Modal verbs and their meaning

The main modal verbs are: *must, can, could, may, might, shall, ought to*.

Most of the meanings of all these modal verbs can be divided into two groups:

✓ obligation and freedom to act, prohibition or permission, advice and ability

e.g.

- *You **ought to/must** know how to solve this equation in order to pass you exam.* (obligation)
- ***Can** you operate this microscope?* (ability)
- ***May** I use your lab manual?* (permission)
- You ***ought to**/**should*** study harder for this difficult exam. (advice)
- You ***cannot/mustn't*** use laboratory glassware as containers for food or beverages. (prohibition)

✓ degrees of certainty (these modal verbs can be used to say that a situation is certain, probable, possible or impossible)

e.g.

- *You **must** be joking!/You **can't** be serious! That's just totally illogical!*
- *He **ought to/should be** at work now.* (probability – He is probably there, I'm 90% sure.)
- *There **could/may/might** be some changes in the timetable.* (possibility - It is theoretically possible.)
- *That **cannot be**/**couldn't** be the correct answer to this question.* (impossibility – I'm about 99% sure that it is impossible.)

1. **Think of 7 words to complete the mind map for the word *'laboratory'*. Discuss as a class.**

2. **Give a definition to the word *'laboratory'*. Compare the definitions as a class.**

3. **Answer the questions.**

- Are there many laboratories at your faculty? What are they?
- Do you often work in the lab?
- Which courses in physics require doing lab work?

- What kind of laboratory equipment and tools do you use?
- What do you like/dislike most about your laboratory classes?
- What do you find difficult about them? Why?

4. **Read the text about the importance of laboratory work in physics.**

THE LABORATORY

The laboratory work in physics can be an exciting or boring part of the course depending upon your attitude toward it. If you regard it as an obstacle to your **getting through the course**, probably you will **get very little benefit from** it. On the other hand, if you regard it as an opportunity to learn more, then it is almost certain you will find the time you spend in the lab both beneficial and interesting.

There are several ways in which you may expect **to benefit from** the laboratory work. It helps you to understand and remember the physics you have studied by practicing the application of physical laws and logic to real cases, which helps you to think clearly and gives you some skill in the use of **scientific instruments and techniques**.

It is true that you are not likely to be the discoverer of anything new in physics during your first-year course, as most (but not all) of the material in first-year physics has been known for decades. Anyway, in the laboratory you

are certain to experience the thrill of discovering for yourself some of **the principles of physics**.

Most of the principles of physics were discovered by men using equipment no better than yours. Most of it, in fact, was not as good. With the equipment in front of you, you have the chance to try out your own ideas, to reason about the results, and **to draw conclusions from** them. **In brief**, you should regard the laboratory as a place for ***intellectual*** **exploration**.

Before you come to the laboratory, study **the laboratory manual** so that you will know what you are going to do and so that you can plan in advance how to use your time efficiently. As you **do the experiment**, **make an effort** to correlate the behavior of the apparatus with the principles discussed in lecture. Pay special attention to **the derivations and equations** used; eventually, when you substitute values into equations, you will know why you use them.

Keep your mind open to the possibilities of the experiment. Constantly ask yourself such questions as: Why do we do it this way? What would happen if we did it another way? What does this measurement show or prove? The purpose of the laboratory manual is to direct your thinking along those channels most likely to be fruitful.

A student must realize that the laboratory work has applications outside the laboratory. For instance, the magnetometer experiment may suggest ideas in connection with the magnetic prospecting for minerals.

The experiment on diffraction may help to explain why better directivity is obtained from the higher frequency radars. The experiment on optical instruments may suggest an approach to the projection of television pictures. There are, of course, innumerable other examples.

Writing laboratory reports is a significant part of your professional training. Speaking and writing are the most important tools of the engineer-scientist. Learn to handle them well. Your report should be well- organized, accurate, clear, concise, and easy to read.

Since you will have to write reports anyway, while you are doing them try to improve your command of your native language. Do not try to impress the reader with your own learning but write as if you were trying to explain the matter to an intelligent personal friend. Ability to express oneself clearly is extremely important for the professional person, even if a few people may tell you otherwise.

5. **Mark the statements *T* for 'true' or *F* for 'false'. Correct the false ones and expand on the true ones.**

- It's up to you whether you make the most of the laboratory work in physics or not. ( ) T
- You are unlikely to discover something new during your lab work. ( ) F
- It is lab work that gives you skills in the use of scientific instruments and techniques.( ) T

- Only in a well-equipped laboratory it was possible to discover all the known principles of physics. ( ) F
- Studying laboratory manual is optional and not very helpful. ( ) F
- Scientific or technical laboratory reports should be brief and easy to understand. ( ) T

6. **Do you know the procedure of writing a lab report? Mark the components of the report in the order required and say a few words about the key elements of each section of the lab report.**

4 **Materials**

2 **Introduction/Purpose**

7 **Conclusions**

3 **Methods**

6 **Results**

8 **Discussion/Analysis**

1 **Title**

5 **Figures and Graphs**

7. **Discuss the following points and comments.**

- You should regard a laboratory as a place for intellectual exploration.
- A student must realize that the laboratory work has applications outside the laboratory.
- When doing lab work students' initiative is not encouraged.

- Writing laboratory reports is a significant part of your professional training.
- What tools and devices do you use in your university physics laboratories?

- When in doubt, leave it out!
- You can't explain something to someone else if you don't understand it yourself.

Focus on grammar

8. **Identify the function of the modal verbs.**

Certainty	Probability	Impossibility	Possibility	
Prohibition	Permission	Obligation	Advice	Ability

- I *can* speak English and German fluently. possibility
- You *can't* work with this device without protection goggles. prohibition
- A physicist *might* work in a laboratory, designing materials for computer chips or smashing atomic particles. probability
- We *ought to* take all the necessary measurements tomorrow. obligation
- Your hypothesis *couldn't* be proved without experiment. impossibility
- I've done my test. *May* I go now? ability
- If your lab report is not well-organized, clear and easy to read you *may* get a lower grade or *may* be asked to rewrite it. probability
- You *must* be very clever if you know how to solve this equation. certainty
- They are not at the party, are they? They *should* be preparing for their quantum mechanics exam now. ?

9. **Choose the correct word in the box to fill in the gaps.**

In all aspects of this class you will be investigating the **1)** of science. I believe that the best way to do this is through hands-on **2)** and laboratory activities. The lab is a place for you to **3)** engage in the process of 'SCIENCE'. Part of this process is writing a laboratory report. The lab report is not only the time for you **4)** the results discovered during experimentation, but it is also an opportunity for you to analyze your **5)** , and evaluate any **6)** you may have made. Remember that science is imperfect - we learn new information by trying out new things and continuing to ask **7)** outside the classroom. In this class, lab **8)** must always be word processed. Figures and **9)** should be generated on the computer and must include a title and information about units. So, your lab reports are the most **10)** and helpful record of what goes on in science class this year.

10. **Speaking**

1. **Are there any safety rules you have to keep to when you work in a lab?**
2. **Work in small groups. Read some of the lab safety instructions. Discuss and sort out the things you *should do* and *shouldn't do* when working in the lab under these headings.**

Do's Don'ts

- follow all written and verbal instructions carefully;
- read all procedures thoroughly before entering the laboratory;
- be sure that the current is turned off before making adjustments in the circuit;
- report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the teacher immediately;
- fool around in the lab;
- look into a container that is being heated;
- use equipment with care for the purpose for which it is intended;
- use laboratory glassware as containers for food or beverages;
- set up and use the equipment as directed by your teacher;
- interfere with the laboratory experiments of others;
- wear goggles when using any type of projectile;
- place hot apparatus directly on the laboratory desk if there is no an insulated pad;
- get the instructor's permission before you try something original;
- ask the instructor to check all electrical circuits before you turn on the power.

3. **What else could you add to these lists? Hold a cross-group discussion and compare your lists.**
4. **Have you or someone you know ever had an accident in the lab? What happened?**
5. **Do you agree that "Discoveries are made by not following instructions"? Why?/Why not?**