

3 Point Questions. Write the letter corresponding to the correct answer in the space provided.

1. The correct decimal representation of 1.201×10^{-7} is:

- A) 12010000
- B) 0.0001201
- C) 0.0000001201
- D) 1201.000
- E) none of the above

1 C

2. In the number 48.93, which digit is estimated?

- A) 4
- B) 8
- C) 9
- D) 3
- E) None of the above, all digits are certain.

2 D

3. The correct number of significant figures in the number 1.250100 is:

- A) 5
- B) 7
- C) 4
- D) ambiguous
- E) none of the above

3 B

4. Which of the following is NOT an example of *matter*?

- A) a pencil eraser
- B) a balloon full of helium
- C) a dust particle
- D) heat from a burning candle
- E) none of the above

4 D

5. Which among the following statements is FALSE?

- A) A solid has a definite shape and a definite volume.
- B) A liquid has a definite volume; but it has no definite shape.
- C) A gas has neither definite volume nor definite shape.
- D) Both solids and liquids are incompressible while gases are compressible.
- E) none of the above

5 E

6. All of the following can be considered physical properties EXCEPT

- A) taste.
- B) color.
- C) flammability.
- D) density.
- E) boiling point.

6 C

7. If a solid piece of shiny sodium metal is exposed to chlorine gas, a large amount of heat is released and the white solid sodium chloride (table salt) forms. Based on this information, which of the following statements is TRUE?

- A) This process represents a physical change.
- B) Mass is lost during this process.
- C) Sodium chloride is an element.
- D) This process was exothermic.
- E) none of the above

7 D

8. Which of the following statements about the nature of electrical charge is FALSE?

- A) Electrical charge is a fundamental property of protons and electrons.
- B) Positive and negative electrical charges attract each other.
- C) Positive-positive or negative-negative charges repel each other.
- D) Positive and negative charges cancel each other so that a proton and electron, when paired, are charge neutral.
- E) All of the above statements are true.

8 E

9. All of the following statements about different elements are true EXCEPT:

- A) Barium is an alkaline earth metal.
- B) Manganese is a transition metal.
- C) Sulfur is considered a metalloid.
- D) Krypton is one of the noble gases.
- E) Iodine is a halogen.

9 C

10. A fictional element has two isotopes and an atomic mass of 87.08 amu. If the first isotope is 86 amu and the second isotope has a mass of 90 amu. Which isotope has the greatest natural abundance?

- A) 86 amu
- B) 90 amu
- C) There are equal amounts.
- D) Not enough information provided.
- E) none of the above

10 A

Show Your Work Questions. Answer the following questions as completely as possible. You must show your work in order to receive any credit for your answers. Partial credit will be given where appropriate.

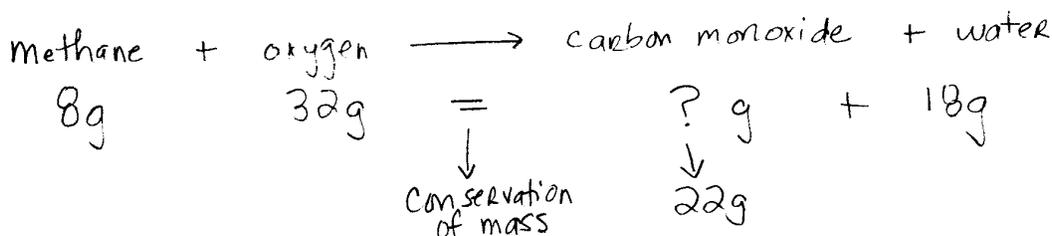
11. (5 pts) Determine the answer to the following equation with correct number of significant figures:

$$106 \div 9.02 \times 1.9 = \underline{22}$$

12. (5 pts) Determine the answer to the following equation with correct number of significant figures:

$$13.96 - 4.9102 + 71.5 = \underline{80.5}$$

13. (5 pts) When methane is burned with oxygen, the products are carbon dioxide and water. If you produce 18 grams of water from 8 grams of methane and 32 grams of oxygen, how many grams of carbon dioxide were produced in the reaction? Give your answer with the correct number of significant figures.



14. (6 pts) How many low dose 81 mg aspirin tablets (that is 81 mg/tablet) can be made from 1.21 kg of aspirin? Give your answer with the correct number of significant figures.

$$\frac{1.21 \text{ Kg} \left| \frac{1000 \text{ g}}{1 \text{ Kg}} \right| \frac{1000 \text{ mg}}{1 \text{ g}} \left| \frac{1 \text{ tablet}}{81 \text{ mg}} \right.}{=} = 14938 \text{ tablets}$$

↓
1.5 × 10⁴ tablets

15. (6 pts) A plastic block has dimensions of 2.2 cm × 3.0 cm × 1.5 cm and a mass of 12.4 grams. Will the block float in water and why?

$$V = l \times w \times h$$

$$= 2.2 \text{ cm} \times 3.0 \text{ cm} \times 1.5 \text{ cm}$$

$$= 9.9 \text{ cm}^3$$

$$D = \frac{\text{mass}}{\text{volume}} = \frac{12.4 \text{ g}}{9.9 \text{ cm}^3} = 1.3 \text{ g/cm}^3$$

→ D_{H₂O} = 1 g/cm³

No, because the density of the block is 1.3 g/cm³ which is larger than the density of water.

16. (6 pts) An object weighing 1.840 kg has a volume of 0.0015 m³. What is the density of the object in g/cm³? Give your answer with the correct number of significant figures.

$$\frac{1.840 \text{ Kg} \left| \frac{1000 \text{ g}}{1 \text{ Kg}} \right| \frac{(1 \text{ m})^3}{(100 \text{ cm})^3}}{0.0015 \text{ m}^3} = 1.2 \text{ g/cm}^3$$

17. (6 pts) How many kilojoules are there in 95.0 Calories?

$$\frac{95.0 \text{ Calories} \left| \frac{1000 \text{ calories}}{1 \text{ Calorie}} \right| \frac{4.184 \text{ J}}{1 \text{ calorie}} \left| \frac{1 \text{ kJ}}{1000 \text{ J}} \right.}{=} =$$

397 kJ

18. (6 pts) The boiling point of water is 373 K. Convert this temperature into units of °F. Show your work for credit.

$$K = \frac{(^{\circ}F - 32)}{1.8} + 273.15$$

$$373 = \frac{(^{\circ}F - 32)}{1.8} + 273.15$$

$$99.85 = \frac{^{\circ}F - 32}{1.8}$$

$$179.73 = ^{\circ}F - 32$$

$$211.73 = ^{\circ}F$$

$$\downarrow$$

$$212^{\circ}F$$

19. (6 pts) What is the specific heat (J/g·°C) of a metal object whose temperature increases by 3.0°C when 17.5 g of metal was heated with 38.5 J?

$$q = m * C * \Delta T$$

$$38.5 \text{ J} = 17.5 \text{ g} * C * 3^{\circ}\text{C}$$

$$\frac{38.5 \text{ J}}{(17.5 \text{ g})(3^{\circ}\text{C})} = C$$

$$0.73 \text{ J/g}\cdot^{\circ}\text{C} = C$$

20. (4 pts) How many protons are in Cl-37? How many neutrons are in Cl-37?

$$P = 17 \quad N = 20$$

always equals atomic number

21. (5 pts) Consider the following specific heats of metals.

Metal	Specific Heat (J/g·°C)
Aluminum	0.903
Copper	0.385
Gold	0.128
Iron	0.449
Silver	0.235

If the same amount of heat is added to 50.0 g samples of each of the metals, which are all at the same temperature, which metal will reach the highest temperature? Briefly explain your answer.

Gold will reach the highest temperature because, with the smallest specific heat capacity, heat will affect/increase its temperature most.

22. (7 pts) A fictional element named Nivadium is found to have three naturally occurring isotopes with the natural abundances shown here:

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

change % values to decimals

What is the calculated atomic mass of Nivadium? Give your answer with the correct number of significant figures.

$$\begin{aligned}
 \text{Atomic mass} &= (\text{mass of isotope 1}) * (\text{fraction of isotope 1}) + \\
 & (\text{mass of isotope 2}) * (\text{fraction of isotope 2}) + \\
 & (\text{mass of isotope 3}) * (\text{fraction of isotope 3}) \\
 &= (22.1760) * (0.4500) + (23.1847) * (0.4500) + \\
 & (24.1934) * (0.1000) \\
 &= \underline{9.9792} + \underline{10.433115} + \underline{2.41934} \\
 &= 22.83 \text{ amu}
 \end{aligned}$$

Short Answer Questions. Complete each statement below.

23. (4 pts)

The names of the elements whose symbols are Si, P, Mn, and S are respectively,

Silicon, Phosphorus, Manganese, and
Sulfur.

24. (4 pts)

Cations are positive ions that form when an atom loses electrons.

25. (2 pts)

Isotopes are atoms of the same element that have different number of neutrons.