Estimating TOD with Algor Mortis

1. Define the following:
   a. Livor mortis:
   b. Rigor mortis:
   c. Algor mortis:

2. What are the cooling rates for algor mortis? For how long after death will a body feel warm?

3. When (and where) does rigor begin? When is it fully set? When does it disappear?

4. When is lividity fully set? What can lividity be used to determine?

5. What are the four common ways used to establish time of death?

6. Explain how the following affect the rate of rigor mortis:
   a. hot weather:
   b. cold weather:
   c. being very thin:
   d. exercise before death:
   e. being heavily clothed:

7. Explain how each would affect a TOD estimate based on body temperature only:
   a. hot weather:
   b. cold weather:
   c. being very thin:
   d. exercise before death:
   e. being heavily clothed:
   f. body stored in a freezer:

8. A woman was found at 6am with a liver temperature of 65 degrees F. Rigor was absent and livor mortis was permanent. The environmental temperature was 65 degrees F. Estimate TOD.

9. A man was found at 8pm with a liver temperature of 82 degrees F. Environmental temperature was 72 degrees F. Rigor and lividity were evident. Estimate TOD.

Calculating TOD using Algor Mortis

**Background** - For the first 12 hours the body loses 0.78 degrees C (1.4 F) per hour. After the first 12 hours the body loses about 0.39 degrees C (0.7 degrees F) per hour. Use the formula:

\[ \text{Temp Loss} = (\text{constant loss rate}) \times (\# \text{ of hours}) \]

**Problems:**

10. What is the temperature loss for someone who has been dead for 12 hours?

11. If the temperature of a dead body is 90 degrees F (normal is 98.6 F), how many hours AND minutes have they been dead?
12. For each of the following state if the body has been dead for more or less than 12 hours based on the number of degrees lost:
   a.  7.9 degrees lost:
   b.  4.4 degrees lost:
   c.  11.7 degrees lost:
   d.  17.2 degrees lost:
   e.  0.6 degrees lost:

13. What if someone was dead for more than 12 hours? You will need to calculate how many hours beyond the 12 hours that someone died and add it to the 12 hours. A dead body was found and the internal temperature was found to be 72 degrees F.
   a.  How many degrees total were lost from the time of death until the body was found?
   b.  How would you know if the person has been dead for more than 12 hours?
   c.  How long has the person been dead? Use Degrees F.

14. List 3 things that could make calculating TOD using algor mortis Inaccurate?

15. If a person died at 2.00am and his body temperature dropped by 0.9 degrees per hour, what would the body temperature be by 9.30 am.?
   a.  Is it likely that the rate of heat loss would get faster or slower as time goes by? Explain your answer.

16. Why is it so important to get an accurate estimate of the time of death when someone has died under suspicious circumstances?

**Making TOD measurements using Algor Mortis more accurate:**

17. Plot the following body temperature measurements taken at 30 minute intervals on a murder victim. Using your graph, estimate the time of death. Assume a fairly even rate of temperature drop.

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature (°C)</th>
<th>Temp Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 am</td>
<td>32.5</td>
<td></td>
</tr>
<tr>
<td>7:30 am</td>
<td>31.8</td>
<td></td>
</tr>
<tr>
<td>8:00 am</td>
<td>31.2</td>
<td></td>
</tr>
<tr>
<td>8:30 am</td>
<td>30.5</td>
<td></td>
</tr>
<tr>
<td>9:00 am</td>
<td>29.9</td>
<td></td>
</tr>
<tr>
<td>9:30 am</td>
<td>29.3</td>
<td></td>
</tr>
</tbody>
</table>

18. What is the average change (loss) in temperature every 30 minutes?

19. Using your graph, work backward, now that you know the average change in temperature, to determine the approximate time of death. What is it?

20. Create a range of time that encompasses 15 minutes before and 15 minutes after your approximate time of death.
21. A forensic biologist takes temperature measurements on a body every 30 minutes to help determine the time of death. Using the data in the table below, estimate the time of death.

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature (°C)</th>
<th>Temp Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 pm</td>
<td>29.7</td>
<td></td>
</tr>
<tr>
<td>1:30 pm</td>
<td>29.2</td>
<td></td>
</tr>
<tr>
<td>2:00 pm</td>
<td>28.6</td>
<td></td>
</tr>
<tr>
<td>2:30 pm</td>
<td>28.1</td>
<td></td>
</tr>
<tr>
<td>3:00 pm</td>
<td>27.7</td>
<td></td>
</tr>
</tbody>
</table>

22. What is the average change (loss) in temperature every 30 minutes?

23. Using your graph, work backward, now that you know the average change in temperature, to determine the approximate time of death. What is it?

24. Create a range of time that encompasses 15 minutes before and 15 minutes after your approximate time of death.

25. What adjustments to the estimated time of death would need to be made under the following circumstances? In each case explain your answer.
   a. The body is found unclothed in August in Tasmania.
   b. The body is found lightly clothed next to an electric heater which is still operating.