Solutions to Further problems

1. They represent constant temperature during melting or boiling, which at the particle level represents the increase in potential energy of the particles in the substance.
2. The increase in temperature of the substance over time, which at the particle level represents the increase in kinetic energy of the particles of the substans.
3. It is a measure of the kinetic energy of the particles of the substance.
4. It is a measure of the potential energy gained by the substance in changing from one state to another at constant temperature.
5. The particle will have increased in the potential energy. They will have gotten farther apart.
6. In general, the higher the energy of a substance, higher the kinetic and potential energy of the particles of substance the more fluid the state of the substance. As energy increases, the physical state changes from solid to liquid and to gas.
7. Three types of motions are possible: vibrational, rotational, and translational. In the solid state motion of particles are restricted to vibrational motion. In the liquid state however both vibration, rotational and translational motions are possible. In the gaseous state all three motions are again possible but translational motiona predominates.
8. a) matter and substance b) matter (and mixture as opposed to a substance). c) matter and a substance. d) matter (and a mixture, not a substance)
9. Plasma constitutes a mixture of positive ions and free electrons at extremely high temperatures (such as achieved in a gas tube, the basis for neon lights, and on the surfaces of hot stars as a result of fusion reactions). As such, it is classified as the fourth state of matter. It is most similar to gas. The reason is that it has neither fixed shape nor volume.
10. The change is chemical since there is a change in color and since a gas was given off. The original material is most likely a compound or a mixture of a compound and element or two compounds, but definitely not an element. It cannot be an element because there were at least two products.
11. (a) substance (b) solution (c) substance
12. (a) mixture, two phases: liquid (solution) and solid (sugar)
    (b) mixture, two phases: liquid (solution) and solid (carbon)
    (c) mixture, two phases: quartz and calcite
    (d) pure substance
13. (a) color is an intensive property, (b) extensive, (c) intensive, (d) intensive, (e) intensive
14. Yes they are consistent with the law of definite proportions. The explanation is that they were analyzing two different compounds.
15. The change is chemical because two products were obtained from what appeared to be one single starting material. However, given the information, it is difficult to determine if the original material was an element or a compound or even a mixture. More information would be needed.
16. No, ozone is not an element according to the definition given on page 13. It should however be considered to be an element. The reason is that it is made up of the same substance throughout, oxygen. A more appropriate definition for an element would be a substance that is made up of one kind of atom.
17. Volume.
18. $\left(\frac{\$\ 50}{2.5\ \text{cm}^3\ \text{solution}}\right)\left(\frac{100\ \text{cm}^3\ \text{solution}}{100\ \text{g solution}}\right)\left(\frac{100\ \text{g solution}}{0.005\ \text{g compound}}\right) = \$\ 400{,}000.00/\ \text{g compound}$

19. hydrogen iodide, sodium bromide, hydrogen chloride, sodium hydroxide, potassium iodide, magnesium oxide, calcium carbonate, calcium fluoride, aluminum chloride, sulfur dioxide, dinitrogen trioxide, iron (II) iodide, iron (III) bromide, lead (II) chloride, hydrochloric acid, copper (II) chloride, magnesium bromide, sulfur tetrafluoride, hydrobromic acid, phosphorus pentoxide, zinc bromide, zinc oxide
20. $NaHCO_3$, $MgSO_4$,CaS_2O_3, $AlNO_3$, $LiNO_2$, $BaPO_4$, $Ca(OH)_2$, $BaCO_3$, CuCl, $CuCl_2$, $AgNO_3$, $ZnSO_4$, NO_2, $CHCl_3$, SFl_6