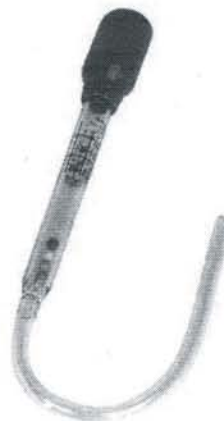


Use complete sentences and proper grammar to answer the following questions:
 A picture of an antifreeze tester is shown here. Each of the balls in the tester are the same size, and the protection level of the antifreeze is indicated by the number of balls that float. The more balls that float, the higher the protection level of the antifreeze.

The balls shown are all the same size. If some float and some don't in the presence of antifreeze, what must be different about them, and why?

$Density_{object} > Density_{liquid}$ sink
 $Density_{object} < Density_{liquid}$ float
Density



The balls shown have different colors, and the order of the balls in the tester is important for it to function properly. How must these balls be ordered in order for the tester to work properly (they are in the order blue, yellow, orange, pink, and green from the top down, you may use these color descriptions to answer the question).

B Y O P G
 →
 more dense

What does this tell you about how the protection level of an antifreeze (how does the density relate to protection level)?

Higher density means less effectiveness of antifreeze protection

Mock Exam Key

Chemistry 105
Introductory Chemistry I

Practice Exam 1

1) What is true of elements in the same period of the periodic table?

- (row)*
- D. their outermost electrons are in the same energy level defined by "n" → period #
- ~~A. they have the same electron configuration~~
~~B. they have the same number of neutrons~~
~~C. they have the same mass~~
~~E. they have similar reactivities (groups/families/columns do)~~

2) Which of the following is the SI unit of time?

- A. parsec B. Newton C. second D. light-year E. grain

3) Which of the following phase changes is endothermic? *(gains energy)*

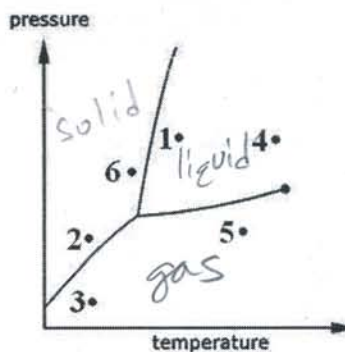
- E. evaporation
- ~~A. solidification~~ ~~B. deposition~~ ~~C. freezing~~
~~D. condensation~~

4) What element has an average atomic mass of 19.00?

- A. boron B. fluorine C. potassium D. argon E. manganese

5) A substance is at a temperature and pressure represented by the dot labeled "3" in the diagram shown. If the pressure is increased, which of the following changes may occur?

- B. deposition
- ~~A. condensation~~ ~~C. evaporation~~ ~~D. sublimation~~
 E. melting



6) If a substance is at a temperature and pressure represented by the dot labeled "1", in what state of matter is the substance?

- D. liquid
- ~~A. gas~~ ~~B. supercritical fluid~~
~~C. plasma~~ ~~E. solid~~

7) Which of the following subshells does not exist in any atom?

- A. 2d ~~B. 2s~~ ~~C. 3s~~ ~~D. 4f~~ ~~E. 1s~~

8) How does a calorie differ from a Calorie?

- A. a calorie is 1/1000th of a Calorie
- ~~B. they are the same unit, just used for different applications~~
~~C. 1 Calorie = 4.184 calories~~
~~D. the Calorie is a unit of light, whereas the calorie is a unit of heat~~
~~E. just differ by hitting the "shift" key haha!~~

9) What element is the chemical symbol Cr used to represent?

- A. copper B. carbon C. chromium D. chlorine E. cobalt

C

Cu C Cr Cl Co

10) When the temperature of a material increases, it is an indication of increasing _____ of that material.

- A. mass B. kinetic energy C. density D. potential energy E. reactivity

B

KE \propto T

11) Which of the following describes the electron configuration of an atom of silicon?

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$
B. $1s^2 2s^2 2p^6 3s^2 3p^2$
C. $1s^2 2s^2 2p^6 3s^2 3p^4$
D. $1s^2 2s^2 1p^6 3s^2 2p^2$
E. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

B

12) Neon gas boils at 27K. What is this temperature in degrees Celsius?

- A. -410 °C B. -300 °C C. -246 °C D. -154 °C E. 27 °C

C

$27 - 273 = -246$

13) Two materials, solid A and solid B, have equal masses at room temperature. They are moved to a freezer, and after 10 minutes, material A is colder than material B. Which of the following statements is most likely true?

- A. Material A has a larger heat of fusion than material B
B. Material B is more dense than material A
C. Material A has a larger volume than material B
D. Material B has a larger specific heat value than material A
E. Material A gained more mass than material B

D

$q = m c \Delta T$
↑ same ↑ same ↑ different
b/c freezer (same environment)

* Larger specific heat = harder to change temp

14) 1×10^6 grams could also be described as a

- A. kilogram B. milligram C. microgram D. nanogram E. megagram

E

10^3 10^{-3} 10^{-6} 10^{-9} 10^6

15) Which state(s) of matter have a definite volume?

- A. solid B. liquid C. gas D. liquid and gas E. solid and liquid

E

can keep expanding

16) Which of the following describes an atom with 13 protons and 14 neutrons?

- A. Co^+ B. ^{13}Al C. ^{27}Si D. ^{27}Co E. ^{27}Al

E

atomic #

mass = protons + neutrons = 27

17) Which of the following terms describes the phase change from a gas to a liquid?

- A. sublimation B. condensation C. deposition D. evaporation E. melting

B

The following data corresponds to phase changes of Freon: Melting point = -111.1°C , Boiling point = 23.75°C , specific heat of liquid = $0.2116 \frac{\text{cal}}{\text{g}^{\circ}\text{C}}$, specific heat of gas = $0.1359 \frac{\text{cal}}{\text{g}^{\circ}\text{C}}$, heat of fusion = $13.75 \frac{\text{cal}}{\text{g}}$, heat of vaporization = $43.86 \frac{\text{cal}}{\text{g}}$

18) Which of the following is closest to the amount of heat required to warm 32.7 grams of Freon from -20°C to 10°C ?

$$Q = mc\Delta T = (32.7\text{g})(0.2116)(10 - (-20)) = 207.6 \text{ cal}$$

- A. 10 calories B. 70 calories C. 130 calories.
 D. 200 calories E. 500 calories

19) A sheet of standard copy paper (20 pound paper) has a thickness of 0.097 millimeters. If a stack of paper stands 5.2 decimeters tall, approximately how many sheets of paper are in the stack?

- A. 5×10^2 sheets B. 5×10^3 sheets C. 5×10^3 sheets
 D. 5×10^5 sheets E. 5×10^9 sheets

$$\frac{5.2 \times 10^{-1} \text{ m}}{9.7 \times 10^{-5} \text{ m}} \approx 1 \times 10^4$$

20) According to Dalton's atomic theory, what occurs during a chemical reaction?

- A. atoms break into their sub-atomic particles
 B. atoms rearrange to form new substances
 C. atoms combine to form new elements
 D. neutrons are exchanged to form new isotopes
 E. atoms are converted into energy

- 1) All matter is made of atoms.
 2) All atoms of a given element are identical in mass + properties.
 3) Compounds are formed by a combination of 2 or more atoms.
 4) A chemical reaction is a rearrangement of atoms.

$$\frac{5 \times 10^{-1}}{1 \times 10^{-4}} = 5 \times 10^3$$

21) An atom of which of the following elements has two valence electrons?

- A. carbon B. lithium C. fluorine D. hydrogen E. calcium

22) Element X has two isotopes, ^{143}X and ^{146}X . If the reported average atomic mass of X is 143.8 amu, which of the following is closest to the isotopic abundance of each isotope?

- A. ^{143}X , 38.2%; ^{146}X 61.8% B. ^{143}X , 52.4%; ^{146}X 47.6% C. ^{143}X , 58.8%; ^{146}X 40.9%
 D. ^{143}X , 73.3%; ^{146}X 26.7% E. ^{143}X , 81.7%; ^{146}X 18.3%

$$143.8 = 143x + 146(1-x)$$

$$143.8 = 143x + 146 - 146x$$

$$3x = 2.2$$

$$x = 73.33\%$$

$$1 - 73.33 = 26.7\%$$

23) A number, when expressed in proper scientific notation, has a positive coefficient and a negative exponent. On what region of the number line would this number fall?

- A. between $-\infty$ and -1 B. between -1 and 0
 C. between 0 and 1 D. between 1 and ∞
 E. it could potentially fall on multiple areas of the number line

24) Which of the following statements is true about the halogens?

- A. All halogen atoms have an even number of protons odd
 B. All halogen atoms tend to ionize by losing an electron gain
 C. All halogen atoms will combine with noble gases in chemical reactions
 D. All halogen atoms have only one isotope unreactive
 E. All halogen atoms have seven valence electrons