AP EAPCET 2026 May 20 Shift 1

Question Paper with Solutions (Memory Based)

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General Instructions

(i) The test is of 3 hours duration.

(ii) This test paper consists of 160 questions. The maximum marks are 160.

(iii) Physics and Chemistry contains 40 questions each and Biology contains 80 questions.

(iv) Each question carries +1 marks for correct answer and there is no negative marking for wrong answer.

Physics

1. The measured value of a quantity is 98 units, while the true value is 100 units. The percentage error is:

(A) 1%
(B) 2%
(C) 3%
(D) 4%

Correct Answer: (B) 2%

Solution:

Step 1: Understanding the Question:
The question asks us to calculate the percentage error in a measurement where the true

(actual) value is 100 units and the experimentally measured value is 98 units.

Step 2: Key Formula or Approach:

The formula for percentage error is:

$$\text{Percentage Error} = \frac{|\text{True Value} - \text{Measured Value}|}{\text{True Value}} \times 100\%$$

This can be written as:

$$\text{Percentage Error} = \frac{\Delta x}{T} \times 100\%$$

where Δx is the absolute error and T is the true value.

Step 3: Detailed Explanation:

- Identify the given parameters:
  True Value (T) = 100 units
  Measured Value (M) = 98 units

- Compute the absolute error (Δx):

$$\Delta x = |100 - 98| = 2 \text{ units}$$

- Apply the percentage error formula:

$$\text{Percentage Error} = \frac{2}{100} \times 100\% = 2\%$$

- This shows that the experimental measurement has a deviation of exactly 2% from the true value.

Step 4: Final Answer:

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The percentage error in the measurement is 2%.

Quick Tip: When the true value is exactly 100 units, the absolute error is directly equal to the percentage error. You can compute this instantly in your head without standard formulas!

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2. The velocity-time graph of a particle is given by v = 4t. The acceleration is:

(A) 2 m/s^2

(B) 4 m/s^2

(C) 8 m/s^2

(D) Variable

Correct Answer: (B) 4 m/s^2

Solution:

Step 1: Understanding the Question:

The question provides a linear relationship for velocity (v) as a function of time (t) given by $v = 4t$. We are required to find the acceleration of the particle from this relationship.

Step 2: Key Formula or Approach:

Acceleration (a) is defined as the time rate of change of velocity:

$$a = \frac{dv}{dt}$$

In a velocity-time graph, the acceleration corresponds to the slope of the curve.

Step 3: Detailed Explanation:

- Given the velocity equation:

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$$v(t) = 4t$$

- To find the acceleration, we differentiate the velocity function with respect to time (t):

$$a = \frac{d}{dt}(4t)$$

- Applying the power rule of differentiation ($\frac{d}{dt}(t) = 1$):

$$a = 4 \times 1 = 4 \text{ m/s}^2$$

- Because the derivative is a constant numerical value (4), it does not depend on time (t). This tells us that the acceleration is uniform and constant.

- Thus, the particle moves with a constant acceleration of 4 m/s^2.

Step 4: Final Answer:

The acceleration of the particle is constant and has a magnitude of 4 m/s^2.

Quick Tip: For any linear velocity equation of the form $v = kt$, the acceleration is simply the constant coefficient k. Here, since $v = 4t$, the acceleration is immediately 4 m/s^2.

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3. A force F = 6t acts on a body of mass 2 kg initially at rest. Find velocity at t = 2 s.

(A) 3 m/s

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(B) 6 m/s

(C) 9 m/s

(D) 12 m/s

Correct Answer: (B) 6 m/s

Solution:

Step 1: Understanding the Question:

We are given a time-varying force $F = 6t$ acting on a body of mass 2 kg which starts from rest (initial velocity $u = 0$ at $t = 0$). We need to determine the final velocity of the body at $t = 2$ s.

Step 2: Key Formula or Approach:

According to Newton's Second Law of Motion, force is mass times acceleration:

$$F = ma = m\frac{dv}{dt}$$

We can rearrange this differential equation to solve for the velocity:

$$dv = \frac{F}{m}\,dt$$

Integrating both sides from $t = 0$ to $t = t$:

$$\int_0^v dv = \int_0^t \frac{F}{m}\,dt$$

Step 3: Detailed Explanation:

- Identify the given terms:
  Mass $(m) = 2$ kg
  Force $(F) = 6t$
  Initial state: $v = 0$ at $t = 0$

- Calculate the acceleration (a) as a function of time:

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$$a(t) = \frac{F}{m} = \frac{6t}{2} = 3t \text{ m/s}^2$$

- Set up the integration for the velocity at $t = 2$ s:

$$v = \int_0^2 a(t)\,dt = \int_0^2 3t\,dt$$

- Perform the integration:

$$v = \left[\frac{3t^2}{2}\right]_0^2$$

$$v = \frac{3 \times 2^2}{2} - 0 = \frac{3 \times 4}{2} = 6 \text{ m/s}$$

- The final calculated velocity of the body at $t = 2$ s is exactly 6 m/s.

Step 4: Final Answer:

The velocity of the body at $t = 2$ s is 6 m/s.

Quick Tip: Never use the standard equations of motion (like $v = u + at$) when the force is variable. You must always use calculus (integration) because acceleration changes with time.

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4. At what depth inside Earth does g become half of its surface value? (Earth radius = R)

(A) R/2

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(B) R/4

(C) 3R/4

(D) R

Correct Answer: (A) R/2

Solution:

Step 1: Understanding the Question:

The question asks us to find the depth (d) below the Earth's surface where the acceleration due to gravity (g_d) is exactly half of its value on the surface (g).

Step 2: Key Formula or Approach:

The variation of acceleration due to gravity with depth (d) inside the Earth is given by the formula:

$$g_d = g\left(1 - \frac{d}{R}\right)$$

where: g = acceleration due to gravity on the Earth's surface

R = radius of the Earth

d = depth from the surface

Step 3: Detailed Explanation:

- We are given that the gravity at depth d is half of its surface value:

$$g_d = \frac{g}{2}$$

- Substitute this value into our depth variation equation:

$$\frac{g}{2} = g\left(1 - \frac{d}{R}\right)$$

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- Divide both sides of the equation by g:

$$\frac{1}{2} = 1 - \frac{d}{R}$$

- Rearrange the terms to solve for $\frac{d}{R}$:

$$\frac{d}{R} = 1 - \frac{1}{2}$$

$$\frac{d}{R} = \frac{1}{2}$$

- Solve for d:

$$d = \frac{R}{2}$$

- This linear relation shows that gravity decreases at a constant rate as we go deeper into the Earth. It becomes half at a depth of $R/2$ and drops to zero at the center of the Earth ($d = R$).

Step 4: Final Answer:

The depth at which the acceleration due to gravity becomes half of its surface value is $R/2$.

Quick Tip: Gravity decreases linearly with depth inside the Earth ($g_d \propto (R - d)$), unlike the inverse-square reduction seen with altitude. This makes mental calculations very simple for any fractional depth!

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5. Which of the following pairs of gaseous contains the same number of molecules

(A) 11g of CO_2 and 7g of N_2

(B) 44g of CO_2 and 14g of N_2

(C) 22g of CO_2 and 28g of N_2

(D) All the above pairs of gases

Correct Answer: (A) 11g of CO_2 and 7g of N_2

Solution:

Step 1: Understanding the Question:

The question asks which pair of gas samples contains the same total number of molecules. According to Avogadro's law, equal moles of any two gases contain the same number of molecules. Thus, we need to calculate the number of moles for each gas in the given options and find the pair where the moles are equal.

Step 2: Key Formula or Approach:

The number of moles (n) is calculated by dividing the given mass (m) by the molar mass (M) of the substance:

$$n = \frac{m}{M}$$

The number of molecules (N) is given by:

$$N = n \times N_A$$

where N_A is Avogadro's number (6.022×10^{23} molecules/mol). If two samples have equal moles, they have equal numbers of molecules.

The molar mass of carbon dioxide (CO_2) is:

$$M(CO_2) = 12 + (2 \times 16) = 44 \text{ g/mol}$$

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The molar mass of nitrogen gas (N_2) is:

$$M(N_2) = 2 \times 14 = 28 \text{ g/mol}$$

Step 3: Detailed Explanation:

- Let us analyze each option by calculating the number of moles:

- For Option (A):
  Moles of $CO_2 = \frac{11 \text{ g}}{44 \text{ g/mol}} = 0.25$ moles
  Moles of $N_2 = \frac{7 \text{ g}}{28 \text{ g/mol}} = 0.25$ moles
  Since both gases have exactly 0.25 moles, they contain the same number of molecules ($0.25 \times N_A$). This option is correct.

- For Option (B):
  Moles of $CO_2 = \frac{44 \text{ g}}{44 \text{ g/mol}} = 1.0$ mole
  Moles of $N_2 = \frac{14 \text{ g}}{28 \text{ g/mol}} = 0.5$ moles
  The moles are unequal, so the number of molecules is different.

- For Option (C):
  Moles of $CO_2 = \frac{22 \text{ g}}{44 \text{ g/mol}} = 0.5$ moles
  Moles of $N_2 = \frac{28 \text{ g}}{28 \text{ g/mol}} = 1.0$ mole
  The moles are unequal, so the number of molecules is different.

Step 4: Final Answer:
The pair containing 11 g of CO_2 and 7 g of N_2 has equal moles (0.25 mol each) and therefore contains the same number of molecules.

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Quick Tip: To quickly compare molecules, just find the moles of each gas ($n = \frac{m}{M}$). If the mole values are identical, then the number of molecules must be identical, regardless of the gas type.

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6. Calculate the amount of CO_2 gas produced, when 32g of CH_4 is burned with sufficient amount of oxygen (Given atomic weight of C=12, O=16 and H=1)

(A) 132g

(B) 44g

(C) 88g

(D) 176g

Correct Answer: (C) 88g

Solution:

Step 1: Understanding the Question:

This question requires us to determine the mass of carbon dioxide (CO_2) gas formed when 32 g of methane (CH_4) gas is completely burned in the presence of excess (sufficient) oxygen.

Step 2: Key Formula or Approach:

First, write the balanced chemical equation for the combustion of methane:

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$$

According to the stoichiometry of this reaction, 1 mole of CH_4 reacts to produce exactly 1 mole of CO_2.

The molar mass of methane (CH_4) is:

$$M(CH_4) = 12 + 4 \times 1 = 16 \text{ g/mol}$$

The molar mass of carbon dioxide (CO_2) is:

$$M(CO_2) = 12 + 2 \times 16 = 44 \text{ g/mol}$$

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Step 3: Detailed Explanation:

- Calculate the moles of CH_4 reactant starting with 32 g:

$$\text{Moles of } CH_4 = \frac{\text{Mass}}{\text{Molar mass}} = \frac{32 \text{ g}}{16 \text{ g/mol}} = 2 \text{ moles}$$

- From the balanced chemical equation, the mole ratio between CH_4 and CO_2 is $1 : 1$. Therefore, 2 moles of CH_4 will produce:

$$\text{Moles of } CO_2 \text{ produced} = 2 \text{ moles}$$

- Now, convert the moles of CO_2 into mass:

$$\text{Mass of } CO_2 = \text{Moles of } CO_2 \times M(CO_2)$$

$$\text{Mass of } CO_2 = 2 \text{ moles} \times 44 \text{ g/mol} = 88 \text{ g}$$

- Thus, the combustion yields exactly 88 g of CO_2 gas.

Step 4: Final Answer:

The amount of CO_2 gas produced from the combustion of 32 g of methane is 88 g.

Quick Tip: A quick shortcut: Since 16 g of CH_4 (1 mole) gives 44 g of CO_2 (1 mole), doubling the reactant to 32 g (2 moles) will naturally double the product mass to 88 g of CO_2.

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Botany

7. In a marine ecosystem, a specific brown alga is found to possess air bladders to maintain buoyancy near the water surface. This plant is likely:

(A) Polysiphonia
(B) Fucus
(C) Gelidium
(D) Porphyra

Correct Answer: (B) Fucus

Solution:

Step 1: Understanding the Question:
The question asks us to identify a marine brown alga (class Phaeophyceae) that possesses air bladders. These gas-filled structures are specialized morphological adaptations that provide buoyancy, helping the alga stay afloat near the water surface to maximize sunlight exposure for photosynthesis.

Step 2: Detailed Explanation:

- Brown algae, belonging to the class Phaeophyceae, are primarily marine plants. They are distinguished by their olive-green to brown colors, which depend on the concentration of the xanthophyll pigment, fucoxanthin, in addition to chlorophyll *a* and *c*.

- Many large brown algae, such as *Fucus* and *Sargassum*, have evolved specialized air-filled floats called air bladders or pneumatocysts. These bladders keep the photosynthetic lamina floating near the photic zone where light is abundant.

- *Polysiphonia* is a genus of marine red algae (class Rhodophyceae) characterized by its filamentous structure. It does not possess air bladders.

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- *Gelidium* is another genus of red algae. It is well known as a primary source of agar-agar, which is used to prepare culture media in microbiology, but it lacks air bladders.

- *Porphyra* is a red alga commonly used as food (such as nori in sushi). It is a leafy thallus without air bladders.

- Therefore, among the choices provided, *Fucus* is the only brown alga that possesses air bladders.

Step 3: Final Answer:

The marine brown alga containing air bladders for buoyancy is *Fucus*.

Quick Tip: Air bladders (pneumatocysts) are characteristic evolutionary structures of Phaeophyceae (brown algae). Think of *Fucus* and *Sargassum* as prime examples of floating brown seaweeds with these structures.

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8. In an urban garden, a student observes a plant where more than two leaves arise at each node, forming a circle. This phyllotaxy is seen in:

(A) Alstonia
(B) Hibiscus
(C) Calotropis
(D) Guava

Correct Answer: (A) Alstonia

Solution:

Step 1: Understanding the Question:

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The question deals with plant morphology, specifically the arrangement of leaves on a stem, which is called phyllotaxy. We are asked to identify the plant that shows an arrangement where more than two leaves arise at each node and form a circle or whorl.

Step 2: Detailed Explanation:

- Phyllotaxy is the scientific term used to describe the pattern of leaf arrangement on a stem or branch. This arrangement is crucial because it ensures that leaves receive maximum sunlight with minimal overlapping.
- There are three main types of phyllotaxy: alternate, opposite, and whorled.
- Alternate phyllotaxy occurs when a single leaf arises at each node in an alternating fashion. Examples of this include *Hibiscus* (China rose), mustard, and sunflower.
- Opposite phyllotaxy occurs when a pair of leaves arises at each node and lies opposite to each other on the stem. This is observed in plants like *Calotropis* and *Guava*.
- Whorled (or verticillate) phyllotaxy is the arrangement where more than two leaves arise at a single node and form a circle or whorl around the stem. This specific arrangement is a characteristic feature of *Alstonia* and *Nerium*.
- Thus, the plant observed by the student with more than two leaves per node in a circle is *Alstonia*.

Step 3: Final Answer:

The whorled arrangement of leaves described in the observation is found in *Alstonia*.

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Quick Tip: To easily remember leaf arrangements:

- Alternate: One leaf per node (e.g., *Hibiscus*)
- Opposite: Two leaves per node (e.g., *Calotropis*, *Guava*)
- Whorled: More than two leaves per node (e.g., *Alstonia*)

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9. While studying wood anatomy, a student finds that the annual rings are less distinct in trees located in which region?

(A) Temperate forests

(B) Tropical rain forests near the equator

(C) Grasslands with distinct seasons

(D) Alpine cold deserts

Correct Answer: (B) Tropical rain forests near the equator

Solution:

Step 1: Understanding the Question:

This question asks about the distinctness of annual (growth) rings in wood anatomy. Annual rings are formed due to seasonal variations in the activity of the vascular cambium. We need to identify the geographical region where these growth rings are least distinct or absent.

Step 2: Detailed Explanation:

- Annual rings are composed of earlywood (springwood) and latewood (autumnwood). These distinct bands are formed because the activity of the vascular cambium is heavily influenced by seasonal climatic variations.

- In temperate regions, such as temperate forests and areas with distinct seasons like seasonal grasslands or cold deserts, there are severe changes in climate between spring and winter.

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- In the spring, the cambium is highly active and produces many xylary elements with wider vessels. In winter or autumn, the cambium is less active and produces fewer, narrower vessels. This transition results in clear, visible annual rings.

- In tropical rain forests near the equator, the climate remains relatively uniform, warm, and humid throughout the entire year without any distinct seasonal cycles of hot and cold or wet and dry.

- Because the environmental conditions are virtually constant, the activity of the vascular cambium remains uniform year-round. No distinct bands of springwood and autumnwood are produced, making the annual rings indistinct or completely absent.

Step 3: Final Answer:

Trees growing in tropical rain forests near the equator do not show distinct annual rings due to the uniform climate throughout the year.

Quick Tip: The distinctness of annual growth rings is directly proportional to the variation in seasonal climates. Sharp seasons (temperate zones) mean distinct rings; uniform seasons (equator/tropical rain forests) mean indistinct rings.

Zoology

10. Who introduced the term "Genetics" to the scientific community?

(A) Gregor Mendel

(B) William Bateson

(C) Herbert Spencer

(D) Ernst Haeckel

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Correct Answer: (B) William Bateson

Solution:

Step 1: Understanding the Question:
This question is a historical scientific query regarding the origin of genetic terminology. We need to identify the scientist who coined and introduced the term "Genetics".

Step 2: Detailed Explanation:

- The term "Genetics" is derived from the Greek word "genesis", meaning "origin" or "generation". It was coined by the English biologist William Bateson in 1905 to describe the study of inheritance and variation.

- William Bateson was a strong defender and popularizer of Mendelian inheritance principles in the early 20th century. He officially proposed the term "Genetics" in a letter to Alan Sedgwick and later popularized it during the Third International Conference on Plant Hybridization in 1906.

- Gregor Mendel is universally recognized as the "Father of Genetics" because of his pioneering breeding experiments on pea plants (*Pisum sativum*). He discovered the laws of segregation and independent assortment, but he never used the word "Genetics" in his publications; he referred to it as the study of "factors" or "elements of inheritance".

- Herbert Spencer was an English philosopher and biologist who coined the phrase "survival of the fittest" in the context of evolutionary biology, but he did not coin "Genetics".

- Ernst Haeckel was a famous German naturalist who coined several biological terms including "Phylum", "Phylogeny", and "Ecology", but he was not responsible for coining "Genetics".

Step 3: Final Answer:

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The term "Genetics" was introduced by William Bateson in 1905.

Quick Tip: Be careful not to confuse Gregor Mendel (the "Father of Genetics") with William Bateson, who actually coined and introduced the term "Genetics" to describe the field of study.

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11. Pentamerous radial symmetry is a characteristic feature primarily observed in:

(A) Ctenophores
(B) Larval stages of Echinoderms
(C) Sea Anemones
(D) Adult Echinoderms

Correct Answer: (D) Adult Echinoderms

Solution:

Step 1: Understanding the Question:
This question is based on animal kingdom classification and symmetry. We are asked to identify which group of organisms or developmental stage is characterized by pentamerous radial symmetry, where the body can be divided into five equal sectors around a central axis.

Step 2: Detailed Explanation:

- Pentamerous radial symmetry is a distinct anatomical arrangement where body parts are arranged in groups of five or multiples of five radiating from a central oral-aboral axis. This is a unique and defining hallmark of the phylum Echinodermata.

- Echinoderms undergo a major structural transition during their life cycle. The larval stages of echinoderms (e.g., bipinnaria, pluteus) are bilaterally symmetrical and free-swimming, which is their primitive ancestral state.

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- During metamorphosis, the bilateral larva transforms into a radial, benthic (bottom-dwelling) adult. This change is associated with their slow-moving or sessile habit. Therefore, pentamerous radial symmetry is exhibited specifically by adult echinoderms.

- Ctenophores (comb jellies) display biradial symmetry, which is a blend of radial and bilateral characteristics.

- Sea anemones belong to the phylum Cnidaria (class Anthozoa). They possess radial symmetry, but it is typically hexamerous (six-part) or octamerous (eight-part) rather than pentamerous.

Step 3: Final Answer:
Pentamerous radial symmetry is a characteristic feature of adult echinoderms, while their larval stages are bilaterally symmetrical.

Quick Tip: Remember that echinoderms are bilateral as larvae but show pentamerous radial symmetry as adults. This shift from bilateral to radial symmetry is a popular and frequently tested concept in animal kingdom classification.

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12. **Which of the following is an example of an Anadromous fish (migrates from sea to fresh water to spawn)?**

(A) Labeo
(B) Hilsa
(C) Anguilla
(D) Channa

Correct Answer: (B) Hilsa

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Solution:

Step 1: Understanding the Question:
The question asks us to identify an "Anadromous" fish. Anadromous fishes are migratory species that spend most of their adult lives in saltwater (seas/oceans) but migrate upstream into freshwater (rivers) to spawn (reproduce).

Step 2: Detailed Explanation:

- Diadromous fish migration involves travel between marine and freshwater environments. It is classified into two major categories: anadromous and catadromous.

- Anadromous fishes (such as salmon, shad, and *Hilsa*) live in the sea and migrate to freshwater rivers to spawn. Once the eggs hatch, the juveniles mature in the river and eventually migrate back down to the sea.

- *Hilsa* (*Tenualosa ilisha*) is a classic example of an anadromous clupeid fish. It inhabits marine and estuarine environments but migrates long distances upstream into rivers like the Ganges and Padma for spawning.

- Catadromous migration is the exact opposite of anadromous migration. Catadromous fishes live in freshwater rivers but migrate to the sea to spawn. The eel (*Anguilla*) is the most famous example of a catadromous fish.

- *Labeo* (such as Rohu, *Labeo rohita*) is a purely freshwater fish that spends its entire life cycle in freshwater rivers and lakes without migrating to the sea.

- *Channa* (snakeheads) are air-breathing freshwater fishes that live, feed, and spawn exclusively within freshwater bodies.

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Step 3: Final Answer:

Among the choices, *Hilsa* is an anadromous fish that migrates from the sea to fresh water to spawn.

Quick Tip: Remember:

- **A**nadromous starts with **A**: **A**scends rivers (sea to fresh water). Example: Salmon, *Hilsa*.
- **C**atadromous starts with **C**: **C**ommitted to the sea (fresh water to sea). Example: *Anguilla* (eel).

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