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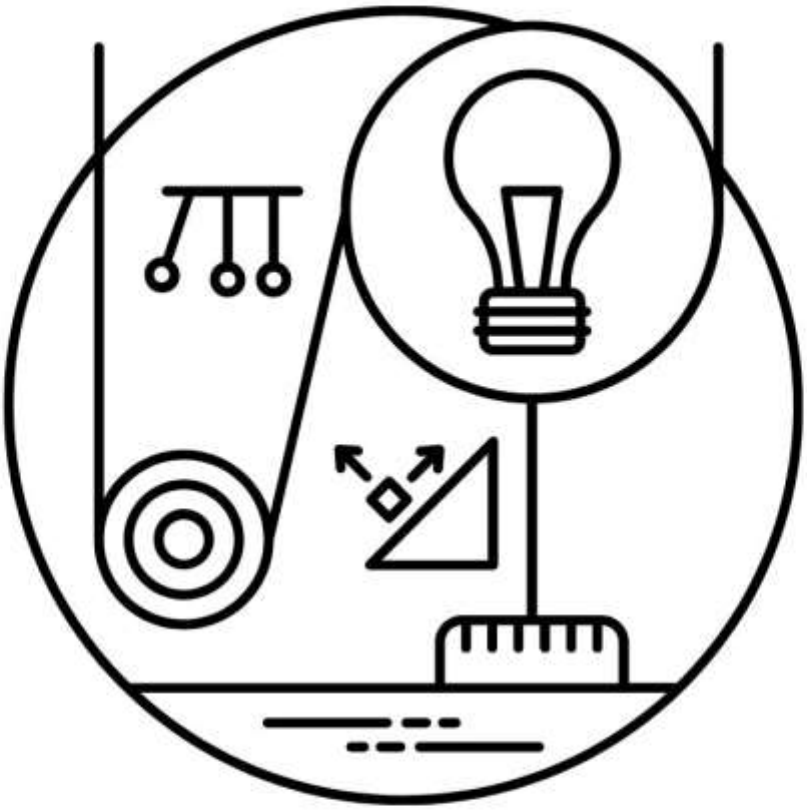
IBMYP Physics Sample Paper 1



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Group 5: Physics
On-Screen Examination

Total Marks: 80

Instructions

- The on-screen examination has not yet started.
- Your time will begin once you have clicked the Start button below. Do not click Start until instructed to do so.
- Before the examination begins you are given 5 minutes to become familiar with its structure. Please navigate around the examination, taking note of the length of each task and question. You have 2 hours to complete the examination.
- There are 10 separate questions in this examination. Each question may have sub-parts. Answer all the questions in the response boxes provided. The maximum mark for this examination is 100 marks.
- As you progress through the questions, your answers are automatically saved.
- When 2 hours has ended. you will no longer be able to answer any questions.

Question 1: 7 marks

1. **This question is about thermal physics**

a. Match the words with the correct definitions (1 mark)

Convection	It is a method of heat transfer that does not require a medium or direct contact. It involves the emission and absorption of electromagnetic waves, primarily in the form of infrared radiation.
Conduction	It is a method of heat transfer that occurs through direct contact between particles or objects.
Radiation	It is a method of heat transfer that involves the movement of fluids (liquids or gases).

Answer:

Convection	Convection is a method of heat transfer that involves the movement of fluids (liquids or gases).
Conduction	Conduction is a method of heat transfer that occurs through direct contact between particles or objects.
Radiation	Radiation is a method of heat transfer that does not require a medium or direct contact. It involves the emission and absorption of electromagnetic waves, primarily in the form of infrared radiation.

b. What are the units used to measure temperature and heat? (2 marks)

Answer: *The SI Unit for temperature is Kelvin (K) and the SI unit for heat is Joules (J)*

c. Consider a solid metal rod of length L and cross-sectional area A. The rod is initially at a temperature T1 and is heated until it reaches a final temperature T2. Explain the concept of thermal expansion and how it relates to the change in length of the rod. (4 marks)

Answer: *Thermal expansion is the phenomenon where substances, such as solids, liquids, and gases, expand or contract when heated or cooled. In the case of the metal rod, when it is heated, the kinetic energy of its atoms and molecules increases, causing them to vibrate more vigorously. This increased vibration leads to a greater average separation between the atoms, resulting in an expansion of the metal rod's dimensions.*

Question 2: 10 marks

2. a) Define the term "refraction" and explain the conditions under which it occurs. Provide an example from everyday life where refraction is observed. (3 marks)
Answer: *Refraction is the bending of waves as they pass from one medium to another, caused by a change in their speed. It occurs when a wave crosses the boundary between two media at an angle other than 90 degrees. One common example of refraction in everyday life is the apparent bending of a pencil partially submerged in a glass of water.*

b) Describe how the speed of light changes when it enters a medium with a higher refractive index. Use an equation, if necessary, to support your answer. (3 marks)

Answer: *When light enters a medium with a higher refractive index, its speed decreases. The relationship between the speed of light in a vacuum (c), the speed of light in the medium (v), and the refractive index (n) of the medium is given by the equation v = c/n. As the refractive index increases, the speed of light in the medium decreases proportionally.*

c) Calculate the wavelength of a sound wave with a frequency of 500 Hz, traveling in air at room temperature (approximately 20°C). Assume the speed of sound in air to be approximately 343 meters per second. (4 marks)

Answer: 0.686 m
Explanation: *To calculate the wavelength of a sound wave, we can use the formula:*

$$\text{Wavelength } (\lambda) = \text{Speed of sound } (v) / \text{Frequency } (f)$$

Given:
Frequency (f) = 500 Hz
Speed of sound (v) = 343 m/s

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