



# **TBAT Chemistry**

## **Sample Questions**

1

For the reaction:  $2\text{NO}(\text{g}) + 2\text{H}_2(\text{g}) \rightarrow \text{N}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$

The rate law is:  $\text{Rate} = k[\text{NO}]^2[\text{H}_2]$

If the rate of the reaction is  $1.552 \times 10^{-2} \text{ mol/s}$ , the concentration of NO is  $2 \times 10^{-2} \text{ mol/dm}^3$ , and the concentration of  $\text{H}_2$  is  $1 \times 10^{-2} \text{ mol/dm}^3$ , what is the value of the rate constant  $k$ ?

- 1)  $38.8 \text{ dm}^3/\text{s}\cdot\text{mol}^2$
- 2)  $3.880 \times 10^{-1} \text{ dm}^3/\text{s}\cdot\text{mol}^2$
- 3)  $3.88 \times 10^{-1} \text{ dm}^9/\text{s}\cdot\text{mol}^2$
- 4)  $3.880 \times 10^3 \text{ dm}^9/\text{s}\cdot\text{mol}^2$
- 5)  $38.80 \text{ dm}^3/\text{s}\cdot\text{mol}^2$

2

Which transition in a hydrogen atom results in the emission of the lowest-energy photon?

- 1)  $n = 6$  to  $n = 5$
- 2)  $n = 5$  to  $n = 4$
- 3)  $n = 4$  to  $n = 3$
- 4)  $n = 3$  to  $n = 2$
- 5)  $n = 2$  to  $n = 1$

3

A radioactive substance decays from 200 Bq to 25 Bq in 12 hours. What is its half-life?

- 1) 2 hours
- 2) 3 hours
- 3) 4 hours
- 4) 6 hours
- 5) 12 hours

4

Which of these particles has an electron configuration that ends in  $3d^7$ ?

- 1)  $^{26}\text{Fe}^{2+}$
- 2)  $^{27}\text{Co}$
- 3)  $^{28}\text{Ni}^{2+}$
- 4)  $^{25}\text{Mn}$
- 5)  $^{29}\text{Cu}^+$

5

A balloon has a volume of 300 mL at 25°C. It is placed in a refrigerator where the temperature drops to 2°C. Assuming the pressure remains constant, what is the new volume of the balloon?

- 1) 270.00 mL
- 2) 273.15 mL
- 3) 275.15 mL
- 4) 276.86 mL
- 5) 298.15 mL

6

How would you prepare 0.75 L of a 25 mM KHP solution?  
(Given: Molar mass of KHP = 204.222 g·mol<sup>-1</sup>)

- 1) Add 0.027 g of KHP to 0.75 kg of water
- 2) Add 0.027 g of KHP to 0.75 L of water
- 3) Dissolve 0.51 g of KHP in 1 kg of water, then take 0.75 kg of the solution
- 4) Dissolve 5.1 g of KHP in 1 L of water, then take 0.75 L of the solution
- 5) Dissolve 5.1 g of KHP in 1 L of water, then take 0.75 kg of the solution

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Which statement explains why  $I_2$  has a higher boiling point than  $Br_2$ ?

1.  $I_2$  has stronger London dispersion forces due to a larger electron cloud.
2.  $I_2$  exhibits stronger dipole–dipole interactions.
3.  $I_2$  is a heavier molecule, therefore it has stronger covalent bonds.

- 1) 1
- 2) 2
- 3) 3
- 4) 2 and 3
- 5) 1 and 2

8

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

with equilibrium constant  $K$ , which of the following actions would change the value of  $K$ ?

- 1) Decrease pressure
- 2) Add a catalyst
- 3) Increase the volume of the container
- 4) Decrease temperature
- 5) Add He gas

9

Which part(s) of the following statement is/are incorrect?

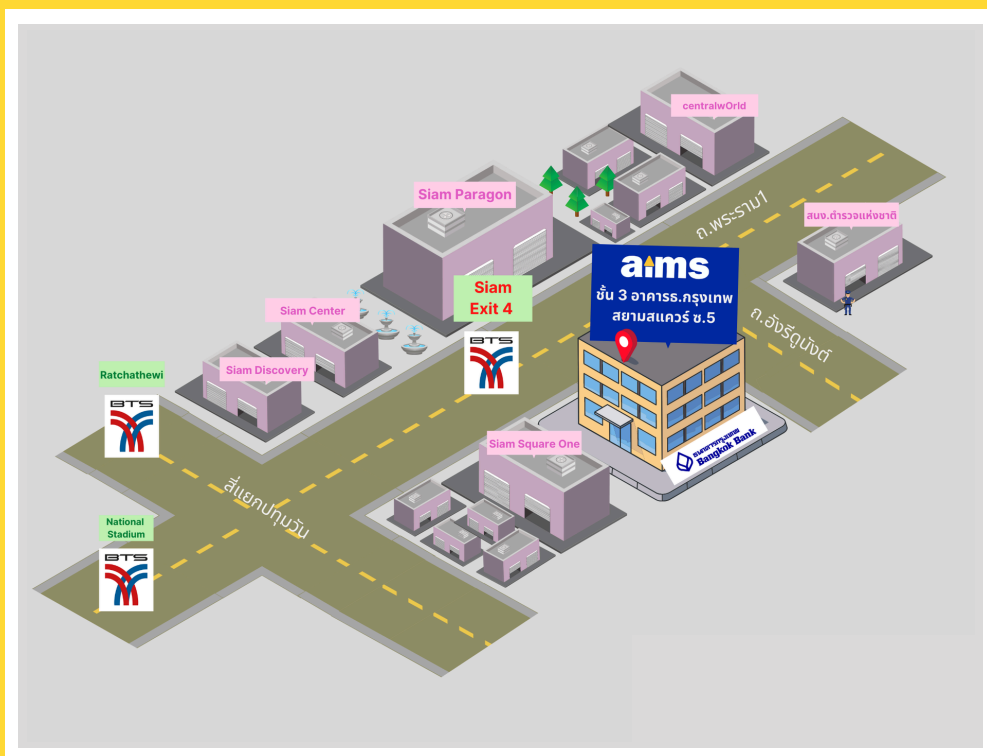
“Metallic bonding arises from the electrostatic force between protons (1) in the middle of the metal ions and localized (2) electrons that are around in the sea of electrons. This gives metal its dull appearance (3), electrical conductivity, and malleability (4).”

- 1) 1 and 2
- 2) 2 and 3
- 3) 3 and 4
- 4) 1 and 4
- 5) 2 and 4

10

A 32 dm<sup>3</sup> sample of an unknown gas A fully decomposes into 48 dm<sup>3</sup> of N<sub>2</sub> gas and some amount of H<sub>2</sub> gas. If each molecule of gas A contains exactly one hydrogen atom, what is the molecular weight of gas A?

- 1) 15
- 2) 29
- 3) 43
- 4) 57
- 5) 71




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