

# Memory Metal Assessment

Name \_\_\_\_\_

Date \_\_\_\_\_ Hour \_\_\_\_\_

## Matching

Match the word with the best definition.

- |       |                             |   |
|-------|-----------------------------|---|
| _____ | 1. austenite                | a. a pattern that can be shifted repeatedly to create the entire structure of atoms in a crystal                        |
| _____ | 2. martensite               | b. a solid solution composed of two or more metals  |
| _____ | 3. transition temperature   | c. alloy containing nearly equal amounts of nickel and titanium   |
| _____ | 4. Nitinol                  | d. a physical state of matter   |
| _____ | 5. alloy                    | e. a type of unit cell  |
| _____ | 6. smart material           | f. a substance that can respond to stimuli in its environment   |
| _____ | 7. density                  | g. high temperature phase   |
| _____ | 8. unit cell                | h. low temperature phase  |
| _____ | 9. coordination number      | i. the temperature at which a phase transformation occurs   |
| _____ | 10. body-centered cubic     | j. mass per unit volume   |
| _____ | 11. phase                   | k. number of nearest neighbors  |
| _____ | 12. LeChatelier's Principle | l. when a system at equilibrium experiences a stress, the equilibrium shifts partially to relieve that stress partially |
|       |                             | m. the temperature at which martensite melts  |

## Multiple Choice

Choose the best answer.

- \_\_\_\_\_ 13. In the high-temperature phase of NiTi, the coordination numbers of the Ni and Ti are
- 6 for Ni and 6 for Ti
  - 6 for Ni and 8 for Ti
  - 8 for Ni and 6 for Ti
  - 8 for Ni and 8 for Ti
- \_\_\_\_\_ 14. What technique lets us determine the atomic positions in NiTi memory metal both before and after the solid has undergone its phase change?
- spectroscopy with visible light
  - measurement of specific heat
  - electrical resistivity
  - x-ray diffraction
- \_\_\_\_\_ 15. Austenite exhibits which characteristic?
- less symmetrical than martensite
  - more rigid than martensite
  - more flexible than martensite
  - both a and c
- \_\_\_\_\_ 16. At room temperature Nitinol can exist in either of two structures, which are dependent upon
- the mass of the sample.
  - the exact ratio of Ni to Ti.
  - the length of the sample.
  - the diameter of the rod.
- \_\_\_\_\_ 17. In some phase changes like that of ice and water, there is a noticeable change; however, there is no visible phase change between austenite and martensite because
- it only occurs at the atomic level.
  - only two atoms exchange places.
  - the structures are the same
  - the temperature is too high
  - no phase change occurs.

## Problems

18. Using [figure 9.10](#) [put this figure in](#), what compositions of  $\text{Ni}_x\text{Ti}_{1-x}$  would you choose so as to have two samples, one of which is in the low-temperature phase at 0 °C, with the other in the high temperature phase at this same temperature. How could you tell them apart without chemical analysis?

