

SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

**I. Birds are very distinctive vertebrates. They all have:**

**A. Feathers - unique covering**

**B. Wings - forelimbs modified into wings**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **C. Light, rigid skeleton**

**1. Bones are thin and almost hollow (lightweight)**

**2. Some bones are fused, making skeleton rigid**





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **D. Endothermic**

**1. Very rapid metabolism - high energy requirement**

**2. Body temperature of 104-106°F**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **E. Unique Respiration**

**1. Most efficient of any land vertebrate**

**2. Air sacs are connected to lungs**

**F. Beak - birds do not have teeth; their beak determines what they eat**





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **G. Oviparous reproductive pattern**

**1. Lay amniotic eggs**

**2. Most are incubated by one or both parents**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

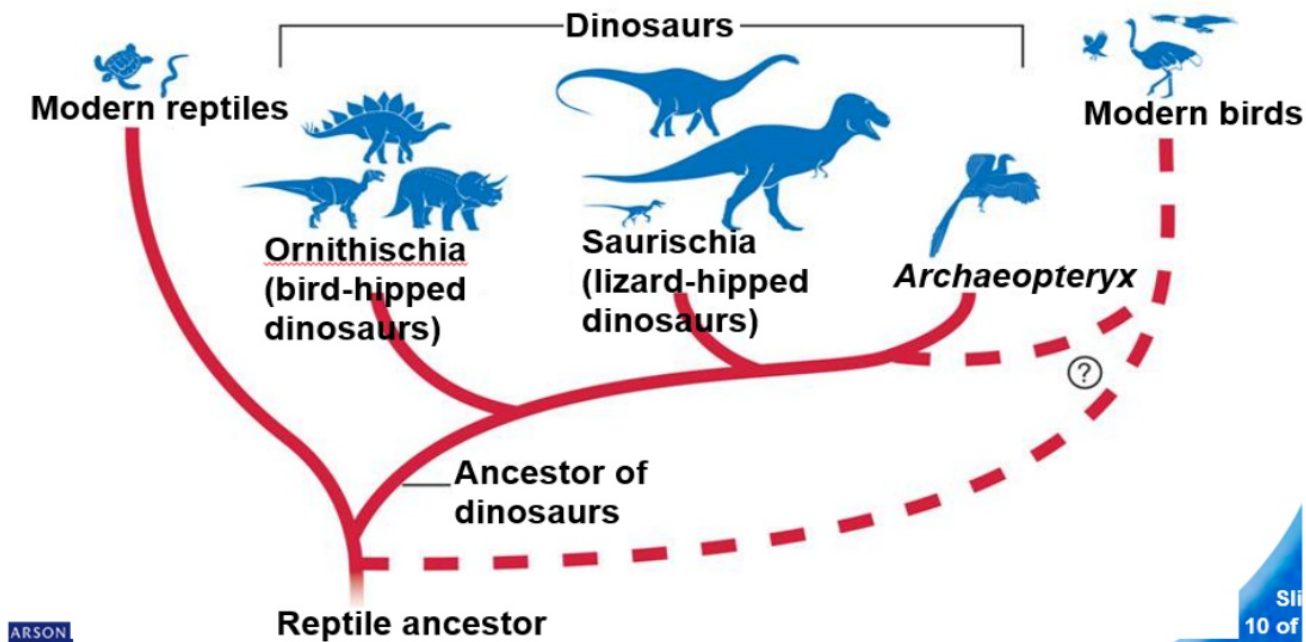
EQ. What are the characteristics of Birds?

## Class Aves - Includes all birds

### II. Evolution of Birds

#### A. Paleontologists agree that birds evolved from extinct reptiles

1. Embryos of birds and reptiles develop within amniotic eggs
2. Both excrete wastes as uric acid
3. Bones that support limbs are similar in both groups





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

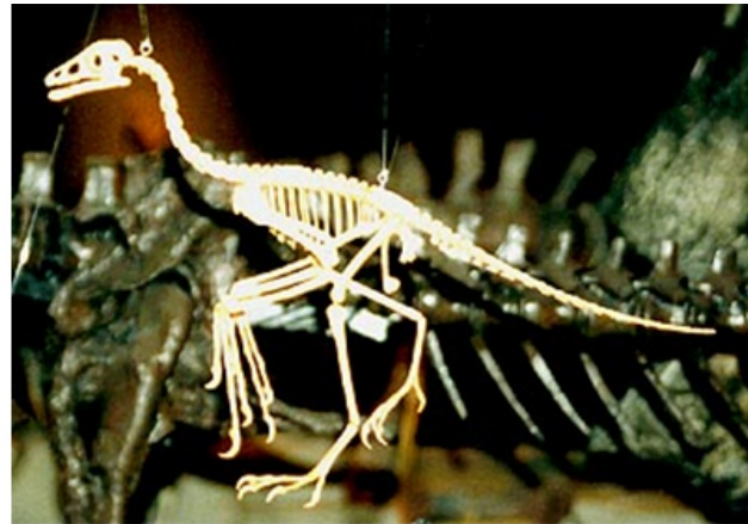
SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **B. *Archaeopteryx* was the first birdlike fossil discovered**

- 1. Looked like a dinosaur but has feathers**
- 2. Had teeth in its beak, a bony tail, and toes and claws on wings**
- 3. May be transitional species between dinosaurs and birds**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

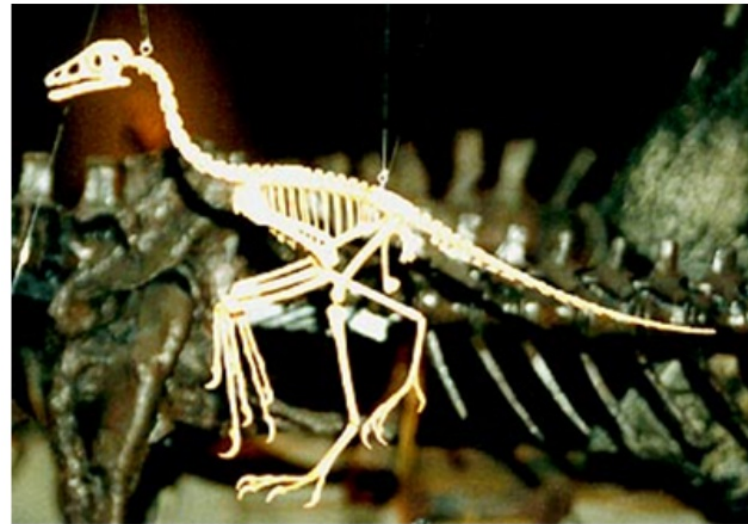
EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

**C. Other evidence leads some to hypothesis that birds and dinosaurs both evolved from an earlier common ancestor**

**1. Bird origin is not completely resolved**

**2. New fossils of ancient birds are still being found**





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **III. Form and Function**

#### **A. Feathers - made of protein**

- 1. Preening - Birds use beaks to rub oil over feathers (grooming)**
- 2. Down feathers - soft and fluffy; provide insulation**
- 3. Contour feathers - used for flight; gives bird shape and coloration; also provides insulation**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **B. Skeletal/Muscular**

- 1. Thin and hollow bones provide light but strong skeleton**
- 2. Many bones are fused; helps provide stability during flight**
- 3. Flight involves complex wing movements made possible by powerful flight muscles**
- 4. Flight muscles are attached to sternum (breastbone)**





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **C. Body Temperature**

- 1. Birds are endothermic - rapid metabolism**
- 2. Cannot go long without eating; need a lot of energy**
- 3. Will fluff feather to conserve heat**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

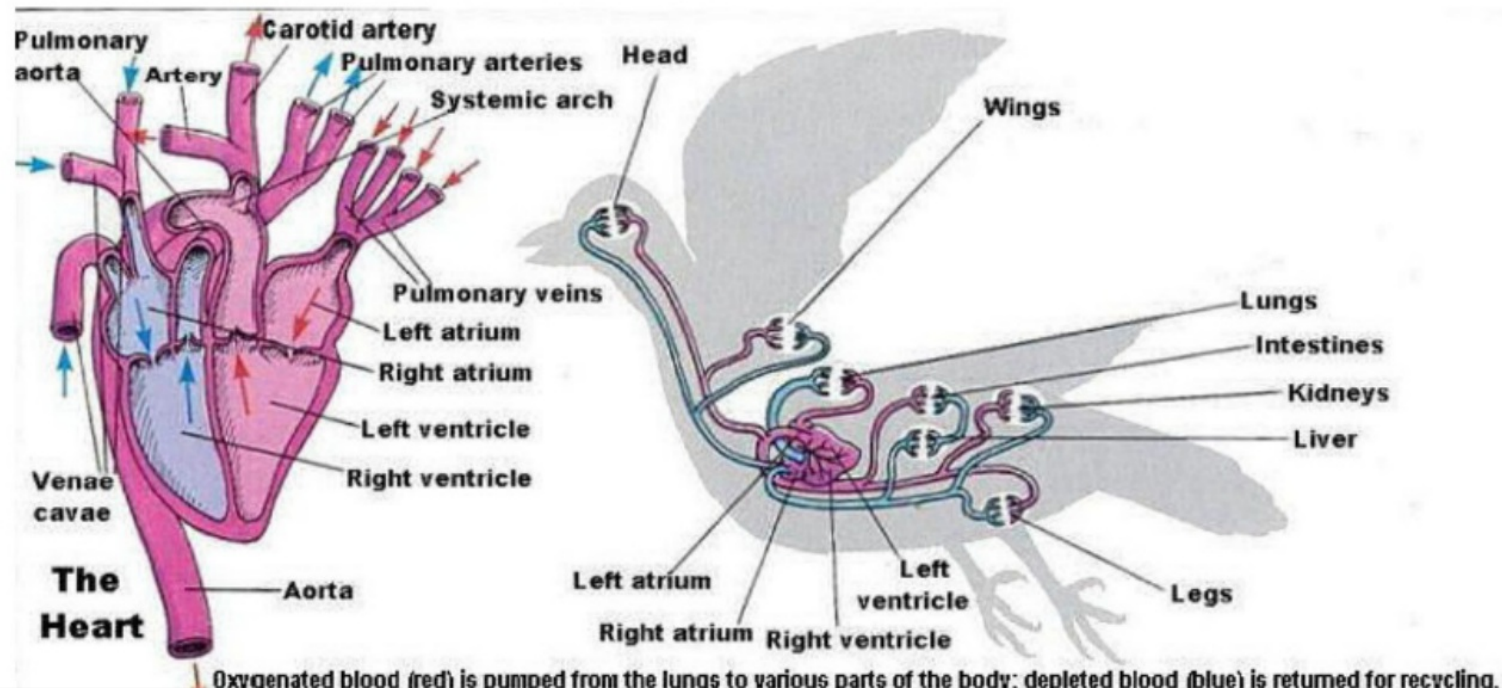
SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## Class Aves - Includes all birds

### D. Circulation - closed, double loop

1. 4-chambered heart - 2 atria and 2 ventricles
2. Pulmonary and Systemic loops (see previous notes for description of each loop)
3. O<sub>2</sub>-Rich and O<sub>2</sub>-Poor blood do not mix
4. Heartbeat varies among species, but is very rapid





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

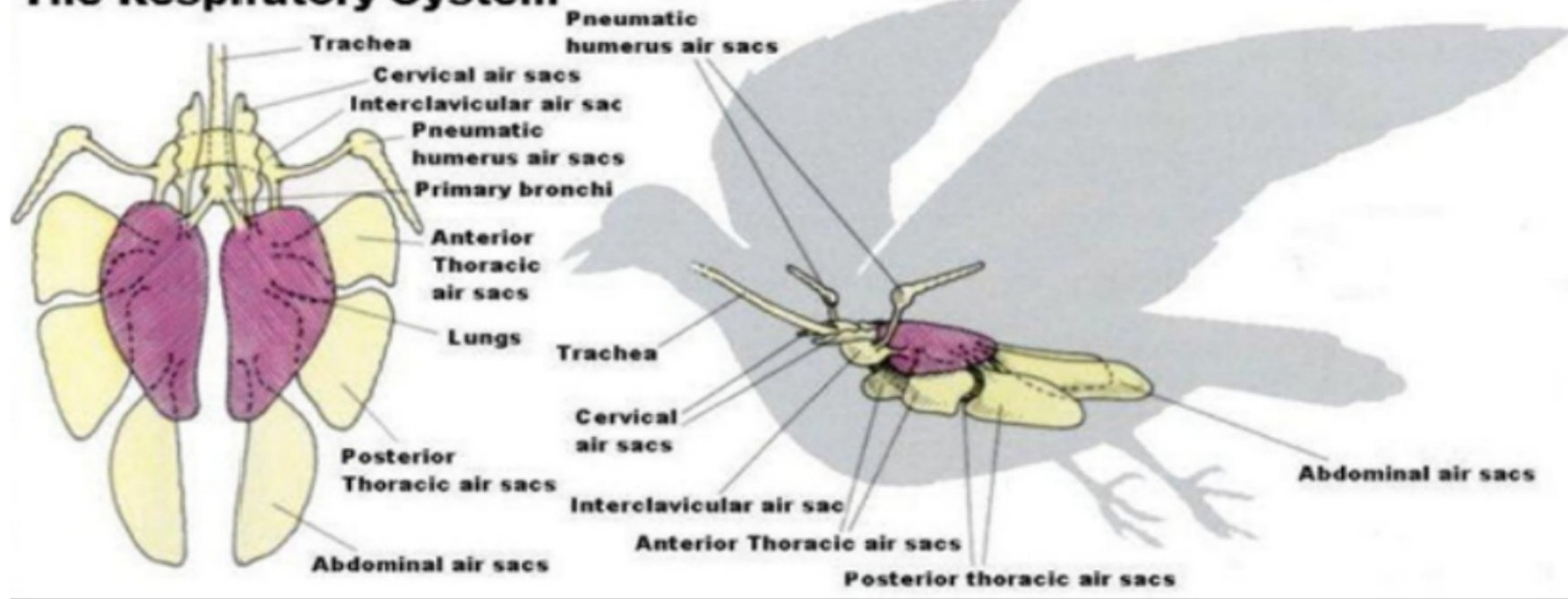
EQ. What are the characteristics of Birds?

## Class Aves - Includes all birds

### E. Respiration

1. All birds have lungs with air sacs attached
2. High metabolism requires large amount of available O<sub>2</sub>
3. Air sacs connected to lungs store air (no gas exchange in air sacs)
4. This ensures that oxygenated air is always in lungs

### The Respiratory System



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

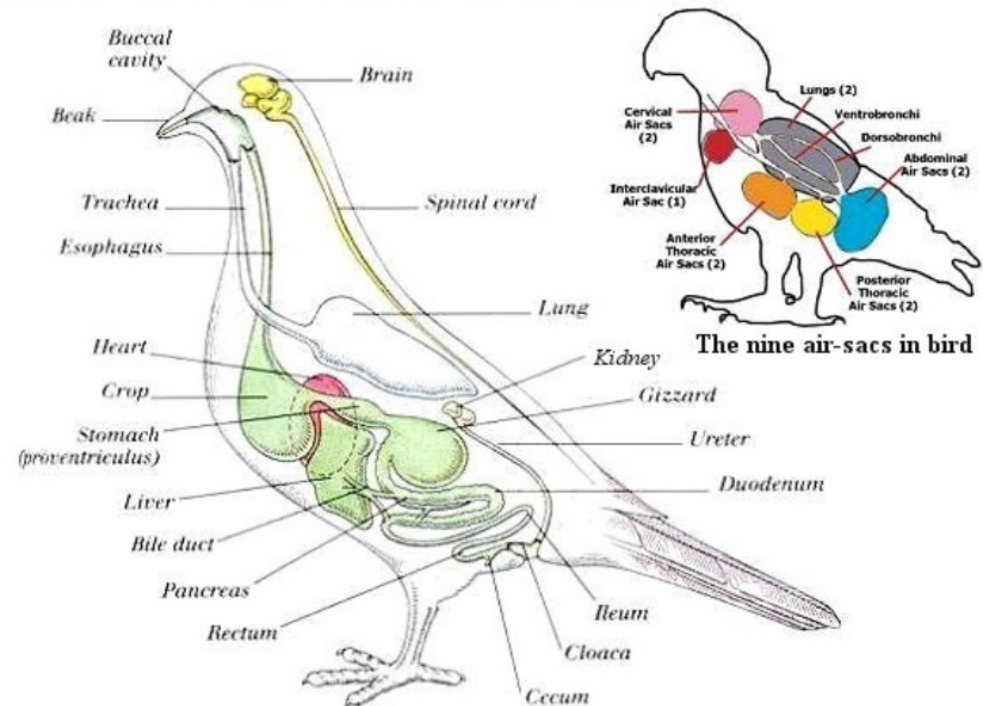
SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## Class Aves - Includes all birds

### F. Excretory

1. System is efficient and lightweight
2. Kidneys filter uric acid from blood
3. Uric acid moves to cloaca, mixes with feces, and is eliminated
4. Birds do not have a urinary bladder (storing urine adds unnecessary weight)
5. Bird "droppings" are a mixture of feces and uric acid





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

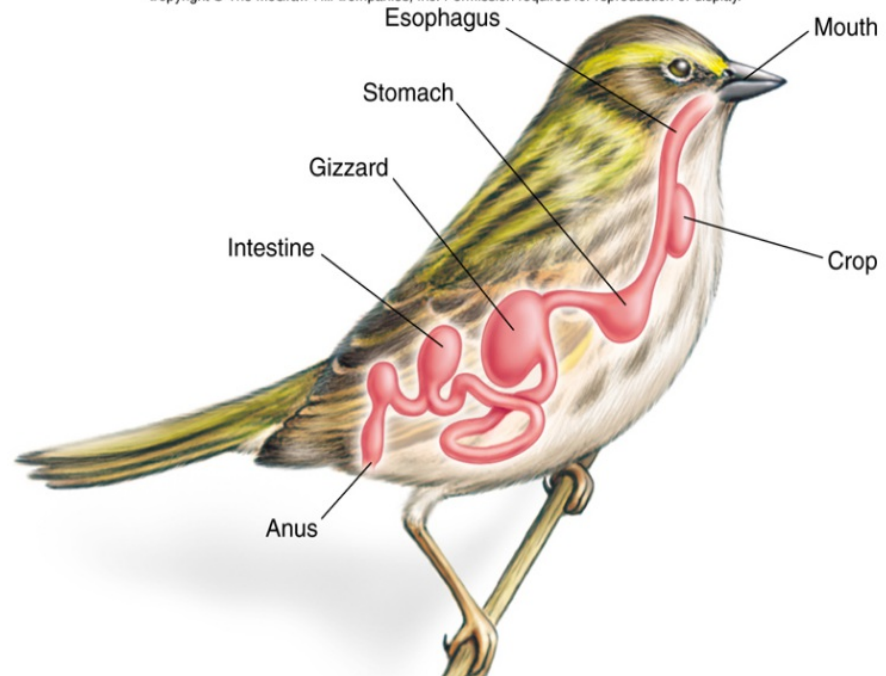
EQ. What are the characteristics of Birds?

## Class Aves - Includes all birds

### G. Digestion

1. Birds don't have teeth, so food cannot be chewed
2. Beaks determine diets
3. Digestive route: Mouth > Esophagus > Crop (stores and moistens) > Stomach (begins digestion) > Small Intestine (completes digestion and absorbs nutrients) > Large Intestine > Cloaca
4. Some birds also have a gizzard (mechanical digestion - grinds food)

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## Class Aves - Includes all birds

### H. Nervous

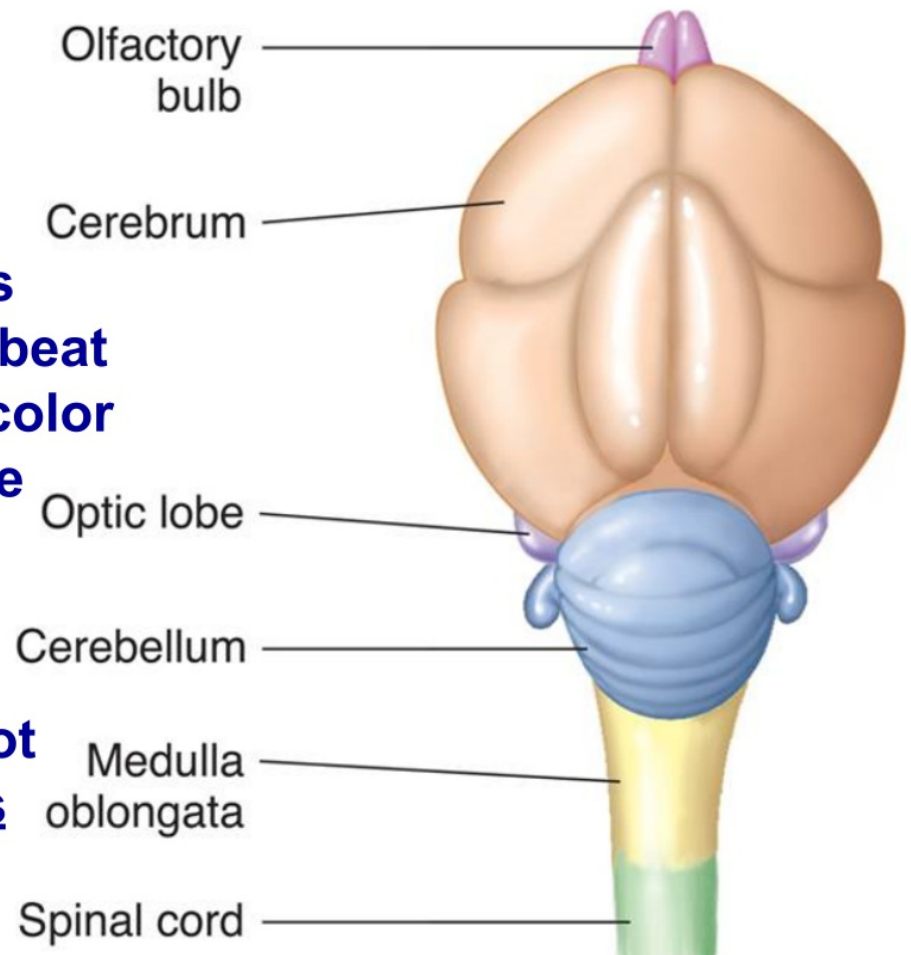
#### 1. Large brain for their size

- Cerebrum - large, controls flight, nest-building, care of young, courtship, and mating
- Cerebellum - well-developed, controls movement
- Medulla oblongata - coordinates basic body processes, ex. heartbeat

2. Sharp vision - most have good color vision and wide field of vision - sizable optic lobes

3. Hearing - very important to nocturnal birds

4. Senses of taste and smell are not well developed - small olfactory bulbs





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **I. Reproduction/Parental Care**

- 1. Internal Fertilization; Oviparous - lay amniotic eggs**
- 2. Usually lay eggs in some type of nest**
- 3. 1 or both parents incubate eggs**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## Class Aves - Includes all birds

### 4. Baby birds are either:

- Precocial

- Active when they hatch - can walk, swim, feed themselves
- Lay many eggs and incubate for long periods
- Ex. Duck, Quail

- Altricial

- Blind, naked, and helpless when they hatch
- Depend on parents for several weeks
- Lay a few eggs that hatch quickly
- Ex. Hawk, Eagle





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **J. Movement**

- 1. Not all birds fly**
- 2. Some walk or run (ostriches)**
- 3. Some swim (penguins)**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **IV. Ecology of Birds**

**A. Birds can help control insect populations**

**B. Some pollinate plants and disperse seeds over great distances**

**C. They can serve as indicators of environmental health**

**D. Many birds migrate seasonally over long distances using stars and landmarks as guides**





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

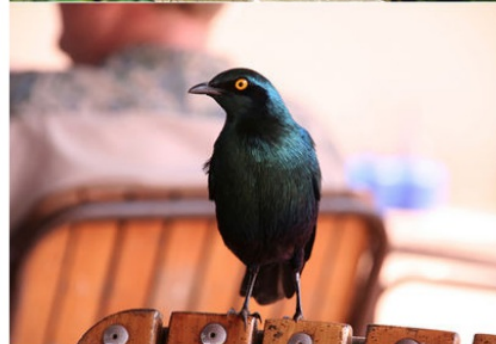
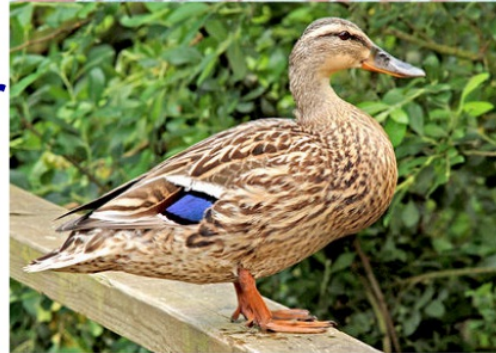
SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **V. Taxonomic Classification of Birds**

- 1. Kingdom Animalia**
  - 2. Phylum Chordata**
  - 3. Subphylum Vertebrata**
  - 4. Class Aves**
  - 5. Orders: There are nearly 30 orders of birds, so we will group them based on their adaptations.**
- \*Fig 31-19, p. 813**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **A. Order Ciconiiformes**

#### **1. Pelicans and their relatives**

- **Found in aquatic ecosystems (oceans, rivers, and lakes)**
- **All have four toes connected by a web**
- **Examples: pelicans, cormorants, boobies, and frigatebirds**





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **2. Herons and their relatives**

- **Adapted to wading in aquatic habitats**
- **Examples: storks, ibises, spoonbills, herons, cranes, flamingoes**



©Nick Athanas

SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **B. Order Falconiformes**

#### **1. Birds of prey**

- **Also known as raptors**
- **Fierce predators with hooked bills, large wingspans, and sharp talons**
- **Examples: condors, hawks, eagles, falcons**





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **C. Order Strigiformes**

- **Also included in birds of prey**
- **Fierce predators with hooked bills, large wingspans, and sharp talons**
- **Nocturnal**
- **Examples: owls**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **D. Order Psittaciformes**

#### **1. Parrots**

- **Colorful and noisy**
- **Use feet to hold food**
- **Examples: macaws, lovebirds, cockatoos**





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **E. Order Passeriformes**

#### **1. Perching Birds**

- **Also called passerines**
- **Largest order of birds**
- **Many are songbirds**
- **Examples: sparrows, crows, mockingbirds, cardinals**



SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **F. Order Piciformes**

#### **1. Cavity-nesting birds**

- **Multicolored birds**
- **Live in holes they make in trees, mounds, or underground tunnels**
- **Examples: barbet, toucans, woodpeckers**





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **G. Order Struthioniformes**

#### **1. Ostriches and their relatives**

- **Flightless birds**
- **Move by running or swimming**
- **Examples: ostriches, rheas, emus, cassowaries, kiwis**





SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.

EQ. What are the characteristics of Birds?

## **Class Aves - Includes all birds**

### **H. Order Galliformes**

#### **1. Fowl-like birds**

- **Ground-dwelling birds**
- **They have short, stout bills, short wings and are poor fliers**
- **Heavy feet with short, strong claws for running or scratching the ground**
- **Examples: peacocks, chickens, turkeys**





