Student's Name: _____ HW #7 Packet Due Date: _____

Scientific Method In Action

How Penicillin Was Discovered?

In 1928, Sir Alexander Fleming was studying Staphylococcus bacteria growing in culture dishes. He noticed that a mold called Penicillium was also growing in some of the dishes. A clear area existed around the mold because all the bacteria that had grown in this area had died. In the culture dishes without the mold, no clear areas were present.

Fleming hypothesized that the mold must be producing a chemical that killed the bacteria. He decided to isolate this substance and test it to see if it would kill bacteria. Fleming transferred the mold to a nutrient broth solution. This solution contained all the materials the mold needed to grow. After the mold grew, he removed it from the nutrient broth. Fleming then added the nutrient broth in which the mold had grown to a culture of bacteria. He observed that the bacteria died which was later used to develop antibiotics used to treat a variety of diseases.

1.) Identify the problem.

2.) What was Fleming's hypothesis?

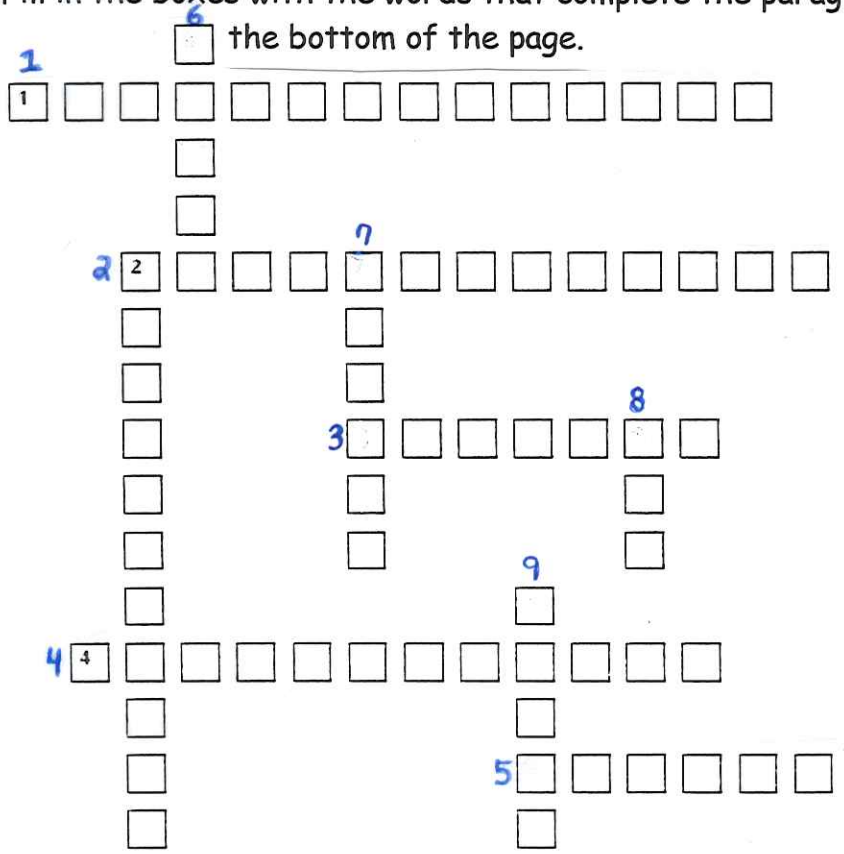
3.) How was the hypothesis tested?

4.) Should the hypothesis be supported or rejected based on the experiment?

5.) This experiment lead to the development of what major medical advancement?

Photosynthesis Crossword

Directions: Fill in the boxes with the words that complete the paragraph at the bottom of the page.



Green plants make their own food in a process called (1) _____. They need (2 across) _____ _____ from the air and (9) _____ from the soil as well as (5) _____ from the (8) _____. The (2 across) _____ _____ is collected through small openings on the underside of the plant's leaves. Each of these openings is called a (6) _____. The plant gains its characteristic green color from the pigment (2 down) _____, which is found in special organelles called (4) _____. The leaf's main job then is to make (3) _____, a form of sugar. During this food-making process (7) _____ is released by the plant into the air. This gas is essential for animal and human survival.

Word Bank:

carbon dioxide	chloroplasts	glucose	photosynthesis	sun
chlorophyll	energy	oxygen	stoma	water

Cell Organelles

Write *true* if the statement is *true* or *false* if the statement is *false*.

_____ 1. The water-hating hydrophobic tails of the phospholipid bilayer face the outside of the cell membrane.

_____ 2. The cytoplasm essentially acts as a "skeleton" inside the cell.

_____ 3. Plant cells have special structures that are not found in animal cells, including a cell membrane, a large central vacuole, and chloroplast.

_____ 4. Ribosomes can be found attached to the endoplasmic reticulum.

_____ 5. ATP is made in the mitochondria.

_____ 6. Many of the biochemical reactions of the cell occur in the cytoplasm.

_____ 7. Animal cells have chloroplasts, organelles that capture light energy from the sun and use it to make food.

_____ 8. Small hydrophobic molecules can easily pass through the plasma membrane.

_____ 9. In cell-level organization, different cells are specialized for different functions.

_____ 10. The flagella on your lung cells sweep foreign particles and mucus toward the mouth and nose.

_____ 11. Mitochondria contains its own DNA.

_____ 12. The plasma membrane is a single phospholipid layer that supports and protects a cell and controls what enters and leaves it.

_____ 13. The cytoskeleton is made from thread-like filaments and tubules.

FLIP-OVER ➔

Cell Types & Cell Theory

Write <u>true</u> if the statement is <u>true</u> or <u>false</u> if the statement is <u>false</u>.

_____ 1. All organisms are made of more than one cell.

_____ 2. Proteins are made on ribosomes.

_____ 3. Prokaryotic cells have a nucleus.

_____ 4. The plasma membrane forms the physical boundary between the cell and its environment.

_____ 5. For cells, a smaller size is more efficient.

_____ 6. Compared to eukaryotic cells, prokaryotic cells are very complex.

_____ 7. Organelles are located within the cytoplasm.

_____ 8. Viruses are similar to prokaryotic cells.

_____ 9. All cells have a plasma membrane, cytoplasm, and ribosomes.

_____ 10. DNA is located in the nucleus of prokaryotic cells.

_____ 11. Organelles allow eukaryotic cells to carry out more functions than prokaryotic cells.

_____ 12. Viruses are considered living organisms.

_____ 13. Most cells are about the size of the period at the end of this sentence.

ScienceNews

Camera Hack Can Spot Cleaned-Up Crimes

by Rachel Ehrenberg September 2012

Spattered blood intentionally hidden under layers of paint can be detected with a standard digital camera that's been tweaked to record infrared light. The approach could become an important tool for cold-case investigators sizing up an old crime scene.

"We hope it gives law enforcement the ability to go on hunches," says Glenn Porter, an expert in forensic photography at the University of Western Sydney in Australia. Blood is potentially powerful evidence, as it may harbor DNA that could allow a killer or victim to be identified.

Porter, formerly a forensic photographer with the Australian Federal Police, had heard of cases where investigators suspected that a crime had taken place in a now-remodeled house. So he and his colleagues decided to see if infrared photography might reveal blood hidden under paint. The researchers took a digital camera and swapped the light filters so the camera's sensor would record only infrared light. With slightly longer wavelengths than visible light, infrared is better at penetrating layers of paint.

The researchers diluted horse blood to one-tenth its original strength and put 200-microliter drops onto plasterboard that had been painted over with primer. After allowing the blood to dry for 48 hours, they painted over the bloodstained plasterboard, testing several colors of acrylic paint and three different types of white paint.

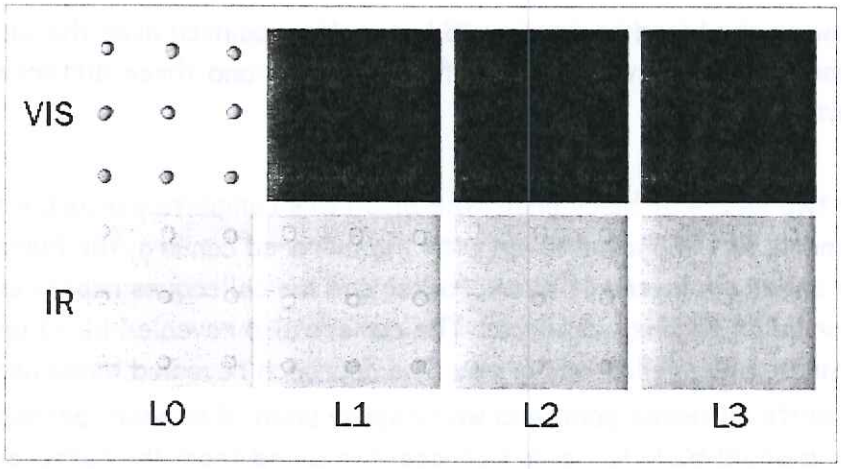
Under two layers of black paint, the blood was completely invisible to a standard digital camera. But in photos taken with the infrared camera, the blood could be seen even under six layers of black, Porter and his colleagues report online July 30 in the *Journal of Forensic Sciences*. The camera also revealed blood under layers of purple, orange, blue, yellow and green. The approach revealed blood under three layers of white oil-based paint and white spray paint. Red paint, perhaps an obvious choice for a would-be killer, didn't conceal the blood from the naked eye — even using six layers.

The technique could allow investigators to test a hunch about a crime scene with little effort and disturbance, says Porter. "You can have your suspicions and then get a hit behind the paint," says Porter. "Then you decide if you want to start scraping paint off or take out a wall."

The camera couldn't see through more than three layers of white acrylic paint, probably because of the effectiveness of particles used in the pigment — often lead or titanium — at scattering light, says Dan Kushel, a specialist in art conservation and imaging at Buffalo State in New York.

The art world has used infrared imaging to reveal drawings hidden under paintings since the 1930s, a technique that often works because the underdrawings were done using black pigments made of carbon, such as charcoal. These "carbon-blacks" are very good at absorbing infrared light. The black paint in the current study must have contained a noncarbon-based dye or it would have absorbed the infrared light in the same way the blood did, creating no contrast, says Kushel. The size and concentration of pigments in the paint also play a role. "It's a very complex mix of variables that determines whether you are going to see what's below," he says.

Criminals hoping to make a blood stain invisible to an infrared camera would be well-advised to go with Mars brown, a family of iron oxide-based pigments, says Kushel. Because the iron in blood's hemoglobin is probably what makes it visible to the infrared camera, paint with a lot of iron oxide might absorb light similarly and eliminate the contrast that makes blood stand out.



Blood completely obscured by black paint (top row) is still visible when seen by an infrared camera (bottom row), even under increasing layers of paint (left to right). Credit: A. Farrarr/J. Forensic Sci. 2012

Science Journal Article Questions
ScienceNews Camera Hack Can Spot Cleaned-Up Crimes
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1.) How are **cold-case investigators** sizing up to old crime scenes?

2.) Define the phrase "**blood is potentially powerful evidence**" regarding law enforcement.

3.) What **type** of light is better at revealing through layers of paint?

4.) How did the researchers **test their hypothesis** regarding digital cameras revealing old blood stains covered up by layers of paint?

5.) Describe **some reasons** why digital cameras could not penetrate through more than 3 layers of white acrylic paint.

6.) Explain in **detail** how the art world have been successful in revealing "hidden drawings" since 1930s.