

Class Practice 2.3

1. Which of the following process is NOT used in extracting common salt from sea water?

→ evaporation

→ crystallization

A. evaporation ✓

B. distillation: extract water from sea water

C. crystallization ✓

D. filtration: separate insoluble solid from the solution
e.g. sand in sea water

2. When a glass of sea water is left on a table under room conditions for 10 days, what will be observed?

Sodium chloride powder: from evaporation

A. Sea water becomes milky.

B. Some crystals are formed. Crystallization occurs.

C. Some white powder is formed.

D. Sea water remains unchanged.

3. When a solution of sodium chloride is concentrated by heating for preparation of crystals, which of the following procedures can be used to check whether the solution is concentrated or not?

被濃縮 / water leaves from the solution

saturated

A. Taste the solution to see if it is salty enough.

B. Observe to see if the solution turns milky.

C. Dip a glass rod into the solution, take it out to see if small crystals appear on the rod.

D. Measure the volume of the solution to see if it decreases at least by half of the initial volume.

$$\frac{30}{100} = 0.3$$

Saturated solution

4. If 100 cm³ of water can dissolve a maximum of 30 g of salt Y at room temperature, which of the following would produce a saturated solution? greater than 0.3, saturated

smaller than < 0.3, not saturated.

(1) Add 20 g of salt Y to 50 cm³ water at room temperature. $\frac{20}{50} = 0.4$ (2) Add 50 g of salt Y to 100 cm³ water at room temperature. $\frac{50}{100} = 0.5$ (3) Add 40 g of salt Y to 200 cm³ water at room temperature. $\frac{40}{200} = 0.2$

- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

5. Which of the following statements concerning a saturated sodium chloride solution is correct?

- (1) The boiling point of the solution is at 100°C. boiling point of water
- (2) The amount of sodium chloride dissolved in water is the maximum at that particular temperature. correct ✓
- (3) The solution is so concentrated that it cannot dissolve any other substances. ✗

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

3 The Atmosphere

3.1 Composition of air

The atmosphere is a gaseous layer surrounding the Earth. Air is a mixture of gases and other substances making up the atmosphere.

The approximate composition of air (by volume)

Composition	Percentage by volume (%)
nitrogen	78
oxygen	21
inert gases (e.g. helium, neon and argon)	0.9
unreactive carbon dioxide	0.03 - 0.04
water vapour	variable
other substances like dusts and harmful gases (e.g. sulphur dioxide)	very small amount

二硫化硫 from burning coal which contains sulphur

Example 3.1

Dry air contains 78% nitrogen and 21% oxygen.

- Name two gases that make up the remaining 1% by volume of dry air.
- State the most abundant compound in dry air.
- Suggest a test for oxygen.

Answer

- carbon dioxide / helium / neon / argon
- carbon dioxide
- Test with a glowing splint. Oxygen will relight a glowing splint.

乾燥的
(無水)

nitrogen oxygen noble gas carbon dioxide

b.p -196°C -183°C -186°C -79°C

3.2 Separation of oxygen and nitrogen from air

fractional distillation

↳ a fractionating

column is added

to get a better

separation.

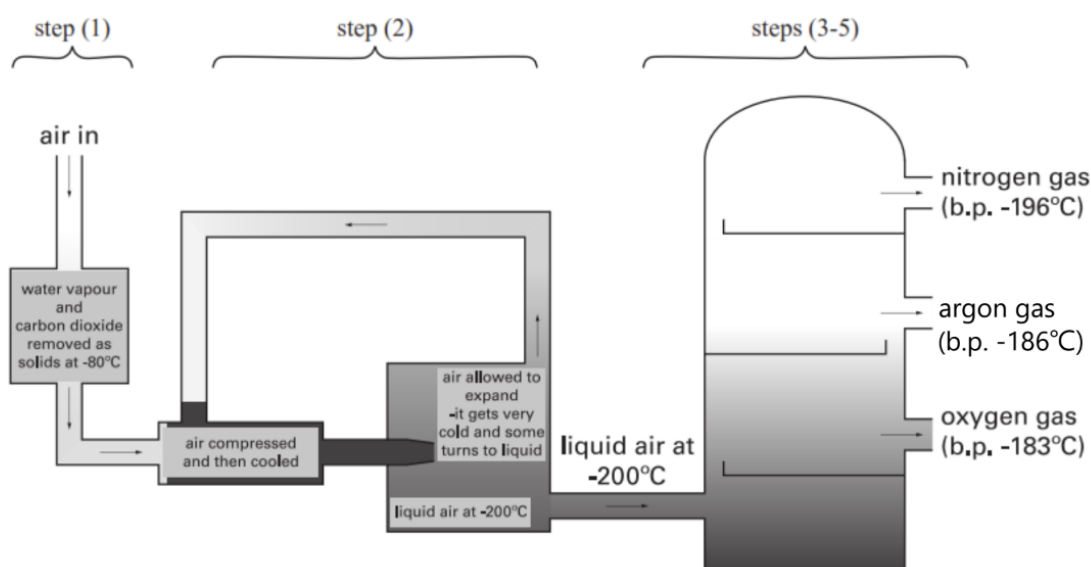
Oxygen and nitrogen are important industrial materials. Oxygen and nitrogen can be separated from air by **fractional distillation of liquid air** because they have **different boiling points**.

Steps of fractional distillation of liquid air

Step 1: Air is **purified** to remove dusts, carbon dioxide, water vapour etc.

Step 2: Purified air is **compressed and cooled** repeatedly to about -200°C . The air changes **from gas to liquid** at this temperature.

Step 3: The liquid air is passed into a **fractionating column** and warmed up slowly.



Note:

1. Nitrogen (b.p. = -196°C) boils and is separated from the mixture first.
2. Argon (b.p. = -186°C) boils and is separated from the mixture at a higher temperature.
3. Oxygen (b.p. = -183°C) boils and is separated from the mixture at the highest temperature.