01

term	example
Isotope	Diamond - Graphite
Isotone	$^{16}_{8}O - ^{14}_{6}C$
Isoelectronic	$_{7}N^{-3} - _{13}Al^{+3}$

Which of the following terms have the correct examples listed next to them?

A) Isotope

B) Isotone

C) Isoelectronic

D) Isotone and Isoelectronic

02

What is the bond angle in a tetrahedral molecule?

A) 90°

B) 109.5°

C) 120°

D) 180°

03

The electron configurations of the particles X^{2+}, Y^{-} and Z are as follows:

X^{2+} : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
Y^{-} : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
Z : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$

Based on this information, which of the following comparisons regarding the atoms of the elements X, Y, and Z in their ground state is correct?

A) Property: Number of valence electrons
Comparison: X = Y > Z

B) Property: Atomic number
Comparison: X > Y > Z

C) Property: Number of half-filled orbitals
Comparison: Y = Z > X

D) Property: Number of orbitals
Comparison: X > Y > Z

04

In a stoichiometric calculation, how do you convert moles to grams?

A) Multiply by the molar mass
B) Divide by the molar mass
C) Add the molar mass
D) Subtract the molar mass

05

How do you assign oxidation numbers to compounds?

A) Use the periodic table and rules for common ions
B) Use only the total number of electrons
C) Use only the total number of protons
D) There are no specific rules

06

In which type of reaction is the rate directly proportional to the concentration of only one reactant?

A) Zero-order reaction
B) First-order reaction
C) Second-order reaction
D) Third-order reaction

07

Which reaction type involves the addition of a functional group to an alkene?

A) Elimination reaction
B) Substitution reaction
C) Addition reaction
D) Rearrangement reaction

08

Which of the following compounds has been incorrectly classified as organic/inorganic?

A) Organic: C_2H_6, Inorganic: KOCN
B) Organic: CH_3OH, Inorganic: $KMnO_4$
C) Organic: H_2CO_3, Inorganic: $(NH_4)_2SO_4$
D) Organic: $C_6H_{12}O_6$, Inorganic: $CaCO_3$

09

In the context of the Second Law of Thermodynamics, what happens to the total entropy of an isolated system?

A) It remains constant.

B) It decreases over time until it reaches thermodynamic equilibrium.

C) It increases over time until it reaches thermodynamic equilibrium.

D) It can fluctuate.

10

In which scenario would the equilibrium constant (K) change for a given reaction?

A) Changing the concentration of reactants

B) Changing the pressure

C) Changing the temperature

D) Adding a catalyst

11

Travertines

Snail shell

Bulb filament

Chalk

Which of the following does not contain the compound $CaCO_3$ in its structure?

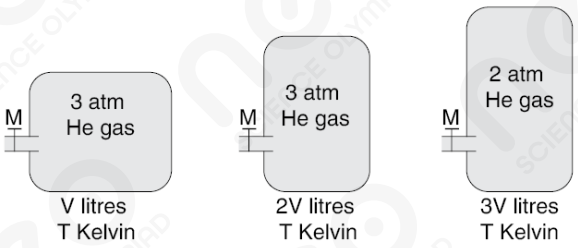
A) Travertines

B) Snail shell

C) Bulb filament

D) Chalk

12



At the same temperature, the above containers contain ideal He gases with fixed volumes. Which of the following correctly describes the relationship between the gas densities in the containers?

A) I > II > III

B) II > III > I

C) I = III > II

D) I = II > III

13

In a fixed-volume, closed container at 25°C, there are 16 g of CH_4 gas.

Which of the following processes, when applied separately to the container, will cause the pressure to double?

I. Adding 2 g of He gas while keeping the temperature constant.

II. Increasing the temperature to 50°C.

III. Adding 2 g of H_2 gas while keeping the temperature constant.

(Assume that the gases behave ideally.)

(H = 1 g/mol, He = 4 g/mol, C = 12 g/mol)

A) I

B) II

C) III

D) I and III

14

The formula that shows the types and numbers of atoms in an organic compound molecule is called the molecular formula, while the formula that shows the simplest form of the atomic counts in the molecule is called the empirical (simplified) formula.

In an organic compound made of C, H, and O, 11 grams of the compound contain 6 grams of C and 1 gram of H. Additionally, the compound has 14 moles of atoms per mole. Based on this information, what are the correct empirical and molecular formulas of the compound?

(H = 1 g/mol, C = 12 g/mol, O = 16 g/mol)

A) Empirical formula: CH_3O_3, Molecular formula: $C_2H_6O_6$

B) Empirical formula: C_2H_4O, Molecular formula: $C_4H_8O_2$

C) Empirical formula: CH_2O, Molecular formula: $C_3H_6O_4$

D) Empirical formula: $C_2H_2O_3$, Molecular formula: $C_4H_4O_6$

15

Which of the following elements typically has a +1 oxidation state?

A) Oxygen
B) Sodium
C) Chlorine
D) Magnesium

16

In the reaction between strong acids and strong bases, if there is no excess of either the acid or the base, it is called a complete neutralisation. If there is an excess of either the acid or the base, it is called a partial neutralisation.

Based on the information above, which of the following reactions is an example of partial neutralisation?

A) 1 mol HCl with 1 mol NaOH
B) 2 mol HNO_3 with 1 mol $Ca(OH)_2$
C) 2 mol NaOH with 1 mol H_2SO_4
D) 1 mol HBr with 1 mol $Ca(OH)_2$

17

What type of reaction occurs when a single compound breaks down into two or more simpler substances?

A) Synthesis reaction
B) Decomposition reaction
C) Combustion reaction
D) Displacement reaction

18

In a double replacement reaction, what usually occurs?

A) The reactants switch partners to form new products
B) One reactant is oxidised and the other is reduced
C) The reactants combine to form one product
D) A gas is produced

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Dry ice turns directly into a gas at normal atmospheric pressure without becoming liquid. What type of change is this?

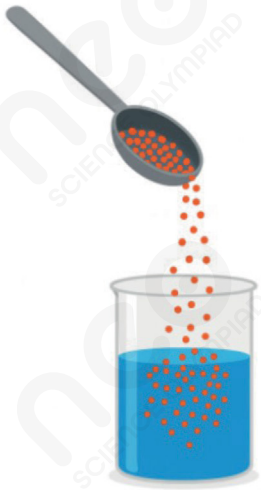
A) Condensation

B) Evaporation

C) Freezing

D) Sublimation

20



Which change will increase the rate at which a solid solute dissolves in a liquid solvent?

A) Lowering the temperature of the solvent

B) Increasing the surface area of the solute by crushing

C) Decreasing the stirring speed

D) Using a solvent that is less polar than the solute

21

Scientists have used everyday materials to provide concrete examples in order to better explain their atomic models and subatomic particles. This helped make their atomic models easier to understand.

Accordingly, which of the following statements are correct?

I. In Dalton's atomic model, the atom is likened to a billiard ball.

II. J.J. Thomson explained his atomic model by comparing it to a plum pudding.

III. Rutherford developed the planetary model by comparing the nucleus to the sun and the electrons orbiting around it to planets.

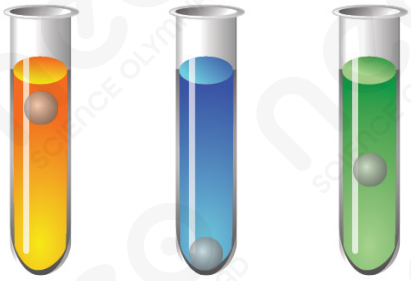
A) I and II

B) I and III

C) II and III

D) I, II, and III

22



In test tubes containing liquids X, Y, and Z in the same environment, identical marbles are dropped from the same height and at the same time. The positions of the marbles at time t are shown in the figure above.

Based on this, which of the following statements are incorrect?

I. The viscosity of liquid Z is smaller than that of liquid Y.

II. The fluidity of liquid X is greater than that of liquid Z.

III. Under the same conditions, the relationship between intermolecular forces is X > Z > Y.

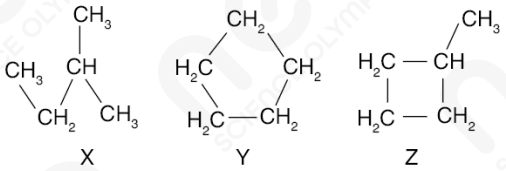
A) I

B) II

C) III

D) I and II

23



The skeletal (line-bond) formulas of three different organic compounds are given above. Based on this, which of the following statements are correct?

I. All three are alkanes.

II. Y and Z are isomers of each other.

III. The number of moles of CO_2 gas produced when one mole of X and one mole of Y are burned is equal.

A) I and II

B) II and III

C) I and III

D) I, II, and III

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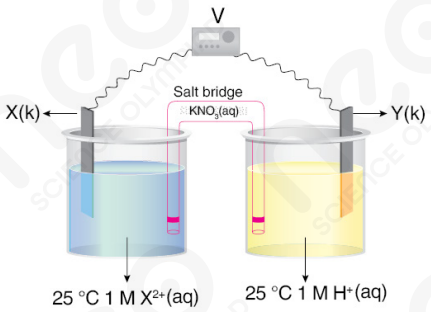

The diagram of a galvanic cell is shown above. While the galvanic cell operates, the NO_3^- ions in the salt bridge move to the container with X^{2+} ions.

Accordingly, which of the following statements are correct?

I. The net cell equation is $X(s) + 2H^+(aq) \rightleftharpoons X^{2+}(aq) + H_2(g)$.

II. Electrons are supplied to the external circuit from the Y electrode.

III. The standard voltage of the cell is equal to the standard oxidation potential of X.

A) I and II B) I and III C) II and III D) I, II, and III

25

$CH_3OH(l) + \frac{3}{2} O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

$\Delta H = -162$ kkal/mol

$C(s) + O_2(g) \rightarrow CO_2(g)$

$\Delta H = -94$ kkal/mol

Which of the following statements are common to both reactions above?

I. They are exothermic.

II. The ΔH values are equal to the molar enthalpy of formation of CO_2 gas.

III. The tendency for minimum energy is towards the products.

A) I and II

B) I and III

C) II and III

D) I, II, and III

Answer Key

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