

Please read all the questions VERY carefully before answering. Use a pen to answer the short question and a pencil to fill out the circles in the scantron. Write neatly. If I cannot read your answer, you will not receive any point. Use the attached periodic table and constant chart. No outside paper is allowed. Total points = 34+ (28x3)=84=118

SHORT ANSWER. When necessary in a calculation, write the set up equation first, then put the raw data with units. Then do your calculations.

1) Show calculations with units to convert 6.32 cm into inches (1 in = 2.54 cm.). (4 pts.)

1) ~~2.94 in~~  
2.49 in.

6.32 cm ~~( $\frac{1 \text{ in}}{2.54 \text{ cm}}$ ) =~~  $6.32 \text{ cm} \left( \frac{1 \text{ in}}{2.54 \text{ cm}} \right) = 2.4881 \dots$   
 $\approx 2.49 \text{ in}$

2) Show your calculation to find how many kilojoules are there in 95.0 Calories? (given 1 cal = 4.18 joules) (6 pts.)

2)  $3.97 \times 10^1 \text{ kJ}$

$95.0 \text{ Calories} \left( \frac{4.18 \text{ joules}}{1 \text{ cal}} \right) \left( \frac{1 \text{ kilojoule}}{1000 \text{ joules}} \right) = 3.971 \times 10^1 \text{ kJ}$   
 $\approx 3.97 \times 10^1 \text{ kJ}$

3) Density of a metal A is 1.7 g/cc and that of metal B is 7.9 g/cc. If a ball made from metal B has a mass of 409.5 grams, then what would be the mass of a ball, made from metal A. The balls have the same volume. (8 pts.)

3) 88 grams

$409.5 \text{ g metal B} \times \left( \frac{1 \text{ cm}^3 \text{ metal B}}{7.9 \text{ g metal B}} \right) = 51.83544 \dots \text{ cm}^3$

$51.83544 \text{ cm}^3 \text{ metal A} \times \left( \frac{1.7 \text{ g metal A}}{1 \text{ cm}^3 \text{ metal A}} \right) = 88.1 \text{ g metal A}$   
 $\approx 88 \text{ g metal A}$

4) A fictional element has three isotopes with their natural abundances shown as:

4) 22.83 amu

MASS (amu)	ABUNDANCE
22.1760	45.00%
23.1847	45.00%
24.1934	10.00%

Show your calculation to determine the atomic mass of the element (8 pts.).

$$\text{atomic mass} = \sum \text{isotopic mass} \times \text{isotopic abundance}$$

$$\begin{aligned} \therefore \text{atomic mass} &= (22.1760 \times 0.45) + (23.1847 \times 0.45) + (24.1934 \times 0.10) \text{ amu} \\ &= (9.979 + 10.43 + 2.419) \text{ amu} \\ &= \boxed{22.83 \text{ amu}} \end{aligned}$$

5) Write next to each question (2 pts. each; Total 4 pts.):

5) \_\_\_\_\_

(a) Formula for ammonium phosphate:  $\text{NH}_4^+ \text{PO}_4^{3-}$   $(\text{NH}_4)_3\text{PO}_4$

(b) Name of  $\text{Ca}(\text{HSO}_4)_2$ : Calcium bisulfate

6) During density measurement of sulphur, if the sulphur piece was large and the top of the sulphur was above the water level, would your measured density of sulphur would be

6) \_\_\_\_\_

(a) HIGH or LOW or it would be CORRECT (circle the correct one) (2 pts)

(b) Explain/show your logic (2 pts.).

\* If sulfur was <sup>partially</sup> above water level, the volume ~~for sulfur~~ <sup>increase observed in the grad. cylinder</sup> that is attributable to sulfur would have been underestimated.

and since Density =  $\frac{\text{mass}}{\text{volume}}$ , the ~~the~~ underestimation of the volume (denominator) would result in an

overestimation of the density.

**MULTIPLE CHOICE.** Start from number 7 on scantron to answer the questions. Choose the one alternative that best completes the statement or answers the question (3 pts. each).

- ✓ 7) The correct scientific notation for the number 500.0 is: 7) \_\_\_\_\_
- (A)  $5.000 \times 10^2$  4 SF
- B)  $5.00 \times 10^2$
- C)  $5 \times 10^{-2}$  8-  $5.000 \times 10^2$
- D)  $5 \times 10^2$
- E) none of the above

- ✓ 8) The correct number of significant figures in the number 865,000 is: 8) \_\_\_\_\_
- A) 6
- B) 4 ambiguous.
- C) 3
- (D) ambiguous
- E) none of the above

- ✓ 9) The correct number of significant figures in the number 0.002320 is: 9) \_\_\_\_\_
- A) 7
- B) 3
- (C) 4
- D) ambiguous
- E) none of the above

- ✓ 10) Determine the answer for the equation below with correct number of significant figures: 10) \_\_\_\_\_
- $3.215 \times 13.2 \div 0.218 =$  \_\_\_\_\_
- A) 194.7
- (B) 195
- C) 194.67
- D) 194.669
- E) none of the above
- ~~194.666~~  $194.6697$   
3 SF  $\Rightarrow$  195

- ✓ 11) How many milliliters are in 17.5 L? 11) \_\_\_\_\_
- A)  $1.75 \times 10^{-2}$
- B)  $1.75 \times 10^3$
- (C)  $1.75 \times 10^4$
- D) 175
- E) none of the above
- $17.5 \text{ L} \left( \frac{1000 \text{ mL}}{1 \text{ L}} \right) = 1.75 \times 10^4$

- ✓ 12) What is the density (g/mL) of an object that has a mass of 14.01 grams and, when placed into a graduated cylinder, causes the water level to rise from 25.2 mL to 33.6 mL? 12) \_\_\_\_\_
- (A) 1.7  $\hookrightarrow v = 8.4 \text{ mL}$
- B) 0.60
- C) 2.4
- D) 1.8
- E) none of the above
- $D = \frac{14.01 \text{ g}}{8.4 \text{ mL}} = 1.667857$   
 $\approx 1.7 \text{ g/mL}$

13) The distance from New York City to Washington, DC is approximately 235 miles. Identify the correct solution map to convert from miles to kilometers using the prefix multipliers and the given conversion factors: 1 mile = 5280 ft; 1 ft = 12 in; 1 in = 2.54 cm. 13) \_\_\_\_\_

- A)  $235 \text{ mile} \times \frac{5280 \text{ ft}}{1 \text{ mile}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{10^{-2} \text{ m}}{1 \text{ cm}} \times \frac{1 \text{ km}}{10^3 \text{ m}}$
- ~~B)  $235 \text{ mile} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{10^{-2} \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ km}}{10^3 \text{ m}}$~~
- ~~C)  $235 \text{ mile} \times \frac{5280 \text{ ft}}{1 \text{ mile}} \times \frac{1 \text{ ft}}{12 \text{ in}} \times \frac{2.54 \text{ in}}{1 \text{ ft}} \times \frac{1 \text{ m}}{10^{-2} \text{ cm}} \times \frac{10^3 \text{ km}}{1 \text{ m}}$~~
- ~~D)  $235 \text{ mile} \times \frac{1 \text{ ft}}{5280 \text{ mile}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{10^{-2} \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ km}}{10^3 \text{ m}}$~~
- ~~E)  $235 \text{ mile} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{10^{-2} \text{ cm}} \times \frac{10^3 \text{ km}}{1 \text{ m}}$~~

14) Which state of matter has indefinite shape and is compressible? 14) \_\_\_\_\_  
 A) plasma  
 B) liquid  
 C) solid  
 D) gas  
 E) none of the above

*ie. indefinite Volume*

15) Which among the following statements is false? 15) \_\_\_\_\_  
 A) A liquid has a definite volume; but it has no definite shape. True  
 B) Both solids and liquids are incompressible while gases are compressible. True  
 C) A gas has neither definite volume nor definite shape. True  
 D) A solid has a definite shape and a definite volume. True  
 E) none of the above

*Not same Comp.*

	Vol. shape	
S	Def	Def
L	Def	Ind.
G	Ind.	Ind.

16) Which of the following is a heterogenous mixture? 16) \_\_\_\_\_  
 A) ~~sugar water~~  
 B) air  
 C) milk  
 D) raisin bran  
 E) none of the above

17) Which of the following statements is FALSE? 17) \_\_\_\_\_  
 A) Mixtures may be composed of two or more elements, two or more compounds, or a combination of both.  
 B) A pure substance may either be an element or a compound. True  
 C) A mixture may be either homogeneous or heterogeneous. True  
 D) Matter may be a pure substance or it may be a mixture. True  
 E) All of the above statements are true.

$7100^{\circ}\text{C} = 373\text{ K} = 212^{\circ}\text{F}$

18) The boiling point of water is \_\_\_\_\_ 18) \_\_\_\_\_  
✓ (1)  $212^{\circ}\text{F}$  (2)  $0^{\circ}\text{C}$  (3)  $373\text{ K}$   
A) 2 and 3 only  
B) 1 and 3 only  
C) 1 and 2 only  
D) all of 1, 2, and 3  
E) none of 1, 2, and 3

19) An atom with  $Z = 26$  and  $A = 58$  contains \_\_\_\_\_ protons, \_\_\_\_\_ electrons, and \_\_\_\_\_ neutrons. 19) \_\_\_\_\_  
A) 32; 26; 32 B) 26; 26; 58 C) 26; 32; 84 D) 58; 26; 26 E) 26; 26; 32

20) An isotope with 15 protons and 17 neutrons will have which symbol? 20) \_\_\_\_\_  
A)  ${}_{17}^{32}\text{Cl}$  B)  ${}_{15}^{17}\text{P}$  C)  ${}_{15}^{32}\text{P}$  D)  ${}_{17}^{32}\text{P}$  E)  ${}_{15}^{17}\text{Cl}$

21) How many electrons can occupy the shell having  $n = 2$ ? 21) \_\_\_\_\_  
A) 6 B) 8 C) 18 D) 2 E) 32

22) What is the maximum number of electrons that can occupy the 4p orbitals? 22) \_\_\_\_\_  
A) 14 B) 8 C) 6 D) 10 E) 2

23) What is the electron configuration of S? 23) \_\_\_\_\_  
A)  $1s^2 2s^2 2p^6 3s^2 3p^2$   
B)  $1s^2 2s^2 2p^2$   
C)  $1s^2 2s^2 2p^6 3s^2 3p^4$   
D)  $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^1$   
E)  $1s^2 2s^2 2p^6 3s^2 3p^6$   
Handwritten: 16 electrons,  $1s^2/2s^2/2p^6/3s^2/3p^4$

24) The number of valence electrons in an element with electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^4$  is \_\_\_\_\_. 24) \_\_\_\_\_  
A) 6 B) 16 C) 4 D) 2 E) 8

25) Which of the following elements is most likely to form an ion with a -1 charge? 25) \_\_\_\_\_  
A) Mg B) Si C) Cl D) Sc E) S

26) What is the formula for the ionic compound formed between calcium and sulfur? 26) \_\_\_\_\_  
A) CaS B)  $\text{CaSi}_2$  C)  $\text{CaS}_2$  D) CaSi E)  $\text{Ca}_2\text{S}$

27) What is the name of  $\text{AlCl}_3$ ? 27) \_\_\_\_\_  
A) aluminum trichloride  
B) aluminum tricarbonide  
C) aluminum chloride  
D) aluminum carbide  
E) aluminum(III) chloride

28) One definition of an acid is a substance that provides which ion in water solution?

28) \_\_\_\_\_

- A)  $H^+$
- B)  $OH^-$
- C)  $NH_4^+$
- D)  $Na^+$
- E) none of the above

29) Which representation of a hydrogen molecule is **not** correct?

29) \_\_\_\_\_

- A) H=H
- B) H-H
- C)  $H_2$
- D) H:H
- E) none of the above

30) Which element is most likely to be "X" in the diatomic molecule shown?

30) \_\_\_\_\_



- A) nitrogen
- B) helium
- C) fluorine
- D) hydrogen
- E) oxygen

TRUE/FALSE. In scantron fill the circle "A" for a True answer and "B" for False answer (3 pts. each).

31) The mass of an object,  $4.55 \times 10^{-3}$  g, expressed in decimal notation is 0.000455 g.

31) B

32) Exact numbers have an unlimited number of significant figures.

32) A

33) When the number 65.59 is rounded to contain 2 significant figures, it becomes 66.0.

33) B

34) Liquids have definite volume and indefinite shape.

34) A