

PENANG SANGAM HIGH SCHOOL
P.O.BOX 44, RAKIRAKI
LESSON NOTES
WEEK 23

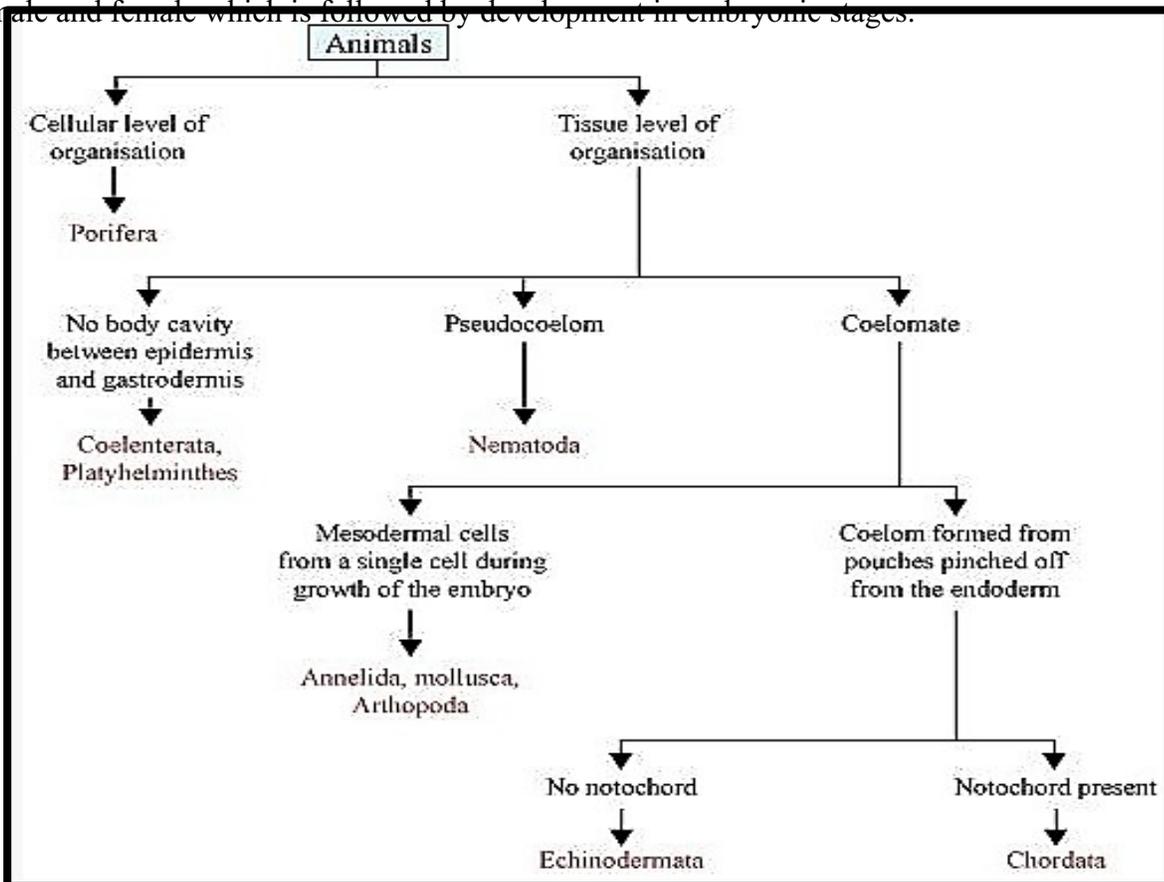
Year/Level: 13A/B

Subject: BIOLOGY

Strand	3 Biodiversity Change & Sustainability
Sub Strand	3.2.6 Kingdom Animalia (Phylum Cnidarians)
Content Learning Outcome	<ul style="list-style-type: none"> Describe the general characteristics of organisms in the phylum Cnidarian Identify the organisms in the three classes of Cnidaria

3.2.6 KINGDOM ANIMALIA

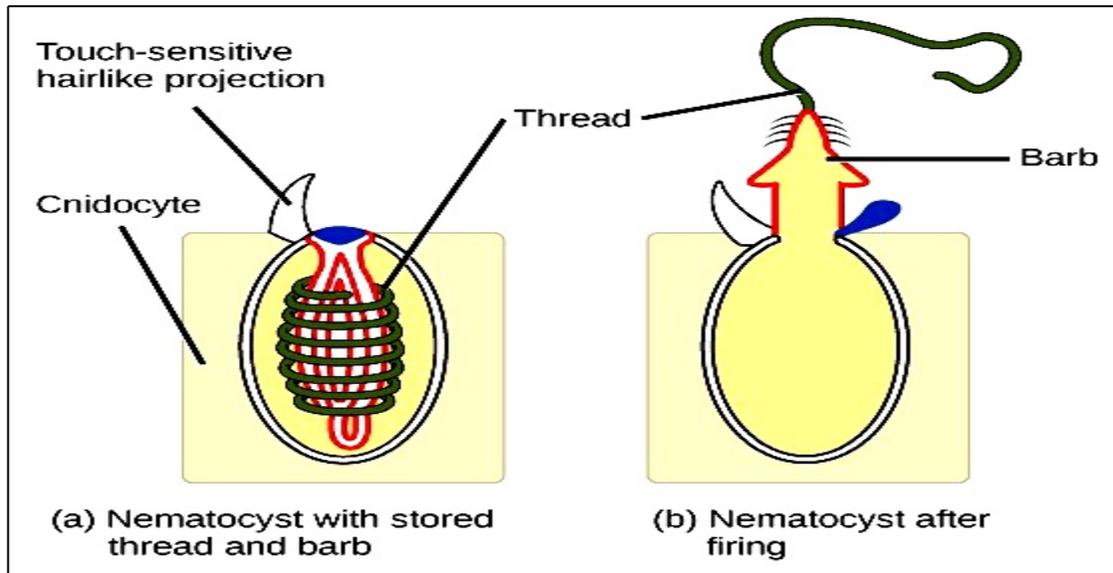
Organisms in the Kingdom Animalia are characterized by having eukaryotic cells, are heterotrophic, multicellular and lack cell wall. The higher animals show well developed sensory and neuromotor mechanism. Most animals are capable of locomotion, and generally, reproduction is by copulation of male and female which is followed by development in embryonic stages.



DIPLOBLASTIC CONDITION

PHYLUM-CNIDARIANS

- old name coelenterate) includes primitive multicellular animals, which are however more advanced than sponges.
- eg. Corals, Jelly fish, Sea anemones, Hydra
- Diploblastic (2 layer- ectoderm and endoderm + jelly-like mesoglea in between both the layers)
- Body Plan - They have **blind sac body plan**- empty space in the gastro vascular cavity.
- **Tissue level of organization**- They have tissues but lack organs and systems.
- **Radial symmetry**- provides the ability to sense from all directions



- Specialized cells called **Cnidoblasts** (Thread cells or stinging cells)- produce nematocysts. Nematocyst/ stinging cell/ cnidoblast/ thread cell- Thread shoots out, Attaches to the prey and injects the poison
- **Planula larvae** - which swims, settles and grows into a sessile polyp
- Exhibit **polymorphism** (occurrence of two or more distinct body forms eg. medusa (bell-shaped) and polyp stage)

- The **medusa (free- swimming)** is free floating or swimming structure. It has a bell or an umbrella like structure with mouth and tentacle facing downward. The medusa can be regarded as the upside down polyp with reduced stalk. It is mainly concerned with **sexual reproduction** and dispersal of the species.

- The **polyp (attached)** is sessile and consists of cylindrical stalk, with mouth and tentacle facing upwards. It is mainly **concerned with feeding.**

- **Reproduction.** The reproduction is both sexual and asexual type. In many cnidarians the polyps usually reproduce **asexually by budding** to give rise to medusas. The medusas bear **gonads** or sex **organs** and reproduce sexually to form polyps. **Sexual reproduction** – development of egg and sperm in the same **individual (hermaphrodites)**

Fertilization may be **external** or **internal**. Zygote develops into a ciliated larva called **Planula**,

- **Body Cavity** - no separate body cavity or coelom.

- **Habitat and Habit.** They are exclusively marine animals. They only fresh water cnidarians are hydra. They are either **sedentary** (fixed) or **free swimming**. The bottoms of shallow warm seas teem with corals and sea anemones of many shapes and colours. Jelly fishes floats in cooler waters.

-**Skeleton.** The soft body of some cnidarians such as corals is supported by calcareous exoskeletons.

- **Digestive tract.** There is a sac like cavity called **gastro vascular cavity**. It has one opening which acts as **mouth** for taking food, as well as **anus** for throwing out fasses. Such a digestive cavity is called **incomplete**. Digestion is partly **extracellular**, that occurs in the coelenterons by the digestive enzymes secreted by the gastro dermal cells and partly **intracellular**, which takes place within the gastro dermal cells. Coelenterons distributes food besides partly digesting it. Because of its dual role, the coelenterons is called gastro vascular cavity.

- **Gastrodermal cavity-This is not a cavity instead the gastrodermis is the inner layer of cells that serves as a lining membrane of the gastrovascular cavity. Gastrovascular cavity- a central cavity with single opening in the body**

- **Respiration and Excretion.** This occurs through general body surfaces.

- **Nervous System.** The cnidarians have a primitive nervous system. It consists of nerve cells and their processes. Sensory cells are also present.

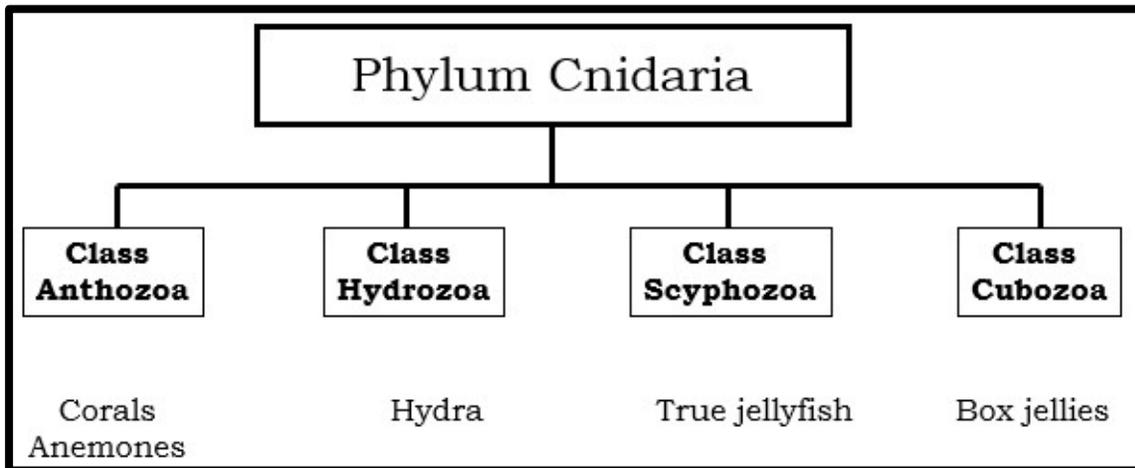
- **Alternation of Generations.** Several cnidarians show alternation of generation in their life cycles. They complete their life cycle through two phases-via asexually reproducing **polyp phase** and sexually reproducing **medusa phase**.

The cnidarians show advancement over the sponges as they have a tissue level of organization of the body with well defined layers of cells, digestive cavity.

Classification

Phylum cnidarians is divided into 3 classes.

- **Hydrozoa** (meaning “water-animals”), e.g. the most diverse group of hydroids, fire corals and many medusa
- **Scyphozoa** (meaning “bowl-animals”), including the true jellyfish.
- **Anthozoa** (meaning “Flower-animals”) e.g. true corals, anemones and sea pens;



Class: Hydrozoa

This class includes both fresh water and marine forms. They have either only polyps or both polyps and medusa, exhibiting polymorphism. Gonads are ectodermal in organ and sex cells are discharged externally. Many of them show alteration of generations.

Examples: Hydra, Physalia (Portuguese man of war)

Example 1: *Hydra*

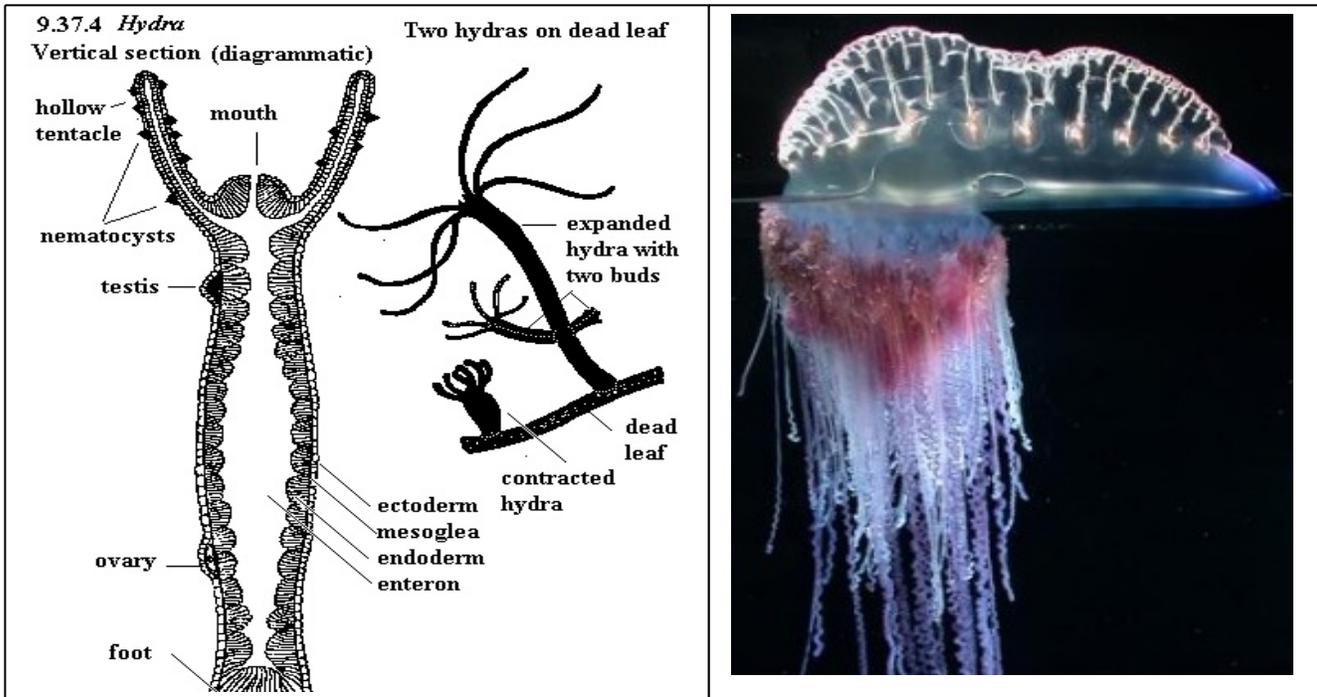
- Sedentary/Sessile and found in fresh water.
- Polyp body form.
- Most live in colonies.
- Attach themselves to rock or water plants means of a sticky secretion produced by the basal disc.

- Produces gas bubbles which allows hydra to float near the surface.

Economic Importance. The poison of its nematocyst is neurotoxins which is as virulent as venom of cobra. It is a nuisance for bathers.

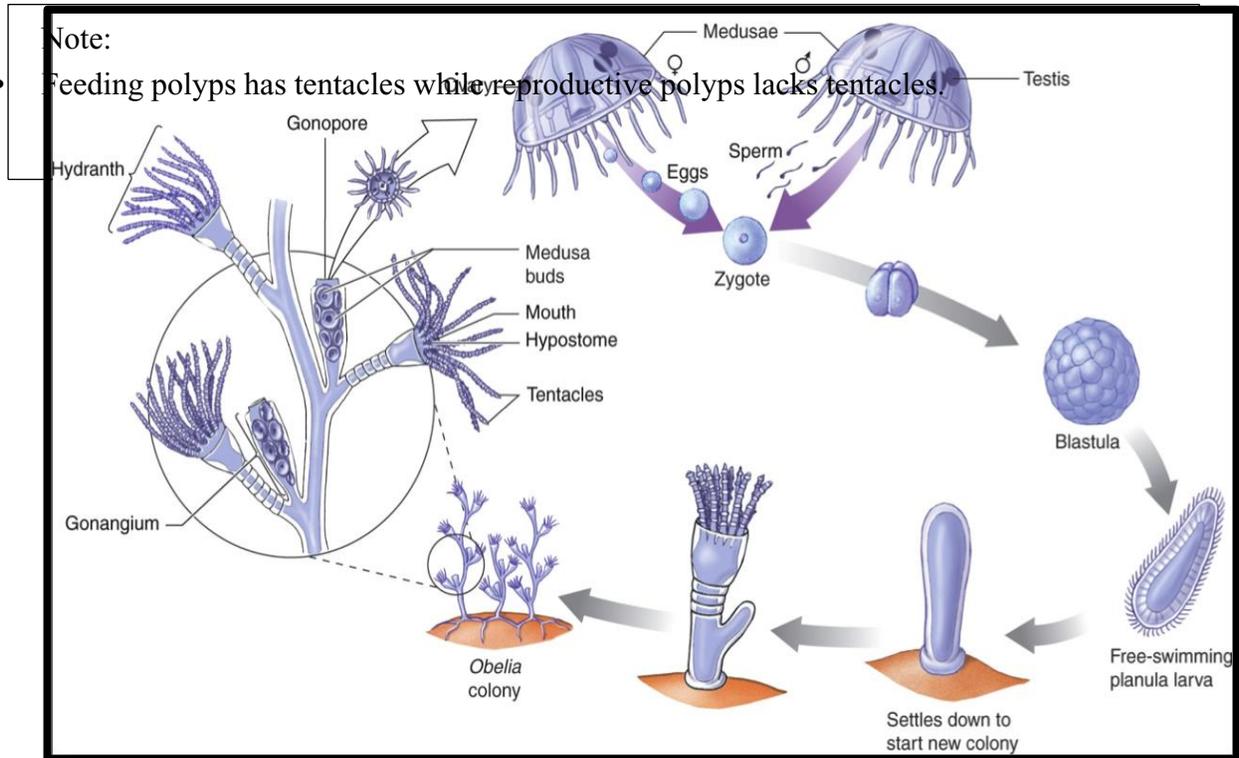
HYDRA

PHYSALIA (PORTUGUESE MAN OF WAR)



Example 2: *Obelia*

- Is sedentary/ sessile, marine colonial form found attached on the surface of sea weeds, mollusc shells and rocks.
- Forms when one polyp asexually produces buds that do not separate from it.
- The reproductive polyps give rise asexually to male and female medusas.
- These medusas leave the polyps and grow to maturity in the ocean waters.
- Reproductive polyps eject bell shaped medusa by budding into the surrounding water.
- Through meiosis, some cells develop into sperms and egg. After fertilization occurs, zygote develops into ciliated planula larva.
- Planula attaches by one end and develops into sedentary *Obelia*.



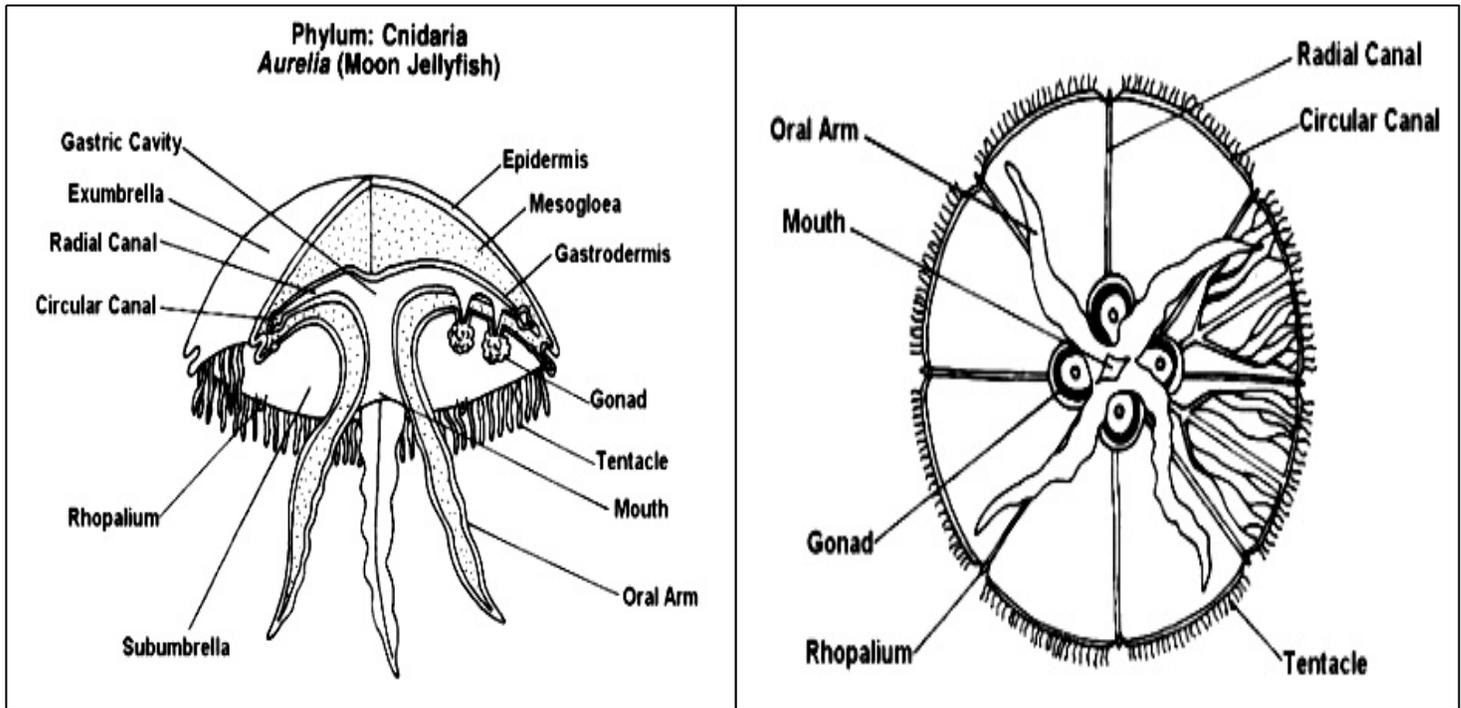
Class: Scyphozoa (Jellyfish)

They are exclusively marine. They are solitary and are represented by bell or umbrella shaped medusas, which are without velum. Polyp form is reduced or absent.

Example. Aurelia (the jelly fish)

- Have medusa body form. However, most species of jellyfish also go through an inconspicuous polyp stage at some point in their life cycle
- Reproduce sexually.
- Aurelia, is one of the most familiar jellyfishes.
- The major difference between Aurelia and Obelia is that Aurelia spends most of its life as a medusa, while Obelia spends most of its life as a polyp.

JELLY FISH

Class: Anthozoa

They are exclusively marine and are solitary or colonial. They are represented by polyp form only. Medusa form is absent. The gastro vascular cavity is divided by complete or incomplete mesenteries or septa. Mesogloea contains fibrous connective tissues.

Examples. Adamsia (the sea anemone), *Astraea* (the star coral), Pennatula (the sea pen), Gorgonian (the sea fan)

SEA ANEMONE

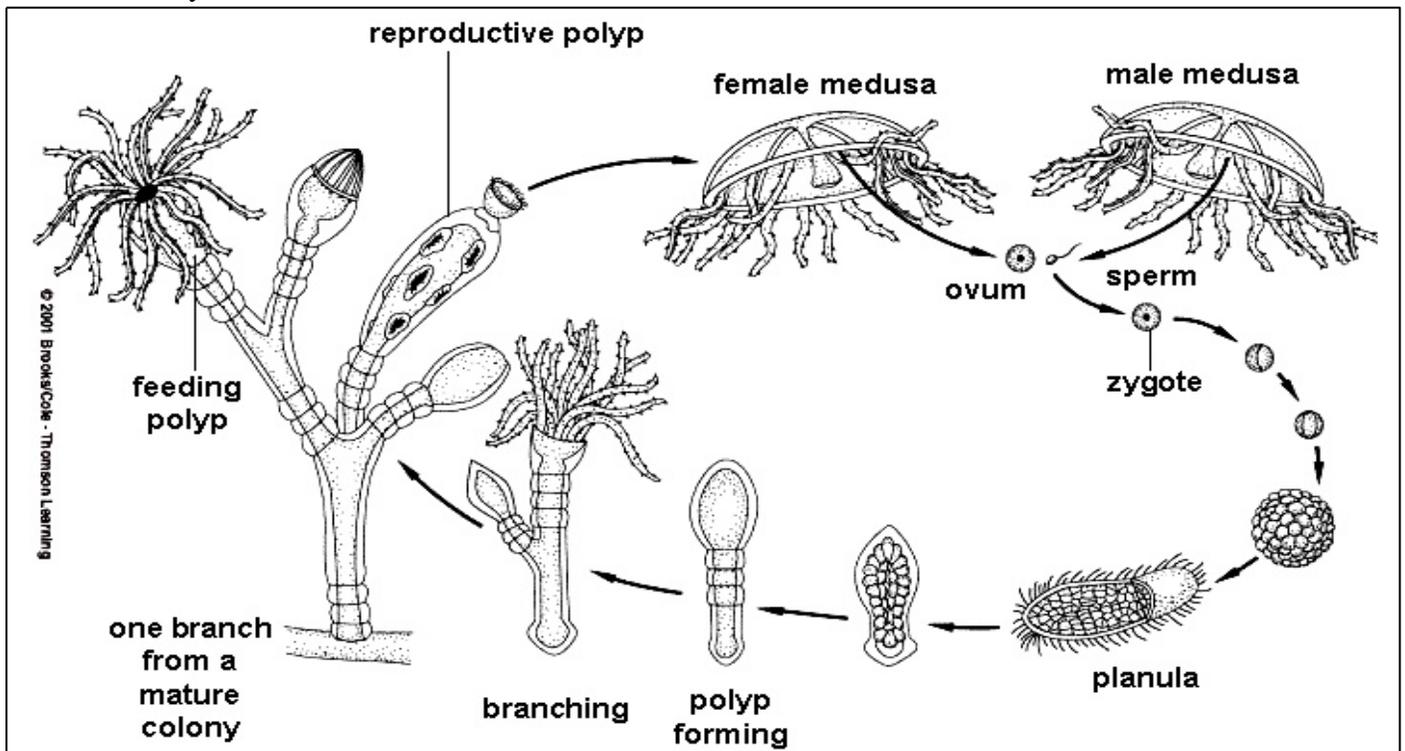
STAR CORAL



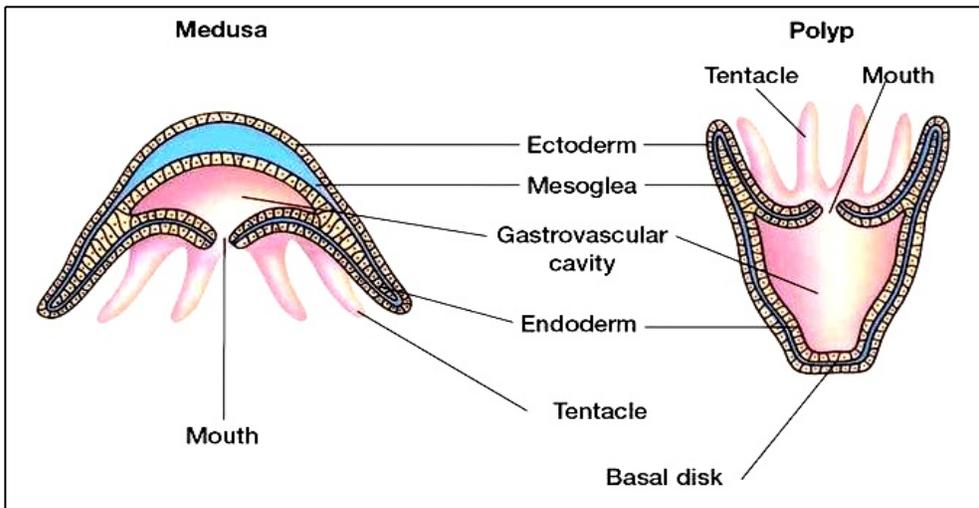
POLYMORPHISM

- occurrence of two or more distinct forms/morphology of an organism. E.g.
- Medusa and polyp stage in Cnidarians. Both the morphs (organism in any physical appearance) are diploid.
- e.g. *Obelia* or hydrozoa in polyp and medusa form
- 2 types of polyp; feeding and reproductive
- 1 medusa; reproductive
- *Obelia*; 3 kinds – feeding polyp, reproductive polyp and medusa
- one advantage of polymorphism. (1 mark)
 - Allows the organism to exploit a diverse range of habitat and food OR
 - Reduces competition OR
 - Division of labour OR
 - increases chances of survival OR
 - Polyp is for growth and colonization and medusa for dispersal

Life cycle of *Obelia*



Difference between Polyp and Medusa



Medusa	Polyp
1. free floating, swim in water and found in open waters	1. fixed, sessile and found near low water mark attached to weeds or rocks
2. bell shaped with a reduced stalk (jelly fish like)	2. cylindrical in shape with a long stalk (hydra like)
3. tentacles face downwards	3. tentacles face upwards
4. tentacles present all over the margin of the bell	4. tentacles surround the mouth region
5. Sexual stage. It gives rise to polyp by sexual reproduction.	5. asexual stage. It gives rise to medusa by budding
6. jelly fish and Portuguese man of war are medusa form	6. corals, hydra and sea anemones exist in the polyp form
7. allows for dispersal and reproduction	7. allows the organisms to grow and colonise

SELF TEST: Cnidaria

1. Name the three major classes of Cnidarians and give examples of each.

2. State the significance of polyp and medusa form.

3. Name of the larva of Obelia and state its biological importance.

4. Name the germ layers present in cnidarians and which tissues do they produce?

5. What are cnidocytes? What is the name of the organelle inside cnidocytes? What are the biological functions of this structure?

6. Why is the digestive system of these animals considered incomplete?

What type of digestion occurs in Cnidarians?

7. State the type of asexual reproduction occurs in Hydra?

8. State the type of symmetry shown in Cnidarians?

9. Give three common features of Cnidarians?

10. Define the term polymorphism and state two advantages.
