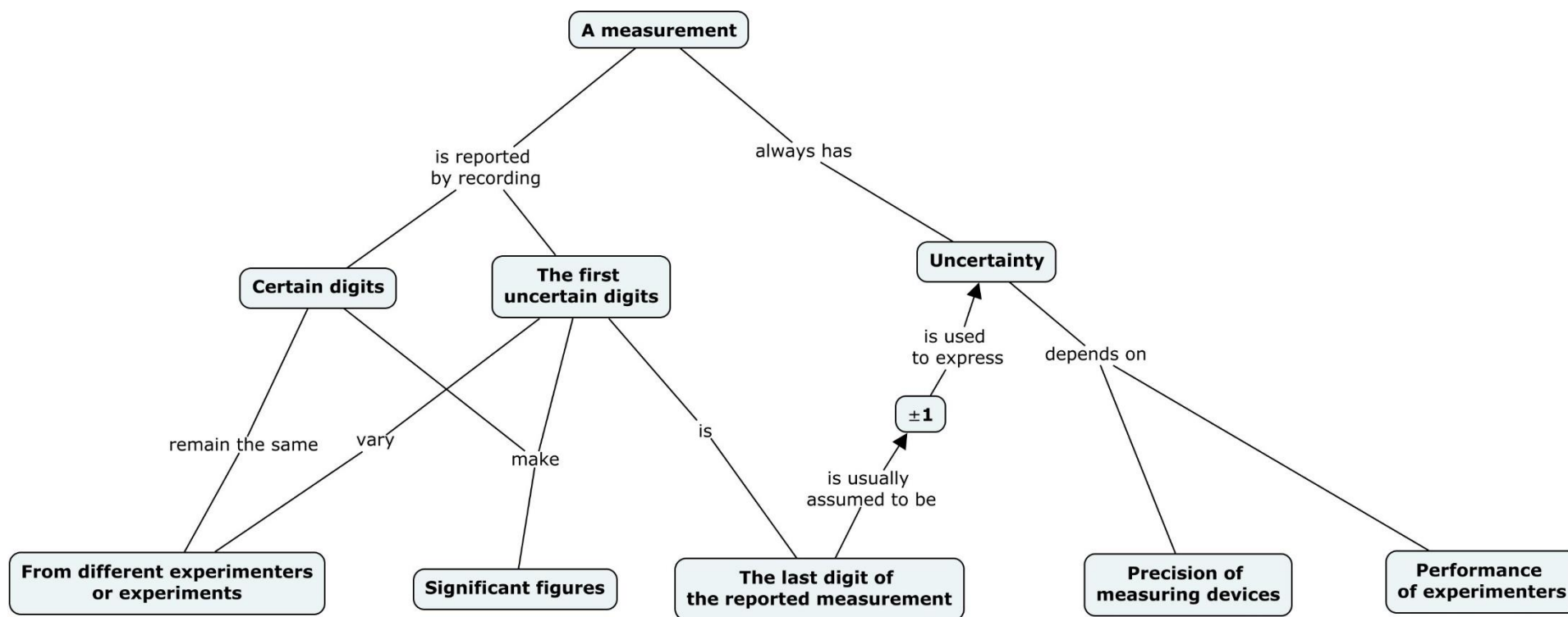


APPENDIX

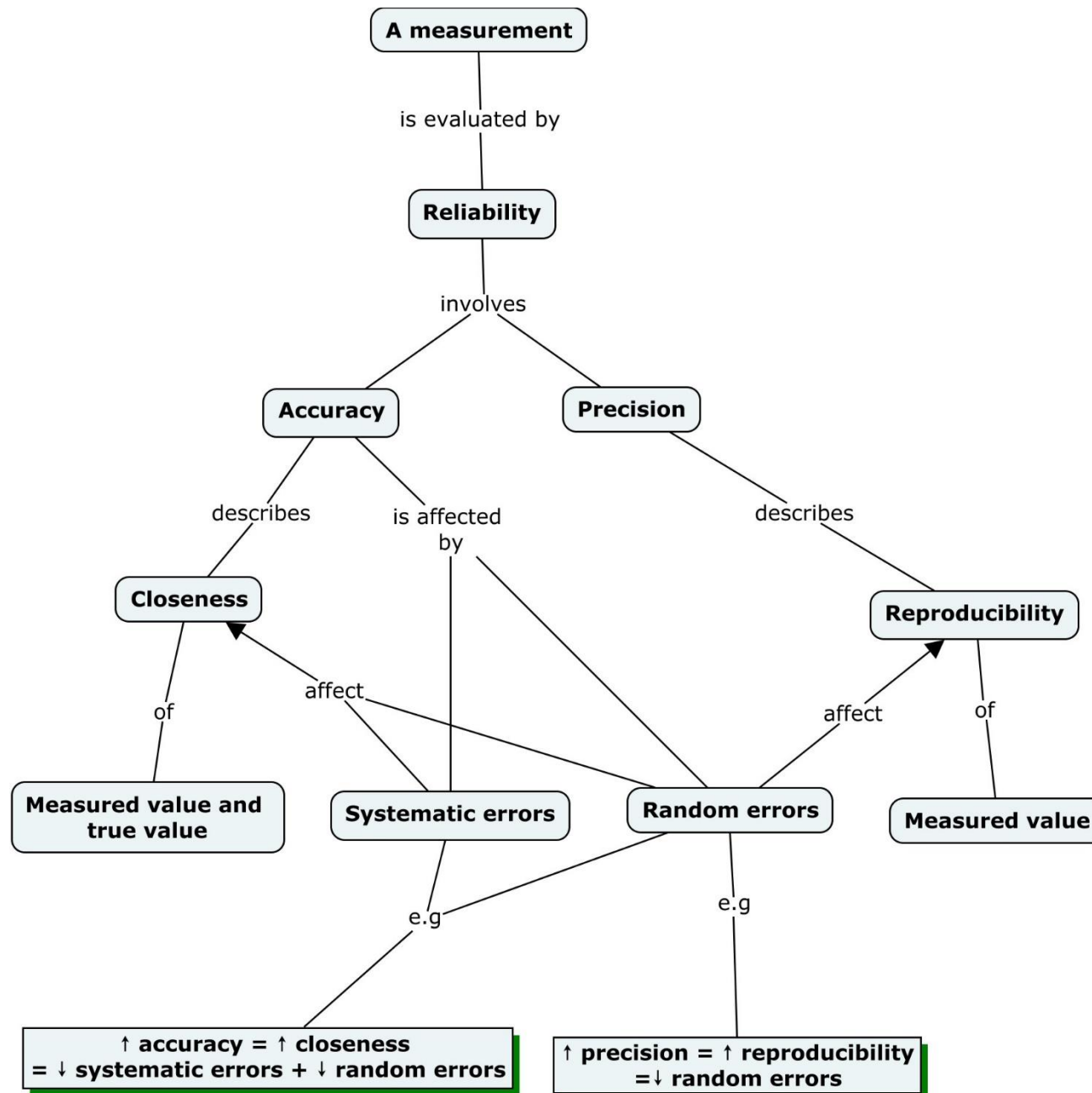
Topic 1 – Uncertainties of measurements

Concept maps

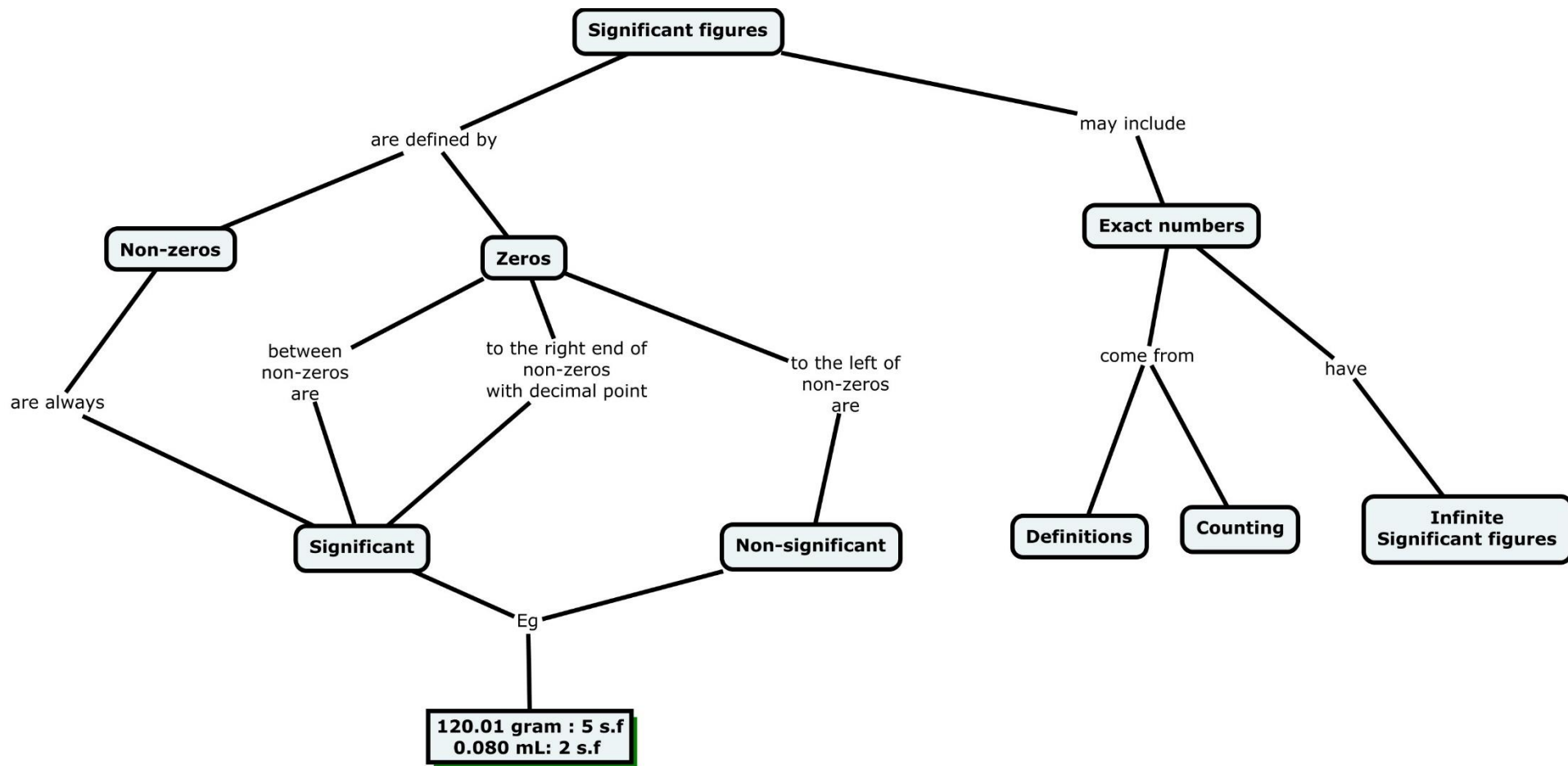
Focus question: what does a measurement involve?



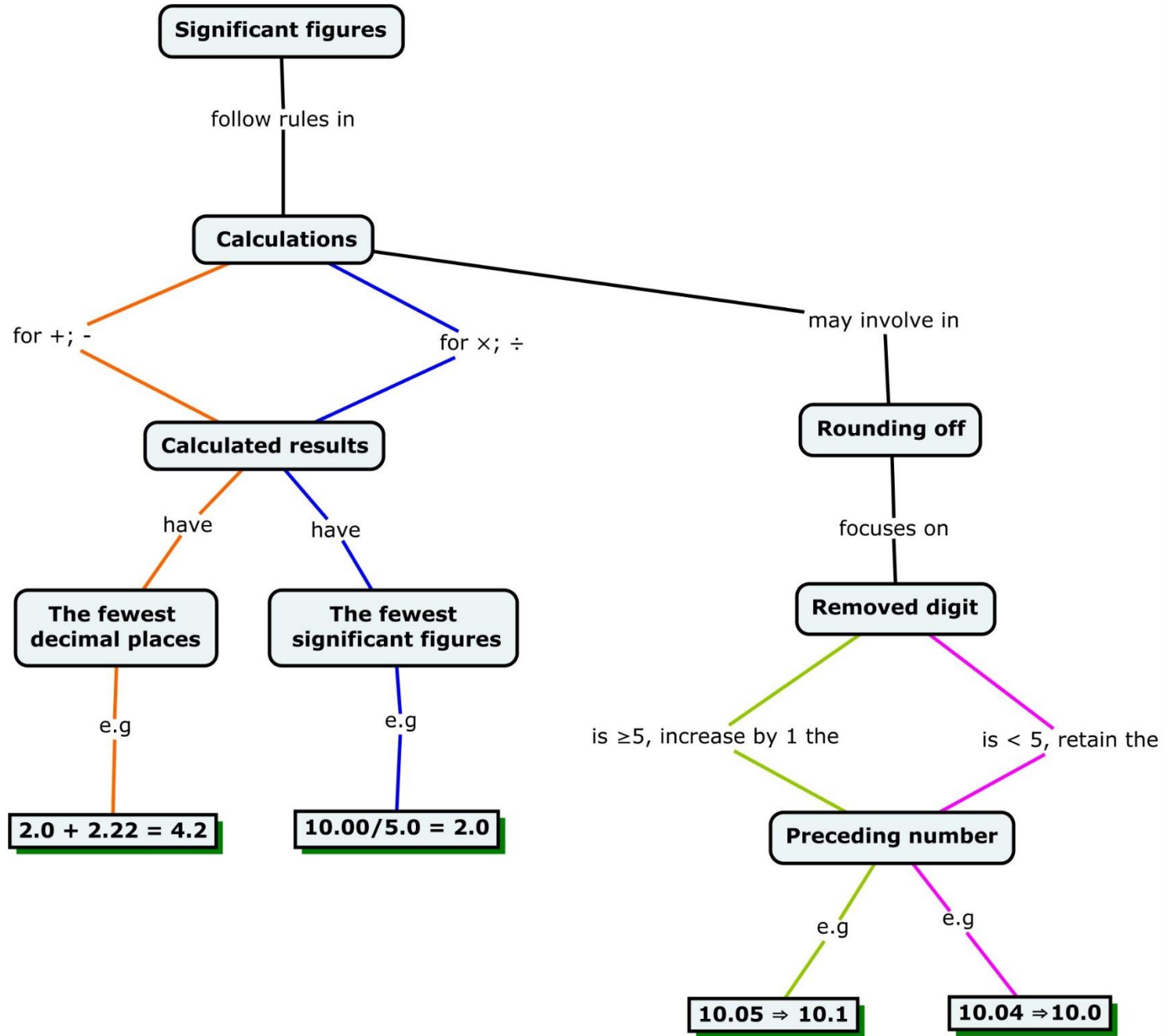
Focus question: what affects the reliability of a measurement?



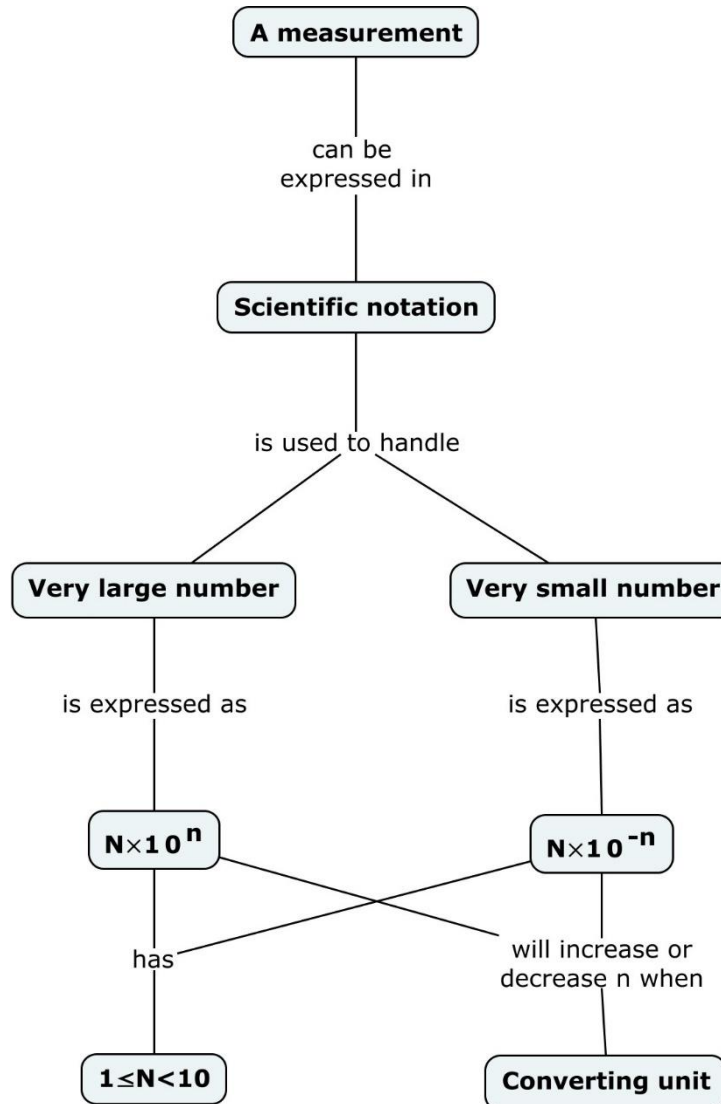
Focus question: How to determine significant figures?



Focus question: What calculation rules associated with significant figures?



Focus question: what are the functions of scientific notation?



Topic 1 – Concept test (* is key)

1/ Why does a measurement always have some degree of uncertainty?

- a. Because of limitations of the precision of measuring devices
- b. Because of limitations of performance of experimenters
- c. Disagree. Measurement does not always have uncertainty. There are some exceptions.
- d. Both a and b are correct. *
- e. No correct answer.

2/ A measurement is reported by recording all certain digits and all uncertain digits. True*/False

3/ How close a measurement is to the true value is called.

- a. Accuracy*
- b. Precision
- c. Significant
- d. Estimate

4/ When a measurement is repeatable and consistent, it is said to have...

- a. Low precision
- b. High precision*
- c. High accuracy
- d. Low accuracy

5/ Accurate measurements have low systematic errors and low random errors. True*/False

6/ Precise measurements have low random errors True*/False

7/ The digits we record in a measurement, both the certain and the uncertain ones, are called significant figures. True*/False

8/ Connect phrases to form correct statements.

A. Random error produces values

B. Systematic error produces values

1. that are either all higher or all lower than the true value.

2. that are higher and lower than the true value.

a. A 1 and B 2*

b. A 2 and B 1

9/ The uncertainty of the last number (the estimated number) of a measurement is usually assumed to be

a. $\pm 1^*$

b. ± 2

c. ± 10

d. ± 0.5

e. other

3 students weigh the same package of sugar with the same digital balance. The results are:

Student A	Student B	Student C
301 g	302 g	304

10/ Please indicate certain digits of these results:

3 and 0*

11/ Please indicate uncertain digits of these results:

1, 2, and 4 *

Please indicate the significant digits of these numbers. Y= yes N = No

12/ 10.40

digit	1	0	.	4	0
Significant?	Y	Y		Y	Y

13/ 0.014

digit	0	.	0	1	4
Significant?	N		N	Y	Y

14/ 0014

digit	0	0	1	4
Significant?	N	N	Y	Y

15/ 1400.

digit	1	4	0	0	.
Significant?	Y	Y	Y	Y	

16/ 1400

digit	1	4	0	0
Significant?	Y	Y	N	N

What are the results of the following calculations?

17/ $1.0 + 1.11 + 1.111 =$

- a. 3.221
- b. 3.22
- c. 3.2*
- d. 3

18/ $10.320 - 5.32 =$

- a. 5
- b. 5.0
- c. 5.00*
- d. 5.000

19/ $2.0 \times 3.0 \times 1.11 =$

- a. 6.7*
- b. 6.66
- c. 7
- d. 7.00
- e. 6

20/ $6.000/3.0 =$

- a. 2
- b. 2.0*
- c. 2.00
- d. 2.000

21/ There are 40 students in a classroom. How many significant figures of the number 40?

Infinite significant figures*

22/ To convert the meter to the centimeter, we need to multiply the number of meters by 100. How many significant figures of the number 100?
Infinite significant figures*

23/ Choose rounding offs that are correct

- a. $13.146 \rightarrow 13.14$
- b. $10.00540 \rightarrow 10.006$
- c. $0.1893 \rightarrow 0.19^*$
- d. $1.977 \rightarrow 1.97$
- e. $90.432 \rightarrow 90.43^*$

24/ Use scientific notation to express 0.03456

- a. 0.3456×10^{-1}
- b. $3.456 \times 10^{-2}^*$
- c. 34.56×10^{-3}
- d. 345.6×10^{-4}
- e. All are correct

25/ Use scientific notation to express 2 300 000

- a. 0.23×10^7
- b. $2.3 \times 10^6^*$
- c. 23×10^5
- d. 230×10^4
- e. All are correct

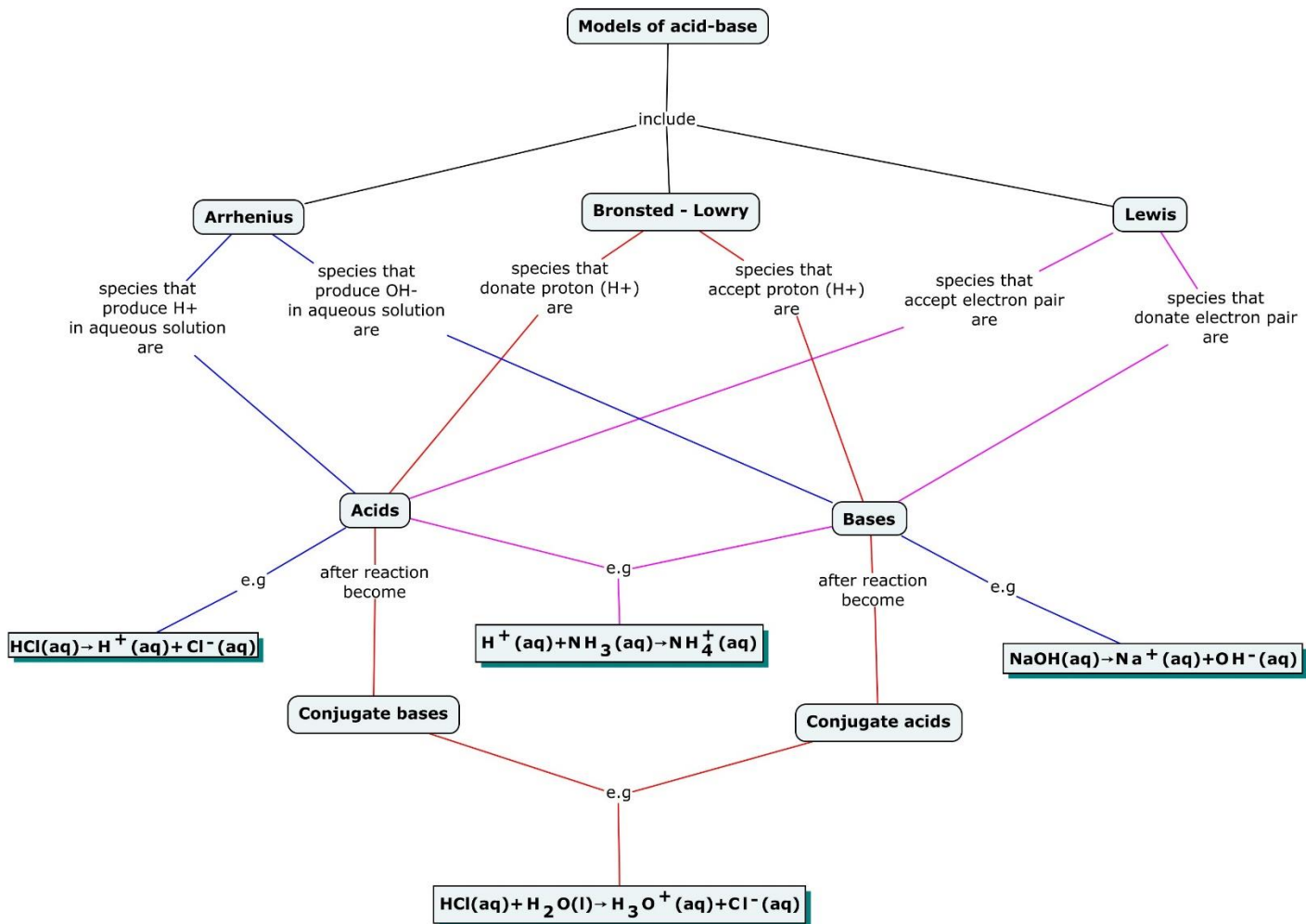
36/ Mass of an electron is 9.10×10^{-28} g. Convert the mass of an electron from gram to kilogram.

- a. 9.10×10^{-31} kg *
- b. 9.1×10^{-31} kg
- c. 9.10×10^{-25} kg
- d. 9.1×10^{-25} kg
- e. Both a, b are correct
- f. Both c, d are correct

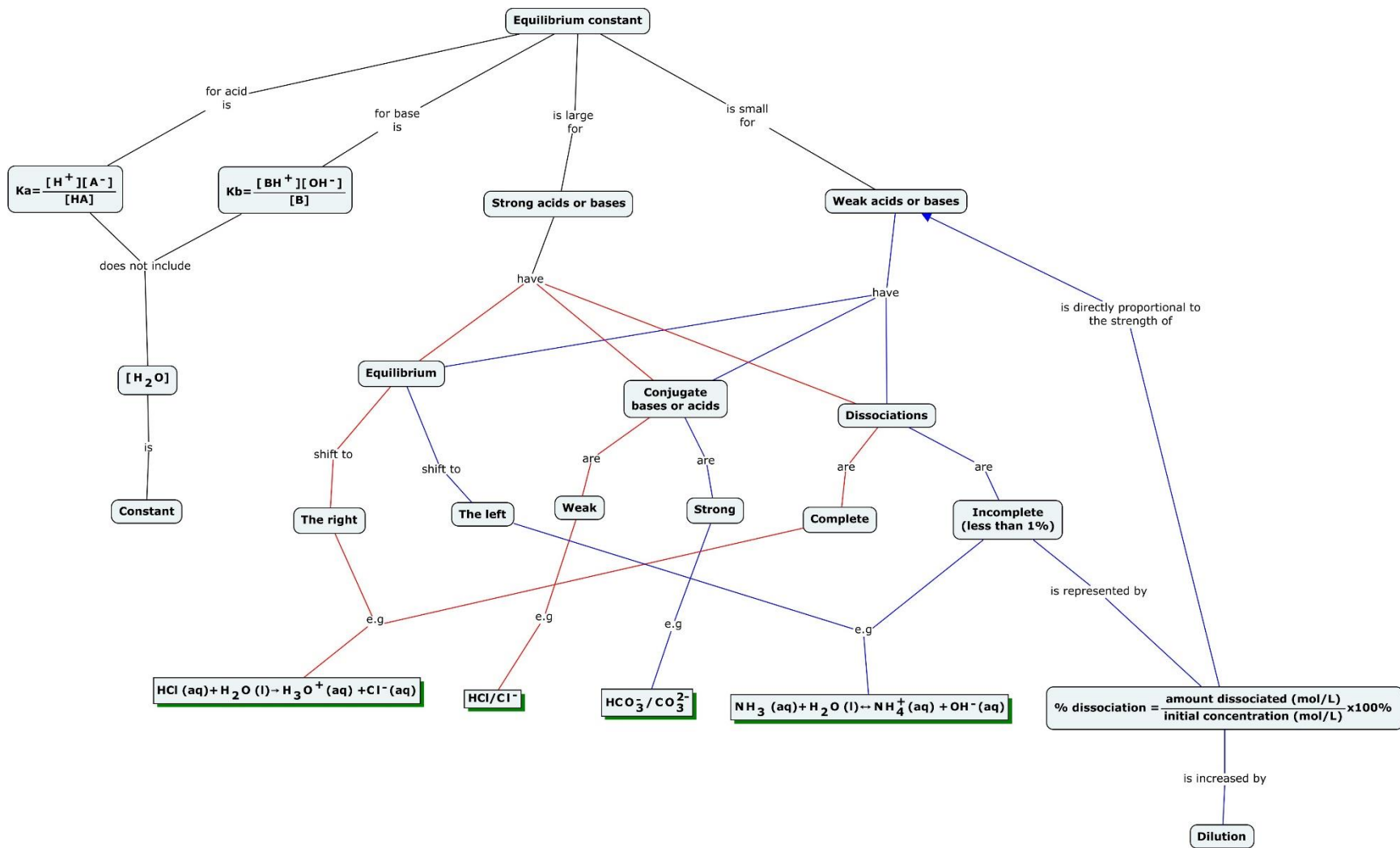
Topic 2 - Acid-base

Concept maps

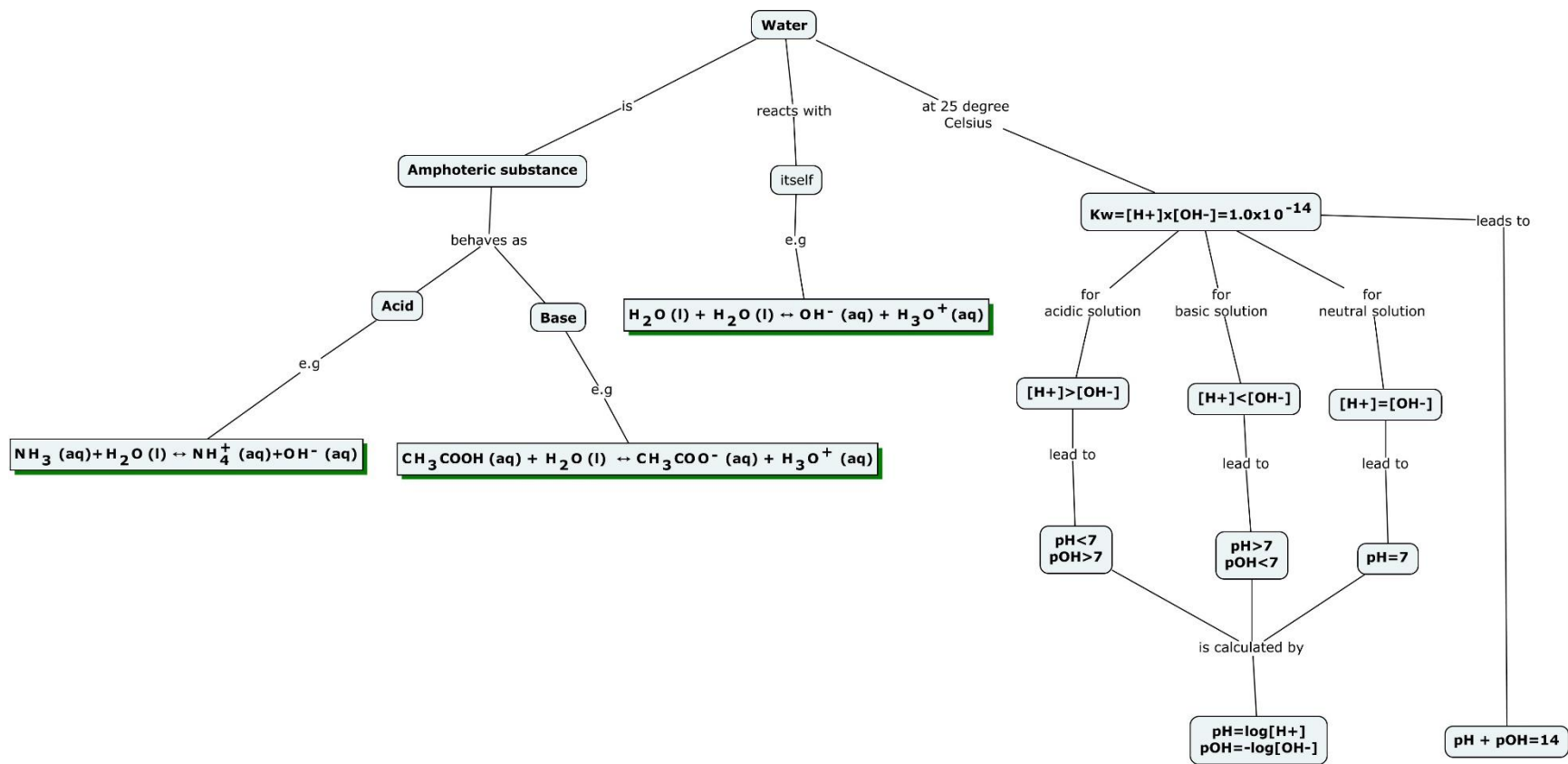
Focus question: How to explain the acid-base properties of chemicals?



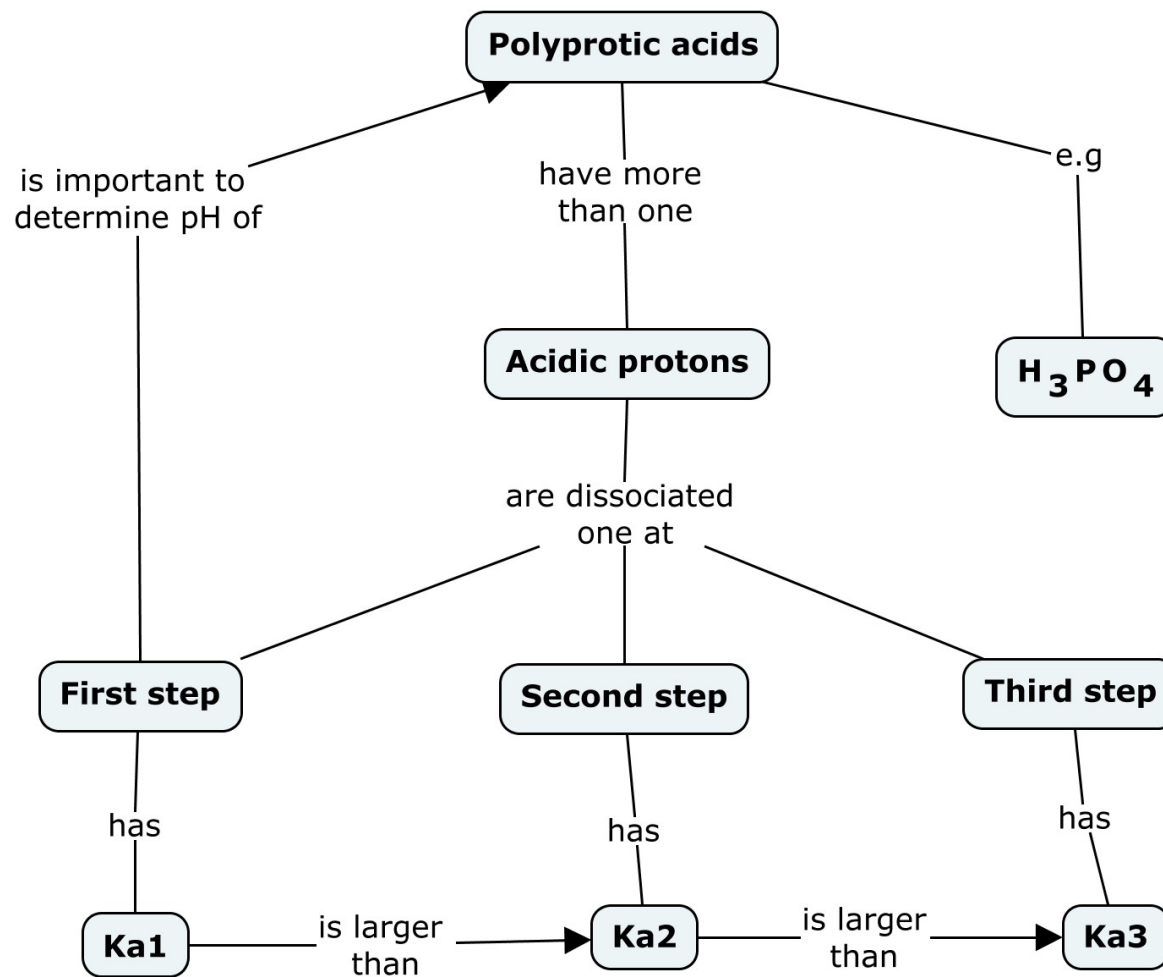
Focus question: What is the acid-base equilibrium constant? How do Acids/bases strengths affect dissociation?



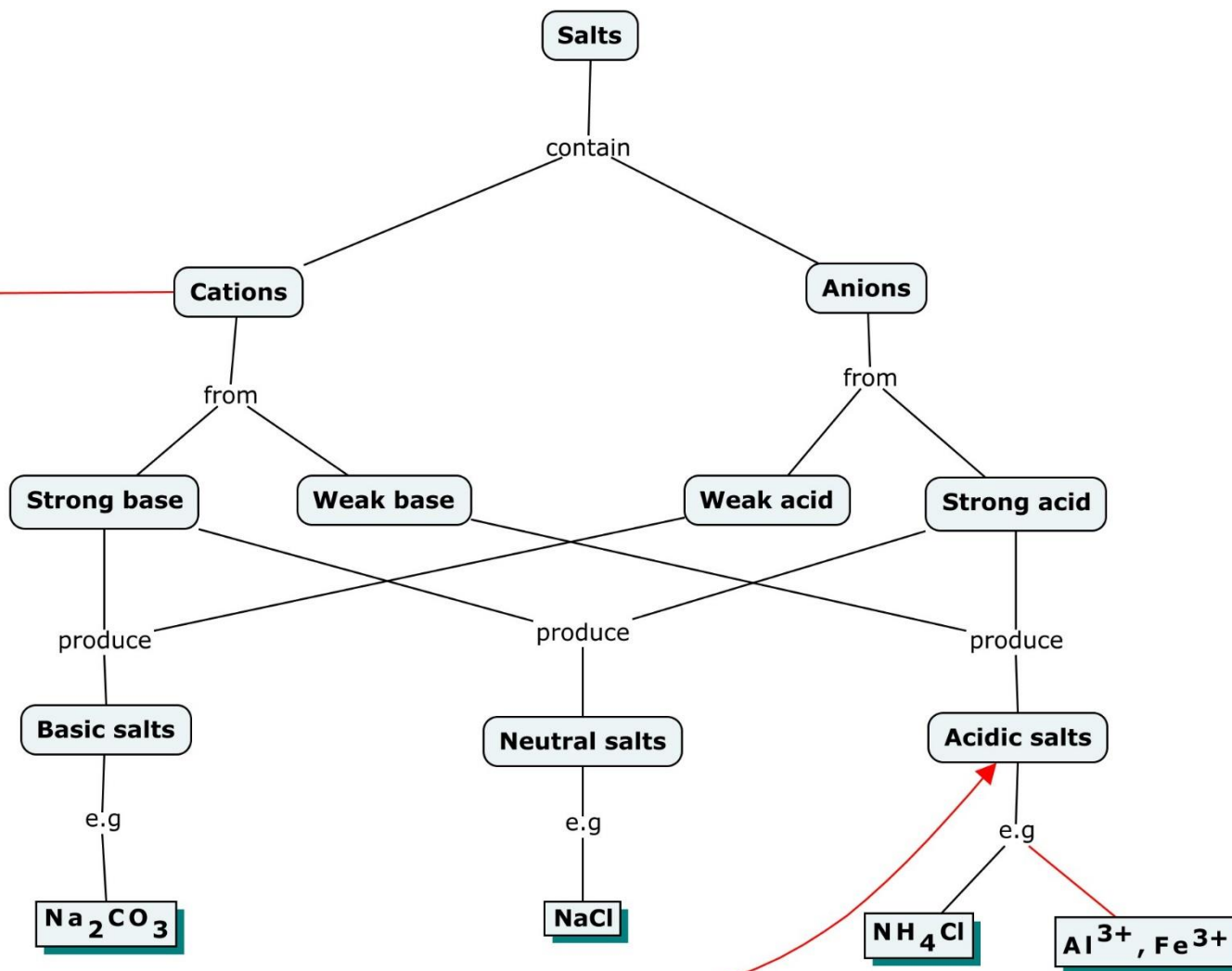
Focus question: What acid-base properties does water have? What is the pH value?



Focus question: What are the properties of polyprotic acids?

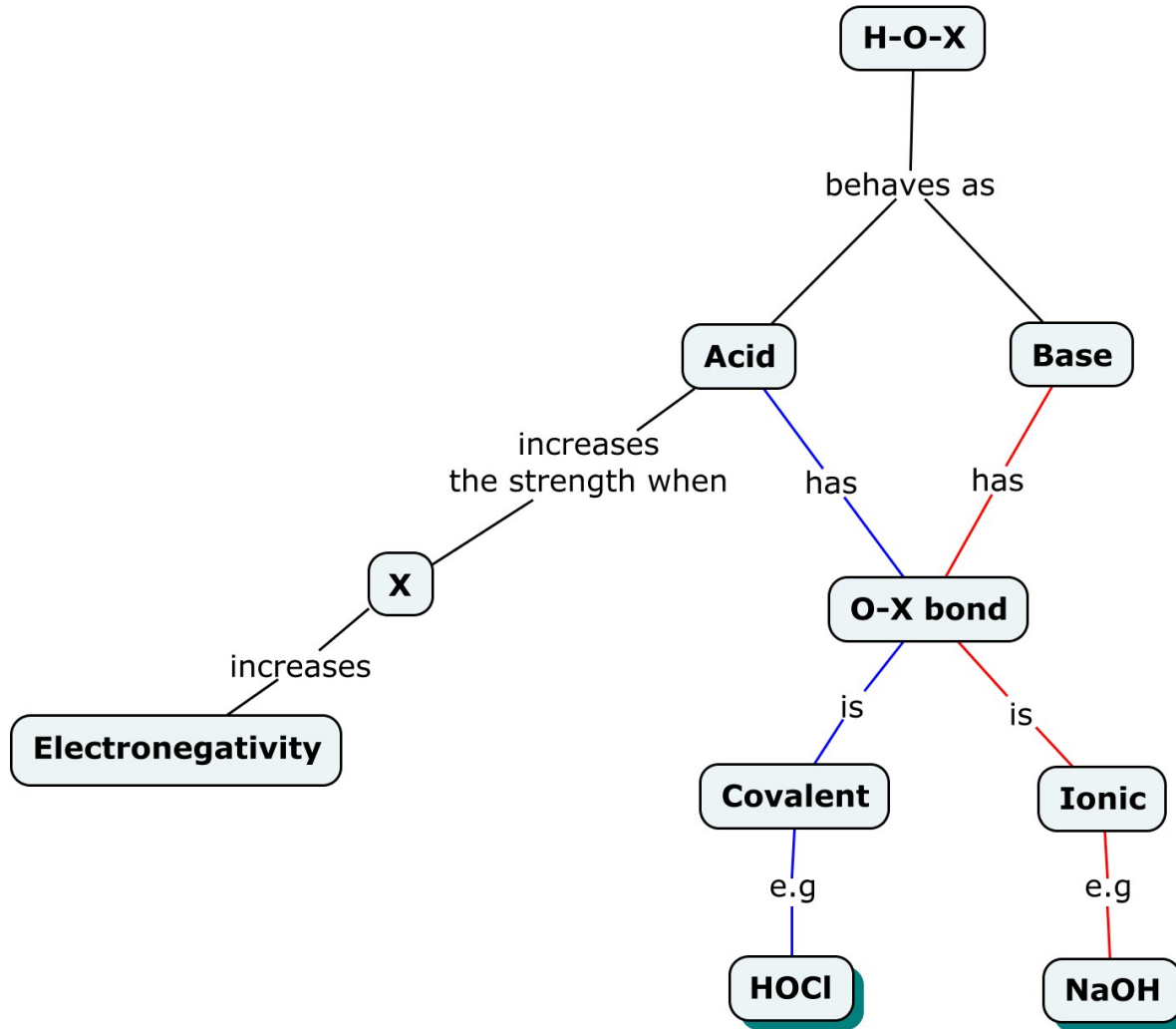


Focus question: How to determine the acid-base properties of salts?



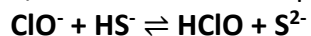
which are highly charged metals
produce

Focus question: How to determine the acid-base properties of HXO?



Topic 2- Concept test (* is key)

1/ For this net ionic equation which following statements are (are) correct? Choose all that apply



- a. ClO^- is a base*
- b. ClO^- is an acid
- c. HS^- is a base
- d. HS^- is an acid*
- e. The formula for the conjugate acid of ClO^- is HClO *
- f. The formula for the conjugate acid of HS^- is S^{2-}

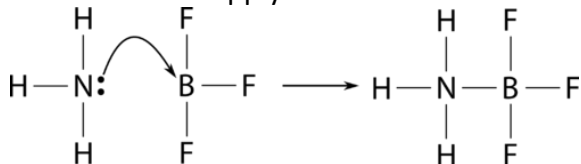
2/ According to the Arrhenius model, KOH is a base and HBr is an acid because:

Choose all that apply

- a. KOH dissociate OH^- *
- b. KOH has an OH group
- c. HBr has H element
- d. HBr dissociate H^+ *

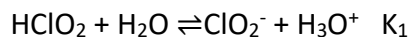
3/ Identify whether each species functions as a Lewis acid or a Lewis base in this reaction.

Choose all that apply



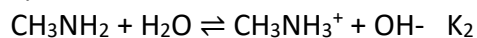
- a. NH_3 is a base*
- b. NH_3 is an acid
- c. BF_3 is a base
- d. BF_3 is an acid*

4/ What is the formula of K_1 ?



- a. $K_1 = \frac{[H_3O^+][ClO_2^-]}{[HClO_2]}$ *
- b. $K_1 = \frac{[H_3O^+][ClO_2^-]}{[HClO_2][H_2O]}$
- c. $K_1 = \frac{[HClO_2]}{[H_3O^+][ClO_2^-]}$
- d. $K_1 = \frac{[HClO_2][H_2O]}{[H_3O^+][ClO_2^-]}$

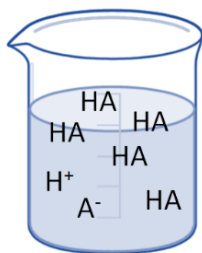
5/ What is the formula of K_2 ?



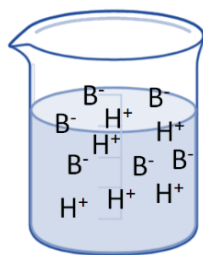
- a. $K_2 = \frac{[CH_3NH_3^+][OH^-]}{[CH_3NH_2][H_2O]}$
- b. $K_2 = \frac{[CH_3NH_3^+][OH^-]}{[CH_3NH_2]}$ *
- c. $K_2 = \frac{[CH_3NH_2][H_2O]}{[CH_3NH_3^+][OH^-]}$
- d. $K_2 = \frac{[CH_3NH_2]}{[CH_3NH_3^+][OH^-]}$

6/ HA and HB are monoprotic acid. The same mole of HA and HB are added to the same volume of water. The figure represents the dissociation of these acids in water.

HA acid



HB acid



Which following statements about acid HA and HB is(are) correct? Choose all that apply

- a. The acidity of HA is stronger than HB
- b. HB slightly dissociates in water

- c. K_a of HB is larger than K_a of HA*
- d. The dissociation (ionization) equilibrium position of HA lies far to the left*
- e. B^- is a weak conjugate base*
- f. When HB is diluted, its percent dissociation will increase
- g. HA has smaller percent dissociation*

7/ The 0.1 M CH_3COOH solution has $pH = 2.88$. the % dissociation of the solution is:

- a. 2.1 %
- b. 1.3%*
- c. 1.5%
- d. 2.6%

8/ Which of the following statements is(are) true? Choose all that apply

- a. Water only behaves as an acid
- b. water reacts with itself in an acid-base reaction*
- c. pure water has $K = 1.0 \times 10^{-7}$ at $25^\circ C$
- d. pure water has $[H^+][OH^-] = 10^{-14}$ at $25^\circ C$ *

9/ Which of the following conditions indicate an acidic solution at $25^\circ C$? Choose all that apply

- a. $pH = 3.4$ *
- b. $[H^+] > 1.0 \times 10^{-7} M$ *
- c. $pOH = 4.51$
- d. $[OH^-] = 3.21 \times 10^{-12} M$ *

10/ Which following statements is(are) correct about H_3PO_4 ? Choose all that apply

- a. H_3PO_4 is an monoprotic acid
- b. H_3PO_4 has three K_a and $K_{a3} > K_{a2} > K_{a1}$
- c. At the first dissociation, H_3PO_4 will donor 1 proton *
- d. $H_2PO_4^- + H_2O \rightleftharpoons HPO_4^{2-} + H_3O^+$ *
- e. the pH of the solution is approximately calculated from the first dissociation. *

11/ Consider a 0.10 M H_2CO_3 solution and a 0.10 M H_2SO_4 solution. Without detailed calculations, choose one of the following statements that best describes the $[\text{H}^+]$ of each solution and explain your answer.

- a. The $[\text{H}^+]$ is less than 0.10 M.
- b. The $[\text{H}^+]$ is 0.10 M.
- c. The $[\text{H}^+]$ is between 0.10 M and 0.20 M. *
- d. The $[\text{H}^+]$ is 0.20 M.

12/ Which the following statement is(are) correct? Choose all that apply

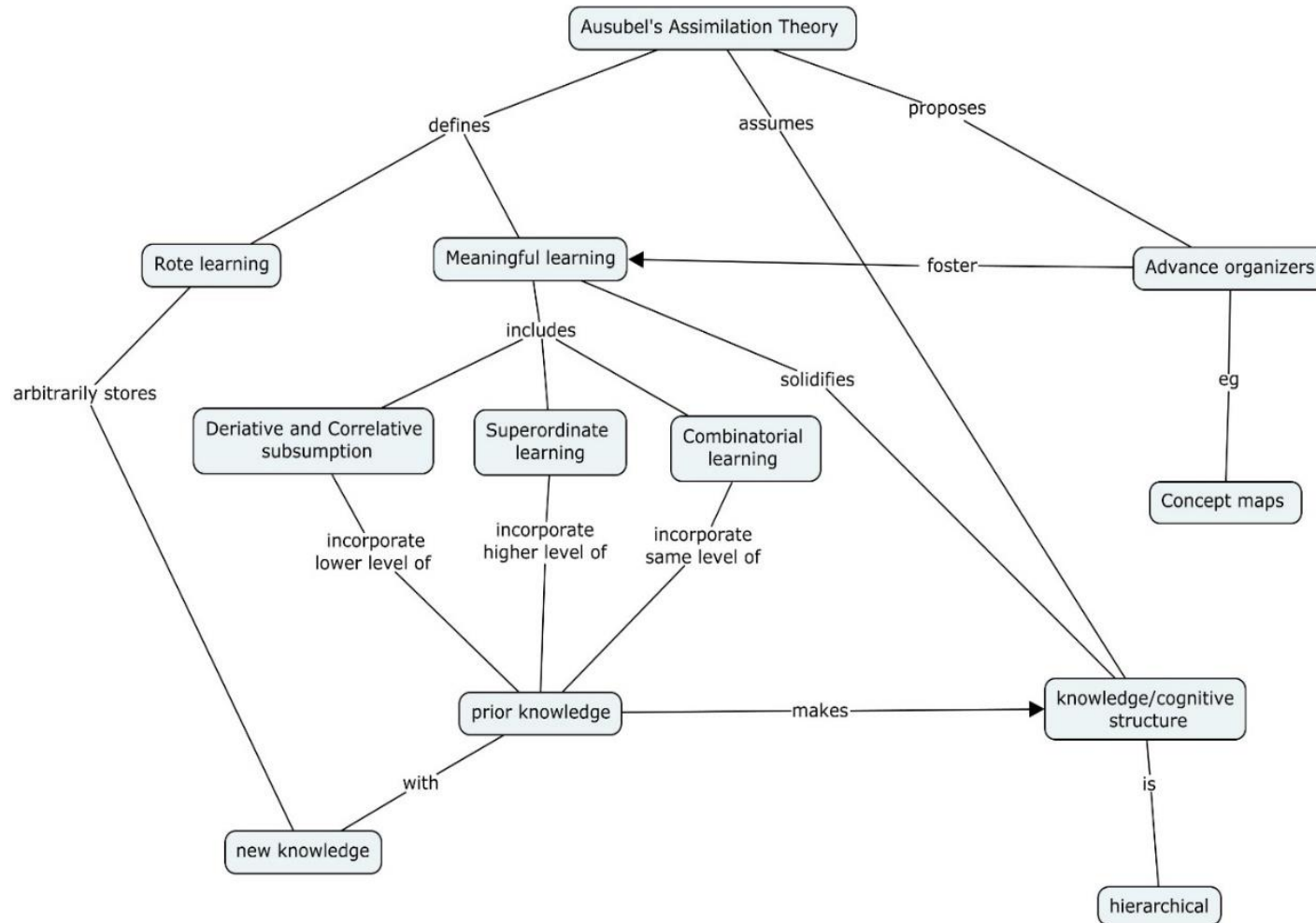
- a. Both NH_4Cl and AlCl_3 solutions are acidity *
- b. Both Na_2CO_3 and K_2S solutions are basic*
- c. Both NH_4NO_3 and NaNO_3 solutions are basic
- d. Both NaCl and FeCl_3 solutions are acidity

13/ Which the following statement is(are) correct? Choose all that apply

- a. pH of CH_3COONa solution is higher than pH of NaHSO_4 *
- b. pH of KNO_3 solution is 7*
- c. pH of FeCl_3 solution is higher than 7
- d. pH of K_2SO_3 is lower than 7

14/ Which the following statement is(are) correct? Choose all that apply

- a. HOCl is weaker Bronsted acid than HOBr because Cl is more electronegative than Br.
- b. The K-O bond of KOH is ionic, so KOH behaves as a base. *
- c. The S-O bond of H_2SO_4 is ionic, so H_2SO_4 behaves as an acid
- d. The Na-O bond of NaNO_3 is ionic, so NaNO_3 behaves neutrally.



Concept map of Ausubel's Assimilation Theory.