

Figure 1

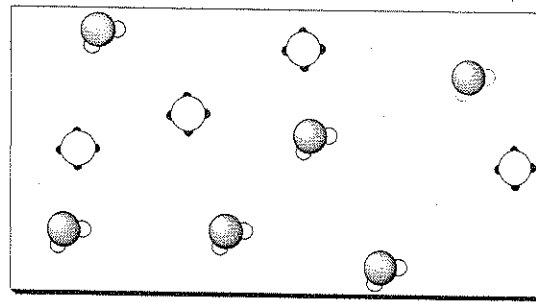


Figure 2

1) (2 points) A particle picture of a reaction between AB & CD is shown above in Figure 1.

a) Identify the reactants (R) and products (P) using the letters (ABCD).

R AB + CD

P AC + BD

b) Is the change shown chemical or physical?

Chemical

c) Is the mass of the product greater than, equal to, or less than the mass of the reactants?

equal

d) If the reaction occurs in a container that does not let energy flow in or out, how does the total energy before compare to the total energy after the reaction?

equal

2) (3 points) Using Figure 2 above answer the following questions.

a) Is the sample of matter a mixture or a pure substance?

mixture

b) Are the particles atoms or molecules? Briefly explain your answer.

The figure shows that one molecule is made of 2 different atoms in a 2:1 ratio and the other is made of another set of atoms in a 4:1 ratio. A whole number ratio exists for

molecules

c) Assuming the box is a container; does the sample appear to be a gas, liquid, or solid? Briefly explain your answer.

A gas fills its container, taking on the container's shape.

gas the smallest particles (atoms)

3) (2 points) Label each process as chemical or physical.

a) baking bread

C

b) white sugar is heated to make a brown caramel sauce

C

c) solid gold is liquefied

P

d) iron powder is made when an iron nail is filed

P

4) (2 points) Label each sample of matter as one of the following: element, compound, homogenous mixture, or heterogeneous mixture.

a) a piece of nigiri sushi

heterogeneous mixture

b) bisphenol A (C₁₅H₁₆O₂)

compound

c) chlorinated tap water

homogeneous mixture

d) molecular sulfur (S₈)

element

5) (1 point) Label each process as endothermic or exothermic.

a) liquid gold is solidified

exothermic

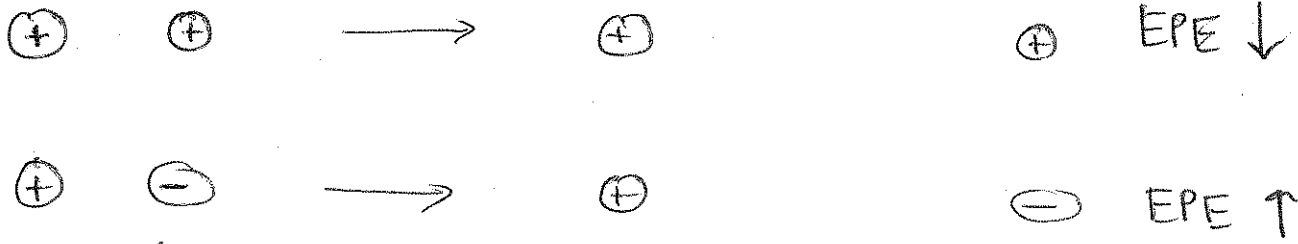
b) cooking oil bursts into flame when overheated

exothermic

melting gold is endothermic

oil (like gas or natural gas) burns in the presence of air.

6) (2 points) Gravitational potential energy increases as a rocket moves farther from the earth. Increasing the distance between two electrically charged objects may raise or lower the electrostatic potential energy. Explain how this can be?



Like charges repel. Moving like charges apart lowers the force of repulsion.
 Unlike charges attract. Moving unlike charges apart increases the force of attraction.

- 7) (3 points) Magnesium has three isotopes with the listed percent abundance and atomic mass (u).
- 1) Write the number of neutrons present in each isotope.
 - 2) Without calculating a weighted average mass explain the W.A.M listed for Mg on the periodic table.

10.00%	24.986 u	≈	25 u	$1p^+ \approx 1u$ $1n \approx 1u$ Mg has 12 p^+	$25 - 12 = 13 n$ $24 - 12 = 12 n$ $26 - 12 = 14 n$
78.99%	23.985 u	≈	24 u		
11.01%	25.983 u	≈	26 u		

This one is similar to gravity

Since nearly 80% of Mg is ^{24}Mg you'd expect the W.A.M to be $\approx 24u$

8) (6 points) Complete the isotope table for the 2 isotopes listed in the 2 columns, respectively. Be sure to identify the unknowns marked with an X and question mark (?).

Symbol	$^{100}\text{Ru}^0$	$^{58}\text{X}^{3+}$
# of Particles	$^{44}\text{Ru}^0$	$^{26}\text{X}^{3+}$ $\rightarrow \text{Fe}$
Neutrons	56	32
Atomic Number	44	26
Mass Number	100	58
Protons	44	26
Electrons	44	23

Given that the W.A.M $> 24u$ it makes sense that the heavier isotopes (^{25}Mg and ^{26}Mg) add to the W.A.M but not significantly so since they are $\approx 20\%$ of the W.A.M.

