Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Chemistry Midterm Exam 2018-2019

Multiple Choice *(1 point each)*
Identify the choice that best completes the statement or answers the question.

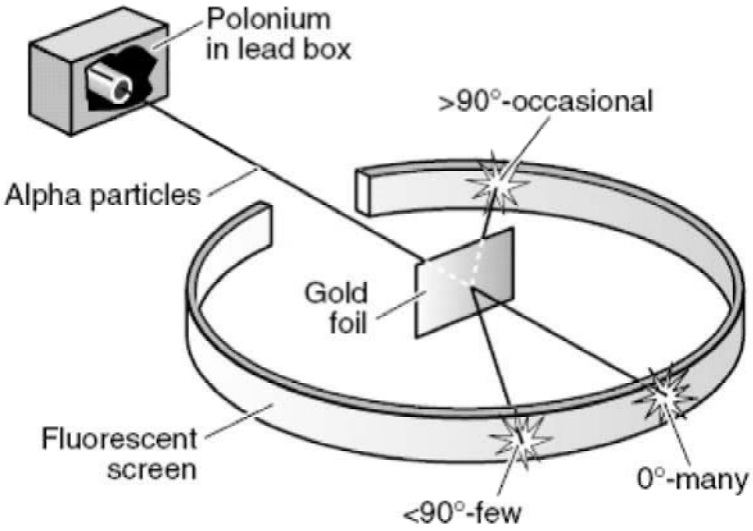
____ 1. **A chemical change occurs when**
a. dissolved minerals solidify to form a crystal.
b. salt deposits form from evaporated seawater.
c. ethanol is purified through distillation.
d. a leaf changes color.

____ 2. **A neutral atom of aluminum-27 contains —**
a. 13 electrons, 13 protons, and 14 neutrons
b. 13 electrons, 14 protons, and 13 neutrons
c. 13 protons and 27 electrons
d. 14 protons and 13 neutrons

____ 3. **Which element naturally occurs as a diatomic molecule?**
a. H
b. K
c. C
d. Zn

____ 4. **The reaction times for three trials of an experiment are 10.6, 10.7, and 10.9 seconds. Which average time is expressed using the correct number of significant figures?**
a. 10.73
b. 11
c. 10.733
d. 10.7

____ 5. **A student wanted to obtain a very accurate value for the volume of a piece of steel. He filled a 100.0 cm^3 graduated cylinder to the 50.0 cm^3 mark with water. After he carefully dropped the steel into the cylinder, the water level rose to the 55.6 cm^3 level. He reported the volume of the steel as 5.6 cm^3. How could the student improve the reliability of his analysis?**
a. Report the volume as 56 mm^3
b. Fill the graduated cylinder to the 70.0 cm^3 mark before adding the steel
c. Mass the steel and report its density in g/cm^3
d. Repeat the measurement many times and report an average value

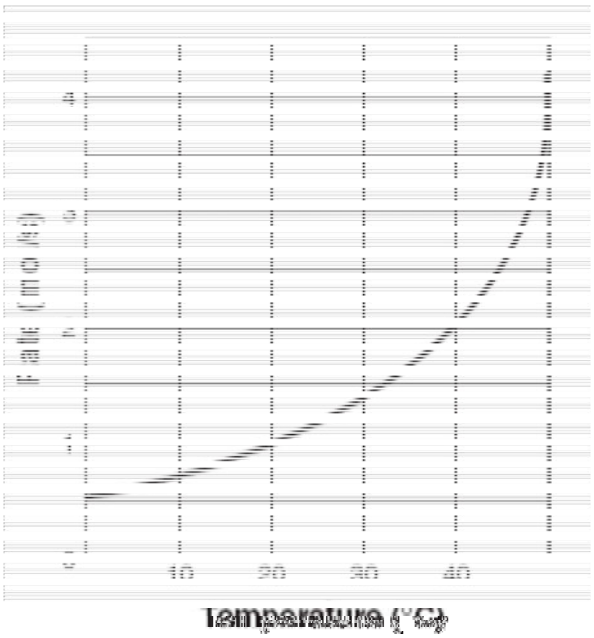


____ 6.

Which of these conclusions can be drawn from Rutherford's experiment?

a. Each atom contains electrons.
b. The nucleus of an atom can be split.
c. Atoms are mostly empty space.
d. Each atom contains protons.

____ 7.

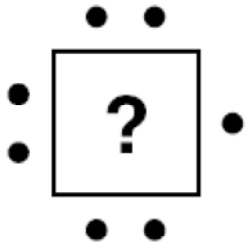


The graph shows the rate of a certain reaction as a function of temperature. According to the graph, in order to double the rate of the reaction at 20°C, the temperature must be *increased* by approximately —

a. 10°C
b. 40°C
c. 30°C
d. 20°C

____ 8. **Atoms of the same element must —**

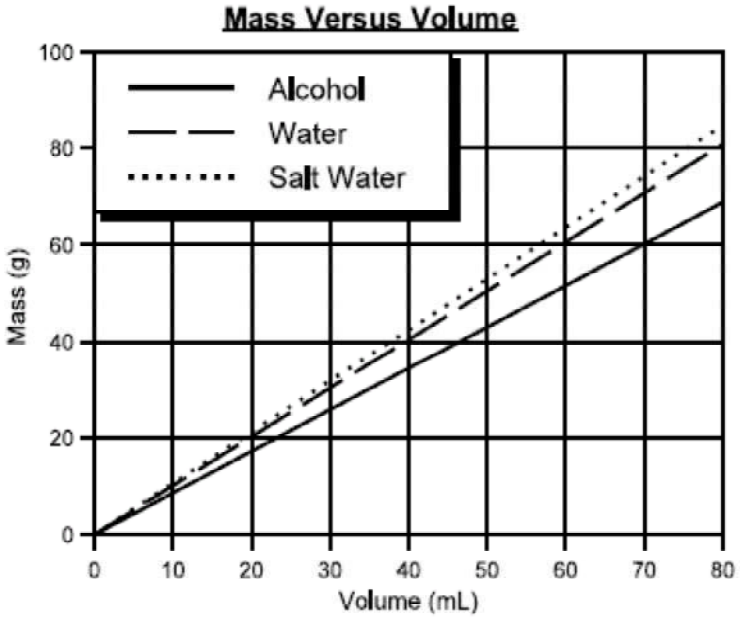
a. have equal numbers of protons and neutrons
b. contain the same number of neutrons
c. have the same mass number
d. contain the same number of protons



____ 9. **Which of the groups below has the electron dot structure shown above?**

a. Transition elements
b. Alkali metals
c. Halogens
d. Noble gases

____ 10.



Using the graph above, determine which substance is less dense than water.

a. Density can not be determined using this graph
b. Alcohol is less dense than water
c. Salt water and alcohol have the same density of water
d. Salt water is less dense than water

____ 11. **The answer to the problem 36.47 cm + 2.721 cm + 5.1 cm = should be recorded as**

a. 44.3 cm
b. 44.29 cm
c. 44.291 cm
d. 44 cm

The following data were collected. The volume of the gas is known to be 2.20 L.

Gas Volume Data

Trial	Measured Volume (L)
1	5.20
2	5.20
3	5.19
4	5.20
5	5.20

This data reflects —

____ 12.
a. low precision and low accuracy
b. low precision and high accuracy
c. high precision and high accuracy
d. high precision and low accuracy

____ 13. **According to the Aufbau Principle, ____.**
a. electrons enter orbitals of highest energy first
b. an orbital may be occupied by only two electrons
c. electrons in the same orbital must have opposite spins
d. electrons enter orbitals of lowest energy first

____ 14. **A scientist has found the following isotope of oxygen:**

$^{19}_{8}\mathrm{O}$

How many neutrons are present in this isotope?
a. 19
b. 11
c. 27
d. 8

____ 15. **How does a covalent bond differ from an ionic bond?**
a. Ionic bonds are usually found in acids and covalent bonds are usually found in bases.
b. An ionic bond involves 2 electrons and a covalent bond involves 4 electrons.
c. An ionic bond is the transfer of electrons and a covalent bond is a sharing of electrons.
d. An ionic bond is usually between two metals and a covalent bond is usually between two nonmetals.

____ 16. **If a student's hand is accidentally exposed to an acidic solution, what should be done?**
a. Cover the hand with oil.
b. Rinse the hand in concentrated base.
c. Wrap the hand in paper towels.
d. Rinse the hand in running water.

____ 17. **Elements in a group or column in the periodic table can be expected to have similar**
a. numbers of neutrons.
b. atomic masses.
c. atomic numbers.
d. properties.

____ 18. **What is the *main* similarity among elements in group 17?**
a. Mass number
b. Chemical properties
c. Atomic radius
d. Boiling point

____ 19. **The elements that are characterized by the presence of an incomplete *d* sublevel are called —**
a. halogens
b. transition elements
c. lanthanoids
d. alkali earth metals

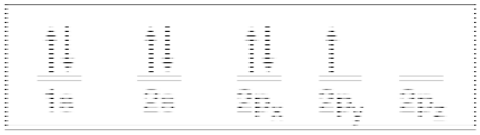
	Protons	Neutrons	Electrons
1	11	12	10
2	1	0	2
3	15	16	15
4	20	20	18

____ 20. **Which of these is an ion with a charge of 1-?**
a. 2
b. 3
c. 4
d. 1

____ 21. **When naming a transition metal that has more than one oxidation number (charge), the numeric value of the oxidation number (charge) is indicated by a —**
a. subscript
b. suffix
c. Greek prefix
d. Roman numeral

____ 22. **How does the radioactive isotope Cl-37 differ from its stable counterpart Cl-35?**
a. It has a different number of protons and two less neutrons than Cl-35.
b. It has a different number of protons and two more neutrons than Cl-35.
c. It has the same number of protons but two more neutrons than Cl-35.
d. It has the same number of protons and two more electrons than Cl-35.

____ 23. **Which of the following orbital diagrams is *incorrect* because it violates Hund's rule?**

a. 

b. 

c. 

d. 

____ 24. **An element has an electron configuration of $1s^2 2s^2 2p^6$. Which of these will be in the same group as this element?**
a. $1s^2 2s^2 2p^6 3s^2 3p^6$
b. $1s^2 2s^2 2p^6 3s^1$
c. $1s^2 2s^2$
d. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

____ 25. **For an experiment, 9.7 mL of HCl are needed. What is the best instrument to use for measuring this volume?**
a. Test tube
b. Erlenmeyer flask
c. Graduated cylinder
d. Beaker

____ 26. **What is the half-life of an isotope if 125 g of a 500 g sample of the isotope remains after 3.0 years?**
a. 2.5 years
b. 4.5 years
c. 1.5 years
d. 3.5 years

____ 27. **A student conducted an experiment to study the effects of temperature on the time it takes to complete a chemical reaction. The student's experimental conditions are shown below.**

	Trial Number			
	1	2	3	4
Temperature	17°C	18°C	20°C	16°C
Amount of A	5g	5g	5g	5g
Amount of B	7g	7g	7g	7g
Time for reaction to complete (min)	10	8	5	3

Which of the following would improve the student's experimental design?

a. Keep all tubes at 18° C
b. Keep the reaction times constant
c. Have multiple trials for each temperature
d. Decrease the quantity of reactants

____ 28. **The element chlorine exists as two naturally occurring isotopes. Cl-35 occurs 75% of the time and Cl-37 occurs 25% of the time. Which of the following calculations should be used to calculate the correct average atomic mass of chlorine?**

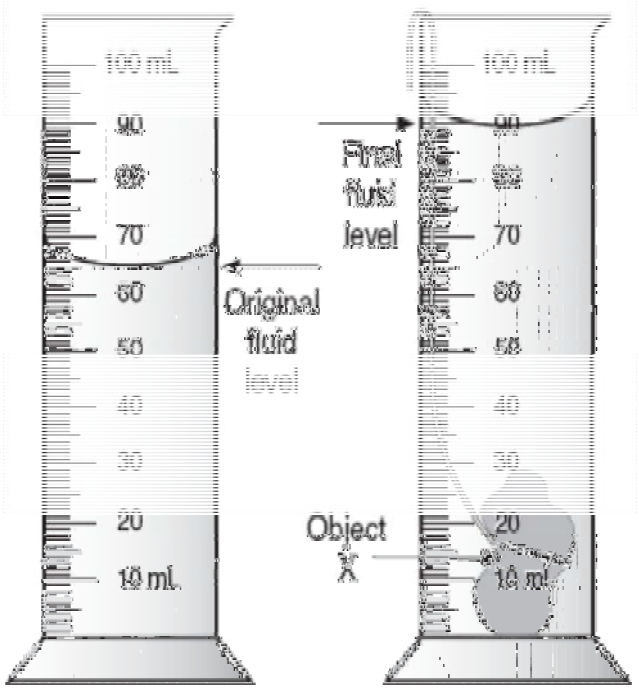
a. $\dfrac{(35\text{ amu} \times 3) + 37\text{ amu}}{3}$

b. $\dfrac{35\text{ amu} + 37\text{ amu}}{2}$

c. $\dfrac{(35\text{ amu} \times 3) + 37\text{ amu}}{2}$

d. $(35\text{ amu} \times .75) + (37\text{ amu} \times .25)$

____ 29.



If the mass of Object X is 50.0 grams, what is its density?

a. 2.00 g/mL
b. 0.600 g/mL
c. 0.500 g/mL
d. 25.0 g/ mL

____ 30. **Which of these describes a tendency for electronegativity as displayed on the periodic chart?**

a. electronegativity decreases top to bottom down a group.
b. electronegativity decreases left to right across a period.
c. electronegativity increases, then decreases from top to bottom down a group.
d. electronegativity increases right to left across a period

____ 31. **Which of the following elements should be classified as a semi-metal?**

a. Br
b. As
c. I
d. Sn

____ 32. **Three elements, X, Y, and Z, have consecutive increasing atomic numbers. If element X is a noble gas, what will be the symbol for the ion of element Z in its compounds?**

a. Z^{2+}
b. Z^{+}
c. Z^{-}
d. Z^{2-}

____ 33. **A student measured the temperature of a boiling solution and found it to be 36.0°C at standard pressure. The theoretical temperature of that boiling solution is 35.0°C. What is the percent error in the student's measurement?**

a. 0.029%
b. 0.29%
c. 2.9%
d. 29%

____ 34. **Balance the following equation**:

$$^{226}_{88}\mathrm{Ra} \rightarrow {}^{226}_{89}\mathrm{Ac} + \mathbf{?}$$

a. $^{4}_{2}\mathrm{He}$
b. $^{0}_{-1}\mathrm{e}$
c. $^{1}_{1}\mathrm{H}$
d. $^{1}_{0}\mathrm{n}$

____ 35. **Which of the following is the name for PCl_3?**

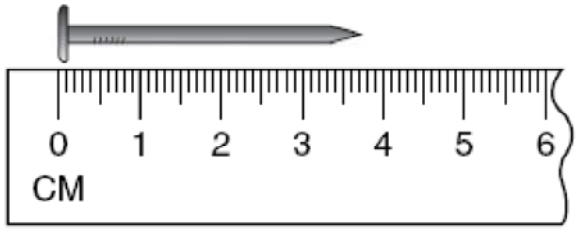
a. Potassium chloride
b. Phosphorus chloride
c. Potassium trichloride
d. Phosphorus trichloride

____ 36. **Under ordinary conditions of temperature and pressure, the particles in a gas are**

a. unevenly distributed.
b. held in fixed positions.
c. very far from each other.
d. closely packed.

____ 37. **An increase in atomic number is related to an increase in atomic mass because —**

a. more protons are present in the atomic nucleus
b. more electrons are present in the atomic nucleus
c. more electrons are orbiting the atomic nucleus
d. more protons are orbiting the atomic nucleus



____ 38. **A student used the above ruler to measure the length of a nail. The length of this nail, according to the precision of the ruler, is —**

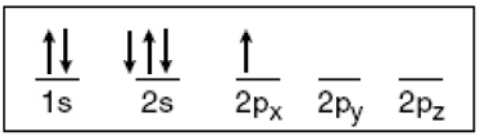
a. 3.75 cm
b. 3.55 cm
c. 3.5 cm
d. 3.7 cm

____ 39. **Which of the following properties decreases from left to right across a period?**

a. Electronegativity
b. Atomic number
c. Atomic radius
d. Ionization energy

____ 40. **Which of the following orbital diagrams is *incorrect* because it violates the Pauli Exclusion Principal?**

a. 

b. 

c. 

d. 

____ 41. **To which group of the periodic table do lithium and potassium belong?**

a. halogens
b. transition metals
c. noble gases
d. alkali metals

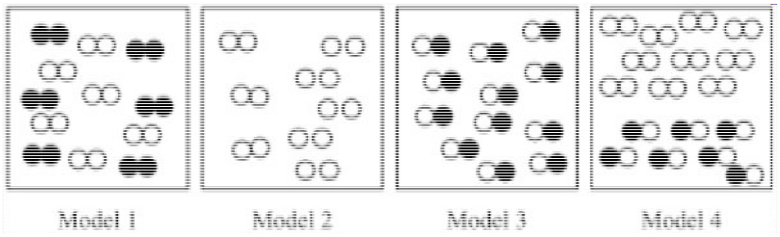
Electronegativity Values of Some Atoms

2.1 H						
1.0 Li	1.5 Be	2.0 B	2.5 C	3.0 N	3.5 O	4.0 F
0.9 Na	1.2 Mg	1.5 Al	1.8 Si	2.1 P	2.5 S	3.0 Cl
0.8 K	1.0 Ca				2.4 Se	2.8 Br

____ 42. **Electronegativity differences are often helpful in determining the bond character between two atoms. A general rule states that if the electronegativity difference between two atoms is greater than 1.67, an ionic bond would most likely be formed. Using the chart above, which pair of atoms would probably form the strongest ionic bond?**

a. Mg-Br
b. Al-P
c. Ca-O
d. Na-Cl

____ 43.



Which model represents a compound?

a. Model 2
b. Model 4
c. Model 1
d. Model 3

____ 44. **In chemical compounds, covalent bonds form when —**

a. electrons are completely transferred between two metals
b. pairs of electrons are shared between two nonmetal atoms
c. two nonmetal ions are attracted to each other by opposite charges
d. the electronegativity difference between two atoms is very large

____ 45. **An element that has an electron configuration of [He]2$s^2$2p^3 is in Group _____ of the periodic table.**

a. 15
b. 3
c. 13
d. 2

____ 46. **Which scientist was the first to conclude through experimentation with cathode ray tubes that atoms have negatively charged particles?**

a. Thomson
b. Rutherford
c. Bohr
d. Mosley

____ 47. **How should 0.000365 be expressed in proper scientific notation?**

a. 3.65×10^{-4}
b. 3.65
c. 365
d. 3.65×10^{4}

____ 48. **The formula for lithium nitride is —**

a. Li_3N_3
b. LiN
c. Li_3N
d. NLi_3

____ 49. **In the nuclear reaction, $^{230}_{90}$Th --> ____ + $^{230}_{89}$Ac, what kind of decay is observed?**

a. positron emission
b. gamma radiation
c. beta decay
d. alpha decay

____ 50. **Which of these shows a volume of 1.25 liters expressed in milliliters?**

a. 1.25×10^2 mL
b. 125 mL
c. 12.5×10^1 mL
d. 1.25×10^3 mL

Chemistry Midterm Exam 2018-2019
Answer Section

MULTIPLE CHOICE

1. ANS: D PTS: 1 DIF: 2 REF: 1
   OBJ: 3
2. ANS: A PTS: 1 STA: ch.2 LOC: ch.2a
3. ANS: A PTS: 1 STA: ch.2 LOC: ch.2f
4. ANS: D PTS: 1 STA: ch.1 LOC: ch.1g
5. ANS: D PTS: 1 STA: ch.1 LOC: ch.1d
6. ANS: C PTS: 1 STA: ch.2 LOC: ch.2i
7. ANS: D PTS: 1 STA: ch.1 LOC: ch.1g
8. ANS: D PTS: 1 STA: ch.2 LOC: ch.2a
9. ANS: C PTS: 1 STA: ch.2 LOC: ch.2d
10. ANS: B PTS: 1 STA: ch.1 LOC: ch.1g
11. ANS: A PTS: 1
12. ANS: D PTS: 1 STA: ch.1 LOC: ch.1f
13. ANS: D PTS: 1 DIF: L2 REF: p. 133
    OBJ: 5.2.1 STA: ch.2 LOC: ch.2g
14. ANS: B PTS: 1 STA: ch.2 LOC: ch.2c
15. ANS: C PTS: 1 OBJ: 7G 7.c
16. ANS: D PTS: 1 STA: ch.1 LOC: ch.1c
17. ANS: D PTS: 1 DIF: 1 REF: 1
    OBJ: 2
18. ANS: B PTS: 1 STA: ch.2 LOC: ch.2d
19. ANS: B PTS: 1 STA: ch.2 LOC: ch.2e
20. ANS: A PTS: 1 STA: ch.2 LOC: ch.2c
21. ANS: D PTS: 1 STA: ch.3 LOC: ch.3a
22. ANS: C PTS: 1 STA: ch.2 LOC: ch.2b
23. ANS: A PTS: 1 STA: ch.2 LOC: ch.2g
24. ANS: A PTS: 1 STA: ch.2 LOC: ch.2g
25. ANS: C PTS: 1
    DIF: k=knowledge c=comprehension a=application or above
    STA: ch.1 LOC: ch.1a
26. ANS: C PTS: 1 DIF: 3 REF: 3
    OBJ: 1
27. ANS: C
    Ch.1- accurate recording , organizing and analyzing of data through repeated trials.

    PTS: 1 STA: ch.1 LOC: ch.1e
28. ANS: D PTS: 1 STA: ch.2 LOC: ch.2a
29. ANS: A PTS: 1 STA: ch.1 LOC: ch.1g
30. ANS: A PTS: 1 STA: ch.2 LOC: ch.2f
31. ANS: B PTS: 1
32. ANS: A PTS: 1 STA: ch.2 LOC: ch.2a

33. ANS: C
Ch.1- mathematical and procedural error analysis

PTS: 1 STA: ch.1 LOC: ch.1f
34. ANS: B PTS: 1 DIF: 2 REF: 2
OBJ: 1
35. ANS: D PTS: 1 STA: ch.3 LOC: ch.3c
36. ANS: C PTS: 1 DIF: 1 REF: 1
OBJ: 2
37. ANS: A PTS: 1 STA: ch.2 LOC: ch.2a
38. ANS: A PTS: 1 STA: ch.1 LOC: ch.1e
39. ANS: C PTS: 1 STA: ch.2 LOC: ch.2f
40. ANS: B PTS: 1 STA: ch.2 LOC: ch.2g
41. ANS: D PTS: 1 DIF: 1 REF: 2
OBJ: 1
42. ANS: C PTS: 1 STA: ch.2 LOC: ch.2f
43. ANS: D PTS: 1
44. ANS: B PTS: 1 STA: ch.3 LOC: ch.3d
45. ANS: A PTS: 1 DIF: 2 REF: 1
OBJ: 2 STA: ch.2 LOC: ch.2g
46. ANS: A PTS: 1 STA: ch.2 LOC: ch.2i
47. ANS: A PTS: 1 STA: ch.1 LOC: ch.1g
48. ANS: C PTS: 1 STA: ch.3 LOC: ch.3c
49. ANS: A PTS: 1
50. ANS: D PTS: 1 STA: ch.1 LOC: ch.1g

Chemistry Midterm Exam 2018-2019 [Answer Strip] **ID: A**

__D__ 7. __B__ 10.

__D__ 1.

__A__ 2.

__C__ 6.

__A__ 3.

__D__ 4. __D__ 12.

__A__ 11.

__D__ 13.

__D__ 5.

__D__ 8.

__B__ 14.

__C__ 9.

Chemistry Midterm Exam 2018-2019 [Answer Strip] **ID: A**

C 15.

D 21.

C 27.

C 33.

C 22.

B 34.

D 16.

D 17.

A 23.

D 35.

B 18.

A 29.

C 36.

D 28.

B 19.

A 30.

A 37.

A 24.

C 25.

B 31.

A 32.

A 38.

A 20.

C 26.

C 39.

B 40.

D 41.

C 42.

D 43.

B 44.

A 45.

A 46.

A 47.

C 48.

A 49.

D 50.