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1. Molecules in \_\_\_ are densely packed, but not held in fixed positions.

A. a solid

C. a liquid

B. a gas

D. an atom

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2. Which category best describes solid CO<sub>2</sub>?

A. compound

C. homogeneous mixture

B. element

D. gaseous matter

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3. Which statement is **true**?

A. N<sub>2</sub> is an element.

C. N<sub>2</sub> is a compound.

B. H<sub>2</sub>O is a mixture.

D. H<sub>2</sub>O is an element.

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4. Which of the following is an example of a **physical** change?

A. corrosion

C. combustion

B. evaporation

D. digestion

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5. Define the **total energy** of an object.

A. the sum of its kinetic and potential energy

B. the conversion of thermal energy to mechanical work

C. the sum of its chemical and mechanical energy

D. the capacity of an object to apply a force

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6. How many nm are in  $1.5 \times 10^{-6}$  cm?

A.  $1.5 \times 10^5$  nm

C.  $1.5 \times 10^{-13}$  nm

B. 15 nm

D.  $1.5 \times 10^{-17}$  nm

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7. Solve the following problem, expressing your answer in scientific notation:

$$(9.992 \times 3.200) + 61.00 =$$

A.  $9.300 \times 10^{-1}$

C.  $1.95 \times 10^3$

B. 92.74

D.  $9.297 \times 10^1$

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8. An *E. coli* cell has a volume of  $1.0 \mu\text{m}^3$  and a human cell has a volume of 35 picoliters. How many times the volume of an *E. coli* cell can a human cell hold?

A.  $3.5 \times 10^2$

C.  $3.5 \times 10^4$

B.  $2.5 \times 10^4$

D.  $4.5 \times 10^4$

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9. What is the **density** of an object with a mass of 10.29 kg and a volume of  $0.035 \text{ m}^3$ ?

A.  $2.9 \times 10^{-3} \text{ g/cm}^3$

C.  $0.29 \text{ g/cm}^3$

B.  $3.4 \times 10^{-3} \text{ g/cm}^3$

D.  $3.4 \text{ g/cm}^3$

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10. Which one is an **intensive** property?

A. volume

C. height

B. mass

D. color

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11.  $1701 + (47.11 - 55.3) =$

A. 1692.81

C. 1693

B. 1692.8

D. 1690

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12. What is the answer, to the correct number of significant figures, to the following

calculation? 
$$\frac{(2.500 \times 10^{-4})}{(0.00035)(4.09 \times 10^8)} =$$

A.  $2.90 \times 10^8$

C.  $1.75 \times 10^{-9}$

B.  $2.00 \times 10^{-9}$

D.  $1.7 \times 10^{-9}$

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13. One can of cola contains 35 g of sugar and a cup of sugar weighs 190 g. How much sugar is in two cans of cola?

A. 0.10 cups

A. 2.7 cups

B. 0.37 cups

B. 3.0 cups

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14. The density of bromine is 3.12 g/mL. What is the volume of 0.255 lb of bromine?

A. 142 in<sup>3</sup>

C. 2.26 in<sup>3</sup>

B. 4.85 in<sup>3</sup>

D. 0.147 in<sup>3</sup>

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15. According to Dalton's atomic theory, an atom

A. can change identity in a chemical reaction.

B. of one element is identical to an atom of any other element.

C. can change the way it is attached to other atoms in a chemical reaction.

D. is different from the other atoms of the same element.

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16. Which of the following is **not** consistent with the law of conservation of mass?

A. Matter is not created in a chemical reaction.

B. Matter is not destroyed in a chemical reaction.

C. Mass of the reactants is always larger than the mass of products of a chemical reaction.

D. Subatomic particles are indestructible by chemical means.

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17. Rutherford's gold foil experiment showed that

A. each element is composed of tiny, indestructible particles.

B. all atoms of a given element have the same mass.

C. atoms combine in simple, whole-number ratios to form compounds.

D. an atom is mostly empty space with a tiny, very dense nucleus.

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18. Which statement about subatomic particles is **true**?

- A. Neutrons and electrons are strongly attracted to one another.
- B. Neutrons and protons have approximately the same mass.
- C. The charge of an electron has the opposite sign but a slightly larger magnitude than the charge of a proton.
- D. An electron has a mass of zero.

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19. Which of the following are **isotopes** of one another?

- A.  $O_3$ ,  $O_2$
- B.  $C_6H_{12}O_6$ ,  $C_6H_{13}O_6^+$
- C. S,  $SO_2$
- D.  $^{13}C$ ,  $^{12}C$

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20. Which is **not** an ion found in typical ionic compounds?

- A.  $K^+$
- B.  $Ca^{2+}$
- C.  $H^-$
- D.  $N^{2-}$

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21. Identify the **alkaline earth metal** in the third period.

- A. Na
  - B. Al
  - C. Mg
  - D. Cl
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22. Rubidium has two naturally occurring isotopes,  $^{85}\text{Rb}$  (84.912 amu) and  $^{87}\text{Rb}$  (86.909 amu). Using the average atomic mass from the periodic table, what is the relative abundance (percentage) of  $^{85}\text{Rb}$ ?

A. 29.8%

C. 72.2%

B. 36.1%

D. 99.2%

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23. How many protons, neutrons and electrons are in one atom of  $^{60}\text{Ni}$ ?

A. 28 p, 32 n, 28 e<sup>-</sup>

C. 28 p, 60 n, 28 e<sup>-</sup>

B. 32 p, 28 n, 28 e<sup>-</sup>

D. 28 p, 32 n, 32 e<sup>-</sup>

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24. Which sample contains the **greatest number** of atoms?

A. 100. g Na

C. 100. g Ag

B. 100. g He

D. 100. g P

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25. Which of the following does **not** describe the same **amount** of copper? The density of copper is  $8.96\text{ g}\cdot\text{cm}^{-3}$ .

A. 3.00 g

C. 0.0315 mol

B.  $0.223\text{ cm}^3$

D.  $1.90 \times 10^{22}$  atoms

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26. What is the **empirical formula** of  $\text{N}_3\text{P}_3\text{Cl}_6$ ?

- A.  $\text{N}_3\text{P}_3\text{Cl}_6$                                       C.  $\text{NPCl}_3$   
B.  $\text{NPCl}_2$     D.  $(\text{NPCl}_2)_3$

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27. Which group contains only **ionic** compounds?

- A.  $\text{LiNO}_3$ ,  $\text{KBr}$ ,  $\text{MgO}$                                       C.  $\text{CO}$ ,  $\text{PF}_3$ ,  $\text{N}_2\text{O}_5$   
B.  $\text{NaCl}$ ,  $\text{H}_2\text{O}$ ,  $\text{CO}_2$                                       D.  $\text{K}_2\text{SO}_4$ ,  $\text{CaBr}_2$ ,  $\text{CH}_4$

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28. What is the formula of iron(III) oxide?

- A.  $\text{Fe}_2\text{O}_3$     C.  $\text{FeO}_3$   
B.  $\text{Fe}_3\text{O}_2$     D.  $\text{Fe}_3\text{O}$

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29. Name  $\text{BCl}_3$ .

- A. boron (II) chloride                                      C. boron chlorine  
B. boron trichloride                                      D. boron trichlorine

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30. Which one of the following  $25.0\text{-cm}^3$  samples contains the **largest number** of atoms?

- A. potassium (density =  $0.862\text{ g/cm}^3$ )  
B. boron (density =  $2.34\text{ g/cm}^3$ )  
C. arsenic (density =  $5.72\text{ g/cm}^3$ )  
D. gold (density =  $19.3\text{ g/cm}^3$ )
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**Answer Key:**

1. C
2. A
3. A
4. B
5. A
6. B
7. D
8. C
9. C
10. D
11. C
12. D
13. B
14. C
15. C
16. C
17. D
18. B
19. D
20. D
21. C
22. C
23. A
24. B
25. A
26. B
27. A
28. A
29. B
30. B