May 05, 2016

General Instructions

1. The experimental examination lasts for 5 hours and is worth a total of 20 marks.
2. You must neither open the envelope with the problems nor touch the experimental equipment before the sound signal indicating the beginning of the competition is given.
3. Dedicated APhO2016 Answer Sheets are provided for writing your answers. Write your answers only on the Answer Sheets (marked **A**). Enter the measured datasets into the appropriate tables/boxes in the corresponding Answer Sheet. All graphs must be drawn only on the APhO2016 Graph Papers provided. Rough sheets are also provided (marked **B**). If you have written something on any sheet which you do not want to be graded, cross it out.
4. Fill out all the entries in the header (Student Code, Page number etc.).
5. There are two experiments in this paper, i.e. E1 and E2. You may begin with either E1 or E2. The full marks for E1 and E2 are 12 and 8, respectively.
6. You are not allowed to leave your working place without permission. If you need any assistance (broken calculator, need to visit a restroom, insufficient answer sheets or rough sheets, etc.), please draw the attention of the invigilator using one of the two cards (red card for help and green card for toilet).
7. The beginning of the examination will be indicated by the sound signal of a gong. Also there will be sound signal every hour indicating the elapsed time. Additionally, there will be a sound signal together with a verbal announcement, fifteen minutes before the end of the examination. At the end of the examination, there will be multiple sound signals.
8. At the end of the examination you must stop writing immediately. Sort and number your Answer Sheets, Rough Papers and Graph Papers. Put them in the corresponding envelopes provided, and leave the envelopes on your table. You are not allowed to take any sheet of paper out of the examination area.
9. Wait at your table till your envelopes are collected. Once all envelopes are collected your student guide will escort you out of the examination area as instructed by the Chief Examiner.

Experimental Examination

May 05, 2016

08:30 – 13:30

Wave phenomana such as diffraction and interference not only have long been one of the facinated areas in physics, but also have been widely used in optical spectroscopy, structural characterisation of materials, thin-film thickness measurements, holographic technologies, etc.

In this APhO2016 experiment section, you will explore the physics of two wave phenomana occuring in materials with artificial micro-structures.

Experiment E1: **Reflected optical diffraction patterns from one-dimensional structures**

Experiment E2: **Reflection phase of metal**

- *Experiments E1 and E2 are independent and use the same optical setup, but with different apparatus and configurations. You may begin with either experiment E1 or E2. The marks for E1 and E2 are 12 and 8, respectively. Error analysis is not required for E1 and E2, unless specified in the tasks. Obtaining one measurement of the required parameters in the tasks is enough, unless specified. Battery can be replaced, if the laser beam is weak.*

Important Precautions

- Do not look into the laser beam directly or through any optical device.
- Switch off the laser diode when it is not in use to avoid the draining of the battery
- Do not place highly reflective objects (such as rings, watches etc.) in the path of the laser beam.
- Handle the samples carefully
- Avoid unnecessary movements during the experimental examination. Do not shake the table or the walls of your cubicle. Laser experiments require stability.

More specific safety precautions and advice will be given in the descriptions of Experiments E1 and E2.