominant. So the white ones would be little d little d. Okay turn the

00:14:06.800 --> 00:14:16.280
page. Now that was all happening in Europe but in 1850 what's also happening

00:14:16.280 --> 00:14:22.420
in the United States? Any wild guess? Same thing, Industrial Revolution, the same

00:14:22.420 --> 00:14:28.639
exact thing. So in our major cities we are doing pollution like crazy also

00:14:28.639 --> 00:14:31.899
because everybody wants to do toad

00:14:30.000 --> 00:14:31.759
and stuff like that.

00:14:31.759 --> 00:14:35.619
So it says, in the United States, as in England,

00:14:35.619 --> 00:14:37.760
the percent of pepper moths that were dark

00:14:37.760 --> 00:14:40.640
increased as air pollution increased

00:14:40.640 --> 00:14:44.399
and industrialization regions.

00:14:44.399 --> 00:14:48.440
Beginning in the late 1950s, air pollution was reduced.

00:14:48.440 --> 00:14:50.200
What do you think happened in 1950?

00:14:52.319 --> 00:14:53.200

Clean Air Act.

00:14:53.200 --> 00:14:54.319
They started talking about, hey,

00:14:54.319 --> 00:14:55.959
we have all these people getting sick

00:14:55.959 --> 00:14:57.200
from all this pollution.

00:14:57.200 --> 00:14:59.420
They did not care about the moths.

00:14:59.420 --> 00:15:01.260
It's just, you have.

00:15:00.000 --> 00:15:04.159
a whole bunch of people in cities getting sick like crazy.

00:15:04.159 --> 00:15:10.119
When I lived in California, well, it was before I lived in California, but the LA basin, it's

00:15:10.119 --> 00:15:13.359
in a bowl like Los Angeles, California.

00:15:13.359 --> 00:15:17.100
Their pollution was so bad, even in the 70s because of cars, that if you were standing

00:15:17.100 --> 00:15:20.520
up on the side of the mountain and looking down at the city, you couldn't see any of

00:15:20.520 --> 00:15:21.520
the buildings.

00:15:21.520 --> 00:15:23.040
They were completely covered up.

00:15:23.040 --> 00:15:27.639
There was lots of people having to move out because of asthma, lung problems, all kinds

00:15:27.639 --> 00:15:29.520
of things going on, especially for kids.

00:15:30.000 --> 00:15:33.299
So in 1950, people were like, hey, we got to stop this.

00:15:33.299 --> 00:15:34.960
This is getting crazy.

00:15:34.960 --> 00:15:37.159
So they started cleaning up the air.

00:15:37.159 --> 00:15:39.399
The pollution was reduced and the percent of pepper moss

00:15:39.399 --> 00:15:42.500
that were dark decreased in industrial regions.

00:15:42.500 --> 00:15:45.199
Again, where do you think the industrial regions are?

00:15:45.199 --> 00:15:46.799
Rural or in the city?

00:15:48.440 --> 00:15:50.000
In the city.

00:15:50.000 --> 00:15:53.100
In rural regions, air pollution remains low

00:15:53.100 --> 00:15:55.860
and dark pepper moss were never common.

00:15:55.860 --> 00:15:58.340
Now again, you might see one.

00:15:58.340 --> 00:15:59.600
You might be out there looking at the tree

00:15:59.600 --> 00:16:00.440
and go, oh.

00:16:00.000 --> 00:16:01.600
look, there's a dark moth.

00:16:01.600 --> 00:16:03.599

But you're not going to see very many of them

00:16:03.599 --> 00:16:05.440
because all the predators see them too.

00:16:05.440 --> 00:16:07.239
And the moment they land on that white lichen,

00:16:07.239 --> 00:16:09.199
they're like, hey, there's something to eat.

00:16:09.199 --> 00:16:10.539
All right.

00:16:10.539 --> 00:16:12.199
So looking at the data,

00:16:12.199 --> 00:16:15.840
it says percent of peppered moths that were dark.

00:16:15.840 --> 00:16:19.959
So right here in 1959 in the United States,

00:16:19.959 --> 00:16:22.000
what did they start worrying about again?

00:16:24.000 --> 00:16:26.159
Pollution, cleaning up the air.

00:16:26.159 --> 00:16:29.600
So even though this is sort of a broken graph.

00:16:30.000 --> 00:16:31.639
Somebody tell me the trend.

00:16:31.639 --> 00:16:35.840
Is it decreasing with dark moss or increasing with dark moss?

00:16:35.840 --> 00:16:37.340
Decreasing.

00:16:37.340 --> 00:16:39.140
It is decreasing.

00:16:39.140 --> 00:16:41.680
When we did data graphs before,

00:16:41.680 --> 00:16:44.479
I was having you actually draw the trend,

00:16:44.479 --> 00:16:46.940
and I could very easily see, Ava,

00:16:46.940 --> 00:16:49.979
that it is going down very rapidly.

00:16:49.979 --> 00:16:52.479
Okay, as that line is going down,

00:16:52.479 --> 00:16:55.340
what's happening to the lichen on the tree?

00:16:55.340 --> 00:16:56.840
It's regrowing.

00:16:56.840 --> 00:16:58.879
It's regrowing, okay?

00:16:58.879 --> 00:16:59.959
So, this line...

00:17:00.000 --> 00:17:08.560
here shows dark, go ahead and put this note for me, moth decline.

00:17:10.640 --> 00:17:17.079
Kenzie, if this is the dark moth declining, what do you think is actually

00:17:17.079 --> 00:17:29.520
increasing at the same time? The light moth. So the light moth numbers increased.

00:17:30.000 --> 00:17:37.000
And Kinsey, one more question. If I go to the city today, what color moth do you think is more likely that I'l
l see?

00:17:37.000 --> 00:17:38.000
The light one.

00:17:38.000 --> 00:17:42.000
The light one. The light one. Because we reduced the pollution.

00:17:42.000 --> 00:17:45.000
Alright, so what does the data tell us?

00:17:45.000 --> 00:17:48.000
Environmental change for industrial regions of England.

00:17:48.000 --> 00:17:55.000
Before 1850, air pollution was low and tree trunks and branches were lighter and often covered with lichen.

00:17:55.000 --> 00:18:00.000
So what do you think the expected percent is going to be of light to dark?

00:18:00.000 --> 00:18:02.759
What do you think, just take a wild guess.

00:18:02.759 --> 00:18:03.759
Zero.

00:18:03.759 --> 00:18:07.000
Okay, so well remember it can't hit zero because it still exists.

00:18:07.000 --> 00:18:08.000
Five.

00:18:08.000 --> 00:18:09.000
Ten.

00:18:09.000 --> 00:18:12.680
Alright, so she's saying about 90% to 10%.

00:18:12.680 --> 00:18:15.199
Now what would the 90% be?

00:18:15.199 --> 00:18:16.200
Light.

00:18:16.200 --> 00:18:17.200
Light.

00:18:17.200 --> 00:18:20.200
What would the 10% be?

00:18:20.200 --> 00:18:21.200
Dark.

00:18:21.200 --> 00:18:22.200
Dark.

00:18:22.200 --> 00:18:25.040
Remember, this is pre-pollution.

00:18:25.040 --> 00:18:27.040
We haven't had the pollution yet.

00:18:27.040 --> 00:18:30.000
He says after 1850 industrialization resulted

00:18:30.000 --> 00:18:33.900
in air pollution, which darken the tree trunks and the branches.

00:18:33.900 --> 00:18:37.519
What do you think the percent's going to be now?

00:18:37.519 --> 00:18:39.079
She says let's go with 90-10.

00:18:39.079 --> 00:18:40.079
Do we agree?

00:18:40.079 --> 00:18:40.579
Yeah.

00:18:40.579 --> 00:18:41.199
OK, let's go.

00:18:41.199 --> 00:18:43.680
We'll do 90-10.

00:18:43.680 --> 00:18:46.239
The only problem is now we have the pollution.

00:18:46.239 --> 00:18:47.239
We have the pollution.

00:18:49.920 --> 00:18:56.000
So Arianna, what do you think 90% is going to be now?

00:18:56.000 --> 00:18:57.239
Dark.

00:18:57.239 --> 00:18:58.959
It's going to be dark.

00:18:58.959 --> 00:19:01.639
And the 10% is going to be?

00:19:00.000 --> 00:19:05.960
light. Beginning in the late 1950s, government regulation resulted in

00:19:05.960 --> 00:19:11.000
decreased air pollution. So tree trunks and branches became lighter again as the

00:19:11.000 --> 00:19:17.159
what is it growing back on the trees? Lichen. The lichens regrowing. So if I

00:19:17.159 --> 00:19:24.000
stick to the 90-10, like Giselle suggested, Georgia what do you think 90

00:19:24.000 --> 00:19:29.040
percent is going to be now? Light. Light. It's going to be light to dark. So 90

00:19:29.040 --> 00:19:31.479
percent light.

00:19:30.000 --> 00:19:37.920
10% dark. Now, do we all understand how a changing environment can cause different types

00:19:37.920 --> 00:19:42.880
of mutations to actually help you benefit, or to benefit you, and cause you to actually

00:19:42.880 --> 00:19:48.200
be the one surviving? It's sort of like, I keep going back to the rock pocket mice, being

00:19:48.200 --> 00:19:54.440
brown on the desert floor, perfect! Predator can barely see me. Lava comes flowing in,

00:19:54.440 --> 00:19:59.040
all of a sudden now it's not so good to be light brown. You want to be dark, so you can

00:19:59.040 --> 00:20:00.079
hide in the lava.

00:20:00.000 --> 00:20:03.759
Okay, so why change the Peppered Moss?

00:20:03.759 --> 00:20:07.119
You will save this assignment for the CRA, which you're not going to do the CRA.

00:20:07.119 --> 00:20:10.680
What you're going to do for me is you're going to do a writing prompt, got it?

00:20:10.680 --> 00:20:14.399
You are more than welcome to work with your partner while you're doing the writing prompt.

00:20:14.399 --> 00:20:16.700
Let's see exactly what it is you have to do.

00:20:16.700 --> 00:20:24.600
It says, make a claim about why most Peppered Moss were dark in 1959 era, but light in the

00:20:24.600 --> 00:20:26.120
2000s.

00:20:26.120 --> 00:20:29.399
Start your claim with evidence from the above graphic, that's this graphic.

00:20:30.000 --> 00:20:34.519
I'll let you use the Europe one also. It has a little bit better graphic, okay?

00:20:34.519 --> 00:20:38.880
Support your claim with evidence from the above graphic

00:20:38.880 --> 00:20:42.720
and the previous chart. We all good? Okay,

00:20:42.720 --> 00:20:46.799
let's look at the rubric real quick. What I'm going to have you do,

00:20:46.799 --> 00:20:50.040
you have plenty of space right here to write it. You do not have to pull out

00:20:50.040 --> 00:20:55.120
your own paper or anything like that, but I do expect in your paper you must

00:20:55.120 --> 00:20:56.159
discuss with me

00:20:56.159 --> 00:21:00.000
why, why, why changes occurred, what caused it.

00:21:00.000 --> 00:21:06.599
it, and individual moths did not change. Okay, the population of colored moths

00:21:06.599 --> 00:21:12.279
changed. So remember the black moth was there, he was just being picked off

00:21:12.279 --> 00:21:16.840
predators, picked off by predators way too much for his numbers to increase. But

00:21:16.840 --> 00:21:20.200
all of a sudden when the tree trunks changed, it was nice to be a dark moth.

00:21:20.200 --> 00:21:24.639
You don't want to be a light moth at that point. Okay, so going back to our

00:21:24.639 --> 00:21:31.079
ICANN real quick, and then I'll let you get busy on that. Your ICANN for today.

00:21:30.000 --> 00:21:38.640
Was I can engage in an argument from evidence to explain how a given adaptation, and what

00:21:38.640 --> 00:21:40.680
adaptation did it have?

00:21:40.680 --> 00:21:44.640
We had light moss, and what was the big adaptation for the Industrial Revolution?

00:21:44.640 --> 00:21:45.640
Dark.

00:21:45.640 --> 00:21:46.639
Dark.

00:21:46.639 --> 00:21:49.200
Impacts the probability of reproductive success.

00:21:49.200 --> 00:21:56.280
Well, if all the trees lost the lichen, who do you think was breeding more?

00:21:56.280 --> 00:21:57.280
The dark.

00:21:57.280 --> 00:21:58.280
The dark.

00:21:58.280 --> 00:21:59.280
The dark.

00:21:59.280 --> 00:22:00.280
The dark.

00:22:00.280 --> 00:22:01.280
The dark.

00:22:01.280 --> 00:22:01.280

00:22:00.000 --> 00:22:03.000
in a population of moths.

00:22:03.000 --> 00:22:05.000
Do I have any questions about today's lesson?

00:22:05.000 --> 00:22:06.000
Yes, ma'am?

00:22:06.000 --> 00:22:09.000
Like, how many paragraphs do we have to write?

00:22:09.000 --> 00:22:11.000
You can probably do it just with one.

00:22:11.000 --> 00:22:13.000
Well, do it with two,

00:22:13.000 --> 00:22:15.000
because then you're introducing why it's happening,

00:22:15.000 --> 00:22:16.000
what caused the change,

00:22:16.000 --> 00:22:19.000
and then what happens after they started the Clean Air Act.

00:22:19.000 --> 00:22:20.000
Okay?

00:22:20.000 --> 00:22:21.000
All right.

00:22:21.000 --> 00:22:22.000
Any other questions?

00:22:22.000 --> 00:22:24.000
Remember, you are allowed to work with a partner.

00:22:24.000 --> 00:22:25.000
Go.

00:22:25.000 --> 00:22:27.000
So what happened in 1850?

00:22:28.000 --> 00:22:29.000
Why is this number...

00:22:29.000 --> 00:22:30.000
Why was it going up?

00:22:30.000 --> 00:22:36.400
before? Pollution. And what happened when the pollution got on the lichen? What happened

00:22:36.400 --> 00:22:40.920
when all the pollution gets on the lichen that grows on the trees? It killed it. What

00:22:40.920 --> 00:22:46.200
color were the trees underneath? Dark. Dark. So during that time, what color did I want

00:22:46.200 --> 00:22:51.200
to be? Dark. Dark. If you're a light mouse, like this white paper landing on here, you're

00:22:51.200 --> 00:22:55.559
gonna get picked off, right? And then if you look at the graph, what happened in the United

00:22:55.559 --> 00:23:00.000
States about 1959? Why did their numbers start going down?

00:23:00.000 --> 00:23:05.000
Clean air. We're taking the pollution out of the air, so what do you think is increasing?

00:23:05.000 --> 00:23:07.000
The light mouth.

00:23:07.000 --> 00:23:09.000
The light mouth. Okay. Good job, kids.

00:23:11.000 --> 00:23:12.000
Is anybody not done?

00:23:14.000 --> 00:23:15.000
You're finishing up?

00:23:15.000 --> 00:23:20.000
Okay, what you gotta do, finish it up, and then you're going to give it to me on your way out. Got it?