Human Muscular System

The secret life of the body

Subject: Biology
Learning topic: Human Muscular System

Learning Outcomes

From the Syllabus:

1. **Understand the basic structure and function** of the human muscular system.
2. **Identify major muscle groups** and their roles in movement and posture.
3. **Comprehend the types of muscle tissues** (skeletal, smooth, and cardiac) and their characteristics.
4. **Learn about muscle metabolism** and its role in energy production.

From the Practical Experiment:

5. **Apply theoretical knowledge** to practical observation and experimentation.
6. **Understand the principles of muscle fatigue and recovery** in a controlled experiment.
7. **Learn to measure and record physical performance data.**
8. **Develop analytical skills** by interpreting and discussing experimental results.

Theoretical Background

Materials: 4D models of human muscles

Introduction

- The human body contains over 600 muscles, accounting for about 40% of body weight.
- Muscles are responsible for movement, maintaining posture, and vital functions like breathing and heartbeats.

Types of Muscle Tissue

1. **Skeletal Muscle**: Attached to bones, responsible for voluntary movements.
2. **Smooth Muscle**: Found in internal organs, controls involuntary actions.
3. **Cardiac Muscle**: Exclusive to the heart, combines features of both skeletal and smooth muscles.

Muscle Anatomy

- **Fibers**: The basic unit of muscle, composed of myofibrils.
- **Myofibrils**: Contain sarcomeres, the contractile units, which have actin and myosin filaments.
- **Contraction**: Occurs when actin and myosin filaments slide past each other, shortening the sarcomere.

Muscle Metabolism

- **ATP Requirement**: Muscles require energy (ATP) to contract and relax.
- **Sources**: ATP is generated through aerobic (with oxygen) and anaerobic (without oxygen) pathways.

Questions and Tasks for Students

1. **Labeling Exercise**: Label a diagram of the muscular system with major muscle groups.
2. **Research Assignment**: Investigate a muscle disease or disorder and present your findings next class.
3. **Discussion Question**: How do different types of muscle tissues contribute to the functioning of the human body?

Practical Exercise: Muscle Endurance Test

Overview
This exercise involves a simple, hands-on experiment to test muscle endurance in the human body. Students will measure how long they can sustain a specific pose or activity, which is a practical way to understand muscle endurance and fatigue.

Objective
To observe and understand muscle endurance and the concept of muscle fatigue through a simple, physical activity.

Materials Needed
- Stopwatch or timer (most smartphones have one).
- Yoga mats or soft surface for floor exercises (optional).
- Pen and paper for recording times.

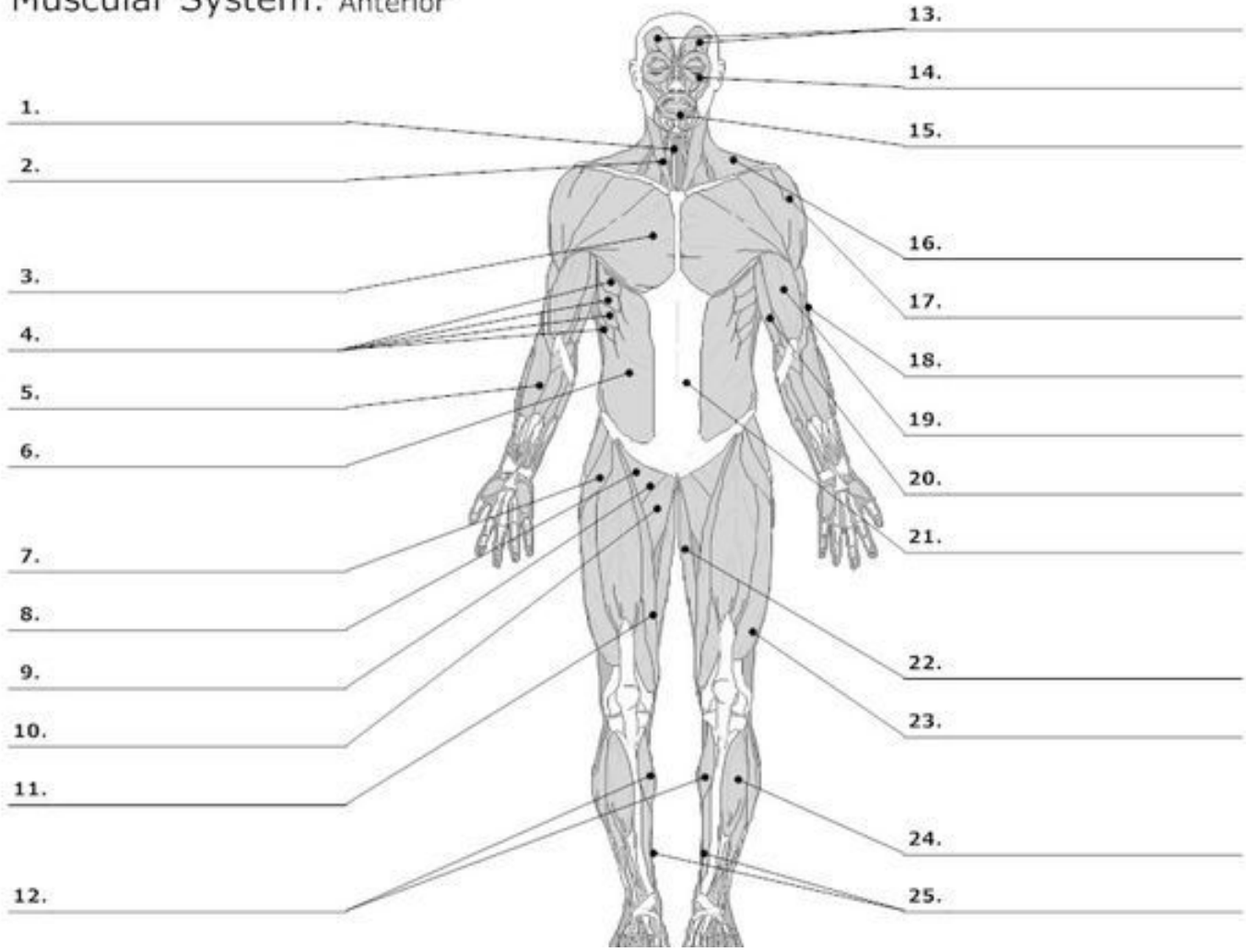
Teacher Guidelines
1. **Preparation**: Ensure there is enough space in the classroom for students to perform the activity safely.
2. **Safety First**: Remind students to be aware of their physical limits and to stop the exercise if they feel any discomfort or pain.
3. **Exercise Selection**: Choose a simple pose or activity, such as a plank, wall sit, or arm hold.
4. **Demonstration**: Demonstrate the correct form for the chosen exercise to the class.
5. **Timing and Recording**: Have students perform the exercise while timing themselves. They should record how long they can maintain the pose before muscle fatigue sets in.
6. **Repeat Trials**: Allow students to rest and try the exercise a few times, recording their times for each attempt.

Student Participation
- **Performing the Exercise**: Each student performs the exercise while being timed.
- **Recording Data**: Students record their endurance times for each trial.
- **Observation and Analysis**: Students note any changes in their performance over successive trials.

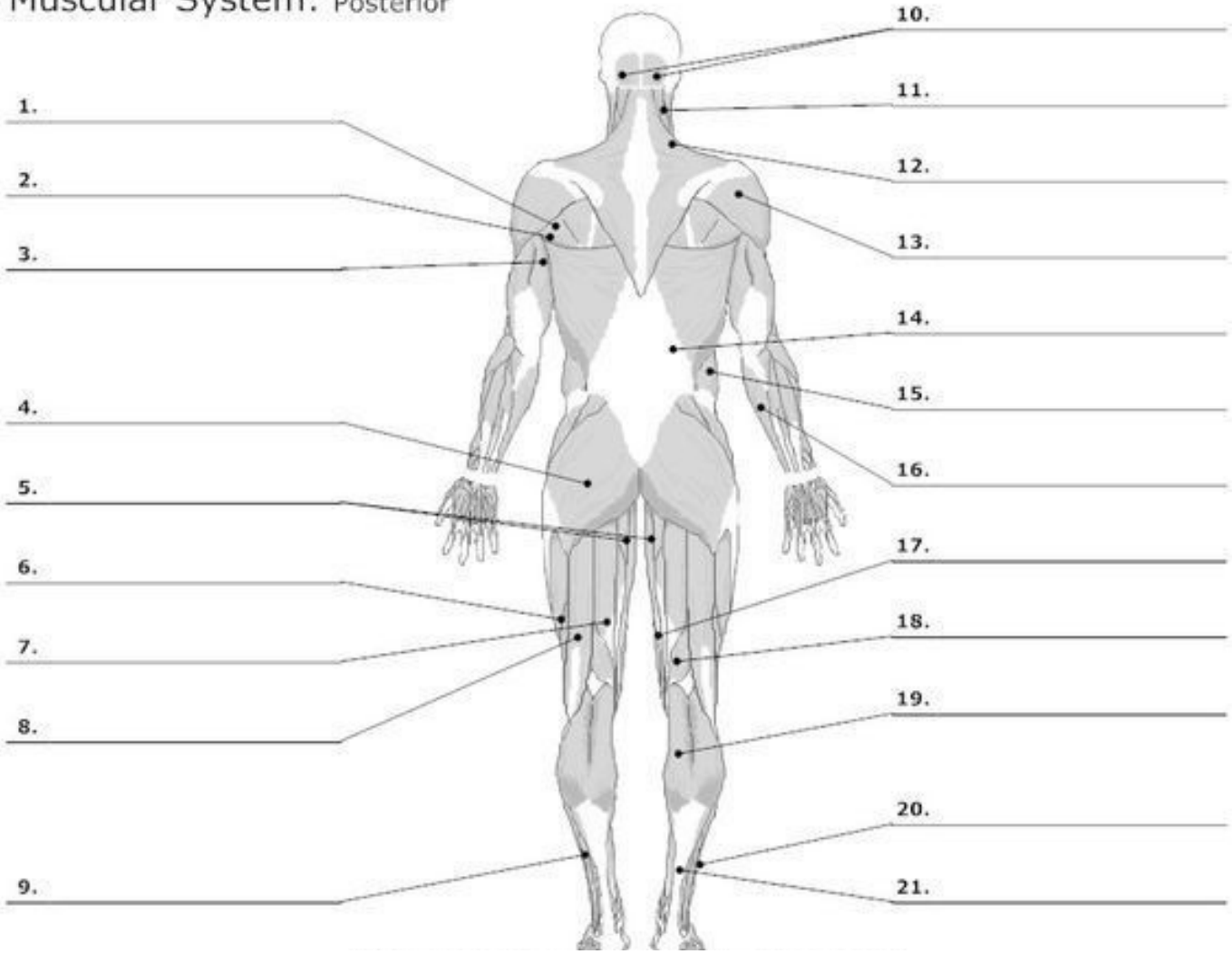
Follow-Up Tasks

- **Data Compilation**: Compile class data to observe variations in muscle endurance among different students.
- **Discussion**: Have a class discussion about factors that could influence muscle endurance (e.g., fitness level, muscle strength, frequency of exercise).
- **Report Writing**: Students write a brief report or reflection on their experience and what it taught them about muscle physiology and endurance.

Muscular System: Anterior



Muscular System: Posterior



STUDENT NAME	TRIAL 1 DURATION (SECONDS)	TRIAL 2 DURATION (SECONDS)	TRIAL 3 DURATION (SECONDS)	AVERAGE DURATION (SECONDS)	OBSERVATIONS/COMMENTS
EXAMPLE	45	48	50	30	HIS LEGS STARTED SHAKING AT THE THIRD TRIAL
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