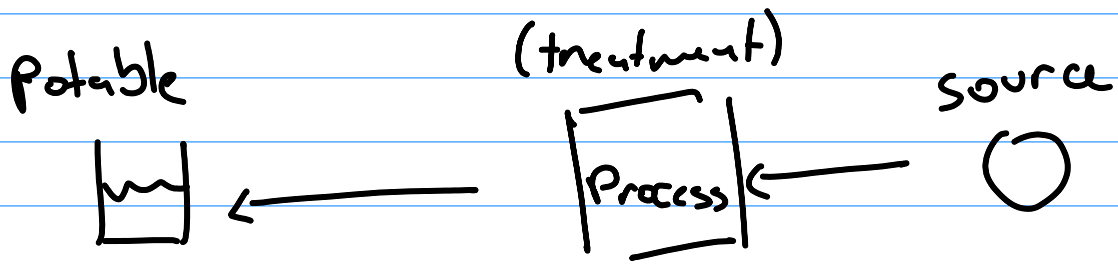
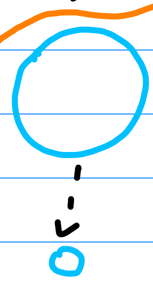


safe for:

- drinking
- cooking

e.g.
filtration
fluoridation
disinfection

e.g.
river
groundwater



(all water) → mostly contains too much salt (> 600 mg L^{-1}) (it's like 35000 mg L^{-1})

(fresh water)

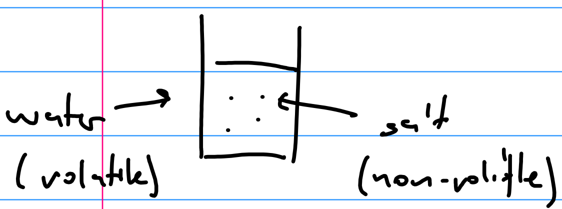
sometimes stagnant/stale

(2012-13)

Perth
- 40% ground
- 27% desal sea
- 33% surface

Seawater → Potable

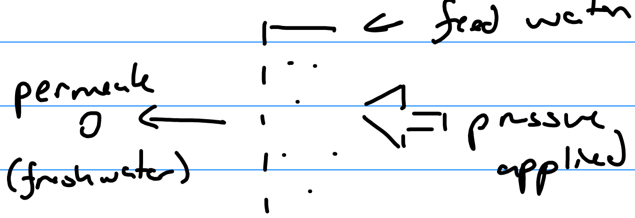
Distillation



water evaporates, then condenses

- high energy demand ∴ C

Reverse Osmosis



salt left is called the concentrate

(better)

Set 28

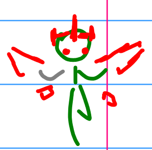
12. The majority of Earth's water is seawater, which has a high TDS, and also contains high levels of salt. As a result, this water is unusable for either human consumption or for agriculture.
On the other hand, not all fresh water is safe for consumption, as some of these sources can be stagnant and have a buildup of dead matter and other harmful organisms.

13. TDS: total dissolved solids, the total amount of solids that is disolved in the water.
There is no upper limit because it depends on the solids that are dissolved in water

14. Potable water is water that is safe to be used for human consumption or for cooking.

b. With advancing technologies, it is getting cheaper and cheaper to filter seawater. Also, it is a very abudant source of water

c. A semipemeable membrane (SPM) is a membrane that allows water to pass through it but not other, larger particles, such as dissolved salts. In plants, a process called osmosis is used to tranfer water from the environment into the plant.



Osmosis occurs when two liquids with different concentrations of TDS are seperated by a semi-permeable membrane. In this scenario, the net flow will be from the liquid with the lower concentration into the liquid with a higher concentration, until both liquids have an equal concentration.

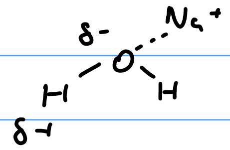
d. Osmosis occurs naturally. Conversely, RO requires some pressure to be applied in order to move the water from the solution of higher concentration into the side with a lower concentration.

what's with this shift?

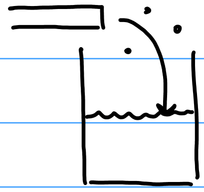
a. Most of the energy involved in desalination by RO involves the use of pressure and an SPM to separate various salt ions from water molecules. **Why** should energy be needed to separate ions like Na^+ from H_2O molecules? **Explain** in terms of chemical bonding.

wth?

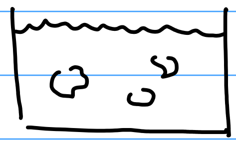
15. Inside the salty feed water solution, the Na^+ and H_2O molecules are attracted to each other by ion-dipole intermolecular forces. In order to seperate these, the ion-dipole force must be overcome and thus energy must be put into the system.



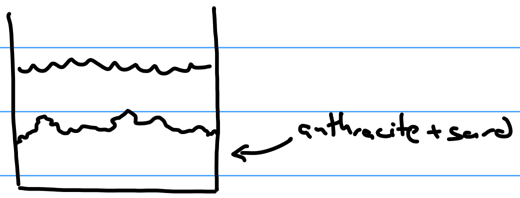
Ground water Processing



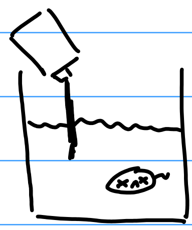
Aeration: removes the air from bore water e.g. CO_2, H_2S (can discolour water, etc)



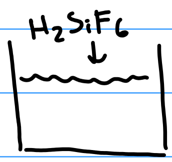
Clarification: fine particles are removed - adds $Al_2(SO_4)_3$ (coagulation & flocculation agent)



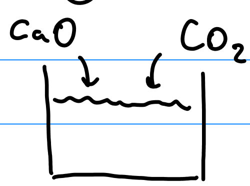
sand filtration: filters other fine particles



disinfection: destroy pathogenic viruses and bacteria by using chlorine



fluoradation: adding fluorine to water strengthens teeth from bacteria



pH control:
+ CaO → basic
+ CO_2 → acidic

Control

- Turbidity
- pH
- TDS
- pathogens
- heavy metals (potentially toxic)
  e.g. Arsenic

Set 28 cont.

16. $1 \times 10^{-6} = \frac{m(F^-)}{45\,000}$

$m(F^-) = 0.045 \text{ kg} = 45 \text{ g}$

b. $n(F^-) = \frac{m(F^-)}{M(F^-)}$

$= \frac{45}{19}$

$= 2.37 \text{ mol}$

$2.37 = \frac{m(NaF)}{14.01+19}$

$m(NaF) = 78.18 \text{ g}$

c. This because ppm does NOT calculate concentration based off of moles but rather off of mass. Because NaF and F^- have a different total mass, their concentration in ppm will also differ.

d. $n(NaF) = \frac{m(NaF)}{M(NaF)}$

$= \frac{4.1}{14.01+19}$

$= 0.124 \text{ mol}$

$n(NaF) = n(F^-) = 0.124 \text{ mol}$

$m(F^-) = 0.124 \times M(F^-)$

$= 0.124 \times 19$

$= 2.36 \text{ g}$

$C = \frac{2.36}{100} \times 10^6$

$= 23\,600 \text{ ppm}$

(p.147)

x . x
⌒

16b but correct:

16. $1 \times 10^{-} = \frac{m(F^-)}{45\,000}$

$m(F^-) = 0.045 \text{ kg} = 45 \text{ g}$

b. $n(F^-) = \frac{m(F^-)}{M(F^-)}$

$= \frac{45}{19}$

$= 2.37 \text{ mol}$

$2.37 = \frac{m(NaF)}{M(NaF)}$

$= \frac{m(NaF)}{22.99 + 19}$

$m(NaF) = 99.45 \text{ g}$

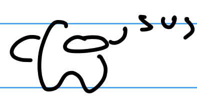
d. $n(NaF) = \frac{4.1}{41.99}$

$= 0.0976 \text{ mol}$

$m(F^-) = 0.0976 \times 19$

$= 1.86 \text{ g}$

$C = \frac{1.86}{100} \times 10^6$



$= 18\,600 \text{ ppm}$

17.a. Chlorine is added to water in order to sanitize it i.e. destroy pathogenic organisms such as bacteria and viruses.

b. $1 = \frac{m(Cl_2)}{9.79 \times 10^8} \times 10^6$

$=$

$\frac{1 \times 9.79 \times 10^8}{10^6} = m(Cl_2)$

$979 \text{ kg} = m(Cl_2)$

c. To keep the Chlorine across the entire system of water distribution, excess chlorine would need to be added in order to account for vary factors, i dunno man