In this assignment, we will take an extremely simplified view of biology and use a set of living organisms as a case study for some object-oriented design. In short, you are to write a “world” class that maintains a variety of organisms and tracks their daily energy levels.

Our world has three general types of organisms: normal, conserving, and accelerating,

- Normal organisms burn energy at a constant rate. That is—other activities notwithstanding—each day their energy level decreases by the same amount. Of course, different kinds of normal organisms may have different rates.
- Conserving organisms burn energy at some constant rate under normal conditions. However, when their energy level goes below some threshold, they conserve energy by cutting their consumption rate in half (see e.g., McCue [1]).
- Accelerating organisms also burn energy at a constant rate under normal conditions. However, when their energy level goes below a threshold, they begin to double their energy consumption rate in an attempt to reproduce before they expire (see e.g., Gielis et al. [2]).

Note that energies may not be negative. Once they reach zero, the organism is considered expired and the energy level may not increase.

There may be several kinds of each of these types of organisms. Each species would thus have their own energy-consumption parameters. For instance, snakes and birds are conserving organisms while mice might be normal. A variety of plants, such as ornamental bamboo, are accelerating organisms.

All organisms live in an environment, one of desert, wetland, or forest.

1. Design and implement a class hierarchy for the general organisms with appropriate fields and methods so that your design exhibits good encapsulation and code re-use (i.e., inheritance).

2. Augment your class hierarchy with at least one type of specific organism for each general type, creating at least two species for one of the general types. The specific organisms should be the only instantiable type.

3. Design and implement a world class that uses an ArrayList to keep track of its organisms. Include methods to:
   - add an organism
   - “update” the energy levels of all the organisms in the world
• calculate the total amount of energy of the world’s organisms, and
• print the energy balance and environment of each organism in the world.

4. Be sure to test your classes and include your tests. In addition to your unit tests, create a method in a separate “driver” class that creates a world with several kinds of organisms, updating energy levels and displaying the total energy and individual information for the organisms over several days.

Note: You should be aware of Java’s enhanced for loop for syntactical ease in processing (see Weiss 2.4.6).

References
