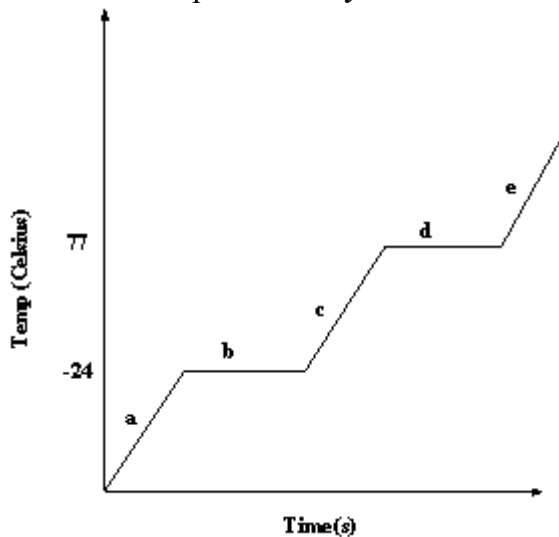


H Chem Summer Part II

Multiple Choice (1 point each)

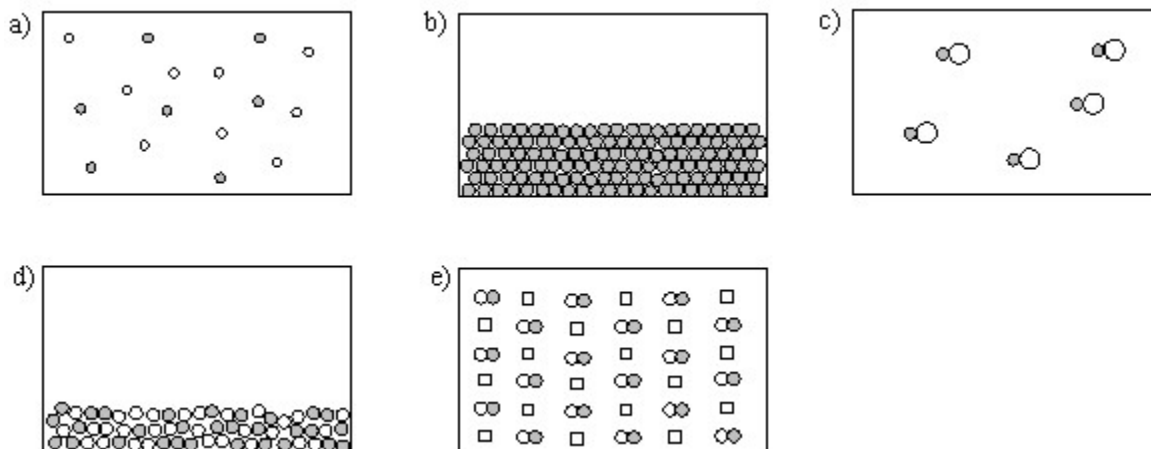
Identify the choice that best completes the statement or answers the question.

- ___ 1. Which letter represents *only* a solid substance?



- a. a
 - b. b
 - c. c
 - d. d
 - e. e
- ___ 2. The state of matter for an object that has a definite volume but not a definite shape is
- a. solid state
 - b. liquid state
 - c. gaseous state
 - d. elemental state
 - e. mixed state
- ___ 3. An example of a pure substance is
- a. elements
 - b. compounds
 - c. pure water
 - d. carbon dioxide
 - e. all of these
- ___ 4. A solution is also called a
- a. homogeneous mixture
 - b. heterogeneous mixture
 - c. pure mixture
 - d. compound
 - e. distilled mixture

Consider the following choices when answering questions 86-89.



- ___ 5. Which best represents a homogeneous mixture of an element and a compound?
- option a
 - option b
 - option c
 - option d
 - option e
- ___ 6. Which best represents a gaseous compound?
- option a
 - option b
 - option c
 - option d
 - option e
- ___ 7. Which best represents a solid element?
- option a
 - option b
 - option c
 - option d
 - option e
- ___ 8. Which best represents a heterogeneous mixture of two elements?
- option a
 - option b
 - option c
 - option d
 - option e

- ___ 9. The boiling of water is a
- physical change because the water merely disappears
 - physical change because the gaseous water is chemically the same as the liquid
 - chemical change because heat is needed for the process to occur
 - chemical change because a gas (steam) is given off
 - chemical and physical damage
- ___ 10. _____ are substances with constant composition that can be broken down into elements by chemical processes.
- Solutions
 - Mixtures
 - Compounds
 - Quarks
 - Heterogeneous mixtures
- ___ 11. Which of the following statements is false?
- Solutions are always homogeneous mixtures.
 - The terms “atom” and “element” can have different meanings.
 - Elements can exist as atoms or molecules.
 - Compounds can exist as atoms or molecules.
 - At least two of the above statements (A-D) are false.
- ___ 12. Which of the following statements from Dalton's atomic theory is no longer true, according to modern atomic theory?
- Elements are made up of tiny particles called atoms.
 - Atoms are not created or destroyed in chemical reactions.
 - All atoms of a given element are identical.
 - Atoms are indivisible in chemical reactions.
 - All of these statements are true according to modern atomic theory.
- ___ 13. The first scientist to show that atoms emit any negative particles was
- J. J. Thomson
 - Lord Kelvin
 - Ernest Rutherford
 - William Thomson
 - John Dalton
- ___ 14. The scientist whose alpha-particle scattering experiment led him to conclude that the nucleus of an atom contains a dense center of positive charge is
- J. J. Thomson
 - Lord Kelvin
 - Ernest Rutherford
 - William Thomson
 - John Dalton

- _____ 15. If the Thomson model of the atom had been correct, Rutherford would have observed:
- Alpha particles going through the foil with little or no deflection.
 - Alpha particles greatly deflected by the metal foil.
 - Alpha particles bouncing off the foil.
 - Positive particles formed in the foil.
 - None of the above observations is consistent with the Thomson model of the atom.
- _____ 16. Rutherford's experiment was important because it showed that:
- Radioactive elements give off alpha particles.
 - Gold foil can be made to be only a few atoms thick.
 - A zinc sulfide screen scintillates when struck by a charged particle.
 - The mass of the atom is uniformly distributed throughout the atom.
 - An atom is mostly empty space.
- _____ 17. Bromine exists naturally as a mixture of bromine-79 and bromine-81 isotopes. An atom of bromine-79 contains
- 35 protons, 44 neutrons, 35 electrons
 - 34 protons and 35 electrons, only
 - 44 protons, 44 electrons, and 35 neutrons
 - 35 protons, 79 neutrons, and 35 electrons
 - 79 protons, 79 electrons, and 35 neutrons
- _____ 18. Which of the following atomic symbols is incorrect?
- ${}^14_6\text{C}$
 - ${}^{37}_{17}\text{Cl}$
 - ${}^{32}_{15}\text{P}$
 - ${}^{39}_{19}\text{K}$
 - ${}^{14}_8\text{N}$
- _____ 19. Which among the following represent a set of isotopes? Atomic nuclei containing:
- 20 protons and 20 neutrons
 - 21 protons and 19 neutrons
 - 22 neutrons and 18 protons
 - 20 protons and 22 neutrons
 - 21 protons and 20 neutrons
- I, II, III
 - III, IV
 - I, V
 - I, IV and II, V
 - No isotopes are indicated.

- ___ 20. Which of the following statements are *true* of uranium-238?
- I. Its chemical properties will be exactly like those of uranium-235.
 - II. Its mass will be slightly different from that of an atom of uranium-235.
 - III. It will contain a different number of protons than an atom of uranium-235.
 - IV. It is more plentiful in nature than uranium-235.
- a. III, IV
 - b. I, II, III
 - c. I, II, IV
 - d. II, III, IV
 - e. all of these
- ___ 21. ${}_{20}^{40}\text{Ca}^{2+}$ has
- a. 20 protons, 20 neutrons, and 18 electrons
 - b. 22 protons, 20 neutrons, and 20 electrons
 - c. 20 protons, 22 neutrons, and 18 electrons
 - d. 22 protons, 18 neutrons, and 18 electrons
 - e. 20 protons, 20 neutrons, and 22 electrons
- ___ 22. A species with 12 protons and 10 electrons is
- a. Ne^{2+}
 - b. Ti^{2+}
 - c. Mg^{2+}
 - d. Mg
 - e. Ne^{2-}
- ___ 23. An ion is formed
- a. By either adding or subtracting protons from the atom.
 - b. By either adding or subtracting electrons from the atom
 - c. By either adding or subtracting neutrons from the atom.
 - d. All of the above are true.
 - e. Two of the above are true.
- ___ 24. The formula of water, H_2O , suggests:
- a. There is twice as much mass of hydrogen as oxygen in each molecule.
 - b. There are two hydrogen atoms and one oxygen atom per water molecule.
 - c. There is twice as much mass of oxygen as hydrogen in each molecule.
 - d. There are two oxygen atoms and one hydrogen atom per water molecule.
 - e. None of these.

- ___ 25. Which of the following has 61 neutrons, 47 protons, and 46 electrons?
- a. ${}_{61}^{80}\text{Pm}$
 - b. ${}_{47}^{108}\text{Ag}^+$
 - c. ${}_{46}^{108}\text{Pd}^-$
 - d. ${}_{47}^{108}\text{Cd}^+$
 - e. ${}_{47}^{108}\text{Ag}$
- ___ 26. How many protons and electrons does the most stable ion for oxygen have?
- | | # protons | # electrons |
|----|-----------|-------------|
| a. | 10 p | 8 e |
| b. | 8 p | 6 e |
| c. | 6 p | 8 e |
| d. | 8 p | 8 e |
| e. | 8 p | 10 e |

Short Answer (4 points)

Give any mathematical answers to the correct number of significant digits. Be sure to show all work to receive full credit.

27. Explain the main differences between a compound and a mixture.
28. Give two physical methods used by chemists to separate mixtures and identify the type of mixture best suited for each process.
29. List the four signs of a chemical change.
30. Naturally occurring iron contains 5.82% ${}_{26}^{54}\text{Fe}$, 91.66% ${}_{26}^{56}\text{Fe}$, 2.19% ${}_{26}^{57}\text{Fe}$, and 0.33% ${}_{26}^{58}\text{Fe}$. The respective atomic masses are 53.940 amu, 55.935 amu, 56.935 amu, and 57.933 amu. Calculate the average atomic mass of iron.
31. The element silver (Ag) has two naturally occurring isotopes, silver-109 and silver-107 with an average atomic mass of 107.868 amu. What is the relative abundance of each isotope of silver?
32. Draw a labeled diagram of Rutherford's experiment.

H Chem Summer Part II Answer Section

MULTIPLE CHOICE

- ANS: A PTS: 1
- ANS: B PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter | states of matter
MSC: Conceptual
- ANS: E PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter MSC: Conceptual
- ANS: A PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter | mixture
MSC: Conceptual
- ANS: E PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter | mixture
MSC: Conceptual
- ANS: C PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter | states of matter
MSC: Conceptual
- ANS: B PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter | element
MSC: Conceptual
- ANS: D PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter | mixture
MSC: Conceptual
- ANS: B PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter MSC: Conceptual
- ANS: C PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter MSC: Conceptual
- ANS: D PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter MSC: Conceptual
- ANS: C PTS: 1 DIF: Easy REF: 2.3
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | Dalton's atomic theory
MSC: Conceptual
- ANS: A PTS: 1 DIF: Easy REF: 2.4
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | structure of the atom |
discovery of electron MSC: Conceptual
- ANS: C PTS: 1 DIF: Easy REF: 2.4
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | structure of the atom |
nuclear model of atom MSC: Conceptual
- ANS: A PTS: 1 DIF: Easy REF: 2.4
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | structure of the atom |
nuclear model of atom MSC: Conceptual
- ANS: E PTS: 1 DIF: Easy REF: 2.4
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | structure of the atom |
nuclear model of atom MSC: Conceptual

17. ANS: A PTS: 1 DIF: Easy REF: 2.5
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | nuclear structure
MSC: Conceptual
18. ANS: E PTS: 1 DIF: Easy REF: 2.5
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | structure of the atom
MSC: Conceptual
19. ANS: D PTS: 1 DIF: Easy REF: 2.5
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | isotope
MSC: Conceptual
20. ANS: C PTS: 1 DIF: Easy REF: 2.5
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | isotope
MSC: Conceptual
21. ANS: A PTS: 1 DIF: Easy REF: 2.6
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | isotope
MSC: Conceptual
22. ANS: C PTS: 1 DIF: Easy REF: 2.6
KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | nuclear structure
MSC: Conceptual
23. ANS: B PTS: 1 DIF: Easy REF: 2.6
KEY: Chemistry | general chemistry | early atomic theory | chemical substance | chemical formula | ionic
substance MSC: Conceptual
24. ANS: B PTS: 1 DIF: Easy REF: 2.6
KEY: Chemistry | general chemistry | early atomic theory | chemical substance | chemical formula |
molecular substance MSC: Conceptual
25. ANS: B PTS: 1 DIF: Easy REF: 2.7
KEY: Chemistry | general chemistry | early atomic theory | periodic table
MSC: Conceptual
26. ANS: E PTS: 1 DIF: Moderate REF: 2.8
KEY: Chemistry | general chemistry | early atomic theory | periodic table | group
MSC: Conceptual

SHORT ANSWER

27. ANS:
A mixture may be separated into pure substances by physical means, while a compound requires chemical means to separate it into elements.
A compound has constant composition (always the same ratio of elements), while a mixture may have varying composition.
See Sec. 1.9 of Zumdahl, *Chemistry*.
- PTS: 1 DIF: Easy REF: 1.9
KEY: Chemistry | general chemistry | general concepts | matter | compound; mixture
MSC: Conceptual
28. ANS:
Three common methods are distillation, filtration, and chromatography.
Distillation is useful for mixtures of volatile liquids (or mixtures of gases that can be condensed).
Filtration is useful to separate a mixture of a solid and a liquid.
See Sec. 1.9 of Zumdahl, *Chemistry*.

PTS: 1 DIF: Moderate REF: 1.9

KEY: Chemistry | general chemistry | general concepts | matter | mixture

MSC: Conceptual

29. ANS:

ppt, color, energy, gas

PTS: 1

30. ANS:

55.85 amu

See Sec. 3.2 of Zumdahl, *Chemistry*.

$0.0582(53.940 \text{ amu}) + 0.9166(55.935 \text{ amu}) + 0.0219(56.935 \text{ amu}) + 0.0033(57.933 \text{ amu}) = 55.85 \text{ amu}$

PTS: 1 DIF: Easy REF: 3.2

KEY: Chemistry | general chemistry | early atomic theory | atomic theory of matter | atomic weight | mass spectroscopy MSC: Quantitative

31. ANS:

Yes!

PTS: 1

32. ANS:

source, beam, gold foil, detector

PTS: 1