Name: _____ Class: _____ Date: _____

5.1: Grading the Tracing Atoms and Energy in Fungi

*This worksheet has "grading" in the title because if they discuss these questions in class, students can be held accountable for correct answers. Level 4 (correct) responses to the questions are in **blue bold italics** below. There are also comments about common Level 2 and Level 3 responses to help you with grading and making decisions about what to emphasize in future lessons.*

Red italics suggest ways to grade student responses by giving them points for correct or partially correct answers. There are 20 points total on this worksheet.

Some things you may already know. One thing you already know is that *atoms last forever* in living systems. So, all the atoms in a fungus must have come from somewhere. Fungi need *water, air,* and *food* to live and grow. So those are the sources that the atoms and the energy in fungi must come from.

You may not know what kinds of atoms fungi are made of. Chemists can take a fungus and analyze what kinds of atoms (what elements) it is made of. The first column of the table below shows what they find (in dry mass, after water has been removed). Where does each kind of atom in a fungus come from?

Kinds of atoms in fungi	***Where atoms come from***	***Your reasons for your ideas***
Carbon atoms make up about 45% of the dry mass of fungi.	Fungi get some carbon atoms from **water.** True ***False***	***Level 4 responses should trace carbon atoms back to large organic molecules in food.*** *There are also carbon atoms in air (in CO_2), but they are not incorporated into organic molecules in cells.*
	Fungi get some carbon atoms from **air.** True ***False***	
	Fungi get some carbon atoms from **food**. ***True*** False	
Oxygen atoms make up about 45% of the dry mass of fungi.	Fungi get some oxygen atoms from **water.** ***True*** False	***Level 4 responses should trace oxygen atoms back to water and large organic molecules in food.*** *See footnote below about oxygen in the air.*
	Fungi get some oxygen atoms from **air.** ***True False***[1]	
	Fungi get some oxygen atoms from **food**. ***True*** False	
Hydrogen atoms make up about 5% of the dry mass of fungi.	Fungi get some hydrogen atoms from **water.** ***True*** False	***Level 4 responses should trace hydrogen atoms back to water and large organic molecules in food.***
	Fungi get some hydrogen atoms from **air.** True ***False***	
	Fungi get some hydrogen atoms from **food**. ***True*** False	

[1] The oxygen that fungi breathe is used exclusively for cellular respiration (not biosynthesis). Some of those oxygen atoms end up in water molecules that stay in them, so a tiny percentage of oxygen atoms in fungi come from air.

All other elements (mostly nitrogen, potassium, calcium, magnesium, and phosphorous) make up about 5% of the mass of fungi.	Fungi get some other atoms from **water.**	True ***False***	***Level 4 responses should trace other atoms back to minerals***
	Fungi get some other atoms from **air.**	True ***False***	
	Fungi get some other atoms from **food**.	***True*** False	

1 point for each correct answer (16 points total)

You already know is that *energy lasts forever* in living systems. The energy in fungi must come from somewhere. Use the table below to show where the chemical energy comes from.

Kinds of energy in fungi	***Where energy comes from***		***Your reasons for your ideas***
Where does the *chemical energy* in a fungus come from?	Fungi get some energy from **water.**	True ***False***	***Level 4 responses should explain that only food has organic molecules with high-energy bonds.*** *Some Level 2 or Level 3 students may suggest that water and air have energy because they are essential for life.*
	Fungi get some energy from **air.**	True ***False***	
	Fungi get some energy from **food**.	***True*** False	

1 point for each correct answer (4 points total)