

Content Guidelines

- Always try to use **simple** language/sentences.
- Always try to keep a point restricted to **one** or **two lines**.
- Maintain a **proper flow** and sentence organization.
- Provide relevant pictures/infographics/maps in **High Definition**.

Example: {GS3 – S&T – Tech – 2023/07} Osmosis and Reverse osmosis (RO)

❖ **Context (TH): Osmosis** is extremely important in living organisms.

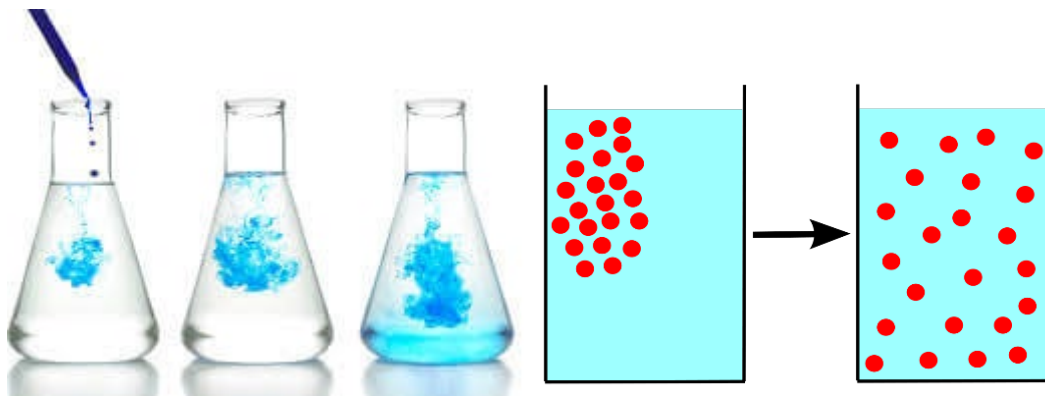
Basics

Solution

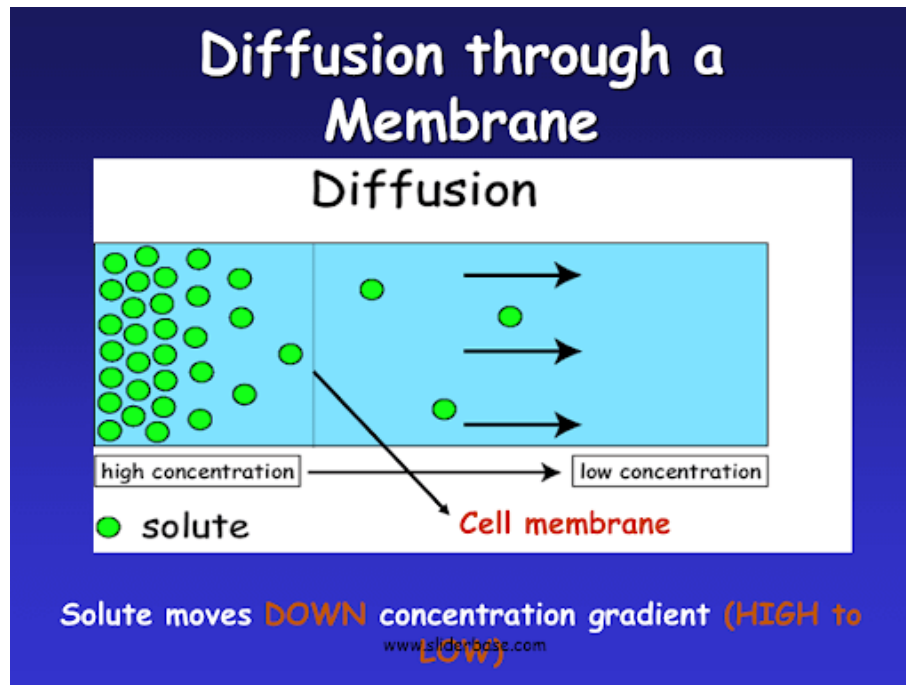
- In chemistry, a **solution** is homogeneous mixture composed of two or more substances.
- In such a mixture, a **solute** is a **substance dissolved** in **another substance**, known as a **solvent**.
- For example, **salt** is the **solute** in salt water, and **water** is the **solvent**.

Diffusion

- **Diffusion** is a spontaneous movement of a substance from an area of high concentration to an area of low concentration.



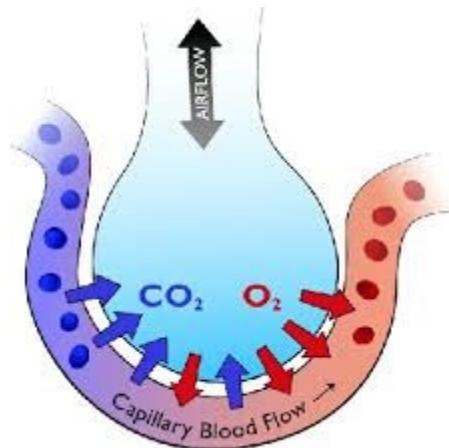
- Diffusion through a **permeable membrane** moves a **substance (solute)** from a region of **high solute concentration (hypertonic)** to a region where its **concentration is low (hypotonic)**.



DO NOT remove copyrights/logos mentioned on the images.

Importance of Diffusion

- ✓ In living organisms, **diffusion** plays an important role in **gaseous exchange** between the cells as well as the cell and its external environment.
- ✓ **Exchange of O₂ and CO₂ in alveoli** (tiny, balloon-shaped sacs in lungs) is an example of **diffusion**.

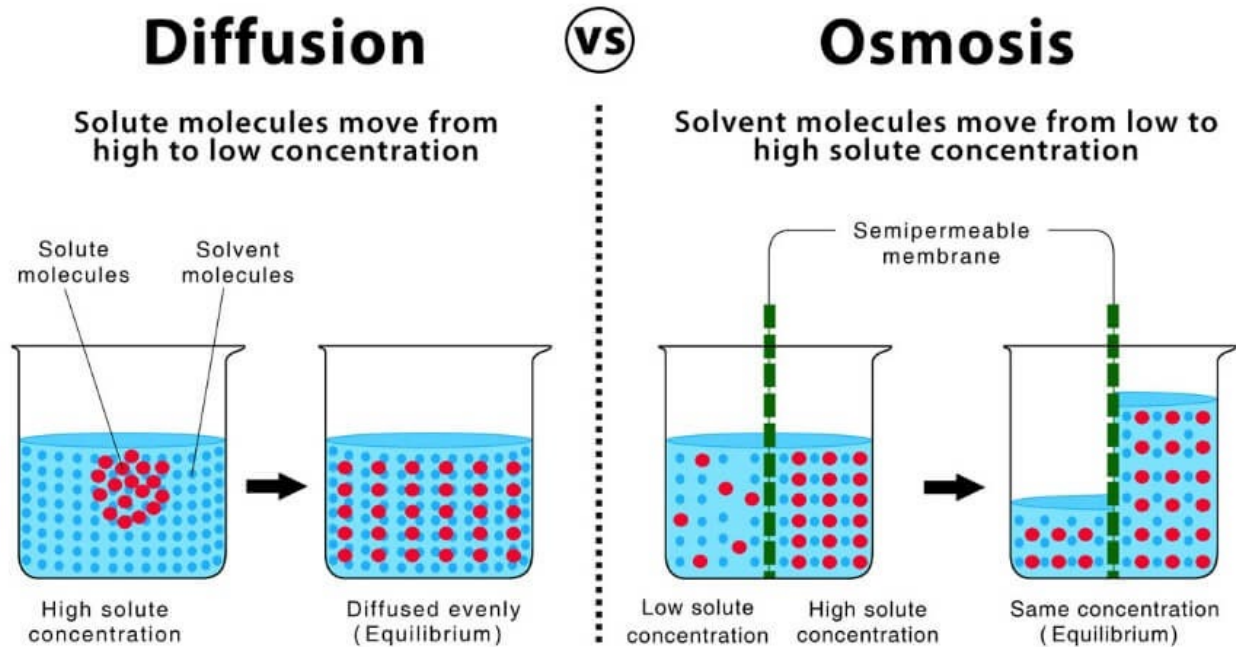


This is poor quality image. Always try to find images that are more clear.

- In a person suffering from **pneumonia**, the air sacs may **fill with fluid or pus**. This **prevents diffusion** of O₂ and CO₂ in alveoli (**breathing issues in COVID patients**).

Osmosis

- Water obeys the **law of diffusion**. This is observed in a phenomenon called **osmosis**.
- **Osmosis** is the **diffusion of a solvent (e.g. water)** from a region of **low solute concentration** **through a semi-permeable membrane** to a region of **high solute concentration**.



- For e.g., in a container in which a **concentrated** sugar solution and a **diluted** sugar solution are separated by a **semipermeable** membrane, **water molecules** will travel from the **diluted solution to the concentrated one** through the membrane **until** the **concentration of water** is **equal on both sides**.

Keep the sentences in 3 or 4 lines only when it is impossible to restrict it to one or two lines.

⇒ **Semi (selectively) permeable** means that the membrane **will allow small molecules** and **ions** to pass through it but **acts as a barrier to larger molecules** or dissolved substances.

⇒ **Osmosis** is a **special case of diffusion** through a **selectively permeable membrane**.

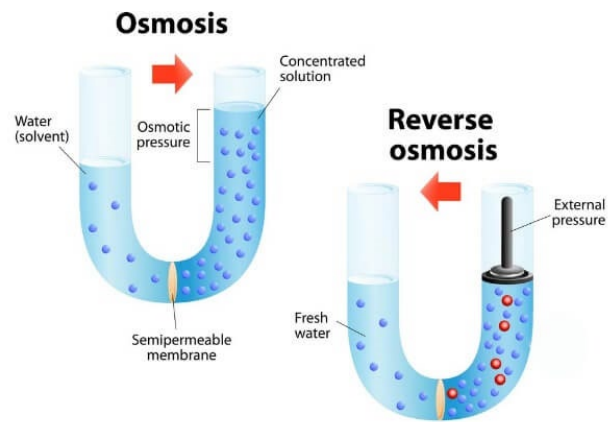
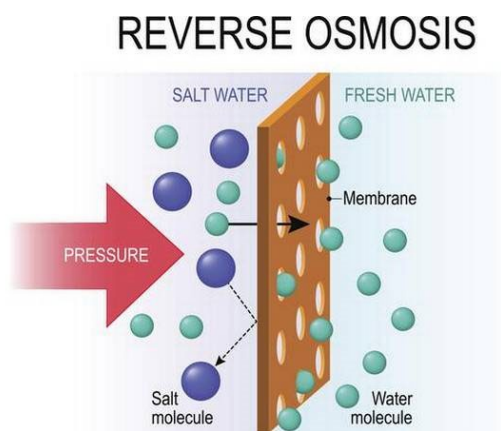
- Examples of osmosis in daily life are the **swelling of seeds when soaked in water** and in **wrinkling of your fingers after taking a long bath**.

Importance of Osmosis

- ✓ **Osmosis** is incredibly **important in living beings**, where **liquids move** from one part of an organism to another through **semi-permeable cellular membranes**.
 - ❖ Unicellular freshwater organisms gain water through osmosis.
 - ❖ In **trees**, osmosis **transports water** and **nutrients** from the **roots to the leaves**.

Reverse Osmosis (RO)

- **Reverse osmosis (RO)** is a **water purification technology** that uses a **semipermeable membrane** to remove larger particles from drinking water.
- In reverse osmosis, an **applied pressure** is used **to overcome osmotic pressure** so that **pure water flows from a region of high solute concentration** (hypertonic) through a **semi-permeable membrane** to a low solute concentration (hypotonic).



Application of Reverse Osmosis (RO)

- ❖ RO was earlier used to **desalinate sea water**. Today, a wide array of membranes can be deployed to filter a wide variety of solutes — **arsenic, fluoride, hexavalent chromium, nitrates**, and **bacteria**. This has led to an industry of **home-RO systems** for drinking water.
- ❖ To create external pressure, RO systems rely on a pump and electric motors. They use **activated carbon** components, such as **charcoal** and **carbon black**, to filter out **contaminants** and **organic substances, such as bacteria** (UV light is also used to kill bacteria).

Problem with RO water purifiers

- RO systems **waste much water** (high carbon footprint).
- RO system **filters out essential micronutrients** such as **calcium, zinc, and magnesium**.
- RO system only reduces Total Dissolved Solids, ensures water is odourless and has a pH of 6.5-8.5. Most RO methods **did not** eliminate the **Hepatitis E virus**.
- RO systems (**expensive**) reduce the incentive for public-funded water distribution systems.
- In the case of seawater desalination, the **deposition of brine** (highly concentrated salt water) along the shores affects plankton, which is the main food for small fish species.

Example: {GS3 – S&T – BioTech} Indigenous CAR-T Cell Therapy

- ❖ **Context (DTE)**: India's **indigenously** developed **Chimeric Antigen Receptor (CAR)-T Cell Therapy** has been approved by the **Central Drugs Standard Control Organization (CDSCO)**.
- ❖ Named **NexCAR19**, it is developed by Mumbai-based Immunoadoptive Cell Therapy Private Limited (**ImmunoACT**), an **IIT Bombay-incubated company**.

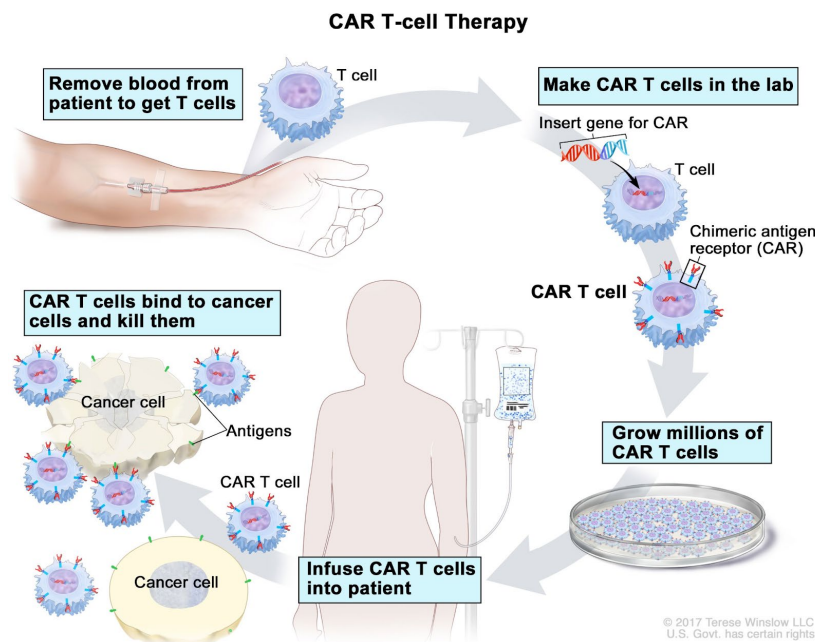
Types of Treatment for Cancer

- The **three major forms of treatment for any cancer** are
 1. **Surgery** (removing the cancer)
 2. **Radiotherapy** (delivering ionising radiation to the tumour)
 3. **Systemic therapy** (administering medicines that act on the tumour).

Systemic Therapy

- **Systemic therapy** involves **administering medicines** that **act on the tumour**.
- Its earliest form was **chemotherapy**, which uses **powerful chemicals** to **kill** fast-growing cancer cells.
 - It has modest response rates and **significant side effects**.
- The next stage of the evolution of systemic therapy was **immunotherapy** (or **targeted agents**).
- **Immunotherapy** uses **drugs** to **boost the immune system** and help the body destroy cancer cells.
 - It has **fewer side effects** but is **effective only against tumours expressing these targets**.
- A **new** advance in **systemic therapy** is **CAR T-cell therapy**.

Chimeric Antigen Receptor (CAR)-T Cell Therapy



- **Unlike** chemotherapy or immunotherapy which uses injectable or oral medication, **CAR T-cell therapies use a patient's own cells**.
- In CAR T-cell therapy, the patient's blood is drawn to harvest **T-cells** (immune cells that play a significant role in destroying tumour cells).
- T cells are **genetically engineered** by introducing DNA into them to produce **chimeric antigen receptors (CARs)** on the surface of the T cells. After reengineering, T cells are called "**CAR T cells**".
- CAR T cells are then **multiplied** and **infused into the patient**.

⇒ CARs are **proteins** that allow T cells to **recognise an antigen in targeted tumour cells**.

T cell

- T cell (**T lymphocyte** or **thymocyte**) is a **white blood cell** essential to the immune system.
- It **protects** the body **from infection** and helps fight cancer.
- It **develops from stem cells** in the **bone marrow**.

TYPES OF BLOOD CELLS

1. Red Blood Cells (Erythrocytes)



Helps in O₂ and CO₂ exchange

3. Platelets (Thrombocytes)



Helps in blood clotting

2. White Blood Cells (Leukocytes)



Neutrophil



Eosinophil



Basophil



Lymphocyte



Monocyte

Fights against infections

ScienceFacts.net

Significance of CAR-T Cell Therapy

- ✓ **More Effective:** CAR T cells are **more specific** and **directly activate the patient's immune system against cancer**. This is why they're called 'living drugs'.
- ✓ **Long-Term Remission:** It can produce **long-term remission**, even for those with **advanced or relapsed cancer**. This is because CAR T cells **remain** in the body for **long durations**.
- ✓ **Lesser Side-Effects:** CAR-T cells are engineered to **target cancer cells** that express a **particular antigen** specifically. This **precision** **minimises damage to healthy cells**.
- ✓ **Customised Treatment:** CAR-T cell therapy **can be customised for each patient**.
- ✓ **New Hope:** It has provided **hope for cancer patients** previously considered **incurable**.

Concerns With CAR-T Cell Therapy

- **Cytokine release syndrome (CRS):** CRS is an **inflammatory response** that can occur after CAR T cell therapy. In severe cases, CRS can lead to **organ failure** and death.
- **Neurotoxicity:** It is a range of **side effects** that can affect the nervous system. These side effects can range from mild (such as headache and confusion) to severe (such as seizures and coma).
- **Low blood cell counts:** It can lead to a **decrease in blood cell counts**, including red blood cells, white blood cells, and platelets
- **Infection Risk:** It **may weaken the immune system**, making the patients more susceptible.
- **Attack healthy tissues:** CAR-T cells **may mistakenly attack healthy tissues** and cancer cells.

Information

Do's

Avoid unnecessary information

Problem Content

- RIC It is a set of symbols on plastic products that **identify the plastic resin from which the product is made.**
- ~~It was developed in 1988 by the **Society of the Plastics Industry** (now the Plastics Industry Association) in the United States, but since 2008 it has been administered by the **American Society for Testing and Materials (ASTM) International**, an international standards organization.~~
- It facilitates in **efficient sorting and recycling of plastics**. Recycling according to RIC **preserves the value of the product.** (Generic statement)

Fixed Content

- RIC It is a set of symbols on plastic products that **identify the plastic resin from which the product is made.** It facilitates in **efficient sorting and recycling of plastics.**

Content Reduction without adversely affecting the essence of the information

Always avoid generic statements

Example 1

- **Problematic:** It facilitates in efficient **sorting and recycling of plastics.** ~~Recycling according to RIC preserves the value of the product.~~ (Generic statement)
- **Fixed:** It facilitates in efficient **sorting and recycling of plastics.**

Example 2

Problematic

- ❖ **Context (DTE):** **Paniya tribe** in the **Nilgiri Hills Biosphere** is making **life-size elephant statues from lantana** under a project by the **Real Elephant Collective (TREC)**, a non-profit social enterprise.
- ❖ Benefits of the project:
 - ✓ Provides the tribal population with steady employment.
 - ✓ Getting rid of **lantana** from forests in an ecologically-sensitive manner.
 - ✓ **Raising awareness about human-wildlife coexistence.** (Generic Statement)

Fixed

- ❖ **Context (DTE):** **Paniya tribe** in the **Nilgiri Hills Biosphere** is making **life-size elephant statues from lantana** under a project by the **Real Elephant Collective (TREC)**, a non-profit social enterprise.

- ❖ The project provides the tribal population with steady employment while eliminating **lantana** from forests in an ecologically-sensitive manner.

Presentation

Breakdown a large sentence into multiple points

Large sentence

- ❖ Around **70% of global plastic production** is concentrated in **six major polymer types** – referred to as **commodity plastics**. These include **Polyethylene terephthalate (PET)**, **High-density polyethylene (HDPE)**, **Polyvinyl chloride (PVC)**, **Low-density polyethylene (LDPE)**, **Polypropylene (PP)**, and **Polystyrene (PS)**. Each of these has different properties and can be identified by their **resin identification codes (RIC)** denoted by symbols found on plastic products.

Large sentence is broken down with appropriate numbering

- ❖ Around **70% of global plastic production** is concentrated in **six major polymer types** – referred to as **commodity plastics**. These include:
 1. **Polyethylene terephthalate (PET)**,
 2. **High-density polyethylene (HDPE)**,
 3. **Polyvinyl chloride (PVC)**,
 4. **Low-density polyethylene (LDPE)**,
 5. **Polypropylene (PP)**, and
 6. **Polystyrene (PS)**
- Each has different properties and can be identified by their **resin identification codes (RIC)** denoted by symbols found on plastic products.

Use appropriate headings structure

Example

- ❖ Threats from Lantana:
 - ✓ It **outcompetes native species**, leading to a reduction in biodiversity. If it infests pastures and farmlands, it suppresses the pastures (grasses) and crops.
 - ✓ It also affects the livestock by reducing pastures and by its toxicity (it is **poisonous for livestock**).

Threats from Lantana

- It **outcompetes native species**, leading to a reduction in biodiversity.
- If it infests pastures and farmlands, it suppresses the pastures (grasses) and crops.
- It also affects the livestock by reducing pastures and by its toxicity (it is **poisonous for livestock**).

Formatting

Bolden and Underline the aspect/parameter/topic/heading

- ❖ **Distribution and habitat:** It is an invasive species; once it is introduced into a habitat it spreads rapidly; between 45°N and 45°S and more than 1,400 m in altitude.
- ❖ **Distribution and habitat:** It is an invasive species; once it is introduced into a habitat it spreads rapidly; between 45°N and 45°S and more than 1,400 m in altitude.

Bullets for Positive Effects/Advantages

Benefits from Seagrass

- ✓ It enhances biodiversity.
- ✓ It has high productivity.
- ✓ It provides food for dugongs.

Bullets for Negatives Effects/Disadvantages

Threats from Lantana

- It **outcompetes native species**, leading to a reduction in biodiversity.
- If it infests pastures and farmlands, it suppresses the pastures (grasses) and crops.
- It also affects the livestock by reducing pastures and by its toxicity (it is **poisonous for livestock**).

Credits

- Source & Credit: [Ensuring the future of the tiger and other large mammals in the southern portion of the Nilgiri Biosphere Reserve, southern India \(researchgate.net\)](#)
- ✓ Source & Credit: [researchgate.net](#)

Numbering vs bullets

Use numbers when there is a sequence

- ❖ Around **70% of global plastic production** is concentrated in **six major polymer types** – referred to as **commodity plastics**. These include:
 1. **Polyethylene terephthalate (PET),**
 2. **High-density polyethylene (HDPE),**
 3. **Polyvinyl chloride (PVC),**
 4. **Low-density polyethylene (LDPE),**
 5. **Polypropylene (PP), and**
 6. **Polystyrene (PS)**

Use bullets when there is no sequence

- Conditions favouring the intensification of Cyclone Biparjay are:
 - ❖ An exceptionally **warm Arabian Sea** (resulting in strong low pressure)

- ❖ A **weak monsoon onset** (cyclones and monsoons influence each other; a strong monsoon onset will not allow a cyclone to form (because a **strong monsoon leads to high vertical wind shear**))
- ❖ **Favourable Madden Julian Oscillation (MJO) conditions in the Indian Ocean** (enhanced MJO phase is favourable for cyclogenesis)

Grammar

Using "first" vs. 1st (Apply Common Sense)

- Cyclone Biparjoy is the **1st** storm brewing in the **Arabian Sea** in **2023**. It is **2nd** strongest in the **Arabian Sea** after **Tauktae** (2021).
- **Fifty Sixth President** of the US.
- ✓ Cyclone Biparjoy is the **first** storm brewing in the **Arabian Sea** in **2023**. It is the **second** strongest in the **Arabian Sea** after **Tauktae** (2021).
- ✓ **56th** President of the US.

In case of dates, use "1st" instead of "first" (Apply Common Sense)

- **First** of July, December **First**
- ✓ **1st** of July, December **1st**