

Multiple Choice: (4 points each. Put answers in left margin as capital letters.)

- Which of the following elements is an alkaline earth metal?
A) argon B) chlorine C) magnesium D) sodium E) sulfur
- A block has a temperature of 150 °C. What is its temperature in K?
A) 66 B) 122 C) 227 D) 302 E) 423
- How many significant figures are in the answer to the following problem? $(305 + 747) \times 12$?
A) 1 B) 2 C) 3 D) 4 E) 5
- Which of the changes is a chemical change?
A) A stove burner is heated until it glows orange.
B) A warm soda bottle fizzes when opened.
C) A cord is plugged into a wall socket and electricity flows to turn on a light bulb.
D) Natural gas is heated until a flame is produced.
E) None are chemical changes

- An unknown substance has a mass of 13.4 g. The temperature of the substance increases by 14.1 °C when 72.7 J of heat is added to the substance.

Substance	Specific heat [J/(g · °C)]
lead	0.128
silver	0.235
copper	0.385
iron	0.449
aluminum	0.903
water	4.184

- A) aluminum B) copper C) iron D) lead E) silver
- Which of the following chemical equations best describes the statement, “magnesium metal is heated in the presence of gaseous oxygen to produce solid magnesium oxide”?
A) $2 \text{Mg}_{(s)} + \text{O}_{2(g)} \rightarrow 2 \text{MgO}_{(s)} + \text{heat}$ C) $2 \text{Mg}_{(s)} + \text{O}_{2(g)} + \text{heat} \rightarrow 2 \text{MgO}_{(s)}$
B) $2 \text{MgO}_{(s)} + \text{heat} \rightarrow 2 \text{Mg}_{(s)} + \text{O}_{2(g)}$ D) $2 \text{MgO}_{(s)} + \text{O}_{2(g)} \rightarrow 2 \text{Mg}_{(s)} + \text{heat}$
 - A typical atom is about a factor of _____ times the size of its nucleus?
A) 1 B) 10 C) 100 D) 1,000 E) 10,000
 - The correct number of protons, neutrons, and electrons in S^{2-} (sulfur-32) is:
A) 14p, 16n, 16e C) 16p, 16n, 16e E) 16p, 16n, 18e
B) 14p, 14n, 16e D) 16p, 18n, 16e

9. On another planet, the isotopes of titanium have the given natural abundances.

Isotope Abundance Mass (amu)

^{46}Ti 70.200% 45.95263

^{48}Ti 12.200% 47.94795

^{50}Ti 17.600% 49.94479

What is the average atomic mass of titanium on that planet?

- A) 45.882 amu C) 46.899 amu E) 48.998 amu
B) 46.759 amu D) 47.948 amu

10. Which element is most likely to form a cation?

A) As B) Bi C) N D) P E) Sb

11. What is the charge on sulfur in SO_3^{2-} ?

A) 0 B) +2 C) +3 D) +4 E) +6

12. Identify the chlorate ion:

A) Cl^- B) ClO^- C) ClO_2^- D) ClO_3^- E) ClO_4^-

Discussion Questions:

1. Define: (4 points each)

energy –

nucleus –

binary compound –

Fill-in-the-blanks (4 points each)

1. What are the units that make up a Joule? _____

2. Provide an English/metric conversion factor for **mass**: _____

3. _____ boron triiodide, P_2S_3 _____
4. _____ potassium sulfate, TiO_2 _____
5. _____ $\text{HBr}_{(\text{aq})}$, phosphoric acid _____
6. How are the amu (Dalton, atomic mass unit) and gram related to each other?
7. What is the formula for the force of attraction between two ions of opposite charge?
8. Complete the following sentence, the first law of thermodynamics: Energy may be _____, but it cannot be _____ or _____.

Show your work problems (4 points each)

1. How many liters are in 1.0 gallon?
2. Calculate the specific heat of a solid in $\text{J/g}\cdot^\circ\text{C}$ if 1638 J raises the temperature of 155 g of it from 25.0°C to 42.6°C .