CONCLUSIONS

1. The heart of *Lamellidens marginalis*, a freshwater unionid bivalve mollusc of India, is situated slightly posterior to the dorsal hinge of the organism.

2. This central pumping organ is enclosed by a thin pericardial envelope. The heart is typically a three-chambered organ with two symmetrically placed thin-walled auricles and a voluminous dorso-median ventricle. The two auricles communicate separately with the ventricle by means of two auriculo-ventricular apertures which are guarded by highly specialized auriculo-ventricular valves. The auricles are triangular in outline and are tapering near the ventricular wall. The auricles demonstrate the presence of two auricular pouches of unknown function(s), while the auriculo-ventricular valves safeguard the backflow of blood or haemolymph from the ventricle.

3. The ventricle is a highly muscular and thickwalled organ. The initiations for the existence of three apparent sub-chambers within the ventricle are due to the complex arrangement of the trabeculae and the muscular dispositions.
4. Both the auricles and the ventricle are histologically covered by an epicardium. Glandular cells similar to the pericardial gland cells are present in the epicardial layer, while the part of the rectum passes through the ventricular floor. There is no nerve cells or fibres either in the auricle or in the ventricle of the heart of *L. marginalis*.

5. The heart of this bivalve has only epicardium and myocardium. There is no endocardium. Therefore, the heart tissues are in direct contact with the blood or haemolymph. There is no mucocytes on the epicardial layer. The muscle fibres generally run in a chaotic way.

6. Ultrastructurally the epicardium is formed of small nucleated cells with microvilli, lateral plasmalemmal infoldings and junctional complexes, cytoplasmic organelles and inclusions. Each epicardial cell is covered in part by the connective tissue elements.

7. Among the cytoplasmic organelles the mitochondria, golgi apparatus and cytosomes are predominant. Among the cellular inclusions the lipid droplets and glycogen particles are important. Besides these, the cell also possesses numerous small-sized, membrane-bound vesicles of pinocytotic origin, scanty amounts of rough-surfaced endoplasmic reticulum. The fine structural details of the nucleus and the nucleoli and the golgi apparatus of the epicardial cell clearly suggest
that this cell is secretory in nature, while the brush border processes indicate its absorptive nature.

8. The characteristic absence of myofibrillar elements in the cytoplasm of the epicardial cell is highly suggestive of the cell's subservient role in cardiac contraction and relaxation.

9. Compared to the epicardial cells, the myocardial cells of L. marginalis are syncytical in nature. Two or more myocardial cells meet in the radiating manner. Such areas of confluence are characterised by the possession of glycogen particles, mitochondria, microtubular profiles and membranous saccules and folds.

10. Each myocardial cell is a smooth type, mononucleated and possesses numerous myofibrillar elements or assemblies, both attached and free dense bodies, huge glycogenic areas and numerous mitochondria.

11. The plasmalemma of the myocardial cell is a highly characteristic organelle which is littered with several attachment plaques, tight or close junctions for electro-chemical coupling, terminal microstructures between the two muscle fibres, and lateral swellings or evaginations containing glycogen particles and mitochondria. Some of these features are highly suggestive of ultrastructural details of a contracted muscle fibre.
12. The contractile apparatus of this cell is highly elaborate in having two sets of myofibrillar elements: (a) actin and (b) paramyosin. These are usually topographically arranged in the subplasmalemmal cytoplasm of the myocyte. The cardiac muscle cells of *L. marginalis* are non-striated and not even obliquely striated.

13. The thick paramyosin filaments are slightly swollen in the middle while tapering at the termini. The thin actin filaments are arranged differently within the cytoplasm. These are particularly apparent within and around the free and attached dense bodies. Actin filaments are also disposed in between the paramyosin filaments.

14. On higher magnifications microstructures, resembling 'glycosomes' containing glycogen aggregates and thin filaments, are recorded in the myocardial cell of *L. marginalis*.

15. Myocardial cell is abundantly rich in mitochondria. Some of these well-formed mitochondria maintain stereomorphological relationship with small, membrane-bound vesicles. These vesicles may travel from the periphery of the myocyte to the deep of the cell. Such a vesicular route may supplement the functions of the sarcoplasmic reticulum. Well-organised sarcoplasmic tubules are absent in the heart cells of *L. marginalis*. 
16. A poorly developed Golgi apparatus may be present in the myocardial cell of this bivalve. The role of the Golgi apparatus in myogenesis is as yet unknown.

17. Cytosome-like bodies are present in the myocardial cells. These are involved in anoxic tolerance of the organism.

18. Microstructures resembling peroxisomes are infrequently seen in the myocardial cell.

19. The large nucleus remains embedded in the huge glycogenic lake of the myocardial cell. The presence of one or two nucleoli within the nucleus and the cytoplasmic polysomes points out the synthetic activity of the cell.

20. The haemolymph cells of *L. marginalis* can be characterized as granulocytes, hyalinocytes, fibroblasts and microcytes. Occasionally 'chloragogen' type of cells are also seen. Brown cells are absent. Granulocytes and fibrocytes are large cells, while the hyalinocytes are small cells. Granulocytes possess numerous granules of different chemical nature, viz., acidophilic, basophilic and refractile granules.

21. The granulocytes clearly demonstrate an agranular ectoplasm and a granular endoplasm. These nucleated cells are capable of throwing pseudopodia and are phagocytic in nature. These participate actively in the formation of cellular clumps and aggregates.
22. Scanning electron microscopy has revealed the unique nature of arrangement of the granules of the granulocytes. Both rounded and granules with pointed ends are present.

23. The fibrocytes change their shapes vigorously and take active part in cellular assemblage. Usually these cells exhibit bipolar cellular microappendages in the form of prolonged filipodia. SEM proves that these filipodia are tubular or rope-like microstructures, originating from the endoplasm of the cell. Hyalinocytes are smaller cells having a small cytoplasmic to nuclear ratio and display a variety of nuclear morphology. These cells usually throw radially arranged spinous processes or filopodia. These cells take less active part in cellular aggregation.

24. Both homogeneous and heterogeneous cell clots or associations are observed in L. marginalis. Homogeneous clots are formed mainly of the agranular amoebocytic cells resulting in the formation of syncytia. Heterogeneous clots are assemblages of nearly all variety of haemolymph cells. These heterogeneous clots are occasionally seen to be held by extracellular substances which may be flocculent or fibrillar in nature.

25. Both epicardium and myocardium are partially supported by the presence of connective tissue elements. The connective tissue cells are nucleated and possess important cellular details.
The extracellular connective tissue substances contain fibrillar elements, dense spherical calcium spherules and amorphous granular materials. Occasionally the connective tissue cells send enormous cytoplasmic processes containing several well-formed mitochondria in the extracellular matrix materials.