

- ___ 11. The unit m^3 measures
- length.
 - area.
 - volume.
 - time.
- ___ 12. Which of these is the abbreviation for the SI base unit of time?
- hr
 - h
 - sec
 - s
- ___ 13. Which of these statements about density is true?
- Larger objects are denser.
 - Density does not depend on temperature.
 - Density is the concentration of matter in a substance.
 - The density of an object depends on the force of gravity.
- ___ 14. What is the density of 37.72 g of material whose volume is 6.80 cm^3 ?
- 0.180 g/cm^3
 - 5.55 g/cm^3
 - 30.9 g/cm^3
 256. g/cm^3
- ___ 15. The number of grams equal to 0.5 kg is
- 0.0005.
 - 0.005.
 - 500.
 - 5000.
- ___ 16. How many hours are in 1 year (365 days)?
- 168 h
 - 720 h
 - 8 760 h
 - 455 520 h
- ___ 17. These values were recorded as the mass of products when a chemical reaction was carried out three separate times: 8.83 g; 8.84 g; 8.82 g. The mass of products from that reaction is 8.60 g. The values are
- accurate, but not precise.
 - precise, but not accurate.
 - both accurate and precise.
 - neither accurate nor precise.
- ___ 18. Which of these measurements has been expressed to three significant figures?
- 0.052 g
 - 0.202 g
 - 3.065 g
 - 500 g
- ___ 19. Which of these measurements has only non-significant zeros?
- 0.0037 mL
 - 60.0 mL
 400. mL
 - 506 mL
- ___ 20. The dimensions of a rectangular solid are measured to be 1.27 cm, 1.3 cm, and 2.5 cm. The volume should be recorded as
- 4.128 cm^3 .
 - 4.12 cm^3 .
 - 4.13 cm^3 .
 - 4.1 cm^3 .
- ___ 21. How many significant figures would the answer to the following calculation have?
- $3.475 \times 1.97 + 2.4712$ is
- 2
 - 3
 - 4
 - 5

- ___ 22. The average distance between the Earth and the moon is 386 000 km. Expressed in scientific notation, this distance is written as
- 386×10^3 km.
 - 39×10^4 km.
 - 3.9×10^5 km.
 - 3.86×10^5 km.
- ___ 23. When 1.92×10^{-6} kg is divided by 6.8×10^2 mL, the quotient equals
- 2.8×10^{-4} kg/mL.
 - 2.8×10^{-5} kg/mL.
 - 2.8×10^{-8} kg/mL.
 - 2.8×10^{-9} kg/mL.
- ___ 24. An atom is electrically neutral because
- neutrons balance the protons and electrons.
 - nuclear forces stabilize the charges.
 - the numbers of protons and electrons are equal.
 - the numbers of protons and neutrons are equal.
- ___ 25. Nuclear forces exists because the particles in the nucleus are
- oppositely charged.
 - close together.
 - highly energized.
 - moving very fast.
- ___ 26. Most of the volume of an atom is occupied by the
- nucleus.
 - nuclides.
 - electrons.
 - protons.
- ___ 27. The smallest unit of an element that can exist either alone or in combination with other such particles of the same or different elements is the
- electron.
 - proton.
 - neutron.
 - atom.
- ___ 28. As the atomic number increases, the number of electrons in a neutral atom
- decreases.
 - increases.
 - remains the same.
 - is undetermined.
- ___ 29. Chlorine has atomic number 17 and mass number 35. It has
- 17 protons, 17 electrons, and 18 neutrons.
 - 35 protons, 35 electrons, and 17 neutrons.
 - 17 protons, 17 electrons, and 52 neutrons.
 - 18 protons, 18 electrons, and 17 neutrons.
- ___ 30. Neon (symbol Ne) contains 10 neutrons. It also contains
- 12 protons.
 - 22 protons.
 - 22 electrons.
 - 10 protons.
- ___ 31. The frequency of electromagnetic radiation is measured in waves/second, or
- nanometers.
 - quanta.
 - hertz.
 - joules.
- ___ 32. The energy of a photon is related to its
- mass.
 - speed.
 - frequency.
 - size.

- ___ 33. A emission spectrum is produced when an electron moves from one energy level
- to a higher energy level.
 - to a lower energy level.
 - into the nucleus.
 - to another position in the same sublevel.
- ___ 34. The electron in a hydrogen atom has its lowest total energy when the electron is in its
- neutral state.
 - excited state.
 - ground state.
 - quantum state.
- ___ 35. The change of an atom from an excited state to the ground state always requires
- absorption of energy.
 - emission of electromagnetic radiation.
 - release of visible light.
 - an increase in electron energy.
- ___ 36. Isotopes of the same element have
- the same atomic number.
 - the same mass number.
 - the same atomic mass.
 - the same number of electrons.
- ___ 37. The average atomic mass of lead is 207.2 amu. The most abundant isotope is likely to be
- lead-204
 - lead-206
 - lead-207
 - lead-208
- ___ 38. Metals tend to form
- anions.
 - cations.
 - neither anions nor cations.
 - both anions and cations.
- ___ 39. Metalloids have properties that are
- similar to metals
 - similar to non-metals
 - similar to halogens
 - in between metals and non-metals.
- ___ 40. Which group of metals are the most reactive?
- Rare earth metals
 - Transition metals
 - Alkaline earth metals
 - Alkali metals
- ___ 41. Which of the following groups are the most reactive?
- Noble gases
 - halogens
 - metalloids
 - Non-metals
- ___ 42. Which group has its last electrons in the p sublevel?
- Alkaline earth metals
 - Rare earth metals
 - Halogens
 - Transition metals

- ___ 43. Which type of electromagnetic radiation has the shortest wavelengths?
a. x-rays
b. radio waves
c. microwaves
d. ultraviolet waves
- ___ 44. Which color has the longest wavelength?
a. green
b. orange
c. blue
d. yellow
- ___ 45. Which has more thermal energy?
a. ice at -5°C
b. ice at -15°C
c. ice at -10°C
d. ice at 0°C
- ___ 46. Which has more interaction energy?
a. carbon dioxide gas
b. liquid carbon dioxide
c. solid carbon dioxide
d. they all have the same
- ___ 47. Which element's electron configuration ends in $6p^4$?
a. tellurium
b. polonium
c. tungsten
d. uranium
- ___ 48. Which element's electron configuration ends in $5d^2$?
a. zirconium
b. titanium
c. hafnium
d. neodymium
- ___ 49. Which has the highest electronegativity?
a. chlorine
b. astatine
c. potassium
d. magnesium
- ___ 50. Which has the strongest Coulombic attraction?
a. selenium
b. chromium
c. sulfur
d. aluminum
- ___ 51. Coulombic attraction has an indirect relationship with
a. atomic radius.
b. electronegativity.
c. ionization energy.
d. electron affinity.
- ___ 52. Which of the following energy sublevels does not exist?
a. $5d$
b. $3d$
c. $4s$
d. $7f$

- ___ 53. Which of the following is an isotope?
- Chlorine-37
 - Calcium-40
 - Hydrogen-2
 - They are all isotopes.
- ___ 54. In a stable nucleus which force is stronger?
- nuclear strong force
 - electrostatic force
 - gravitational force
 - they are equal
- ___ 55. According to the quantum theory of an atom, in an orbital
- an electron's position cannot be known precisely.
 - an electron has no energy.
 - electrons cannot be found.
 - electrons travel around the nucleus on paths of specific radii.
- ___ 56. How many quantum numbers are needed to describe the energy state of an electron in an atom?
- 1
 - 2
 - 3
 - 4
- ___ 57. Each atomic orbital is described by its principal quantum number followed by the
- value of the electron's spin state.
 - magnetic quantum number.
 - number of electrons in the sublevel.
 - letter of the sublevel.
- ___ 58. A spherical electron cloud surrounding an atomic nucleus would best represent
- an s orbital.
 - a p_x orbital.
 - a combination of p_x and p_y orbitals.
 - a combination of an s and a p_x orbital.
- ___ 59. In the electron configuration for scandium (atomic number 21), what is the notation for the three highest-energy electrons?
- $3d^1 4s^2$
 - $4s^3$
 - $3d^3$
 - $4s^2 4p^1$
- ___ 60. What is the electron configuration for nitrogen, atomic number 7?
- $1s^2 2s^2 2p^3$
 - $1s^2 2s^3 2p^2$
 - $1s^2 2s^3 2p^1$
 - $1s^2 2s^2 2p^2 3s^1$

Completion. Complete each statement.

61. A direct relationship between two variables means that as the one variable increases the other variable

_____.

62. An indirect relationship between two variables means that as the one variable increases the other variable

_____.

63. Ionization energy _____ as you go across a period from _____ to _____.
64. The part of the atom that has the highest density is the _____ .
65. Magnesium-24 has _____ neutrons.

Short Answer. *Answer the questions below in a complete sentence.*

66. Why does Coulombic attraction decrease down a group?
67. Explain the differences between qualitative and quantitative observations.
68. Distinguish between precision and accuracy.
69. What is the atomic number of an atom?
70. What is the mass number of an atom?

Open Answer. *Answer the questions as directed in the problems below.*

71. Explain why electronegativity increases as the atomic radius decreases.
72. Draw a visual model of a neutral boron (symbol B) atom. Be sure to label the name and number of subatomic particles and the two regions of the atom.

Chemistry Mid-Term Practice Exam Answer Section

MULTIPLE CHOICE

- ANS: C PTS: 1 DIF: I REF: 2
OBJ: 1 STA: 3.4.12.A
- ANS: C PTS: 1 DIF: I REF: 2
OBJ: 1 STA: 3.4.12.A
- ANS: D PTS: 1 DIF: III REF: 2
OBJ: 1 STA: 3.4.12.A
- ANS: B PTS: 1 DIF: II REF: 2
OBJ: 3 STA: 3.4.12.A.4
- ANS: D PTS: 1 DIF: II REF: 2
OBJ: 3 STA: 3.4.12.A.4
- ANS: D PTS: 1 DIF: I REF: 1
OBJ: 3 STA: 3.1.12.E.2
- ANS: B PTS: 1 DIF: I REF: 1
OBJ: 3 STA: 3.1.12.E.2
- ANS: D PTS: 1 DIF: I REF: 2
OBJ: 2 STA: 3.1.12.D.3
- ANS: D PTS: 1 DIF: I REF: 2
OBJ: 2 STA: 3.1.12.D.3
- ANS: D PTS: 1 DIF: I REF: 2
OBJ: 2 STA: 3.1.12.D.3
- ANS: C PTS: 1 DIF: I REF: 2
OBJ: 2 STA: 3.1.12.D.3
- ANS: D PTS: 1 DIF: I REF: 2
OBJ: 2 STA: 3.1.12.D.3
- ANS: C PTS: 1 DIF: I REF: 2
OBJ: 4 STA: 3.1.12.D.3
- ANS: B

Solution:

$$D = \frac{m}{V}$$

$$D = \frac{37.72 \text{ g}}{6.80 \text{ cm}^3} = 5.55 \text{ g/cm}^3$$

- PTS: 1 DIF: III REF: 2 OBJ: 4
STA: 3.1.12.D.3
- ANS: C PTS: 1 DIF: II REF: 2
OBJ: 5 STA: 3.1.12.D.1
 - ANS: C

Solution: $1 \text{ year} \times \frac{365 \text{ days}}{1 \text{ year}} \times \frac{24 \text{ h}}{1 \text{ day}} = 8760 \text{ h}$

PTS: 1 DIF: II REF: 2 OBJ: 5

	STA: 3.1.12.D.1			
17.	ANS: B OBJ: 1	PTS: 1 STA: 3.2.12.B.1	DIF: II	REF: 3
18.	ANS: B OBJ: 2	PTS: 1 STA: 3.2.12.B.1	DIF: II	REF: 3
19.	ANS: A OBJ: 2	PTS: 1 STA: 3.2.12.B.1	DIF: II	REF: 3
20.	ANS: D OBJ: 3	PTS: 1 STA: 3.2.12.B.1	DIF: III	REF: 3
21.	ANS: B OBJ: 3	PTS: 1 STA: 3.2.12.B.1	DIF: III	REF: 3
22.	ANS: D OBJ: 4	PTS: 1 STA: 3.2.12.B.1	DIF: III	REF: 3
23.	ANS: D OBJ: 4	PTS: 1 STA: 3.2.12.B.1	DIF: III	REF: 3
24.	ANS: C OBJ: 3	PTS: 1	DIF: I	REF: 2
25.	ANS: B OBJ: 3	PTS: 1	DIF: I	REF: 2
26.	ANS: C OBJ: 4	PTS: 1	DIF: I	REF: 2
27.	ANS: D OBJ: 4	PTS: 1	DIF: I	REF: 2
28.	ANS: B OBJ: 2	PTS: 1 STA: 3.4.12.A.3	DIF: I	REF: 3
29.	ANS: A OBJ: 3	PTS: 1 STA: 3.4.12.A.3	DIF: III	REF: 3
30.	ANS: D OBJ: 3	PTS: 1 STA: 3.4.12.A.3	DIF: III	REF: 3
31.	ANS: C OBJ: 1	PTS: 1 STA: 3.4.12.C.1	DIF: I	REF: 1
32.	ANS: C OBJ: 3	PTS: 1	DIF: I	REF: 1
33.	ANS: B OBJ: 3	PTS: 1	DIF: II	REF: 1
34.	ANS: C OBJ: 4	PTS: 1	DIF: I	REF: 1
35.	ANS: B OBJ: 4	PTS: 1	DIF: II	REF: 1
36.	ANS: A OBJ: 1	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 1
37.	ANS: B OBJ: 1	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 1
38.	ANS: A OBJ: 2	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 1
39.	ANS: A OBJ: 2	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 1
40.	ANS: A OBJ: 3	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 1

41.	ANS: A OBJ: 3	PTS: 1 STA: 3.4.12.A.4	DIF: II	REF: 1
42.	ANS: B OBJ: 3	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 1
43.	ANS: B OBJ: 4	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 1
44.	ANS: B OBJ: 1	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 2
45.	ANS: A OBJ: 2	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 2
46.	ANS: B OBJ: 3	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 2
47.	ANS: A OBJ: 1	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 3
48.	ANS: A OBJ: 1	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 3
49.	ANS: C OBJ: 1	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 3
50.	ANS: B OBJ: 1	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 4
51.	ANS: B OBJ: 2	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 4
52.	ANS: C OBJ: 4	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 4
53.	ANS: C OBJ: 4	PTS: 1 STA: 3.4.12.A.4	DIF: II	REF: 4
54.	ANS: A OBJ: 4	PTS: 1 STA: 3.4.12.A.4	DIF: I	REF: 4
55.	ANS: A OBJ: 3	PTS: 1	DIF: I	REF: 2
56.	ANS: D OBJ: 4	PTS: 1	DIF: I	REF: 2
57.	ANS: D OBJ: 4	PTS: 1	DIF: I	REF: 2
58.	ANS: A OBJ: 5	PTS: 1	DIF: II	REF: 2
59.	ANS: A OBJ: 3	PTS: 1	DIF: III	REF: 3
60.	ANS: A OBJ: 3	PTS: 1	DIF: II	REF: 3

COMPLETION

61.	ANS: increases			
	PTS: 1	DIF: I	REF: 1	OBJ: 1
	STA: 3.4.12.A			
62.	ANS: decreases			

- PTS: 1 DIF: I REF: 1 OBJ: 1
STA: 3.4.12.A
63. ANS: state, solid, liquid
- PTS: 1 DIF: II REF: 2 OBJ: 2
64. ANS: liquid
- PTS: 1 DIF: II REF: 2 OBJ: 3
STA: 3.4.12.A.4
65. ANS: gaseous
- PTS: 1 DIF: I REF: 2 OBJ: 3
STA: 3.4.12.A.4

SHORT ANSWER

66. ANS:
Gas particles do not attract one another, and can easily and quickly move from one place to another.
- PTS: 1 DIF: I REF: 2 OBJ: 3
STA: 3.4.12.A.4
67. ANS:
In qualitative observations, the data are descriptive and non-numerical. In quantitative observations, the data are numerical.
- PTS: 1 DIF: II REF: 1 OBJ: 2
STA: 3.2.12.C.4
68. ANS:
Precision is how close a set of measurements of the same quantity are. Accuracy is how close a measurement is to the true value.
- PTS: 1 DIF: II REF: 3 OBJ: 1
STA: 3.2.12.B.1
69. ANS:
The number of protons in the nucleus of an atom.
- PTS: 1 DIF: I REF: 3 OBJ: 1
STA: 3.4.12.A.3
70. ANS:
The sum of the number of protons and neutrons in an atom.
- PTS: 1 DIF: I REF: 3 OBJ: 1
STA: 3.4.12.A.3

ESSAY

71. ANS:

Gases have the fastest speed of motion, followed by liquids, and then by solids, which only vibrate in fixed positions. Gases have the largest range of motion. Liquids have much shorter range of motion and solids have even less range of motion. For a given substance gases have the highest temperature, whereas solids have the lowest temperature. Gases have the highest thermal and interaction energies, solids have the least, and liquids are in between. Solids, however, have the strongest attractive forces, while gases have the weakest attractive forces.

PTS: 1 DIF: III REF: 2 OBJ: 3
 STA: 3.4.12.A.4

72. ANS:

.

PTS: 1 DIF: III REF: 2 OBJ: 3
 STA: 3.4.12.A.4

PROBLEM

73. ANS:

$$D = \frac{m}{V} = \frac{902g}{105cm^3} = 8.59 \frac{g}{cm^3}$$

PTS: 1 DIF: III REF: 4 OBJ: 4
 STA: 3.4.12.A.4

74. ANS:

$$m = V \times D = 152.5cm^3 \times 0.875 \frac{g}{cm^3} = 133g$$

PTS: 1 DIF: III REF: 4 OBJ: 4
 STA: 3.4.12.A.4

75. ANS:

$$Q = mC\Delta T = 82.5g \times (4.184J/g \cdot C) \times (89.0C - 71.5C) = 6040 J$$

PTS: 1 DIF: III REF: 4 OBJ: 4
 STA: 3.4.12.A.4

76. ANS:

$$Q = m\Delta H_f = 95.5g \times 333.4J/g = 3180J$$

PTS: 1 DIF: III REF: 4 OBJ: 4
 STA: 3.4.12.A.4

77. ANS:

$$f = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \frac{m}{s}}{1555nm} \times \frac{1 \times 10^9 nm}{1m} = 1.93 \times 10^{-14} Hz$$

PTS: 1 DIF: III REF: 5 OBJ: 3
 STA: 3.4.12.A.4

78. ANS:

$$E = \frac{hc}{\lambda} = \frac{(6.626 \times 10^{-34} \text{ J} \cdot \text{s}) \times (3.00 \times 10^8 \frac{\text{m}}{\text{s}})}{1555 \text{ nm}} \times \frac{1 \times 10^9 \text{ nm}}{1 \text{ m}} = 1.29 \times 10^{-19} \text{ J}$$

PTS: 1

DIF: III

REF: 5

OBJ: 3

STA: 3.4.12.A.4

79. ANS:

[Ne] $3s^2 3p^2$

PTS: 1

DIF: III

REF: 3

OBJ: 3