

Mystery Boxes, X-Rays, and Radiology
"a way of knowing science"

NAME: _____

X-Rays

X-rays are a form of energy (photons) that are able to pass through some objects and not others. Radiographs are special pictures (negatives) which have been exposed to X-rays. How do X-rays work? When X-rays pass through your body more X-rays are absorbed by the denser parts (such as teeth and bone) than by softer tissues (such as muscles and digestive organs) before striking the film.

X-rays create a negative image on the radiograph. Blood, muscles, and digestive organs appear darker or do not appear at all because the X-rays pass directly through the tissues onto the film. Bones and teeth appear brighter because fewer X-rays penetrate and reach the film during exposure. (For detail of specific body tissues the exposure (quantity or time) of X-rays can be controlled or specific dyes are used to indicate digestive, circulatory, and urinary systems).

Now look at the X-ray pictures of the box. The mystery box has been exposed to 4 different levels of X-rays (Exposure #1 is the lowest intensity, Exposure #4 the highest). Using the following information try to extend your knowledge about what might be in the mystery box. Record your data in the spaces provided.

Exposure Level #1:

X-rays can easily penetrate paper and cloth but can not penetrate denser materials such as rubber, glass, wood, or metals (aluminum, steel, and lead).

Exposure Level #2:

X-rays can easily penetrate paper, cloth, and rubber. Some X-rays can penetrate glass, but can not penetrate denser materials such as wood, or metals (aluminum, steel, and lead).

Exposure Level #3:

X-rays can easily penetrate paper, cloth, and rubber. Most X-rays can penetrate glass. Some X-rays can penetrate wood and begin to penetrate aluminum or steel, but can not penetrate lead.

Exposure Level #4:

X-rays can easily penetrate paper, cloth, and rubber, glass, and wood, and aluminum. Many X-rays can penetrate steel, but they can not penetrate lead.

2. Using X-ray exposure data develop and share with your friends inferences about what might be in the mystery box. In the space below record what you have learned from each exposure and about what the objects might be in the box. (You might also like to measure the objects).

EXPOSURE**WHAT YOU HAVE LEARNED****INFERENCE****Exposure Level #1:****Exposure Level #2:****Exposure Level #3:****Exposure Level #4:**

In the space below write a summary of what you now believe is in the box and reasons that support your inferences.

How do your ideas compare between what you were able to observe with and without X-ray information?

X-Ray Exposures of Mystery Box

Exposure 1



Exposure 2



Exposure 3



Exposure 4

