SLE 132 – Form and Function - Trimester 1 2022

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Introduction

Unit Coordinator

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Email for appointments and consultations

Email etiquette

Please include the unit code in the subject line

-we all teach multiple units so please provide enough information so that we can help you

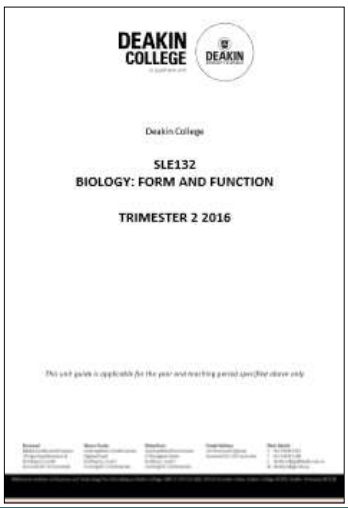
Please also include your student number

Emails are a professional communication
(not a text message), please use appropriate language

Please allow at least 24 hours for a response, and do not expect a response over the weekend

What you need for this unit

- Unit Outline and Study Guide
- Available on Moodle: Resources and Assessment section
- Unit Outline contains important information about assessments, due dates, special consideration applications etc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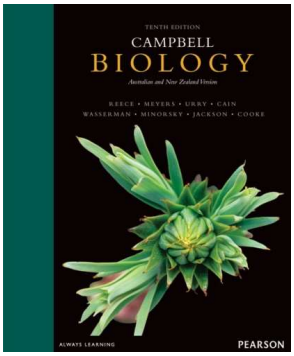
SLE132
BIOLOGY: FORM AND FUNCTION

TRIMESTER 2 2016

What you need for this unit

- Prescribed Text Book
  - Biology 12th edition (Campbell Biology 9th 10th or 11th editions are ok to use)
  - Available from the book shop and can also be used for SLE111 Cells and Genes



What you need for this unit

All resources for this unit are available on Moodle

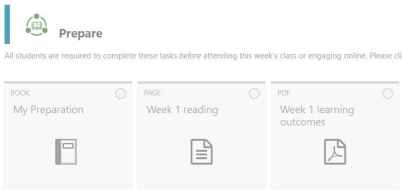
- Outline
- practical class timetable
- Quizzes
- practical (practical) manuals
- Lecture notes (you should also make your own notes)
- Tutorial questions
- Activities to do before class, in class and after class
- Assignment information
- Link to mastering biology course (recommended but optional)

Program

- 2 x 2 hour class every week
  - Lecture notes will be available on Moodle (at least 24 hours prior to the lecture) as will any important information for this unit.
- 5 x 3 hour practicals
  - Refer to Timetable (on Student Portal) for when practical classes are held
  - **Hurdle: submit and pass 4 out of 5 practicals**

Information for Classes

- Come to class prepared.
- Look at and complete any **Prepare activities** eg. Week 1:



- This may include activities to cover material that will be needed in class or material assessable in the mid-trimester test or exam.

Information for Classes

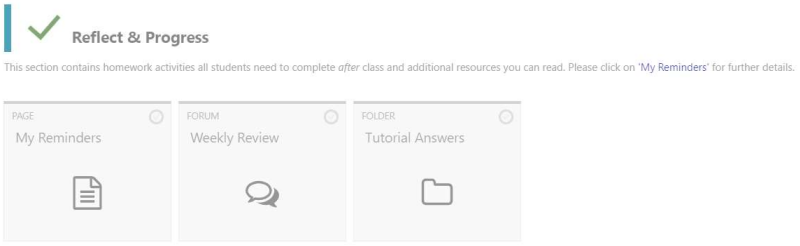
- Class notes and any relevant activities done in class are available on Moodle in the **Engage activities** section for each week.

Expectations:

- Attend class prepared to participate in activities and discussion.
- Make notes
- Respect the teacher and your peers
- Make the most of this time – ask questions!

Information for Classes

Reflect & Progress activities may involve completing required reading or consolidation activities for each week



Practical Classes

SLE010 Laboratory safety induction

- Need to complete this unit before attending any practical sessions (see course on Moodle)
- Online zero credit point unit
- Online quiz which you can attempt more than once but you need to pass this quiz before attending any practicals
- Does appear on your transcript but is not worth any credit points (no cost)

Practical Classes

Pre practical Quiz

- One for each practical (5 Quizzes, worth 1% each)
- Online through Moodle in **Practicals.**
- Open 9am 8 days before the practical and close 8pm the day before your practical class.
- 2 attempts allowed
- Time allowance is 20 minutes

Practical Classes

- Practical 1 and 5 have pre-practical tasks.
- These are available on Moodle in the **practicals** section.
- To be submitted with the practical worksheet

Practical Classes

- **Be prepared**
  - Pre read practical manual
  - Complete pre-practical quiz and tasks
- **What you will need**
  - practical manual and worksheet

  All available in practicals on Moodle

  - Appropriate PPE (lab coat, safety glasses)
  - Pencil and eraser
  - Ruler

  You will need to bring these materials

What should I do if I need an extension?

- Please fill out the **Request for Extension of Assessment Due Date form** – available on **StudentHub** and email it to your unit coordinator with any supporting documentation.
- Must be submitted in advance of the assignment due date (2 days is minimum)
- If you need assistance – seek our help early for assessments.

Assessment

- Practicals (including pre lab tasks) 35%
  Hurdle: submit and pass 4 out of 5 practicals
- Practical 4 Assignment 10%
- Mid semester Test – week 6 15%
  - Multiple choice test of 45 questions
  - Covers content from weeks 1 – 4
- Final exam 40%

Assessment – Practicals (35% total)

- **Hurdle: submit and pass 4 out of 5 practicals**

practical component	Percentage of final mark
Pre-practical 1 quiz practical 1 (including pre practical task)	1 % 7 %
Pre-practical 2 quiz practical 2	1 % 7 %
Pre-practical 3 quiz practical 3	1% 6 %
Pre-practical quiz 4 practical 4	1% 3 %
Pre-practical quiz 5 practical 5 (including pre practical task)	1% 7 %

Topic Outlines

Introduction to the unit and to the study of animals

- The place of animals in the tree of life
- Animals are classified using a hierarchical system first devised by Linnaeus
- Each animal species has a Latin name called a binomial
- Animals are multicellular, heterotrophic, eukaryotes
- There are many advantages to multicellularity

Summary of major points of the lecture

Reading

Biology 10th ed.: Chapter 26, p. 539 – 542; Chapter 32, p. 664

Suggested Readings

Assessing and applying your knowledge

Biology 10th ed.: Chapter 32, p. 675: Self-quiz question 1

Example questions

Topics in this Unit

1. The Structure and Function of Animals

2. The Structure and Function of Plants

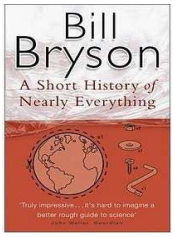
We will also briefly cover:

- Fungi
- Algae
- Animal Behaviour

How to Succeed

- Attend and participate in all classes and practicals **(actively participate and take notes)**
- Complete all pre reading for practical classes before completing pre lab quiz questions on Moodle
- Read the relevant sections from the text book for each lecture and attempt the questions in/at the end of the chapters
- Ask questions if you do not understand – don't suffer in silence!

Read and view widely

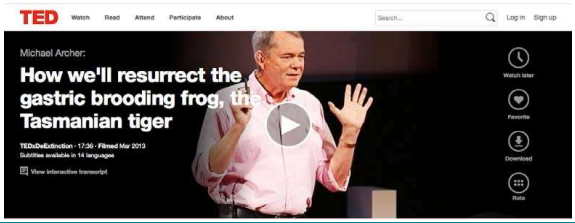


In addition to David Attenborough, Brian Cox …

•Bill Bryson. *A Short History of Nearly Everything*. 2003, Black Swan … a decade old, but still excellent

•*Nature*, *Science, New Scientist*

•TED talks. Technology, Entertainment, Design.



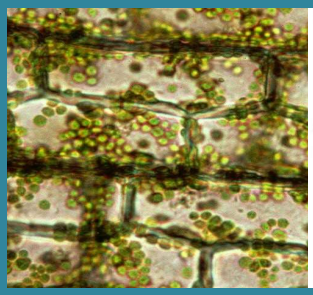
TED Ideas worth spreading

Class activity 1

In groups of 3 or 4 brainstorm some good study techniques or online study tips (5 – 10 minutes).

- Share your best three with the class.

SLE 132 – Form and Function
Introduction to the Study of Animals
& Diversity of Animals



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Learning Objectives

- What is the name and order of the 8 mandatory categories used to classify animals?
- How do you write the scientific name of a species?
- What does a phylogenic tree represent?
- What is meant by sister taxa and polytomy?
- How are the animals divided into groups according to their body plans (symmetry, tissue layers, presence or absence of body cavities)?

What makes an animal, an animal?

(or how might you explain what an animal is to a non-biology student?)

Introduction to the study of Animals

Kingdom Animalia - General Characteristics

- **Multicellular**
- **Eukaryotic cells** (lack cell wall)
- **Heterotrophic**
  - Need pre formed organic molecules
  - Digest food internally
- **Most are able to move**
  - Most have muscles and nervous tissue
- Cells held together by a protein called **collagen**

What is the advantage of being multicellular?

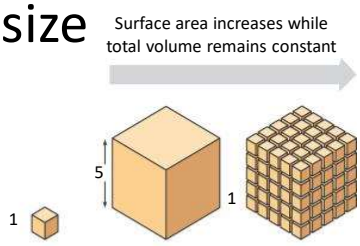
Single Celled organisms

- The cell is the basic unit of life
- **The smallest unit capable of survival and reproduction**
- Some organisms are composed of a single cell

Single Cells are limited by size

Due to the need to maintain high surface area to volume ratio

- To get adequate nutrients from environment
- To dispose of wastes
- Via diffusion



Total surface area (height × width × number of sides × number of boxes)	6	150	750
Total volume (height × width × length × number of boxes)	1	125	125
Surface-to-volume ratio (surface area ÷ volume)	6	1.2	6

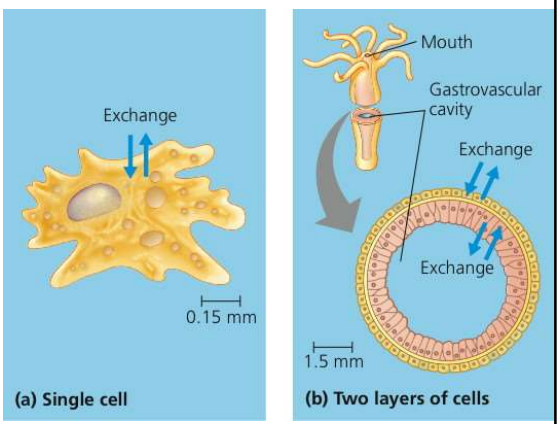
What drove evolution of multi-cellularity?

Advantages in being multicellular:

- **Division of labour increases efficiency**
  - Cell can specialise
  - Specialised cells are grouped into tissues
- **Increased size of the organism gives competitive advantage in:**
  - Obtaining energy (food)
  - Defence
  - Ability to exploit a wide range of environmental conditions

Challenges of being multicellular

- All cells need access to nutrients and oxygen
- All cells need to get rid of wastes
- Animals with simple structure
  - Cells in close contact with environment
  - Direct exchange
  - via diffusion and active transport

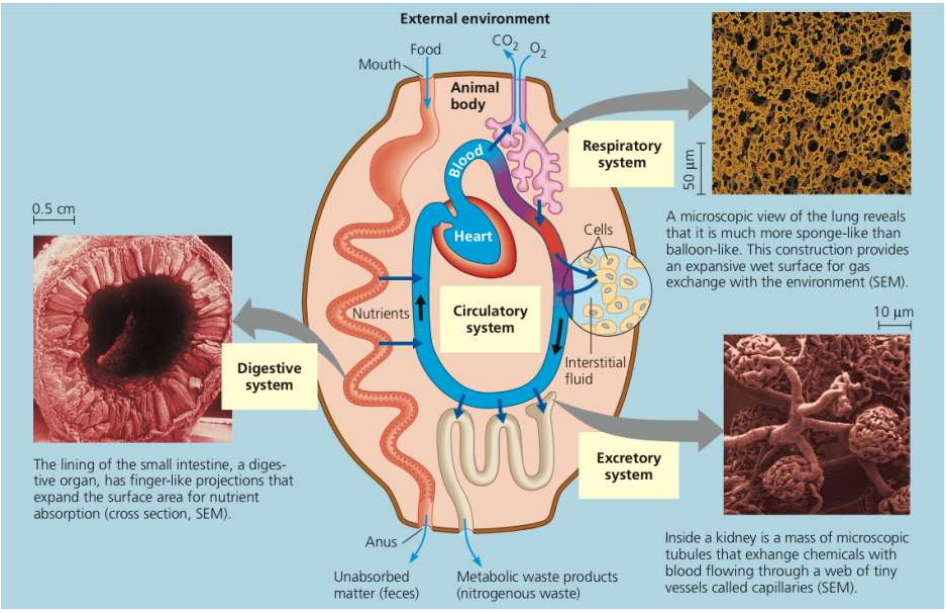


Animals with more complex structure

- Not every cell exposed to the environment.
- Indirect exchange of gasses/wastes/nutrients.
- <u>Need specialised internal surfaces</u> for exchange with the environment
  e.g. Lungs, digestive epithelium etc.
- Internal transport system needed.
- Allows for large sizes, greater complexity.

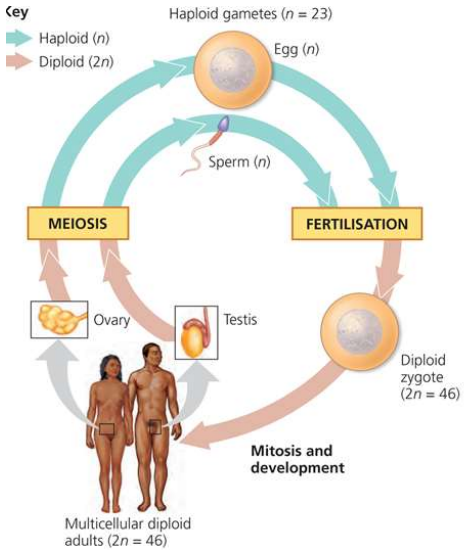
Larger and more complex animals require internal systems to transport substances towards/away from cells not in contact with the environment – discussed further in Week 3.

Exchange surfaces have high SA:V ratios to facilitate exchange.



Animals reproduce sexually

- **Somatic Cells** are diploid (contain 2 sets of chromosomes)
- **Gametes** (egg and sperm) are haploid (contain 1 set of chromosomes)
  - Produced via meiosis
- Haploid gametes fuse to form a diploid organism
- Allows for mixing of genes
  - More phenotypes upon which natural selection can work on

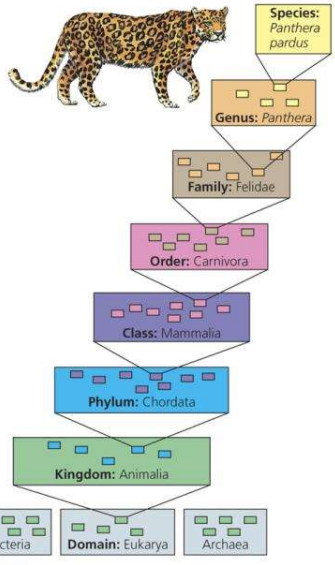


How do we name and group (classify) organisms?

- **Taxonomy** is the ordered division and naming of organisms.
- In the 18th century, Carolus Linnaeus published a system of taxonomy based on resemblances.
- Two key features of his system remain useful today: two-part names for species and hierarchical classification.

Hierarchical Classification

- Linnaeus introduced a system for grouping species in increasingly narrow categories.
- The taxonomic groups from broad to narrow are **domain**, **kingdom**, **phylum**, **class**, **order**, **family**, **genus**, and **species**
- A taxonomic unit at any level of hierarchy is called a **taxon**

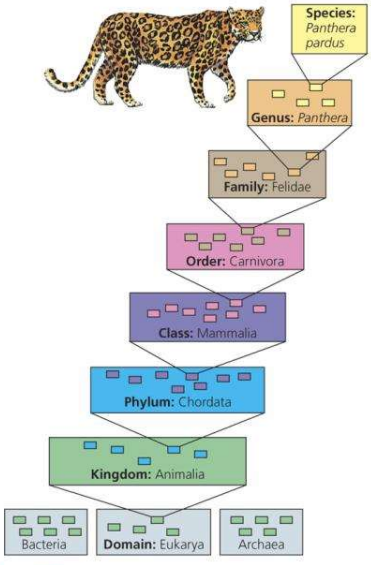


▲ **Figure 26.3 Hierarchical classification.** At each level of the Linnaean classification system, species are placed into groups belonging to more comprehensive groups.

This is one way to remember the Hierarchical classification system:

Kingdom = King
Phylum = Phillip
Class = Cried
Order = Oh
Family = For
Genus = Goodness
Species = Sake

The Three Domains

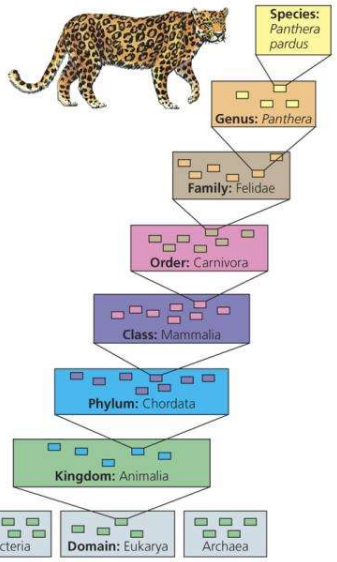


▲ **Figure 26.3 Hierarchical classification.** At each level of the Linnaean classification system, species are placed into groups belonging to more comprehensive groups.

Domain Eukarya

Cells with DNA enclosed in a nucleus and containing organelles

Eukarya includes Animals, Plants, Fungi and the Protists.



▲ **Figure 26.3 Hierarchical classification.** At each level of the Linnaean classification system, species are placed into groups belonging to more comprehensive groups.

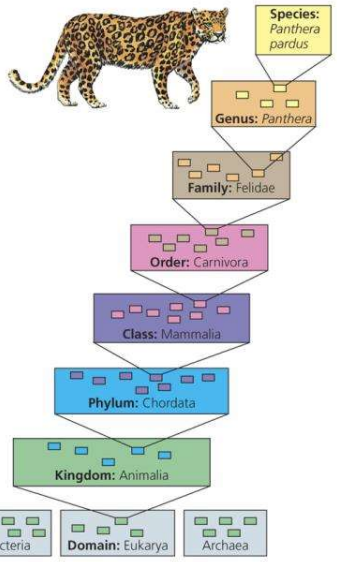
Kingdom Animalia

Multicellular, Eukaryotic, Heterotrophs

Animals are then grouped into Phyla according to **fundamental differences in body plan**.

Examples

- Phylum Annelida
- Phylum Arthropoda
- Phylum Chordata



▲ **Figure 26.3 Hierarchical classification.** At each level of the Linnaean classification system, species are placed into groups belonging to more comprehensive groups.

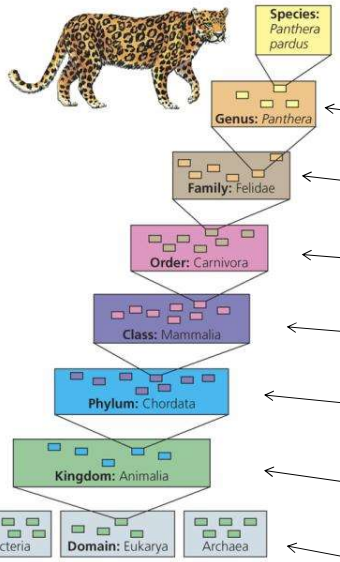
Phylum Chordata

Animals with a hollow dorsal nerve cord.

Animals in one **Phylum** can be grouped into **Classes**

Examples

- Class Amphibia
- Class Reptilia
- Class Mammalia



▲ **Figure 26.3 Hierarchical classification.** At each level of the Linnaean classification system, species are placed into groups belonging to more comprehensive groups.

Leopards

Big Cats

All Cats

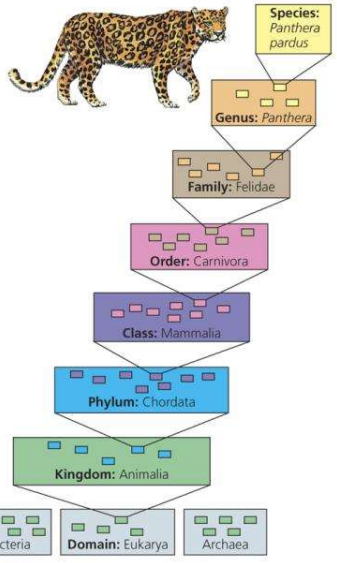
Meat eating mammals

Mammary Glands
(Feed young with milk) Hair etc.

Animals with a hollow dorsal nerve cord

Multi cellular, heterotrophic eukaryotes

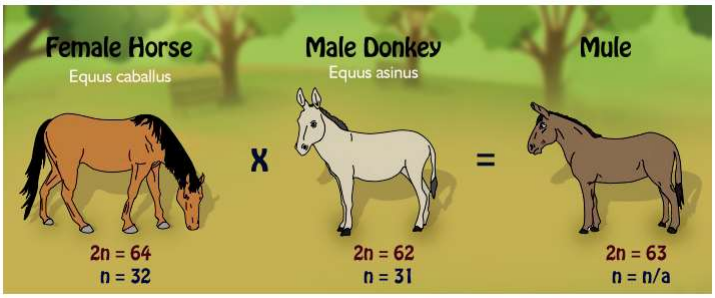
Cells with Nucleus and Organelles



▲ **Figure 26.3 Hierarchical classification.** At each level of the Linnaean classification system, species are placed into groups belonging to more comprehensive groups.

Species is the grouping of those individuals that have similar physical characteristics and genetics and **can interbreed, producing fertile offspring.**

Sometimes though, we end up with sterile hybrids (eg: ligers, zebroids, mules)



https://www.scienceabc.com/nature/animals/why-cant-mules-have-babies.html

Binomial Nomenclature

- More than **1.3 Million species** of animals named to date
  - Less than 20% all living species
  - Total number? 10 million to 200 million
- **Common names can be confusing:**
  - For example 'Butterfly' – this is the common name for maybe hundreds of species, 'fly', 'jellyfish', 'fish' etc.
  - Horny Toad, is a lizard not a toad, etc.

Binomial Nomenclature

- Formal naming system with a set of international rules
  - Better communication between scientists speaking any language
  - Based on a Binomial (two name) system derived from Linnaeus in 1700's
  - For example a dog's scientific name is *Canis familiaris*

https://www.youtube.com/watch?v=Gb_IO-SzLgk

Pelecanus onocrotalus

First part: genus to which the species belongs

Second part: name just for one particular species in the genus

Rules

- First letter of genus is in capitals
- Lower case for species name
- Whole binomial is typed in italics – (if handwritten you underline).
- Naming is Latinised

Classification and Phylogeny

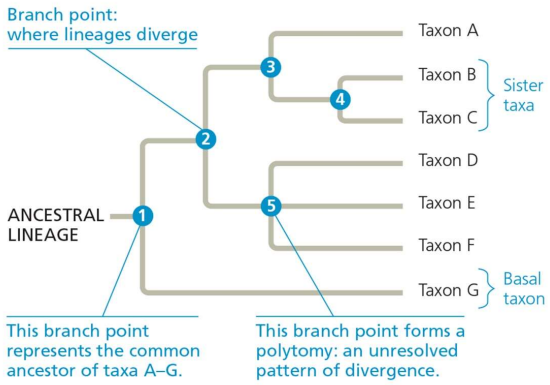
- **Phylogeny** – the evolutionary history of a species or group of species (evolutionary relationships)
  - Based on fossils, morphologies, molecules, genes…
- **Phylogenetic Tree** – represents a hypothesis about evolutionary relationships
  - These trees can change as more information comes to light such as molecular data. Thus species can be reclassified and moved on the tree

Information from phylogenetic tress

- Depict the evolutionary events and hence evolutionary relationships

Branch point 2 represents <u>divergence</u> from recent, common ancestor **(monophyletic group)**

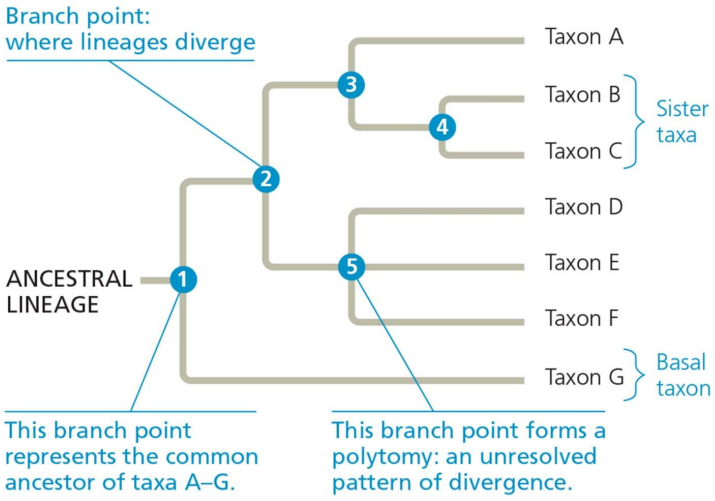
Shows that species B and C are **sister taxa**, evolved from an immediate common ancestor



▲ **Figure 26.5** How to read a phylogenetic tree.

Point 5 represents **Polytomy**

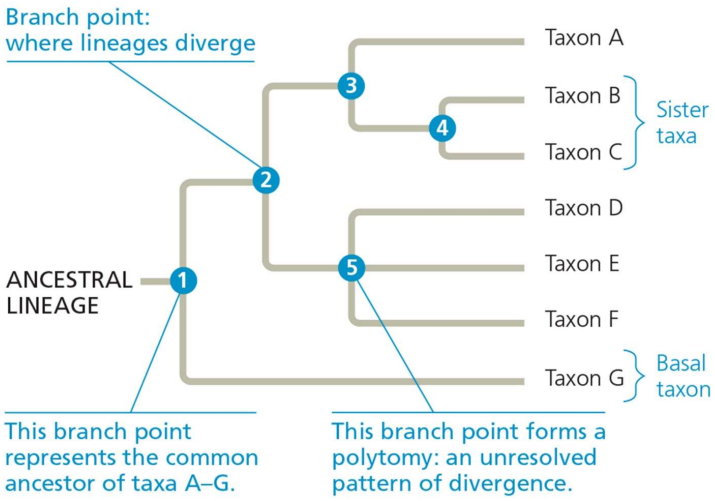
- More that two descendent groups.
- Evolutionary relationships unclear



▲ **Figure 26.5** How to read a phylogenetic tree.

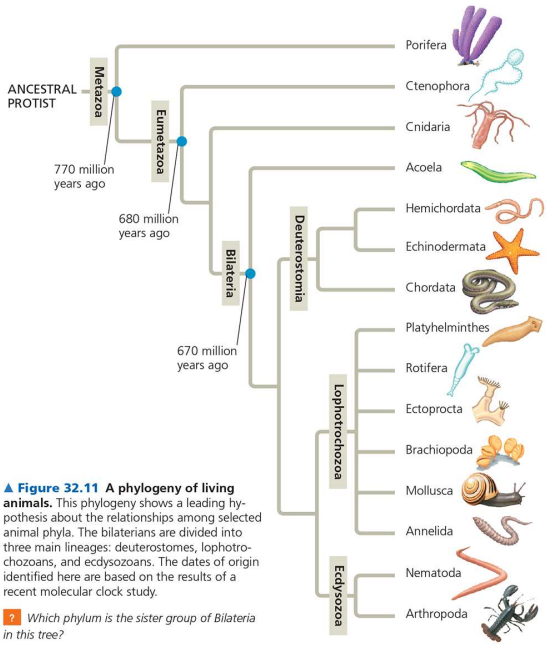
Point 1 represents **basal branch point**.

- Indicates a common ancestor of all species



▲ **Figure 26.5** How to read a phylogenetic tree.

Phylogenetic Tree – Animals



▲ **Figure 32.11 A phylogeny of living animals.** This phylogeny shows a leading hypothesis about the relationships among selected animal phyla. The bilaterians are divided into three main lineages: deuterostomes, lophotrochozoans, and ecdysozoans. The dates of origin identified here are based on the results of a recent molecular clock study.

? *Which phylum is the sister group of Bilateria in this tree?*

Quick Question

The scientific name of an organism is composed of two names. The first part identifies the _____ while the second part designates the _____?

A. Genus; species
B. Species; genus
C. Genera; genus
D. Phylum; species
E. Family; species

Quick Question

Scientific names…..

A. Are always written in capital letters and in italics
B. Are always written in italics in lower case
C. Are always written in lower case and underlined
D. Are always written in italics with both genus and species capitalized
E. Are always written in italics with only the first letter of the genus name in capitals