



HISTOLOGY

PRACTICAL MANUAL



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CHAPTER FIVE

MUSCLE TISSUES

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Muscle tissue is a vital component of the human body, involved in movement, stability, and maintaining posture. It plays a crucial role in various physiological functions, such as generating force, producing heat, and aiding in the circulation of blood and lymph. They are responsible for optimizing movement in the human body by achieving the process of contractility.

There are basically three muscle types, based on the morphologic and functional properties of their cells, namely: skeletal, cardiac and smooth muscles. Each type of muscle tissue exhibits unique characteristics in terms of structure, location, features and function.

The important features of the muscle types are summarised below:

Muscle type	Skeletal muscle	Cardiac muscle	Smooth muscle
Structure	-composed of long, cylindrical, multinucleated fibres	-consists of branching, interconnected cells with intercalated discs.	-consists of spindle-shaped cells with a single nucleus.
Location	-attached to bones - most abundant type of muscle tissue	-found only in the heart	-found in various internal organs, blood vessels, and tissues
Characteristics	-Striated, due to the arrangement of actin and myosin filaments - - -.....	- Striated, has in addition branching fibres that form a complex network in the heart. - -	- No striations - spindle-shaped appearance under the microscope. -..... -.....

	-		
Functions	- under conscious control and allow for precise movements and coordination; voluntary contraction - -	- involuntary and is responsible for pumping blood throughout the body - -	- involuntary - control the movement of substances within the body, such as food through the GIT or blood flow through blood vessels. - -

5.1. Smooth Muscle

Slide 49: This is a cross section through the umbilical cord. The three large blood vessels are used as examples of smooth muscle.

Identify:

Macroscopic

The orientation of the blood vessels in the umbilical cord.

Microscopic

- (i) Longitudinally sectioned smooth muscle fibres. (ii) Cross sectioned smooth muscle fibres.

Draw and annotate:

A few longitudinal and cross sectioned smooth muscle fibres. Note the shape and different diameters of the smooth muscle fibres.

Questions:

1. What is characteristic of the cellular and nuclear shapes?

.....

2. How does the nucleus appear in a contracted smooth muscle fibre?

.....

3. How does the nucleus appear in a contracted smooth muscle fibre?

.....

4. What is found between the muscle fibres?

.....

5.2. Skeletal Muscle (I)

Slide 50: This specimen contains a longitudinal and cross section of skeletal muscle.

Slide 51: This is a section through the tip of the tongue in which the skeletal muscle is sectioned longitudinally, obliquely and crosswise.

To view the striations of skeletal muscle in the H/E specimen, the condenser of the microscope must be turned down to obtain as much contrast as possible. (Remember to turn the condenser back to its original position after you have finished).

Identify:

- a) Longitudinal section
 - (i) Skeletal muscle fibres
 - (ii) Nuclei of the skeletal muscle fibres and connective tissue
 - (iii) Cross striations
 - (iv) Connective tissue
- b) Cross section
 - (i) Skeletal muscle fibres arranged in bundles
 - (ii) Size, shape and diameter of the muscle bundles
 - (iii) Nuclei of the skeletal muscle fibres Myofibrils
 - (iv) Connective tissue

Draw and annotate:

A longitudinal section of skeletal muscle.

A cross section of skeletal muscle.

Questions:

1. What is characteristic of skeletal muscle?

.....

2. What is characteristic of the nuclei of skeletal muscle and how do they differ from those of smooth muscle?

.....

.....

3. How does skeletal muscle differ in longitudinal and cross section from smooth muscle?

.....

.....

4. What are skeletal muscle fibre bundles called?

.....

5. Can all the subdivisions of muscle connective tissue be seen on this specimen?
What is the connective tissue is called?

.....

.....

5.3. Skeletal Muscle (II)

Slide 52: This is a section through the tip of the tongue stained to show the cross striations.

Identify:

Microscopic:

- (i) Longitudinal section of skeletal muscle
- (ii) The different bands in the longitudinal section that form the cross striations
- (iii) Nuclei of the skeletal muscle and connective tissue.

Draw and annotate:

A skeletal muscle fibre. Indicate all the different components in detail.

Questions:

1. How many of the cross striation of skeletal muscle are visible under the light microscope? Can all the bands be seen?

.....

2. How does each band appear?

.....

.....

5.4. Heart Muscle

5.4.1. Heart Muscle (Longitudinal Section)

Slide 53: This is a longitudinal section through heart muscle. To view the cross striations, the condenser of the microscope must be turned downward to produce contrast.

Identify: Microscopic

- (i) Muscle fibres and branching
- (ii) Nuclei of the heart muscle fibres and connective tissue
- (iii) Intercalated discs and cross striations
- (iv) Connective tissue

Draw and annotate:

A heart muscle fibre. Indicate the characteristic components in detail.

Questions:

1. What are the characteristics of heart muscle fibres?

.....
.....

2. How do heart muscle differs differ from skeletal and smooth muscle?

.....
.....
.....

3. What is the connective tissue found between the heart muscle fibres called?

.....

5.4.2. Heart Muscle (Longitudinal Section – Cross Striations)

Slide 54: This is a longitudinal section through heart muscle, stained to show the cross striations clearly.

Identify:

Microscopic

- (i) Muscle fibres
- (ii) Nuclei of the heart muscle fibres
- (iii) Intercalary discs and cross striations
- (iv) Connective tissue

Draw and annotate:

A few heart muscle fibres. Indicate the different components in detail.

Questions:

1. Which bands are visible with the light microscope?

.....
.....

2. How do the intercalary discs appear?

.....
.....

3. What are the regions at the poles of the nucleus called and how are they formed?

.....
.....

5.4.3. Heart Muscle (Transverse Section)

Slide 55: This is a specimen of a cross section of the heart/cardiac muscle.

Identify:

Microscopic

- (i) Muscle fibres
- (ii) Nuclei of the heart muscle fibres
- (iii) Connective tissue

Draw and annotate:

A few cross sectioned heart muscle fibres.

Questions:

1. What are the characteristics of heart muscle in cross section?

.....
.....

2. How does heart and skeletal muscle differ in cross section?

.....
.....
.....

3. Which connective tissues found in skeletal muscle is/are also found in heart muscle?

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.....

Revision Notes on Contractile Cells:

1. How are the functions of muscle tissues adapted to their features?

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.....

2. Name the 3 types of muscle cells.

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.....
.....

3. Name and define the striations of skeletal muscle.

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.....

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.....
4. What is the unit between two Z-lines termed?

.....
5. How are individual cardiac muscle cells linked?

.....
.....
6. Name 2 parts of the body where smooth muscles are found.

.....
.....
7. Name 3 diseases of muscle.