

## Review Questions

1. Which statement describes a chemical property of the element magnesium?

- A) Magnesium is malleable.
- B) Magnesium conducts electricity.
- C) Magnesium reacts with an acid.
- D) Magnesium has a high boiling point.

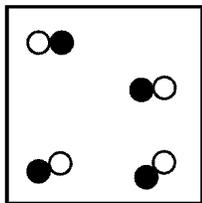
2. Which statement best describes the shape and volume of an aluminum cylinder at STP?

- A) It has a definite shape and a definite volume.
- B) It has a definite shape and no definite volume.
- C) It has no definite shape and a definite volume.
- D) It has no definite shape and no definite volume.

3. Which process is a chemical change?

- A) melting of ice
- B) boiling of water
- C) subliming of ice
- D) decomposing of water

4. Given the particle diagram representing four molecules of a substance:



Which particle diagram best represents this same substance after a physical change has taken place?

- A) B)
- C) D)

5. Which statement describes a chemical property of oxygen?

- A) Oxygen has a melting point of 55 K.
- B) Oxygen can combine with a metal to produce a compound.
- C) Oxygen gas is slightly soluble in water.
- D) Oxygen gas can be compressed.

6. Which grouping of the three phases of bromine is listed in order from left to right for increasing distance between bromine molecules?

- A) gas, liquid, solid
- B) liquid, solid, gas
- C) solid, gas, liquid
- D) solid, liquid, gas

7. Which phase change is an exothermic process?

- A)  $\text{CO}_2(\text{s}) \rightarrow \text{CO}_2(\text{g})$
- B)  $\text{NH}_3(\text{g}) \rightarrow \text{NH}_3(\ell)$
- C)  $\text{Cu}(\text{s}) \rightarrow \text{Cu}(\ell)$
- D)  $\text{Hg}(\ell) \rightarrow \text{Hg}(\text{g})$

8. Which statement correctly describes a sample of gas confined in a sealed container?

- A) It always has a definite volume, and it takes the shape of the container.
- B) It takes the shape and the volume of any container in which it is confined.
- C) It has a crystalline structure.
- D) It consists of particles arranged in a regular geometric pattern.

9. Which 5.0-milliliter sample of  $\text{NH}_3$  will take the shape of and completely fill a closed 100.0-milliliter container?

- A)  $\text{NH}_3(\text{s})$
- B)  $\text{NH}_3(\ell)$
- C)  $\text{NH}_3(\text{g})$
- D)  $\text{NH}_3(\text{aq})$

10. Which substance has vibrating particles in regular, fixed positions?

- A)  $\text{Ca}(\text{s})$
- B)  $\text{Hg}(\ell)$
- C)  $\text{Cl}_2(\text{g})$
- D)  $\text{CaCl}_2(\text{aq})$

11. Which term is defined as a measure of the average kinetic energy of the particles in a sample?

- A) temperature
- B) pressure
- C) thermal energy
- D) chemical energy

12. At which temperature would atoms of a  $\text{He}(\text{g})$  sample have the greatest average kinetic energy?

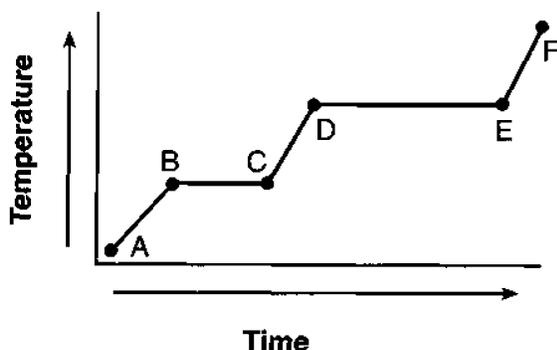
- A)  $25^\circ\text{C}$
- B)  $37^\circ\text{C}$
- C) 273 K
- D) 298 K

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13. Which change of phase is exothermic?  
 A) solid to liquid    B) gas to liquid  
 C) solid to gas    D) liquid to gas
14. Which physical changes are endothermic?

- A) melting and freezing  
 B) melting and evaporating  
 C) condensation and sublimation  
 D) condensation and deposition

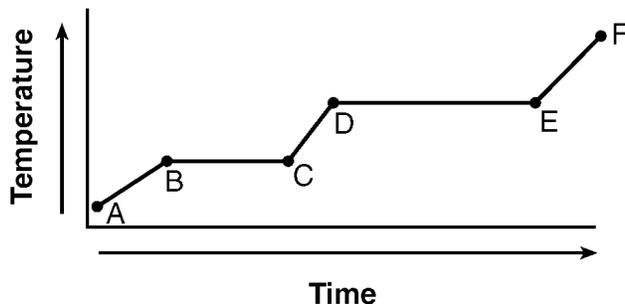
15. The graph below represents the uniform heating of a substance, starting below its melting point, when the substance is solid.



Which line segments represent an increase in average kinetic energy?

- A)  $\overline{AB}$  and  $\overline{BC}$     B)  $\overline{AB}$  and  $\overline{CD}$   
 C)  $\overline{BC}$  and  $\overline{DE}$     D)  $\overline{DE}$  and  $\overline{EF}$

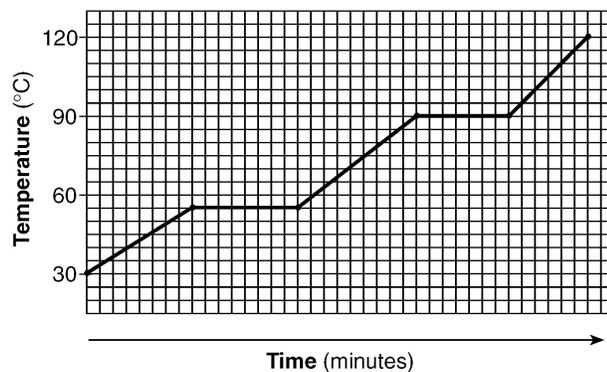
16. The graph below represents the uniform heating of a substance, starting with the substance as a solid below its melting point.



Which line segment represents an increase in potential energy and no change in average kinetic energy?

- A)  $\overline{AB}$     B)  $\overline{BC}$     C)  $\overline{CD}$     D)  $\overline{EF}$

17. The graph below represents the heating curve of a substance that starts as a solid below its freezing point.



What is the melting point of this substance?

- A) 30°C    B) 55°C  
 C) 90°C    D) 120°C

18. The freezing point of bromine is

- A) 539°C    B) -539°C  
 C) 7°C    D) -7°C

19. In which process does a solid change directly into a vapor?

- A) condensation    B) sublimation  
 C) deposition    D) solidification

20. Which phase change at STP represents sublimation?

- A)  $\text{CO}_2(\text{s}) \rightarrow \text{CO}_2(\text{g})$   
 B)  $\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\text{l})$   
 C)  $\text{CO}_2(\text{l}) \rightarrow \text{CO}_2(\text{g})$   
 D)  $\text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{O}(\text{s})$

21. Bronze contains 90 to 95 percent copper and 5 to 10 percent tin. Because these percentages can vary, bronze is classified as

- A) a compound    B) an element  
 C) a mixture    D) a substance

22. A dilute, aqueous potassium nitrate solution is best classified as a

- A) homogeneous compound  
 B) homogeneous mixture  
 C) heterogeneous compound  
 D) heterogeneous mixture

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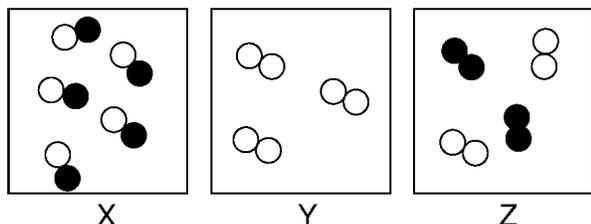
23. A mixture of crystals of salt and sugar is added to water and stirred until all solids have dissolved. Which statement best describes the resulting mixture?

- A) The mixture is homogeneous and can be separated by filtration.
- B) The mixture is homogeneous and cannot be separated by filtration.
- C) The mixture is heterogeneous and can be separated by filtration.
- D) The mixture is heterogeneous and cannot be separated by filtration.

24. Which must be a mixture of substances?

- A) solid
- B) liquid
- C) gas
- D) solution

25. Given the diagrams *X*, *Y*, and *Z* below:



Key
Atom of element A = ○
Atom of element B = ●

Which diagram or diagrams represent a mixture of elements *A* and *B*?

- A) *X*, only
- B) *Z*, only
- C) *X* and *Y*
- D) *X* and *Z*

26. Which sample of matter is a mixture?

- A)  $\text{H}_2\text{O}(s)$
- B)  $\text{H}_2\text{O}(g)$
- C)  $\text{NaCl}(l)$
- D)  $\text{NaCl}(aq)$

27. At room temperature, a mixture of sand and water can be separated by

- A) ionization
- B) combustion
- C) filtration
- D) sublimation

28. When a mixture of water, sand, and salt is filtered, what passes through the filter paper?

- A) water, only
- B) water and sand, only
- C) water and salt, only
- D) water, sand, and salt

29. Which property makes it possible to separate the oxygen and the nitrogen from a sample of liquefied air?

- A) boiling point
- B) conductivity
- C) hardness
- D) electronegativity

30. Which process would most effectively separate two liquids with different molecular polarities?

- A) filtration
- B) fermentation
- C) distillation
- D) conductivity

31. Recovering the salt from a mixture of salt and water could best be accomplished by

- A) evaporation
- B) filtration
- C) paper chromatography
- D) density determination

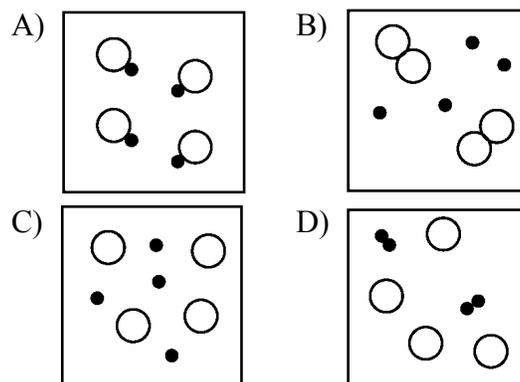
32. Matter that is composed of two or more different elements chemically combined in a fixed proportion is classified as

- A) a compound
- B) an isotope
- C) a mixture
- D) a solution

33. Two different samples decompose when heated. Only one of the samples is soluble in water. Based on this information, these two samples are

- A) both the same element
- B) two different elements
- C) both the same compound
- D) two different compounds

34. Which particle diagram represents one pure substance, only?



35. Which substance represents a compound?

- A)  $\text{C}(s)$
- B)  $\text{Co}(s)$
- C)  $\text{CO}(g)$
- D)  $\text{O}_2(g)$

36. Which type of change must occur to form a compound?

- A) chemical
- B) physical
- C) nuclear
- D) phase

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37. Which substance can be decomposed by a chemical change?

- A) Co    B) CO    C) Cr    D) Cu

38. Which species represents a chemical compound?

- A) N<sub>2</sub>                      B) NH<sub>4</sub><sup>+</sup>  
C) Na                        D) NaHCO<sub>3</sub>

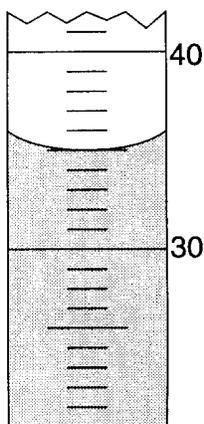
39. The list below shows four samples: *A*, *B*, *C*, and *D*.

- (A) HCl(aq)  
(B) NaCl(aq)  
(C) HCl(g)  
(D) NaCl(s)

Which samples are mixtures?

- A) *A* and *B*                      B) *A* and *C*  
C) *C* and *B*                      D) *C* and *D*

40. The diagram below represents a portion of a 100-milliliter graduated cylinder.



What is the reading of the meniscus?

- A) 35.0 mL                      B) 36.0 mL  
C) 44.0 mL                      D) 45.0 mL

41. Which kelvin temperature is equal to 56°C?

- A) -329 K                      B) -217 K  
C) 217 K                        D) 329 K

42. Which kelvin temperature is equivalent to -24°C?

- A) 226 K                        B) 249 K  
C) 273 K                        D) 297 K

43. A student calculates the density of an unknown solid. The mass is 10.04 grams, and the volume is 8.21 cubic centimeters. How many significant figures should appear in the final answer?

- A) 1    B) 2    C) 3    D) 4

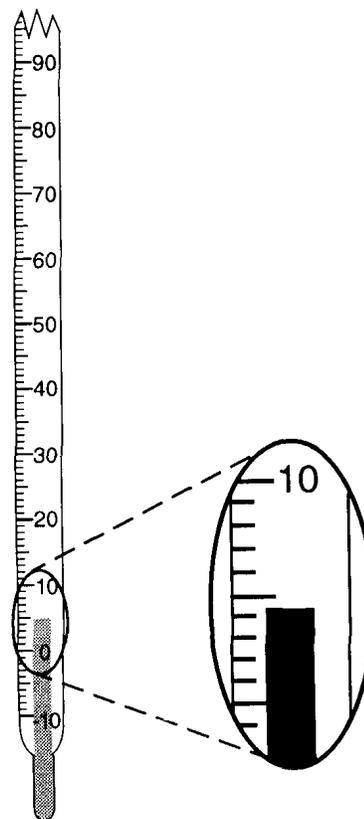
44. Which mass measurement contains four significant figures?

- A) 0.086 g                      B) 0.431 g  
C) 1003 g                        D) 3870 g

45. Expressed to the correct number of significant figures, the sum of two masses is 445.2 grams. Which two masses produce this answer?

- A) 210.10 g + 235.100 g  
B) 210.100 g + 235.10 g  
C) 210.1 g + 235.1 g  
D) 210.10 g + 235.10 g

46. The diagram below represents a Celsius thermometer recording a certain temperature.



What is the correct reading of the thermometer?

- A) 5°C                        B) 4.3°C  
C) 0.3°C                      D) 4°C

47. The measurement 0.41006 gram, rounded to three significant figures, is expressed as

- A) 0.41 g                        B) 0.410 g  
C) 0.4100 g                      D) 0.4101 g

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48. A solution contains 12.55 grams of a solid dissolved in 50.0 milliliters of water. What is the number of grams of solid dissolved per milliliter of water, rounded to the correct number of significant figures?

- A) 0.25 g/mL      B) 0.251 g/mL  
C) 0.3 g/mL      D) 0.2510 g/mL

49. Which measurement contains a total of three significant figures?

- A) 0.12    B) 012    C) 120    D) 120.

50. What is the product of  $(2.324 \text{ cm} \times 1.11 \text{ cm})$  expressed to the correct number of significant figures?

- A)  $2.58 \text{ cm}^2$       B)  $2.5780 \text{ cm}^2$   
C)  $2.5796 \text{ cm}^2$       D)  $2.57964 \text{ cm}^2$

51. A student calculated the percent by mass of water in a hydrate as 14.2%. A hydrate is a compound that contains water as part of its crystal structure. If the accepted value is 14.7%, the student's percent error was

- A)  $\frac{0.5}{14.2} \times 100$       B)  $\frac{14.7}{14.2} \times 100$   
C)  $\frac{0.5}{14.7} \times 100$       D)  $\frac{14.2}{14.7} \times 100$