Website: contoureducation.com.au | **Phone:** 1800 888 300
Email: hello@contoureducation.com.au

VCE Chemistry ¾
Equilibrium [2.7]
Test

20 Marks. 1 Minute Reading. 16 Minutes Writing.

Results:

Test Questions	_____ / 15
Extension	_____ / 5

Section A: Test Questions (15 Marks)

Question 1 (4 marks)

Tick whether the following statements are **true** or **false**.

Statement	True	False
a. If a reaction is reversible, this means that both the forward and backward reactions occur at the same time.		
b. In VCE chemistry, we study equilibria occurring in open systems.		
c. A dynamic equilibrium is established when the forward and backward reactions occur at the same rate and subsequently stop reacting.		
d. The K_c value gives you the ratio of the concentration of reactants to the concentration of products.		
e. Equilibria in which solids and liquids are present are assigned a 'concentration' value of 1, and consequently ignored in K_c and Q_c expressions.		
f. If a particular reaction has a large extent of reaction, its Q_c value will be high.		
g. If the Q_c value is less than the K_c value, the rate of the forward reaction will be greater than the rate of the reverse reaction until equilibrium is established.		
h. RICE tables are used to find the **moles** of each reactant and product at equilibrium, and then these values are directly plugged into the K_c expression to obtain the equilibrium constant.		

Space for Personal Notes

Question 2 (6 marks)

Henry is investigating the reaction between nitrogen and oxygen to produce nitrogen monoxide:

$$N_2(g) + O_2(g) \rightleftharpoons 2NO(g) \qquad K_c \text{ at } 25°C = 2.20 \times 10^{-5}$$

a. Explain what can be said about the extent of the reaction above at 25°C. Justify your answer with reference to the position of equilibrium. (2 marks)

b.

i. Calculate the K_c value for the reaction, $NO(g) \rightleftharpoons \frac{1}{2}N_2(g) + \frac{1}{2}O_2(g)$ at 25°C. (1 mark)

ii. For the reaction provided in **part b. i.** if the reaction takes place in a 2.00 L vessel and $[NO] = 2.30 \times 10^2\ M$ and $[O_2] = 1.80 \times 10^3\ M$ at equilibrium, calculate the amount, in $M\ mol$, of N_2 which must be present in the vessel when the rates of the forward and reverse reactions are equal. (3 marks)

Question 3 (5 marks)

The following reversible reaction is being investigated in a laboratory:

$$2P(g) + 5Cl_2(g) \rightleftharpoons 2PCl_5(g) \qquad K_c = 118.7\ M^{-5} \text{ at } 100°C$$

The reaction was initiated by mixing 2.32 mol of phosphorus with 5.27 mol of chlorine in a sealed, 5.00 L evacuated vessel at 100°C. 10 minutes into the reaction, it is observed that the concentration of PCl_5 is 0.333 M.

a. Calculate the reaction quotient for this reaction once 10 minutes have elapsed. (3 marks)

b. State whether the system is at equilibrium 10 minutes into the reaction or not. If not, explain how the reactions will progress towards equilibrium. (1 mark)

c. Had this reaction occurred in a compressed, 1.00 L vessel (still at 100°C), predict the effect this would have had on the equilibrium constant. (1 mark)

Section B: Extension (5 Marks)

Question 4 (5 marks)

Anika is investigating the production of hydrogen iodide via the reversible reaction between gaseous iodine and hydrogen in a closed vessel of volume V litres, according to the following equation:

$$I_2(g) + H_2(g) \rightleftharpoons 2HI(g)$$

The K_c value for this reaction is 26.9 at 300°C.

a. Given that Anika placed 3.20 mol of both $H_2(g)$ and $I_2(g)$ into the empty container at 300°C, calculate the amount of HI, in mol, that would have been present at equilibrium. (4 marks)

b. Anika decides to conduct the same experiment at a slightly cooler temperature to ensure her safety and calculates the system's reaction quotient (Q_c) after 5 minutes, obtaining a value of 26.9. Explain what Anika may conclude about the position of equilibrium in this instance. (1 mark)

_____

_____

Space for Personal Notes

CONTOUREDUCATION

Website: contoureducation.com.au | **Phone:** 1800 888 300 | **Email:** hello@contoureducation.com.au

VCE Chemistry ¾

Free 1-on-1 Support

Be Sure to Make The Most of These (Free) Services!

- Experienced Contour tutors (45 + raw scores, 99 + ATARs).
- For fully enrolled Contour students with up-to-date fees.
- After school weekdays and all-day weekends.

1-on-1 Video Consults	Text-Based Support
➢ Book via bit.ly/contour-chemistry-consult-2025 (or QR code below). ➢ One active booking at a time (must attend before booking the next).	➢ Message +61 440 137 304 with questions. ➢ Save the contact as "Contour Chemistry".

Booking Link for Consults

bit.ly/contour-chemistry-consult-2025

Number for Text-Based Support

+61 440 137 304