

19/02/25/21  
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P.G. Sem I, CC-1, Unit-3.  
sub-unit-3.1 (Part-2)

## Lungs as organs of Respiration in Vertebrates (Part-2)

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Sharma

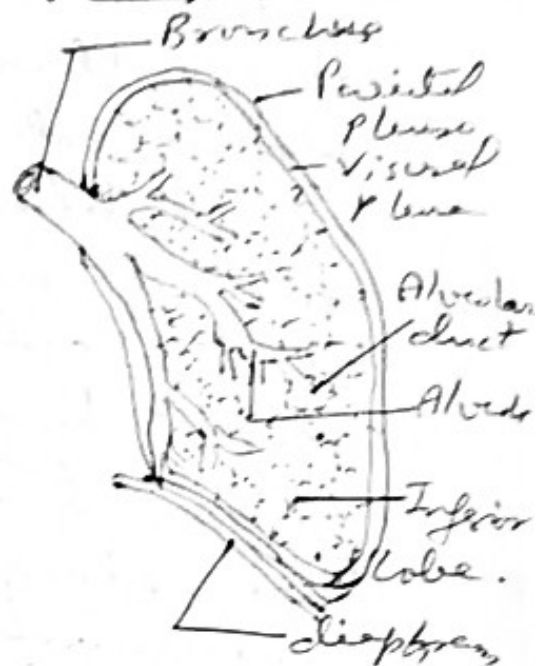
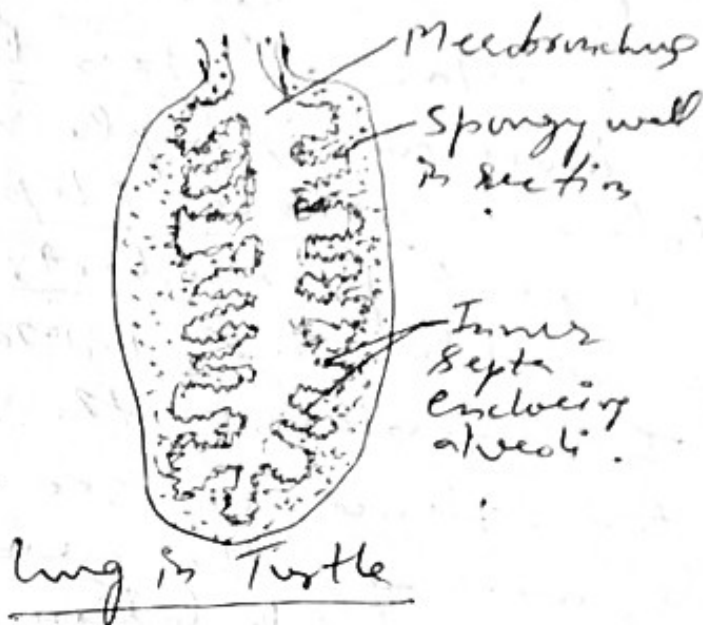
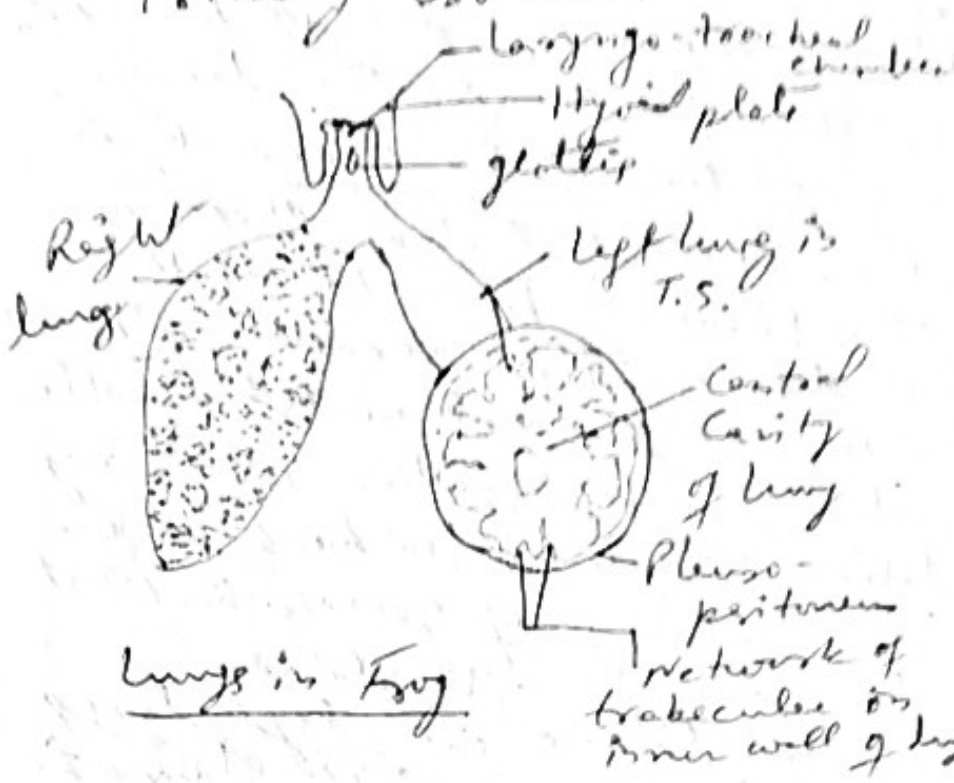
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Introduction: → Most ~~adult~~ adult amphibians and all amniotes breathe by means of lungs, though lungs are also present in lung fishes. In an embryo, a hollow outpouching, called lung-primordium arises from the ventral wall of pharynx. It goes backwards and divides into two right and left lung buds. The undivided proximal portion develops into trachea and larynx and opens into pharynx by glottis. Late lung buds grow posteriorly into coelom and branch repeatedly and get covered by mesoderm. Thus, each lung has an endodermal lining and an outer visceral peritoneum and is between the two mesodermal mesenchyme having blood and lymph vessels, nerves and smooth muscle fibres and connective tissue. Inner Endodermal epithelium of lungs is raised,

In birds, the lungs are small and are incapable of the great amount of expansion. The lungs, however, are connected with nine air sacs, that are situated in various parts of the body. The air sacs have no respiratory epithelium, serve essentially as reservoirs. Air passes through the bronchial circuit into the air sacs and then returns, generally by a separate set of bronchi, to the air capillaries in the lungs.

The respiratory system of the Mammal, is much less complicated than that of the bird. The primary bronchi after entering the lungs divide into secondary bronchi which divide into smaller and smaller bronchioles, finally terminating into tiny alveoli or alveolar pockets, in which there occurs an exchange of gases. In most mammals lungs are sub-divided externally into lobes i.e. left lung has two lobes and right lung has three lobes in Man and four lobes in Rabbit. Lungs are simple and without lobes in whale, Elephant, Horse and several perissodactyles. Right lung is lobulated in Monotremes and Rats. In Primates, the lungs are elongated. Hence, we see higher the animals, more is the need of oxygen, hence more lobulations in lungs.

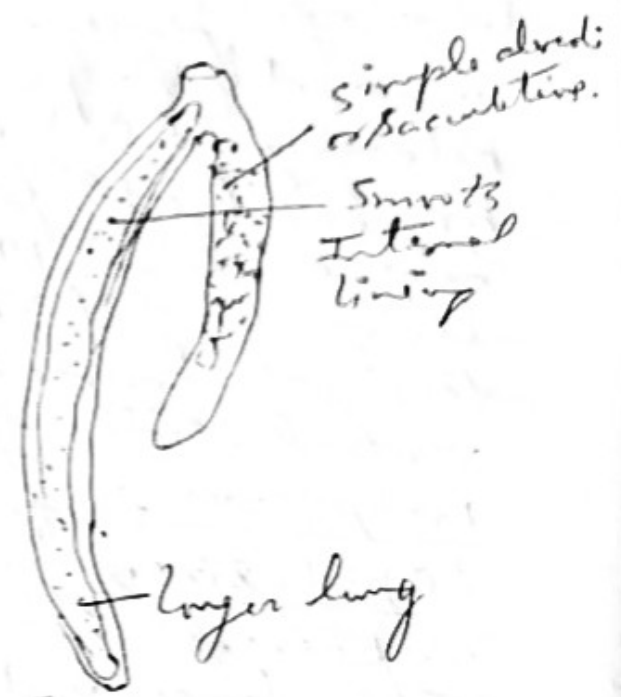
The left lung is spherical or oval-shaped  
 In some species. Conchoidal or pitted  
 lungs that are quite similar to those  
 of mammals. A few ligaments pass over  
 the larynx, extending posteriorly from  
 the lungs, ascending into sac of  
 larynx. In some lizards, the bronchi is  
 subdivided into primary, secondary and  
 tertiary bronchi.



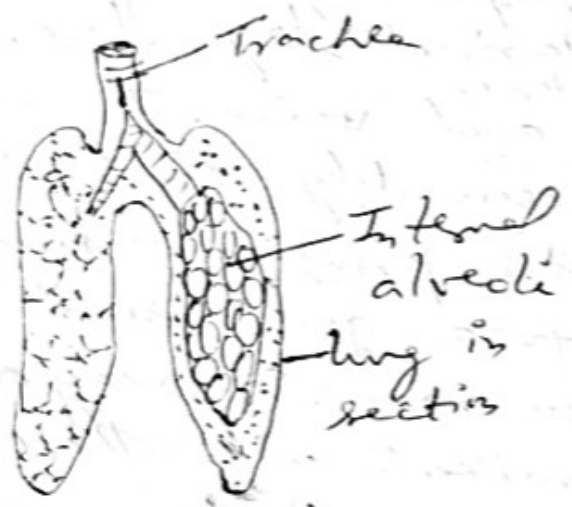
and lined with mucous epithelium whose cells are columnar and ciliated.



Protopterus  
(lungs)



larger lung



spheroid lungs.



Lungs in chameleons

In Reptiles, lungs are more complex than those of amphibians with an increase in the number of internal chambers and alveoli. In Some lizards, one lung is considerably larger than the other. and in Snakes,

Structure of Lungs: - In Polypterus (African <sup>bichir</sup>), paired ventral lungs are present which enable them to survive during periods of drought. Dipnoans belonging to subclass Sarcopterygii which branched off from Actinopterygii also have a lung-like structure. In all the living lung fishes, the lung is dorsal to the gut connected by a tube to the ventral side of the oesophagus. In Protopterus (African) and South American Lepidosiren, it is bilobed and unpaired in Australian lung fish. Their lungs unlike Polypterus contain internal chambers or pockets to increase the respiratory surface and highly vascularised by branches of pulmonary <sup>arteries</sup> and veins. In most bony fishes and presumably the Crossopterygians also, the primitive lung is modified into a gas or swim bladder or hydrostatic organ. It may or may not be connected with the oesophagus by a dorsal connection.

In Amphibians, the lungs are simple, sac-like structures with a central large cavity. In aquatic amphibians, the inner surface of the lungs is smooth. In Frogs and Toads, the inner wall contains numerous folds lined with alveoli so as to increase the respiratory surface. They are richly vascular

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into a network of ridges to increase the vascularised surface exposed to the action of air.

In lower forms, the lungs are hollow bags, but in higher forms the ridges increase in number and unite with one another across the lumen of the lung to convert it into a solid but spongy structure with innumerable air spaces.

In Mammals, internal surface area of lungs may be thirty times that of the external surface area of the body. The original duct of the lung sac connecting the pharynx to the lungs becomes a trachea in most animals. trachea is absent.

In many tetrapods, the anterior end of the trachea becomes modified into a larynx or sound box which opens into the pharynx by a glottis. At its lower end, the trachea divides into two bronchi, each of which enters a lung.

The bronchi divide into two bronchi, each of which enters a lung. The bronchi divide to form an immense system of bronchioles carrying air into minute bags or alveoli. The alveoli have very thin walls invested with blood capillaries, an exchange of gases occurs in the alveoli.

Larynx - The upper end of trachea is enlarged to form larynx, specially in frogs & toads.