JOE PERFECT

Practice Test - Chapter 1 - Matter and Measurement

Be sure you are practicing solving problems w/out a calc. ☺

Directions: Answer each of the following questions. No calculators are allowed.

Target #1: I can define and provide examples for each of the following terms: physical property, chemical property, physical change, chemical change, intensive property, extensive property element, compound, mixture

For # 1-4, fill in the blanks with physical change (PC), physical property (PP), chemical change (CC), or chemical property (CP):

CP 1. Sodium has the ability to react with water.

PP 2. Aluminum has a density of 2.7 g/cm^3.

PC 3. An ice cube melts.

CC 4. A piece of coal burns.

INTENSIVE: density, b.p., m.p., malleability
EXTENSIVE: mass, vol., length

For #5-7, finish the statements.

5. The difference between an intensive property and an extensive property is that an intensive property is . . . independent of the amount of substance present.
6. A compound is different than a mixture in that a compound . . . the elements are chemically combined. In a mixture, the elements are physically mixed.
7. An element is defined as . . . a substance that cannot be separated into simpler substances by chemical means.

For #8-10, circle **true** or **false**. Correct all false statements to make them true.

(T) F 8. Malleability is an example of a physical, intensive property of metals.

(T) F 9. It is possible to separate a compound by use of electrolysis. ie: $H_2O \rightarrow H_2 + O_2$

(T) F 10. Air is an example of a mixture. AIR is a HOMOGENEOUS mixture!

Target #2: I can differentiate between the three states of matter.

11. Solids are matter . . .
    a. which have a definite shape but no definite volume.
    (b) which have a definite shape and a definite volume.
    c. have a definite volume and take the shape of their container.
    d. easily compressed and have a definite volume.

LIQUIDS: def. vol. but no def. shape

GASES: no def. vol. or def. shape

12. The state of matter which contains the particles with the greatest kinetic energy is _____.
    a. solids b. liquids (c. gases) ⇒ particles MOVE very fast!

Target 3: I can list the commonly used metric prefixes and their meanings.

13. Complete the table below. Giga has been done for you!

Prefix	Giga	Mega	Kilo	Milli	Micro	Nano	Pico
Meaning	10^9	10^6	10^3	10^{-3}	10^{-6}	10^{-9}	10^{-12}

↳ You should also know femto... 10^{-15} ☺

The set-up and calculations for selected problems is at the end of this answer key.

14. Circle the biggest quantity for each of the following:
    a. 10 meters or 1,000 mm
    b. 5 micrograms or 0.50 milligrams
    c. 650 mL or 0.065 L

15. Circle all of the following which of the following is/are **NOT** correct?
    a. There are 1,000 mg in a gram.
    b. There are 100 cm in a meter.
    c. There are 1,000 mL in a liter.
    d. There are 100 mm in a centimeter.
    e. There are 1,000 microjoules in a millijoule.

10 mm = 1 cm

$x\,\mu J = \left|\frac{1\ mJ}{10^3\ mJ}\right|\left|\frac{1\ J}{1\ J}\right|\left|\frac{10^6\ \mu J}{1\ J}\right| = 10^3\,\mu J = 1{,}000\ \mu J$

16. 2.5 nm equals . . .
    a. 2.5×10^{-9} m b. 2.5×10^{-4} mm c. 2.5×10^{-7} cm d. a & b e. a & c

Target #4: I can determine the number of significant digits in a measured quantity and determine the appropriate number significant digits in a calculation.

17. Underline the significant digits in each of the following measured numbers:
    a. 50,500 L b. 0.02500 mg c. 400. miles d. 7.0080 cm^3

18. When 125 mg, 1.2 dg, and 1.2223 g are added, how many significant digits does the answer have?
    a. 2 b. 3 c. 4 d. 5 e. 6

19. Which of the following have precisely three significant figures? (There may be more than one correct answer . . . circle all answers which have exactly 3 sig fig's!)
    a. 0.01 (1) b. 100 (1) c. 0.100 (3) d. 0.00100 (3) e. 110 (2)

20. The molar mass of H_2SO_4 is calculated through the following:
    H: 2 X 1.0079 amu
    S: 1 X 32.066 amu
    O: 4 X 15.9994 amu
    ---

when adding, round to 0.001 place ... the sulfur is the least accurate number.

What is the molar mass (g/mol) of H_2SO_4?

to 0.001 place!

    a. 100 b. 98 c. 98.1 d. 98.08 e. 98.079 f. 98.0794

Target #5: I can convert temperatures between Celsius and Kelvin.

°C + 273 = Kelvin

21. Fill in the blanks with the correct temperature:
    a. 25°C = 298 K b. 312 K = 39 °C

22. Solid carbon dioxide, dry ice, changes directly from a solid to a vapor at 195 K if left in an open container. What is this temperature in degrees Celsius and Fahrenheit?
    a. -78°C, 468°F b. -108°C, 468°F c. 468°C, -108°F d. -78°C, -108°F

195 − 273 = −78°C

Choices "A" & "D" are both −78°C ... but choice "D" is the only one in which °F makes sense.

23. Which is the smallest temperature change?
    a. 25°C to 26°C
    b. 25 K to 26 K
    c. 25°F to 26°F
    d. They are all the same.

Target #6: I can perform calculations involving density.

24. A 9.00 gram rectangular solid with a density of 1.5 g/cm^3 has a length of 60.00 mm and a width of 2.00 cm. What is the height of this rectangular solid? *(Remember . . . no calculators!)*

    a. 1.5 mm b. 10. cm c. 1.0 cm d. 5.0 cm e. 5.0 mm

25. An empty container weighs 15.2 grams. When filled with water (density = 1.00 g/mL), it weighs 35.9 grams. When filled with an unknown liquid to the same mark as it was filled to with the water, it weighs 36.2 grams. What is the density of the unknown liquid?

    a. 1.80 g/mL b. 1.61 g/mL c. 1.01 g/mL d. 0.986 g/mL e. 0.00506 g/mL

Target# 7: I can convert between units by using dimensional analysis.

26. The copper content of a normal healthy human is approximately 1.1 X 10^{-4} percent by mass. How many grams of copper would exist in a person weighing 1.00 X 10^3 lb? (1.0 kg = 2.2 lb)

    a. 0.00050 g b. 0.050 g c. 0.50 g d. 5.0 g e. 50.0 g

27. The density of an object is 15 mg/m^3. What is its density in g/cm^3?
    a. 1.5 X 10^8 b. 1.5 X 10^6 c. 1.5 X 10^2 d. 1.5 X 10^{-6} e. 1.5 X 10^{-8}

<u>Part 2:</u> Show all of your work and label your answer with correct units. Please circle your final answer. You may use calculators!

A pycnometer is a device used to measure density. It weighs 20.455 grams when empty and 31.486 grams when filled with water. Pieces of an alloy are placed into the empty, dry pycnometer. The mass of the alloy and the pycnometer is 28.695 grams. Water is added to the alloy to exactly fill the pycnometer. The mass of the pycnometer, water, and alloy is 38.689 grams. Assume the density of the water is 1.000 g/cm^3, calculate the density (in g/cm^3 **<u>and</u>** in g/mm^3) of the alloy?

7.946 g/cm^3

0.007946 g/mm^3 = 7.946 x 10^{-3} g/mm^3

WORK FOR CHAPTER 1 PRACTICE TEST

14 (a) 1 meter = 1,000 mm

(b) convert both to grams...

$$x\,g = \left|\frac{5\ \mu g}{}\right|\left|\frac{1\ g}{10^6\ \mu g}\right| = 5\times10^{-6}\ g$$

$$x\,g = \left|\frac{0.50\ mg}{}\right|\left|\frac{1\ g}{10^3\ mg}\right| = 0.50\times10^{-3}\ g = 5.0\times10^{-4}\ g$$

Bigger!

(c) 650 mL = 0.65 L

16

$$x\ m = \left|\frac{2.5\ nm}{}\right|\left|\frac{1\ m}{10^9\ nm}\right| = 2.5\times10^{-9}\ m$$ ☺

$$x\ mm = \left|\frac{2.5\ nm}{}\right|\left|\frac{1\ m}{10^9\ nm}\right|\left|\frac{10^3\ mm}{1\ m}\right| = \frac{2.5\times10^3}{1\times10^9} = 2.5\times10^{-6}\ mm$$ ☹

$$x\ cm = \left|\frac{2.5\ nm}{}\right|\left|\frac{1\ m}{10^9\ nm}\right|\left|\frac{10^2\ cm}{1\ m}\right| = \frac{2.5\times10^2}{1\times10^9} = 2.5\times10^{-7}\ cm$$ ☺

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18 Convert all to the SAME unit... then add!

125 mg ⇒ 0.125 g

1.2 dg ⇒ 0.12 g

1.2223 g ⇒ 1.2223 g

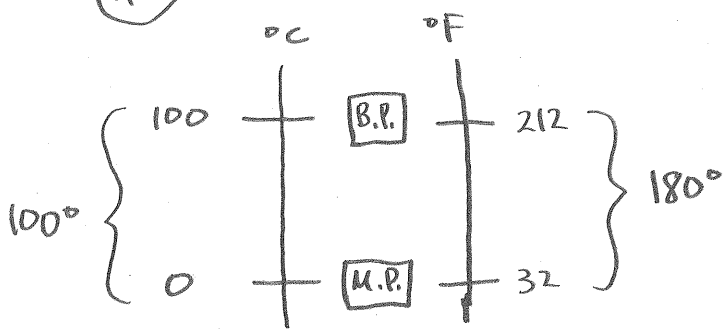
1.4673 g ⇒ round to 0.01 place!

1.47 g

3 sig. fig's

☺

(23) For H_2O...



From diagram at left, you can see that $1°C = 1.8°F$.

Therefore, $1°F$ is a smaller increment than $1°C$.

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(24) $D = \frac{M}{V}$; $V = \frac{M}{D} = \frac{9.00\,g}{1.5\,g/cm^3} \Rightarrow$ Volume $= 6.0\,cm^3$

(convert mm to cm)

$V = L \times W \times H$; $6.0\,cm^3 = (6.000\,cm)(2.00\,cm)(H)$

$H = 0.50\,cm = \boxed{5.0\,mm}$

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(25) CONTAINER: $35.9\,g - 15.2\,g = 20.7\,g\ H_2O = 20.7\,mL$ (vol. of container)

UNKNOWN: $D = \frac{M}{V} = \frac{36.2\,g - 15.2\,g}{20.7\,mL} = \frac{21.0\,g}{20.7\,mL}$ = a little bigger than 1

choice "C" is best guess w/out calculator!

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(26) $x\,g\,Cu = \left|\frac{1{,}000\,lbs}{2.2\,lbs}\right|\left|\frac{1\,kg}{1\,kg}\right|\left|\frac{1{,}000\,g}{1\,kg}\right|\left|\frac{1.1\times10^{-4}\,g\,Cu}{100\,g\,body}\right| =$

$\frac{(1\times10^3)(1\times10^3)(1.1\times10^{-4})}{(2.2)(1\times10^2)} = \frac{1\times10^2}{(2.2)(1\times10^2)} = \frac{1}{2.2} \approx \frac{1}{2} = 0.5\,g\,Cu$

choice "C"

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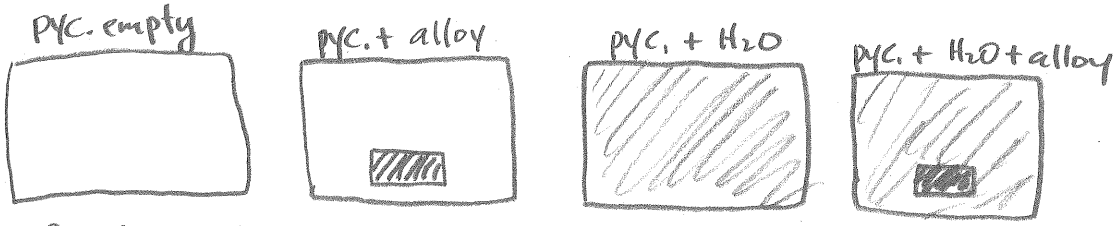
(27) $x\,\frac{g}{cm^3} = \left|\frac{15\,mg}{1\,m^3}\right|\left|\frac{1\,g}{10^3\,mg}\right|\left|\frac{(1\,m)^3}{(100\,cm)^3}\right| = \frac{15}{(10^3)(10^2)^3} = \frac{15}{10^3 \cdot 10^6} = \frac{15}{10^9}$

$= 15\times10^{-9}\,g/cm^3 = 1.5\times10^{-8}\,g/cm^3$

PART 2: It is often best to make mini-diagrams when given lots of information... the problem seems less daunting this way!



20.455g 28.695g 31.486g 38.689g

MASS ALLOY: $28.695\,g - 20.455\,g = 8.240\,g$

VOL. PYC: $31.486\,g - 20.455\,g = 11.031\,g = 11.031\,cm^3$ (since density of H_2O is $1.000\,g/cm^3$)

(VOL) MASS H_2O: $38.689\,g - 28.695\,g = 9.994\,g = 9.994\,cm^3$

VOL. ALLOY: $V_{PYC.} - V_{H_2O} = 11.031\,cm^3 - 9.994\,cm^3 = 1.037\,cm^3$

$$D_{ALLOY} = \frac{M}{V} = \frac{8.240\,g}{1.037\,cm^3} = 7.946\,g/cm^3$$

$$X\ \frac{g}{mm^3} = \left|\frac{7.946\,g}{1\,cm^3}\right|\left|\frac{(1cm)^3}{(10mm)^3}\right| = 0.007946\,g/mm^3$$

NOTE TO ALL STUDENTS: Please be sure to ask questions on ALL questions that you are not sure of! It is your responsibility to identify the targets that you are having the most troubles with.