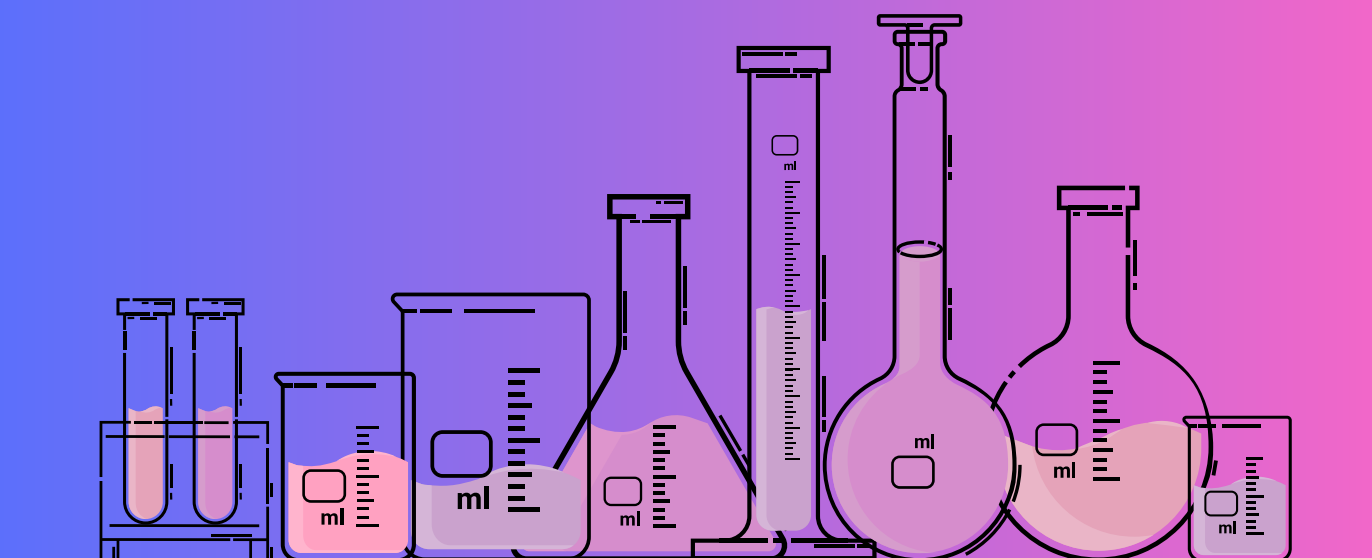


CU-ATS

Chemistry

Oct 2025 Question Style

35 questions, 38 minutes



1

In J.J. Thomson's plum pudding model of the atom, the "pudding" represents which component of atomic structure?

- 1) Electrons
- 2) Protons
- 3) Neutrons
- 4) Protons and neutrons
- 5) A uniform mixture of positive and negative charges

2

When Niels Bohr proposed his atomic model in 1913, which of the following was not yet known at that time?

- 1) The nucleus contains protons and neutrons
- 2) Electrons move around the nucleus in fixed orbits with quantized energy
- 3) The hydrogen emission spectrum consists of distinct lines
- 4) The atom is mostly empty space with a dense central nucleus
- 5) Atoms combine in fixed ratios to form compounds

3

An alpha particle is shot at a lithium nucleus, and they fuse together. What is the product of this reaction?

- 1) $^{12}_6\text{C}$
- 2) $^{10}_5\text{Be}$
- 3) $^{11}_5\text{Be}$
- 4) $^{10}_4\text{B}$
- 5) $^{14}_7\text{N}$

4

How many grams of nitric acid (HNO_3) are required to prepare 500.0 mL of a 2.00 M nitric acid solution?

- 1) 31.5 g
- 2) 63.0 g
- 3) 126.0 g
- 4) 15.8 g
- 5) 94.5 g

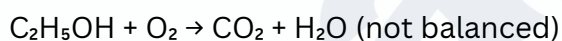
5

A solution contains 3.01×10^{22} molecules of calcium chloride dissolved in 0.5 L of solution. What is the concentration of the solution?

- 1) 0.1 M
- 2) 1.0 M
- 3) 0.05 M
- 4) 2.0 M
- 5) 0.2 M

6

Ethanol burns completely in oxygen according to the equation:



When 2.00 mol of ethanol are completely burned, what volume of oxygen gas at RTP is required? (Assume molar gas volume at RTP = $24.0 \text{ dm}^3 \text{ mol}^{-1}$)

- 1) 22.4 dm^3
- 2) 67.2 dm^3
- 3) 112 dm^3
- 4) 134.4 dm^3
- 5) 157 dm^3

7

A student has a sample of hydrated cobalt(II) chloride, $\text{CoCl}_2 \cdot n\text{H}_2\text{O}$.

A 0.207 g sample is heated until all water is driven off, leaving 0.113 g of anhydrous CoCl_2 .

What is the value of n ?

- 1) 1
- 2) 2
- 3) 5
- 4) 6
- 5) 7

8

The reaction $\text{A} + \text{B} \rightleftharpoons \text{C} + 2\text{D}$ is exothermic.

Which of the following statements about this reaction is incorrect?

- 1) The energy of the products is lower than that of the reactants.
- 2) The amount of product formed increases when temperature increases.
- 3) The surrounding temperature increases when the reaction is complete.
- 4) The enthalpy change (ΔH) is negative.
- 5) The reaction absorbs heat from the surroundings as it proceeds.

9

For the equilibrium reaction: $A(s) + B(aq) \rightleftharpoons C(aq) + D(g)$

What happens when the pressure is decreased?

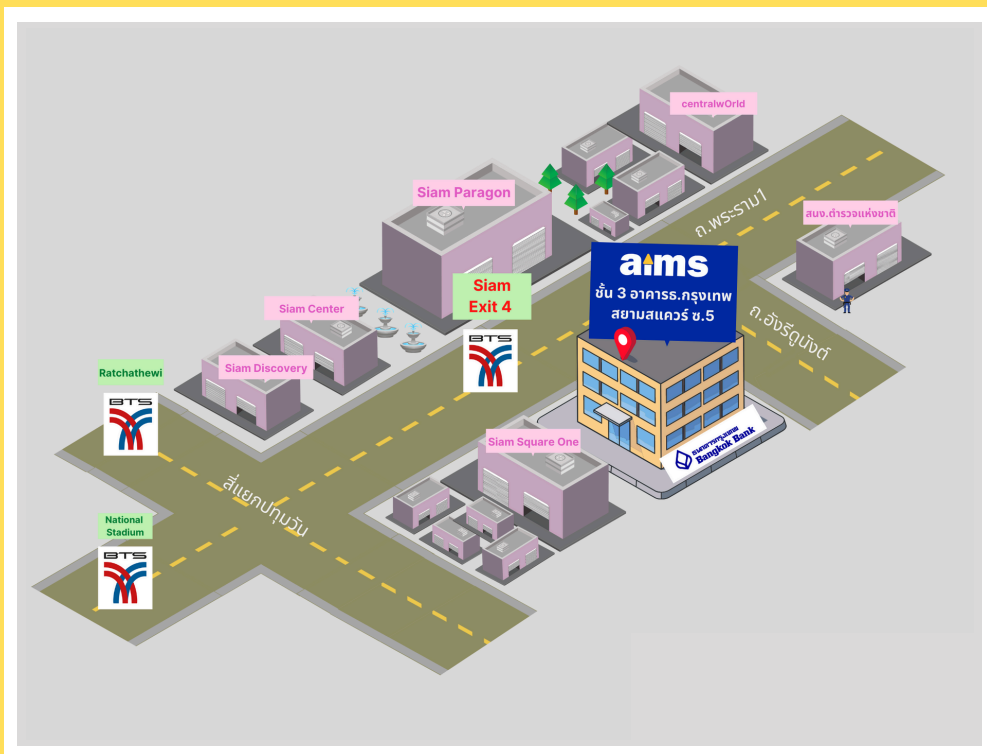
- 1) The value of the equilibrium constant increases.
- 2) The equilibrium does not change.
- 3) The rate of the forward reaction increases.
- 4) The equilibrium shifts to the left, producing more A(s) and B(aq).
- 5) The equilibrium shifts to the right, producing more D(g).

10

For the reaction: $A(s) + B(aq) \rightleftharpoons C(aq) + Q(g)$
the reaction is exothermic.

Which of the following changes would increase the amount of Q(g) present at equilibrium?

- 1) Add more solid A and mix well into the solution.
- 2) Add more solid B and mix well into the solution.
- 3) Add more solution C to the system.
- 4) Add a catalyst.
- 5) Increase the temperature.



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