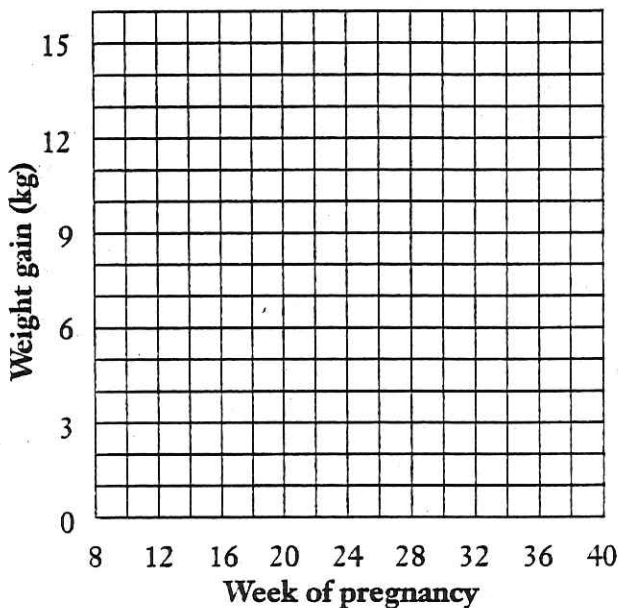


Thinking Critically

One hundred pregnant women and their developing fetuses were monitored over the course of pregnancy in a study designed to compare the average weight gain of a woman during pregnancy with the average weight gain of the developing fetus. (Note that the weight gain of the developing fetus is its actual weight.) The averages for the group are recorded in the table below.

- Graph the data for the mother and the fetus on the same grid. Decide on a method to distinguish the sets of data. Be sure to label each graph.

Week of pregnancy	Weight gain of mother (kg)	Weight gain of fetus (kg)
8	1.5	not measureable
12	1.8	0.25
16	3.0	0.25
20	4.0	0.50
24	5.5	0.75
28	8.0	1.25
32	10.0	2.00
36	13.0	2.25
40	15.0	3.00



- How would you describe the weight gain of the developing fetus?

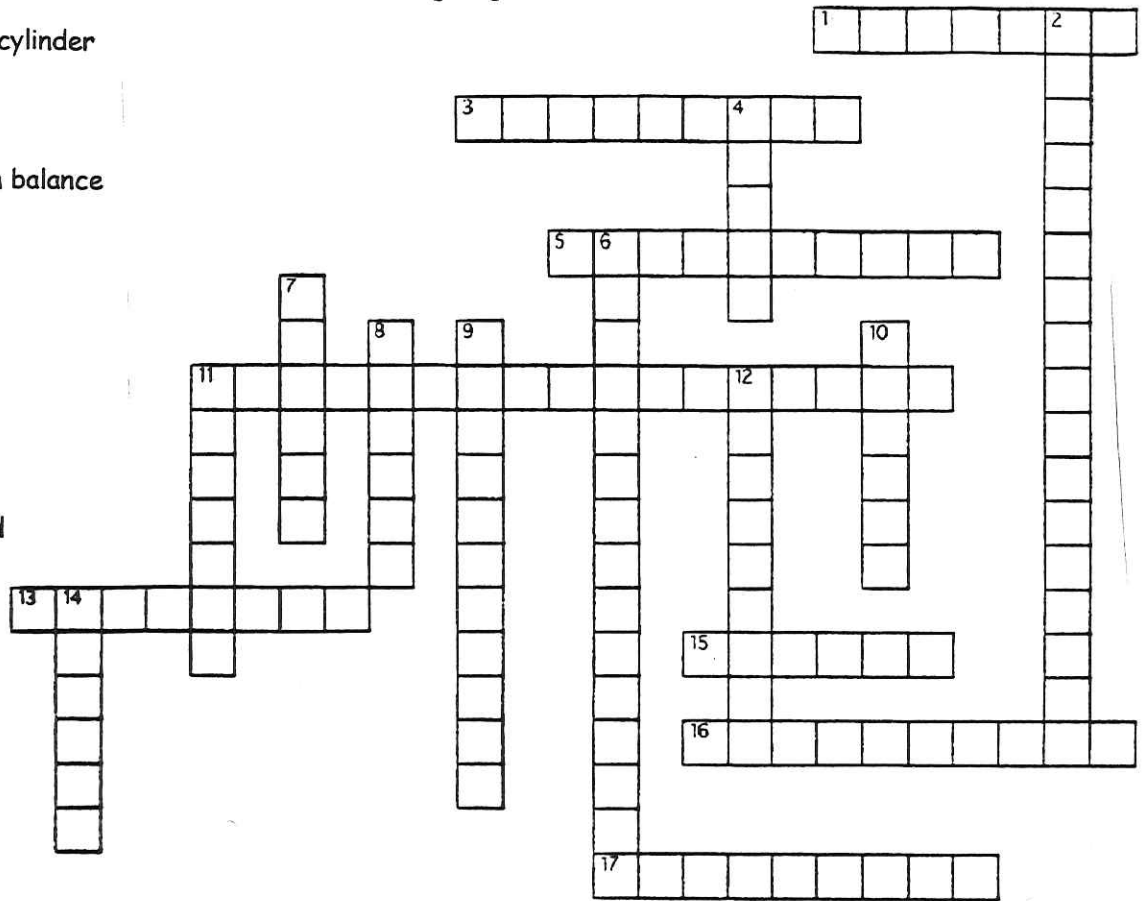
- During the last 16 weeks of pregnancy, how does the mother's total weight gain compare with the total weight gain of the developing fetus?

- Overall, how does the mother's rate of weight gain compare with the rate of weight gain of the developing fetus? How can you determine this by looking at the graphs?

Word Bank

Lab Equipment

- erlenmeyer
- pipette
- florence
- microscope
- stains
- metric
- beaker
- litmus
- autoclave
- inoculating loop
- graduated cylinder
- goggles
- triple beam balance
- petri dish
- incubator
- bunsen
- apron
- stirring rod

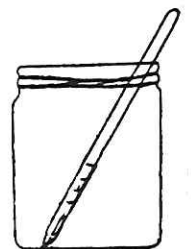
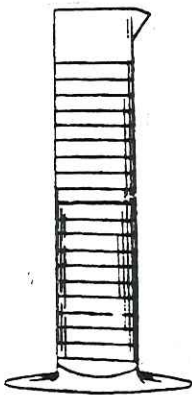


ACROSS _____

- 1. Shaped like a drinking straw, it is used to measure and/or transfer specific volumes of liquid
- 3. Used for sterilizing materials
- 5. Magnifies very small specimens
- 11. Used for measuring volumes of liquid (2 words)
- 13. Bulb-shaped flask
- 15. Applied to microorganisms to make them easier to observe
- 16. Conical-shaped flask
- 17. Used for culturing microorganisms (2 words)

DOWN _____

- 2. Used for weighing materials (3 words)
- 4. Very important piece of safety equipment that should be worn in the lab
- 6. Used to transfer microorganisms safely (2 words)
- 7. Used for heating liquids over a burner flame
- 8. Burner used for heating
- 9. Used to mix liquids (2 words)
- 10. System of measurement used in the lab
- 11. Very important piece of safety equipment that should be worn in the lab
- 12. Chamber that controls environmental conditions such as heat for culturing organisms
- 14. Type of paper used to indicate the pH of a substance



HSA Practice Review

1.) An organism is affected by interactions with which of the following?

- A. Other organisms of the same species
- B. Other organisms of different species
- C. The natural environment
- D. All of the above

2.) A group of organisms that can interbreed and produce fertile offspring is called a(n) -

- A. family.
- B. species.
- C. organization
- D. community.

3.) Inside the human body, heat is constantly generated as a byproduct of chemical reactions. Humans must be able to release heat to the environment. This adaptation is necessary for maintaining —

- A. energy.
- B. organization.
- C. homeostasis.
- D. locomotion.

4.) Sugar dissolves in, or mixes completely with, water. The solubility of a substance in water is determined by measuring the maximum amount of the substance that dissolves in a given amount of water at a given temperature. Hypothesis: The solubility of sugar in water increases as the temperature of the water decreases. Identify the independent variable and the dependent variable that you would use to test this hypothesis.

- A. Dependent variable—volume of water; independent variable—water temperature
- B. Dependent variable—water temperature; independent variable—amount of sugar that dissolves
- C. Dependent variable—amount of sugar that dissolves; independent variable water temperature.
- D. Dependent variable—amount of sugar. that dissolves; independent variable mineral content of the water

5.) Which of the following tools would you need to carry out the experiment in question 4?

- A. Thermometer
- B. Metric balance
- C. Graduated cylinder
- D. All of the above

HSA Practice Review

- 6.) A scientist performs a series of experiments to confirm an idea regarding cellular metabolism. The results of her experiments support her initial idea, and after conferring with colleagues, she discovers that evidence from many experiments has supported the same idea. This idea now can be considered a(n)
- A. theory.
 - B. hypothesis.
 - C. observation.
 - D. control.
- 7.) Which of the following procedures is considered a scientific method?
- A. Collecting data
 - B. Making a hypothesis
 - C. Observing
 - D. all of the above
- 8.) To simplify the results of an experiment, many researchers hold all variables constant except for one. They then compare the results with respect to that one variable. This type of experiment is known as a —
- A. A variable experiment.
 - B. multi-factor experiment.
 - C. controlled experiment.
 - D. None of the above
- 9.) Which of the following units is part of the International System of Measurement (SI)?
- A. Pound
 - B. Inch
 - C. Meter
 - D. Gallon
- 10.) A scientist uses graphs, tables, and charts to publish the results of his research. What type of research was he probably performing?
- A. Descriptive research
 - B. Quantitative research
 - C. Qualitative research
 - D. None of the above

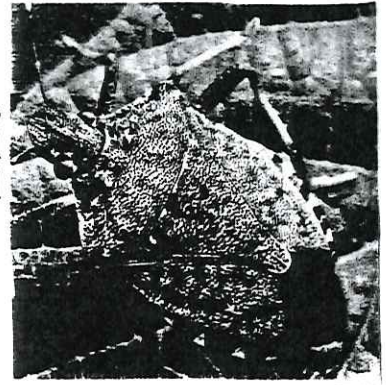
FLIP-OVER
→

An Unprecedented Threat

By Joy Drohan

Shelley Coneybeer sat down on her bed and cried. The past few months of her life felt like a horror movie. Hundreds of stink bugs invaded her home. They crawled on her baby, walked on her in her sleep, and dropped from the ceiling into her hair and her food.

“It was like a plague!” she said. “I felt so defeated and helpless.”



Coneybeer's log home sits on a wooded property in Rostaver Township, about 30 miles south of Pittsburgh. She reports having about 120 brown marmorated stink bugs in her bedroom almost every day during the past winter and spring.

But as infuriating as they can be for homeowners, the impact on agriculture can be staggering. According to the U.S. Apple Association, brown marmorateds caused more than \$37 million in apple crop losses in the Mid-Atlantic region in 2010. Much of the crop could not be sold for fresh consumption, which typically brings \$20–40 per bushel, but instead had to be sold for juice or cider, which yields only \$2–4 per bushel.

The invasive insects from Asia don't “eat” apple flesh, but they stick their piercing-sucking mouthparts into the fruit and “spit” into the hole. Enzymes in the saliva liquefy the fruit tissue, and the bugs suck it back up. The result is indented depressions and “corking,” soft brown areas under the skin of the fruit.

The damage is similar in other crops. In 2010, some growers of peaches and other fruit suffered even more than apple growers because these are sold almost entirely as fresh fruit.

“When our native insects damage 4 or 5 percent of the fruit, we're talking about disaster,” says Greg Krawczyk, senior research associate in entomology at Penn State's Fruit Research and Extension Center (FREC) in Biglerville. “But we've seen in 2010 that brown marmorateds can damage 70 percent of fruit.” Growers cannot make a living while sustaining injury levels over 10–15 percent.

Fruit growers told Krawczyk in 2010 that if they didn't get help in managing this insect, they would be out of business in two to three years. Not only do growers face devastating crop losses, but they have to spend more on insecticides as well.

Penn State is one of ten institutions on a new three-year, \$5.7 million grant from the U.S. Department of Agriculture's (USDA) Specialty Crop Research Initiative (SCRI) to reduce brown marmorateds' effects on tree fruit, small fruit, grapes, vegetables, and ornamentals.

Krawczyk, who is coordinating the Penn State activities within the USDA-SCRI project, says that brown marmorated stink bugs pose a significant national threat to a cross-section of agricultural production.

The overall goal of the grant is to develop nonchemical permanent controls for brown marmorateds before the bugs become a problem in other parts of the country. The team is studying the biology and life phases of this insect, developing effective monitoring and management programs for brown marmorateds, and developing and delivering practical recommendations to help growers and homeowners manage them.

Fifty-one scientists in ten states are collaborating on this project. Penn State alumna Tracy Leskey ('95), research entomologist with the USDA Agricultural Research Service, in Kearneysville, West Virginia, is the grant's project leader.

“The brown marmorated presents a challenge in that it's the first stink bug that poses a threat to a wide variety of commodities in the Mid-Atlantic region,” says Leskey.

A Formidable Pest

North America has about 200 native stink bug species, but they don't tend to aggregate like brown marmorateds do. Good scouting, spot spraying, and natural enemies typically work to control the natives.

Brown marmorateds were first collected in the United States near Allentown, Pennsylvania, in 1996. Growers first noticed serious problems about ten years later, and the trouble intensified in the Mid-Atlantic in both 2009 and 2010.

Several aspects of their biology make them a formidable pest.

They can feed on about 300 different plants. In fruit systems, they prefer stone fruits early in the growing season. In the late growing season, they feast on apples, pears, and berries. The vegetables hardest hit in Pennsylvania are sweet corn, tomatoes, and peppers. Field corn and soybeans are probably important nursery crops where the populations build. The diversity of food means that even if the bugs are controlled in one place, the populations could simply build elsewhere and invade all season long.

Each female can lay at least 300 eggs over a lifetime, and the adults are fairly robust, with few natural enemies in the Mid-Atlantic region.

Entomologists believe brown marmorateds produce two generations per year in southern Pennsylvania. The reproductively immature adults typically emerge from overwintering shelters in late April to early June and start eating. They mature and lay eggs, often in late May or early June. The wingless nymphs then feed, grow, and molt to immature adults in late July or early August and start seeking overwintering sites in about the third week of September. In areas where a second generation occurs within one growing season, the nymphs appear in July and August.

Science Journal Article Questions
An Unprecedented Threat
By Joy Drohan

- 1.) In 2010, how much monetary damage to the apple crop by stink bugs was reported by the U.S. Apple Association?

- 2.) Describe in detail how the marmorated stink bugs attack and damage fruit crop fields (your answer should be 3 to 4 sentences).

- 3.) What does the acronym **SCRI** represent and describe their ecological role in society?

- 4.) What challenge does the **USDA-SCRI** project face according to the grant's project leader, Tracy Leskey?

- 5.) When and where was the first brown marmorated stink bug spotted?

- 6.) Define the phrase "several aspects of the stink bug's biology makes them a *formidable pest*".