


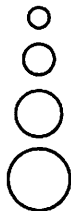


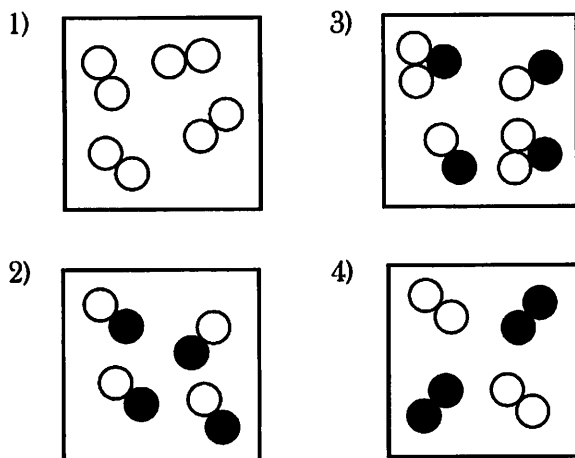
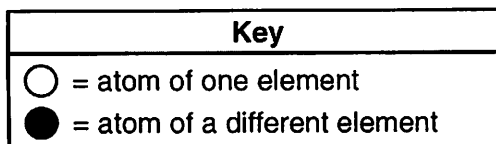
1. According to the wave-mechanical model of the atom, electrons in an atom
- 1) have a positive charge
 - 2) are located in orbitals outside the nucleus
 - 3) travel in defined circles
 - 4) are most likely found in an excited state
2. What is the total charge of the nucleus of a carbon atom?
- 1) 0
 - 2) -6
 - 3) +12
 - 4) +6
3. A sample composed only of atoms having the same atomic number is classified as
- 1) a compound
 - 2) a solution
 - 3) an isomer
 - 4) a element
4. Which two particles each have a mass approximately equal to one atomic mass unit?
- 1) electron and positron
 - 2) proton and electron
 - 3) proton and neutron
 - 4) electron and neutron
5. Which two characteristics are associated with metals?
- 1) high first ionization energy and high electronegativity
 - 2) low first ionization energy and high electronegativity
 - 3) low first ionization energy and low electronegativity
 - 4) high first ionization energy and low electronegativity
6. Which element is most chemically similar to chlorine?
- 1) Ar
 - 2) Fr
 - 3) S
 - 4) F
7. Which substance can be decomposed by chemical means?
- 1) silicon
 - 2) ammonia
 - 3) oxygen
 - 4) phosphorus
8. A dilute, aqueous potassium nitrate solution is best classified as a
- 1) homogeneous mixture
 - 2) homogeneous compound
 - 3) heterogeneous mixture
 - 4) heterogeneous compound
9. When an atom loses one or more electrons, this atom becomes a
- 1) negative ion with a radius larger than the radius of this atom
 - 2) negative ion with a radius smaller than the radius of this atom
 - 3) positive ion with a radius larger than the radius of this atom
 - 4) positive ion with a radius smaller than the radius of this atom
10. Which electron configuration could represent a strontium atom in an excited state?
- 1) 2-8-18-7-3
 - 2) 2-8-18-8-2
 - 3) 2-8-18-8-1
 - 4) 2-8-18-7-1
11. Which grouping of circles, when considered in order from the top to the bottom, best represents the relative size of the atoms of Li, Na, K, and Rb, respectively?
- 1) 
 - 2) 
 - 3) 
 - 4) 
12. What is the total number of neutrons in an atom of $^{57}_{26}\text{Fe}$?
- 1) 26
 - 2) 31
 - 3) 57
 - 4) 83
13. At STP, which element is brittle and *not* a conductor of electricity?
- 1) S
 - 2) Ar
 - 3) Na
 - 4) K
14. What is the total number of electrons in a Mg^{2+} ion?
- 1) 14
 - 2) 12
 - 3) 10
 - 4) 24

Test# _____

15. Compared to an electron in the first electron shell of an atom, an electron in the third shell of the same atom has

- 1) less mass
- 2) more energy
- 3) less energy
- 4) more mass

16. Which particle diagram represents a sample of one compound, only?



17. An atom in the ground state contains a total of 5 electrons, 5 protons, and 5 neutrons. Which Lewis electron-dot diagram represents this atom?



18. Solid X is placed in contact with solid Y . Heat will flow spontaneously from X to Y when

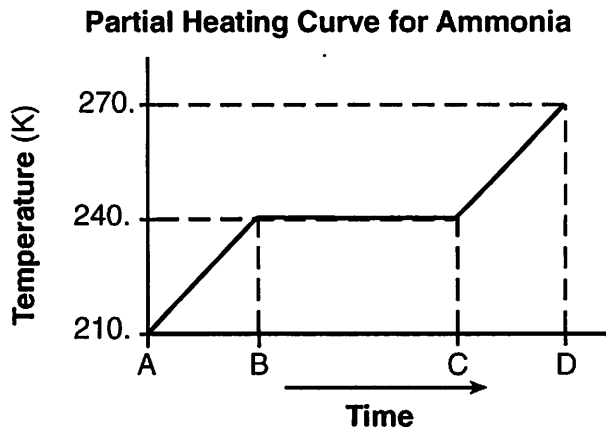
- 1) X is 20°C and Y is 20°C
- 2) X is 25°C and Y is 30°C
- 3) X is 10°C and Y is 5°C
- 4) X is -25°C and Y is -10°C

19. Which process is a chemical change?

- 1) subliming of ice
- 2) melting of ice
- 3) decomposing of water
- 4) boiling of water

Base your answers to questions 20 through 22 on the information below

A 5.00-gram sample of liquid ammonia is originally at 210. K. The diagram of the partial heating curve below represents the vaporization of the sample of ammonia at standard pressure due to the addition of heat. The heat is *not* added at a constant rate.



Some physical constants for ammonia are shown in the data table below.

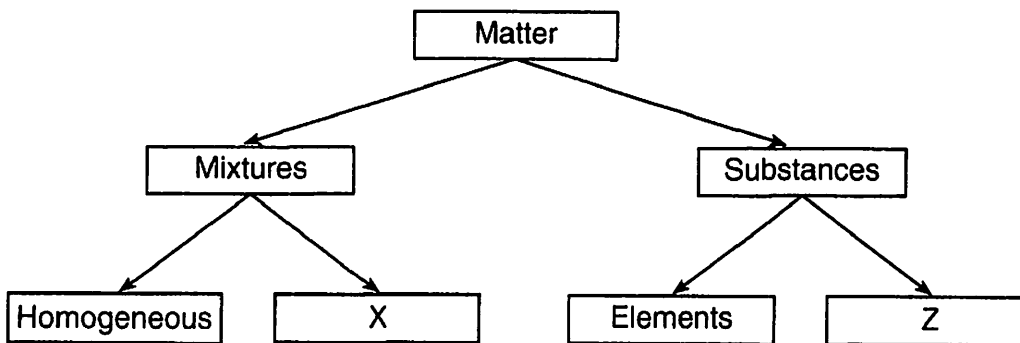
Some Physical Constants for Ammonia

specific heat capacity of $\text{NH}_3(\ell)$	4.71 J/g•K
heat of fusion	332 J/g
heat of vaporization	1370 J/g

20. Calculate the total heat absorbed by the 5.00-gram sample of ammonia during time interval AB. Your response must include *both* a correct numerical setup and the calculated result.
21. Describe what is happening to *both* the potential energy and the average kinetic energy of the molecules in the ammonia sample during time interval BC. Your response must include *both* potential energy and average kinetic energy.
22. Determine the total amount of heat required to vaporize this 5.00-gram sample of ammonia at its boiling point.
-
23. A bottle of rubbing alcohol contains both 2-propanol and water. These liquids can be separated by the process of distillation because the 2-propanol and water
- 1) have combined physically and have the same boiling point
 - 2) have combined chemically and have the same boiling point
 - 3) have combined chemically and retain their different boiling points
 - 4) have combined physically and retain their different boiling points
-

Base your answers to questions 24 through 27 on the diagram below concerning the classification of matter.

Classification of Matter



24. Given a mixture of sand and water, state *one* process that can be used to separate water from the sand.

25. Explain, in terms of particle arrangement, why NaCl(aq) is a homogeneous mixture.

26. What type of substance is represented by Z?

27. What type of mixture is represented by X?

28. Experiments performed to reveal the structure of atoms led scientists to conclude that an atom's

- 1) mass is evenly distributed throughout its volume
- 2) negative charge is mainly concentrated in its nucleus
- 3) volume is mainly unoccupied
- 4) positive charge is evenly distributed throughout its volume

29. Which two nuclides are isotopes of the same element?

- | | |
|--|--|
| 1) ${}^{39}_{19}\text{K}$ and ${}^{42}_{19}\text{K}$ | 3) ${}^{39}_{19}\text{K}$ and ${}^{40}_{20}\text{Ca}$ |
| 2) ${}^{12}_6\text{C}$ and ${}^{14}_7\text{N}$ | 4) ${}^{23}_{11}\text{Na}$ and ${}^{20}_{10}\text{Ne}$ |

30. The temperature of a sample of a substance changes from 10.°C to 20.°C. How many Kelvin does the temperature change?

- | | |
|--------|--------|
| 1) 293 | 3) 10. |
| 2) 20. | 4) 283 |

31. Element X has two isotopes. If 72.0% of the element has an isotopic mass of 84.9 atomic mass units, and 28.0% of the element has an isotopic mass of 87.0 atomic mass units, the average atomic mass of element X is numerically equal to

- 1) $(72.0 + 84.9) \times (28.0 + 87.0)$
- 2) $(72.0 \times 84.9) + (28.0 \times 87.0)$
- 3) $(72.0 - 84.9) \times (28.0 + 87.0)$
- 4) $\frac{(72.0 \times 84.9)}{100} + \frac{(28.0 \times 87.0)}{100}$

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

- | | |
|-------------------------------|----------------------------|
| 1) $\text{CaCl}_2(\text{aq})$ | 3) $\text{Cl}_2(\text{g})$ |
| 2) $\text{Hg}(\ell)$ | 4) $\text{Ca}(\text{s})$ |

33. Which phase change is accompanied by the release of heat?

- 1) $\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\ell)$ 3) $\text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{O}(\text{s})$
2) $\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\text{g})$ 4) $\text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{O}(\text{g})$

34. Base your answer to the following question on the information below.

Two isotopes of potassium are K-37 and K-42.

Explain, in terms of subatomic particles, why K-37 and K-42 are isotopes of potassium.

35. Base your answer to the following question on the table below.

First Ionization Energy of Selected Elements

Element	Atomic Number	First Ionization Energy (kJ/mol)
lithium	3	520
sodium	11	496
potassium	19	419
rubidium	37	403
cesium	55	376

Explain, in terms of atomic structure, why cesium has a *lower* first ionization energy than rubidium.

Answer Key
[New Exam]

1. 2

2. 4

3. 4

4. 3

5. 3

6. 4

7. 3

8. 1

9. 4

10. 1

11. 4

12. 2

13. 1

14. 3

15. 2

16. 2

17. 1

18. 3

19. 3

20. $q = mC\Delta T = (5.00 \text{ g})(4.71 \text{ J/g} \cdot \text{K})(30. \text{ K})$
 $(5)(4.71)(30)$
 710 J

21. The potential energy of the ammonia molecules increases and the average kinetic energy of the ammonia molecules remains the same.

22. 6850 J

23. 4

24. Examples: - Evaporate the water. - Decant the water. - filtration

25. Examples: - The water molecules, sodium ions, and chloride ions are uniformly mixed together.
- All particles distribute evenly.

26. compound or compounds

27. Examples: - heterogeneous - nonuniform

28. 3

29. 1

30. 3

31. 4

32. 4

33. 3

34. Acceptable responses include, but are not limited to:
same number of protons, different number of neutrons
K-37 has fewer neutrons than K-42.
same element; different number of neutrons

35. Acceptable responses include, but are not limited to:
As atomic radius increases, valence electrons are more easily removed.
The force of attraction between the nucleus and the valence electrons decreases down the group.
cesium has more shells, easier to remove electrons