ZOOLOGY

ASSIGNMENT

Submitted by:

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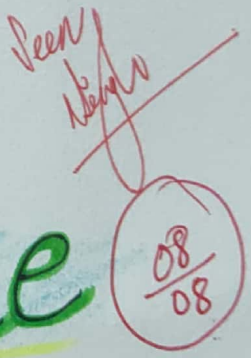

Submitted to

Dr. Neetu Singh

Topic :-

FLIGHT ADAPTATION & MIGRATION IN BIRDS

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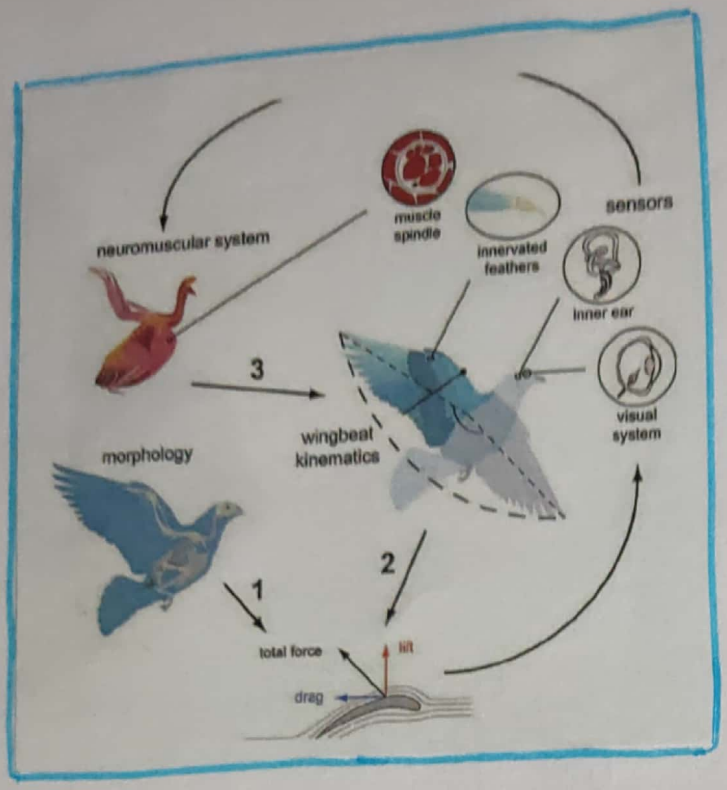
INTRODUCTION

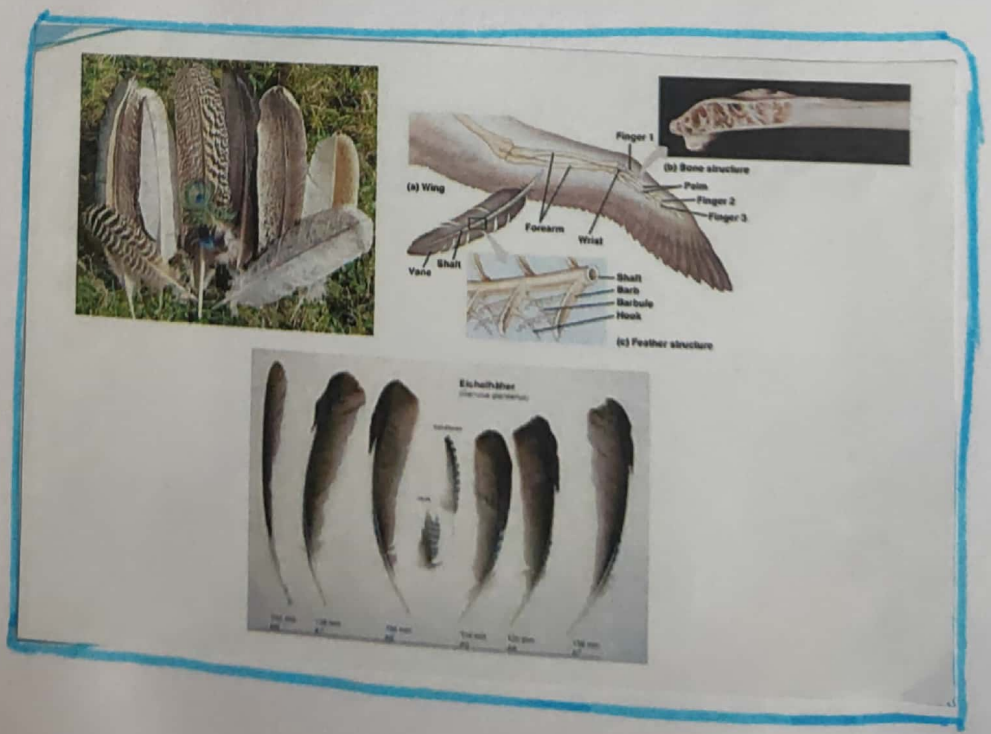
★ Birds constitute a well defined group of Vertebrate animals, especially designed and adapted for aerial mode of life. They evolved not only wings, but many other adaptations that make it possible to fly. Feathers makes the body light and provide insulation. Hollow bones reduces the body weight. Replacement of jawbones and teeth with beak, and many more features. All these changes can be studied under morphological, anatomical and physiological changes responsible for flight adaptations.

Bird flight is the primary mode of locomotion used by most bird species in which birds take off and fly. Flight helps birds in feeding, breeding, avoiding predators, and in migration. The flight motion compromises of hovering, taking off, and landing, involves many complex movements. Birds adapted over millions of years through evolution for specific environments, prey, predator and other needs. Flight adaptation in birds are divided into two categories

(A) Morphological Adaptations

(B) Anatomical Adaptations





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Morphological Adaptations

(1) **Body Shape:**
The birds have a spindle body to offer less air resistance during flight. This helps the birds to conserve energy and become more efficient at flying. Most Organs and large muscles are located near the centre of gravity, which is slightly below and behind the wings to provide better balance during flight

(*) **Compact body:**
The body of a bird is compact, dorsally strong and ventrally heavy to maintain equilibrium in the air. Their wings are attached on the thorax, the light Organs like lungs and sacs are positioned high, the heavy muscles placed centrally are other features that help in flight.

(*) **Body Covered with feathers:**

The feathers are smooth, directed backward and closely fitting which makes the body streamlined and reduce friction during flight. It lightens the body weight and protects it from the effect of environmental temperature. They also have a wide

surface area for striking the air.
Feathers add to the body buoyancy. It insulates the body and prevents any loss of heat from the body.
They also have a wide surface area for striking the air.

Forelimbs modified into wings :

The forelimbs are modified into wings which is the only organ of flight. These consist of a framework of bones, muscles, nerves, feathers, and blood vessels.
The wings have a large surface area. They also support the bird in the air. The wings have a thick strong leading edge with a concave lower surface and a convex upper surface. This helps in increasing the air pressure below and reducing the air pressure above. Thus the bird can fly upward and forward during flight.

Perching :

When a bird sits on the branch of a tree, its toes wrap around the twig. This is known as perching. The muscles are so well-developed that a bird can sleep in that position without falling.

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Bipedal locomotion

The anterior part of the body of a bird helps in taking off during flight. The anterior part of the body also helps to land. The hindlimbs help in the locomotion on land. They can support the entire body weight of a bird.

Mobile neck and head :

The birds have a long and flexible neck which helps in the movement of head important for various functions. They possess a horny beak which helps them to pick the grains and insects while feeding.

Short tail :

The tail bears long feathers that spread like a fan and functions as a rudder during flight. They also helps in balancing, lifting, and steering while flying and perching.

Integument

Loose skin is responsible for the extensive movement of the skeletal musculature.

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Beak:

- Beak Compensate the function of forelimbs.
- Mobile Neck and head.
- The birds have a long and flexible neck which helps in the movement of head important for various functions. They possess a horny beak which helps them to pick the grains and insects while feeding.
- Bipedal locomotion.

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Anatomical Adaptations

(*) Flight Muscles :

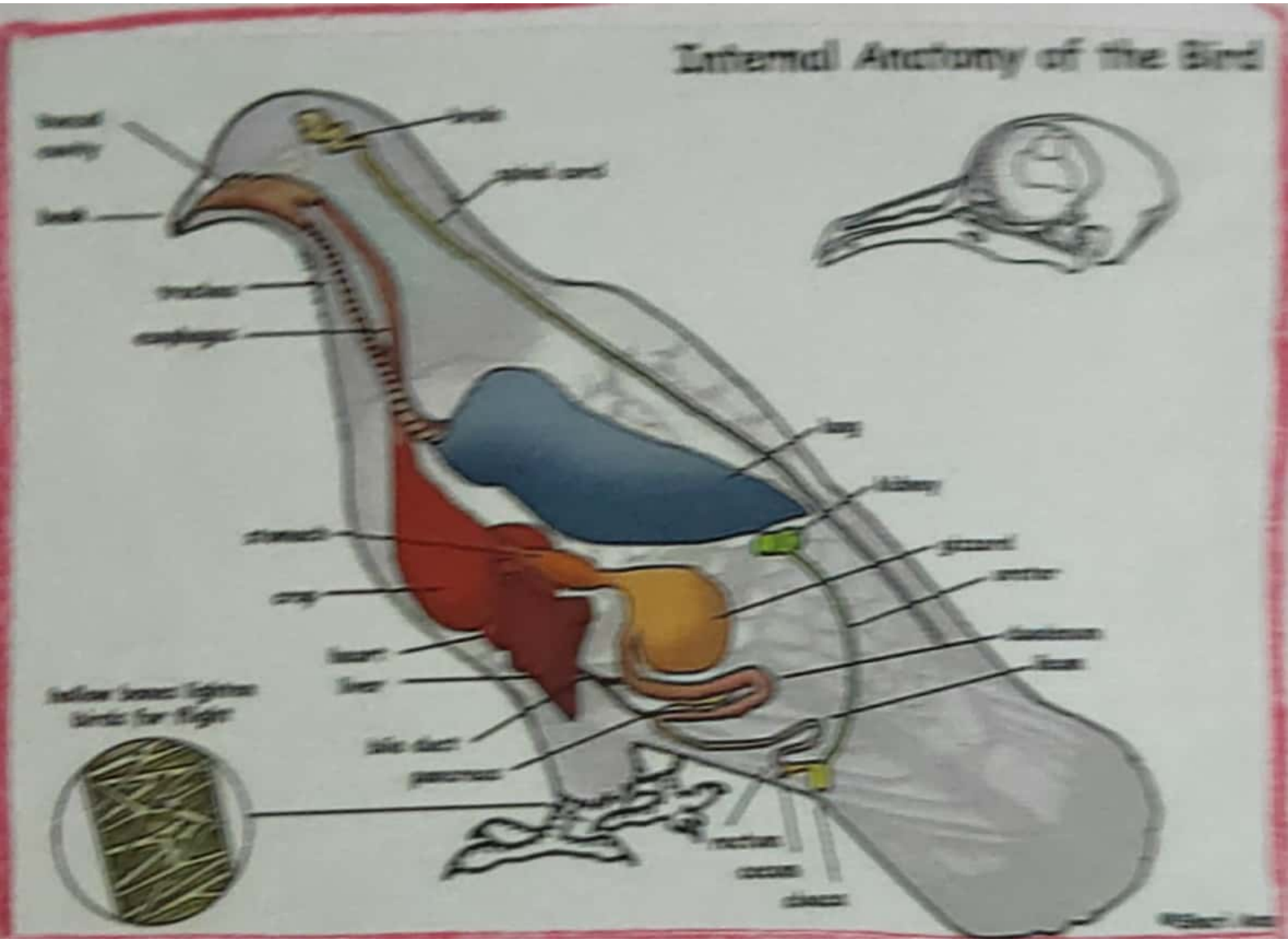
The well-developed muscles control the action of the flight muscles. It weighs about 1/6th of the entire bird. The flight muscles are straited. The muscles on the wings are large. Other muscles helps the above muscles in functioning.

*) Light and rigid Endoskeleton :

The birds have a very stout and light skeleton The bones are hollow, filled with air sacs. They provide with a secondary plastering to increase their rigidity. The bones are fused and lack bone marrow. The birds lack teeth. The thoracic vertebrae are fused except for the last one.
This plays an essential role in the action of wings striking the air.

(*) Warm blooded :

The temperature of the body of a bird remains high and does not change with the change in the environment. This facilitates the birds to fly at very high altitudes.



(*) Brain and Sense Organs :

Eyes are large and the large optic lobes correspond to the great development of sight.
The eyes occupy a large portion of the head. and both eyes together are often heavier than the brain. The ability to accommodate rapidly is also well developed for birds must change quickly from a distinct to a near vision in flight.
The much developed of corpus and convoluted cerebellum indicates the delicate sense of equilibrium and great power of muscular co-ordinate belongings to birds. The enormous development of Corpus Striata in the cerebrum also add to the extra ordinary manoeuvreability to attain stability in flight

(*) Single Ovary

Presence of a single functional Ovary of the left side in the female bird also leads to reduction of weight which is so essential for flight.

system. Birds have a four-chambered heart that performs double circulation. This prevents the mixing of oxygenated and deoxygenated blood.
Also, the birds contain a large amount of haemoglobin in their red blood cells which helps in the quick aeration of body tissue.

(•) Excretory System :

The nitrogenous waste is converted to less toxic Organic compounds such as uric acid, and urates. They have no urinary bladder. The uriniferous tubules efficiently absorb water.

(•) Reproductive System :

Ovaries and testes are reduced in size except in the breeding seasons. Usually only one functional Ovary is present in most of the birds and Second Ovary is greatly reduced to decrease the weight of body. Female liver is displaced to the right to compensate for weight difference. But in the case of birds of prey generally both ovaries and oviduct are present. This is because during hunting these birds have to pounce on the prey with great force and struggling prey can kick and break the eggs in reproductive system. Eggs developing in two ovaries can compensate for this loss.

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Migration of Birds

→ **Migration:**

The migratory birds migrate in a variety of ways and accordingly following kinds.
Majority of birds have the inherent quality to move from one place to another to obtain the advantages of the favourable condⁿ. Such birds are called migratory birds.
Some birds such as bobwhite and ruffed sand grouse, however, do not migrate at all and they remain throughout the year in a country. Such birds are called resident birds.
Migratory birds cover thousands of miles in their periodic seasonal journeys. Migration is a remarkable device to obtain the advantages of the favourable conditions in more northerly regions only during the summer.
Migration occurs during the particular period of the year and the birds usually follow the same route.

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Kinds of Migration :-

★ **Latitudinal Migration**

Migration from north to south and vice versa (most familiar migration).

eg: Siberian Crane - migrate to India and other parts of Asia during winter to avoid express cold of Siberian region and return back to Siberia after winter.

★ **Longitudinal Migration**

- Migration from east to west and vice versa

eg: Starling moves from breeding areas in east Europe to Atlantic coast to avoid continental winter.

★ **Altitudinal Migration**

Altitudinal / vertical migration, migration from mountain to valley.

eg: Grebes and Coots of Andes in Argentina.

★ **Partial Migration**

Migration when all invidivuals do not migrate.

eg: Blue birds and many blue jays of Canada and Northern United States travel southwards to mingle with the sedentary populations of southern states.

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- Other birds travel in mixed companies
Eg: Swallows, blue birds.

(3) Range of migration
- Distance travelled during migration depends on local condition
Eg: Himalayan snow patridge descends few hundred feet only whereas Artic turn travel about 11,000 miles.

(4) Altitude of Migration
- Some birds fly close to earth while most routine migration takes place within 3000 feet from earth

(5) Speed and duration of flight
- Average flight velocity of small bird is 30 miles per hour whereas greatest speed by swifts which can travel up to 180 miles per hour.
- Birds usually travel 5 to 6 hours in a day or night and resting in between whereas golden plover travel a distance of 2400 miles non stop.

(6) Regularity of migration
- several species of birds show striking similarity of arrival and departure every year.

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★ CONCLUSION :-

The evolution of flight has provided birds with many physical features in addition to wings and feathers. One way to reduce weight in birds is by the fusion and elimination of some unnecessary bones and the 'pneumatization" of the remaining ones. Not only are some bones of birds hollow but many of the larger ones are connected to the air sacs of the respiratory system.
To keep the cyllindrical walls of a bird's major wings bones from sudden change the bones have internal Compressive framework. Fusion of bones in birds makes the skeleton light as well as strong. Coracoid, furcula, and scapula form a strong and well built tripod for supporting the wings and broad surface for the attachement of large fight muscle.
One key adaptation is the fusing of caudal bones into single pygostyle; which supports the tail feathers. Birds also lack healthy teeth or even a true jaw, instead having evolved a beak, which is more lightweight.
Birds have uncinate processes on the ribs. These are hooked extensions of bone which help to strengthen the rib cage by overlapping with the rib behind them. There is practically every organ and system has been modified in relation to flight.