

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 = 43+ (29x3)=87=130

SHORT ANSWER. In all calculations, write the set up equation first, then put the raw data with units. Then do your calculations.

- 1) Show calculations with units to convert 16.32 gallon (gal) into milliliter (mL) (given 1 gal = 3.785 L and 1 L = 1000 mL). (5 pts.)

$$16.32 \text{ gal} \times \frac{3.785 \text{ L}}{1 \text{ gal}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 61771.2 \text{ mL} = 6.177 \times 10^4 \text{ mL}$$

- 2) Calculate (with units) how many m^2 are in 2659 cm^2 (given 1 m = 100 cm.)? (6 pts.)

$$2659 \text{ cm}^2 \times \frac{(1 \text{ m})^2}{(100 \text{ cm})^2} = \frac{2659 \text{ m}^2}{10000} = 0.2659 \text{ m}^2$$

- 3) Calculate the density of 96 mL of a liquid that has a mass of 90.5 g? (6 pts.)

$$\text{Density} = \frac{\text{Mass (g)}}{\text{Volume (mL)}} \quad 1 \text{ L} = 1000 \text{ mL} \Rightarrow 1 \text{ mL} = 1 \text{ cm}^3$$

$$D = \frac{90.5 \text{ g}}{96 \text{ mL}}$$

$$D = 0.9427083$$

$$= 0.94 \text{ g/mL}$$

$$3) D = 0.94 \text{ g/mL}$$

- 4) Show your calculation to find how many kilojoules are there in 95.0 Calories? (Note the capital C in Calorie and given 1 cal = 4.18 joules) (6 pts.)

3st

4) 397 Kilojoules

$$95.0 \cancel{\text{Cal}} \times \frac{1000 \cancel{\text{cal}}}{1 \cancel{\text{Cal}}} \times \frac{4.18 \cancel{\text{J}}}{1 \cancel{\text{cal}}} \times \frac{1 \text{ kJ}}{1000 \cancel{\text{J}}} = 397.1 = 397 \text{ Kilojoules}$$

- 5) Suppose it took 108 joules of energy to raise a bar of gold from 25.0°C to 29.7°C. Given that the specific heat capacity of gold is 0.128 J/g°C, what is the mass (in grams) of the bar of gold? Show all your calculations with set up equation and units. (8 pts.)

3st

5) 180 gram

$$q = m \cdot c \cdot \Delta T \Rightarrow m = \frac{q}{c \Delta T}$$

$$m = \frac{108 \cancel{\text{J}}}{0.128 \frac{\cancel{\text{J}}}{\text{g}^\circ\text{C}} (29.7^\circ\text{C} - 25.0^\circ\text{C})}$$

$$m = \frac{108 \cancel{\text{J}}}{0.6016}$$

$$= 179.521$$

$$m = 180 \text{ g}$$

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

6) _____

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

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

If the sulphur piece was large and the top of the sulphur was above the water level, then we would get a lower volume than the actual volume of the sulphur. The lower measured volume in the denominator would cause us to have a higher density for the sulphur. So the error would make the volume low thus in turn making the density high.

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

~~7) 22.8376 amu~~
22.83 amu

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

6 SF 4 SF

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

$$\text{Atomic Mass} = (22.1760 \times .4500) + (23.1847 \times .4500) + (24.1934 \times .1000)$$

$$= (9.9792) + (10.4331) + (2.41934)$$

$$= 22.83164$$

$$\text{Atomic Mass} = 22.8316 \text{ amu}$$

$$\text{Atomic Mass} = (22.1760 \times .4500) + (23.1847 \times .4500) + (24.1934 \times .1000)$$

$$= (9.979) + (10.43) + (2.419)$$

2 decimal places

$$= 22.83 \text{ amu}$$

MULTIPLE CHOICE. Use scantron to answer the questions. Choose the one alternative that best completes the statement or answers the question (3 pts. each).

- 8) The correct decimal representation of 1.201×10^{-7} is: 8) B
 A) 12010000
 B) 0.0000001201
 C) 0.0001201
 D) 1201.000
 E) none of the above
- 9) There are exactly 2.54 centimeters in 1 inch. When using this conversion factor, how many significant figures are you limited to? 9) E
 A) 1
 B) 3
 C) ambiguous
 D) depends on if you are using it in multiplication/division or addition/subtraction
 E) infinite number of significant figures
- 10) The correct number of significant figures in the number 0.002320 is: 10) C
 A) 7
 B) 3
 C) 4
 D) ambiguous
 E) none of the above
- 11) Determine the answer to the following equation with correct number of significant figures: 11) D
 $13.96 - 4.9102 + 71.5 = 80.5498$
 A) 80.5498
 B) 81
 C) 80.55
 D) 80.5
 E) none of the above
- 12) Determine the answer to the following equation with correct number of significant figures: 12) C
 $(17.103 + 2.03) \times 1.02521 = 19.133454$
 A) 19.6
 B) 20
 C) 19.62
 D) 19.6153
 E) none of the above
- 13) The correct prefix for the multiplier 1,000,000,000 is: 13) B
 A) milli.
 B) giga.
 C) mega.
 D) tera.
 E) none of the above

14) The standard SI unit for temperature is:

- A) atmospheres.
- B) Fahrenheit.
- ☒ C) Kelvin.
- D) Celsius.
- E) none of the above.

14) C

15) How many cm^3 are there in 1.25 ft^3 ?

- A) 38.1
- ☒ B) 3.54×10^4
- C) 5.49×10^3
- D) 246
- E) none of the above

$$1.25 \text{ ft}^3 \times \frac{(12 \text{ in})^3}{(1 \text{ ft})^3} \times \frac{(2.54 \text{ cm})^3}{(1 \text{ in})^3}$$
$$1.25 \times 1728 \times 35396 = 3.54 \times 10^4$$

15) B

16) 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?

- ☒ A) 1.7
- B) 0.60
- C) 2.4
- D) 1.8
- E) none of the above

$$D = \frac{14.01 \text{ g}}{(33.6 - 25.2) \text{ mL}} = \frac{14.01 \text{ g}}{8.4 \text{ mL}} = 1.7$$

16) A

17) 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.

- ☒ 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) $235 \text{ mile} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{10^{-2} \text{ cm}} \times \frac{10^3 \text{ km}}{1 \text{ m}}$

17) A

18) Which state of matter has indefinite shape and is compressible?

- A) plasma
- B) liquid
- ☒ C) solid
- ☒ D) gas
- E) none of the above

18) D

19) Which of the following items is a pure substance?

- A) seawater
- B) brass
- C) air
- ☒ D) ice
- E) none of the above

19) D

20) Which of the following is a heterogenous mixture?

- A) sugar water
- B) air
- C) milk
- ☒ D) raisin bran
- E) none of the above

20) D

21) Which of the following statements is FALSE?

- 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.
- C) A mixture may be either homogeneous or heterogeneous.
- D) Matter may be a pure substance or it may be a mixture.
- ☒ E) All of the above statements are true.

21) E

22) An energy diagram that shows the reactants having greater energy than the products illustrates an

- A) isothermic reaction.
- ☒ B) exothermic reaction.
- C) endothermic reaction.
- D) impossible reaction.
- E) none of the above

22) B

23) What is the value of 335 K on the Celsius temperature scale?

- A) 66.4
- ☒ B) 62
- C) 167
- D) 608
- E) none of the above

$$K = ^\circ C + 273$$
$$335 = ^\circ C + 273$$
$$= ^\circ C$$

23) B

24) A 15.0 gram lead ball at 25.0°C was heated with 40.5 joules of heat. Given the specific heat of lead is 0.128 J/g°C, what is the final temperature of the lead?

- A) 0.844°C
- ☒ B) 46.1°C
- C) 21.1°C
- D) 77.8°C
- E) none of the above

$$q = mc\Delta T = \Delta T = \frac{q}{mc}$$
$$\Delta T = \frac{40.55}{(15.0g)(0.128 \frac{J}{g^\circ C})}$$

$$\Delta T = \frac{40.5}{1.92}$$

$$\Delta T = 21.1^\circ C$$

$$\Delta T = T_f - T_i$$

$$21.1^\circ = T_f - 25.0$$
$$= T_f$$

24) B

25) The atomic mass unit is defined as:

- A) the mass of electrons found in a carbon atom containing six protons and neutrons.
- B) the mass of the hydrogen atom containing only one proton.
- C) 1/14 the mass of a nitrogen atom containing 7 protons and 7 neutrons.
- ☒ D) 1/12 the mass of a carbon atom containing six protons and six neutrons.
- E) none of the above

25) D

26) Which of the following elements has an atomic number of 4?

- A) H
- B) C
- ☒ C) Be
- D) He
- E) none of the above

26) C

27) What is the atomic symbol for tin?

- A) Ti
- B) Tn
- C) Si
- ☒ D) Sn
- E) none of the above

27) D

28) Nonmetals are located where on the periodic table?

- A) left side
- B) zig-zag diagonal line
- ☒ C) right side
- D) middle
- E) none of the above

28) C

29) Cr is a member of which family?

- A) halogens
- B) alkali metals
- C) noble gases
- D) alkaline earth metals
- ☒ E) none of the above

29) E

30) How many electrons are in Br^- ?

- ☒ A) 36
- B) 4
- C) 7
- D) 34
- E) none of the above

30) A

31) How many protons and neutrons are in Cl-37 ?

- ☒ A) 17 protons, 20 neutrons
- B) 20 protons, 17 neutrons
- C) 17 protons, 37 neutrons
- D) 37 protons, 17 neutrons
- E) none of the above

31) A

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

- 32) The number 0.010100 has five significant figures. 32) A
- 33) In addition or subtraction, the result carries the same number of decimal places as the quantity carrying the fewest decimal places. 33) A
- 34) When the number 65.59 is rounded to contain 2 significant figures, it becomes 66.0. 34) B
- 35) The elemental symbol for manganese is Mg. 35) B
- 36) Protons and electrons each have a mass of 1 amu. 36) B