ANSWER KEY.

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7.2 Direction of Reversible Reactions

AP Chemistry | ANSWER KEY

Compare the forward and reverse rates. Forward greater: net forward. Reverse greater: net reverse. Equal: equilibrium.

1. For C ⇌ D, the forward rate is 2.5×10^{-4} M/s and the reverse rate is 8.0×10^{-4} M/s. Which way is the net reaction going? What happens to [C] and [D]?

Reverse is greater, so net reverse (D → C). [C] increases and [D] decreases.

2. A flask starts with only D. At the start, which rate is larger? Which way does the reaction go?

There is no C, so the forward rate is zero and the reverse rate is larger. Net reverse, toward C.

3. The table shows the rates for A ⇌ B over time.

Time	Forward rate (M/s)	Reverse rate (M/s)
t_0	6.0×10^{-3}	0
t_1	4.1×10^{-3}	1.5×10^{-3}
t_2	3.0×10^{-3}	2.6×10^{-3}
t_3	2.8×10^{-3}	2.8×10^{-3}
t_4	2.8×10^{-3}	2.8×10^{-3}

(a) Which way is the net reaction going between t_0 and t_2?

Net forward, since the forward rate is greater.

(b) When is equilibrium reached? How can you tell?

At t_3: the two rates are equal.

(c) Explain why the forward rate goes down.

A is being used up, so there are fewer A particles and fewer collisions each second.

(d) Explain why the reverse rate goes up.

B is building up, so more B particles collide and react each second.

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4. Particle counts for A ⇌ B in a closed box: t_1: 10 A, 2 B; t_2: 7 A, 5 B; t_3: 6 A, 6 B; t_4: 6 A, 6 B.

(a) Which rate was greater from t_1 to t_2?

Forward: A went down and B went up.

(b) When was equilibrium reached?

By t_3, when the counts stop changing.

(c) At t_4, are A particles still turning into B?

Yes, but B turns into A at the same rate, so the counts stay at 6 and 6.

5. A student says the reaction in question 4 "finished" at t_3, because A and B are equal.

Explain the two mistakes.

The reaction did not finish; both directions keep going at equal rates. Equal counts are a coincidence here. Equilibrium means constant counts, not equal counts.

6. Sketch the forward and reverse rates vs time for a reaction that starts with only reactants.

Forward starts high and curves down; reverse starts at zero and curves up. The two curves meet and continue as one flat line once equilibrium is reached.

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