Try This Activity (page 371)
(a) Algae have green chlorophyll, while fungi do not.

10.3 Practice (page 372)
1.

Plants	Fungi
Similarities	
consist of eukaryotic cells with numerous organelles	
most have cell walls	
most have parts of their bodies anchored in soil	
reproduction can be asexual, sexual, or both	
stationary	
Differences	
cell walls with cellulose	cell walls reinforced with chitin
Chlorophyll	no chlorophyll
Autotrophic	heterotrophic
roots, stems, leaves	no roots, stems, leaves.

2. Fungi as decomposers break down dead and nonliving tissues, returning the nutrients to the biosphere. Examples are bread mould and club fungi. Fungi as parasites live on another organism from which they obtain their food. Examples are water moulds, mildew, and imperfect fungi, such as those which cause athletes foot.
3. (a) Mycelium are branching filaments that constitute the vegetative body of fungi. Mycelium are the sites of nutrient absorption.
   (b) Hyphae are individual filamentous threads of mycelium, involved in nutrient absorption.
   (c) Spores are reproductive cells that have a haploid number of chromosomes. Fungal spores have thick, resistant outer coverings to protect them.
   (d) Sporangia are the reproductive structures in which spores are produced.
4. The dikaryotic stage of the fungal life cycle occurs when compatible haploid parent hyphae fuse.
5.

Class	Examples
Zygomycetes (moulds)	common moulds (bread moulds, dung moulds)
Ascomycetes (sac fungi)	yeast, morels, truffles
Basidiomycetes (club fungi)	mushrooms, shelf fungi

6. (a) Mycorrhiza is a symbiotic relationship between the hyphae of a fungus and the roots of a plant. In mycorrhizae, fungal hyphae help the plant absorb nutrients, such as phosphorus.
   (b) Lichens represent a form of symbiotic relationship between green algae or cyanobacteria and a fungus. The fungus provides the photosynthetic cells of the plant with carbon dioxide and water. The fungus also provides structural support.

7. (a) Haploid spores form by meiosis in the mature gills of the field mushroom. In a process considered to be a sexual union, the two nuclei in some of the tangled hyphae extensions fuse. The new diploid nucleus then undergoes meiosis to produce four haploid spores.
   (b) The dikaryotic stage begins when two haploid hyphae fuse.

Sections 10.1–10.3 Questions (page 373)

1. Cells of fungi do not contain chlorophyll and do not undergo photosynthesis.
2. If fungi began to disappear, nutrients would not be returned to the soil as quickly. This would slow the growth of new organisms.
3. Fungi as decomposers return nutrients to ecosystems. Fungi also provide foods–mushrooms, truffles, etc. Fungi, such as penicillin are an important source of antibiotics.
4. Fungi, such as moulds and blights, cause the destruction of crops. Some fungi cause disease.
5. Fungi help trees absorb nutrients. In some cases trees will not germinate in the absence of mycorrhizal fungi.
6. Fungi are able to survive in environments considered to be too severe for plants because they do not need sunlight for photosynthesis. A symbiotic relationship between fungi and algae also allows fungi to survive with little nutrients. The fungi provide a framework hyphae that house the algae and provide water. The algae use the water to perform photosynthesis and provide the fungi with carbohydrates.
7. Moulds break down nutrients in the bread. The enzymes released by the hyphae, during the digestion process, can be toxic to humans.
8. Cold temperatures and light can help to prevent mould growth on foods.
9. (a) Desirable fresh food items are high in nutrients, have a pleasant taste, and are fast growing and resistant to disease.
   (b) Generally, foods that are ripe are higher in sugars, have a more pleasant odor and appear more attractive.
   (c) Mature fruits spoil quickly, and many less attractive-appearing foods are rich in nutrients. If we only select fresh food items based on a limited number of characteristics, farmers will seek to produce foods that exhibit these characteristics. This may lead to limited genetic diversity, which can render crops more susceptible to diseases and may adversely affect the ecosystem.

10.4 Practice (page 375)

1. Plants are immobile, composed of eukaryotic cells, have many cellular organelles, cell walls with cellulose, and the ability to photosynthesize.
2. A nonvascular plant does not have a system of conductive tissue.
3. Tracheophytes are also known as vascular plants.
4. Vascular tissues transport water and dissolved materials in a plant.
5. The two types of vascular tissue are xylem and phloem.
6. Gymnosperms have naked seeds, e.g., a pine tree. Angiosperms have enclosed seeds, e.g., an apple tree.

10.5 Practice (page 378)

1. The colonization of the world by terrestrial fungi and plants more than 400 million years ago represents one of the major events in the evolutionary history of life. Before this time, most of our planet was covered by water, and any dry land was barren and inhospitable. Organisms existed only in seas and freshwater ponds, where they were protected from the harsh conditions of the earth's atmosphere.
2. Adaptation to a drier environment and poor soil quality were two major obstacles encountered by the first plants that washed ashore. As some plants died, they contributed to the formation of richer soil. As other plants lived and grew tall, they shaded the soil, thus changing the microclimate by lowering the temperature and raising the humidity under them.
3. Survival by which they changed the microclimate providing habitat and nutrition for herbivores and their predators, death while contributing to the formation of richer soil, or adaptation for species differentiation.
4. The cuticle, a layer of noncellular material secreted by epidermal cells, protects plant cells from drying out. Stomata, pores in the epidermis of plants, permit the exchange of gases between the plant and atmosphere while at the same time helping to prevent excessive water loss.
5. The development and use of spores, pollen, nectar, colourful flowers, fruit, and seeds in plant reproduction helped plants survive terrestrial life.
6. Rhizoids, hair-like structures that function like tiny roots, probably evolved before true roots. Roots have a vascular system consisting mainly of xylem tissue and phloem tissue, while rhizoids do not contain vascular tissue.
7. Plants are autotrophs and capable of making their own food. Animals are heterotrophs, relying on plants or other animals that eat plants for their food. Thus, plant development on land must have preceded animal development on land.
8. A changing environment selects different genes. The greater the genetic diversity, the greater is the probability that a group of individuals carry desirable genes that will ensure the survival and development of the species.
9. The environments in houses and apartments are often dry.
10. In polar regions, plants encounter extreme cold, few nutrients, and limited sunlight for extended periods. The soils also tend to freeze, limiting root development, which in turn limits nutrient and water absorption. In warm desert regions, which receive less than 25 cm of rain, plants have little water available to them. Also, deserts experience extreme temperature variation between day and night.

10.6 Practice (page 380)

1. Spore mother cells belong to the diploid generation.
2. Spores belong to the haploid generation.
3. The change from the gametophyte to the sporophyte generation is brought about by fertilization, the fusion of two gametes.

Sections 10.4–10.6 Questions (page 380)

1. Vascular plants developed because of the movement of plants onto terrestrial surfaces. This occurred about 400 million years ago.
2. Angiosperms are the last major plant group to evolve.
3. The greater the genetic diversity within a changing, natural community, the greater the probability that a group of individuals carrying desirable genes will survive and thus ensure the development of the species.
4. The two major divisions of the plant kingdom are vascular and nonvascular plants. Nonvascular plants do not have roots stems and leaves. Vascular plants have xylem and phloem and true roots, stems, and leaves.
5. Meiosis creates the haploid cells that begin the gametophyte generation, two of these haploid cells eventually fuse to produce a zygote, beginning the sporophyte generation. Both processes depend on each other, and no one part of the cycle can be considered more important than the other.
6. Many possible answers. One major reason is interest; humans are part of the animal kingdom.
7. Humans know more about angiosperms because more time has been spent cultivating that type of plant.
8. It might be surprising to discover that oak trees are angiosperms because they don't produce any visible flowers.
9. Since plants are made of mostly cellulose, plants decompose very easily, thus fossilized plants are rare.
10. Two plants that are not autotrophic are *Rafflesia arnoldi* and *Pholisma sonorae*, both of which are parasitic. *Rafflesia arnoldi* is a rare plant found in Indonesia, producing the largest flower of any living plant, which has been known to weigh up to 7 kg and span nearly 1 m in diameter. It is totally dependent on the vine *Tetrastigma* for its supply of nutrients. *Pholisma sonorae*, commonly known as "sand food", is a rare plant found in Mexico and California. This plant is a root parasite, attaching to the roots of nearby shrubs for its supply of nutrients. Both plants have a very unusual appearance, and lack chlorophyll since they do not depend on photosynthesis.
11. Amber is the fossilized resin of ancient trees, mostly conifers. Amber is formed over millions of years when these ancient trees fell into the soft sediment of calm, shallow bodies of water. Though amber is often a yellow colour, it can be white, red, blue or green. Amber frequently washes up onto the seashore, and has been found in a number of areas, from the Mediterranean to the Baltic.
12. Petrified wood is ancient wood that has turned to stone, formed when ancient trees were buried under sand and silt.

Try This Activity (page 384)

(a) Mosses obtain water from the environment through osmosis.
(b) Peat moss increases the water-holding capacity of garden soil.
(c) One problem associated with using too much peat moss in garden soil is that many plants cannot live in a environment with too much water. Also, mosses become acidic as they decompose.
(d) Bogs, composed of peat moss, are responsible for a variety of ecologically beneficial actions. Bogs filter and collect water, accumulate carbon, and provide a habitat for

flora and fauna. Peat moss economically beneficial as a commercial garden product, but is also renewable source of energy.

10.7 Practice (pages 385-386)

1. (a) Mosses form the largest and most familiar group of bryophytes. Mosses, like other bryophytes, are mostly restricted to swampy regions and other relatively moist environments. Mosses can be found on a walk through the woods as low-growing, tightly knit clumps of green, velvety carpets. They also form a thin mat on rocks and tree trunks in very moist areas.
   (b) Bryophytes are similar to vascular plants in that they undergo photosynthesis, their cells have cell walls, and they have one nucleus per cell.
   (c) Mosses have evolved many of the same features that are found in other successful terrestrial plants, but they lack one important evolutionary development, a vascular system.
   Like multicellular algae and fungi, mosses depend on simple diffusion, osmosis, and active transport to move nutrients, wastes, and water to and from their cells. As a result, there are strict limits on their overall size.
   In place of the complex roots found in more recently evolved plants, mosses have simple root-like filaments called rhizoids, which have only a limited capacity for absorption and anchorage.
2. Like multicellular algae and fungi, mosses depend on simple diffusion, osmosis, and active transport to move nutrients, wastes, and water to and from their cells.
3. See Figure 3 on page 383 for a diagram of the moss life cycle.
4. (a) Moss cells are haploid during the gametophyte generation.
   (b) Moss cells are diploid during the sporophyte generation.
   (c) The reduction in the number of chromosomes of moss cells occurs during meiosis in the spore mother cells.
   (d) the diploid condition is restored during fertilization, when egg and sperm unite.
5. A moss protonema is a tiny green gametophyte tissue produced after a spore germinates.
6. It is important that the moss plants form mats of thousands of plants during fertilization; it is important that the sperm and egg cells are close together, this helps ensure the successful union of gametes.
7. You should recommend that the gardener add moss, because it is slightly acidic and will also increase the water-holding capacity of the soil.
8. Peat moss is a renewable energy source. Unfortunately, peat also contains trace chemicals, such as sulphur, that are air pollutants and are released when peat moss is burned.
9. Many possible answers. Students should consider the importance of plants in the biosphere and more specifically how they contribute to the economy of Canada. Agriculture, lumber, and pulp and paper could be mentioned.

10.8 Practice (pages 389-390)

1. (a) Tracheophytes have a vascular system, brophytes do not.
   (b) Ferns can transport water and nutrients over greater distances—they are larger than brophytes and can be further from the source of water, the ground.