Name _____ Date _____

Natural Selection: Moth Color Over Generations

Directions: Read the passage and study the table of moth counts. Then answer each question.

Dark Moths, Pale Moths

By day, a peppered moth sits perfectly still on a tree, and its best defense against hungry birds is being hard to see. The moths fly at night, and many fly toward bright lights, so scientists can count them with light traps.

In Britain, peppered moths come mainly in two forms. The pale form is white speckled with black, a pattern that blends in with bark covered by pale lichens. The dark form is almost all black. Wing color is inherited, so dark parents tend to have dark offspring and pale parents tend to have pale offspring. Before the 1800s, dark moths were rare, but a few were already part of the population.

As coal-burning factories spread in the 1800s, soot darkened tree bark near cities, and pollution killed many lichens. Near Manchester, the dark form was first recorded in 1848, and by 1895 about 98 percent of the peppered moths there were dark. Scientists explained the change through natural selection. On sooty bark, birds found and ate pale moths more often, so dark moths tended to survive and leave more offspring. In natural selection, a fitter moth is not a stronger one: it is one that leaves more offspring that survive. Peppered moths in Britain have one generation each year, so the share of each form can shift a little with every generation.

In the 1950s, Bernard Kettlewell released marked moths of both forms in a polluted wood and in an unpolluted wood, then caught as many as he could again. In each wood, he recaptured a higher share of the form that matched the bark. Critics later questioned some of his methods, such as releasing far more moths than would normally live in a wood and placing them on tree trunks, which may not be where the moths usually rest. In a six-year experiment in the early 2000s, Michael Majerus released 4,864 moths in more natural numbers and resting places near Cambridge, where soot no longer darkens the trees. Dark moths were more likely than pale moths to be eaten by birds. Scientists still discuss some details, such as how much moths flying between woods added to the changes, but most see bird predation as a main cause.

After clean air laws were passed in the 1950s and 1960s, lichens grew back and bark became lighter. Since about 1970, the share of dark moths has fallen quickly, and in most places only a small share of peppered moths are dark today.

Volunteers in one woodland near an industrial city ran a light trap on the same ten nights of July in each of five survey years. They used the same trap in the same spot every time and counted the moths of each form.

Peppered moths caught in one woodland's light trap in each survey year

Survey year	Dark moths caught	Pale moths caught	Total caught	Dark moths (percent of total)
1975	117	13	130	90
1985	84	56	140	60
1995	33	77	110	30
2005	12	108	120	10
2015	2	98	100	2

1. According to the passage, why did pale moths become easier for birds to find near industrial cities in the 1800s?

A. Soot darkened the bark and pollution killed many pale lichens, so pale moths stood out.

B. Birds could see better in smoky air than in clean air.

C. Pale moths began resting in the open because they needed more sunlight.

D. Pollution made the pale moths grow larger and brighter.

2. What does the passage say scientists still discuss about the peppered moth?

A. Whether dark peppered moths ever existed

B. Whether the share of dark moths rose and later fell

C. Some details, such as how much moths flying between woods added to the changes

D. Whether each moth can change its wing color to match the bark

3. What percent of the moths caught in 1985 were pale?

_____ percent

4. Why did the volunteers use the same trap, in the same spot, on the same July nights in every survey year?

A. So that the trap would catch exactly the same number of moths in every survey year, making the totals match

B. So that dark moths would be easier to catch than pale moths, giving the volunteers more dark moths to count

C. So that changes in the catch would more likely come from changes in the moth population than from changes in how moths were caught

D. So that the moths could learn where the trap was and come back to it in later survey years

5. Why is the percent of dark moths a better way to compare the survey years than the number of dark moths caught?

A. The number of dark moths caught stayed the same every year.

B. Percents are always larger numbers than counts.

C. Dark moths are harder to count than pale moths.

D. The total number of moths caught was different in each survey year.

6. The number of pale moths caught fell from 108 in 2005 to 98 in 2015. Why doesn't this show that pale moths became a smaller share of the woodland's moths?

A. Some pale moths turned dark between 2005 and 2015, which lowered the pale count.

B. Pale moths always become rarer once the air is clean, so their share must have dropped.

C. The volunteers must have counted the 2015 moths wrong, so those numbers cannot be used.

D. The 2015 catch was smaller in all, and pale moths made up 98 percent of it, up from 90 percent in 2005.

7. Peppered moths in Britain have one generation each year. How many generations after the moths caught in 1975 were the moths caught in 2015?

_____ generations

8. In the passage's sense, what makes one moth fitter than another?

A. It is stronger and can fly farther.

B. It can change its wing color to match the bark.

C. It leaves more offspring that survive.

D. It is larger than the other moths around it.

9. Suppose the bark in this woodland became lighter after the air got cleaner. Which statement best explains how the woodland's moths became mostly pale again?

A. Dark moths turned pale once the soot was gone from the trees they rested on.

B. Birds stopped eating moths once the air was clean, so pale moths took over.

C. Pale moths, already part of the population, survived and reproduced more on the lighter bark, so their share rose over many generations.

D. Each dark moth chose to have pale offspring so that its young would match the lighter bark.

10. Taken together, what do the woodland's five surveys show?

A. In this woodland, the percent of dark moths in the catch fell in every survey, from 90 percent in 1975 to 2 percent in 2015.

B. In this woodland, individual dark moths turned pale as the air got cleaner between 1975 and 2015.

C. The survey proves that birds caused the change in the share of dark moths in this woodland.

D. In every woodland in Britain, exactly 2 percent of peppered moths were dark in 2015.