Chemistry Mid-Term Practice Exam

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

- 1. A measure of the 3-D space matter occupies is
 - a. density.c. volume.b. weight.d. mass.
 - o. weight.
- 2. Energy includes all of the following *except*
 - a. x-rays.

c. smoke.

b. light.

- d. microwaves.
- 3. A true statement about mass is that
 - a. mass if often measured with a spring scale.
 - b. mass is expressed in pounds.
 - c. as the force of Earth's gravity on an object increases, the object's mass increases.
 - d. mass is determined by comparing the mass of an object with a set of standard masses that are part of a balance.
 - 4. Which statement best describes the electron cloud?
 - a. It is uniform throughout.
 - b. All electrons in it have the same energy.
 - c. Electrons closer to the nucleus have more energy.
 - d. Electrons farther from the nucleus have more energy.
 - 5. An atom with more electrons than protons is called a(n)
 - a. neutral atom.
 - b. cation.
 - c. anion.
 - d. isotope.
 - 6. A statement that can be tested experimentally is a
 - a. variable. c. generalization.
 - b. model. d. hypothesis.
 - 7. The metric prefix that represents the smallest unit of measure is
 - a. micro.
 - b. milli.
 - c. kilo.
 - d. nano.
 - 8. The SI base units for length and time are
 - a. centimeter and second.
 - b. meter and hour.

- c. centimeter and hour.
- d. meter and second.
- 9. The symbol kg represents the SI Unit for
 - a. volume.
 - b. length.

- c. force. d. mass.
- 10. The quantity of matter per unit volume is a. mass.
 - b. weight.

- c. inertia.
- d. density.

11.	The unit m ³ measures		
 	a. length.	c.	volume.
	b. area.	d.	time.
12	Which of these is the abbreviation for the SI ba	ise ii	unit of time?
 12.	a. hr	с.	sec
	b. h	d.	S
 13.	Which of these statements about density is truea. Larger objects are denser.b. Density does not depend on temperature.c. Density is the concentration of matter in a sid. The density of an object depends on the formatter in a side of the statement of the statem	subs	stance. of gravity.
 14.	What is the density of 37.72 g of material whose	se vo	olume is 6.80 cm ³ ?
	a. 0.180 g/cm^3	c.	30.9 g/cm^3
	b. 5.55 g/cm^3	d.	256. g/cm ³
15.	The number of grams equal to 0.5 kg is		
	a. 0.0005.	c.	500.
	b. 0.005.	d.	5000.
16	How many hours are in 1 year (365 days)?		
 10.	a. 168 h	c.	8 760 h
	b. 720 h	d.	455 520 h
 17.	 These values were recorded as the mass of prod times: 8.83 g; 8.84 g; 8.82 g. The mass of prod 8.60 g. The values are a. accurate, but not precise. b. precise, but not accurate. c. both accurate and precise. d. neither accurate nor precise. 	duct ucts	s when a chemical reaction was carried out three separate from that reaction is
18.	Which of these measurements has been express	sed t	to three significant figures?
	a. 0.052 g	c.	3.065 g
	b. 0.202 g	d.	500 g
19.	Which of these measurements has only non-sig	nifi	cant zeros?
 	a. 0.0037 mL	с.	400. mL
	b. 60.0 mL	d.	506 mL
 20.	The dimensions of a rectangular solid are meas recorded as	urec	d to be 1.27 cm, 1.3 cm, and 2.5 cm. The volume should be
	a. 4.128 cm^3 .	c.	4.13 cm^3 .
	b. 4.12 cm^3 .	d.	4.1 cm^3 .
 21.	How many significant figures would the answe	er to	the following calculation have?
	3.475 × 1.97 + 2.4712 is		
			4
	a. 2 b 3	c. d	4 5

 22.	The average distance between the Earth and the distance is written as a. 386×10^3 km.	e mo c.	bon is 386 000 km. Expressed in scientific notation, this 3.9×10^5 km.
	b. 39×10^4 km.	d.	3.86×10^{5} km.
 23.	When 1.92×10^{-6} kg is divided by 6.8×10^{2} m a. 2.8×10^{-4} kg/mL. b. 2.8×10^{-5} kg/mL.	L, tł c. d.	the quotient equals $2.8 \times 10^{-8} \text{ kg/mL.}$ $2.8 \times 10^{-9} \text{ kg/mL.}$
 24.	An atom is electrically neutral becausea. neutrons balance the protons and electronsb. nuclear forces stabilize the charges.c. the numbers of protons and electrons are edd. the numbers of protons and neutrons are ed	qual qual.	
 25.	Nuclear forces exists because the particles in tha. oppositely charged.b. close together.	ne ni c. d.	ucleus are highly energized. moving very fast.
 26.	Most of the volume of an atom is occupied by a. nucleus. b. nuclides.	the c. d.	electrons. protons.
 27.	The smallest unit of an element that can exist e same or different elements is the a. electron. b. proton.	c. d.	r alone or in combination with other such particles of the neutron. atom.
 28.	As the atomic number increases, the number of a. decreases. b. increases.	f ele c. d.	ctrons in a neutral atom remains the same. is undetermined.
 29.	 Chlorine has atomic number 17 and mass numa. 17 protons, 17 electrons, and 18 neutrons. b. 35 protons, 35 electrons, and 17 neutrons. c. 17 protons, 17 electrons, and 52 neutrons. d. 18 protons, 18 electrons, and 17 neutrons. 	ber 3	35. It has
 30.	Neon (symbol Ne) contains 10 neutrons. It alsa. 12 protons.b. 22 protons.	o co c. d.	ntains 22 electrons. 10 protons.
 31.	The frequency of electromagnetic radiation is a a. nanometers. b. quanta.	neas c. d.	sured in waves/second, or hertz. joules.
 32.	The energy of a photon is related to its a. mass. b. speed.	c. d.	frequency. size.

	c. into the nucleus.d. to another position in the same sublevel.		
 34.	The electron in a hydrogen atom has its lowesta. neutral state.b. excited state.	tota c. d.	l energy when the electron is in its ground state. quantum state.
 35.	The change of an atom from an excited state toa. absorption of energy.b. emission of electromagnetic radiation.c. release of visible light.d. an increase in electron energy.	the	ground state always requires
 36.	Isotopes of the same element havea. the same atomic number.b. the same mass number.	c. d.	the same atomic mass. the same number of electrons.
 37.	The average atomic mass of lead is 207.2 amu. a. lead-204 b. lead-206	Th c. d.	e most abundant isotope is likely to be lead-207 lead-208
 38.	Metals tend to forma. anions.b. cations.c. neither anions nor cations.d. both anions and cations.		
 39.	Metalloids have properties that are a. similar to metals b. similar to non-metals	c. d.	similar to halogens in between metals and non-metals.
 40.	Which group of metals are the most reactive?a. Rare earth metalsb. Transition metalsc. Alkaline earth metalsd. Alkali metals		
 41.	Which of the following groups are the most reada. Noble gasesb. halogensc. metalloidsd. Non-metals	ctiv	re?
 42.	Which group has its last electrons in the p sublea. Alkaline earth metalsb. Rare earth metalsc. Halogens	evel	?

33. A emission spectrum is produced when an electron moves from one energy level
 a. to a higher energy level.
 b. to a lower energy level.

d. Transition metals

43. Which type of electromagnetic radiation has the shortest wavelengths?

a. x-rays

- c. microwaves
- b. radio waves 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

c. solid carbon dioxide

- d. ice at 0° C
- 46. Which has more interaction energy?
 - a. carbon dioxide gasb. liquid 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
 - d. aluminum

c. sulfur

- _____ 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 c. 4s
 - b. 3d d. 7f

- 53. Which of the following is an isotope?
 - a. Chlorine-37
 - b. Calcium-40
 - c. Hydrogen-2
 - d. They are all isotopes.

a. nuclear strong force

- ____ 54. In a stable nucleus which force is stronger?
 - c. gravitational force
 - b. electrostatic force d. they are equal
- ____ 55. According to the quantum theory of an atom, in an orbital
 - a. an electron's position cannot be known precisely.
 - b. an electron has no energy.
 - c. electrons cannot be found.
 - d. 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?
 - a. 1 c. 3
 - b. 2 d. 4
- 57. Each atomic orbital is described by its principal quantum number followed by the
 - a. value of the electron's spin state. c. number of electrons in the sublevel.
 - b. magnetic quantum number. d. letter of the sublevel.
 - _ 58. A spherical electron cloud surrounding an atomic nucleus would best represent
 - a. an *s* orbital.
 - b. a p_x orbital.
 - c. a combination of p_x and p_y orbitals.
 - d. 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 highestenergy electrons?
 - a. $3d^{1} 4s^{2}$ b. $4s^{3}$ c. $3d^{3}$ d. $4s^{2} 4p^{1}$
- 60. What is the electron configuration for nitrogen, atomic number 7?
 - a. $1s^2 2s^2 2p^3$
 - b. $1s^2 2s^3 2p^2$
 - c. $1s^2 2s^3 2p^1$
 - d. $1s^2 2s^2 2p^2 3s^1$

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.

Problem. Show all work and include the correct units and sig figs with your answer.

- 73. A metal object has a volume of 105 cm^3 and a mass of 902g. What is its density?
- 74. An object has a volume of 152.5 cm^3 and a density of 0.875 g/cm³. What is its mass?

75. How much energy must be added to 82.5 grams of water to raise its temperature from 71.5° C to 89.0° C?

76. Use orbital notation to write aluminum's electron configuration.

77. What is the frequency of a photon with a wavelength of 1555 nm Hz?

78. What is the energy of a photon with a wavelength of 1555 nm Hz?

79. Write the noble-gas electron configuration for silicon.

Chemistry Mid-Term Practice Exam Answer Section

MULTIPLE CHOICE

1.	ANS: C	PTS: 1	DIF: I	REF: 2
	OBJ: 1	STA: 3.4.12.A		
2.	ANS: C	PTS: 1	DIF: I	REF: 2
	OBJ: 1	STA: 3.4.12.A		
3.	ANS: D	PTS: 1	DIF: III	REF: 2
	OBJ: 1	STA: 3.4.12.A		
4.	ANS: B	PTS: 1	DIF: II	REF: 2
_	OBJ: 3	STA: 3.4.12.A.4		
5.	ANS: D	PTS: 1	DIF: II	REF: 2
6	OBJ: 3	SIA: 3.4.12.A.4		
6.	ANS: D	PTS: 1	DIF: I	REF: 1
_	OBJ: 3	STA: 3.1.12.E.2		
7.	ANS: B	PTS: 1	DIF: I	REF: 1
	OBJ: 3	STA: 3.1.12.E.2		
8.	ANS: D	PTS: 1	DIF: I	REF: 2
	OBJ: 2	STA: 3.1.12.D.3		
9.	ANS: D	PTS: 1	DIF: I	REF: 2
	OBJ: 2	STA: 3.1.12.D.3		
10.	ANS: D	PTS: 1	DIF: I	REF: 2
	OBJ: 2	STA: 3.1.12.D.3		
11.	ANS: C	PTS: 1	DIF: I	REF: 2
	OBJ: 2	STA: 3.1.12.D.3		
12.	ANS: D	PTS: 1	DIF: I	REF: 2
	OBJ: 2	STA: 3.1.12.D.3		
13.	ANS: C	PTS: 1	DIF: I	REF: 2
	OBJ: 4	STA: 3.1.12.D.3		
14.	ANS: B			
	Solution:	$D = \frac{m}{V}$		
		37.72 g	2	
		$D = \frac{0}{6.80 \text{ cm}^3} = 5.55 \text{ g/cm}^3$	ก้	
		0.00 CIII		
	PTS· 1	DIE: III	RFF· 2	OBI- 1
	STA: 3112Γ) 3	KLI. Z	ODJ. 4
15	ANS: C	PTS· 1	DIE: II	REF 2
15.	OBI: 5	$STA \cdot 3112 D1$	DII. II	KLI. Z
16	$\Delta NS^{-}C$	JIN. J.1.12.D.1		
10.		365 dove 241	L	
	Solution:	$1 \text{ year } \times \frac{300 \text{ uays}}{1 \text{ max}} \times \frac{24}{1 \text{ max}}$	<u></u> =8 760 h	
		iyear Ida	ну	
	DTC 1			6 D I -
	P1S: 1	DIF: II	REF: 2	OBJ: 5

	STA:	3.1.12.D.1						
17.	ANS:	В	PTS:	1	DIF:	II	REF:	3
10	OBJ:	1	STA:	3.2.12.B.1	DIE	11	DEF.	2
18.	ANS: OBI	в 2	STA	1 3 2 12 B 1	DIF	11	KEF:	3
19.	ANS:	Ā	PTS:	1	DIF:	II	REF:	3
	OBJ:	2	STA:	3.2.12.B.1				
20.	ANS:	D	PTS:	1	DIF:	III	REF:	3
21	OBJ:	3 D	SIA:	3.2.12.B.1	DIE	III	DEE	2
21.	OBJ:	3	STA:	3.2.12.B.1	DII'.	111	KEF.	3
22.	ANS:	D	PTS:	1	DIF:	III	REF:	3
	OBJ:	4	STA:	3.2.12.B.1				
23.	ANS:	D	PTS:	1	DIF:	III	REF:	3
24	OBJ:	4 C	SIA: DTS·	3.2.12.B.1	DIE	т	DEE	2
24.	OBJ:	3	115.	1	DII'.	1	KET.	2
25.	ANS:	В	PTS:	1	DIF:	Ι	REF:	2
	OBJ:	3						
26.	ANS:	C	PTS:	1	DIF:	Ι	REF:	2
27	ANS.	4 D	ΡΤ S·	1	DIE	T	REE	2
27.	OBJ:	4	115.	1	DII.	1	KLI.	2
28.	ANS:	В	PTS:	1	DIF:	Ι	REF:	3
	OBJ:	2	STA:	3.4.12.A.3				_
29.	ANS:	A 2	PTS:	1	DIF:	III	REF:	3
30	ANS.	3 D	STA. PTS·	3.4.12.A.3 1	DIE	Ш	REE	3
50.	OBJ:	3	STA:	3.4.12.A.3	DII.	111	KLI.	5
31.	ANS:	С	PTS:	1	DIF:	Ι	REF:	1
	OBJ:	1	STA:	3.4.12.C.1		_		
32.	ANS:	C 2	PTS:	1	DIF:	I	REF:	1
33	ANS.	B	PTS∙	1	DIF	П	REF	1
55.	OBJ:	3	110.	1	DII.		10D1 .	1
34.	ANS:	С	PTS:	1	DIF:	Ι	REF:	1
	OBJ:	4	DTG		DIE	**	DEE	
35.	ANS:	B A	PTS:	1	DIF:	11	REF:	1
36	ANS.	4 A	PTS∙	1	DIF	T	REF	1
20.	OBJ:	1	STA:	3.4.12.A.4	2	-	itzi i	-
37.	ANS:	В	PTS:	1	DIF:	Ι	REF:	1
20	OBJ:	1	STA:	3.4.12.A.4	DIE	Ŧ	DEE	1
38.	ANS: ORI	A 2	PTS: STA	1 3 4 12 A 4	DIF:	1	KEF:	1
39.	ANS:	- A	PTS:	1	DIF:	Ι	REF:	1
- / .	OBJ:	2	STA:	3.4.12.A.4				-
40.	ANS:	А	PTS:	1	DIF:	Ι	REF:	1
	OBJ:	3	STA:	3.4.12.A.4				

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

COMPLETION

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

	63.	PTS: STA: ANS:	1 3.4.12.A state, solid, lic	DIF: Juid	Ι	REF:	1	OBJ:	1
	64.	PTS: ANS:	1 liquid	DIF:	II	REF:	2	OBJ:	2
	65.	PTS: STA: ANS:	1 3.4.12.A.4 gaseous	DIF:	II	REF:	2	OBJ:	3
		PTS: STA:	1 3.4.12.A.4	DIF:	Ι	REF:	2	OBJ:	3
SHOR	T A	NSWE	R						
	66.	ANS: Gas pa	articles do not a	attract o	ne another, and	l can ea	sily and quickl	y move	from one place to another.
	67.	PTS: STA: ANS:	1 3.4.12.A.4	DIF:	Ι	REF:	2	OBJ:	3
		In qua are nu	litative observa merical.	tions, t	he data are desc	criptive	and non-nume	rical. Ir	a quantitative observations, the data
	68	PTS: STA: ANS [.]	1 3.2.12.C.4	DIF:	II	REF:	1	OBJ:	2
		Precisi is to th	ion is how clos ne true value.	e a set (of measurement	ts of the	e same quantity	are. Ao	ccuracy is how close a measuremen
		PTS: STA:	1 3.2.12.B.1	DIF:	II	REF:	3	OBJ:	1
	69.	ANS: The nu	umber of protor	ns in the	e 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:	Ι	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.

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

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: $m = V \times D = 152.5 cm^3 \times 0.875 \frac{g}{m^2} = 133g$ PTS: 1 DIF: III REF: 4 OBJ: 4 STA: 3.4.12.A.4 75. ANS: $Q = mC\Delta T = 82.5g \times (4.184J/g \bullet C) \times (89.0C - 71.5C)$ = 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: $f = \frac{c}{\lambda} = \frac{3.00x10^8 \frac{m}{s}}{1555mm} \times \frac{1x10^9 nm}{1m} = 1.93x10^{-14} Hz$ DIF: III REF: 5 PTS: 1 OBJ: 3 STA: 3.4.12.A.4 78. ANS:

	$E = \frac{hc}{\lambda} = \frac{(6.626x10)}{1000}$	$^{-34}J \bullet s) \times (3.00x10^8 \frac{J}{2})$ 1555 <i>nm</i>	$\frac{m}{s}$) $\times \frac{1x10^9 nm}{1m} = 1.297$	10 ⁻¹⁹ ر
79.	PTS: 1 STA: 3.4.12.A.4 ANS: [Ne] $3s^2 3p^2$	DIF: III	REF: 5	OBJ: 3
	PTS: 1	DIF: III	REF: 3	OBJ: 3