8.5 D

Name _____

1. In which of these compounds are there twice as many oxygen atoms as hydrogen atoms?

F H_3PO_4

G H_2SO_4

H $HClO_3$

J H_2O

2. How many atoms of oxygen are in a molecule of glucose ($C_6H_{12}O_6$)?

Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

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3. Strontium phosphate, $Sr_3(PO_4)_2$, is a crystalline substance used in medicine and industry. How many phosphorus atoms are represented in the formula for $Sr_3(PO_4)_2$?

A 2

B 3

C 4

D 8

4. The equation below represents a chemical reaction that occurs in living cells.

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + \text{energy}$$

How many atoms are represented in the reactants of this equation?

F 6

G 12

H 24

J 36

5. Which information could a student determine from only the chemical formula of a protein?

F The color of the protein

G The number of molecules in each sequence that makes up a protein

H The physical arrangement of atoms in the structure of the protein

J The number of atoms of each element in the protein

6. Which of these formulas contain equal numbers of nitrogen atoms?

I. $Co(NO_3)_2$
II. $(NH_4)_2CO_3$
III. $(NH_4)_3PO_4$
IV. $Al(NO_3)_3$
V. NH_4NO_3

A Formulas I and III

B Formulas I and IV

C Formulas II and III

D Formulas I, II, and V

7. A student is using colored beads to make a model of aluminum sulfate, $Al_2(SO_4)_3$. Aluminum atoms are represented by blue beads, sulfur atoms by yellow beads, and oxygen atoms by green beads.

What combination of beads should the student use for the model?

F 6 blue, 3 yellow, and 7 green

G 2 blue, 1 yellow, and 4 green

H 2 blue, 3 yellow, and 12 green

J 6 blue, 12 yellow, and 12 green

8. The chemical formula for sodium sulfate is Na_2SO_4. How many sulfur atoms are in the formula for sodium sulfate?

A 1

B 2

C 6

D 7

GO ON

9. Serotonin is a chemical substance that acts as a neurotransmitter. It helps relay messages in the human brain. The formula for one molecule of serotonin is shown below.

$$C_{10}H_{12}N_2O$$

How many atoms in all are in a molecule of serotonin?

Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

10. The table lists some compounds found in foods and their formulas.

Compound	Formula
Glutamine	$C_5H_{10}N_2O_3$
Lactose	$C_{12}H_{22}O_{11}$
Fructose	$C_6H_{12}O_6$
Sorbitol	$C_6H_{14}O_6$

Based on this information, which of these statements is NOT true?

A A molecule of sorbitol contains three more oxygen atoms than a molecule of glutamine does.

B A molecule of lactose contains twice as many atoms as a molecule of fructose does.

C A molecule of fructose contains four more atoms than a molecule of glutamine does.

D A molecule of lactose contains twice as many carbon atoms as a molecule of sorbitol does.

11. The table shows the chemical formulas for four substances.

Substance	Chemical Formula
1	C_2H_6O
2	C_8H_{18}
3	CH_3CH_2Br
4	$C_4H_{10}O$

Which substances have the same number of carbon atoms?

A Substances 1 and 2

B Substances 2, 3, and 4

C Substances 2 and 3 only

D Substances 1 and 3

12. Nitrogen dioxide is a gas that can be generated by emissions from vehicles and factories. It can also be generated by natural sources, such as forest fires, lightning, and microbial activity in soil. The equation for producing nitrogen dioxide is shown below.

$$\underset{\text{Colorless gas}}{2NO} + \underset{\text{Colorless gas}}{O_2} \longrightarrow \underset{\text{Brown gas}}{2NO_2}$$

Which of these provides evidence that a chemical reaction occurs?

A A gas is present.

B The total number of atoms remains unchanged.

C The state of matter remains the same.

D A brown gas is produced.

8.5E

13. A silver ring reacts with compounds containing sulfur in the air to form silver sulfide, a black substance that makes up the tarnish on the surface of silver objects. To remove the tarnish from the ring, students placed it in a pan lined with aluminum foil and added hot water. Baking soda was added to the hot water and stirred. Students made observations about the process.

Which observation of this process provides evidence of a chemical reaction?

F Hot water heated the aluminum foil.

G The liquid solution changed color.

H The pan was lined with aluminum foil.

J The hot water cooled.

14. A student obtains two strips of magnesium, Mg, ribbon that are each 3 cm long. One strip of magnesium is placed in a test tube containing 5 mL of water, and the other strip is placed in a test tube containing 5 mL of hydrochloric acid, HCl. Both liquids are at room temperature. The student's observations are recorded in the table.

Test Tube 1 Magnesium in Water	Test Tube 2 Magnesium in HCl
No observable activity takes place.	Bubbling occurs on the surface of the magnesium.
The temperature of the water remains constant.	The temperature of the liquid increases.
A lit match placed near the mouth of the test tube continues to burn.	A lit match placed near the mouth of the test tube makes a popping sound and goes out.
The appearance of the metal does not change.	The metal strip gradually becomes smaller until nothing is left except for a clear liquid.

Which statement is **not** supported by the student's observations?

F A chemical reaction takes place between magnesium and hydrochloric acid.

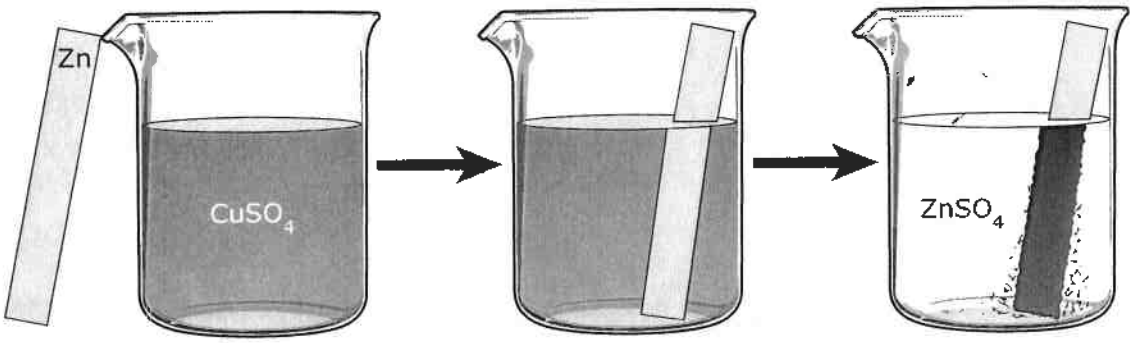
G A gas is released in Test Tube 2.

H The substances in both test tubes are reactive only at high temperatures.

J Energy is released in the reaction involving hydrochloric acid.

15. For an investigation a student poured a blue solution of $CuSO_4$ into a beaker. The student placed a shiny, silver-colored strip of zinc metal in the solution and observed the changes.

Observations of an Investigation



Blue solution | Zinc in blue solution | Zinc in clear solution

The student inferred that a chemical reaction occurred. What evidence supports this inference?

F A dark solid formed on the zinc metal.

G The zinc metal remained silver-colored and shiny.

H The $CuSO_4$ solution turned blue when the zinc metal was added.

J None of these

16. A scientist spilled a few drops of dilute hydrochloric acid (HCl) on a lab table. For safety purposes, the scientist sprinkled some baking soda ($NaHCO_3$) onto the spill. Which observation would provide the best evidence that a chemical reaction occurred?

F The baking soda and hydrochloric acid combined, and bubbles formed.

G The baking soda absorbed the hydrochloric acid.

H Some of the baking soda dissolved in the hydrochloric acid.

J The hydrochloric acid evaporated, leaving only the baking soda.

17. Coal contains carbon and other elements. Carbon dioxide forms when coal burns in the presence of oxygen. Which of these is the best evidence that a chemical reaction occurs when coal burns?

A The shape of the coal changes.

B Oxygen is present.

C A new substance is produced.

D Coal is made up of more than one element.

18. A scientist performed four investigations using eight different liquids. In each investigation, the scientist combined two of the liquids under a fume hood and recorded observations in the table below.

Scientist's Observations

Investigation	Observations After Two Liquids Are Combined
1	The temperature of the combined liquids increased, and a solid substance formed.
2	The temperature of the combined liquids decreased, and bubbles formed.
3	One liquid settled to the bottom of the beaker, and the other liquid rose to the top.
4	The combined liquids turned from clear to a bright purple.

In which investigation is it least likely that the liquids reacted chemically?

A 1

B 2

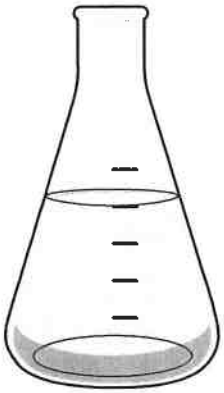
C 3

D 4

GO ON

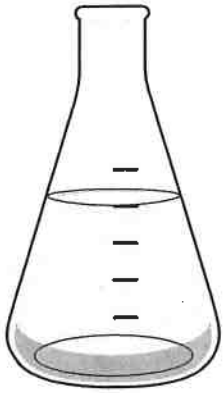
19. During an investigation, a student combined the two clear, colorless solutions shown below.

Solution 1



Compound A dissolved in water at 25°C

Solution 2



Compound B dissolved in water at 25°C

The student observed that the temperature changed from 25°C to 23°C when the solutions were combined and that a white substance rapidly formed and settled to the bottom of the container. What most likely happened to produce these results?

F One of the original compounds came out of solution.

G The solutions reacted chemically.

H Some of the water froze into ice crystals.

J Rapid evaporation of water occurred, leaving a solid.

20. Some students in a chemistry lab conducted an investigation in which they added four different solid substances to separate beakers of water. They stirred the mixtures for one minute and then recorded their observations in the table below.

Student Observations

Substance	Observation
1	The substance dissolved.
2	The substance caused bubbles to form.
3	The substance sank to the bottom.
4	The substance floated on top.

Which substance most likely caused a new substance to be formed when mixed with water?

F Substance 1

G Substance 2

H Substance 3

J Substance 4