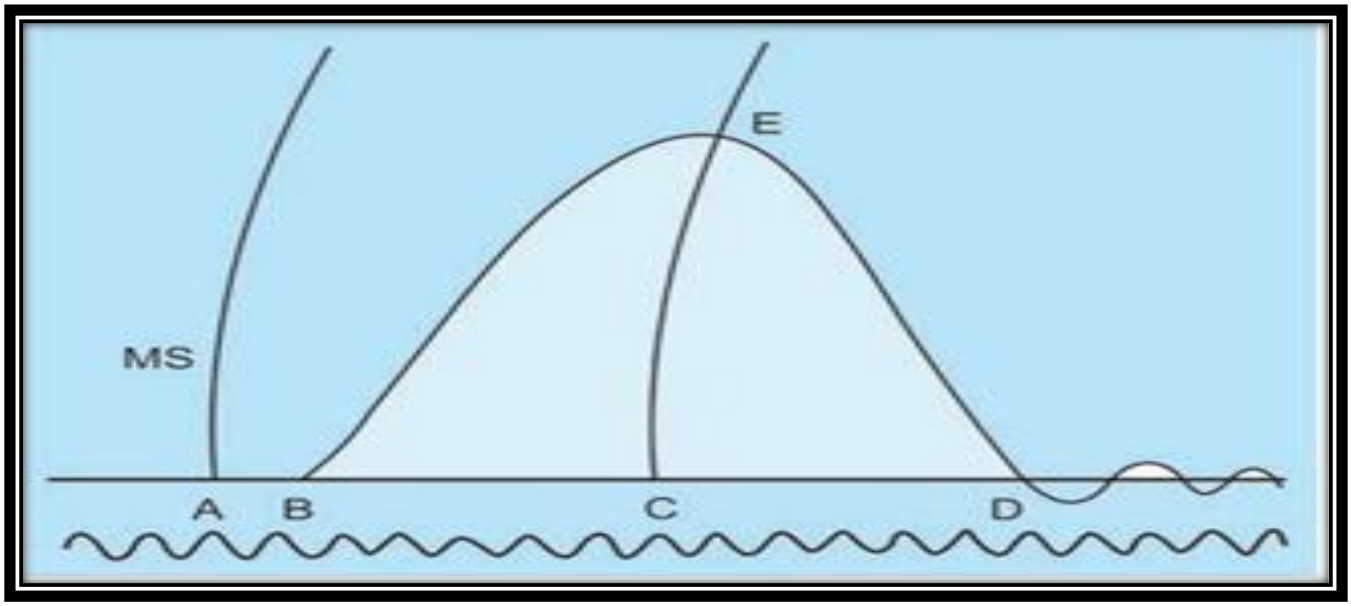
Experiment No. 3 – Simple Muscular Curve

1. **Draw a simple muscular curve in the space below and measure the following phases-**
   (a) Latent period = 0.01 sec
   (b) Contraction phase = 0.04 sec
   (c) Relaxation phase = 0.05 sec

Ans:-



2. **The main curve is followed by a few smaller ones. What is the cause of these?**

Ans:-

The small curves following the main muscular curve are due to **after-vibrations of the lever** and are **mechanical, not physiological** in origin.

Why they occur

- The muscle and the writing lever together act like a **mass–spring system**.
- When the muscle suddenly relaxes, the lever **continues to vibrate** due to inertia.
- These vibrations are **not true muscular contractions**; they are mechanical artefacts.

3. **How does the fibres are classified into fast & slow? Give the example fast fibre and slow fibre.**

Ans:-

Classification of Muscle Fibres into Fast and Slow

Basis of Classification:
Muscle fibres are classified into **fast** and **slow** fibres on the basis of:

1. **Speed of contraction**
    - Fast fibres contract quickly
    - Slow fibres contract slowly
2. **Myosin ATPase activity**
    - Fast fibres → **High** ATPase activity
    - Slow fibres → **Low** ATPase activity
3. **Metabolism**
    - Fast fibres → Predominantly **anaerobic (glycolytic)**
    - Slow fibres → Predominantly **aerobic (oxidative)**
4. **Fatigue**
    - Fast fibres → Fatigue **rapidly**
    - Slow fibres → Fatigue **slowly**

5. **Colour**
    - Fast fibres → Pale/white (low myoglobin)
    - Slow fibres → Red (high myoglobin)

Examples:

- **Fast fibres (Type II):** *Gastrocnemius*
- **Slow fibres (Type I):** *Rectus abdominal muscle*

4. How contraction differs from shortening?

Ans:- Contraction is the development of tension; shortening is the decrease in muscle length. A muscle can contract without shortening.

Contraction	Shortening
• Contraction means **development of tension** in the muscle. • It may or may not be accompanied by a change in length. • Occurs in both **isometric** (no shortening) and **isotonic** (with shortening) contractions.	• Shortening refers to **actual decrease in muscle length**. • It occurs **only in isotonic contraction** when the muscle tension exceeds the load. • Shortening is not essential for contraction to occur.

5. Why the frog is stunned and not anesthetized?

Ans:-

The frog is stunned, not anaesthetized, because anaesthetics depress muscle and nerve activity, whereas stunning does not interfere with muscle physiology.

Reason:

- **Anaesthetics depress the central nervous system** and may also depress **skeletal muscle and neuromuscular transmission**.
- This **alters the normal excitability and contractility** of the muscle.
- Such depression would **interfere with recording a normal simple muscle twitch**.

Stunning, on the other hand:

- Produces **instant unconsciousness** without affecting muscle physiology.
- It does **not alter neuromuscular function**, ensuring **normal muscle responses** in the experiment.

6. **What are the causes of Latent Period?**

Ans:-

Latent period is due to nerve conduction, excitation–contraction coupling, Ca^{2+} release, cross-bridge formation, and stretching of elastic elements.

It occurs due to the following events:

a. **Time taken for stimulus conduction**
b. **Excitation–contraction coupling**
c. **Release of Ca^{2+} from sarcoplasmic reticulum**
d. **Formation of actin–myosin cross-bridges**
e. **Mechanical delay**