

Name: _____

GRAVE FINDINGS

In "Teen Mummy" (p. 12), you read about how scientists analyzed the remains of Egtved Girl to investigate how she lived thousands of years ago. During research studies like this, scientists make many observations. They use those observations to draw conclusions about the topic. The chart below shows the difference between an observation and a conclusion.

OBSERVATION	CONCLUSION
Description of what has occurred	Based on observations
Information gathered by the senses or through measurements from scientific equipment	An explanation for why or how something occurred
	May includes statements that one thing caused another

Match each observation in the left-hand column below with the conclusion it supports in the right-hand column.

OBSERVATIONS

- _____ 1. Egtved Girl's wool clothes have a strontium signature from 500 miles away, possibly Germany's Black Forest.
- _____ 2. A yarrow flower was found in the coffin.
- _____ 3. The mummy was wearing a belt with a circular bronze plate that may represent the sun.
- _____ 4. The first molar of Egtved Girl has a strontium signature that matches Germany.
- _____ 5. Strontium analysis from the oldest section of Egtved Girl's hair—from one to two years before she died—match Germany's Black Forest.

CONCLUSIONS

- A. Egtved girl was born and spent her early years in Germany.
- B. The clothes of Egtved Girl came from a region far from where she was buried.
- C. Egtved Girl spent time in the Germany's Black Forest one to two years before she died.
- D. Egtved Girl likely died during summertime.
- E. Egtved Girl may have been a religious leader.

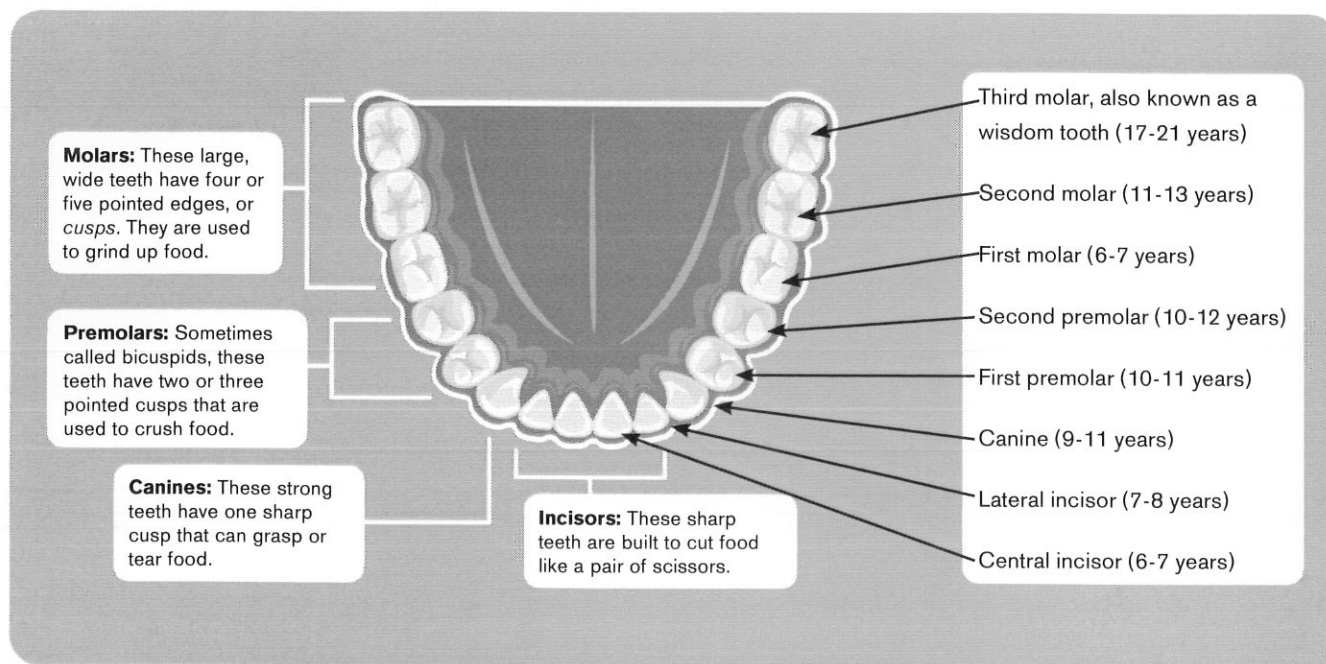
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DENTAL CHECKUP

In "Teen Mummy" (p. 12), you learned that a tooth of an ancient mummy revealed clues about where the person had lived. Egved Girl's *first molar*, which developed from before birth until age three, revealed she was born in Germany. The diagram below shows the development of permanent teeth in humans. Use the diagram to answer the questions that follow.

Tooth Development

At around age 6 or 7, your *permanent teeth* began pushing out of your gums. Some of these teeth replaced the *primary teeth* that you had as a baby. The diagram below shows the arrangement of permanent teeth in your lower jaw and the ages at which they typically break through. Permanent teeth usually erupt in pairs on both sides of the mouth.



QUESTIONS

1. What is the purpose of the incisors?
2. All of your teeth except the molars replace primary teeth when they grow. How many of your lower teeth grow in only once?
3. What is the difference between premolars and molars?
4. Which molar has typically grown in by the age of 10?
5. In the article "Teen Mummy," you learned that the first molar grows from birth until about 3 years old. When does that tooth break through? How might you explain that difference in the age it develops compared with the age it breaks through?

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THE SECRETS OF BOG BODIES

In "Teen Mummy" (p. 12), you learned about a mummy that was found preserved in Denmark. Egtved Girl was one of many "bog bodies" that are found in northeastern Europe. In this passage, you'll learn more about why bogs are the perfect place to preserve ancient bodies. Read the article and paired text below. Then answer the questions that follow.

MOSSY GRAVE

It's estimated that thousands of mummified bodies have been discovered in bogs all over northwestern Europe. "Bog bodies" date as far back as 8000 B.C. and vary from partial skeletons to nearly perfectly preserved bodies. One reason there are so many bog bodies is that the conditions in bogs prevent the normal decay of organic material.

Bogs form on damp, low-lying areas of land. In some of these areas, a lot of moisture-loving sphagnum moss grows. Over time, a dense blanket of moss several feet thick develops, trapping water within and beneath it.

The conditions inside this moss carpet stop the growth of bacteria that would normally breakdown organic material like a dead body. Oxygen and nutrients that bacteria need to survive cannot penetrate into the moss. Plus, the moss releases an acid that helps kill off the bacteria.

Scientists think many bog bodies were initially placed in shallow graves. They were quickly covered in water that prevented decomposition. Depending on the chemistry of the water, the body may be preserved whole, or parts may be dissolved away.

QUESTIONS

1. Which of the following statements BEST represents the central idea of the passage?

- (A) Many people were buried in bogs in northwestern Europe.
- (B) The conditions in bogs help preserve bodies.
- (C) Bacteria prevent mummies from forming.
- (D) Sphagnum moss is needed to make mummies.

2. Which of the following is a synonym for *decomposition*?

- (A) preservation
- (B) melting
- (C) examination
- (D) decay

3. Which of the following characteristics is NOT typical of a bog?

- (A) nutrient-rich
- (B) moss-covered
- (C) wet
- (D) low-lying

4. What is one reason why bodies are more easily preserved in bogs?

- (A) The moss in bogs prevents water from coming in contact with the bodies.
- (B) Oxygen in bogs prevents decomposition of the bodies.
- (C) The bodies were protected by materials placed in their graves.
- (D) The conditions in bogs kill off decay-causing bacteria.

5. What evidence from Egtved Girl's remains supports scientists' theory about the way in which many bodies ended up in bogs?

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INSIDE A MUMMY

In "Teen Mummy" (p. 12), you read about how scientists analyzed the element strontium to learn about the history of Egtved Girl. Researchers use many different techniques to gather information about mummified remains. Many of these techniques help scientists analyze the bodies without damaging the mummies. Study the chart below to compare some of the techniques scientists use to study mummies. Then answer the questions that follow.

TECHNIQUES FOR STUDYING REMAINS

Technology	How It Works	What It Reveals
Magnetic Resonance Imaging (MRI)	A strong magnetic field in the machine causes positively charged protons in the body's tissues to line up in one direction. Then bursts of energy waves from the machine shift the particles. The moving particles send out an energy signal that is detected by the machine. Different tissue types send out different signals, allowing computers to create an image of the inside of the body.	MRI machines are often used to produce images of soft tissues like the heart and lungs. Standard MRI technology can't be used on mummies because it won't work unless there's water in the body. Scientists recently modified the technique so it could be used on mummies' dry bodies. Their scans revealed signs that a mummified Egyptian man had a disease that damaged his kidneys.
X-ray Images	A machine sends high-energy X-ray radiation through the body. The waves are absorbed in varied amounts by different materials in the body, such as bone and soft tissue. When the X-rays hit a special film on the other side of the body, they produce an image in different shades of black and white.	X-rays are ideal for studying bones, which appear white on the images. Researchers can also estimate the age at which a person died by measuring the size of the pelvic bone on an X-ray. Without unwrapping a mummy, scientists can also use X-rays to see if artifacts such as jewelry or tools were placed with the bodies.
Computed Tomography (CT)	Instead of a single X-ray image, a CT machine takes many X-ray images of slices of a body. The machine revolves around the body, and a computer combines the images to make a three-dimensional picture.	By using CT scans to produce 3-D images of skeletons and teeth, scientists have learned that many mummies had severe dental problems, including tooth decay. CT scans of the famous mummy of King Tut revealed a broken leg bone that may have led to his death.
Mass Spectrometry	A sample from the mummified remains is placed in a chamber. The mass spectrometer machine shoots a high-energy beam at the sample, which separates molecules in the material into individual positively and negatively charged atoms. These ions are measured by detectors in the machine. The measurements reveal what elements and chemical compounds are present in the sample.	Scientists can use mass spectrometry to analyze mummified hair samples. When hair grows, it traps certain chemicals that are present in the body. The chemicals in hair can give clues to a person's diet or if a person had drugs in their body. Mass spectrometry analysis of mummies from Chile revealed that they had nicotine—the drug found in tobacco—in their hair.

ANALYZE IT

- What structures in the body are best studied with X-rays?
- How are CT scans similar to X-rays? How are they different?
- What is one discovery about mummies scientists have made using MRI analysis?
- What sets mass spectrometry apart from the other three techniques in the chart?
- Which technique was most likely used by Karin Frei to analyze the remains of Egtved Girl? Explain your answer.