Name:

CiF12_chapter 2_rq

Multiple Choice

Identify the choice that best completes the statement or answers the question.

▼ 1. Which of the following reactions will definitely occur spontaneously?

	Change in entropy	Change in enthalpy
a	Positive	Positive
b	Positive	Negative
c	Negative	Negative
d	Negative	Positive

a. a
b. b
c. c
d. d

▼ 2. Which of the following correctly describes the following chemical system occurring in a beaker:
$H_2O\ (l) \rightarrow H_2O\ (g)$

	Type of system	Type of change
a	Closed	Chemical
b	Closed	Physical
c	Open	Chemical
d	Open	Physical

a. a
b. b
c. c
d. d

▼ 3. Which of the following chemical systems represents an exothermic chemical change?

a. $H_2O\ (l) \rightarrow H_2O\ (g)$
b. $H_2O\ (g) \rightarrow H_2O\ (l)$
c. $H_2\ (g) + ½O_2\ (g) \rightarrow H_2O\ (l)$
d. $H_2O\ (l) \rightarrow H_2\ (g) + ½O_2\ (g)$

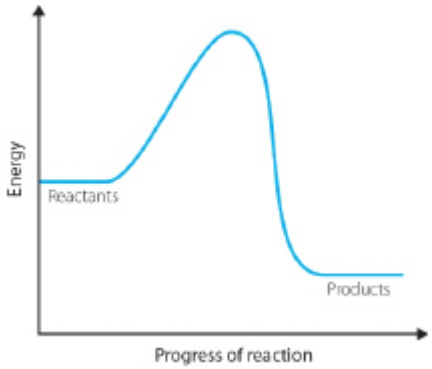
▼ 4. Identify the correct statement about reversible reactions.

a. All physical and chemical changes are reversible reactions.
b. All physical changes are reversible but only some chemical changes are reversible.
c. All chemical changes are reversible but only some physical changes are reversible.
d. Only physical changes are reversible.

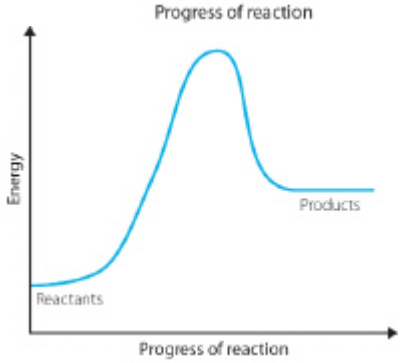
▼ 5. Which one of the following indicates the energy profile diagram for a reversible reaction?

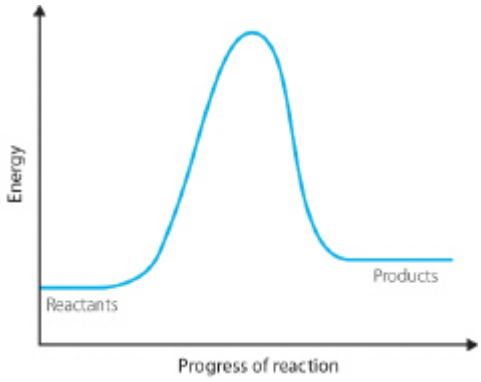
a.
b.

c.



d.



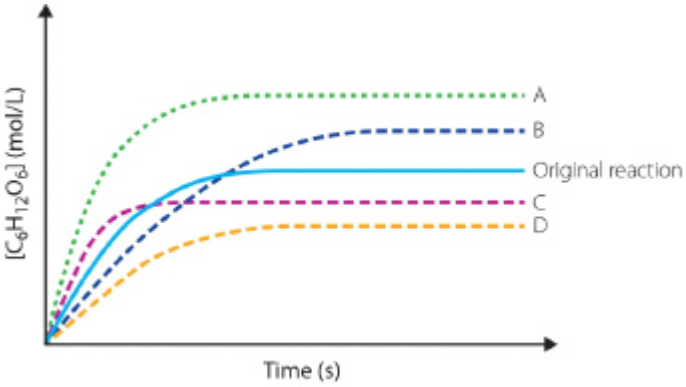


6. A closed chemical system commences with only reactants present. The statements below are about a chemical system establishing dynamic equilibrium.
   1 The reverse reaction will start to occur.
   2 Concentration of reactants is high compared to the concentration of the products.
   3 The concentration of products increases.
   4 Products will form at the same rate they are used up.

   Which of the following shows the correct sequence of steps for establishing dynamic equilibrium for this system?
   a. 1, 2, 3, 4
   b. 1, 3, 2, 4
   c. 2, 1, 3, 4
   d. 2, 3, 1, 4

7. $6CO_2\,(g) + 6H_2O\,(l) \rightleftharpoons C_6H_{12}O_6\,(aq) + 6O_2\,(g)$ ΔH is positive

   The reaction is performed at a particular temperature. It is then repeated at a higher temperature.



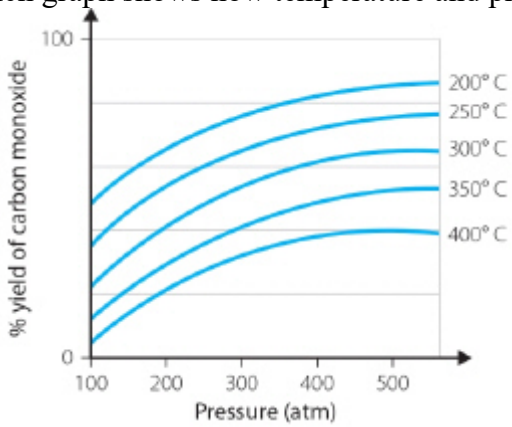
Which graph shows the results for the reaction at the higher temperature?

a. Graph A
b. Graph B
c. Graph C
d. Graph D

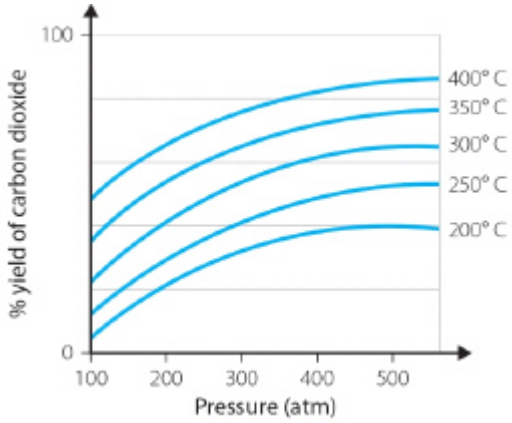
8. $2C\,(s) + O_2\,(g) \rightleftharpoons 2CO\,(g)$ ΔH is negative

Which graph shows how temperature and pressure affect the yield of carbon monoxide?

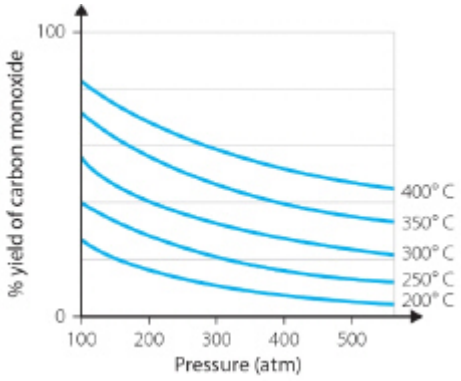
a.



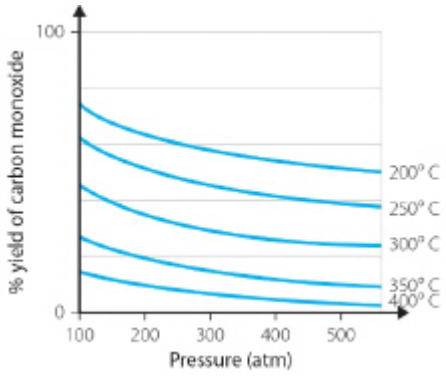
b.



c.



d.



▼ 9. N_2O_4 (g) ⇌ $2NO_2$ (g) ΔH is positive

Which condition favours the production of nitrogen dioxide?

a. Increasing the pressure
b. Increasing the volume
c. Decreasing the temperature
d. Adding argon gas to the system

▼ 10. Ammonia gas is produced by reacting nitrogen gas with hydrogen gas. The production of ammonia is an exothermic reaction.

Which condition favours the production of ammonia?

a. Increasing the pressure
b. Increasing the volume
c. Increasing the temperature
d. Adding argon gas to the system

▼ 11. $4HCl\ (g) + O_2\ (g) \rightleftharpoons 2H_2O\ (g) + 2Cl_2\ (g)$ exothermic reaction

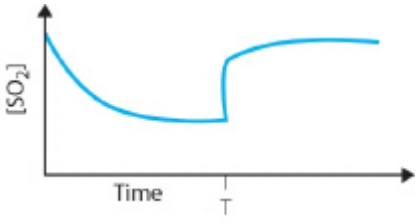
Identify the conditions required to favour the forward reaction.

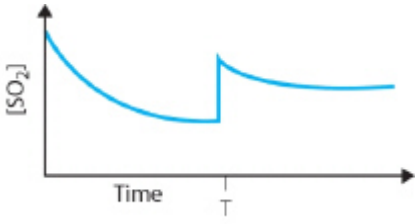
	Pressure	Temperature
a.	High	High
b.	High	Low
c.	Low	High
d.	Low	Low

▼ 12. The equation shows an equilibrium established when sulfur trioxide is produced by reacting sulfur dioxide with oxygen.

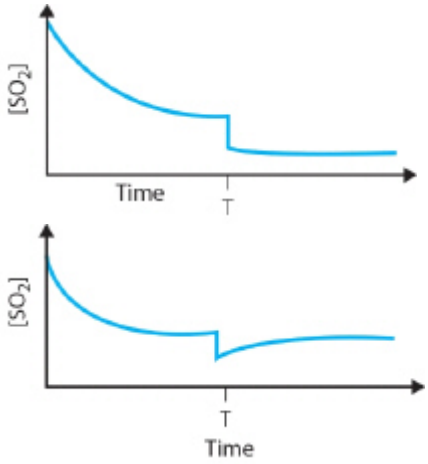
$2SO_2\ (g) + O_2\ (g) \rightleftharpoons 2SO_3\ (g)$

The volume of the system is halved at time T. Which of the following graphs shows the change in sulfur dioxide over time?

a.


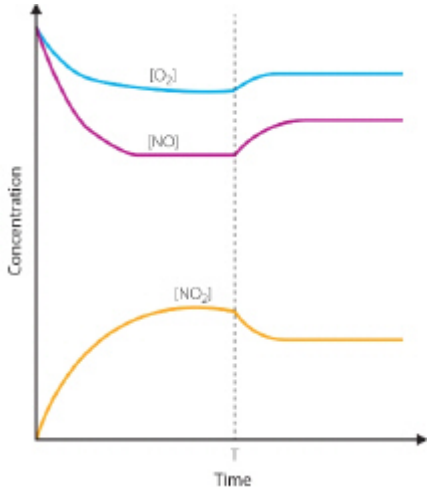
b.


c.



d.

▼ 13. $2NO\ (g) + O_2\ (g) \rightleftharpoons 2NO_2\ (g)$ ΔH is negative



Which of the following occurred at time T?

a. increase in volume
b. decrease in volume
c. increase in temperature
d. decrease in temperature

▼ 14. Which of the following statements is true for a reaction that has reached equilibrium?

a. The concentration of reactants is zero.
b. The amount of products is equal to the amount of reactants.
c. Both the forward and reverse reactions have stopped.
d. The rate of the forward and reverse reactions is equal.

▼ 15. In this reaction, initially only ammonia is present in the reaction vessel. Which effect is shown as equilibrium is approached?

$2NH_3\ (g) \rightleftharpoons N_2\ (g) + 3H_2\ (g)$

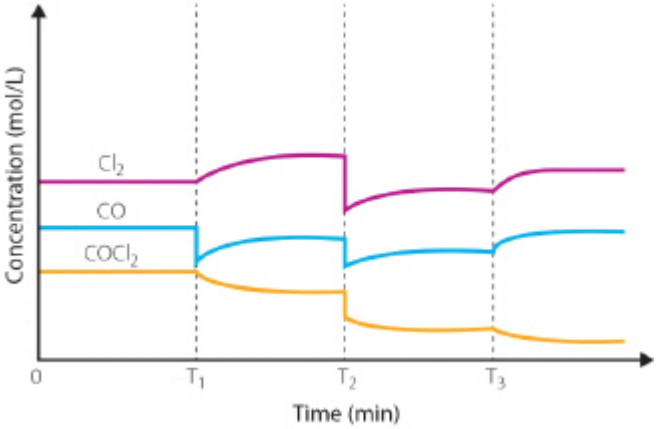
	Rate of reverse reaction	$[H_2]$
a	Decreases	Decreases
b	Decreases	Increases
c	Increases	Decreases
d	Increases	Increases

a. a
b. b
c. c
d. d

▼ 16.

$COCl_2\ (g) \rightleftharpoons CO\ (g) + Cl_2\ (g)$ $\Delta H = +108$ kJ

The graph below shows the changes in concentration for each of the reactants and products over time.



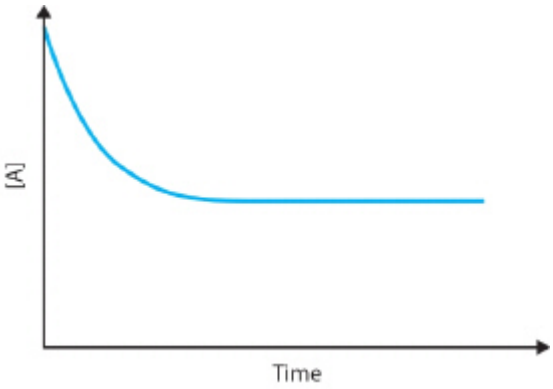
Identify the changes that occur at T_1, T_2 and T_3.

	T_1	T_2	T_3
a	Decrease in [CO]	Increase in volume	Increase in temperature
b	Decrease in [$COCl_2$]	Increase in pressure	Decrease in temperature
c	Decrease in [$COCl_2$]	Increase in temperature	Increase in volume
d	Decrease in [CO]	Decrease in temperature	Increase in pressure

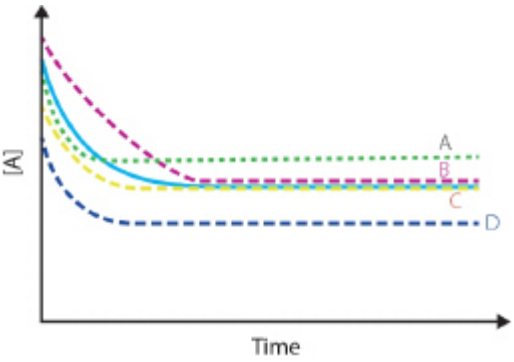
a. a
b. b
c. c
d. d

17. $2A\ (g) + B\ (g) \rightleftharpoons 2C\ (g)$ ΔH is positive

The graph shows the change in concentration of *A*, as the reaction approaches equilibrium.



A catalyst was added when the experiment was repeated. Which of the graphs represents this?



a. Graph A
b. Graph B

c. Graph C
d. Graph D

▼ 18. N_2 (g) + $3H_2$ (g) ⇋ $2NH_3$ (g) ΔH is negative

A magnetite catalyst is used for the Haber process. The catalyst:

a. increases the rate of both the forward and reverse reactions and shifts the equilibrium to the right.
b. increases the rate of both the forward and reverse reactions and shifts the equilibrium to the left.
c. increases the time for the reaction but does not change the position of the equilibrium.
d. decreases the time for the reaction but does not change the position of the equilibrium.

▼ 19. An equilibrium will exist between $[Co(H_2O)_6]^{2+}$ and $[CoCl_4]^{2-}$ when they are in a solution. The equation representing this is:

$[Co(H_2O)_6]^{2+}$ (aq) + $4Cl_2$ (aq) ⇌ $[CoCl_4]^{2-}$ (aq) + $6H_2O$ (l)

The $[Co(H_2O)_6]^{2+}$ ion is a pink colour while the $[CoCl_4]^{2-}$ ion is a deep blue colour.

The reaction mixture is heated until it is almost boiling. The reaction mixture turns blue.

This reaction is:

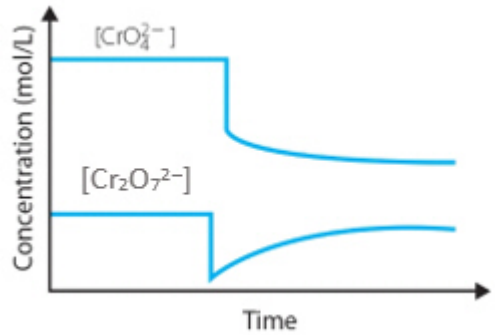
a. endothermic and favours the production of $[Co(H_2O)_6]^{2+}$.
b. endothermic and favours the production of $[CoCl_4]^{2-}$.
c. exothermic and favours the production of $[Co(H_2O)_6]^{2+}$.
d. exothermic and favours the production of $[CoCl_4]^{2-}$.

▼ 20. Consider the equilibrium between chromate and dichromate:

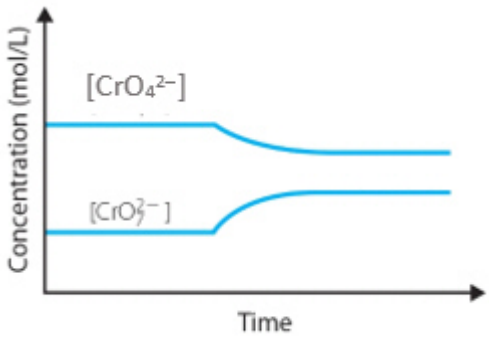
$2CrO_4^{2-}$ (aq) + $2H^+$ (aq) ⇌ $Cr_2O_7^{2-}$ (aq) + H_2O (l)

Water is added to the solution. Which graph indicates the effect on the concentration of the chromate and the dichromate ions?

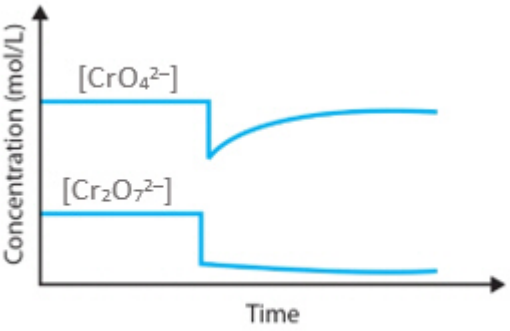
a.

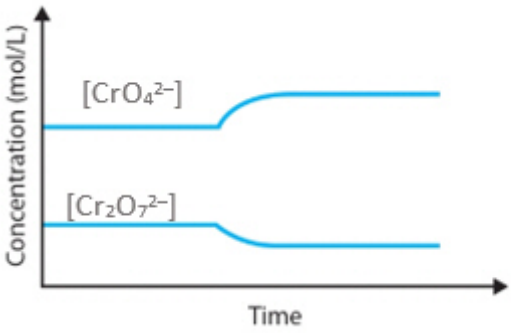


b.



c.





d.

Check Your Work Start Over