# Sample Assessment Task Year 12 Physics

### Sample for implementation for Year 12 from Term 4, 2018

### Context:

The theories underpinning light and its physics have changed markedly since the first rigorous considerations of the phenomena by Newton. Scientists such as Maxwell, Hertz, Huygens, Planck and Einstein have all contributed to how we study and model light and its interactions with matter.

| Task number: 3 | Weighting: 25% | Timing: Due Term 2 Week 8 |
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| Outcomes assessed:* **PH12-14** describes and analyses evidence for the properties of light and evaluates the implications of this evidence for modern theories of physics in the contemporary world.
* **PH11/12-2** designs and evaluates investigations in order to obtain primary and secondary data and information
* **PH11/12-3** conducts investigations to collect valid and reliable primary and secondary data and information
* **PH11/12-4** selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media
* **PH11/12-5** analyses and evaluates primary and secondary data and information
* **PH11/12-7** communicates scientific understanding using suitable language and terminology for a specific audience or purpose
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| Nature of the task:This assessment task will occur in two phases:* Initial research and literature review on an aspect of the physics of light
* First-hand investigations to explore findings of literature review

**Phase 1 – Initial Research and Literature Review**Students choose ONE of the following principles or themes relating to light:* Unification of electricity and magnetism
* Prediction of the velocity of light
* Production of electromagnetic waves
* Identification of elements
* Interference and diffraction of light
* Photoelectric effect

For the chosen principle or theme, students write a brief outline of the theory or principle and the evidence that was used by scientists, at the time, to validate or support the theory or principle. In this outline, students write a review of the supporting literature that was used to develop the theory and/or subsequent literature in the field.The outline and literature review should be no longer than 1000 words. The review of the literature should highlight:* Criticisms of the research methods of the authors and their conclusions
* A justification of the phase 2 work on a first-hand investigation to support or disprove the principle being discussed.

A full reference list in the appropriate format should be included with the outline and review.**Phase 2 – First-hand Investigation**The Phase 2 submission will outline a first-hand investigation to test or validate a concept or principle uncovered or discussed in Phase 1. This could be, but is not limited to:* Verification of light as a combination of electric and magnetic fields
* Determining the velocity of light
* Exploration of the production of electromagnetic waves
* Measuring and validating interference patterns and investigating diffraction
* Evaluating the relationship between intensity, frequency and photoelectric phenomena

The first-hand investigation has the following structure:* Abstract
* Aim
* Hypothesis (linked to research)
* Methodology
* Results
* Discussion (including errors/assumptions/limitations and their impact on findings)
* Conclusion

This outline should not exceed 1500 words |
| Feedback provided:To inform future learning your feedback will consist of:* an annotated marking criteria sheet
* annotations on the submitted literature review and investigation report
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### Marking criteria:

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| Knowledge and Understanding – 10 marks**PH12-14 Describes and analyses evidence for the properties of light and evaluates the implications of this evidence for modern theories of physics in the contemporary world**Students:* investigate Maxwell’s contribution to the classical theory of electromagnetism
* describe the production and propagation of electromagnetic waves
* investigate the phenomena of interference and diffraction of light

Conducting Investigations – 10 marks**PH11/12-2 Designs and evaluates investigations in order to obtain primary and secondary data and information**Students:* assess risk and select appropriate materials and technologies when designing and planning an investigation
* justify and evaluate the use of variables and experimental controls to ensure that a valid procedure is developed

**PH11/12-3 Conducts investigations to collect valid and reliable primary and secondary data and information**Students:* employ and evaluate safe work practices and manage risks
* use appropriate technologies to ensure and evaluate accuracy

Communicating and Problem Solving – 20 Marks**PH11/12-4 Selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media**Students:* select qualitative and quantitative data and information and represent them using a range of formats, digital technologies and appropriate media
* apply quantitative processes where appropriate
* evaluate reliability, validity and accuracy of the data

**PH11/12-5 Analyses and evaluates primary and secondary data and information**Students:* derive trends, patterns and relationships in data and information
* assess error, uncertainty and limitations in data
* assess the relevance, accuracy, validity and reliability of primary and secondary data and suggests improvements to investigations

**PH11/12-7 Communicates scientific understanding using suitable language and terminology for a specific audience or purpose**Students:* select and use suitable forms of digital, visual written and/or oral forms of communication
* select and apply appropriate scientific notations, nomenclature and scientific language to communicate in a variety of contexts
* construct evidence-based arguments and engage in peer feedback to evaluate an argument or conclusion
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### Marking Guidelines:

| Outcome | Developing | Elementary | Substantial | High |
| --- | --- | --- | --- | --- |
| **PH12-14 describes and analyses evidence for the properties of light and evaluates the implications of this evidence for modern theories of physics in the contemporary world****Max. Marks 10** | * demonstrates limited knowledge of some properties of light
* states contributions made by one of the scientists Maxwell, Hertz, Huygens, Plank or Einstein

**Marks 1-3** | * describes some properties of light and describes some implications of the evidence for these properties
* describes contributions made by at least one of the scientists Maxwell, Hertz, Huygens, Plank or Einstein

**Marks 4-5** | * relates some properties of light and explains implications of the evidence for these properties
* relates contributions made by at least one of the scientists Maxwell, Hertz, Huygens, Plank or Einstein to the development of the current theories of light

**Marks 6-8** | * relates the properties of light and explains implications of the evidence for these properties
* explains the contributions made by at least one of the scientists Maxwell, Hertz, Huygens, Plank or Einstein to the development of the current theories of light

**Marks 9-10** |
| **PH11/12-2** **designs and evaluates investigations in order to obtain primary and secondary data and information****Maximum marks 5** | * identifies variables correctly
* chooses appropriate equipment

**Marks 1** | * chooses appropriate equipment to complete the practical investigation
* identifies variables correctly, including a number of controlled variables
* modifies the method as a result of testing

**Marks 2** | * chooses appropriate equipment to complete the practical investigation
* assesses risks
* justifies the selection of variables
* modifies the investigation in response to new evidence

**Marks 3** | * chooses appropriate equipment to complete the practical investigation
* assesses risks and considers a range of issues
* justifies and evaluates the selection of variables
* evaluates and modifies the investigation in response to new evidence

**Marks 4-5** |
| **PH11/12-3 Conducts investigations to collect valid and reliable primary and secondary data and information****Max. Marks 5** | * requires teacher assistance to conduct the investigation and to select appropriate equipment

**Marks 1** | * some suitable equipment is chosen
* safe practices are employed
* minimal identification of risks

**Marks 2** | * provides some evidence of validity reliability of data and sources
* safe practices are employed
* explanation of risks

**Marks 3** | * evaluates validity reliability of data and sources
* employs and evaluates safe work practices and manage risks
* uses appropriate technologies to ensure and evaluate accuracy
* data and source information is included

**Marks 4-5** |
| **PH11/12-4 Selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media****Max. Marks 7** | * data is disorganised and only one set of data from one experiment present

**Marks 1** | * selects data and information and represents them using a range of formats, digital technologies and appropriate media

**Marks 2-3** | * selects qualitative and quantitative data and information and represents them using a range of formats, digital technologies and appropriate media
* applies quantitative processes where appropriate
* discusses the reliability and validity of the data

**Marks 4-5** | * selects relevant qualitative and quantitative data and information and represents them using a range of formats, digital technologies and appropriate media
* applies quantitative processes where appropriate
* evaluates the reliability, validity and accuracy of the data

**Marks 6-7** |
| **PH11/12-5 Analyses and evaluates primary and secondary data and information****Max. Marks 7** | * presents data with limited analysis

**Marks 1** | * identifies trends, patterns and relationships in data and information with limited analysis
* identifies errors, uncertainty and limitations in data

**Marks 2-3** | * describes trends, patterns and relationships in data and information
* describes error, uncertainty and limitations in data

**Marks 4-5** | * explains trends, patterns and relationships in data and information
* assesses error, uncertainty and limitations in data
* assesses the relevance, accuracy, validity and reliability of primary and secondary data and suggests improvements to investigations

**Marks 6-7** |
| **PH11/12-7 Communicates scientific understanding using suitable language and terminology for a specific audience or purpose****Max. Marks 6** | * presents limited information
* shows limited understanding of the scientific concepts

**Marks 1** | * communicates basic information through descriptive texts
* uses some scientific terminology

**Marks 2** | * presents a well-organized report
* selects and uses suitable forms of digital, visual written and/or oral forms of communication
* selects and applies appropriate scientific notations, nomenclature and scientific language to communicate

**Marks 3-4** | * presents a sustained, logical and cohesive report supporting conclusions/ideas with evidence
* selects and uses effective forms of digital, visual written and/or oral forms of communication
* selects and applies appropriate scientific notations, nomenclature and scientific language to communicate in a variety of contexts

**Marks 5-6** |