2016-17

Forensic Science Test Outline

Resources and Suggestions:
- Handouts and Labs
- Online resources some of which are listed for you at www.portaportal.com (sign in at guest as dallenfs

Locard's Exchange Principle
- Principle that states that we take something away from where we've been and we leave something behind.
- How does this apply to criminal investigation?

Metric System and English-Metric Conversions
- Metric conversions
- English – metric conversions

Medical Examiner and Coroner Systems
- Pathology – definition
- Role of the Medical Examiner
- Training of the Medical Examiner
- Role and training of the Coroner

Death Investigation and the Forensic Pathologist
- ☐ Training and role of the forensic pathologist
- Manner of Death
- Cause of Death
- Rigor Mortis
- Livor Mortis (Lividity)
- Algor Mortis
- Calculate Time since death from body temperature
- Convert degrees Celsius to Fahrenheit
- Convert degrees Farenheit to Celsius
- Importance of the body farm (see web site)

Entomology
- Fly life cycle
- Importance of eggs, maggots, pupa and flies in determining time since death
- Estimate PMI from data on insect activity
- Estimate ADH Accumulated Degree Hours

NOTES:

Body Farm
- Bill Bass, PhD
- Types & Research

5. What is the Relationship between ADH & Energy
- Constant for Each Species

Test Date:
Test Location:

Practice Problems

Metric-English Measure Conversion Problems

1. 62.55 µm = .062255 mm
2. 857 km = 532.2 miles $857\ km \left|\frac{10^5\ cm}{1\ km}\right| \frac{ft}{cm} \left| \frac{mi}{ft}\right.$
3. 695 m^3 = 24,495.4 ft^3 $695\ m^3 \left|\frac{100^3\ cm^3}{1\ m^3}\right| \frac{1}{(30.5)^3\ cm^3} \left| \frac{ft^3}{}\right.$
4. 57 oz = 1615.95 g $57\ oz \left|\frac{28.35\ g}{1\ oz}\right.$
5. 24 km^2 = 25800000 ft^2
6. 15.5 cc = 15.5 mL = 15.5 cm^3

T=37 – 1.5 t **F = 1.8C + 32**

1. Time since death is 4 hours and 15 minutes. Solve for current body temperature
   $T = 37 - 1.5(4.25) = 30.6°C$
2. Convert the result of #1 to degrees F
   $T = 37 - 1.5(4.25) = 30.6°C$
3. Current body temperature is 88 degrees F. Solve for time since death (PMI)
   $88°F = 31.1°C$ $31.1 = 37 - 1.5t$ $t = 3.9$ Hours

$F = 1.8(30.6) + 32 = 87.1°F$

Maggot Data Table – To determine PMI

1. House fly larvae measure 20mm $8 + 2 = 10$
   Cheese Skipper larvae measure 8mm $10 + 1 = 11$
   Temperature has been around 65 degrees.
   Determine PMI 11 Days
   No Drugs

Calculate ADH using data for the Blow Fly
T x t = ADH

1. Define T and t. Where does ADH come from? T = Temp °F t = Time in Hours
2. How many hours does it take to progress from 1st stage larvae to 2nd stage, with a temperature of 80 degrees F. $27 \times 70 = 1890$
   $T \times 4 = 1890$ $80 \times T = 1890$ $t = 23.6$ Hours
3. What temperature would be need to progress from pupa to adult in 4.5 days? $143 \times 70 = 10{,}010$
   $T \times 108 = 10{,}010$ $T = 92.7°F$
4. The data you have is for the life cycle of the Blow Fly. What would you need to know if you were calculating ADH for a different species of fly? The amt of time needed for each stage to progress at a particular temp

Warm Up: Practice Problem **Forensic Science** **Name:** Key

Helpful Tip – do these things BEFORE you give up or yell for help:
roblem Solving Strategies include

a. **Ask yourself: What information am I given:**
b. **Ask yourself: What am I to do with it:**
c. **Ask yourself: What formula should I use:**

Formulae: **T = 37 – 1.5t** **F = 1.8C + 32** **ADH = T * t** **Maggot Data Table**

Formula Mind Map: Use the following table to indicate WHEN and WHY you would use each of these formulae.

T = 37 – 1.5t Algor Mort's • **When:** To determine TOD (PMI) or estimate body temperature. • **Why** – use only for the first 8 hours after death **What do T, t, 37 and 1.5 mean?** T = Current Body temp. in °C t = Time or TOD in hours 1.5 = heat loss per hour | 37 = Normal Body Temp	**ADH = T * t** • **When** This is species specific and is a constant. Use this when working with energy & fly Life cycles • **Why** – a measure of the energy needed for a fly to pass from one stage to the next **What do ADH, T, and t mean?** Accumulated Degree
F = 1.8C + 32 = Temperature Conversion • **When** To Convert °C to °F or °F to °C • **Why**	**Maggot Data Table** • **When** when maggots are present on the body • **Why** To determine TOD (PMI)

1. Which formula would you use for each of the following:
   a. To estimate PMI or time since death: T = 37 - 1.5t
   b. To convert 32 °C to degrees Fahrenheit: F = 1.8C + 32
   c. To verify an eyewitness account of the time of an event that results in death: T = 37 - 1.5t
   d. To represent the amount of energy that is needed to move from one stage to another in the fly life cycle: ADH = T * t
   e. To convert 90 °F to degrees Celsius: F = 1.8C + 32
   f. To estimate time since death when a body's temperature is 90°F: F = 1.8C + 32 and T = 37 - 1.5t
   g. Which part of these equations represents heat lost per hour, after death: -1.5
   h. Which part of these equations represents PMI or time since death: t

i. Which part of these equations represents current temperature of a body: T

j. Which part of these equations represents normal average body temperature of a living person: 37°C

2. List 4 processes that can be used to estimate PMI and what they mean:
   - Algor mortis ($T = 37 - 1.5t$) = heat loss
   - Rigor mortis (stiffening of the body
   - Livor Mortis
   - maggot life cycle or Entomology

3. What are the four manners of death?
   Homicide Accident
   Suicide Natural Causes

4. Identify the following with the specific TOD, MOD, COD
   a. Heart attack COD
   b. Suffocation by hanging COD
   c. Circumstance in which death is caused intentionally: MOD - Suicide or Homicide
   d. Circumstance in which a victim drinks too much, falls off a boat and dies: Accident (MOD)
   e. Circumstance in which a person dies of a heart attack - Natural Causes (MOD)
   ↳ MOD

5. Work the following Problems, showing all steps. You may use the back of this sheet.

A. Body temperature of a victim is measure at 94.5°F. Determine PMI. (Hint: you must convert to °C first.

$94.5°F = 1.8C + 32$

$C = 34.7$

$34.7 = 37 - 1.5t$

$t = 1.5$ Hrs

B. Witnesses report hearing gunshots 80 minutes ago. Convert to hours and estimate current body temperature of the victim.

$\frac{80 \text{ min}}{1} \cdot \frac{1 \text{ Hrs}}{60 \text{ min}} = 1.3$

$T = 37 - 1.5(1.3)$

$T = 35.1°C$

C. A body is found in a field near a rural community. The ambient temperature (average outside temperature) has been around 55 degrees F. Use the larvae data below to estimate time since death – (make a claim and justify it with data).

Cheese skippers: 15mm; Flesh Flies: 39mm
House Fly: 18 mm

		Days	Adjust	PMI
Skippers	15 mm	12	+3	15
Flesh	39	7	+4	11
House	18	8	+4	12

PMI = 15 days based on the Cheese skipper larvae 15mm are adjusted for 55°F by adding 3 days

↓ adjust for 55°F

Do you suspect criminal activity?
yes - cheese skippers are city animals. This body has been moved

D. A body has maggots everywhere. Traces of heroin are found in her system. Temperature outside has been around 80 degrees Fahrenheit. Estimate TOD or PMI.

	Days	Temp	Heroin	PMI
House fly larvae – 12mm	7	-1	+0	= 8
Blow fly larvae – 23 mm	8/9	-2	+2	= 8/9
Flesh fly larvae – 38mm	7	-1.5	+0	= 5.5
Pupa - 38mm (Flesh)	minimum 11	-1.5	+0	= 9.5

PMI is estimated to be 9.5 days based on the Flesh fly pupa which had a length of 38mm yielding 11 days. This was adjusted for 80°F temperatures by subtracting 1.5 days. This species of Fly is NOT sensitive to drug

6. Rate yourself: A. I am ready for a test B. I am almost ready C. I need more help

The type of help I need is: