

Equilibrium Multiple Choice Provincial Exam Practice

1.

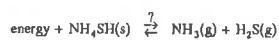
Reacting systems naturally tend toward what changes in enthalpy and entropy?

	Change in Enthalpy	Change in Entropy
A.	decreasing	increasing
B.	decreasing	decreasing
C.	increasing	increasing
D.	increasing	decreasing

- A. 1
B. 2
C. 3
D. 4

3.

Consider the following:



Which of the following describes how enthalpy and entropy change in the forward direction?

	Enthalpy	Entropy
A.	increasing	increasing
B.	increasing	decreasing
C.	decreasing	decreasing
D.	decreasing	increasing

- A. 1
B. 2
C. 3
D. 4

4.

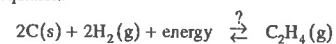
Which of the following forward reactions demonstrates decreasing enthalpy and increasing entropy?

- A. $\text{Hg}(\ell) + \frac{1}{2}\text{O}_2(g) \rightleftharpoons \text{HgO}(s) \quad \Delta H = -91 \text{ kJ}$
 B. $2\text{HCl}(g) \rightleftharpoons \text{H}_2(g) + \text{Cl}_2(g) \quad \Delta H = +185 \text{ kJ}$
 C. $2\text{HgO}(s) \rightleftharpoons 2\text{Hg}(\ell) + \text{O}_2(g) \quad \Delta H = +182 \text{ kJ}$
 D. $2\text{SO}_3(g) \rightleftharpoons 2\text{SO}_2(g) + \text{O}_2(g) \quad \Delta H = -200 \text{ kJ}$

- B. 2
C. 3
D. 4

2.

Consider the following equation:



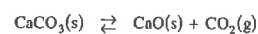
Which of the following occurs when C and H₂ are combined?

	Enthalpy Change	Entropy Change	Result
A.	increasing	decreasing	no reaction
B.	increasing	decreasing	reacts completely
C.	increasing	increasing	equilibrium
D.	decreasing	decreasing	no reaction

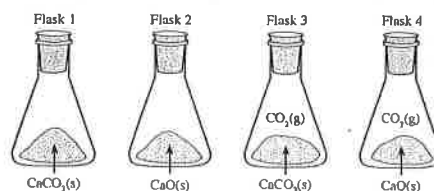
- A. 1
B. 2
C. 3
D. 4

5.

Consider the following equilibrium:



In which of the flasks will this equilibrium be established?



- A. 1, 2, 3 only
 B. 1, 2, 4 only
 C. 1, 3, 4 only
 D. 3, 4 only

- A. 1
B. 2
C. 3
D. 4

6.



Which of the following would cause a shift to the right?

- A. adding NH_4Cl
- B. removing NH_3
- C. increasing pressure
- D. decreasing temperature

- A. 1
- B. 2
- C. 3
- D. 4

7.

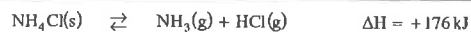


When HCl is added, how do the concentrations of NH_3 and HCl at the new equilibrium compare to the original equilibrium concentrations?

	$[\text{NH}_3]$	$[\text{HCl}]$
A.	higher	higher
B.	higher	lower
C.	lower	higher
D.	lower	lower

- A. 1
- B. 2
- C. 3
- D. 4

8.

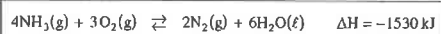


Solid NH_4Cl is added to the preceding equilibrium. What will happen to the forward and reverse rates?

	Forward Rate	Reverse Rate
A.	increases	increases
B.	no change	no change
C.	increases	decreases
D.	decreases	increases

- A. 1
- B. 2
- C. 3
- D. 4

9.

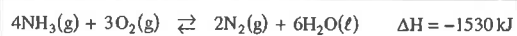


Which of the following would cause the amount of NH_3 at equilibrium to increase?

- A. an increase in $[\text{O}_2]$
- B. a decrease in volume
- C. a decrease in temperature
- D. an increase in temperature

- A. 1
- B. 2
- C. 3
- D. 4

10.

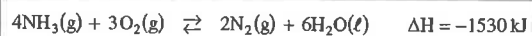


What happens when O_2 is added to the above system?

	Equilibrium	$[\text{N}_2]$
A.	no shift	unchanged
B.	shifts right	decreases
C.	shifts right	increases
D.	shifts left	increases

- A. 1
- B. 2
- C. 3
- D. 4

11.



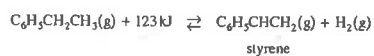
If some O_2 is injected into the system, what happens to the forward and reverse reaction rates during the shift to re-establish equilibrium?

	Forward Reaction Rate	Reverse Reaction Rate
A.	increases	decreases
B.	decreases	decreases
C.	increases	increases
D.	decreases	increases

- A. 1
B. 2
C. 3
D. 4

13.

Styrene is manufactured as follows:



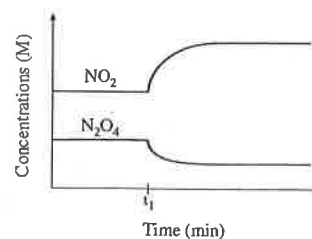
Which of the following describes the temperature and pressure needed for the maximum yield of styrene?

	Temperature	Pressure
A.	low	low
B.	low	high
C.	high	low
D.	high	high

- A. 1
B. 2
C. 3
D. 4

12.

Consider the following diagram for the equilibrium system:



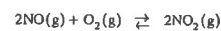
Which of the following stresses was applied at time t_1 ?

- A. $[\text{NO}_2]$ was increased.
B. $[\text{N}_2\text{O}_4]$ was decreased.
C. Temperature was increased.
D. Temperature was decreased.

- A. 1
B. 2
C. 3
D. 4

14.

Consider the following equilibrium system:

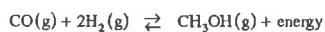


An equilibrium mixture of $\text{NO}(\text{g})$, $\text{O}_2(\text{g})$ and $\text{NO}_2(\text{g})$ is transferred from a 1.0L container to a 2.0L container. Which reaction is favoured and what happens to the $[\text{NO}_2]$?

	Reaction Favoured	$[\text{NO}_2]$
A.	reverse	increases
B.	reverse	decreases
C.	forward	increases
D.	forward	decreases

- A. 1
B. 2
C. 3
D. 4

15.

Methanol (CH_3OH) is produced according to the following equilibrium equation:

Which conditions would favour a high yield of methanol?

	Temperature	Pressure
A.	low	low
B.	low	high
C.	high	low
D.	high	high

- A. 1
B. 2
C. 3
D. 4

16.

Consider the following reactions:

I	$\text{Na}_2\text{O}(\text{s}) \rightleftharpoons 2\text{Na}(\ell) + \frac{1}{2}\text{O}_2(\text{g})$	$K_{eq} = 2 \times 10^{-25}$
II	$\text{Na}_2\text{O}_2(\text{s}) \rightleftharpoons 2\text{Na}(\ell) + \text{O}_2(\text{g})$	$K_{eq} = 5 \times 10^{-29}$
III	$2\text{Na}_2\text{O}(\text{s}) \rightleftharpoons 4\text{Na}(\ell) + \text{O}_2(\text{g})$	$K_{eq} = 3 \times 10^{-14}$

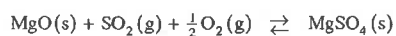
Which of the following lists the reactions in order, from the greatest $[\text{O}_2]$ at equilibrium, to the least $[\text{O}_2]$ at equilibrium?

- A. I, II, III
B. I, III, II
C. III, I, II
D. III, II, I

- A. 1
B. 2
C. 3
D. 4

17.

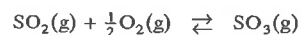
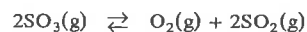
Consider the following equilibrium equation:

Which expression represents the $[\text{O}_2]$ at equilibrium?

- A. $[\text{O}_2] = \frac{1}{K_{eq}[\text{SO}_2]}$
B. $[\text{O}_2] = (K_{eq}[\text{SO}_2])^2$
C. $[\text{O}_2] = \left(\frac{1}{K_{eq}[\text{SO}_2]}\right)^2$
D. $[\text{O}_2] = \frac{[\text{MgSO}_4]}{K_{eq}[\text{MgO}][\text{SO}_2]}$

- A. 1
B. 2
C. 3
D. 4

18.

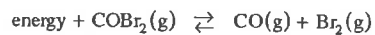
Consider the equilibrium expression K_{eq1} for reaction 1:and the equilibrium expression K_{eq2} for reaction 2:How is K_{eq2} related to K_{eq1} ?

- A. $K_{eq2} = K_{eq1}$
B. $K_{eq2} = (K_{eq1})^2$
C. $K_{eq2} = \left(\frac{1}{K_{eq1}}\right)$
D. $K_{eq2} = \left(\frac{1}{K_{eq1}}\right)^2$

- A. 1
B. 2
C. 3
D. 4

19.

Consider the following equilibrium system:



Which of the following statements is true?

- A. Decreasing $[\text{CO}]$ will increase K_{eq} .
- B. Increasing $[\text{COBr}_2]$ will increase K_{eq} .
- C. Increasing the temperature will decrease K_{eq} .
- D. Decreasing the temperature will decrease K_{eq} .

- A. 1
- B. 2
- C. 3
- D. 4

20.

Due to a change in temperature, a system at equilibrium shifts, causing the concentration of products to change. Which of the following could be correct?

	[Products]	Value of K_{eq}
I	increases	no change
II	increases	increases
III	decreases	decreases
IV	decreases	increases

- A. I only
- B. II only
- C. I and IV only
- D. II and III only

- A. 1
- B. 2
- C. 3
- D. 4

21.

Consider the following equilibrium system:



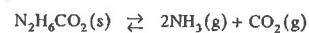
At equilibrium, a 2.0L reaction vessel contained 1.2×10^{-3} mol H_2S , 7.2×10^{-6} mol H_2 and 6.0×10^{-2} mol S_2 . What is the value of K_{eq} ?

- A. 6.5×10^{-10}
- B. 1.1×10^{-6}
- C. 2.2×10^{-6}
- D. 9.3×10^5

- A. 1
- B. 2
- C. 3
- D. 4

22.

Consider the following equilibrium equation:



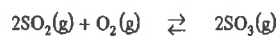
Initially, 0.245 mol $\text{N}_2\text{H}_6\text{CO}_2$ is placed in a 1.0L container. At equilibrium, $[\text{CO}_2] = 0.18\text{M}$. What is the value of K_{eq} ?

- A. 5.8×10^{-3}
- B. 2.3×10^{-2}
- C. 3.2×10^{-2}
- D. 6.5×10^{-2}

- A. 1
- B. 2
- C. 3
- D. 4

23.

Consider the equilibrium:



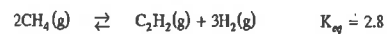
Initially, 1.6 mol SO_3 is placed in a 3.0 L container. At equilibrium, $[\text{O}_2] = 0.15 \text{ M}$. What is the value of K_{eq} ?

- A. 0.26
- B. 1.2
- C. 4.0
- D. 43

- A. 1
- B. 2
- C. 3
- D. 4

24.

Consider the following equilibrium system:



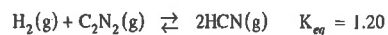
Initially, 0.4 mol of each substance is placed in a 1.0 L container. Which of the following describes this system as it approaches equilibrium?

	$[\text{C}_2\text{H}_2]$	Forward Rate
A.	increases	decreases
B.	increases	increases
C.	decreases	decreases
D.	decreases	increases

- A. 1
- B. 2
- C. 3
- D. 4

25.

Consider the following equilibrium equation:



Initially, 0.86 mol H_2 , 2.8 mol C_2N_2 and 1.6 mol HCN are placed in a 2.0 L flask. Which of the following is true?

- A. Trial $K_{eq} > K_{eq}$ so the reaction proceeds to the left.
- B. Trial $K_{eq} < K_{eq}$ so the reaction proceeds to the left.
- C. Trial $K_{eq} < K_{eq}$ so the reaction proceeds to the right.
- D. Trial $K_{eq} > K_{eq}$ so the reaction proceeds to the right.

- A. 1
- B. 2
- C. 3
- D. 4