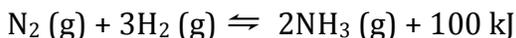
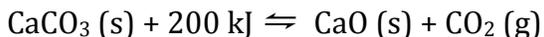


For questions 1-4, use the following reaction to predict which direction the equilibrium will shift when certain stressors are applied.



1. Concentration of nitrogen gas is increased.
 - a. no change
 - b. left
 - c. right
2. Concentration of hydrogen gas is increased.
 - a. no change
 - b. left
 - c. right
3. Concentration of ammonia is increased.
 - a. no change
 - b. left
 - c. right
4. Temperature is increased.
 - a. no change
 - b. left
 - c. right

For questions 5-8, use the following reaction to predict which direction the equilibrium will shift when certain stressors are applied.

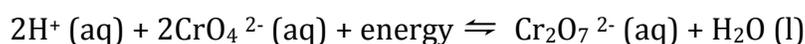


5. Calcium carbonate is added.
 - a. no change
 - b. left
 - c. right
6. Calcium oxide is added.
 - a. no change
 - b. left
 - c. right
7. Concentration of carbon dioxide gas is increased.
 - a. no change
 - b. left
 - c. right
8. Temperature is increased.
 - a. no change
 - b. left
 - c. right

Which direction will the following equilibrium reactions shift to accommodate the changes detailed to the right of the reactions?

9. $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g}) + \text{heat}$ decrease temperature
a. no change
b. left
c. right
10. $\text{C}(\text{s}) + \text{CO}_2(\text{g}) + \text{energy} \rightleftharpoons 2\text{CO}(\text{g})$ increase temperature
a. no change
b. left
c. right
11. $3\text{Fe}(\text{s}) + 4\text{H}_2\text{O}(\text{g}) \rightleftharpoons \text{Fe}_3\text{O}_4(\text{s}) + 4\text{H}_2(\text{g})$ add elemental iron
a. no change
b. left
c. right
12. $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ volume of vessel increased
a. no change
b. left
c. right

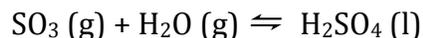
13. Given the following reaction:



Which stress change would result in a color change from original state if chromate ions in solution are yellow and dichromate ions are orange in solution?

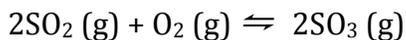
- a. increase in hydrogen ion concentration
b. increase in dichromate ion concentration
c. decrease in temperature
d. decrease in chromate ion concentration
14. Given the following reaction:
- $$\text{N}_2\text{O}_4(\text{g}) + \text{heat} \rightleftharpoons 2\text{NO}_2(\text{g})$$
- Which would result increase product yield?
- a. decreasing the temperature
b. decreasing the concentration of $\text{NO}_2(\text{g})$
c. increasing pressure
d. decreasing the concentration of $\text{N}_2\text{O}_4(\text{g})$

15. At equilibrium, the concentration of sulfite ions is 0.700M, water vapor 0.900M, and pure sulfuric acid 0.500M according to the following reaction:



Calculate the equilibrium constant.

- a. 1.59
 - b. 0.794
 - c. 0.630
 - d. 1.26
16. Consider the following equilibrium reaction:

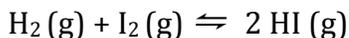


If 0.900 mol of SO_2 and 0.900 mol of O_2 are together in a 5.00 L flask at equilibrium and the $K_{\text{eq}} = 460$, calculate the number of moles of SO_3 assuming that x is negligible.

- a. 2.73
 - b. 5.46
 - c. 27.3
 - d. 13.7
17. A 4.20 mol sample of phosphorus pentachloride, PCl_5 , dissociates according to the following equation to give 0.339 mol of chlorine, Cl_2 , at equilibrium. What is the concentration of the PCl_5 at equilibrium?

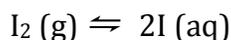


- a. 0.339 M
 - b. 4.20 M
 - c. 3.86 M
 - d. 4.54 M
18. For the following reaction equilibrium concentrations are found to be
 $[\text{H}_2] = 0.212 \text{ M}$ $[\text{I}_2] = 0.098 \text{ M}$ $[\text{HI}] = 1.08 \text{ M}$
What is the equilibrium constant of this reaction?



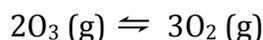
- a. 11.0
- b. 2.34
- c. 52.0
- d. 56.1

19. Find the concentration of I when 5 mol of I₂ is placed in a 5 L flask at 100 K according to the following reaction assuming that the change in concentration is negligible. The equilibrium constant is 3.2x10⁻⁴.



- 0.018
- 0.009
- 0.00032
- 4.1x10⁻⁷

20. Which represents the equilibrium constant for the reaction



- $[\text{O}_3]^2 / [\text{O}_2]^3$
- $[\text{O}_2] / [\text{O}_3]$
- $[\text{O}_3] / [\text{O}_2]$
- $[\text{O}_2]^3 / [\text{O}_3]^2$

Complete the following matching section by placing the letter of the matching description on the line next to each question.

- | | | |
|-------|-----------------------------|---|
| _____ | 21. Transition Metals | A. This group of elements includes solids, liquid, and gases. They have 7 valence electrons. |
| _____ | 22. Representative Elements | B. The two rows that are traditional cut from the periodic table and pasted to the bottom for the purpose of conserving paper. They represent the "f-block". |
| _____ | 23. Period | C. Series of elements that produce a spark when struck. |
| _____ | 24. Nonmetals | D. Series of elements that are all radioactive. |
| _____ | 25. Noble Gases | E. Particle with either a positive or negative charge. |
| _____ | 26. Metals | F. Group of elements that have the highest ionization energies. |
| _____ | 27. metalloids | G. Elements that react with the air and water, but have 2 valence electrons. |
| _____ | 28. Lanthanides | H. Elements that react violently with water and air. They have one valence electron and very low electronegativities and ionization energies. |
| _____ | 29. Ionization Energy | I. Elements that are lustrous and somewhat malleable, but are poor conductors of electricity. |
| _____ | 30. Ion | J. Elements that are dull, brittle, and do not conduct electricity. |
| _____ | 31. Innertransition Metals | K. Elements in the tall columns of the periodic table. These columns are usually depicted with the letter "A". They are the elements that follow the general patterns with very few exceptions. |
| _____ | 32. Halogens | L. Elements in the shorter columns of the periodic table. These columns are usually depicted with the letter "B". |
| _____ | 33. Group | M. Elements that are lustrous, malleable, ductile, and conduct electricity and heat well. |
| _____ | 34. Electronegativity | N. Another name for a "row" within the periodic table. |
| _____ | 35. Alkaline Earth Metals | O. Another name for a "column" within the periodic table. |
| _____ | 36. Alkali Metals | P. An atom's affinity for electrons. |
| _____ | 37. Actinides | Q. Amount of energy needed to remove an electron from an atom. |

38. As the atomic number of elements increases down a column:
- atomic radius decreases
 - atomic mass decreases
 - ionization energy decreases
 - the number of electrons in outermost energy level increases
39. Arrange the following elements in order of increasing atomic radius.
Carbon, Fluorine, Hydrogen, Nitrogen, Aluminum
- H, Al, F, N, C
 - H, F, N, C, Al
 - H, C, F, Al, N
 - Al, C, N, F, H
40. The most electronegative element is:
- fluorine
 - hydrogen
 - lithium
 - nickel