BIRD BODY SYSTEMS

INTEGUMENTARY:

Thin skin, scales on legs; Feathers are modified scales/made of KERATIN/grow from follicles in skin; MOLT (shed) feathers annually; can regrow lost or damaged feathers RACHIS = center shaft; VANES = 2 side sections made of BARBS ; BARBULES = hooks that lock barbs together for strength and to catch air Feather functions= provide lift in flight/ preserve body heat/attract a mate/hide from predators Rub feathers with oil from PREEN GLAND to keep in order/make waterproof; CONTOUR feathers give shape/color; DOWN feathers-cover babies/ give warmth to adults CERE- skin near beak; NICTITATING MEMBRANE protects eyes;

SKELETAL/MUSCULAR

Bones are HOLLOW; air sacs extend into some long bones to make them less dense; some bones fused for strength: FURCULA (fused collarbones) = "wishbone"- stabilizes shoulders; PYGOSTYLE- fused lower vertebrae- supports tail STERNUM- attaches flight muscles (LARGE PECTORALIS muscle);

DIGESTIVE:

No teeth;/BEAK; beak shape depends on diet

High energy requirements for heat/flight require food to move through fast

CROP (enlargement of esophagus) STORES & MOISTENS FOOD/

no digestion here; allows birds to eat when stomach is full so food always moving through system;

Food fuels high metabolism (ENDOTHERMIC) so more energy for extended activity (flying)

2 part STOMACH:

PROVENTRICULUS: acid & digestive enzymes break down food

GIZZARD (muscular portion of stomach/contains small stones)

Kneads & crushes food/replaces teeth; rocks here aid in grinding

SMALL INTESTINE: DUODENUM- bile/trypsin added here; finish digestion ILEUM:/absorb nutrients

LARGE INTESTINE (COLON): removes water/concentrates digestive waste; CLOACA;

LIVER: makes bile (to digest FATS) ; stores glycogen & vitamins; processes nitrogen waste for kidneys; GALL BLADDER stores bile;

PANCREAS: makes insulin & glucagon to control blood sugar; makes TRYPSIN to digest proteins;

COLIC CAECA = pouches at junction of small/large intestine contain microorganisms to help digest plant material (cellulose)

RESPIRATORY

Super efficient respiratory system to meet high oxygen demand of flight

Air in through EXTERNAL NARES on BEAK; TRACHEA; BRONCHI; LUNGS with ALVEOLI

SYRINX (voice box) near junction of trachea and bronchi

9 Extra AIR SACS extend from lungs; some air sacs extend into bones;

No gas exchange in air sacs/just store air; Movement of air between lungs/air sacs keeps oxygen rich air in lungs on BOTH INHALE AND EXHALE;

CIRCULATORY- 4 chambers/2 loops

Heart large for body size;

RAPID heartbeat compared to other vertebrates; 4 CHAMBER heart most efficient; 2 ATRIA; 2 VENTRICLES; HIGH/LOW oxygen blood kept separate by



COMPLETE SEPTUM in ventricle;

Largest vein returning to heart from body = VENA CAVA;

Largest Artery leaving heart to body organs = AORTA PULMONARY ARTERIES carry blood to the lungs

PULMONARY VEINS return blood from the lungs

SPLEEN makes, stores, and recycles red blood cells; RBC's have NUCLEI

<u>ENDOCRINE</u> - HIGH metabolism provides energy for flight and body heat THYROID GLAND controls heart rate, blood pressure, rate of metabolism PANCREAS- regulates blood sugar (insulin-cells take up & store glucose; glucagon- cells release glucose)

EXCRETORY

NO URINARY BLADDER so lighter weight for flight

Nitrogen waste in form of URIC ACID removed by KIDNEYS

(least toxic form , needs least water to dilute); urine moves through URETERS to CLOACA

NERVOUS

Large BRAIN for their body size; Most highly developed areas are for flight control Larger CEREBELLUM (muscle coordination);

Larger CEREBRUM (higher thinking; learning) allows more complex behavior like: nest building; mating; navigation; caring for young

OPTIC LOBES for keen vision/ see color; Some store iron in brain for navigation (acts as compass) Eyes in front gives 3D vision (predators); Eyes on side of head gives wide field of vision (prey birds) Good hearing for catching food/hearing predators; mating songs; No external ears; TYMPANIC MEMBRANE inside head like ours

REPRODUCTIVE - OVIPARITY

Separate sexes/INTERNAL fertilization; birds press CLOACA together Males: Sperm from TESTES via VAS DEFERENS (pl. VASA DEFERENTIA) to CLOACA<u>;</u> Females: single OVARY & OVIDUCT on left side; Shrink when not breeding; eggs fertilized & albumen/shell added in OVIDUCT; CALCIUM added to shells for strength;

Eggs leave body via CLOACA; Lay eggs in nests; parents keep eggs warm using featherless BROOD PATCH;

Parents care for babiesCOLUMBIFORMES make CROP MILK (milk-like fluid) to feed young

2 kinds of young:

precocial= many eggs; long incubation; young can walk, feed self right after hatching (ground nesters: ducks, pheasant, geese)

Altricial = few eggs; short incubation; babies blind, naked, helpless for weeks; parents must care for them (hawks, pigeons, parrots, songbirds)

BEHAVIOR

Nesting/complex mating behavior/songs Migration-Store fat for energy; Navigate by: position of sun/stars; geographical landmarks; can sense Earth's electromagnetic field; changes in air pressure;

MISCELLLANEOUS

Deuterostomes (blastopore becomes anus) Eucoelomates Vertebrates Endothermic (warm-blooded) Birds are largest class of land vertebrates. Evolved from small carnivorous dinosaurs 150 million years ago. Oldest known bird is Archaeopteryx had some characteristics of dinosaurs (teeth, claws on wings, long tail) Ornithology = study of birds PHYLUM: Chordata SUBPHYLUM: Vertebrata CLASS: Aves (Latin: Plural of "avis" meaning "bird") ORDER: Columbiformes (pigeons and doves)

CHARACTERISTICS OF BIRDS:

Feathers/Wings Lightweight/strong skeleton 4 chamber heart ENDOTHERMIC (warm blooded) Super efficient respiratory system Beak Lay Amniotic eggs (Oviparity)