



DIRECTIONS:

- Go to the class website <http://msrobbinsprhs.weebly.com/> or <http://mrsgonsalves.weebly.com/>
- Scroll down to the Forensic Entomology section and download the notes
- Complete the notes and questions and then do the Online Activity

1. What do they do?

Forensic _____ apply their knowledge of entomology to provide information for criminal investigations.

A forensic entomologist's job may include:

- Identification of insects at various stages of their _____, such as eggs, larva, pupa, and adults.
- Collection and preservation of insects as _____.
- Determining an estimate for the postmortem interval or _____ (the time between death and the discovery of the body) using factors such as insect evidence, weather conditions, location and condition of the body, etc.
- _____ in court to explain insect-related evidence found at a crime scene.

2. Insects as Evidence

Forensic entomologists use their knowledge of insects and their life cycles and _____ to give them clues as about a crime.

Most insects used in investigations are in two major orders: _____ (flies) and _____ (beetles).

Species _____ may also provide clues for investigators. Some species may to feed on a _____ corpse, while another species may prefer to feed on one that has been dead for two weeks. Investigators will also find other insect species that _____ on the insects feeding on the corpse.

3. Other Factors

_____ data is also an important tool in analyzing insect evidence from a corpse. Investigators will make note of the temperature of the _____, ground surface, the interface area between the body and the ground, and the _____ under the body as well as the temperature inside any _____ masses. They will also collect weather data related to daily _____ (highs/lows) and _____ for a period of time before the body was discovered to the time the insect evidence was collected.

What are some other factors that could affect a forensic entomologist's estimate of PMI? _____

4. Blow Fly Life Cycle

Blow flies are attracted to dead bodies and often arrive within _____ of the death of an animal. They have a _____ life cycle that consists of egg, larva, pupa, and adult stages.

Label the life cycle diagram.

Fill in the blanks below.

1st – Adult flies lay eggs on the carcass.

2nd – Eggs hatch into larva (maggots) in ____ - ____ hours.

3rd – Larvae continue to grow and molt (shed their exoskeletons) as they pass through the various instar stages.

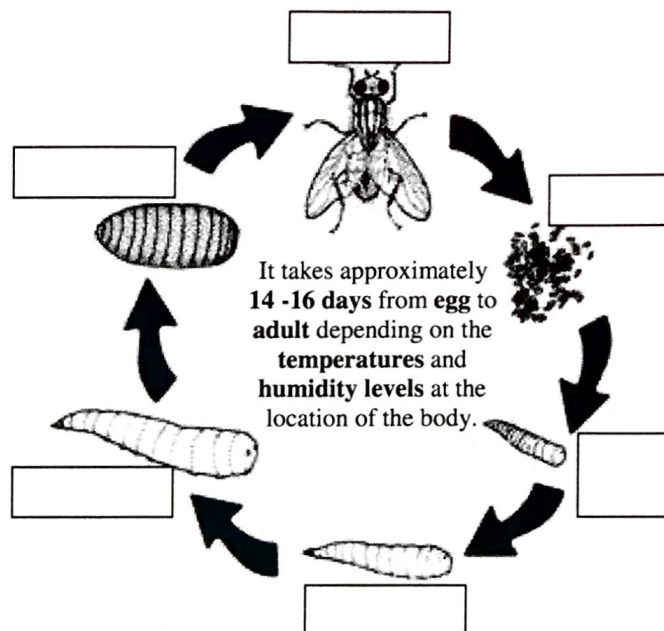
1st Instar - 5 mm long after ____ days

2nd Instar - 10 mm long after ____ days

3rd Instar - 14-16 mm long after ____ days

4th – The larvae (17 mm) develop into pupa after burrowing in surrounding soil.

5th – Adult flies emerge from pupa cases after ____ - ____ days.



** Go Back to the Forensic Sci Notes Page + Click on the link*

CRIME SCENE CREATURES

Online Activity

#1 - What is the crime? _____

#2 - Identify each tool by letter and then draw an line to connect it to its function.



- ____ Forceps
- ____ Ventilated jars
- ____ Thermometer
- ____ Hand net
- ____ Trowel
- ____ Specimen Jars
- ____ Weather Station

- Used to dig up soil samples
- Used to store live species
- Used to collect crawling insects
- Used to collect flying insects
- Used to collect & preserve specimens
- Used to collect weather data
- Used to take temperatures (air, soil, masses)

#3 - Which specimens did you take back to the lab? Circle the five that you chose.

Scorpion

Small Maggots

Spider

Beetle

Empty Pupa Cases

Fly Eggs

Large Maggots

Adult Fly

Fly (Crumpled Wings)

#4 - What was the correct PMI? _____

#5 - Which two specimens were most helpful in finding the correct answer? _____

THINGS TO REMEMBER

- The progression of insect life follows a **pattern**, and the developmental rates of flies are relatively **predictable**.
- The rate of insect development is influenced by temperature because insects are **ectothermic** (cold blooded).
- The **postmortem interval**—the time between death and discovery of the corpse – can be estimated using insect evidence, temperature data, and other factors
- Not all **fly species** are found everywhere, and this can provide important information also.
- Flies & beetles have **complete** metamorphosis—egg, larva, pupa, and adult.
- After the adults mate, the females lay eggs onto corpses - usually near natural **body openings** or **wounds**.
- The length of the life cycle varies between species and is dependent on **temperature**.

STAGES OF DECAY

- 1 - Fresh Stage** - Begins at the moment of death and lasts until the body becomes bloated. Blow flies and flesh flies are among the first to find the body.
- 2 - Bloated Stage** - Begins when the body becomes inflated due to the production of gases from bacteria that begin to putrefy the body or cause it to decompose. House flies now join the other flies and their maggots form feeding masses that help to liquefy the tissues of the body.
- 3 - Decay Stage** - Begins when the skin breaks and the gases escape. Maggot masses are large and very active as they grow older and larger. This is the stage of decomposition that smells bad. At the end of this stage, the maggots leave the corpse in search of a place to pupate in the soil.
- 4 - Post-Decay Stage** - Most of the flesh is gone from the corpse, with only cartilage, bone, and skin remaining. This stage is devoid of flies. Some beetles continue to feed on the highly desiccated or dried remains.

Table 1: Body Length Development of Flies at 72° F

L = Larvae P = Pupae A = Adult Measurement Unit: Millimeter

Days after Death	<i>Musca domestica</i> House fly	<i>Calliphora vomitoria</i> Blow fly	<i>Sarcophaga carnaria</i> Flesh fly	<i>Piophilina nigriceps</i> Skipper fly
1		Egg	L 9-11	
2	Egg	L 9-11	L 12-16	
3	Egg	L 9-11	L 17-20	
4	L 6	L 12-16	L 21-25	
5	L 6	L 12-16	L 26-30	Egg
6	L 7-11	L 17-20	L 31-35	Egg
7	L 12-16	L 17-20	L 36-40	L 3
8	L 17-20	L 21-25	L 41-44	L 3
9	L 21-25	L 21-25	L 44-46	L 4-6
10	L 26-30	L 26-30	L 44-46	L 7-9
11	L 31-35	L 26-30	P 38-40	L 10-13
12	P 26-29	L 31-35	P 38-40	L 14-16
13	P 26-29	L 31-35	P 38-40	P 13-15
14	P 26-29	P 31-34	P 38-40	P 13-15
15	P 26-29	P 31-34	P 38-40	P 13-15
16	P 26-29	P 31-34	P 38-40	P 13-15
17	P 26-29	P 31-34	P 38-40	P 13-15
18	A 30-32	P 31-34	P 38-40	P 13-15
19		P 31-34	A 42-45	A 16-18
20		P 31-34		
21		A 36-38		

Table 2: Ecological information for certain species of flies. The delays/accelerations are given in number of days relative to the schedule in Table 1.

		<i>Musca domestica</i> House fly	<i>Calliphora vomitoria</i> Blow fly	<i>Sarcophaga carnaria</i> Flesh fly	<i>Piophilina nigriceps</i> Skipper fly
Temperature (°F)	55°	delayed 4	delayed 4.5	delayed 4	delayed 3
	65°	delayed 4	delayed 3	delayed 2	delayed 1
	80°	accelerated 1	accelerated 2	accelerated 1.5	accelerated 1
	85°	accelerated 3	accelerated 4	accelerated 3	accelerated 2
Ecological Traits	Habitat	urban and rural	urban and rural	urban and rural	urban
	Lighting	full to partial sun	partial sun to shady	prefers sunny	prefers sunny
	Drugs	no effect	sensitive to effects	no effect	no effect

Modified from Smith (1986)

Did you know? Flesh flies do not lay eggs, but deposit newly hatched maggots directly onto the corpse.

Species Key

House Fly



Blow Fly



Flesh Fly



Skipper Fly

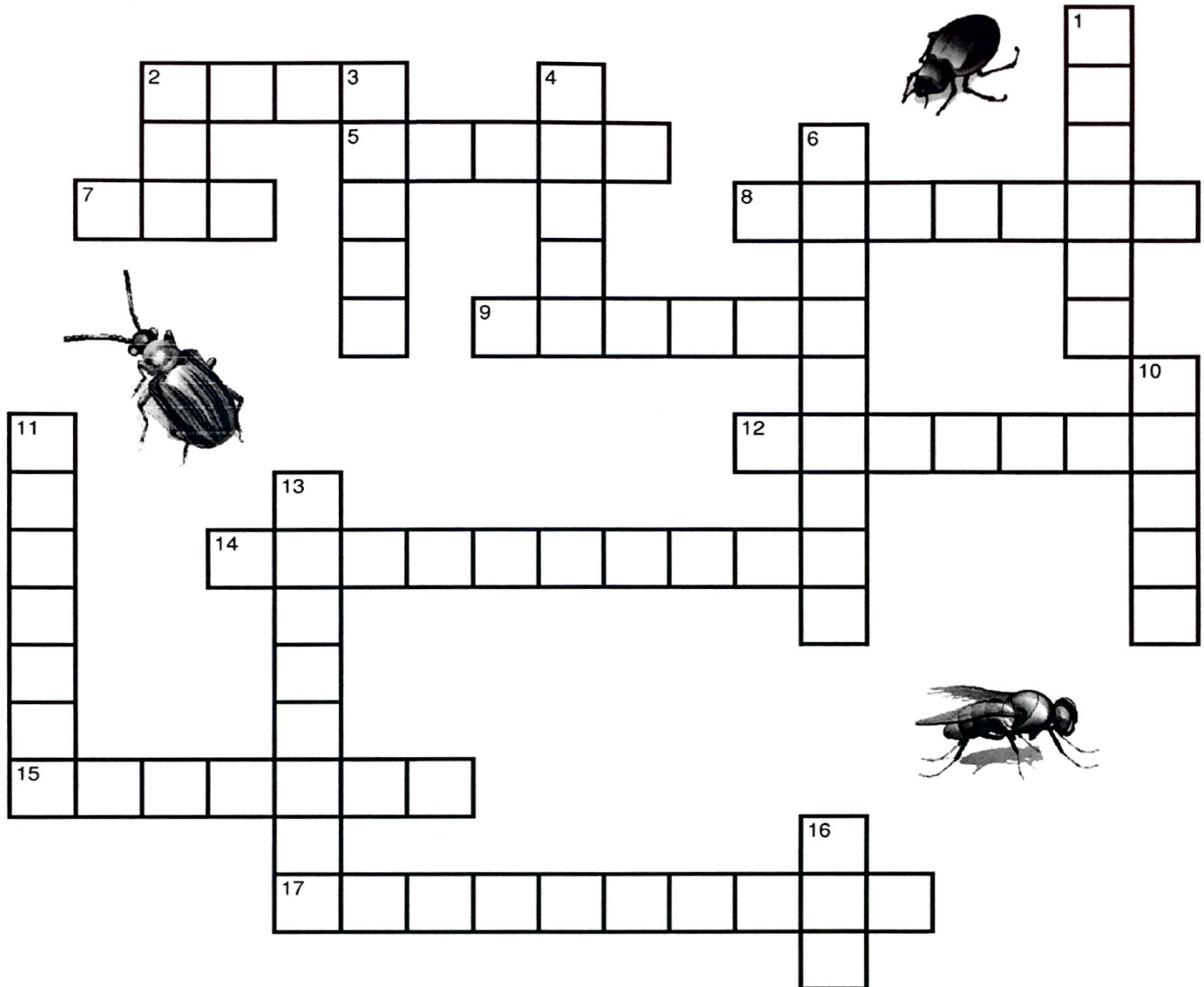


Pupae

Fly species determined by size

FORENSIC ENTOMOLOGY UNIT REVIEW

Name _____



Across

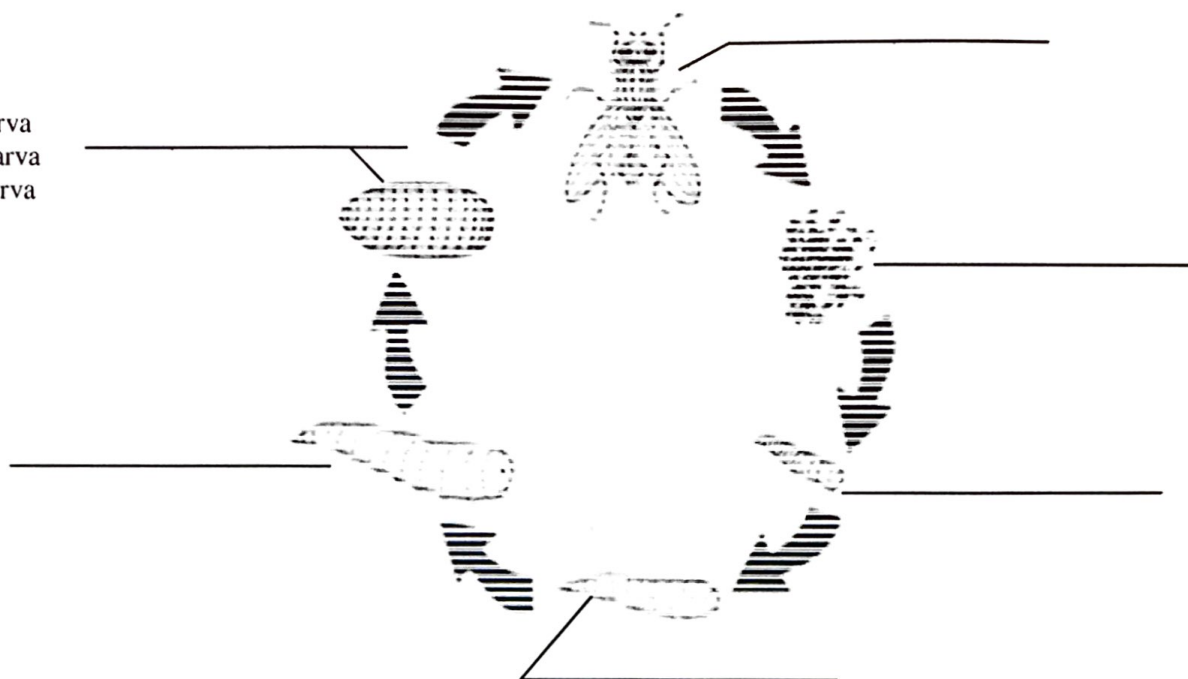
2. Third stage of a fly's life cycle
5. Third stage of decomposition; will have large maggot masses and noticeable odor
7. Type of animal that is often used to simulate a human body in forensic entomological experiments
8. The shedding of an exoskeleton that occurs as a larva or adult insect grows
9. Term that refers to the larval stage of a fly
12. Data related to the temperature and precipitation in an area where a crime scene is located
14. Order that includes beetles
15. Order that includes flies
17. Study of insects

Down

1. Female flies will lay their eggs near body openings or _____
2. The time between the death and the discovery of a body; called the postmortem interval
3. Last stage of a fly's life cycle
4. Second stage of a fly's life cycle
6. Last stage of decomposition in which most of the flesh is gone
10. Stage of decomposition that begins at the moment of death
11. Second stage of decomposition in which the body becomes inflated due to the production of gases from bacteria
13. Type of metamorphosis that has four stages
16. First stage of a fly's life cycle

18. Label the life cycle diagram using the word list provided.

Egg
Adult
Pupa
1st Instar Larva
2nd Instar Larva
3rd Instar Larva



19. Use the charts on the Crime Solving Insects reference card to determine the age of the maggots listed in the chart.

Species	Size (mm)	Average Temperature	Age (Days)
Blow fly maggot	30	85°	
Skipper fly maggot	6	79°	
House fly maggot	33	72°	
Flesh fly maggot	12	64°	

20. Explain how a forensic entomologist would use fly larva to estimate the PMI.

21. Go to the class webpage +
complete the Google Form
ENTOMOLOGY QUIZ