

Question 1.

Which of the following is a chemical change?

- (A) Activated carbon adsorbing pigments
- (B) Ice melting into water
- (C) Iron rusting
- (D) Hydrochloric acid volatilization

Question 2.

The correctly named compound is ().

- (A) CO Carbon dioxide
- (B) Na_2CO_3 Baking soda
- (C) FeCO_3 Iron(II) carbonate
- (D) CuCl Copper(II) chloride

Question 3.

The incorrectly named compound is ().

- (A) $\text{CH}_3\text{CH}_2\text{OH}$ Ethanal
- (B) $\text{CH}_2 = \text{CH}_2$ Ethene
- (C) $\text{HC} \equiv \text{CH}$ Ethyne
- (D) $\text{CH}_3 - \text{CH}_3$ Ethane

Question 4.

The correct chemical notation is ().

- (A) 2 hydrogen molecules: 2H_2
- (B) 3 oxygen atoms: 3O
- (C) 4 water molecules: $4\text{H}_2\text{O}$
- (D) 5 sodium ions: 5Na^+

Question 5.

Which substance is pure?

- (A) Hydrochloric acid
- (B) Air
- (C) Saturated brine
- (D) Ice-water mixture

Question 6.

A pair of allotropes is ().

- (A) Water and hydrogen peroxide
- (B) Oxygen and liquid oxygen
- (C) White phosphorus and red phosphorus
- (D) Ice and dry ice

Question 7.

The oxidation states of N in NH_4NO_3 are ().

- (A) +1, +5
- (B) -3, +5
- (C) +1, -1
- (D) -3, +3

Question 8.

Which is a solution? ()

- (A) Saline
- (B) Peanut oil
- (C) Distilled water
- (D) Cement slurry

Question 9.

The flame color of sodium chloride in a flame test is ().

- (A) Pale white
- (B) Pale blue
- (C) Yellow
- (D) Green

Question 10.

Which of the following is a non-electrolyte? ()

- (A) Sodium carbonate
- (B) Sulfuric acid
- (C) Sucrose
- (D) Sodium hydroxide

Question 11.

Which of the following substances belongs to electrolyte? ()

- (A) Metal aluminum
- (B) NaCl
- (C) Sucrose
- (D) Carbon dioxide

Question 12.

Which of the following reactions is a redox reaction? ()

- (A) $\text{HCl} + \text{NaOH} = \text{NaCl} + \text{H}_2\text{O}$
- (B) $\text{CO}_2 + \text{H}_2\text{O} = \text{H}_2\text{CO}_3$
- (C) $\text{Fe} + \text{CuSO}_4 = \text{FeSO}_4 + \text{Cu}$
- (D) $\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2 \uparrow$

Question 13.

Which of the following is commonly used as oxidizing agent? ()

- (A) Potassium permanganate
- (B) Sodium
- (C) Carbon monoxide
- (D) Hydrogen gas

Question 14.

Which of the following groups consists of allotropes of the same element? ()

- (A) ^{12}C and ^{14}C
- (B) CO and CO_2
- (C) Diamond and graphite
- (D) CH_4 and C_3H_8

Question 15.

Which compound's aqueous solution is acidic? ()

- (A) NaCl
- (B) NaOH
- (C) Na_2CO_3
- (D) NH_4Cl

Question 16.

When phenolphthalein is added to a solution and it turns red, the solution is?

- (A) Neutral
- (B) Acidic
- (C) Basic
- (D) Unable to determine

Question 17.

Which gas can be collected by both water displacement and upward air displacement methods? ()

- (A) Hydrogen
- (B) Ammonia
- (C) Oxygen
- (D) Carbon dioxide

Question 18.

Take 10 mL of NaOH solution from 1 L of $1 \text{ mol} \cdot \text{L}^{-1}$ NaOH solution. The molar concentration of this 50 mL NaOH solution is ().

- (A) $0.2 \text{ mol} \cdot \text{L}^{-1}$
- (B) $2 \text{ mol} \cdot \text{L}^{-1}$
- (C) $1 \text{ mol} \cdot \text{L}^{-1}$
- (D) $0.02 \text{ mol} \cdot \text{L}^{-1}$

Question 19.

Which of the following statements is incorrect about substance applications? ()

- (A) 75% ethanol can be used for disinfection (B) Carbon can be used as fuel
(C) CO can be used for fire suppression (D) O_2 supports combustion

Question 20.

The position of sulfur $_{16}S$ in the periodic table is ().

- (A) Period 3, Group IVA (B) Period 2, Group VA
(C) Period 3, Group VIA (D) Period 2, Group IVA

Question 21.

When concentrated sulfuric acid is left exposed to air, what changes occur?

- (A) Solution mass decreases (B) Solute mass increases
(C) Solvent mass decreases (D) Solution mass increases

Question 22.

Which pair of compounds are homologs? ()

- (A) CH_3CH_3 and $HC \equiv CH$ (B) $CH_3CH = CHCH_3$ and $CH_3C \equiv CCH_3$
(C) CH_3CH_3 and $CH_3CH_2CH_3$ (D) $CH_3CH = CH_2$ and CH_3CH_3

Question 23.

Which of the following reaction classifications is correct? ()

- (A) $FeO_3 + 3CO \rightarrow 2Fe + 3CO_2$ Single displacement
(B) $MnO_2 + 4HCl (conc.) \rightarrow MnCl_2 + Cl_2 \uparrow + 2H_2O$ Combination
(C) $HClO + NaOH = NaClO + H_2O$ Double displacement
(D) $3Fe + 2O_2 = Fe_3O_4$ Decomposition

Question 24.

When the reaction reaches equilibrium, what is always equal in the reaction system? ()

- (A) Forward reaction rate and reverse reaction rate
(B) Mass of reactants and products
(C) Concentration of reactants and products
(D) The time that atoms exist in reactant molecules and product molecules

Question 25.

Which of the following substances is classified as an oxide? ()

- (A) NaOH (B) O_2
(C) H_2O (D) $KClO_3$

Question 26.

Which of the following statements about catalysts is incorrect? ()

- (A) Catalysts can alter reaction rates (B) A catalyst's mass changes after reaction
(C) Some reactions can use different catalysts (D) The chemical properties of a catalyst remain unchanged after the reaction

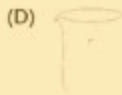
Question 27.

Which pair of substances share identical chemical bond types? ()

- (A) O_2 and H_2 (B) NaOH and KCl
(C) NaCl and HCl (D) HNO_3 and NH_4NO_3

Question 28.

Which of the following glassware is called beaker?



Question 29.

When $BaCl_2$ solution is added to an unknown solution, a white precipitate forms that doesn't dissolve in nitric acid. Which of the following statements is correct?

- (A) The solution must contain Ag^+ (B) The solution may contain CO_3^{2-}
(C) The solution may contain SO_4^{2-} or Ag^+ (D) The solution must contain SO_4^{2-}

Question 30.

The reaction between hydrochloric acid and sodium hydroxide belongs to ().

- (A) neutralization reaction (B) combination reaction
(C) decomposition reaction (D) displacement reaction

Question 31.

Which elements belong to the same group in the periodic table?

- (A) Hydrogen, Lithium, Sodium (B) Carbon, Oxygen, Sulfur
(C) Sodium, Magnesium, Aluminum (D) Hydrogen, Carbon, Oxygen

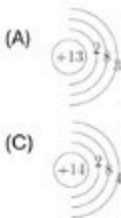
Question 32.

The correct order of increasing atomic radius is ().

- (A) $Al < B < Na < Mg$ (B) $Al < B < Mg < Na$
(C) $B < Al < Mg < Na$ (D) $B < Al < Na < Mg$

Question 33.

The correct electron configuration diagram for sodium (Na) is ().



Question 34.

At 25°C, after evaporating water from 100 mL of a 0.05 mol·L⁻¹ H₂SO₄ solution and concentrating it to 10 mL, the pH of the resulting solution is ().

- (A) 14 (B) 2
(C) 1 (D) 0

Question 35.

For the reaction $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$ in a 2L closed container, SO₂ decreases from 1.0 mol to 0.6 mol in 10 seconds. The reaction rate for O₂ is ().

- (A) $0.04 \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1}$ (B) $0.02 \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1}$
(C) $0.2 \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1}$ (D) $0.01 \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1}$

Question 36.

What reagents can be used to detect Cl⁻ ions? ()

- (A) AgNO₃ and dilute nitric acid (B) BaCl₂ and dilute hydrochloric acid

(C) AgNO_3 and dilute sulfuric acid

(D) $\text{Ba}(\text{NO}_3)_2$ and dilute nitric acid

Question 37.

Which of the following equilibrium systems will shift toward product formation when either pressure is decreased or temperature is increased? ()

(A) $\text{C(s)} + \text{CO}_2(\text{g}) \rightleftharpoons 2\text{CO(g)}$ (forward is endothermic)

(B) $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ (forward is exothermic)

(C) $2\text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$ (forward is exothermic)

(D) $3\text{O}_2(\text{g}) \rightleftharpoons 2\text{O}_3(\text{g})$ (forward is endothermic)

Question 38.

Which of the following is a substitution reaction ().

(A) Ethene with hydrogen chloride

(B) Benzene with hydrogen

(C) Methane with chlorine

(D) Ethene with water

Question 39.

The correct statement about organic compounds is ().

(A) Carbon-containing compounds may be organic or inorganic

(B) All exhibit isomerism

(C) They contain only carbon and hydrogen

(D) They cannot be synthesized artificially

Question 40.

When 0.02 mol of water undergoes photolysis to produce hydrogen, which statement is correct? ()

(A) Produces 0.02 g of H_2

(B) Produces 0.01 mol of H_2

(C) Produces 0.224 L of H_2 (at standard temperature and pressure)

(D) Produces 0.02 mol of H_2

Question 41.

Which solution has a concentration of 0.5 mol/L? ()

(A) 1 L solution containing 40g NaOH

(B) 1 L solution containing 1 mol K^+ from K_2SO_4

(C) 11.2 L HCl dissolves in water to make 1 L solution

(D) 20g NaOH dissolves in 1 L of water

Question 42.

For the endothermic reaction $\text{C(s)} + \text{H}_2\text{O(g)} \rightleftharpoons \text{CO(g)} + \text{H}_2\text{(g)}$, what can cause the equilibrium to shift in the opposite direction? ()

- (A) Increase temperature, decrease pressure (B) Increase temperature, increase pressure
(C) Decrease temperature, increase pressure (D) Decrease temperature, decrease pressure

Question 43.

The liquid that, together with fresh Cu(OH)_2 , to form a red Cu_2O precipitate is ().

- (A) $\text{CH}_3\text{COOCH}_2\text{CH}_3$ (B) CH_3CHO
(C) CH_3COOH (D) $\text{CH}_3\text{CH}_2\text{OF}$

Question 44.

Which ions can coexist in large amount in solution? ()

- (A) Acidic solution: Fe^{3+} SO_4^{2-} NO_3^- Mg^{2+} (B) Acidic solution: Na^+ Ag^+ Cl^- NO_3^-
(C) Basic solution: Al^{3+} NO_3^- Cl^- HCO_3^- (D) Basic solution: Ba^{2+} Na^+ CO_3^{2-} Cl^-

Question 45.

A 23.4 g mixture of Cu and CuO yields 20.2 g pure Cu after reduction with CO. The original CuO mass was ().

- (A) 40 g (B) 32 g
(C) 16 g (D) 20 g

Question 46.

In a chemistry experiment class, which of the following targets can be achieved by performing the corresponding operations? ()

	Operations	Targets
1.	Add excess concentrated NaOH into ZnCl_2 solution	To produce Zn(OH)_2 precipitate
2.	Evaporate AlCl_3 solution completely	To produce anhydrous AlCl_3
3.	Treat Cu/CuO mixture with dilute nitric acid, then filter, wash and dry	To purify Cu from mixture of CuO
4.	Bubble CO_2 through $\text{C}_6\text{H}_5\text{ONa}$ solution, the solution becomes cloudy	To compare the acidity of the carbonic acid to phenol

(A) 1

(B) 2

(C) 1, 2

(D) 3

Question 47.

A certain white powder is composed of two substances, and the following experiments are conducted to identify its composition:

- (1) Take a small amount of sample and add sufficient water, the solid partly dissolves; then add a sufficient amount of dilute hydrochloric acid, bubbles are formed, and the solid completely dissolves.
(2) Take a small amount of sample and add sufficient dilute sulfuric acid, bubbles are produced; after shaking, there is still solid present. The white powder may be ().

(A) NaOH , CuSO_4

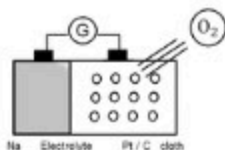
(B) CaCO_3 , BaCO_3

(C) AgNO_3 , Na_2CO_3

(D) Na_2CO_3 , BaCO_3

Question 48.

Scientists have developed a $\text{Na} - \text{O}_2$ secondary battery at room temperature, which uses NaClO_4 dissolved in organic solvents as the electrolyte. The total reaction of the battery using metallic sodium and Pt/C loaded carbon cloth as electrode materials is $\text{O}_2 + 2\text{Na} \rightleftharpoons \text{Na}_2\text{O}_2$. Which of the following statements is correct? ()



(A) When discharged, ClO_4^- moves to cathode

(B) Anode reaction occurs when discharging: $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$

(C) O_2 is released when discharging, O_2 is absorbed when charging

(D) Cathode reaction occurs when charging: $\text{Na}_2\text{O}_2 - 2\text{e}^- \rightarrow 2\text{Na}^+ + \text{O}_2$

09927367140