Respiratory System:

(i) Respiration is both aquatic and aerial
(ii) In protopterus 5 pairs of gill slits are present. Neoceratodus has only 4 pairs of gills.
(iii) Air bladder highly vascularised and acts as lungs
(iv) Protopterus and Lepidosiren has a pair of lung but in Neoceratodus it is single.

Blood Vascular System:

① The heart lies in pericardial cavity situated below and somewhat behind gills
② The sinus venosus and atrium imperfectly divided into two parts
(iii) Ventral aorta modified into small truncus arteriosus. Hence pulmonary and systemic system separate.
(iv) Pulmonary vein open in left auricle. It carries pure blood from air sac to heart.

Nervous System:

(i) Cerebral hemispheres are well developed.
(ii) Cerebellum is poorly developed
(iii) optic lobes fuse to form single oval body

Urinogenital System:

(i) Kidney are mesonephric. The ureter open into cloaca
(ii) Females have a pair of ovaries situated near kidney
(iii) Males have a pair of testes situated closed to kidney.
(iv) A pairs of vestigeal Mullerian ducts is also present in male.

Affinities:

The Dipnoans exhibit affinity with bony fishes on one hand and with amphibian on the other hand. Besides this, they also bear many primitive characters. Above all, they have also some special features:

Primitive features:

(i) Persistant notochord in adult
(ii) Presence of spiral valve in the intestine
(iii) Presence of cloaca

In the above mentioned characteristics Dipnoi resemble ~~Crossopterygian fishes~~.

Affinities with Teleostomii – Bony fishes

(i) Similarities in shape
(ii) Presence of cosmine layer on scales
(iii) Presence of palatine and splenial teeth.

Special features:

(i) Cranium more or less cartilaginous with very little ossification.
(ii) A number of investing or membranous bone in roof of cranium.
(iii) Absence of pre-maxilla and maxilla
(iv) Presence of dermal plates on the jaw.
(v) Air-bladder act as lung which is dorsally placed.
(vi) Presence of external and internal nostril.
(vii) Presence of archipterygian type of reduced pair fins.

Affinities with Amphibians

(i) Presence of lungs for aerial respiration
(ii) Presence of external and internal nostril
(iii) Heart with partly divided Sinus venosus, auricle and ventricle
(iv) Presence of pulmonary artery and vein.
(v) Autostylic Suspensorium.
(vi) Nervous System shows affinity with amphibian nervous system.
(vii) Embryology similar to amphibians.

Dipnoi differ from modern fishes and resemble amphibian in many features. It is therefore presumed that amphibians and Dipnoi have evolved from the same common stock of early crossopterygian fishes.

Conclusion:

Most author do not link the Dipnoi with the amphibians. It is believed that the two groups evolved from a common ancestor stock. According to Romer, the lung fishes are not the ancestors but the uncle of the dwellers. Jarvik (1955) is of the opinion that dipnoan exhibit similarities with placoderms, elasmobranchs and amphibians, as well as with the Crossopterygii. ~~It can best be~~ It can best be suggested that the dipnoans diverged very early from remote basic stock from which the amphibian actually originated and subsequently both aquired characters. Rhipidistians and dipnoans are divergent offshoots of a common ancestral Piscine stock.