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Zoology Hons (B.Sc. II)

(Part III, Cor A)

(24 Marks)

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ORIGIN OF BIRDS

Birds undoubtedly originated from some extinct stock of reptiles during Mesozoic era. But there is a lack of intermediate stages that are able to reveal the way through which cold blooded tetrapod reptiles passed during their gradual transformation into warm blooded aerial birds. The absence of complete intermediate fossil records prevailed because the delicate nature of avian bone and arboreal life of birds are unfavourable for preservation. Only two fossil specimens of Archaeopteryx helped in establishing the fact that birds originated from reptiles. The first fossil bird was discovered in Solenhofen, lithographic stone of Bavarian (south Germany), by Andreas Wagner in 1861. It was named Archaeopteryx lithographica and is now kept in British Museum. The second more complete specimen was found in the same locality by Daves in 1877. It was named Archaeornis Siemens and is now kept in Royal Museum of Natural History, Berlin.

The reptilian ancestry was established on the basis of following tri-fold evidence obtained by study of comparative anatomy, embryology and palaeontology.

(1) COMPARATIVE ANATOMY

(1) Feathers and scales of birds are homologous to the scales of reptiles.

- (ii) Both have diapsid, monocandylic and autostylic skull.
- (iii) presence of columella, absence of epiphyses.
- (iv) Both have cloaca.
- (v) Trachea is made of Complete tracheal rings. Avian air sacs are also present in chamaeleon.
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- (vi) Four chambered avian heart is found in crocodiles. RBCs are oval and nucleated in both.
- (vii) Both have 12 pairs of cranial nerves.
- (viii) Kidneys are metanephros in both.

(2) EMBRYOLOGICAL EVIDENCES :

- (i) In both eggs are megalecithal, telolecithal and cleidonic.
- (ii) In both cleavage is mesoblastic.
- (iii) Blastoderm bears distinct central area pellucida and outer area opaca.
- (iv) The mode of gastrulation and mesoderm formation are similar in both.
- (v) In both extra embryonic membranes are formed.

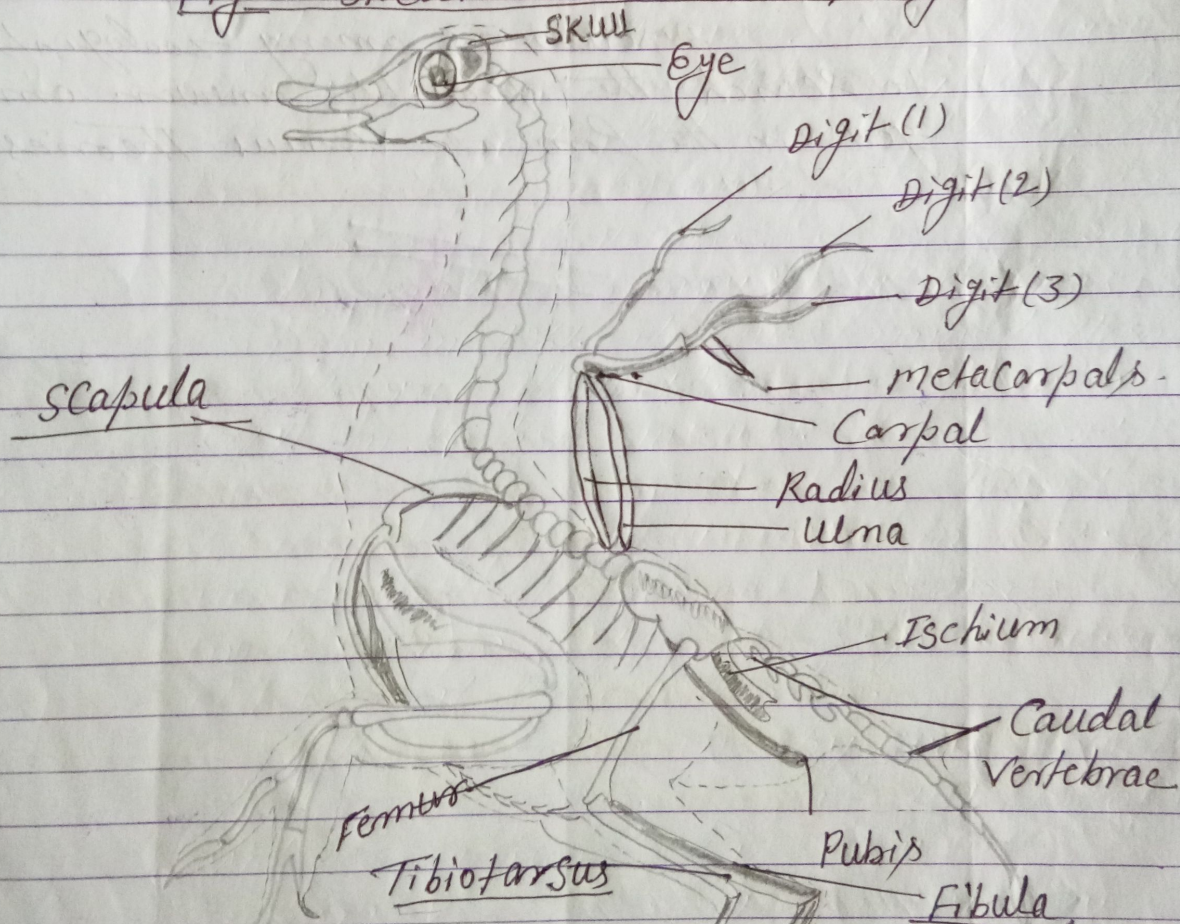
(3) PALAENTOLOGICAL EVIDENCES : —

Archaeopteryx retained characters of both reptiles and birds, and is considered as a connecting link b/w the two groups.

(A.) REPTILIAN CHARACTERS :-

- (i) Lizard like elongated body with a long tail comprised of 21-23 caudal vertebrae, pygostyle being absent.
- (ii) presence of strong jaws provided with a series of conical teeth lodged in sockets 13 above, 3 below, beak being very short and blunt.
- (iii) Amphicoelous vertebrae.
- (iv) Non-pneumatic bones.
- (v) Digits are provided with claws.

Fig = skeleton of Archaeopteryx.



(B.) AVIAN CHARACTERS.

- (i) fore limbs fully modified into strong wings
- (ii) presence of V shaped strong and wide furcula formed by fusion of clavicles.

(III) presence of delicate small coverts and contour feathers in the various parts of the body.

(VI) Rectrices i.e. tail feathers are arranged in two lateral rows, one on each side of the caudal vertebrae.

Although above mentioned evidence led to establishment of "Evolution" that birds certainly originated from reptiles. Necessity of separation and the mode of transition remained unanswered.

Discussion among zoologists to search the probable answer emerged in the form of various theories.