

Year 12 Chemistry – Equilibrium Practice Problems

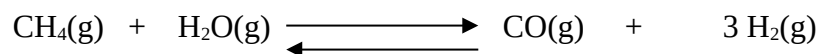
[22 marks]

Name: _____

Question 1

(1 mark)

Consider the following endothermic reaction for the production of hydrogen gas in a rigid container:



Which of the following would increase the **Final yield** of hydrogen gas?

- (a) adding a catalyst
- (b) adding inert argon gas
- (c) increasing the pressure
- (d) increasing the temperature

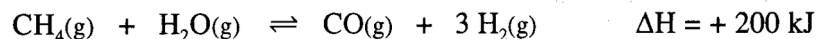
Question 2

A syringe full of nitrogen dioxide is compressed by a student to the point where no more compression is physically possible. What will the student observe and why? Write a chemical reaction that describes the observation

[3 marks]

Question 3

The following equilibrium is being investigated:



Four identical sealed boxes are set up at 300°C and 1.00 atm, each containing the equilibrium mixture. Each of the boxes is treated as described below, and time allowed for a new equilibrium to be established. In each case describe the change between the original equilibrium and the new equilibrium.

| | What happens to the total pressure? Write 'increase', 'decrease' or 'no change'. | What happens to the partial pressure of CO? Write 'increase', 'decrease' or 'no change'. | What happens to the equilibrium position? Write 'move to the right', 'move to the left' or 'no change'. |
|---|--|---|---|
| The system is heated above 300°C. | | | |
| More CH ₄ (g) (at 300°C) is injected into the box. | | | |
| Ne(g) (at 300°C) is injected into the box. | | | |
| The volume of the box is halved. | | | |

[8 marks]

Please Turn Over

Question 4

Write the equilibrium constant expression for each of the following:

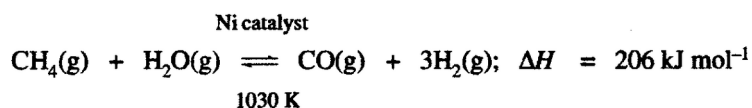
| | |
|---------------------------------|---|
| Equation | $\text{Fe}(\text{H}_2\text{O})_5\text{NCS}^{2+}(\text{aq}) + \text{H}_2\text{O}(\ell) \rightleftharpoons \text{Fe}(\text{H}_2\text{O})_6^{3+}(\text{aq}) + \text{NCS}^-(\text{aq})$ |
| Equilibrium constant expression | |

| | |
|---------------------------------|--|
| Equation | $2 \text{NOCl}(\text{g}) \rightleftharpoons 2 \text{NO}(\text{g}) + \text{Cl}_2(\text{g})$ |
| Equilibrium constant expression | |

[4 marks]

Question 5

Hydrogen, which is used for the synthesis of ammonia, is sometimes made from the reaction



In a research laboratory, some methane and water are added to a 1000 cm³ reaction vessel and equilibrium is established.

- a. More CO(g) at 1030 K is added. As a result, the temperature in the reaction vessel should

rise

fall

remain constant

Circle the correct response above and explain your answer in the space below.

(2 marks)

- b. The total pressure on the reacting system is increased by decreasing the volume of the reaction vessel. As a result the yield of hydrogen would

increase

decrease

remain constant

Circle the correct response **and** explain your answer in the space below.

(2 marks)

- c. The total pressure on the reacting system is increased by adding argon (an inert gas) to the reaction vessel without changing its volume. As a result the yield of hydrogen would

increase

decrease

remain constant

Circle the correct response **and** explain your answer in the space below.

(2 marks)
