## **Matter and Energy Transformations** What the reviewers looked for However complex the workings of living organisms. they share with all other natural systems the same physical principles of the conservation and transformation of matter and energy. Over long spans of time, matter and energy are transformed among living things, and between them and the physical environment. In these grand-scale cycles, the total amount of matter and energy remains constant, even though their form and location undergo continual change. SFAA, p. 66 At each link in a food web, some The chemical elements that energy is stored in newly made make up the molecules of Most of what goes on in the No matter how substances within a structures but much is universe ... involves some living things pass repeatedly closed system interact with one another, dissipated into the environment through food webs and the form of energy being or how they combine or break apart, the as heat. Continual input of environment, and are transformed into another. total mass of the system remains the energy from sunlight keeps the Energy in the form of heat is combined and recombined same. The idea of atoms explains the process going. ...5E(9-12)/3 almost always one of the in different ways. conservation of matter: If the number of products of an energy 5E(9-12)/3... atoms stavs the same no matter how they transformation. ...4E(6-8)/2 are rearranged, then their total mass stays the same. 4D(6-8)/7 Different amounts of energy are associated with different Other organisms break down configurations of atoms and Plants get energy to grow the consumed body structures molecules. Some changes of and function by oxidizing to sugars and get energy to configuration require an input the sugar molecules. grow and function by oxidizing of energy whereas others Some of the energy is their food, releasing some of release energy. 4E(9-12)/4 released as heat. the energy as heat. 5E(6-8)/3... ...5E(6-8)/3... Other organisms break down The chief elements that the stored sugars or the body Plants break down the sugar make up the molecules structures of the plants they molecules that they have of living things are eat (or animals they eat) into Within cells are synthesized into carbon carbon, oxygen, simpler substances, specialized parts for the dioxide and water, use them hydrogen, nitrogen. reassemble them into their capture and release of as building materials, or store sulfur, phosphorus, own body structures, them for later use. 5E(6-8)/1. energy. 5C(9-12)/2 calcium, sodium, including some energy potassium, and iron. stores. ...5E(6-8)/1 5C(9-12)/8..., SFAA, p. 66 An especially important kind of reaction between Plants transfer the substances involves a<sub>2</sub> energy from light into combination of oxygen "energy-rich" sugar [As in physical with something else--as systems] Energy can molecules. in burning or rusting. .5E(6-8)/1.. only change from one Carbon atoms can easily ..4D(6-8)/6.. a1 Plants make sugar form into another. bond to several other carbon molecules from carbon 5E(6-8)/3.. atoms in chains and rings to dioxide (in the air) and form large and complex Food provides the water. ...5E(6-8)/1... molecules. ...5C(9-12)/8 molecules that serve as fuel and building Arrangements of Κeγ materials for all atoms have organisms. chemical energy. Carbon and hydrogen Text Color 5E(6-8)/1.. ..4E(6-8)/4... are common elements Black: Key Ideas of living matter. Blue: Related Ideas ..4D(6-8)/6 Red: Prerequisite Ideas Benchmark Codes **5E(6-8)/1** = Benchmarks for Science Literacy Chapter 5, Section E (Grades 6-8)/ First benchmark in the list SFAA = Science for All Americans

