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

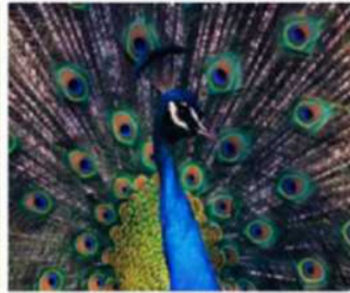
EQ. What are the characteristics of Birds?

Class Aves - Includes all birds

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

A.

B. Wings - forelimbs modified into wings



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C. Light, rigid skeleton

- 1.
- 2.



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D.

- 1. Very rapid metabolism - high energy requirement**
- 2. Body temperature of**



Why do you think birds have high energy requirements?

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- E.
1. Most efficient of any land vertebrate
 2. Air sacs are connected to lungs

F. Beak -



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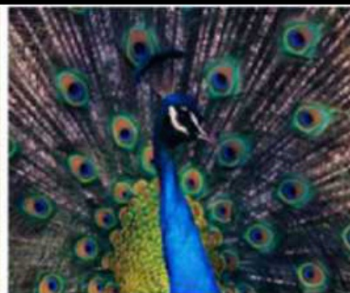
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G. Oviparous reproductive pattern

1. Lay amniotic eggs

2.



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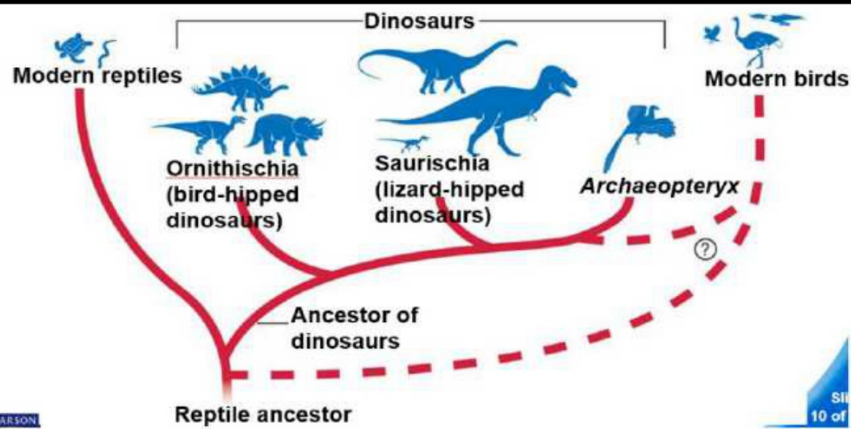
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II. Evolution of Birds

A. Paleontologists agree that birds evolved from extinct reptiles

- 1.
- 2.
- 3.



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B. *Archaeopteryx*

- 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**



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

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- 2.



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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**



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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)**



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C. Body Temperature

1. Birds are endothermic - rapid metabolism

2.

3.



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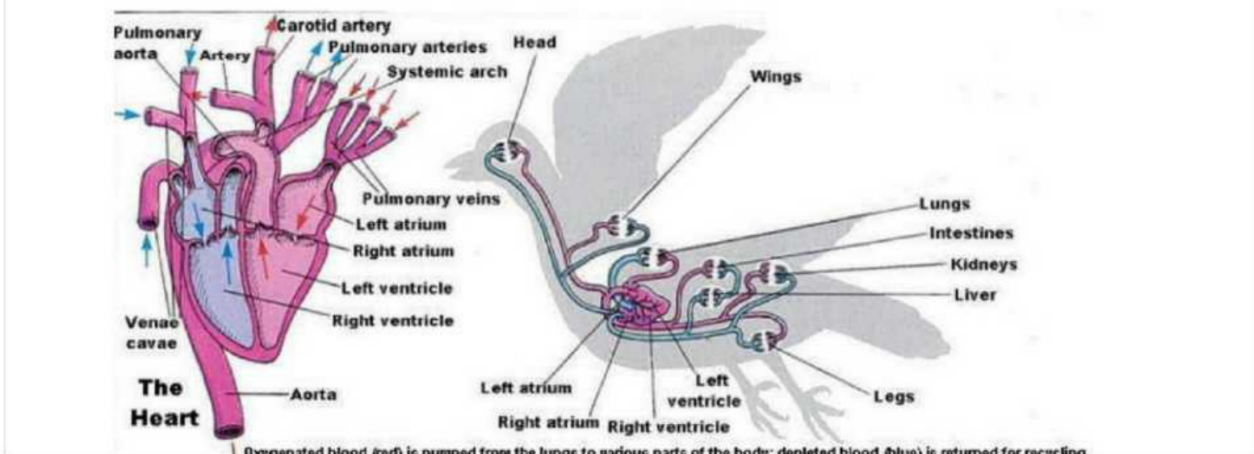
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D. Circulation - closed, double loop

1. 4-chambered heart - 2 atria and 2 ventricles
2. Pulmonary and Systemic loops (see previous notes for description of each loop)
3. O₂-Rich and O₂-Poor blood do not mix
4. Heartbeat varies among species, but is very rapid



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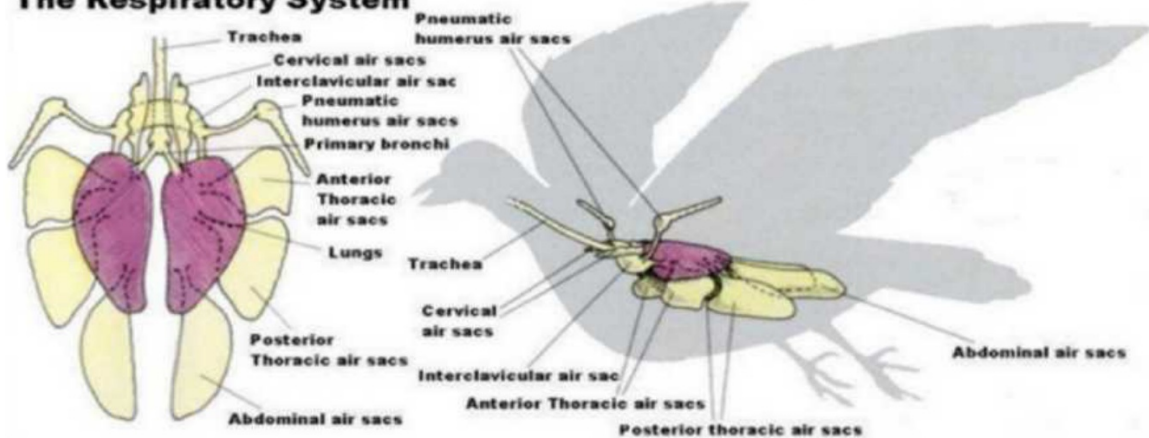
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E.

1. All birds have lungs with air sacs attached
2. High metabolism requires large amount of available O_2
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



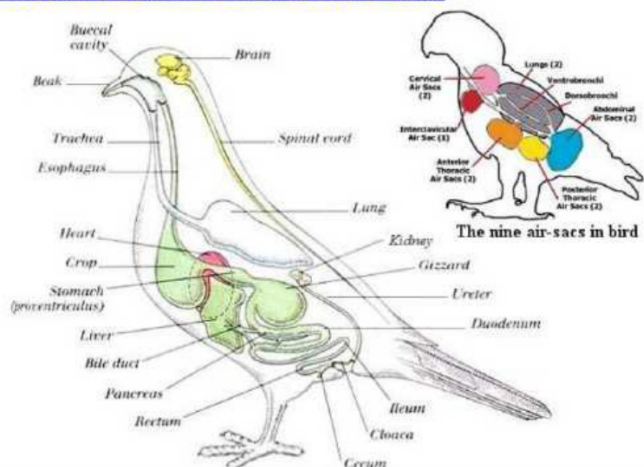
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F.

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



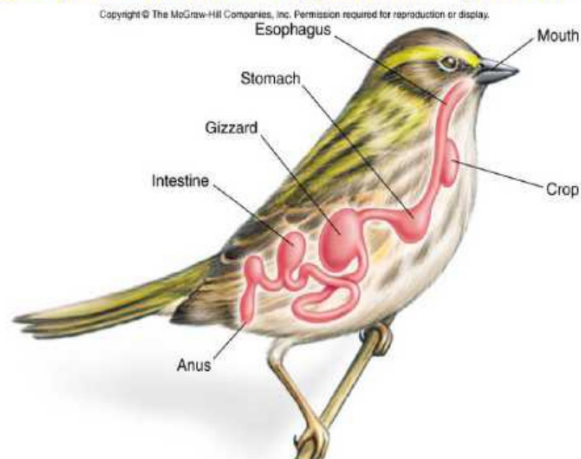
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G. Digestion

1. 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)



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I.

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



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IV.

- 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**



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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**



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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**



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2. Herons and their relatives

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



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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**



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C. Order Strigiformes

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



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D. Order Psittaciformes

1. Parrots

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



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E. Order Passeriformes

1. Perching Birds

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



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F. Order Piciformes

1. Cavity-nesting birds

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



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G. Order Struthioniformes

1. Ostriches and their relatives

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



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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**



