Cavity-nesting birds must find trees that provide suitable sites for nest construction. These birds excavate nest depressions by removing wood from the tree, making a hollow cavity that provides a shelter for the nest. Once constructed, cavities may serve as nest sites for many years.

A study was done to provide information about the characteristics of trees used by 4 species of cavity-nesting birds. Such information could prove useful to resource managers who are concerned about creating a balance between resource exploitation (e.g., lumbering) and the preservation of wildlife (e.g., cavity-nesting birds).

Nest sites were sampled for yellow-bellied sap-suckers, hairy woodpeckers, downy woodpeckers, and black-capped chickadees. The characteristics of nest trees used by these 4 bird species are shown in the Table 1. In addition, trees were investigated that appeared to be suitable for nesting but were not currently being used for that purpose by any of the study birds.

<table>
<thead>
<tr>
<th>Tree characteristic</th>
<th>Number of nests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yellow-bellied sapsucker</td>
</tr>
<tr>
<td>Species</td>
<td></td>
</tr>
<tr>
<td>Quaking aspen</td>
<td>26</td>
</tr>
<tr>
<td>American beech</td>
<td>2</td>
</tr>
<tr>
<td>Paper birch</td>
<td>0</td>
</tr>
<tr>
<td>Yellow birch</td>
<td>0</td>
</tr>
<tr>
<td>Red maple</td>
<td>6</td>
</tr>
<tr>
<td>Sugar maple</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>38</td>
</tr>
<tr>
<td>Attribute</td>
<td></td>
</tr>
<tr>
<td>Living</td>
<td>33</td>
</tr>
<tr>
<td>Broken top</td>
<td>14</td>
</tr>
<tr>
<td>Branch stub</td>
<td>38</td>
</tr>
<tr>
<td>Hard outer wood</td>
<td>34</td>
</tr>
<tr>
<td>Fungal conk</td>
<td>32</td>
</tr>
<tr>
<td>Soundness (%) nondecayed wood</td>
<td></td>
</tr>
<tr>
<td>0–25</td>
<td>11</td>
</tr>
<tr>
<td>26–50</td>
<td>16</td>
</tr>
<tr>
<td>51–75</td>
<td>4</td>
</tr>
<tr>
<td>76–100</td>
<td>7</td>
</tr>
<tr>
<td>% bark cover</td>
<td></td>
</tr>
<tr>
<td>0–25</td>
<td>0</td>
</tr>
<tr>
<td>26–50</td>
<td>0</td>
</tr>
<tr>
<td>51–75</td>
<td>4</td>
</tr>
<tr>
<td>76–100</td>
<td>34</td>
</tr>
</tbody>
</table>
These “non-nest” trees displayed at least 2 of the following qualities.

- Fungal conks (areas of fungal decomposition of the wood)
- Branch or stem stubs
- Old wounds or scars
- Existing woodpecker holes
- Dead portions (trees can be living with dead portions visible)

Both nest trees for the 4 species and adjacent non-nest trees were measured for total tree height and trunk diameter at chest height. Nest trees only were also measured for nest height and trunk diameter at nest height (see Table 2).

<table>
<thead>
<tr>
<th>Tree measurement</th>
<th>Yellow-bellied sapsucker (20 cm)$^a$</th>
<th>Hairy woodpecker (19 cm)$^a$</th>
<th>Downy woodpecker (14 cm)$^a$</th>
<th>Black-capped chickadee (11 cm)$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trunk diameter, chest height (cm)</td>
<td>NST</td>
<td>NNST</td>
<td>NST</td>
<td>NNST</td>
</tr>
<tr>
<td>33.6</td>
<td>28.1</td>
<td>27.1</td>
<td>23.9</td>
<td>30.7</td>
</tr>
<tr>
<td>Trunk diameter, nest height (cm)</td>
<td>22.8</td>
<td>—</td>
<td>22.4</td>
<td>—</td>
</tr>
<tr>
<td>Total height (m)</td>
<td>19.4</td>
<td>14.1</td>
<td>17.5</td>
<td>14.1</td>
</tr>
<tr>
<td>Nest height (m)</td>
<td>8.6</td>
<td>—</td>
<td>8.3</td>
<td>—</td>
</tr>
</tbody>
</table>

$^a$ = total, live body length
NST = nest tree
NNST = non-nest tree


Questions

1. The data in Table 1 suggest that black-capped chickadees tend to avoid which kind of tree?
   A. Those with broken tops
   B. Those with 25% or less sound wood
   C. Those that are living
   D. Birches

2. Managed stands of timber usually have few older, dying, or dead trees. In such a forest, one would expect the number of cavity-nesting birds to be:
   A. high, because of the great number of live trees.
   B. high, because nest trees would have small trunk diameters.
   C. low, because most of the trees would be sound.
   D. low, because the average tree height would be over 10 m.

3. Which of the 4 bird species studied would most likely be found nesting in woodlots containing only paper-birch and yellow-birch trees?
   I. Yellow-bellied sapsucker
   II. Hairy woodpecker
   III. Downy woodpecker
   IV. Black-capped chickadee
   A. I only
   B. III only
   C. I and III only
   D. II and IV only
4. Which of the following data from Table 2 would support the hypothesis that birds longer than 15 cm choose larger nest trees than birds less than 15 cm in length?
   I. Tree trunk diameter at nest height
   II. Tree trunk diameter at chest height
   III. Total tree height
   A. I only
   B. II only
   C. I and II only
   D. I, II, and III

5. Which characteristic of non-nest trees would researchers NOT be likely to identify?
   A. Total height
   B. Trunk diameter at nest height
   C. Species
   D. Soundness

6. Which statement below best describes why the researchers considered the characteristics of both nest and non-nest trees?
   A. Nest trees are used as an experimental control for non-nest trees.
   B. Non-nest trees are used as an experimental control for nest trees.
   C. Comparing both types of trees allows for a better definition of nest-tree criteria.
   D. Non-nest trees are used as lookout points for spot-ting cavity-nesting birds.
Part B: (4 points)
Draw a tree of life (phylogenetic tree) and label as many features as you can.
Part C:

Here are a number of statements that may or may not describe your beliefs about learning biology. You are asked to rate each statement by selecting a letter between A and E where the letters mean the following:

A. Strongly Disagree  
B. Disagree  
C. Neutral  
D. Agree  
E. Strongly Agree

1. My curiosity about the living world led me to study biology.
2. I think about the biology I experience in everyday life.
3. After I study a topic in biology and feel that I understand it; however I have difficulty applying that information to answer questions on the same topic.
4. Knowledge in biology consists of many disconnected topics.
5. When I am answering a biology question, I find it difficult to put what I know into my own words.
6. The specific details of biology do not help me understand the big ideas in biology.
7. To understand biology, I sometimes think about my personal experiences and relate them to the topic being analyzed.
8. If I get stuck on answering a biology question on my first try, I usually try to figure out a different way that works.
9. I want to study biology because I want to make a contribution to society.
10. If I don’t remember a particular approach needed for a question on an exam, there’s nothing much I can do (legally!) to come up with the answer.
11. If I want to apply a method or idea used for understanding one biological problem to another problem, the problems must involve very similar situations.
12. I enjoy figuring out answers to biology questions.
13. It is important for the government to approve new scientific ideas before they can be widely accepted.
14. Learning biology changes my ideas about how the natural world works.
15. To learn biology, I only need to memorize facts and definitions.
16. Reasoning skills used to understand biology can be helpful to my everyday life.
17. It is a valuable use of my time to study the fundamental experiments behind biological ideas.

18. If I had plenty of time, I would take a biology class outside of my major requirements just for fun.

19. The subject of biology has little relation to what I experience in the real world.

20. There are times I think about or solve a biology question in more than one way to help my understanding.

21. If I get stuck on a biology question, there is no chance I'll figure it out on my own.

22. When studying biology, I relate the important information to what I already know rather than just memorizing it the way it is presented.

23. There is usually only one correct approach to solving a biology problem.

24. When I am not pressed for time, I will continue to work on a biology problem until I understand why something works the way it does.

25. Learning biology that is not directly relevant to or applicable to human health is not worth my time.

26. Mathematical skills are important for understanding biology.

27. I enjoy explaining biological ideas that I learn about to my friends.

28. We use this statement to discard the survey of people who are not reading the questions. Please select agree (not strongly agree) for this question to preserve your answers.

29. The general public misunderstands many biological ideas.

30. I do not spend more than a few minutes stuck on a biology question before giving up or seeking help from someone else.

31. Biological principles are just to be memorized.

32. For me, biology is primarily about learning known facts as opposed to investigating the unknown.
Part D

33. I am a _________.
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior
   e. Other

34. What is your current major?
   a. Biology
   b. Chemistry
   c. Physics
   d. Other science
   e. Other

35. Currently, what is your interest in biology?
   a. Very low
   b. Low
   c. Medium
   d. High
   e. Very high

36. My future plans are_________.
   a. Biology related graduate school
   b. Medical, dental or pharmacy school
   c. Teaching K-12 science
   d. Other science related career
   e. Other career outside of science

37. I think I will need to spend _____ hours per week outside of lecture to get the grade I want in this course.
   a. 0-3
   b. 4-6
   c. 7-9
   d. 10-12
   e. more than 12