NOTICE WRITING

WHAT IS A NOTICE?

- Written or printed announcement (Example - a notice for sale)
- **To inform** a large number of people about something that has happened or is about to happen.
  - EXAMPLE: upcoming event, competition, lost and found notice or just a piece of information to be delivered to the targeted audience.
- Written in a **formal** tone (**third person**).
- Always enclosed in a **box**.
- Factual and **to-the-point**.
- **Simple and formal** language, not flowery.
- They are **put up on display boards** in schools or at public places.

FORMAT FOR NOTICE WRITING

- The **format of a notice** should include: NAME OF THE INSTITUTION / ISSUING AUTHORITY / NOTICE / TITLE, DATE, and WRITER'S NAME WITH DESIGNATION.
  - A notice should contain all the necessary details such as:
  - Name of the issuing agency (school, etc)
  - Date of issue/release of the notice
  - Title/Subject of the Event (what?)
  - BODY-Date/time/duration/Place/Venue (when and where?)
  - Authorized signatory: Name and signature (contact details)

Name of the issuing agency/authority

NOTICE

Date of issue/Release of the notice

Title/Subject of the Event

BODY
(Date/time/duration/Place/Venue)

Authorized signatory
(Name, Designation and signature)

MARK-BREAKUP

The breakup of 4 marks for **class 12 English writing skills - notice writing** as per CBSE guidelines is as follows:

Format	**01 mark**
Content	02 marks
Expression	O1 mark
Total	04 marks

TIPS

- Do not cross the word limit to avoid penalty of marks. The prescribed word limit is 50 words.
- Repetition of any information should be avoided.
- Always enclose the notice in a box. Make sure you draw the box with a pencil.
- Keep your notice short, crisp and to-the-point.
- Highlight the word “NOTICE” and “TITLE”. It can be either bold or underlined.
- The title should be captivating and eye-catching.
- Don’t make hypothetical information and facts. Make use of what’s given in the question.
- Make sure you do not mention your personal information.
- Make use of all the available information in the question.
- Your answer shall include answers to all the 5 W’s – What, Why, When, Where and Who.
- The purpose for which it is being written should be stated clearly.
- Focus on presentation and clarity.

EXAMPLE FOR NOTICE WRITING

Here is a question for notice writing. Students can take help of these solved questions and examples of notice writing format.

Question: You are Shivani/Shivam, the Head Girl/Boy of ABC school. Your school is soon going to publish the annual magazine next month. Write a notice for the notice board of your school inviting students to submit write-ups, sketch.

ANSWER

ABC SCHOOL

NOTICE

04th April 2020

ARTICLES FOR SCHOOL MAGAZINE

The school is going to publish its annual magazine next month. All those who wish to contribute articles, sketches etc can mail their entries to abcmagazine@gmail.com. The last date for submission of articles is April 30,2020. Original articles are to be submitted. For further information, contact your respective class teachers.

Shivani/Shivam
Head Girl/Head Boy

NOTICE WRITING TOPICS

- A Notice can be written for various reasons. The **format of notice** remains the same in all cases. Here is a list of **topics for notice writing** that students must prepare-
- A competition
- An excursion trip
- A lost and found notice
- An inauguration to take place
- An exhibition
- A blood donation camp to be held
- Or any such type of event or information to be issued in public interest.

HOMEWORK

1. Water supply will be suspended for eight hours (10 am to 6 pm) on 6th of March for cleaning of the water tank. Write a notice in about 50 words advising the residents to store water for a day. You are Karan Kumar/Karuna Bajaj, Secretary, Janata Group Housing Society, Palam Vihar, Kurnool.

1. While walking in a park in your neighbourhood you found a small plastic bag containing some documents and some cash. Write a notice in about 50 words to be put on the park notice board asking the owner to identify and collect it from you. You are Amar/Amrita 9399123456.

SOLID STATE CHEMISTRY

WHAT IS SOLID?

- Definite shape.
- Definite volume.
- Highly incompressible.
- Rigid.
- Constituent particles held closely by strong intermolecular forces.
- Fixed position of constituents.

TYPES OF SOLIDS

Two types (based upon atomic arrangement, binding energy, physical & chemical properties):

1. Crystalline
2. Amorphous

CRYSTALLINE SOLIDS

- The building constituents arrange themselves in regular manner throughout the entire three dimensional network.
- Existence of crystalline lattice.
- A crystalline lattice is a solid figure which has a definite geometrical shape, with flat faces and sharp edges.
- Incompressible orderly arranged units.
- Definite sharp melting point.
- Anisotropy.
- Definite geometry.
- Give x-ray diffraction bands.
- Examples: NaCl, CsCl, etc.

AMORPHOUS SOLIDS

- Derived from Greek word 'Omorphe' meaning shapeless.
- No regular but haphazard arrangement of atoms or molecules.
- Also considered as non-crystalline solids or super-cooled liquids.
- No sharp m.p.
- Isotropic.
- No definite geometrical shape.
- Do not give x-ray diffraction bands.
- Examples: glass, rubber, plastics.

TYPES OF CRYSTAL STRUCTURES

- Ionic crystals
- Covalent crystals
- Molecular crystals
- Metallic crystals

IONIC CRYSTALS

- Lattice points are occupied by positive and negative ions.
- Hard and brittle solids.
- High m.p. due to very strong electrostatic forces of attraction.
- Poor conductors of electricity in solid state but good in molten state.

COVALENT CRYSTALS

- Lattice points are occupied by neutral atoms.
- Atoms are held together by covalent bonds
- Hard solids.
- High m.p.
- Poor conductors of electricity.
- Two common examples: diamond & graphite.

MOLECULAR SOLIDS

- These are further divided into non polar molecular solids, polar molecular solids and hydrogen bonded molecular solids.
- Non polar molecular solids:-

These solids are soft and non-conductors of electricity. They have low melting points and are usually in liquid or gaseous state at room temperature and pressure . They are held by weak london or van der Waals forces.

- Polar molecular solids:

he molecules of substances like HCl, SO2, *etc.* are formed by polar covalent bonds. The molecules in such solids are held together by relatively stronger dipole-dipole interactions. These solids are soft and non-conductors of electricity. Their melting points are higher than those of non polar molecular solids yet most of these are gases or liquids under room temperature and pressure . Eg:-SO_2

- Hydrogen bonded molecular solids:

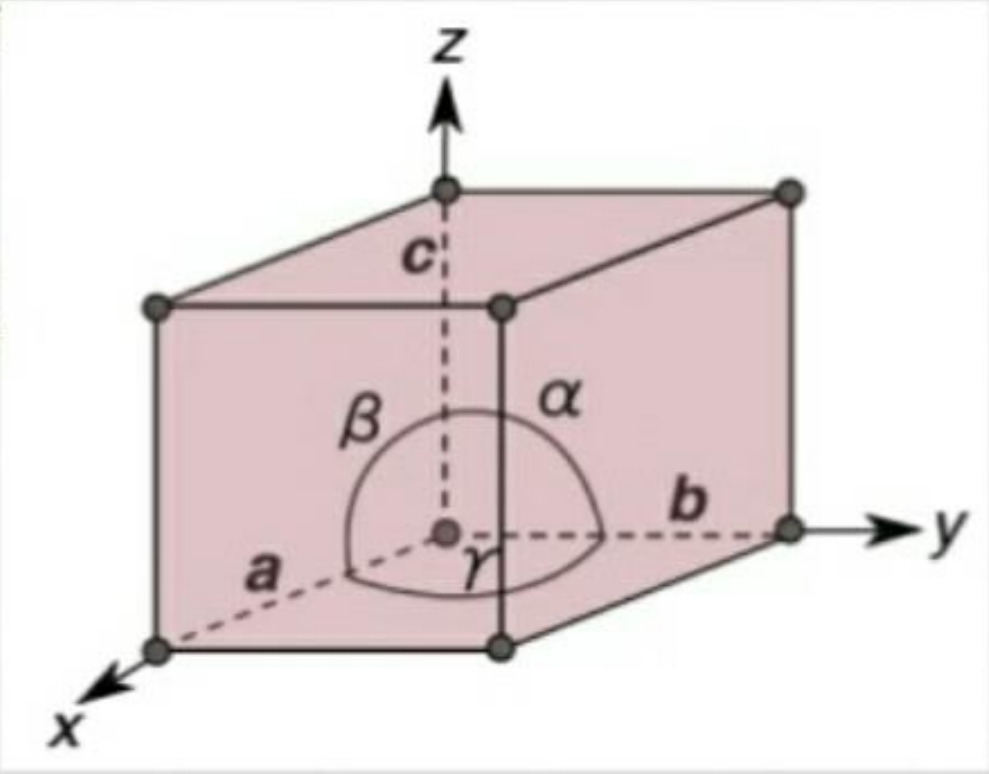
The molecules of such solids contain polar covalent bonds between H and F, O or N atoms. Strong hydrogen bonding binds molecules of such solids like H_2O (ice). They are non-conductors of electricity. Generally they are volatile liquids or soft solids under room temperature and pressure.

METALLIC CRYSTALS

- Lattice points are occupied by positive metal ions surrounded by a sea of mobile e^-.
- Soft to very hard.
- Metals have high tensile strength.
- Good conductors of electricity.
- Malleable and ductile.
- Bonding electrons in metals remain delocalized over the entire crystal.
- High density.

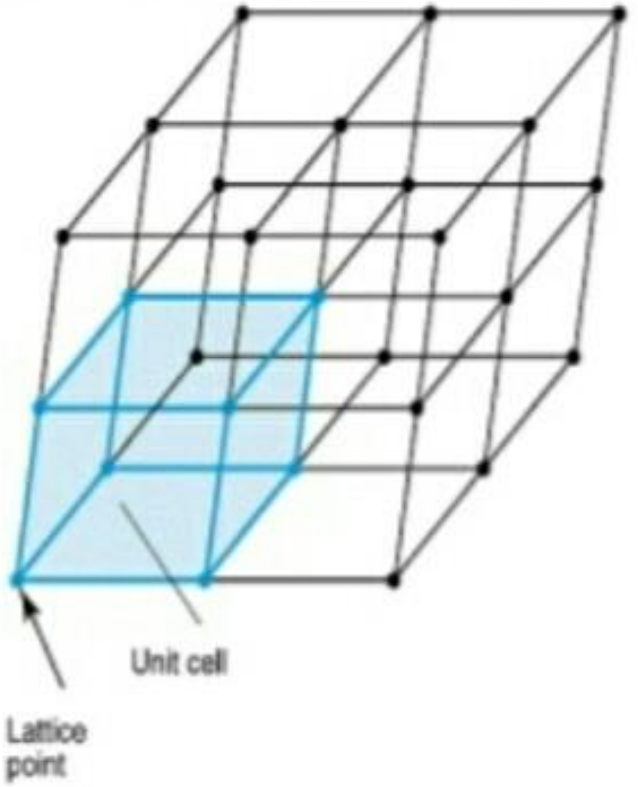
CRYSTAL LATTICES AND UNIT CELLS

- The main characteristic of crystalline solids is a regular and repeating patterr of constituent particles.
- If the three dimensional arrangement of constituent particles in a crystal is represented diagrammatically, in which each particle is depicted as a point, the arrangement is called *crystal lattice*. Thus, a regular three dimensional arrangement of points in space is called a **crystal lattice**.
- There are only 14 possible three dimensional lattices. These are called **Bravais Lattices.**



CHARACTERISTICS OF A UNIT LATTICE

- A unit cell is characterised by:
- (i) its dimensions along the three edges, *a*, *b* and *c*. These edges may or may not be mutually perpendicular.
- (ii) angles between the edges, α (between *b* and *c*) β (between
- *a* and *c*) and γ (between *a* and *b*). Thus, a unit cell is characterised by six parameters, a, b, c, α, β and γ.



CHARACTERISTICS OF A LATTICE

- (a)Each point in a lattice is called lattice point or lattice site.
- (b)Each point in a crystal lattice represents one constituent particle which may be an atom, a molecule (group of atoms) or an ion.
- (c) Lattice points are joined by straight lines to bring out the geometry of the lattice.

PRIMITIVE AND CENTERED UNIT CELLS

(a) Primitive Unit Cells

- When constituent particles are present only on the corner positions of a unit cell, it is called as **primitive unit cell**.

(b) Centered Unit Cells

- When a unit cell contains one or more constituent particles present at positions other than corners in addition to those at corners, it is called a **centered unit cell**.

TYPES OF CENTERED UNIT CELLS

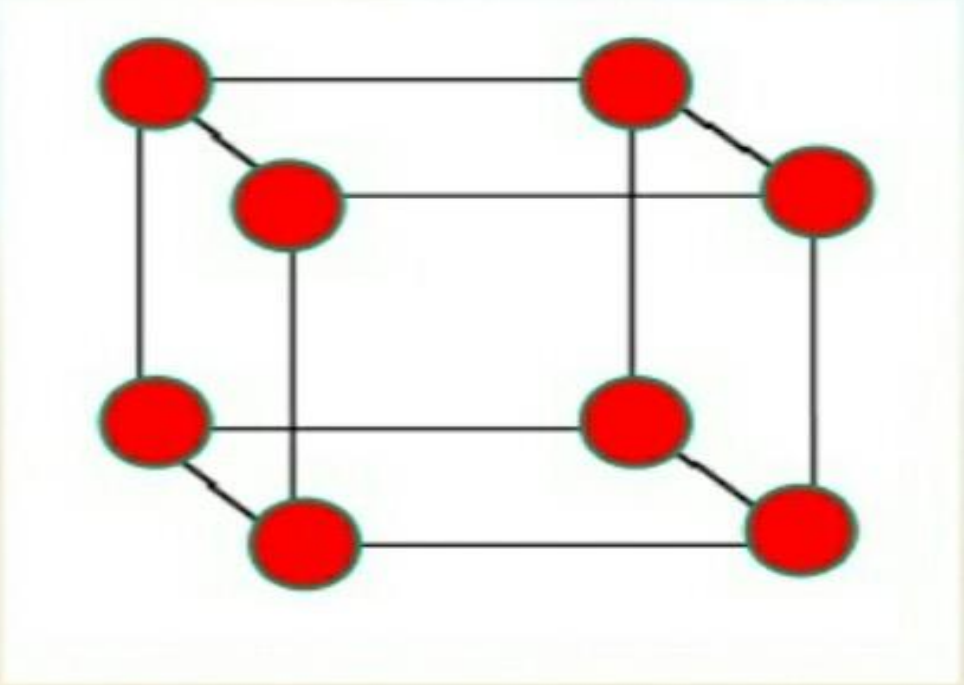
- **(i) *Body-Centred Unit Cells:*** Such a unit cell contains one constituent particle (atom, molecule or ion) at its body-centre besides the ones that are at its corners.
- **(ii) *Face-Centred Unit Cells:*** Such a unit cell contains one constituent particle present at the centre of each face, besides the ones that are at its corners.
- **(iii) *End-Centred Unit cells:*** In such a unit cell, one constituent particle is present at the centre of any two opposite faces besides the ones present at its corners.

TYPES OF CUBIC CRYSTALS

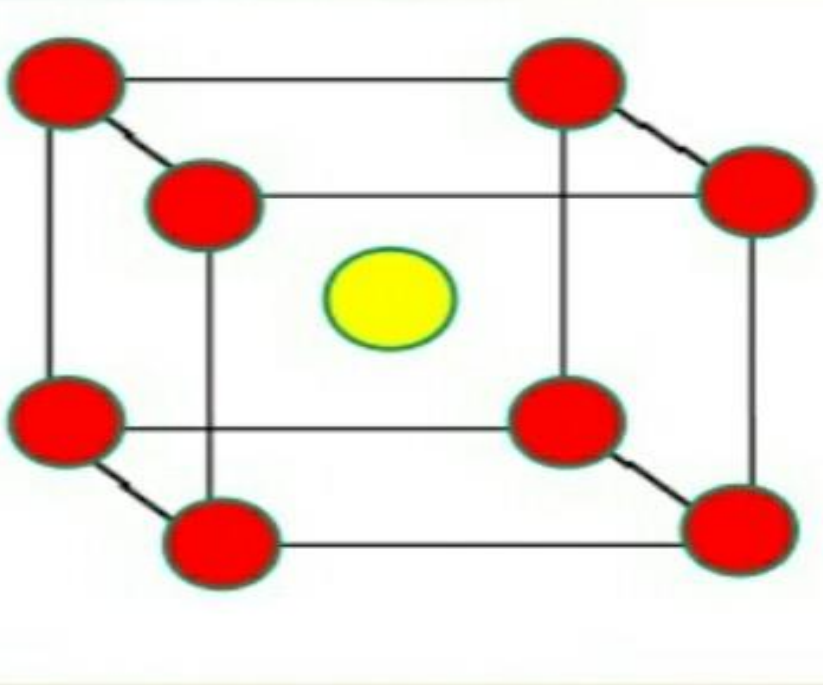
Four types:

1. Simple or primitive type
2. Body-centered
3. Face-centered
4. End face-centered

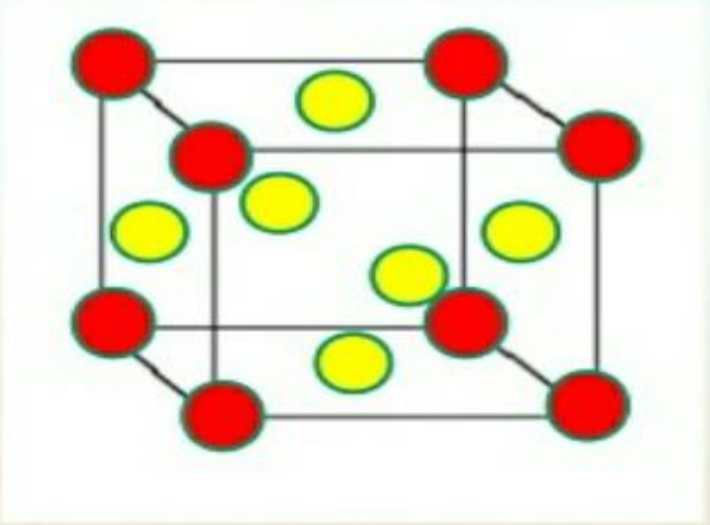
Simple or primitive type (sc)



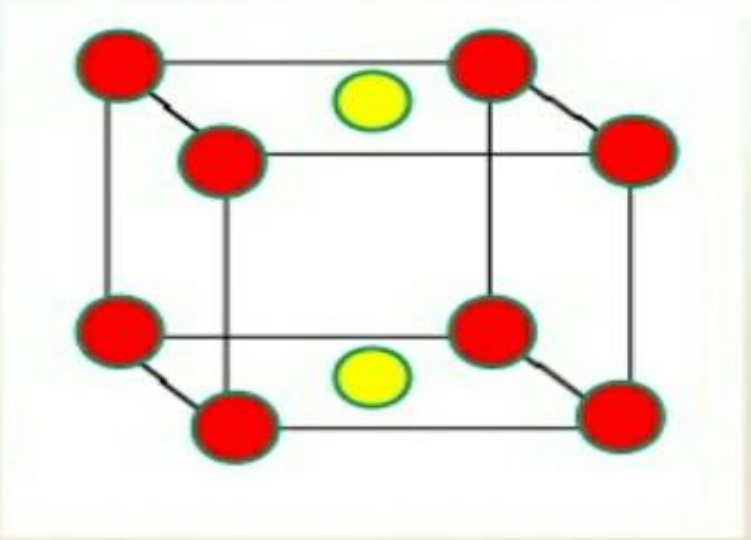
Body-centered cell (bcc)



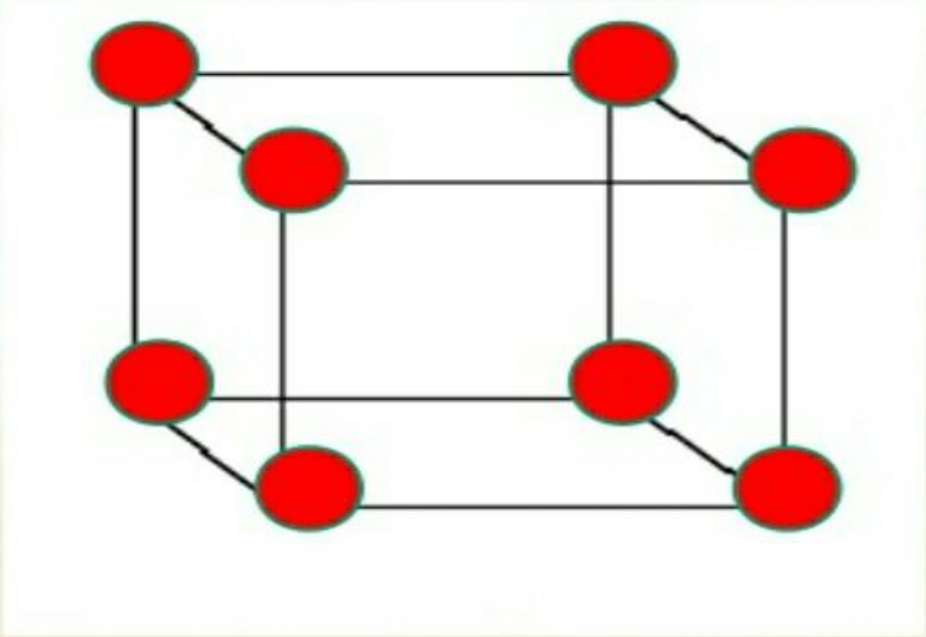
Face-centered cell (fcc)



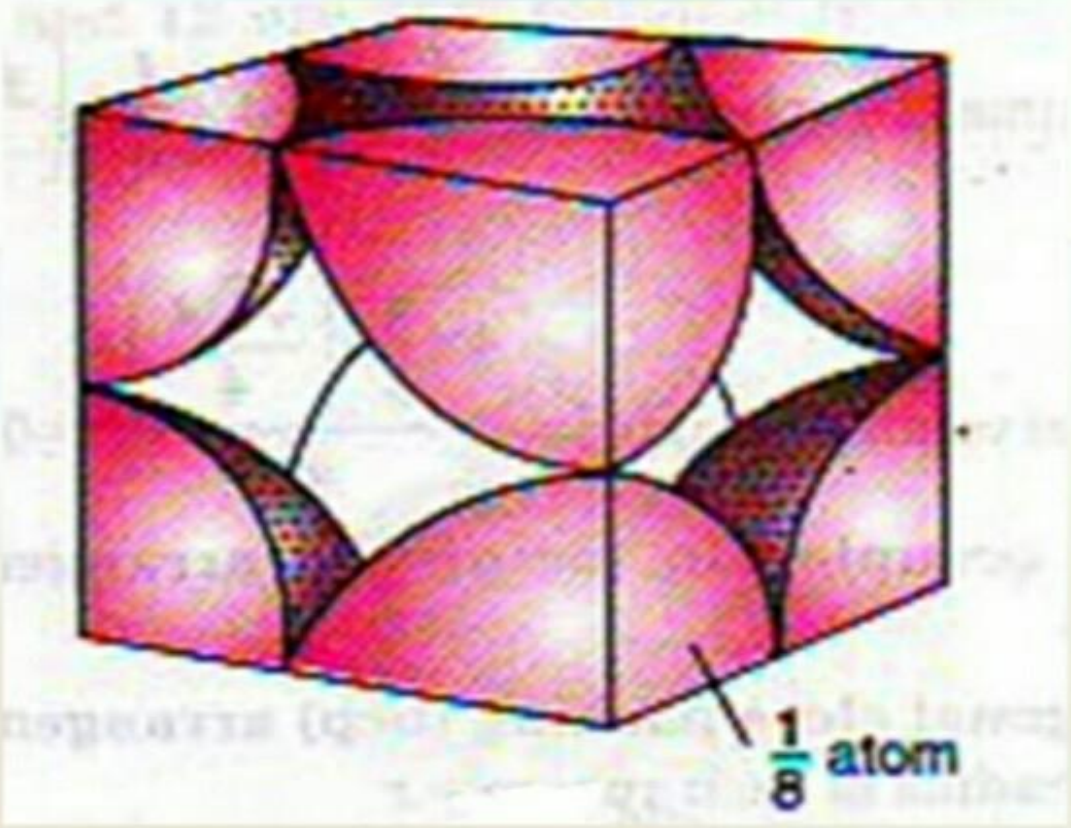
End face-centered cell



Simple cube

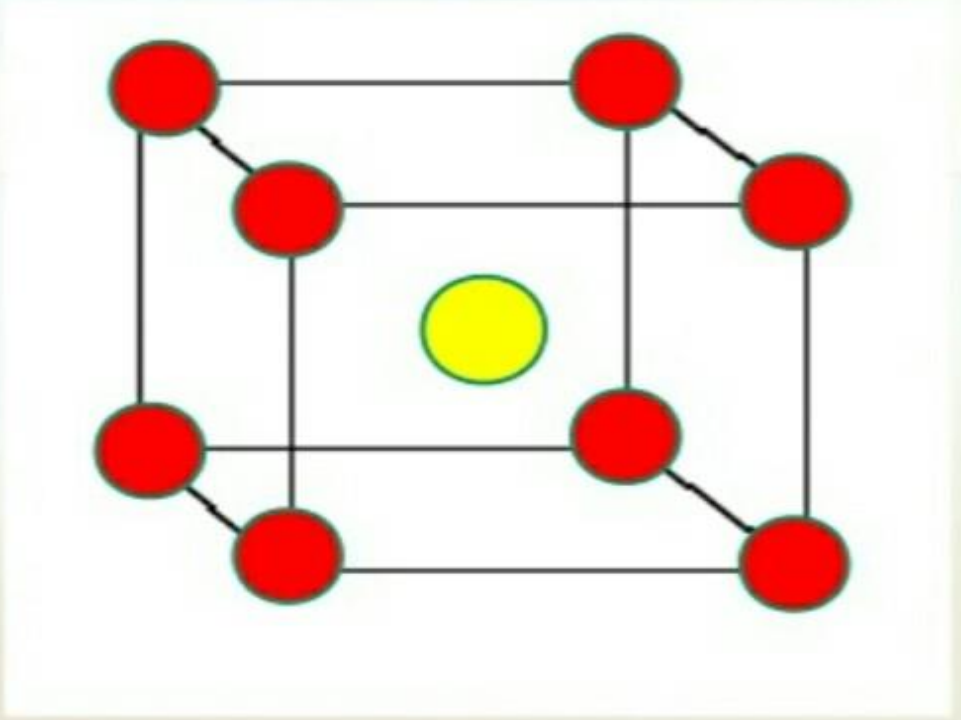


No of atoms per unit cell= 8 x 1/8 = 1



No of atoms per unit cell= 8 x 1/8 = 1

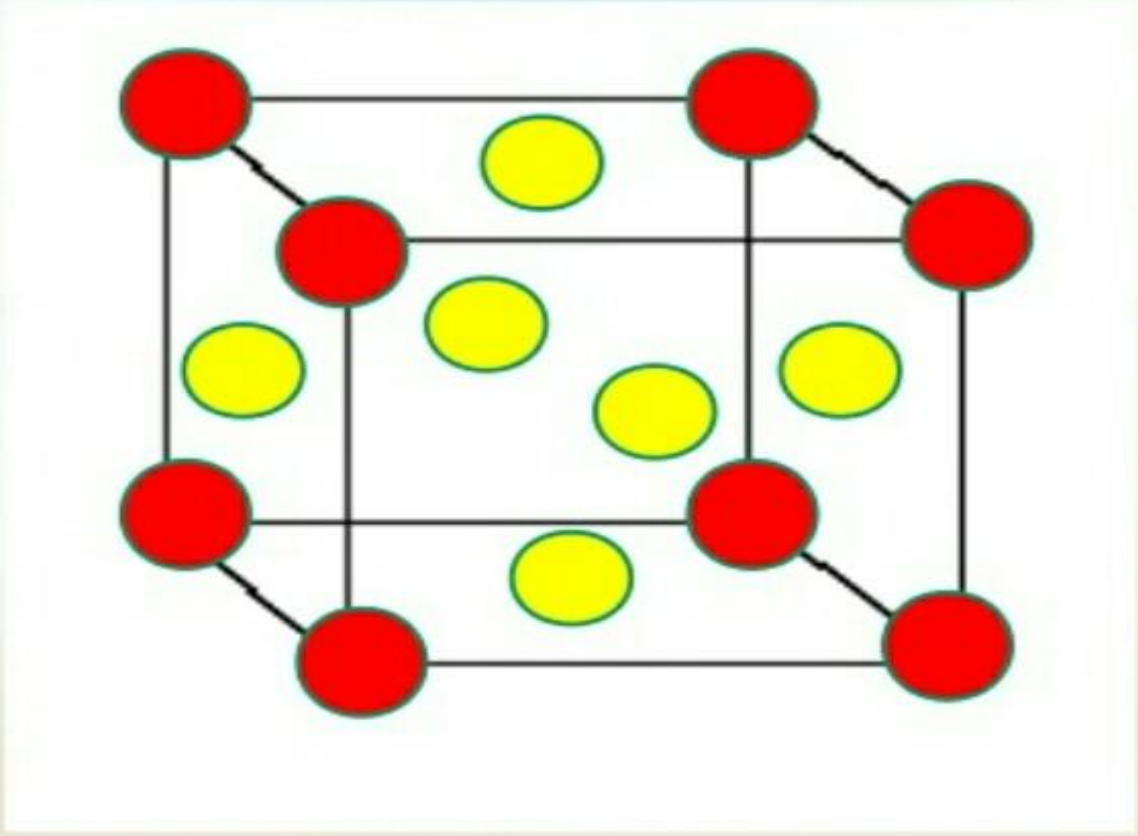
Body centered cubic lattice



No of atoms present per unit cell

$= (8 \times 1/8) + (1 \times 1) = 2$

Face-centered cubic lattice



No of atoms present per unit cell

$= (8 \times 1/8) + (6 \times 1/2) = 4$

ATOMIC RADIUS OF A CUBIC LATTICE

- Simple cubic cell:

$$r = a/2$$

- Face-centered cubic cell:

$$r = a/\sqrt{8}$$

- Body-centered cubic cell:

$$r = \sqrt{3}a/4$$

(where a $\rightarrow$ length of cube)

- Prepared by Padmavathy.K.V

Getting Started with Python

Python

- Developed by Guido Van Rossum
- High level language
- Object oriented programming language

Advantages of Python

- Easy to use
  - Object oriented programming language with simple syntax and programmer friendly
- Expressive language
  - Easily expressed and fewer lines of code
- Interpreted language
  - Python interprets and executes the code line by line
  - Easy to debug
- Cross platform language
  - Portable language
  - Runs on all types of platforms

Continued…

- Free and Open Source
  - Freely available and can be modified
- Variety of applications
  - Python is used in diverse fields like
    - Scripting
    - Web applications
    - Game development
    - GUI programs
    - Database applications

Disadvantages of Python

- Not a perfect programming language
  - Not the fastest language
    - Execution takes time compared to fully compiled languages
  - Lesser libraries
    - Libraries not competent with languages like C, Java etc.
  - Not strong on type binding
    - Does not have type mismatch issues
  - Not easily convertible
    - Difficult to translate a program to another programming language as Python does not have a structured defined syntax

Interpreter vs Compiler

Interpreter

- Converts a HLL to machine language
- Converts and executes a program line by line
- Reports error in a line if any and cannot continue until it is rectified
- Needs to be in memory every time a program is executed which leads to unnecessary use of memory
- Useful for error debugging

Compiler

- Converts a HLL to machine language
- Converts the entire HLL program in one go
- Reports all errors along with line numbers and once the errors are rectified program is recompiled
- Not required in memory once the object code of the program is available.

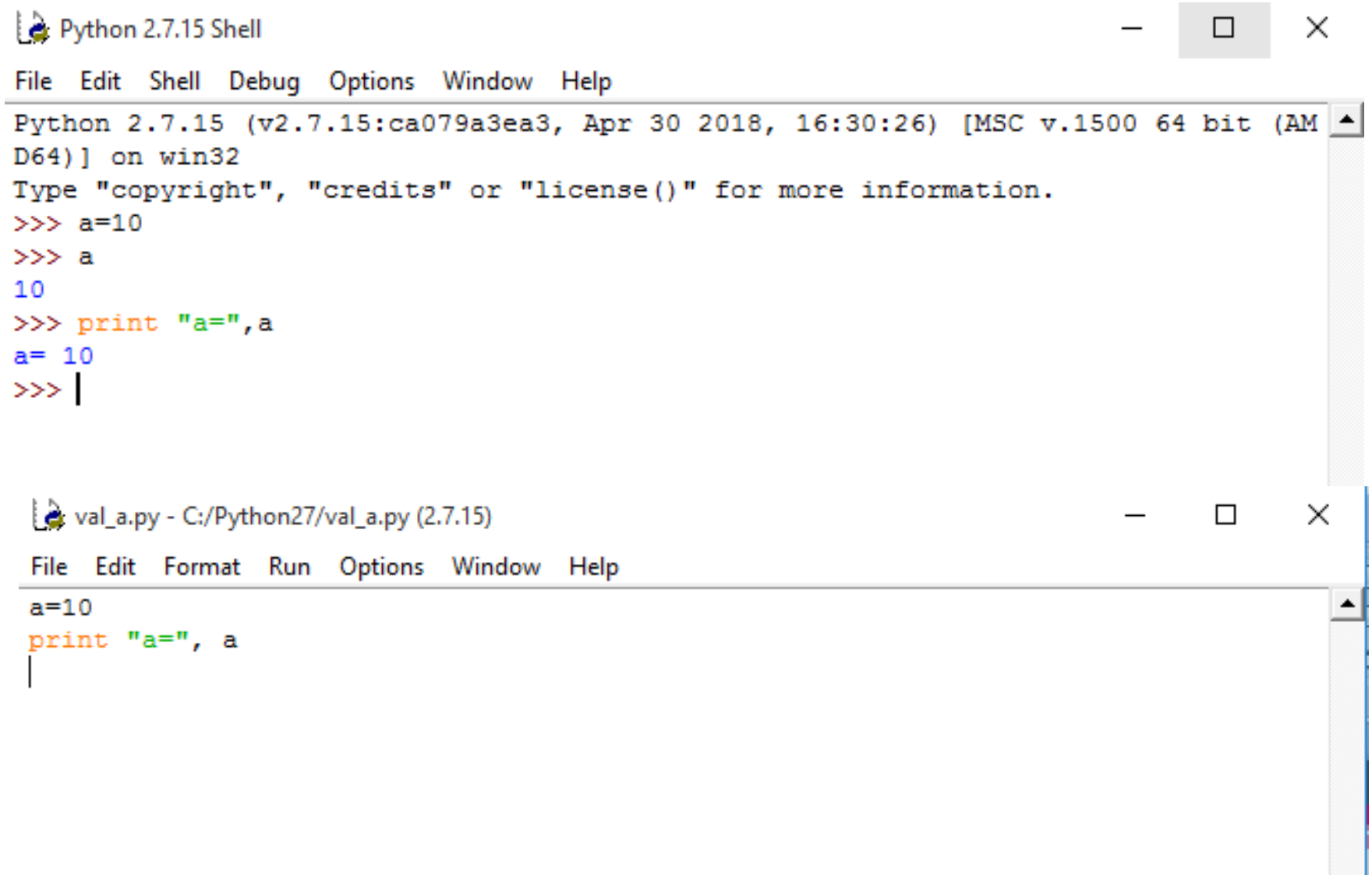
Interactive mode and script mode

Interactive mode

- Instructions are given in front of the Python prompt (>>>)in Python shell
- Python executes the given instruction and shows the result in the same window

Script mode

- Obtained from the new option in the File menu
- Instructions are stored in a file saved with a .py extension
- Instructions are executed together as a unit
- Saved instructions together are called Python script or python program


Python 2.7.15 Shell
File Edit Shell Debug Options Window Help
Python 2.7.15 (v2.7.15:ca079a3ea3, Apr 30 2018, 16:30:26) [MSC v.1500 64 bit (AM
D64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>> a=10
>>> a
10
>>> print "a=",a
a= 10
>>>
val_a.py - C:/Python27/val_a.py (2.7.15)
File Edit Format Run Options Window Help
a=10
print "a=", a

What will be the output of the following code?

```
#This is a sample program
#to output simple statements
#print “Such as”
print “Take every chance”
print “Drop every fear”
```

Identify the valid and invalid strings in Python:

- “Hello”
- ‘Hello”
- ‘He.llo’
- ‘Hello’
- ‘He_llo’
- “Hello’
- {Hello}

Tokens

- Smallest individual unit in a program is called a Token or Lexical Unit
- Tokens of Python
  - Keywords
  - Identifiers (Variables)
  - Literals
  - Operators
  - Punctuators

Identifiers

- Fundamental building blocks of a program
- General terminology for names given to different parts of a program like variables, objects, classes, functions, lists etc.

Literals

- Data items that have a fixed value
- Types of literals
  - String literals
  - Numeric literals
  - Boolean literals
  - Special literal None

String literals

- Sequence of characters enclosed by either single quotes or double quotes
- Escape sequences are used to represent nongraphic characters i.e., characters that cannot be typed directly from keyboard
- Escape sequences are represented by a backslash (\) followed by one or more characters

Escape Sequence	Use
\\	Back Slash
\’	Single quote
\”	Double quote
\b	Backspace
\n	New line character
\t	Horizontal tab
\v	Vertical tab

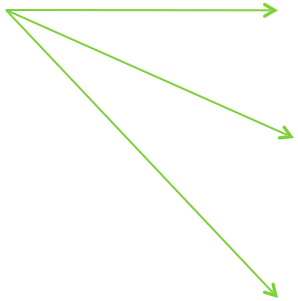
Types of Strings

- Single line strings – enclosed within ‘ ’ or “ ”
- Multiline strings
  - Spread across multiple lines as one single string
  - Add a backslash at the end of a line before pressing enter to continue typing text on the next line
  - Text1=‘hello \
    world’

Size of strings

- Size of string = count of characters in string
- ‘\\’
- ‘abc’
- “\ab”
- “Seema\’s pen”

Numeric literals



Integers or int

Real numbers or float

Complex numbers

Boolean Literals

- Represents one of the two Boolean values – TRUE or FALSE

Special Literal NONE

- None is used to indicate absence of a value
- Also indicates end of List in Python

REPRODUCTION IN ORGANISMS

(CHAPTER 1)

Rubina pasha

LIFE SPAN

ORGANISMS	LIFE SPAN
May fly	1 day
Butter fly	1-2 weeks
crow	15 years
crocodile	60 years
man	100years
parrot	140 years
tortoise	100-150 years
Wheat plant	6 months
Banyan tree	200 years

TYPES OF REPRODUCTION

ASEXUAL	SEXUAL
A single parent is involved.	Two parents (a male and a female)
No formation or fusion of gametes	Formation and fusion of gametes
Involves mitotic division	Involves meiosis
Individuals are genetically identical i.e. clone	Individuals show variation i.e. offspring

MODES OF ASEXUAL REPRODUCTION

- Fission- (a) binary (b) multiple
- Budding
- Spore formation
- Vegetative propagation

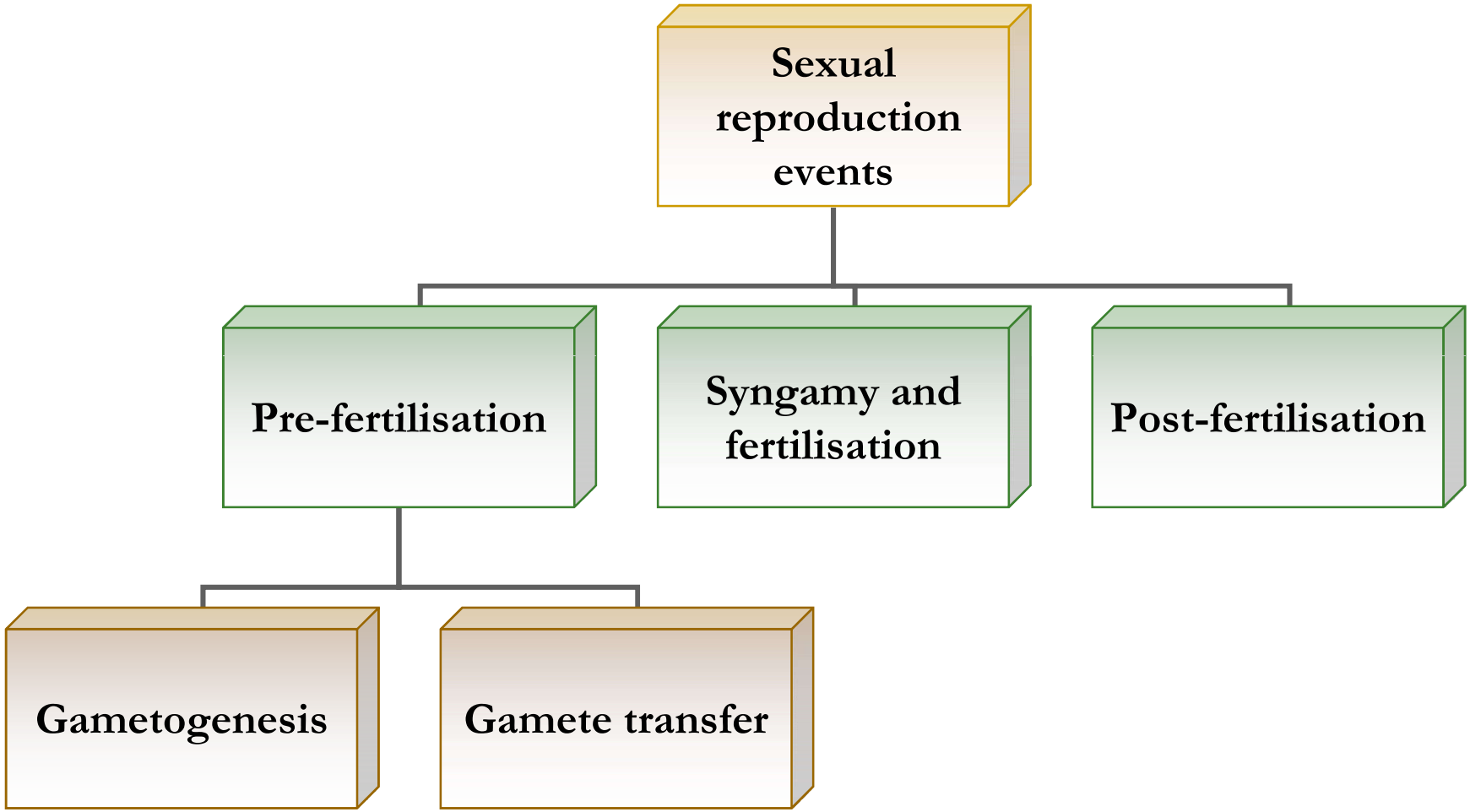
ASEXUAL REPRODUCTIVE STRUCTURES

- Motile microscopic zoospores *-(chlamydomonas)*
- Conidia *(penicillium)*
- Buds (hydra)
- Gemmules- (sponges)

VEGETATIVE PROPAGULES

- Runner- *oxalis*
- Sucker
- Tuber- potato
- Offset- *water hyacinth, pistia*
- Bulb- onion, garlic
- Rhizome- ginger
- Bulbil- agave
- Leaf buds- *Bryophyllum*

SEXUAL REPRODUCTION



PRE-FERTILISATION CHANGES

(a) gametogenesis

- It is the process of formation of haploid male and female gametes.
- Gametes may be **homogametes (isogametes)** or **heterogametes.**
- In heterogametes the male gamete is called **antherozoid or sperm** and the female gamete is called the **ovum.**

PRE-FERTILISATION CHANGES

(a) gametogenesis

- If the parent body is haploid gametes are formed by mitosis, if diploid gametes are formed by meiosis.
- An organism may be homothallic/monoecious or heterothallic/dioecious.

PRE –FERTILIZATION CHANGES

(b) gamete transfer

- Fusion of male and female gamete is called fertilisation.
- So male and female gamete must be brought together.
- In some organisms both gametes are motile (algae) but in most cases male gamete is motile where as female is not.
- Algae, bryophytes and pteredophytes, water is the medium for gamete transfer

PRE –FERTILIZATION CHANGES

(b) gamete transfer

- Pollination is the method of gamete transfer in higher plants as pollen grains contain male gametes.
- The number of male gametes are thousand times the number of female gametes as there is loss of male gametes during transfer.
- In dioecious animals there is special mechanism for gamete transfer.

SYNGAMY AND FERTILISATION

- It results in the formation of diploid zygote.
- In some animals like rotifers, honey bees, some lizards and birds (turkey) female gametes develop in to organism without fertilisation, such a phenomenon is called parthenogenesis.

POST-FERTILISATION EVENTS

- The events after zygote formation is called post-fertilisation events.
- Zygote development (i) type of life cycle of organism and (ii) the environment it is exposed to.
- In algae and fungi it develops a thick wall around it to resist desiccations and damage and undergoes a period of rest.

POST-FERTILISATION EVENTS

- Organisms showing haplontic life cycle, zygote undergoes meiosis. While organisms showing diplontic life-cycle undergoes mitosis.
- The zygote develops into an embryo.
- Embryogenesis involves (i) cell division (ii) cell enlargement or growth (iii) cell differentiation.
- In oviparous animals zygote development occurs outside of female's body, they are egg laying e.g. reptiles, birds.

POST-FERTILISATION EVENTS

- In viviparous animals zygote development occurs inside of female's body. They give birth to young individuals. E.g. mammals
- In plants zygote is formed inside ovule, where it develops into embryo, then ovule becomes seed and ovary into fruit.
- Germination of seeds produce new plants.

TYPES OF FERTILISATION

EXTERNAL FERTILISATION	INTERNAL FERTILISATION
Syngamy occurs outside of the body of organisms.	Syngamy occurs inside of the body of organisms.
Large number of gamets (male & female) are released into surrounding medium. E.g. bony fish, amphibians	Number of ova are less, but large number of male gametes are formed. E.g. birds, mammals, earthworm.

TYPES OF ANIMALS

OVIPAROUS	VIVIPAROUS
Animals lay fertilise or unfertilised eggs.	Give birth to young individuals.
Eggs have calcareous shell to protect from the harsh environment.	No shell, they are protected inside the mother's body.

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"People rarely succeed unless they have fun in what they are doing."

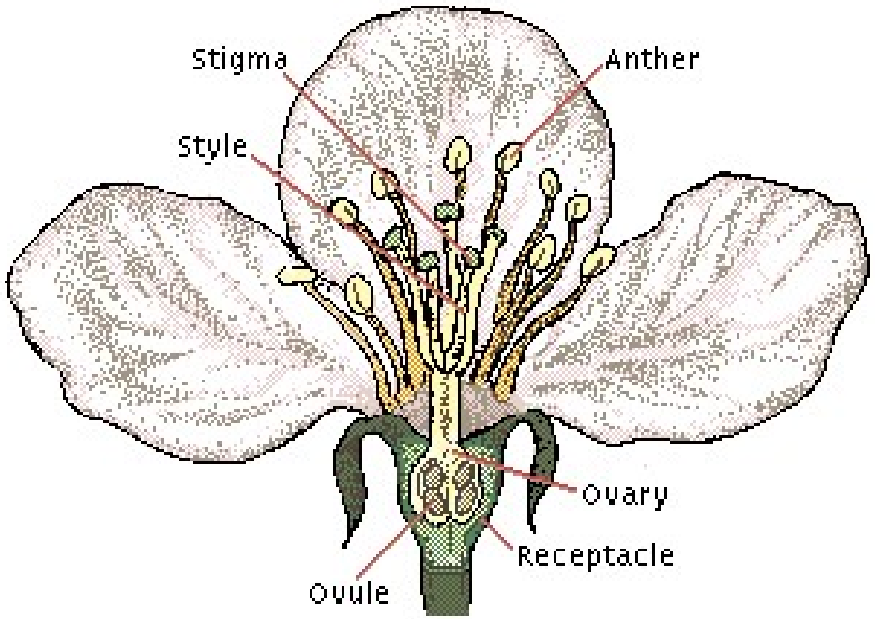
- Dale Carnegie

2. SEXUAL REPRODUCTION IN FLOWERING PLANTS

PREPARED BY

RUBINA PASHA

Parts Of Flower



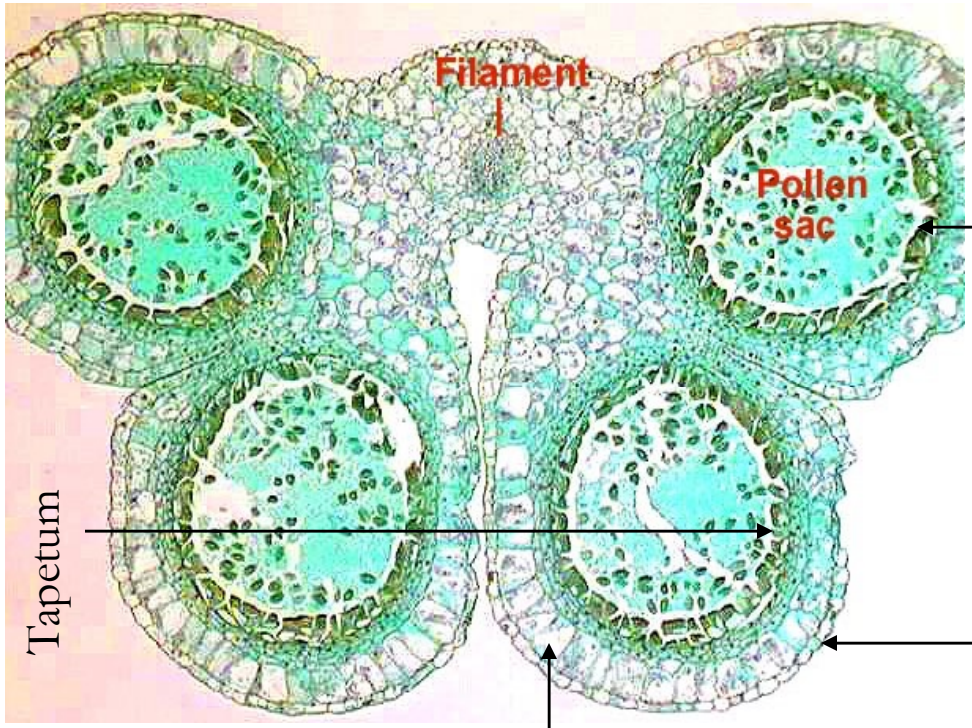
Flower

- Modified shoot
- Develops from floral primordia
- Primordia develop first into floral bud and then into a flower.
- Reproductive part of plant
- Androecium is male reproductive whorl, consists of stamens.
- Gynoecium is female reproductive part of flower, consists of carpel(S).

Stamen

- Male reproductive unit.
- Consists of two parts- **fillament** and **anther**
- Fillament is attached to thalamus or petal.

C S Of Anther


Filament
Pollen sac
Tapetum
Middle layer
Epidermis
Endothecium

Structure Of Anther (Microsporangium)

- Bilobed and dithecus.
- A longitudinal groove separate the theca.
- In a cross- section anther is a tetragonal structure, consisting of 4 microsporangia, two in each lobes.
- Later two microsporangia of each lobe fuse as a pollen sac.

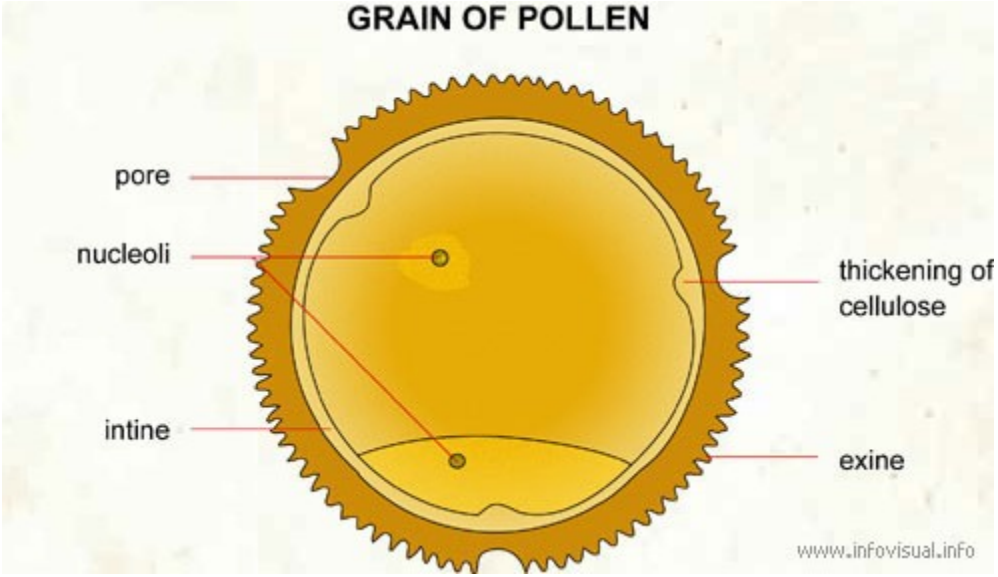
Structure Of Anther

- A microsporangium is circular and surrounded by 4 layers.
- These are epidermis, endothecium,middle layers tapetum.
- Outermost layers protect the pollen and help in dehiscence of anther to release pollen.

Structure Of Anther

- Tapetum nourishes the developing pollen grains.
- When the anther is young a group of compactly arranged homogenous cells called sporogenous tissue occupies the centre of each microsporangium.

Pollen grain



Microsporogenesis

- The process of formation of microspores from a pollen mother cell through meiosis is called microsporogenesis.
- The cells of sporogenous tissue undergo meiosis to form **microspore tetrad** arranged in a cluster of 4 cells..
- As each cell of sporogenous tissue has potential to form tetrad, so each cell is a microspore mother cell (PMC).
- On maturation and dehydration of anther, the spores dissociate and develop into pollen grains.
- Pollen grains release with the dehiscence of anther.

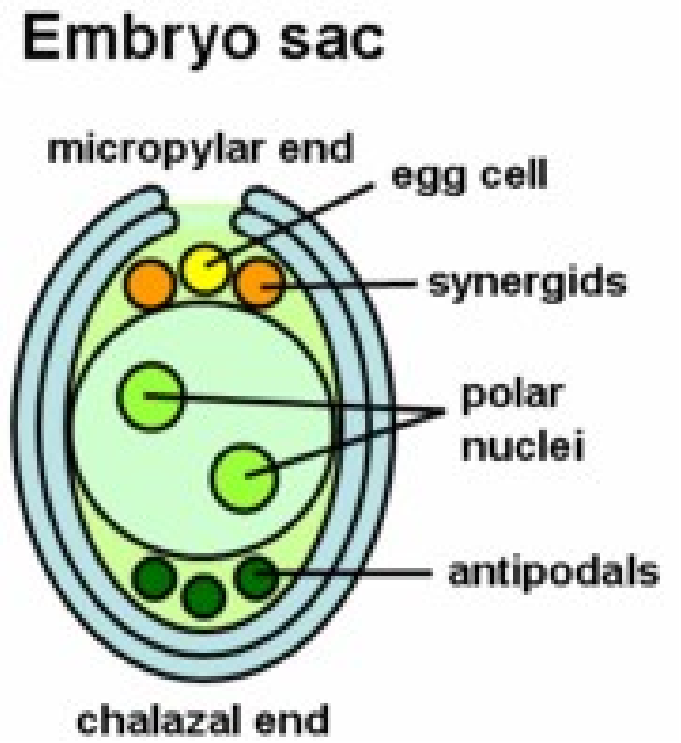
Pollen Grain (Male Gametophyte)

- Spherical in shape.
- Have two layered wall- outer hard **exine** layer and inner thin **intine.**
- **Exine-** made up of sporopolenin. Resistant to organic matter, withstand high temperature, acids, alkalis and enzymes. It has prominent apertures called **germ pores**, where sporopolenin is absent.
- **Intine**- It is thin, continuous layer, made of cellulose and pectin.

Pollen Grain (Male Gametophyte)

- Pollen grain cytoplasm is surrounded by plasma membrane.
- Mature pollen grain has 2 cells- (i) vegetative cell (ii) generative cell.
- Vegetative cell- bigger, abundant food reserve, large irregular nucleus.
- Generative cell- small, spindle shaped with dense cytoplasm and a nucleus, floats in vegetative cell cytoplasm.
- In 60% species pollen grains are shed in 2 celled stage where as 40% species shed in 3 celled stage in which generative cell divides mitotically into 2 male gametes.

Embryo Sac


Embryo sac
micropylar end
egg cell
synergids
polar
nuclei
antipodals
chalazal end

Female Reproductive Unit- Pistil

- Pistil- female reproductive part of flower.
- It may be mono or bi or tri or polycarpellary, syncarpous or apocarpous.
- Each pistil consists of ovary, style and stigma.
- The ovary has one or more cavities called **locules**.
- Placenta in locules bears ovules.
- Number of ovules may be one or more.

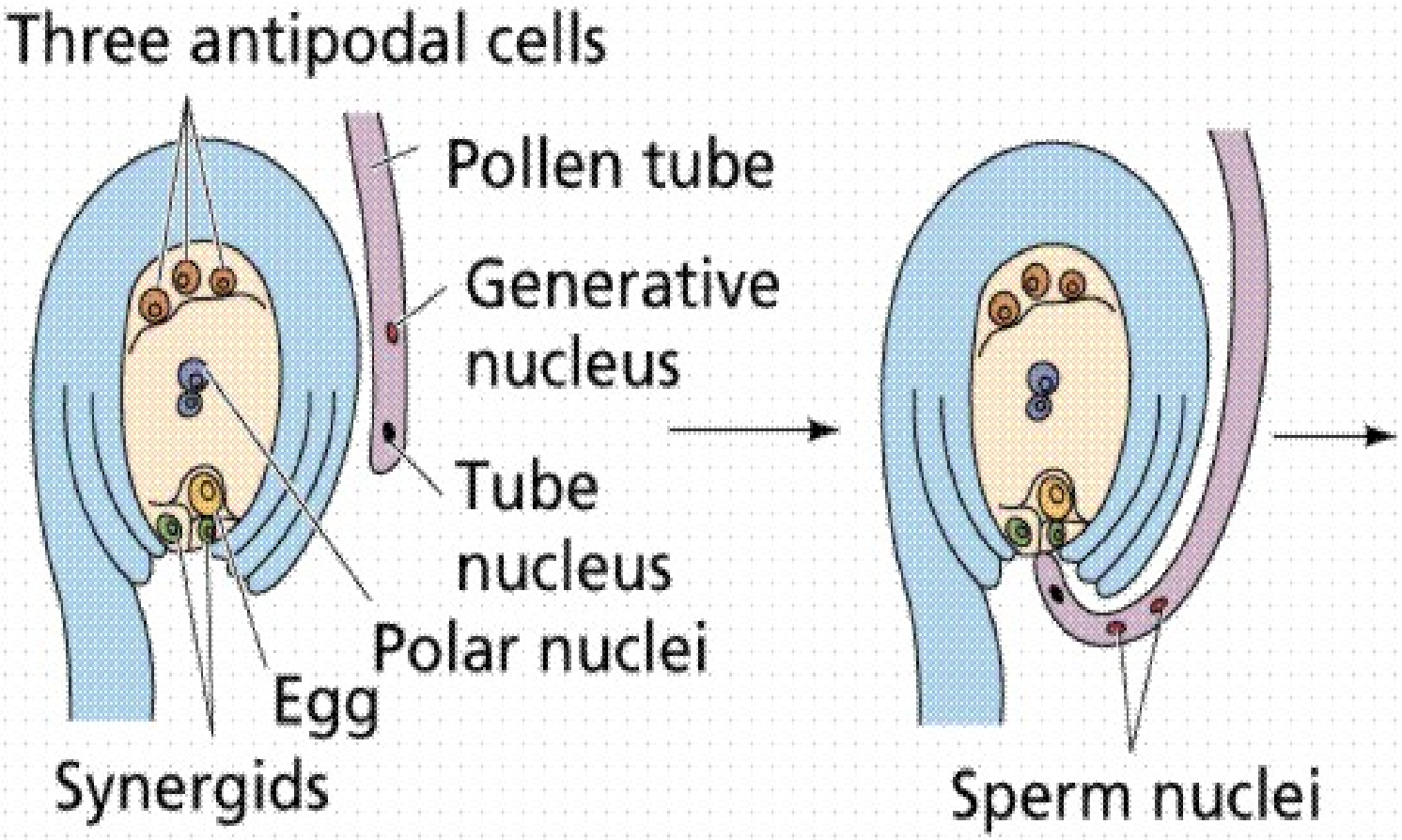
Ovule

- Arises as primordium on placenta.
- The short stalk which attach ovule with placenta is **funicle.**
- The primordium grows into a mass of cells forming **nucellus**, the body of ovule.
- The two protective covering of nucellus is **integuments**, except at the tip leaving a small opening called **Micropyle.**

Ovule

- Basal part of ovule is called **chalaza** that lie opposite to micropyle.
- Cells of nucellus are rich in reserve food.
- A single **embryo sac** or **female gametophyte** located in the nucellus, which is developed from megaspore.

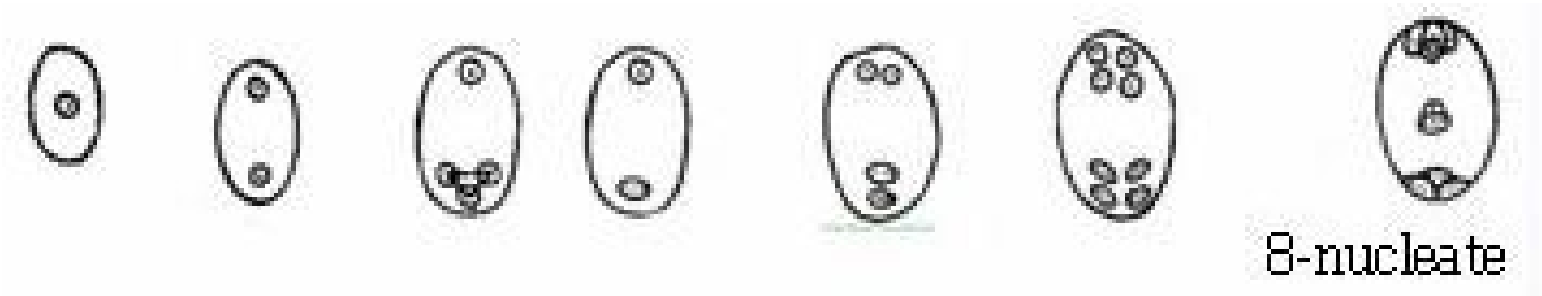
Female Gametophytes



Megasporogenesis And Development Of Female Gametophyte

- One of the nucellar cell in the micropylar region is differentiated into megaspore mother cell.
- The cell is larger, contains dense cytoplasm and a prominent nucleus.
- It undergoes meiosis forming 4 haploid cells called megaspore tetrad.
- 3 megaspores degenerate and only one megaspore become functional.

Development Of Female Gametophytes



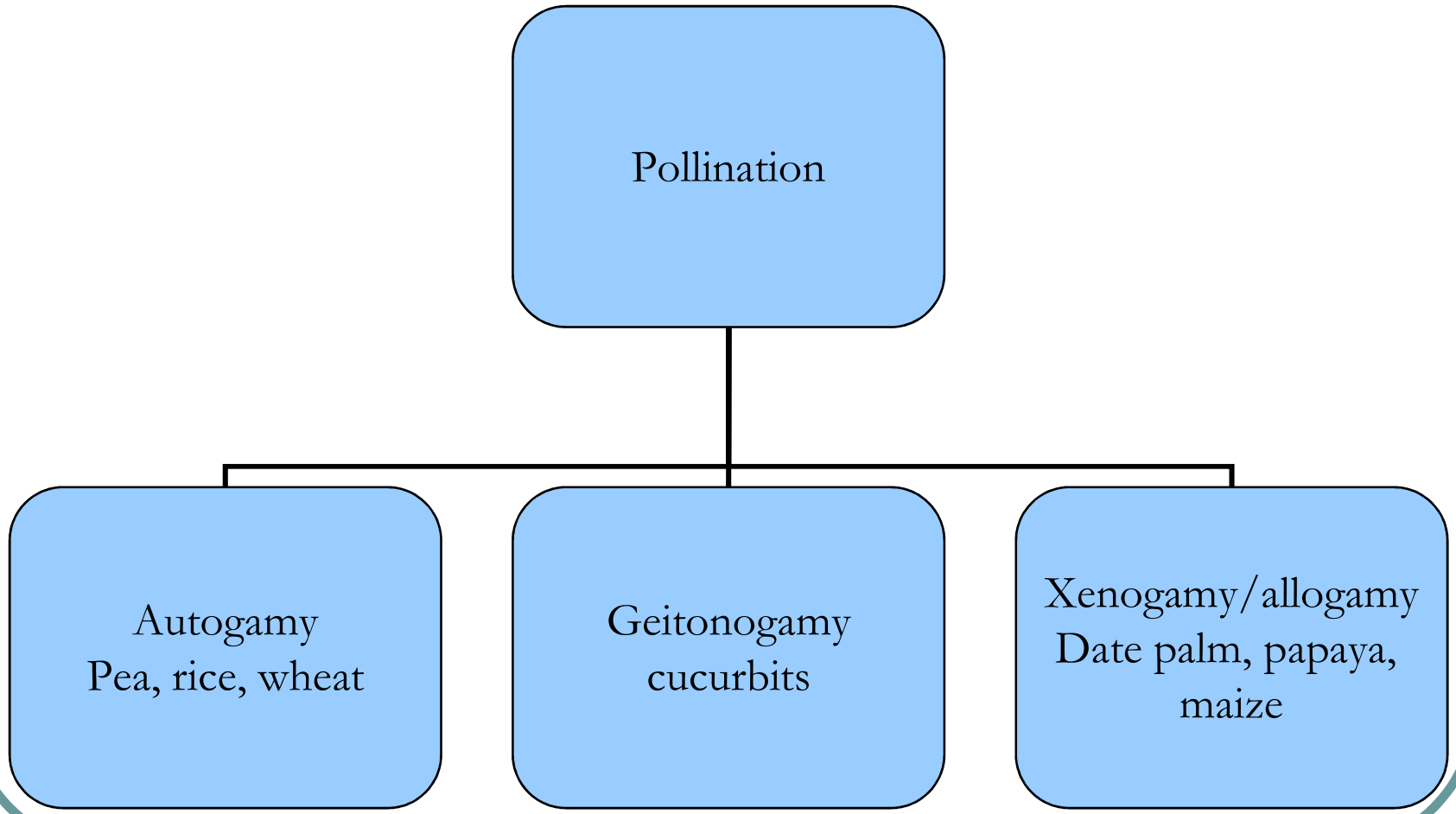
Megasporogenesis And Development Of Female Gametophyte

- Functional megaspore is the first cell of female gametophyte.
- Its nucleus undergoes mitosis and the two nuclei move to opposite poles and form 2 nucleate embryo sac.
- Two successive mitotic division in each of these 2 nuclei form an 8 nucleate embryo sac.

Megasporogenesis And Development Of Female Gametophyte

- Cell wall in 8 nucleate stage form a typical **female gametophyte.**
- 3 cells of micropylar end form **egg apparatus**, 2 **synergids** and a **female gamete or egg cell**.
- 3 cells of chalazal end are called **antipodal cells**.
- Two nuclei move to the centre, called **polar nuclei,** fuse to form diploid **central cell.**
- So embryo sac is **8 nucleate and 7 celled**.

Types Of Pollination



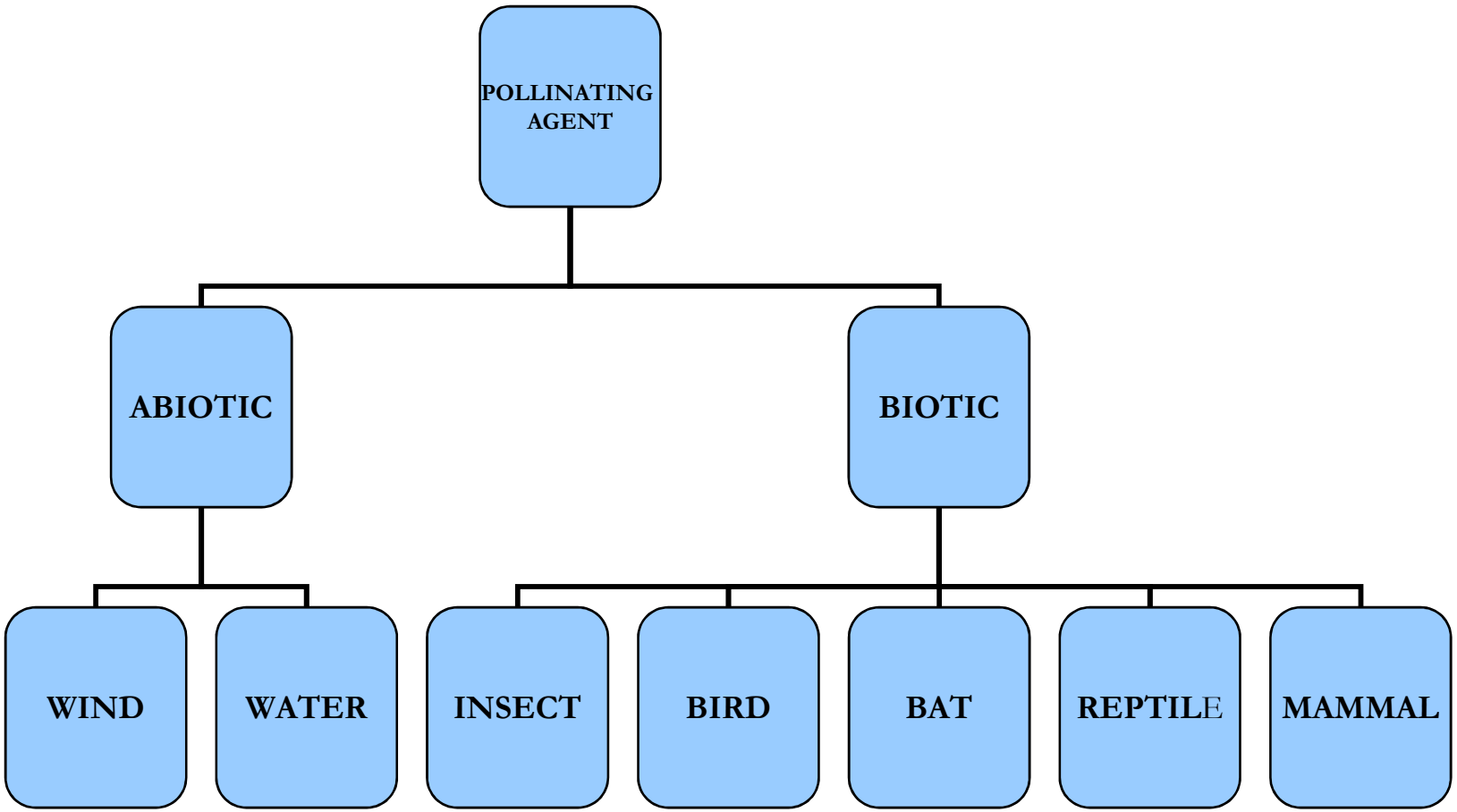
Devices For Autogamy

- Simultaneous maturation of anther and pistil.
- Anther and stigma lie close to each other.
- Cleistogamous flower (oxalis, commelina, viola)

Devices For Xenogamy

- Unisexual flower and dioecious plants.
- Pollen release and stigma receptivity are not synchronised.
- Different orientation of anther and stigma of flower.
- Self incompability.

Agents For Pollination



Adaptation Of Wind Pollinated Flowers

- Pollen grains are light, nonsticky/ dry, sometimes winged.
- Well exposed anther.
- Large feathery stigma.
- Flowers arranged as inflorescence.
- Single ovules.

Adaptation Of Water Pollinated Flowers

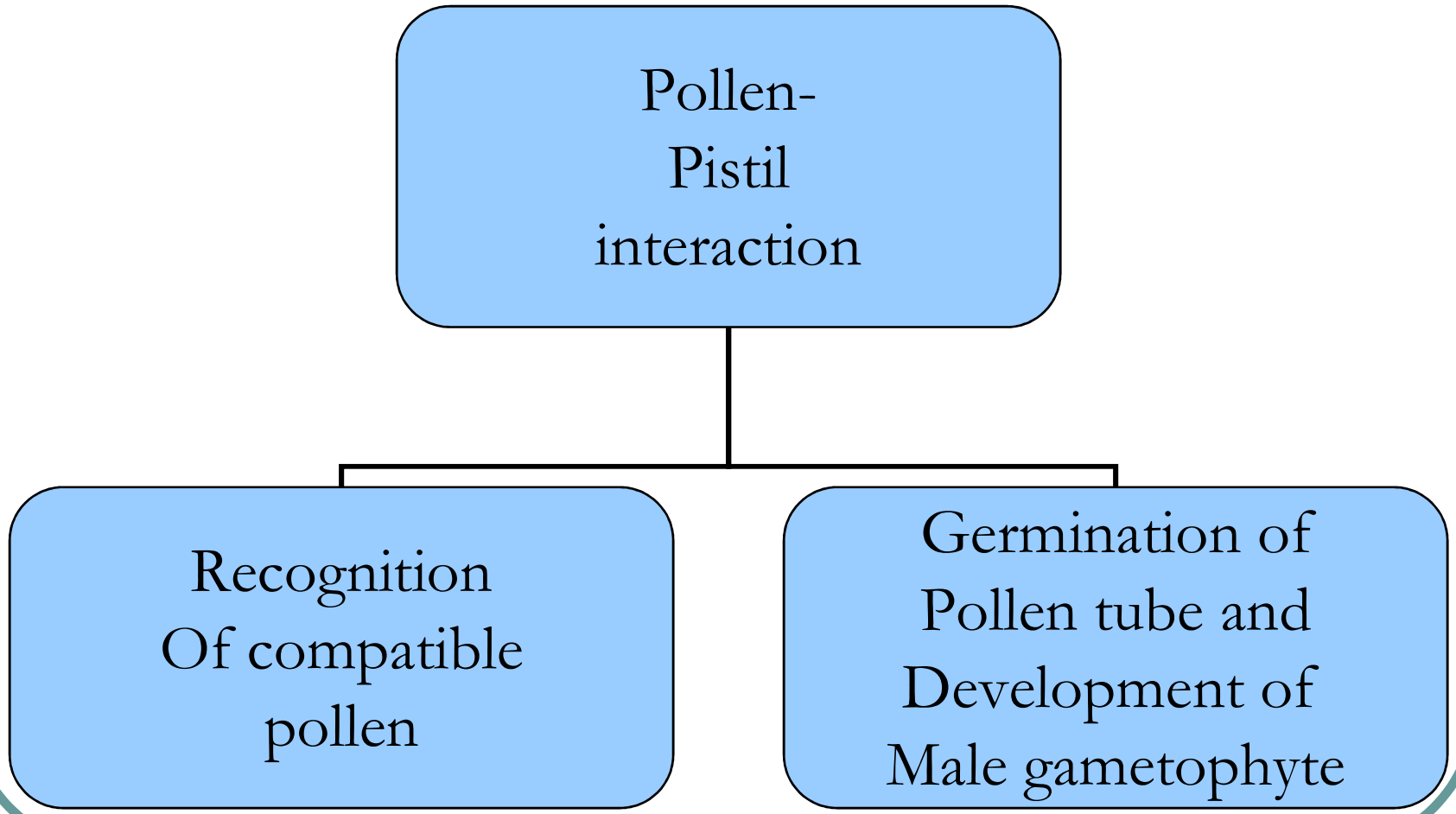
- Seen in submerged flowers like *Vallisneria* and *Hydrilla* and Zostera.
- In Vallisneria male flowers released on water surface and female flowers reaches the surface for pollination.
- In sea grasses, pollen grains are long ribbon like and carried passively to submerged female flowers.
- Mucilage coated pollen grains.

Adaptation In Insect Pollinated Flowers

- Large
- Brightly coloured and showy.
- If flowers are small, grouped into inflorescence.
- Highly fragrant
- Produce nectar
- Sticky pollen and stigmatic surface
- Provide rewards to animal pollinator such as nectar, food (pollen) or provide safe place for laying eggs.

Pollen Pistil Interaction

(The event from deposition of pollen on stigma till pollen tube enters ovule)



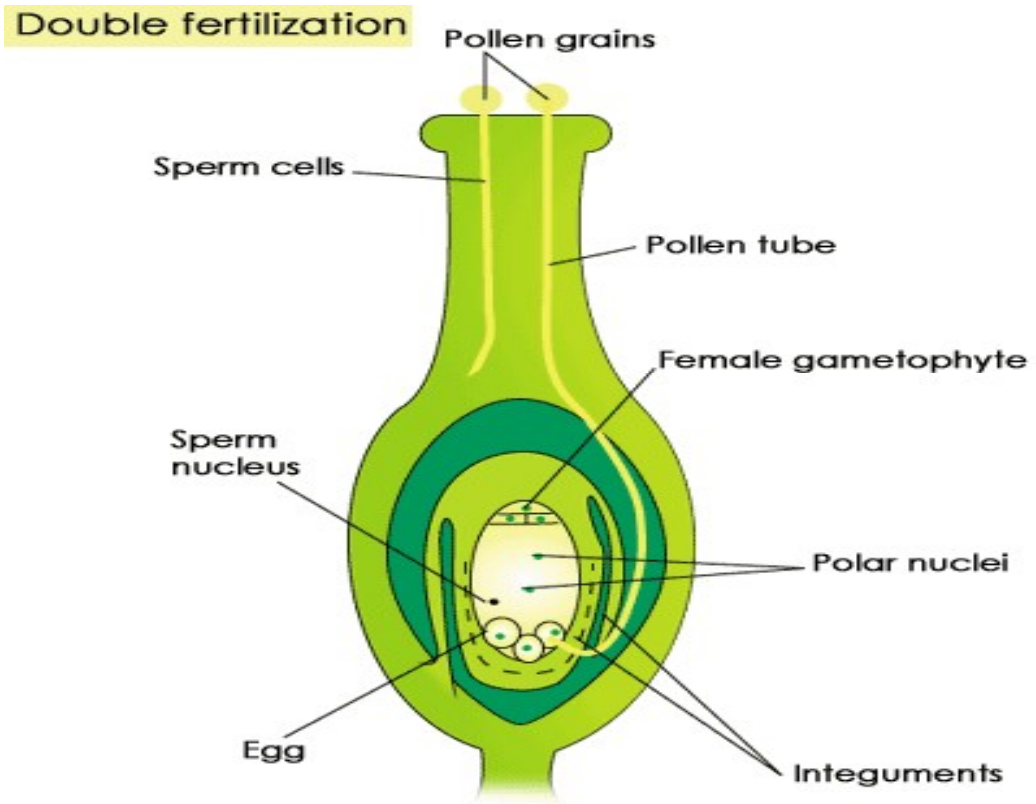
Pollen-pistil Interaction

- **Recognition of compatible pollen-**It is the interaction between chemical components of pollen and those of stigma.
- **Germination of pollen and development of male gametophyte-** (a) compatible pollen starts its germination, stimulated by certain secretion of stigma. (b) intine grows out through one of germ pore. (c) content of pollen moves into the tube i.e. vegetative and generative / 2 male gametes.

Pollen-pistil Interaction

- (d) pollen tube grows through the tissues of stigma and style by secreting enzymes to digest them and enters ovule through micropyle. (e) It enters the embryo sac through filliform apparatus of one synergids to liberate male gametes. (f) germinated pollen grain with pollen tube carrying vegetative nucleus and 2 male gametes is the fully developed female gametophyte.

Double Fertilisation



Double Fertilisation

- Release of 2 male gametes from pollen tube into cytoplasm of synergids.
- fusion of one male gamete with egg cell called **Syngamy** and form zygote(2n) which develops into embryo.
- Fusion of 2nd male gamete with polar nuclei of central cell to form PEN(3n).
- As syngamy and triple fusion occur in an embryo sac, the phenomenon is known as double fertilisation.
- Central cell with PEN is called PEC which develops into endosperm.

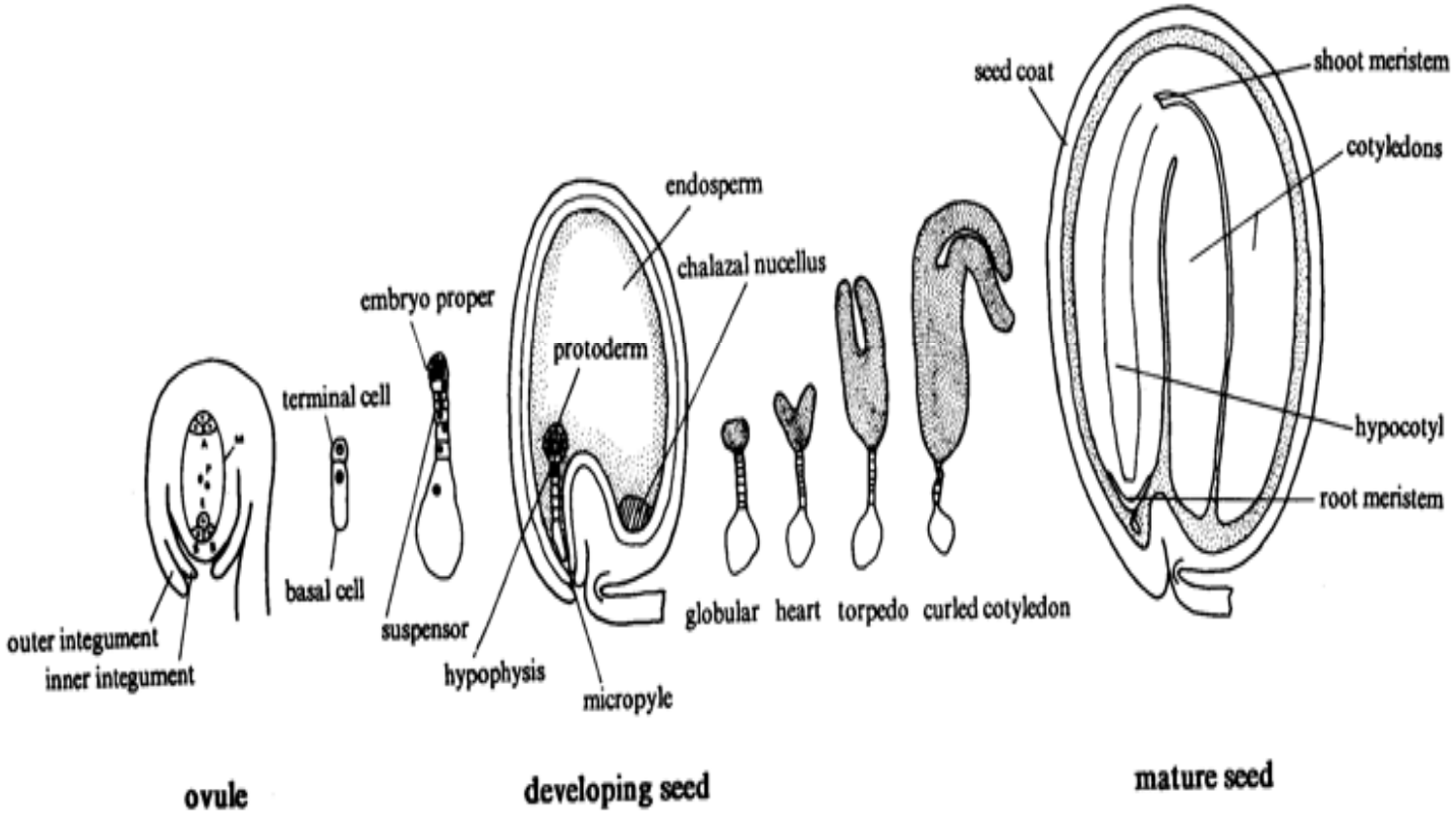
Post Fertilisation Events

- Development of endosperm
- Development of embryo
- Maturation of ovule into seed
- Maturation of ovary into fruit.

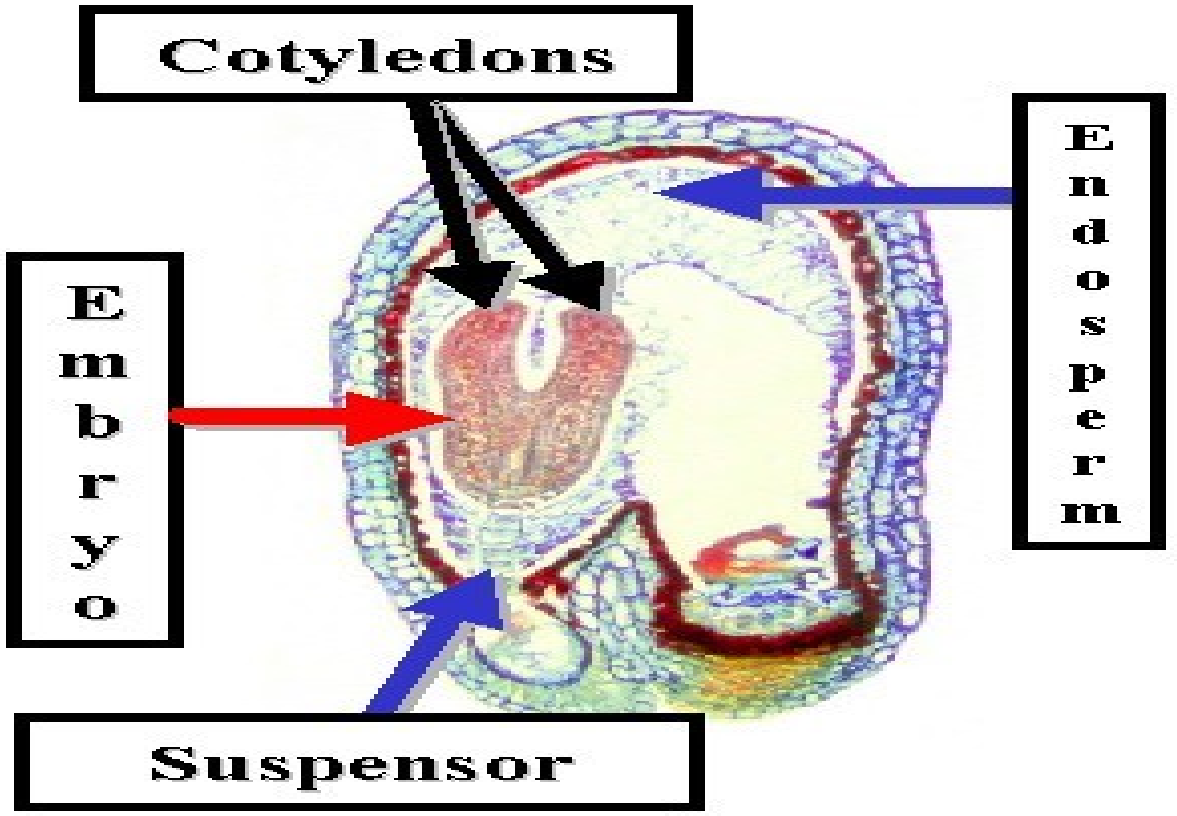
Endosperm

- Its development precedes embryo development.
- There are 3 methods of endosperm development- nuclear, cellular, helobial.
- In nuclear type PEN divides mitotically without cytokinesis and endosperm is free nuclear, then cell wall formation starts from periphery and endosperm become cellular.
- It provides food to developing embryo.
- If endosperm is completely utilised by embryo, seed is non-albuminous, if present ,seed is albuminous.

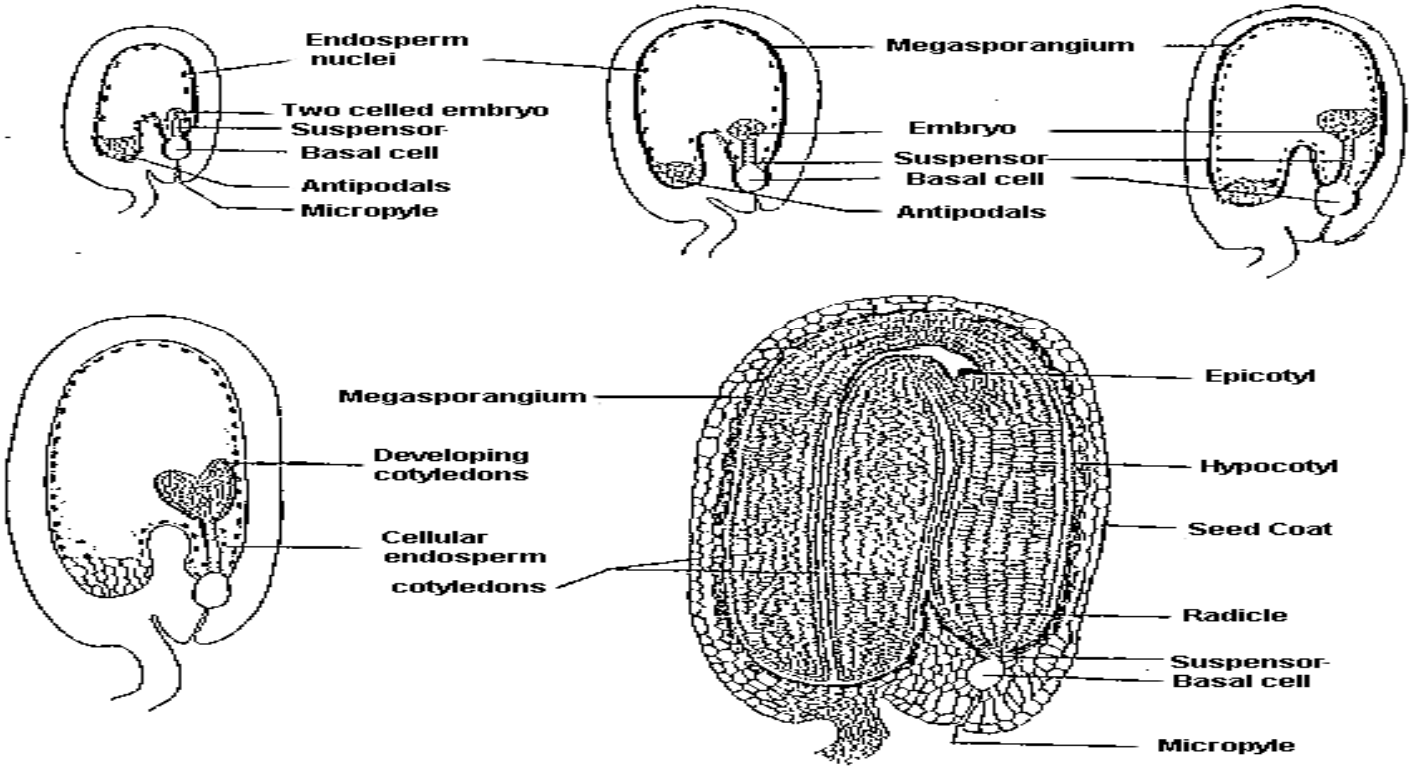
Embryo Development



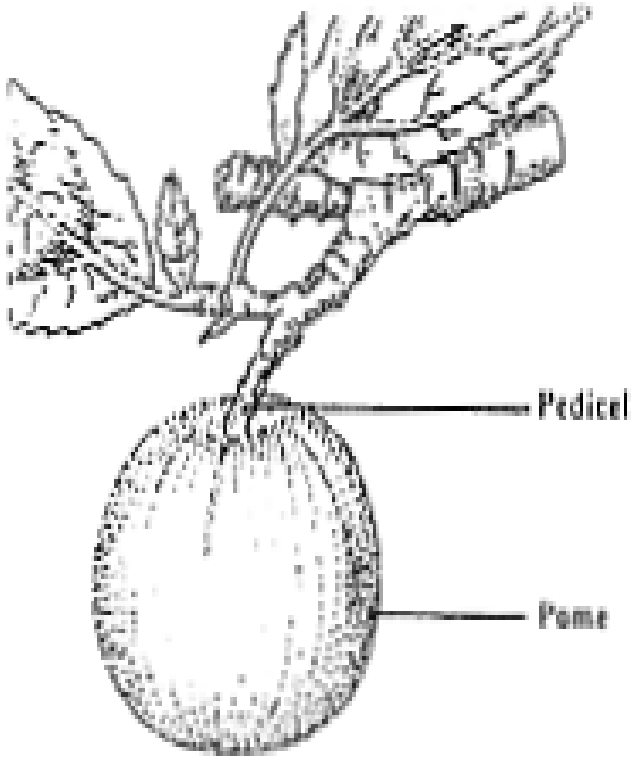
Dicot Embryo



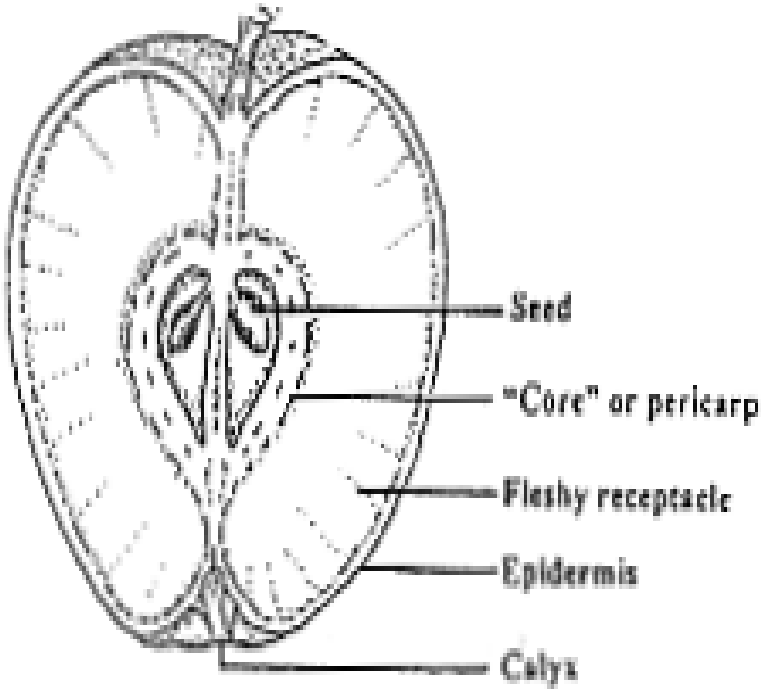
Seed Development



False Fruits (Apple)



Pome of Apple



Section of Apple

Embryo

- It starts after certain embryo formation.
- Zygote divides mitotically and form proembryo.
- Then it develops into globular and heart shaped embryo and then horse shoe shaped mature embryo with one or two cotyledon.

Special Reproduction (Apomixis / Agamospory)

- Seeds are formed without fertilisation.
- It may develop if a diploid egg cell develops into embryo without fertilisation.
- If cells of nucellus may develop into embryo and pushed into the embryo.

Special Reproduction (Polyembryony)

- If more than one egg may form in embryo sac.
- If more than one embryo sac formed in an ovule.
- Other cells like synergids or nucellus develop into embryo.
- E.g. orange, lemon, mango, onion, groundnut etc.

"You are the average of the five people you spend the most time with."

- Jim Rohn

Relations and Functions For Class 12 Concepts

The topics and subtopics covered in relations and Functions for class 12 are:

- Introduction
- Types of relations
- Types of Functions
- Composition of functions and invertible functions

Let us discuss the concept of relation and function in detail

Relation

The concept of relation is used in relating two objects or quantities with each other. If two sets are considered, the relation between them will be established if there is a connection between the elements of two or more non-empty sets.

Types of Relations

A relation in set A is a subset of A **×** A. Thus, A **×** A is two extreme relations.

Empty Relation

If no element of A is related to any element of A, i.e. R = φ ⊂ A **×A,** then the relation in a set is called empty relation.

Universal Relation

If each element of A is related to every element of A, i.e. R = A **×** A, then the relation is said to be universal relation.

A relation R in a set A is called-

Reflexive- if $(a,a) \in R$, for every $a \in A$.

Symmetric- if $(a_1,a_2) \in R$ implies that $(a_2,a_1) \in R$, for all $a_1,a_2 \in A$.

Transitive- if $(a_1,a_2) \in R$ and $(a_2,a_3) \in R$ implies that $(a_1,a_3) \in R$ for all $a_1,a_2,a_3 \in A$.

Equivalence Relation- A relation in a set A is equivalence relation if R is reflexive, symmetric and transitive.

Functions

A function is a relationship which explains that there should be only one output for each input. It is a special kind of relation(a set of ordered pairs) which obeys a rule i.e every X-value should be connected to only one y-value.

Types of Functions

1. **One to one Function:** A function $f : X \rightarrow Y$ is defined to be one-one (or injective), if the images of distinct elements of X under f are distinct, i.e., for every $x_1, x_2 \in X$, $f(x_1) = f(x_2)$ implies $x_1 = x_2$. Otherwise, f is called many-one.
2. **Onto Function:** A function $f : X \rightarrow Y$ is said to be onto (or surjective), if every element of Y is the image of some element of X under f, i.e., for every $y \in Y$, there exists an element x in X such that $f(x) = y$.
3. **One-one Function:** A function $f : X \rightarrow Y$ is said to be one-one and onto (or bijective), if f is both one-one and onto.

Composition of Functions and Invertible Function

Let $f : A \rightarrow B$ and $g : B \rightarrow C$ be two functions. Then the composition of f and g, denoted by **gof**, is defined as the function $gof : A \rightarrow C$ given by;

$gof(x) = g(f(x)), \forall x \in A$

Example

Example 5 Show that the relation R in the set **Z** of integers given by

$$R = \{(a, b) : 2 \text{ divides } a - b\}$$

is an equivalence relation.

Solution R is reflexive, as 2 divides $(a - a)$ for all $a \in \mathbf{Z}$. Further, if $(a, b) \in R$, then 2 divides $a - b$. Therefore, 2 divides $b - a$. Hence, $(b, a) \in R$, which shows that R is symmetric. Similarly, if $(a, b) \in R$ and $(b, c) \in R$, then $a - b$ and $b - c$ are divisible by 2. Now, $a - c = (a - b) + (b - c)$ is even (Why?). So, $(a - c)$ is divisible by 2. This shows that R is transitive. Thus, R is an equivalence relation in **Z**.

Exercise 1.1

1. Determine whether each of the following relations are reflexive, symmetric and transitive:

(i) Relation R in the set A = {1, 2, 3,……., 13, 14} defined as R = {(x, y) : 3x – y = 0}

(ii) Relation R in the set N of natural numbers defined as R = {(x, y) : y = x + 5 and x < 4}

(iii) Relation R in the set A = {1, 2, 3, 4, 5, 6} as R = {(x, y) : y is divisible by x}

(iv) Relation R in the set Z of all integers defined as R = {(x, y) : x – y is an integer}

(v) Relation R in the set A of human beings in a town at a particular time given by

(a) R = {(x, y) : x and y work at the same place}

(b) R = {(x, y) : x and y live in the same locality}

(c) R = {(x, y) : x is exactly 7 cm taller than y}

(d) R = {(x, y) : x is wife of y}

(e) R = {(x, y) : x is father of y}

Solution:

(i)R = {(x, y) : 3x - y = 0} A = {1, 2, 3, 4, 5, 6, ……13, 14} Therefore, R = {(1, 3), (2, 6), (3, 9), (4, 12)} …(1) As per reflexive property: (x, x) ∈ R, then R is reflexive) Since there is no such pair, so R is not reflexive. As per symmetric property: (x, y) ∈ R and (y, x) ∈ R, then R is symmetric.

Since there is no such pair, R is not symmetric As per transitive property: If (x, y) ∈ R and (y, z) ∈ R, then (x, z) ∈ R. Thus R is transitive. From (1), (1, 3) ∈ R and (3, 9) ∈ R but (1, 9) ∉ R, R is not transitive. Therefore, R is neither reflexive, nor symmetric and nor transitive

(ii) R = {(x, y) : y = x + 5 and x < 4} in set N of natural numbers.

Values of x are 1, 2, and 3 So, R = {(1, 6), (2, 7), (3, 8)} As per reflexive property: (x, x) ∈ R, then R is reflexive) Since there is not such pair, R is not reflexive.

As per symmetric property: (x, y) ∈ R and (y, x) ∈ R, then R is symmetric. Since there is no such pair, so R is not symmetric As per transitive property: If (x, y) ∈ R and (y, z) ∈ R, then (x, z) ∈ R. Thus R is transitive. Since there is no such pair, so R is not transitive. Therefore, R is neither reflexive, nor symmetric and nor transitive.

(iii) R = {(x, y) : y is divisible by x} in A = {1, 2, 3, 4, 5, 6} From above we have, R = {(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 2), (2, 4), (2, 6), (3, 3), (3, 6), (4, 4), (5, 5), (6, 6)}

As per reflexive property: (x, x) ∈ R, then R is reflexive. (1, 1), (2, 2), (3, 3), (4, 4), (5, 5) and (6, 6) ∈ R . Therefore, R is reflexive.

As per symmetric property: (x, y) ∈ R and (y, x) ∈ R, then R is symmetric. (1, 2) ∈ R but (2, 1) ∉ R. So R is not symmetric.

As per transitive property: If (x, y) ∈ R and (y, z) ∈ R, then (x, z) ∈ R. Thus R is transitive. Also (1, 4) ∈ R and (4, 4) ∈ R and (1, 4) ∈ R, So R is transitive. Therefore, R is reflexive and transitive but nor symmetric.

(iv) R = {(x, y) : x - y is an integer} in set Z of all integers. Now, (x, x), say (1, 1) = x – y = 1 – 1 = 0 ∈ Z => R is reflexive. (x, y) ∈ R and (y, x) ∈ R, i.e., x – y and y – x are integers => R is symmetric. (x, y) ∈ R and (y, z) ∈ R, then (x, z) ∈ R i.e., x – y and y – z and x - z are integers. (x, z) ∈ R => R is transitive Therefore, R is reflexive, symmetric and transitive.

(v)

(a) R = {(x, y) : x and y work at the same place} For reflexive: x and x can work at same place (x, x) ∈ R R is reflexive.

For symmetric: x and y work at same place so y and x also work at same place. (x, y) ∈ R and (y, x) ∈ R R is symmetric.

For transitive: x and y work at same place and y and z work at same place, then x and z also work at same place. (x, y) ∈ R and (y, z) ∈ R then (x, z) ∈ R R is transitive Therefore, R is reflexive, symmetric and transitive.

(b) R = {(x, y) : x and y live in the same locality} (x, x) ∈ R => R is reflexive. (x, y) ∈ R and (y, x) ∈ R => R is symmetric. Again, (x, y) ∈ R and (y, z) ∈ R then (x, z) ∈ R => R is transitive.

Therefore, R is reflexive, symmetric and transitive. NCERT Solutions for Class 12 Maths Chapter 1 Relations and Functions

(c) R = {(x, y) : x is exactly 7 cm taller than y} x can not be taller than x, so R is not reflexive. x is taller than y then y can not be taller than x, so R is not symmetric. Again, x is 7 cm taller than y and y is 7 cm taller than z, then x can not be 7 cm taller than z, so R is not transitive. Therefore, R is neither reflexive, nor symmetric and nor transitive.

(d) R = {(x, y) : x is wife of y} x is not wife of x, so R is not reflexive. x is wife of y but y is not wife of x, so R is not symmetric. Again, x is wife of y and y is wife of z then x can not be wife of z, so R is not transitive. Therefore, R is neither reflexive, nor symmetric and nor transitive.

(e) R = {(x, y) : x is father of y} x is not father of x, so R is not reflexive. x is father of y but y is not father of x, so R is not symmetric. Again, x is father of y and y is father of z then x cannot be father of z, so R is not transitive. Therefore, R is neither reflexive, nor symmetric and nor transitive.

2. Show that the relation R in the set R of real numbers, defined as R = {(a, b) : a ≤ b2 } is neither reflexive nor symmetric nor transitive.

Solution:

R = {(a, b) : a ≤ b2 } , Relation R is defined as the set of real numbers. (a, a) ∈ R then a ≤ a2 , which is false. R is not reflexive. (a, b)=(b, a) ∈ R then a ≤ b2 and b ≤ a2 , it is false statement. R is not symmetric. Now, a ≤ b2 and b ≤ c 2 ,then a ≤ c 2 , which is false. R is not transitive Therefore, R is neither reflexive, nor symmetric and nor transitive.

3. Check whether the relation R defined in the set {1, 2, 3, 4, 5, 6} as R = {(a, b) : b = a + 1} is reflexive, symmetric or transitive.

Solution:

R = {(a, b) : b = a + 1} R = {(1, 2), (2, 3), (3, 4), (4, 5), (5, 6)} When b = a, a = a + 1: which is false, So R is not reflexive. If (a, b) = (b,a), then b = a+1 and a =b+1: Which is false, so R is not symmetric. Now, if (a, b), (b,c) and (a, c) belongs to R then b = a+1 and c =b+1 which implies c = a + 2: Which is false, so R is not transitive. Therefore, R is neither reflexive, nor symmetric and nor transitive.

4. Show that the relation R in R defined as R = {(a, b) : a ≤ b}, is reflexive and transitive but not symmetric.
   Solution:
   a ≤ a: which is true, (a, a) ∈ R, So R is reflexive. a ≤ b but b ≤ a (false): (a, b) ∈ R but (b, a) ∉ R, So R is not symmetric. Again, a ≤ b and b ≤ c then a ≤ c : (a, b) ∈ R and (b, c) and (a, c) ∈ R, So R is transitive. Therefore, R is reflexive and transitive but not symmetric.
5. Check whether the relation R in R defined by R = {(a, b) : a ≤ b3 } is reflexive, symmetric or transitive.
   Solution:
   R = {(a, b) : a ≤ b3 } a ≤ a3 : which is true, (a, a) ∉ R, So R is not reflexive. a ≤ b3 but b ≤ a3 (false): (a, b) ∈ R but (b, a) ∉ R, So R is not symmetric. Again, a ≤ b3 and b ≤ c3 then a ≤ c3 (false) : (a, b) ∈ R and (b, c) ∈ R and (a, c) ∉ R, So R is transitive. Therefore, R is neither reflexive, nor transitive and nor symmetric.
6. Show that the relation R in the set {1, 2, 3} given by R = {(1, 2), (2, 1)} is symmetric but neither reflexive nor transitive.

Solution: R = {(1, 2), (2, 1)} (x, x) ∉ R. R is not reflexive. (1, 2) ∈ R and (2,1) ∈ R. R is symmetric. Again, (x, y) ∈ R and (y, z) ∈ R then (x, z) does not imply to R. R is not transitive. Therefore, R is symmetric but neither reflexive nor transitive.

7. Show that the relation R in the set A of all the books in a library of a college, given by R = {(x, y) : x and y have same number of pages} is an equivalence relation.
   Solution:
   Books x and x have same number of pages. (x, x) ∈ R. R is reflexive. If (x, y) ∈ R and (y, x) ∈ R, so R is symmetric. Because, Books x and y have same number of pages and Books y and x have same number of pages. Again, (x, y) ∈ R and (y, z) ∈ R and (x, z) ∈ R. R is transitive. Therefore, R is an equivalence relation.
8. Show that the relation R in the set A = {1, 2, 3, 4, 5} given by R = {(a, b) : |a – b| is even}, is an equivalence relation. Show that all the elements of {1, 3, 5} are related to each other and all the elements of {2, 4} are related to each other. But no element of {1, 3, 5} is related to any element of {2, 4}.
   Solution:
   A = {1, 2, 3, 4, 5} and R = {(a, b) : |a – b| is even} We get, R = {(1, 3), (1, 5), (3, 5), (2, 4)} For (a, a), |a – b| = |a – a| = 0 is even. Therfore, R is reflexive. If |a – b| is even, then |b – a| is also even. R is symmetric. Again, if |a – b| and |b – c| is even then |a – c| is also even. R is transitive. NCERT Solutions for Class 12 Maths Chapter 1 Relations and Functions Therefore, R is an equivalence relation. (b) We have to show that, Elements of {1, 3, 5} are related to each other. |1 – 3| = 2 |3 – 5| = 2 |1 - 5| = 4 All are even numbers. Elements of {1, 3, 5} are related to each other. Similarly, |2 - 4| = 2 (even number), elements of (2, 4) are related to each other. Hence no element of {1, 3, 5} is related to any element of {2, 4}.

9. Show that each of the relation R in the set A = {x ∈ Z : 0 ≤ x ≤ 12}, given by (i) R = {(a, b) : |a – b| is a multiple of 4} (ii) R = {(a, b) : a = b} is an equivalence relation. Find the set of all elements related to 1 in each case.

Solution: (i) A = {x ∈ Z : 0 ≤ x ≤ 12} So, A = {0, 1, 2, 3, ……, 12} Now R = {(a, b) : |a – b| is a multiple of 4} R = {(4, 0), (0, 4), (5, 1), (1, 5), (6, 2), (2, 6), ..., (12, 9), (9, 12),...., (8, 0), (0, 8), ..., (8, 4), (4, 8),....., (12, 12)} Here, (x, x) = |4-4| = |8-8|= |12-12| = 0 : multiple of 4. R is reflexive. |a – b| and |b – a| are multiple of 4. (a, b) ∈ R and (b, a) ∈ R. R is symmetric. And |a – b| and |b – c| then |a - c| are multiple of 4. (a, b) ∈ R and (b, c) ∈ R and (a, c) ∈ R R is transitive. Hence R is an equivalence relation.

(ii) Here, (a, a) = a = a. (a, a) ∈ R . So R is reflexive. a = b and b = a. (a, b) ∈ R and (b, a) ∈ R. R is symmetric. And a = b and b = c then a = c. (a, b) ∈ R and (b, c) ∈ R and (a, c) ∈ R R is transitive. Hence R is an equivalence relation. Now set of all elements related to 1 in each case is

(i) Required set = {1, 5, 9}

(ii) Required set = {1} 10. Give an example of a relation. Which is

(i) Symmetric but neither reflexive nor transitive.
(ii) Transitive but neither reflexive nor symmetric.
(iii) Reflexive and symmetric but not transitive.
(iv) Reflexive and transitive but not symmetric.
(v) Symmetric and transitive but not reflexive. Solution: (i)Consider a relation R = {(1, 2), (2, 1)} in the set {1, 2, 3} (x, x) ∉ R. R is not reflexive. (1, 2) ∈ R and (2,1) ∈ R. R is symmetric. Again, (x, y) ∈ R and (y, z) ∈ R then (x, z) does not imply to R. R is not transitive. Therefore, R is symmetric but neither reflexive nor transitive.

(ii) Relation R = {(a, b): a > b} a > a (false statement). Also a > b but b > a (false statement) and If a > b but b > c, this implies a > c Therefore, R is transitive, but neither reflexive nor symmetric

PHYSICS

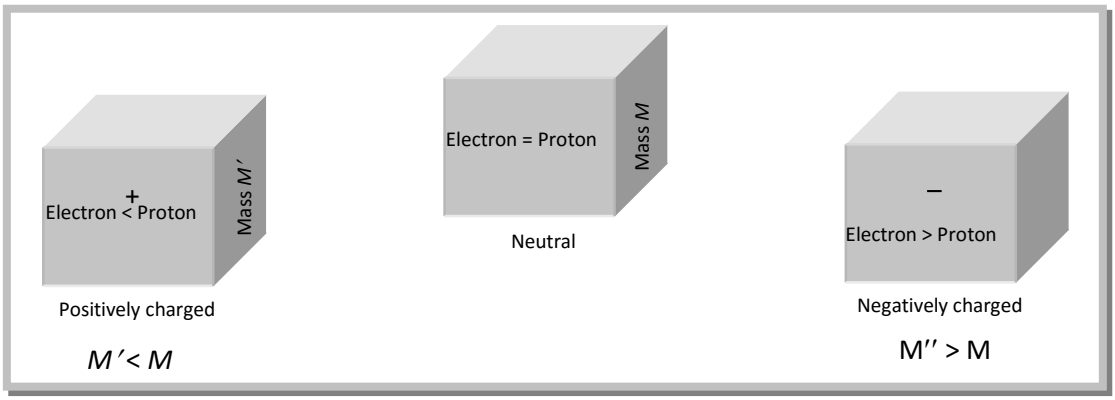
Electrostatics

Electric Charge

(1) **Definition :** Charge is the property associated with matter due to which it produces and experiences electrical and magnetic effects.

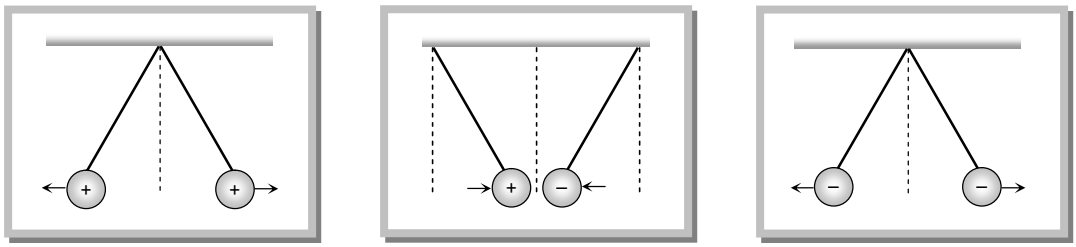
(2) **Origin of electric charge :** It is known that every atom is electrically neutral, containing as many electrons as the number of protons in the nucleus.

Charged particles can be created by disturbing neutrality of an atom. Loss of electrons gives positive charge (as then $n_p > n_e$) and gain of electrons gives negative charge (as then $n_e > n_p$) to a particle. When an object is negatively charged it gains electrons and therefore its mass increases negligibly. Similarly, on charging a body with positive electricity its mass decreases. Change in mass of object is equal to $n \times m_e$. Where, n is the number of electrons transferred and m_e is the mass of electron $= 9.1 \times 10^{-31}\ Kg$.



(3) **Type** : There exists two types of charges in nature (i) Positive charge (ii) Negative charge

Charges with the same electrical sign repel each other, and charges with opposite electrical sign attract each other.



(4) **Unit and dimensional formula :** Rate of flow of electric charge is called electric current *i.e.,* $\boldsymbol{i = \frac{dQ}{dt}} \Rightarrow \boldsymbol{dQ = idt}$, hence S.I. unit of charge is – $Ampere \times sec = coulomb\ (C)$,

smaller S.I. units are mC, μC, nC $(1mC = 10^{-3}C, 1\mu C = 10^{-6}C, 1nC = 10^{-9}C)$. C.G.S. unit of charge is – *Stat coulomb* or *e.s.u*. Electromagnetic unit of charge is – *ab coulomb*

$1C = 3 \times 10^9$ *stat coulomb* $= \frac{1}{10}$ *ab coulomb* . Dimensional formula $[Q] = [AT]$

Note :
- Benjamin Franklin was the first to assign positive and negative sign of charge.
- The existence of two type of charges was discovered by Dufog.
- Franklin (*i.e.*, *e.s.u.* of charge) is the smallest unit of charge while faraday is largest (1 *Faraday* = 96500 *C*).
- The *e.s.u.* of charge is also called stat coulomb or Franklin (*Fr*) and is related to *e.m.u.* of charge through the relation $\frac{\text{emu of charge}}{\text{esu of charge}} = 3 \times 10^{10}$

(5) **Point charge :** A finite size body may behave like a point charge if it produces an inverse square electric field. For example an isolated charged sphere behave like a point charge at very large distance as well as very small distance close to it's surface.

(6) **Properties of charge**

(i) **Charge is transferable :** If a charged body is put in contact with an uncharged body, uncharged body becomes charged due to transfer of electrons from one body to the other.

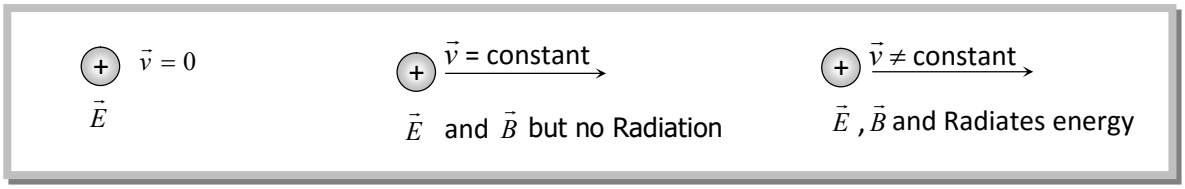
(ii) **Charge is always associated with mass**, *i.e.*, charge can not exist without mass though mass can exist without charge.

(iii) **Charge is conserved :** Charge can neither be created nor be destroyed. *e.g.* In radioactive decay the uranium nucleus (charge $= +92e$) is converted into a thorium nucleus (charge $= +90e$) and emits an α-particle (charge $= +2e$)

$_{92}U^{238} \rightarrow_{90} Th^{234} +_2 He^4$. Thus the total charge is $+92e$ both before and after the decay.

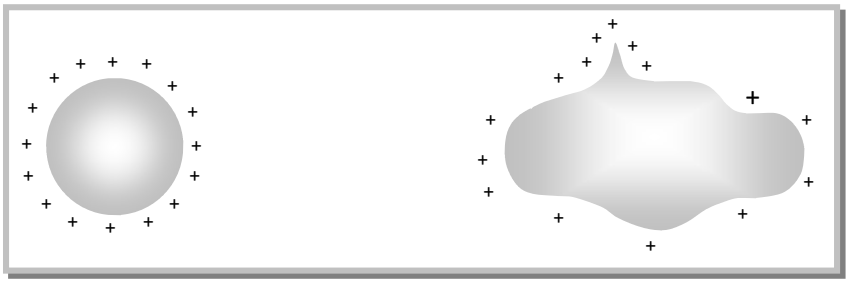
(iv) **Invariance of charge** : The numerical value of an elementary charge is independent of velocity. It is proved by the fact that an atom is neutral. The difference in masses on an electron and a proton suggests that electrons move much faster in an atom than protons. If the charges were dependent on velocity, the neutrality of atoms would be violated.

(v) **Charge produces electric field and magnetic field** : A charged particle at rest produces only electric field in the space surrounding it. However, if the charged particle is in unaccelerated motion it produces both electric and magnetic fields. And if the motion of charged particle is accelerated it not only produces electric and magnetic fields but also radiates energy in the space surrounding the charge in the form of electromagnetic waves.



(vi) **Charge resides on the surface of conductor :** Charge resides on the outer surface of a conductor because like charges repel and try to get as far away as possible from one another and stay at the farthest distance from each other which is outer surface of the conductor. This is why a solid and hollow conducting sphere of same outer radius will hold maximum equal charge and a **soap bubble expands on charging.**

(vii) **Charge leaks from sharp points :** In case of conducting body no doubt charge resides on its outer surface, if surface is uniform the charge distributes uniformly on the surface and for irregular surface the distribution of charge, *i.e.*, charge density is not uniform. It is maximum where the radius of curvature is minimum and vice versa. *i.e.*, $\sigma \propto (1/R)$. This is why charge leaks from sharp points.



(viii) **Quantization of charge** : When a physical quantity can have only discrete values rather than any value, the quantity is said to be quantised. The smallest charge that can exist in nature is the charge of an electron. If the charge of an electron ($= 1.6 \times 10^{-19}\ C$) is taken as elementary unit *i.e.* quanta of charge the charge on any body will be some integral multiple of *e* *i.e.*,

$\boxed{Q = \pm ne}$ with $n = 1, 2, 3 ....$

Charge on a body can never be $\pm \frac{2}{3}e$, $\pm 17.2e$ or $\pm 10^{-5}\ e$ *etc.*

Note : ❑ Recently it has been discovered that elementary particles such as proton or neutron are composed of quarks having charge $(\pm 1/3)e$ and $(\pm 2/3)e$. However, as quarks do not exist in free state, the quanta of charge is still *e*.

❑ Quantization of charge implies that there is a maximum permissible magnitude of charge.

Comparison of Charge and Mass

We are familiar with role of mass in gravitation, and we have just studied some features of electric charge. We can compare the two as shown below

Charge	Mass
(1) Electric charge can be positive, negative or zero.	(1) Mass of a body is a positive quantity.

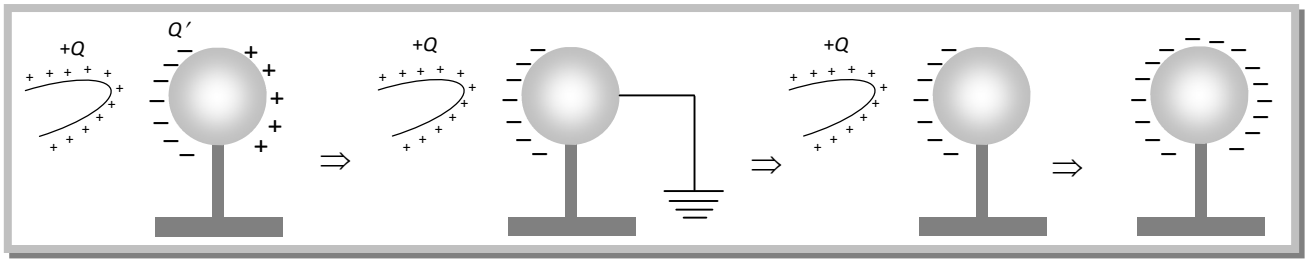
(2) Charge carried by a body does not depend upon velocity of the body.	(2) Mass of a body increases with its velocity as $m = \frac{m_0}{\sqrt{1 - v^2/c^2}}$ where c is velocity of light in vacuum, m is the mass of the body moving with velocity v and m_0 is rest mass of the body.
(3) Charge is quantized.	(3) The quantization of mass is yet to be established.
(4) Electric charge is always conserved.	(4) Mass is not conserved as it can be changed into energy and vice-versa.
(5) Force between charges can be attractive or repulsive, according as charges are unlike or like charges.	(5) The gravitational force between two masses is always attractive.

Methods of Charging

A body can be charged by following methods :

(1) **By friction :** In friction when two bodies are rubbed together, electrons are transferred from one body to the other. As a result of this one body becomes positively charged while the other negatively charged, e.g., when a glass rod is rubbed with silk, the rod becomes positively charged while the silk negatively. However, ebonite on rubbing with wool becomes negatively charged making the wool positively charged. Clouds also become charged by friction. In charging by friction in accordance with conservation of charge, both positive and negative charges in equal amounts appear simultaneously due to transfer of electrons from one body to the other.

(2) **By electrostatic induction :** If a charged body is brought near an uncharged body, the charged body will attract opposite charge and repel similar charge present in the uncharged body. As a result of this one side of neutral body (closer to charged body) becomes oppositely charged while the other is similarly charged. This process is called electrostatic induction.



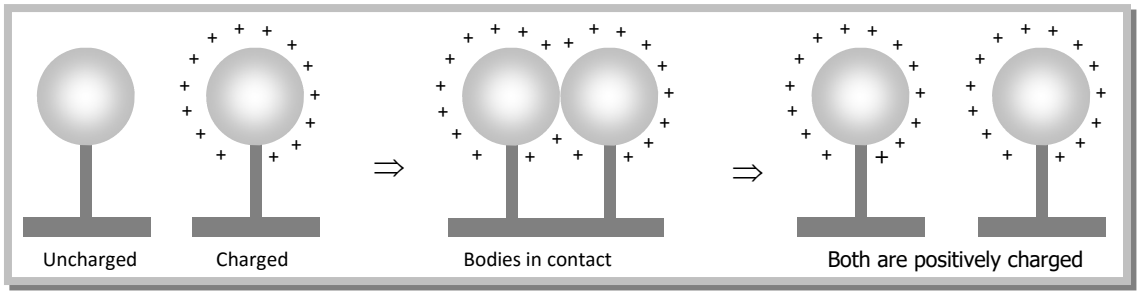
Note : ❑ Inducting body neither gains nor loses charge.

- Induced charge can be lesser or equal to inducing charge (but never greater) and its maximum value is given by $Q' = -Q\left[1 - \frac{1}{K}\right]$ where Q is the inducing charge and K is the dielectric constant of the material of the uncharged body. Dielectric constant of different media are shown below

Medium	***K***
Vacuum / air	1
Water	80
Mica	6
Glass	5–10
Metal	∞

- Dielectric constant of an insulator can not be ∞
- For metals in electrostatics $K = \infty$ and so $Q' = -Q$; i.e. in metals induced charge is equal and opposite to inducing charge.

(3) **Charging by conduction :** Take two conductors, one charged and other uncharged. Bring the conductors in contact with each other. The charge (whether $-ve$ or $+ve$) under its own repulsion will spread over both the conductors. Thus the conductors will be charged with the same sign. This is called as charging by conduction (through contact).



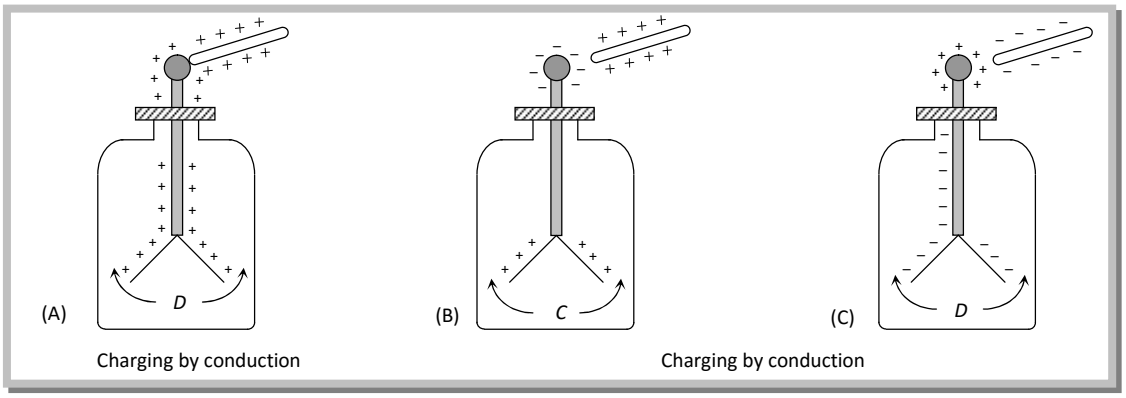
Note : - A truck carrying explosives has a metal chain touching the ground, to conduct away the charge produced by friction.

Electroscope

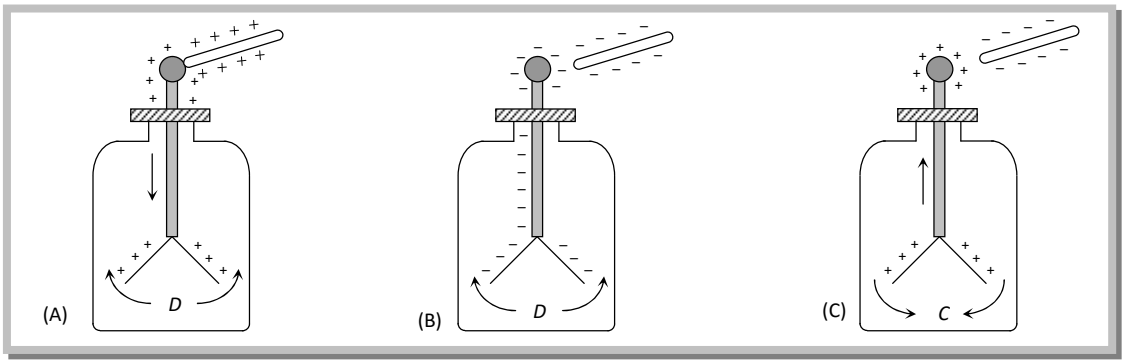
It is a simple apparatus with which the presence of electric charge on a body is detected (see figure). When metal knob is touched with a charged body, some charge is transferred to the gold leaves, which then diverges due to repulsion. The separation gives a rough idea of the amount of charge on the body. If a charged body brought near a charged electroscope the leaves will further

diverge. If the charge on body is similar to that on electroscope and will usually converge if opposite. If the induction effect is strong enough leaves after converging may again diverge.

(1) **Uncharged electroscope**



(2) **Charged electroscope**



Home work

1 Define electric charge?
2 How many numbers of electron in 1 coulomb charge.
3 Give any three properties of charge.
4 Write down any four difference between charge and mass.