

Chem 1A Chapter 5 and 21 Practice Test Grosser (2013-2014)**Multiple Choice**

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

- _____ 1. The periodic law states that the properties of elements are periodic functions of their atomic numbers. What determines the position of each element in the periodic table?
- mass number
 - number of neutrons
 - number of protons
 - number of isotopes
- _____ 2. Refer to the figure below. To which group does magnesium belong?

	1 H Hydrogen 1.01					Group 18 2 He Helium 4.00
1		Group 1	Group 2		Group 17	
2	3 Li Lithium 6.94		4 Be Beryllium 9.01		9 F Fluorine 19.00	10 Ne Neon 20.18
3	11 Na Sodium 22.99		12 Mg Magnesium 24.30		17 Cl Chlorine 35.45	18 Ar Argon 39.95
4	19 K Potassium 39.10		20 Ca Calcium 40.08		35 Br Bromine 79.90	36 Kr Krypton 83.80
5	37 Rb Rubidium 85.47		38 Sr Strontium 87.62		53 I Iodine 126.90	54 Xe Xenon 131.29
6	55 Cs Cesium 132.90		56 Ba Barium 137.33		85 At Astatine (210)	86 Rn Radon (222)
7	87 Fr Francium (223)		88 Ra Radium (226)			

- alkaline-earth metals
 - transition elements
 - halogens
 - actinides
- _____ 3. A horizontal row of blocks in the periodic table is called a(n)
- group.
 - period.
 - family.
 - octet.
- _____ 4. The elements in Group 1 are also known as the
- alkali metals.
 - rare-earth series.
 - Period 1 elements.
 - actinide series.
- _____ 5. In a row in the periodic table, as the atomic number increases, the atomic radius generally
- decreases.
 - remains constant.
 - increases.
 - becomes immeasurable.

- _____ 6. In the alkaline-earth group, atoms with the smallest radii
- are the most reactive.
 - have the largest volume.
 - are all gases.
 - have the highest ionization energies.
- _____ 7. Which is the best reason that the atomic radius generally increases with atomic number in each group of elements?
- The nuclear charge increases.
 - The number of neutrons increases.
 - The number of occupied energy levels increases.
 - A new octet forms.
- _____ 8. How does the energy required to remove an electron from an atom change as you move left to right in Period 4 from potassium through iron?
- It generally increases.
 - It generally decreases.
 - It does not change.
 - It varies unpredictably.
- _____ 9. The number of valence electrons in Group 17 elements is
- 7.
 - 8.
 - 17.
 - equal to the period number.
- _____ 10. Among the *d*-block elements, as atomic radii decrease, electronegativity values
- remain constant.
 - increase.
 - decrease.
 - drop to zero.
- _____ 11. Which of the following categories includes the majority of the elements?
- metalloids
 - liquids
 - metals
 - nonmetals
- _____ 12. Of the elements Pt, V, Li, and Kr, which is a nonmetal?
- Pt
 - V
 - Li
 - Kr
- _____ 13. In which of the following sets is the symbol of the element, the number of protons, and the number of electrons given correctly?
- In, 49 protons, 49 electrons
 - Zn, 30 protons, 60 electrons
 - Cs, 55 protons, 132.9 electrons
 - F, 19 protons, 19 electrons
- _____ 14. Which subatomic particle plays the greatest part in determining the properties of an element?
- proton
 - electron
 - neutron
 - none of the above
- _____ 15. How does atomic radius change from left to right across a period in the periodic table?
- It tends to decrease.
 - It tends to increase.
 - It first increases, then decreases.
 - It first decreases, then increases.
- _____ 16. What element in the second period has the largest atomic radius?
- carbon
 - lithium
 - potassium
 - neon
- _____ 17. The metals in Groups 1A, 2A, and 3A _____.
- gain electrons when they form ions
 - all form ions with a negative charge
 - all have ions with a 1⁺ charge
 - lose electrons when they form ions
- _____ 18. What is the element with the highest electronegativity value?
- cesium
 - helium
 - calcium
 - fluorine

- ____ 19. Which of the following elements has the smallest ionic radius?
- Li
 - K
 - O
 - S
- ____ 20. Which of the following factors contributes to the decrease in ionization energy within a group in the periodic table as the atomic number increases?
- increase in atomic size
 - increase in size of the nucleus
 - increase in number of protons
 - fewer electrons in the highest occupied energy level
- ____ 21. As you move from left to right across the second period of the periodic table ____.
- ionization energy increases
 - atomic radii increase
 - electronegativity decreases
 - atomic mass decreases
- ____ 22. Which of the following is the correct relationship between mass and energy?
- $E = mc^2$
 - $E = mc$
 - $E^2 = mc$
 - $E = m^2c$
- ____ 23. Balance the following equation: ${}_{92}^{238}\text{U} + \text{_____} \rightarrow {}_{92}^{239}\text{U}$
- ${}^4_2\text{He}$
 - 1_0n
 - ${}^1_1\text{H}$
 - ${}^0_{-1}e$
- ____ 24. Balance the following equation: ${}^9_4\text{Be} + {}^4_2\text{He} \rightarrow {}^{12}_6\text{C} + \text{_____}$
- ${}^4_2\text{He}$
 - 1_0n
 - ${}^1_1\text{H}$
 - ${}^0_{-1}e$
- ____ 25. The spontaneous disintegration of a nucleus into a slightly lighter and more stable nucleus, accompanied by emission of particles, electromagnetic radiation, or both, is
- nuclear fusion.
 - nuclear radiation.
 - radioactive decay.
 - nuclear fission.
- ____ 26. Which of the following particles has the same mass as an electron but a positive charge and is sometimes emitted from the nucleus during radioactive decay?
- beta particle
 - alpha particle
 - positron
 - gamma ray
- ____ 27. Alpha particles are
- electrons.
 - helium nuclei.
 - electromagnetic waves.
 - neutrons.
- ____ 28. Beta particles are
- electrons.
 - helium nuclei.
 - electromagnetic waves.
 - neutrons.
- ____ 29. Gamma rays are
- electrons.
 - helium nuclei.
 - electromagnetic waves.
 - neutrons.
- ____ 30. What is the half-life of an isotope if 125 g of a 500 g sample of the isotope remain after 3.0 years?
- 1.5 years
 - 2.5 years
 - 3.5 years
 - 4.5 years

- _____ 31. According to the table below, if a ancient fabric contains 12.5% as much carbon-14 as cotten being formed today, how old is the fabric?

Nuclide	Half-Life (years)
carbon-14	5.71×10^3
potassium-40	1.26×10^9
radium-226	1.60×10^3
thorium-230	7.54×10^4
uranium-235	7.04×10^8

- a. 11,420 years
b. 17,130 years
c. 22,890 years
d. 44,897 years
- _____ 32. Which of the following generally have the lowest penetrating ability?
a. alpha particles
b. beta particles
c. gamma rays
d. All have the same penetrating ability.
- _____ 33. Which of the following processes produces nuclei of lower mass than the reactants?
a. fission
b. fusion
c. Both (a) and (b)
d. Neither (a) nor (b)
- _____ 34. Which of the following is a fission reaction?
a. hydrogen-2 and hydrogen-3 combining to form a helium-4 atom and a neutron
b. carbon-12 and hydrogen-1 combining to form a nitrogen-13 atom
c. uranium-235 absorbing a neutron and breaking into barium-141, krypton-92, and three neutrons
d. a glucose molecule being metabolized with oxygen to form carbon dioxide and water
- _____ 35. Which of the following is a fusion reaction?
a. uranium-235 absorbing a neutron and splitting into xenon-140, strontium-94, and two neutrons
b. hydrochloric acid combining with sodium hydroxide to form NaCl and water
c. carbon-14 decaying into nitrogen-14 and a beta particle
d. curium-246 combining with carbon-12 to form nobelium-254 and four neutrons
- _____ 36. What is the function of shielding in a nuclear reactor?
a. to cool the reactor
b. to contain radiation
c. to absorb free neutrons
d. to slow neutrons
- _____ 37. An unstable nucleus _____.
a. increases its nuclear mass by fission
b. increases its half-life
c. emits energy when it decays
d. expels all of its protons
- _____ 38. What particle is emitted in alpha radiation?
a. electron
b. photon
c. helium nucleus
d. hydrogen nucleus
- _____ 39. A beta particle is a(n) _____.
a. photon
b. electron
c. helium nucleus
d. hydrogen nucleus

- _____ 40. What is the change in atomic mass when an atom emits gamma radiation?
- decreases by 2
 - decreases by 1
 - remains the same
 - increases by 1
- _____ 41. What is the change in atomic number when an atom emits a beta particle?
- decreases by 2
 - decreases by 1
 - increases by 2
 - increases by 1
- _____ 42. Which symbol is used for an alpha particle?
- ${}^2_1\text{He}$
 - ${}^2_2\text{He}$
 - ${}^4_1\text{He}$
 - ${}^4_2\text{He}$
- _____ 43. Which of the following materials is necessary to stop an alpha particle?
- three feet of concrete
 - three inches of lead
 - single sheet of aluminum foil
 - single sheet of paper
- _____ 44. What particle decomposes to produce the electron of beta radiation?
- proton
 - neutron
 - electron
 - positron
- _____ 45. Which of the following materials is necessary to stop a beta particle?
- three feet of concrete
 - three inches of lead
 - thin pieces of wood
 - single sheet of paper
- _____ 46. Which of the following is NOT a reason that water is used to store spent fuel rods from nuclear power plants?
- Water cools the spent rods.
 - Water increases the speed of the chain reaction in the fuel rods.
 - Water acts as a radiation shield to reduce the radiation levels.
 - Water protects nuclear power plant workers from the high temperature and radiation of the fuel rods.
- _____ 47. What is the change in atomic mass number when an atom emits an alpha particle?
- decreases by 2
 - decreases by 4
 - increases by 2
 - increases by 4
- _____ 48. To what element does polonium-208 (atomic number 84) decay when it emits an alpha particle?
- ${}^{210}_{82}\text{Pb}$
 - ${}^{210}_{82}\text{Po}$
 - ${}^{204}_{82}\text{Pb}$
 - ${}^{214}_{86}\text{Rn}$
- _____ 49. What happens in a chain reaction?
- Products that start a new reaction are released.
 - Reactants that have two parts split.
 - Products that are radioactive are lost.
 - Radioactive reactants are deposited on control rods.
- _____ 50. Controlled nuclear chain reactions _____.
- take place in nuclear reactors
 - are always fusion reactions
 - never produce radioactive by-products
 - are characteristic of atomic bombs
- _____ 51. What is the main detector of a scintillation counter?
- ionizable gas in a metal tube
 - phosphor-covered surface
 - plates of ionizable plastic
 - potassium metal surface

- _____ 52. Radiation therapy is used to _____.
a. study reaction mechanisms
b. detect elements
c. treat cancer
d. initiate neutron activation analysis

CONCEPT MASTERY

Use the diagrams to answer the questions or complete the statements.

Element	Atomic mass (amu)	Density (g/cm ³)	Melting point (°C)	Boiling point (°C)
X	10	3		600
Y		4	200	800
Z	20		300	

Figure 5-1

- _____ 53. In Figure 5-1, what is the approximate density of element Z?
a. 2 g/cm³
b. 5 g/cm³
c. 10 g/cm³
d. 12 g/cm³
- _____ 54. In Figure 5-1, what is the approximate melting point of element X?
a. 100°C
b. 190°C
c. 250°C
d. 400°C

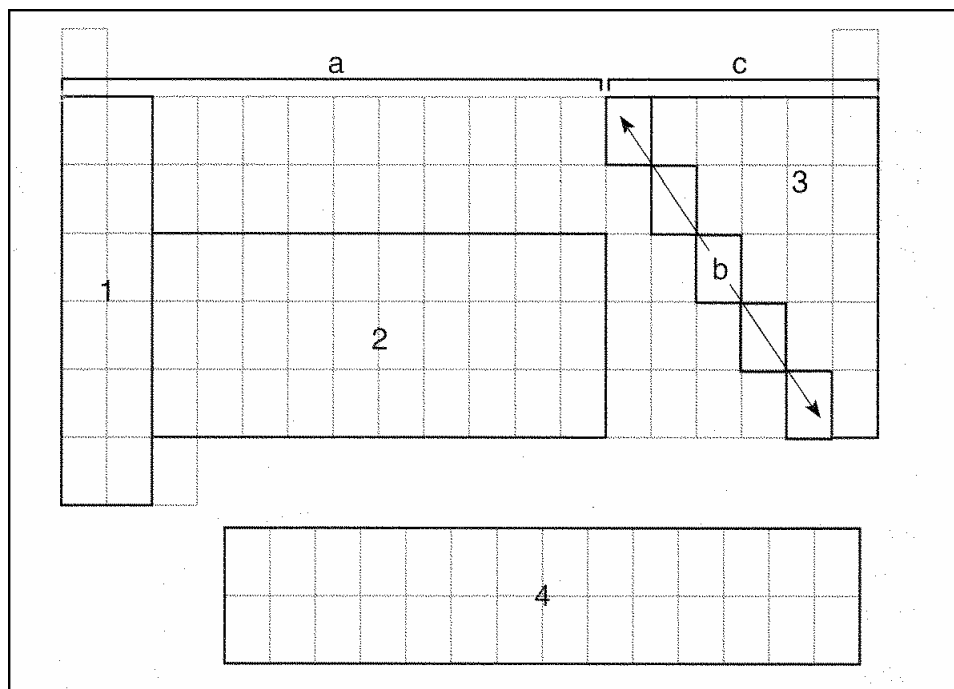


Figure 5-3

- _____ 55. Which numbered region in Figure 5-3 represents the *f*-block of elements?
- | | |
|------|------|
| a. 1 | c. 3 |
| b. 2 | d. 4 |
- _____ 56. Which numbered region in Figure 5-3 represents the *d*-block of elements?
- | | |
|------|------|
| a. 1 | c. 3 |
| b. 2 | d. 4 |
- _____ 57. Which numbered region in Figure 5-3 represents the inner transition metals?
- | | |
|------|------|
| a. 1 | c. 3 |
| b. 2 | d. 4 |
- _____ 58. Which lettered region in Figure 5-3 represents the semimetals?
- | | |
|------|------------------------|
| a. a | c. c |
| b. b | d. none of the regions |

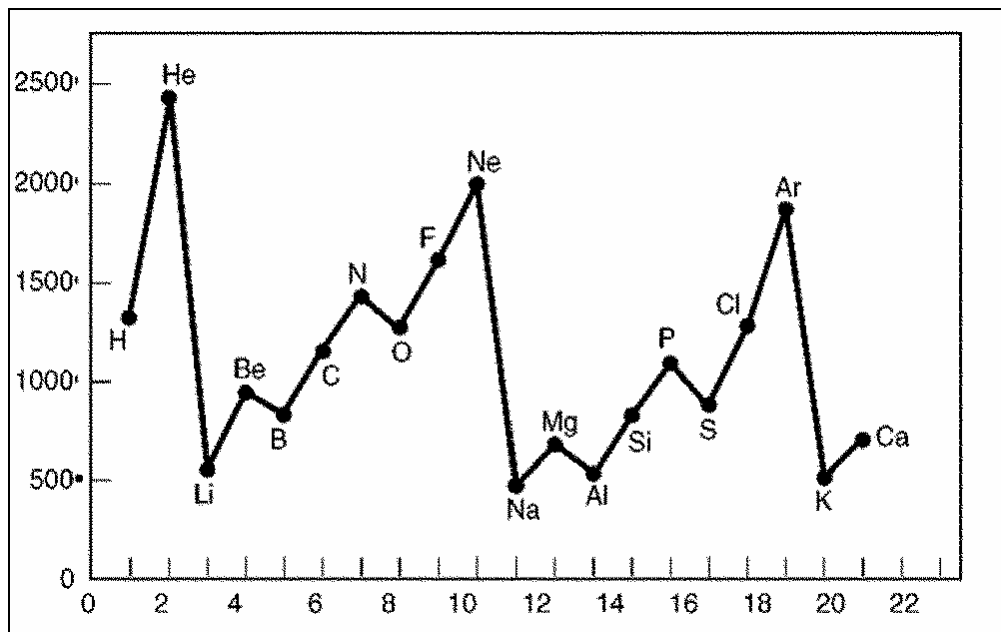


Figure 5-4

- ____ 59. Based on Figure 5-4, what general trend exists for first ionization energy down a group?
- Ionization energy increases.
 - Ionization energy decreases.
 - Ionization energy remains fairly constant.
 - Ionization energy first increases, then decreases.

CONTENT REVIEW

- ____ 60. The beta decay of ${}_{36}^{87}\text{Rb}$ produces
- | | |
|------------------------------|------------------------------|
| a. ${}_{36}^{87}\text{Kr}$. | c. ${}_{35}^{83}\text{Br}$. |
| b. ${}_{38}^{87}\text{Sr}$. | d. ${}_{37}^{86}\text{Rb}$. |

CONCEPT MASTERY

Use the diagrams to answer the questions or complete the statements.

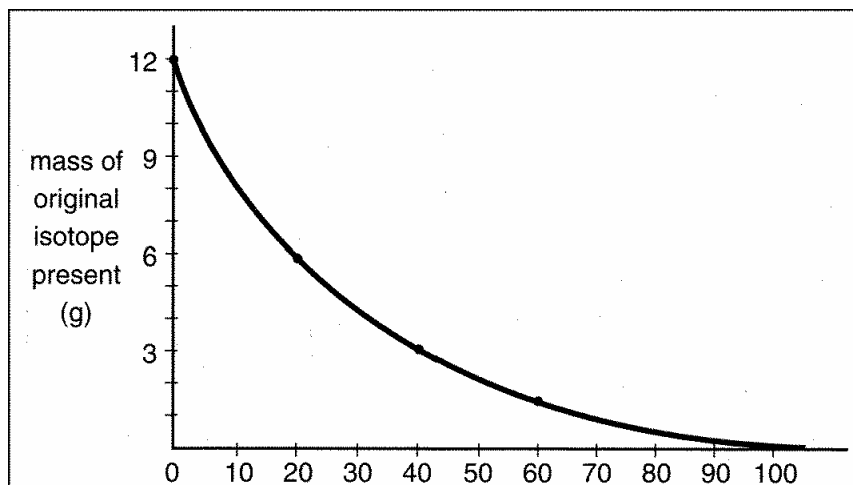


Figure 24-1 (Time in Minutes)

- _____ 61. At what time in Figure 24-1 will there be 1.5 grams of the isotope remaining?
- | | |
|---------------|---------------|
| a. 11 minutes | c. 40 minutes |
| b. 20 minutes | d. 60 minutes |
- _____ 62. What mass of the isotope in Figure 24-1 will remain after the end of one half-life period?
- | | |
|------------|-------------|
| a. 0 grams | c. 12 grams |
| b. 6 grams | d. 24 grams |
- _____ 63. How much of the isotope in Figure 24-1 remains at the end of two half-life periods?
- | | |
|-------------|--------------|
| a. 48 grams | c. 3 grams |
| b. 6 grams | d. 1.5 grams |
- _____ 64. How much time will have passed at the end of six half-life periods in Figure 24-1?
- | | |
|---------------|----------------|
| a. 72 minutes | c. 100 minutes |
| b. 80 minutes | d. 120 minutes |

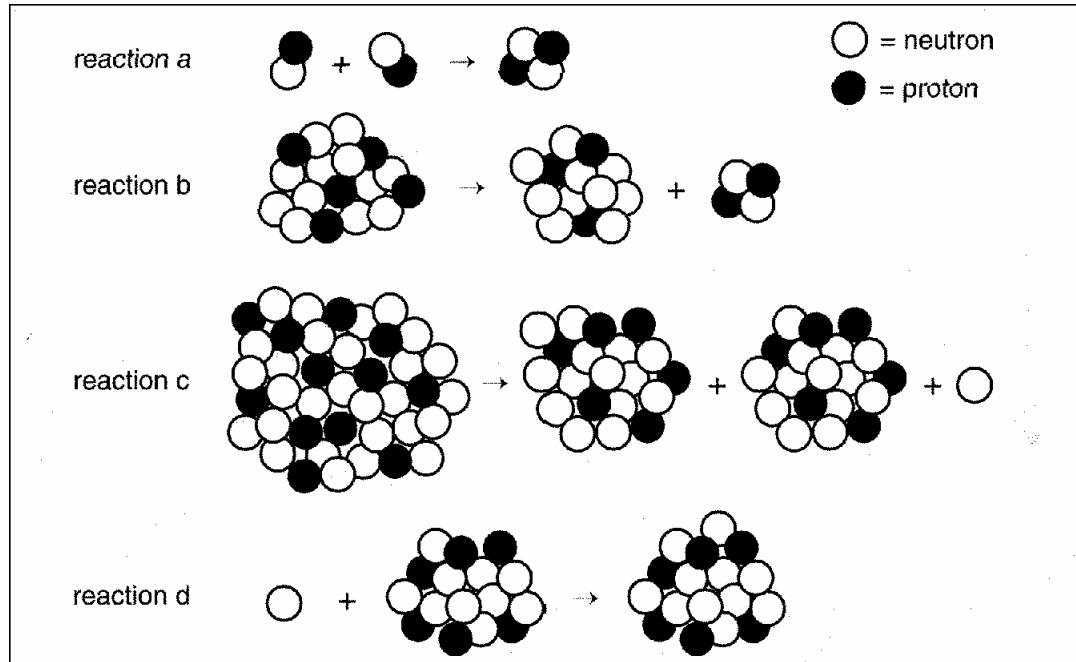


Figure 24-3

- _____ 69. Which of the reactions in Figure 24-3 illustrates nuclear fission?
- a. a
 - b. b
 - c. c
 - d. d