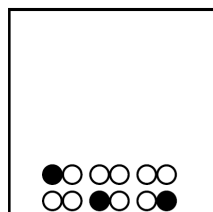


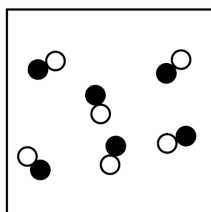
Matter and Energy

1. Which two particle diagrams represent two different phases of the same compound, only?

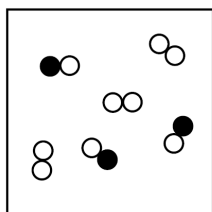
Key	
○	= atom of one element
●	= atom of a different element



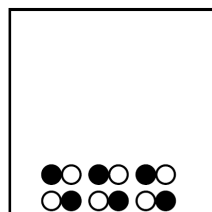
A



B



C



D

A) *A* and *B*

B) *A* and *C*

C) *B* and *C*

D) *B* and *D*

2. Which property is determined by the structure, arrangement, and interactions of the molecules of a substance at a given temperature and pressure?

A) atomic radius B) half-life
C) formula mass D) physical state

3. Which sample of matter has the greatest distance between molecules at STP?

A) $\text{N}_2(\text{g})$ B) $\text{NH}_3(\text{aq})$
C) $\text{C}_6\text{H}_{14}(\text{l})$ D) $\text{C}_6\text{H}_{12}\text{O}_6(\text{s})$

4. The arrangement of particles is most ordered in a sample of

A) $\text{NaCl}(\text{aq})$ B) $\text{NaCl}(\text{l})$
C) $\text{NaCl}(\text{g})$ D) $\text{NaCl}(\text{s})$

5. A sample of gas is in a rigid cylinder with a movable piston. The pressure of the gas is kept constant. If the Kelvin temperature of the gas is doubled, the volume of the gas is

A) halved B) doubled
C) tripled D) unchanged

6. Which equation represents a physical change?

A) $\text{H}_2\text{O}(\text{s}) + 6.01 \text{ kJ} \rightarrow \text{H}_2\text{O}(\text{l})$
B) $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g}) + 483.6 \text{ kJ}$
C) $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) + 53.0 \text{ kJ} \rightarrow 2\text{HI}(\text{g})$
D) $\text{N}_2(\text{g}) + 2\text{O}_2(\text{g}) + 66.4 \text{ kJ} \rightarrow 2\text{NO}_2(\text{g})$

7. Which substance can be decomposed by chemical means?

A) aluminum B) octane
C) silicon D) xenon

8. The table below shows mass and volume data for four samples of substances at 298 K and 1 atmosphere.

Masses and Volumes of Four Samples

Sample	Mass (g)	Volume (mL)
A	30.	60.
B	40.	50.
C	45	90.
D	90.	120.

Which two samples could consist of the same substance?

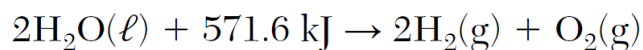
A) *A* and *B* B) *A* and *C*
C) *B* and *C* D) *C* and *D*

9. Which transfer of energy occurs when ice cubes are placed in water that has a temperature of 45°C ?

A) Chemical energy is transferred from the ice to the water.
B) Chemical energy is transferred from the water to the ice.
C) Thermal energy is transferred from the ice to the water.
D) Thermal energy is transferred from the water to the ice.

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10. Given the balanced equation representing a reaction:



What occurred as a result of this reaction?

- A) Energy was absorbed, and entropy increased.
 - B) Energy was absorbed, and entropy decreased.
 - C) Energy was released, and entropy increased.
 - D) Energy was released, and entropy decreased.
11. Which term represents a form of energy?
- A) heat
 - B) degree
 - C) kilocalorie
 - D) temperature
12. Which unit is used to express the energy absorbed or released during a chemical reaction?
- A) kelvin
 - B) joule
 - C) volt
 - D) torr
13. Which kind of energy is stored within a chemical substance?
- A) free energy
 - B) activation energy
 - C) kinetic energy
 - D) potential energy
14. The average kinetic energy of the particles in a sample of matter is expressed as
- A) density
 - B) volume
 - C) pressure
 - D) temperature
15. Which temperature represents the highest average kinetic energy of the particles in a sample of matter?
- A) 298 K
 - B) 267 K
 - C) 27°C
 - D) 12°C
16. Which temperature is equal to 120. K?
- A) -153°C
 - B) -120.°C
 - C) +293°C
 - D) +393°C
17. Which Kelvin temperature is equal to -73°C?
- A) 100 K
 - B) 173 K
 - C) 200 K
 - D) 346 K
18. A liquid's freezing point is -38°C and its boiling point is 357°C. What is the number of Kelvin between the boiling point and the freezing point of the liquid?
- A) 319
 - B) 395
 - C) 592
 - D) 668

19. The average kinetic energy of water molecules *decreases* when

- A) $\text{H}_2\text{O}(\ell)$ at 337 K changes to $\text{H}_2\text{O}(\ell)$ at 300. K
 - B) $\text{H}_2\text{O}(\ell)$ at 373 K changes to $\text{H}_2\text{O}(\text{g})$ at 373 K
 - C) $\text{H}_2\text{O}(\text{s})$ at 200. K changes to $\text{H}_2\text{O}(\text{s})$ at 237 K
 - D) $\text{H}_2\text{O}(\text{s})$ at 273 K changes to $\text{H}_2\text{O}(\ell)$ at 273 K
20. Which phase change is exothermic?
- A) solid to liquid
 - B) solid to gas
 - C) liquid to solid
 - D) liquid to gas
21. Which phase change results in an increase in entropy?
- A) $\text{I}_2(\text{g}) \rightarrow \text{I}_2(\text{s})$
 - B) $\text{CH}_4(\text{g}) \rightarrow \text{CH}_4(\ell)$
 - C) $\text{Br}_2(\ell) \rightarrow \text{Br}_2(\text{g})$
 - D) $\text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{O}(\text{s})$
22. Which term is defined as a measure of the disorder of a system?
- A) heat
 - B) entropy
 - C) kinetic energy
 - D) activation energy
23. Under which conditions of pressure and temperature is a real gas most like an ideal gas?
- A) low pressure and low temperature
 - B) low pressure and high temperature
 - C) high pressure and low temperature
 - D) high pressure and high temperature
24. According to the kinetic molecular theory, which statement describes the particles in a sample of an ideal gas?
- A) The particles are constantly moving in circular paths.
 - B) The particles collide, decreasing the total energy of the system.
 - C) The particles have attractive forces between them.
 - D) The particles are considered to have negligible volume.

Matter and Energy

25. Which phrase describes the motion and attractive forces of ideal gas particles?

- A) random straight-line motion and no attractive forces
- B) random straight-line motion and strong attractive forces
- C) random curved-line motion and no attractive forces
- D) random curved-line motion and strong attractive forces

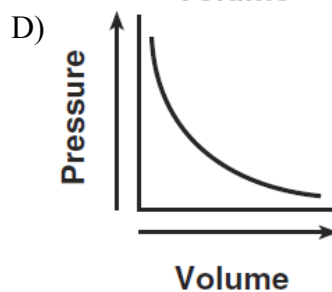
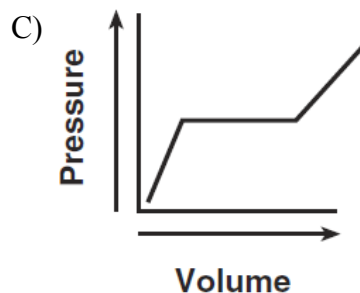
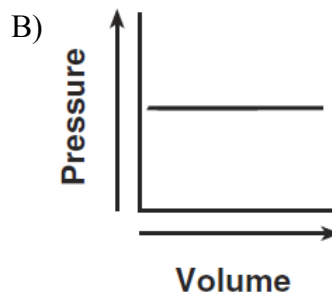
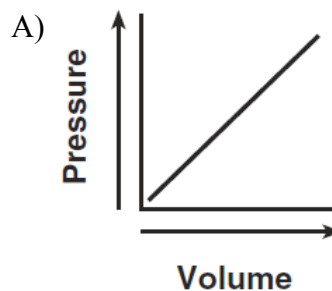
26. A gas is most likely to change to the liquid phase when the pressure on the gas

- A) decreases and its temperature increases
- B) decreases and its temperature decreases
- C) increases and its temperature increases
- D) increases and its temperature decreases

27. A cylinder with a movable piston contains a sample of gas having a volume of 6.0 liters at 293 K and 1.0 atmosphere. What is the volume of the sample after the gas is heated to 303 K, while the pressure is held at 1.0 atmosphere?

- A) 9.0 L B) 6.2 L C) 5.8 L D) 4.0 L

28. Which graph represents the relationship between pressure and volume for a sample of an ideal gas at constant temperature?



Matter and Energy

29. The molar masses and boiling points at standard pressure for four compounds are given in the table below.

Compound	Molar Mass (g/mol)	Boiling Point (K)
HF	20.01	293
HCl	36.46	188
HBr	80.91	207
HI	127.91	237

Which compound has the stronger intermolecular forces?

- A) HF B) HCl C) HBr D) HI
-

30. What happens when NaCl(s) is dissolved in water?

- A) Cl^- ions are attracted to the oxygen atoms of water molecules.
 - B) Na^+ ions are attracted to the oxygen atoms of water molecules.
 - C) Cl^- ions are repelled by the hydrogen atoms of water molecules.
 - D) Na^+ ions are repelled by the oxygen atoms of water molecules.
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