

SECTION

Attempt all questions from this section.

Item 1: (12 scores)

Students in a certain class examined an extract from a novel describing the use of an echo sounder producing ultrasonic waves from a ship at sea. The recorded data has been organized in the table below:

Position	Time taken to hear the echo (seconds)
A	11
B	5.2

The students were intrigued by the choice of ultra sound waves over conventional sound waves. The room was full of white light and a set of coloured lights that were used interchangeably. When the white set of lights was switched on, their clothes appeared blue and green. However, the clothes changed colour when the coloured set of lights were switched on, thus surprising them.

HINT:

Speed of sound in sea water is 1500 ms^{-1}

Task:

As a Physics learner:

- Determine whether point A or B, of the given points, is closer to the shore?
- Describe the appearance of the colours in white light?
- Why the clothes changed colour in coloured light?
- Explore the factors affecting speed of sound?

blue and green

$$\lambda = d \sin \theta$$

Item 2: (12 scores)

A certain group of people from a village with a mining area are experiencing skin disorders and general body weakness. Since they share a common water source, they decided to take a water sample to the National Nuclear Research centre. After two weeks, the nuclear centre sent the authorities a report as shown in the table below.

Count rate (counts per minute)	395	258	186	147	125
Time (minutes)	0	40	80	120	160

Task: Use your knowledge of Physics to:

- assist the local authorities in determining the amount of radioactive material present after one and a half hours in the water if the background radiation in the area is 100 counts per minute and, after what time will the water be safe for the people if its okay at a count rate of 24 counts per minute?