

Physics Sept 2013

Paper I

- 1ai) While the girl is swimming down, pressure is increasing but once she swims horizontally, then pressure remains constant since pressure is the same at the same height.
- 1aii) The pressure on the boy keeps increasing since pressure increases with height. The column of water above the boy keeps increasing, hence increasing pressure.
- 1b) Total Pressure = 8590000Pa (rounded) (This does not really make sense, but since question asked for total pressure, I found the individual pressures and then added them up)
- 1c) In the Sun, temperature inside the ring increases. Hence keeping the same volume, the pressure increases

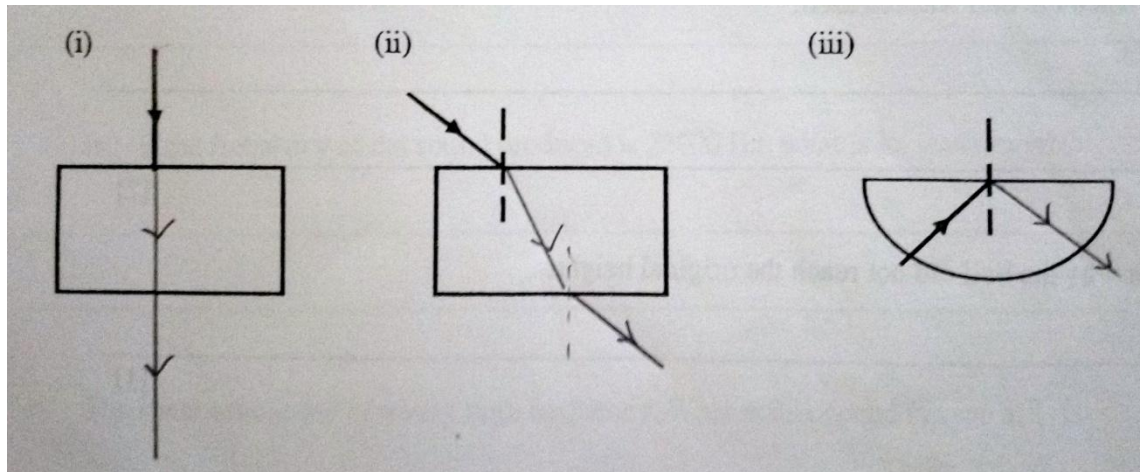
2ai) air

2aii) glass

2b) 2.26×10^8 m/s

2c) Total internal reflection cannot occur since it only occurs when light is passing from a dense medium to a less dense medium. But water is less dense than glass, therefore light is passing from a dense to a more dense medium. Therefore total internal reflection does not occur.

2d)



3a) 1.4256J

3b) 0

3c) 1.4256J since PE lost = KE gained

3d) 6.9 m/s

3e) difference = 0.2376 J

3f) since PE/KE was changed into heat and sound energy losses

4a) longitudinal

4bi) 225m (since 0.3 had to be divided by 2 because it is echo)

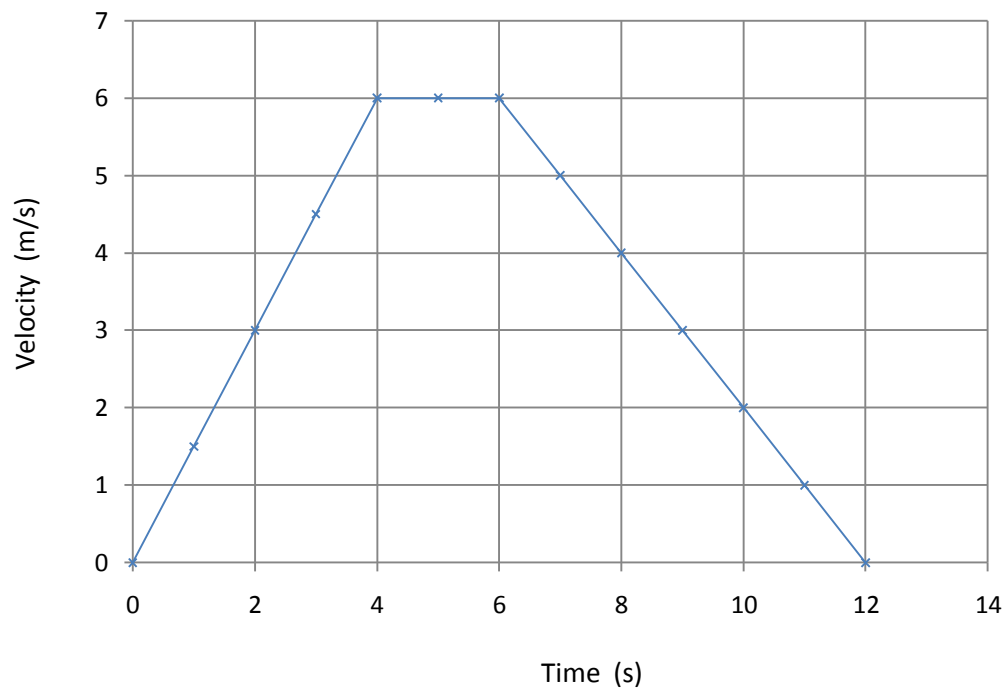
4bii) the distance travelled by sonar decreases, so the time for echo to be heard is less

4biii) $t = 0.1$ sec

4biv) 0.068m

4c) ultrasound

5a) **Graph of velocity against time**



5bi) gradient = acceleration = 1.5 m/s²

5bii) gradient = acceleration = -1 m/s²

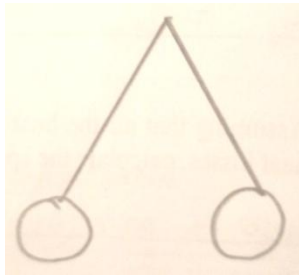
Deceleration = 1 m/s²

5biii) total distance = area under graph = 42 m

- 6a) when electromagnet is switched on, it becomes a magnet, iron is a magnetic material and it is in the magnetic field, so the piece of iron is attracted to the electromagnet.
- 6b) force of attraction = stretching force of spring. Measure extension e , find spring constant k and use $F = ke$ to find the force F .
- 6c) increasing the number of turns, increasing the current passing through the electromagnet or moving the iron piece closer to the electromagnet
- 6d) the steel bar would still be attracted
- 6e) no, there would be no difference in strength

7a) positively, negative

7b)



- 7c) Since both spheres are given the same charge, then they will repel
- 7d) If positive charge is increased, then they will go further apart due to a greater force of repulsion
- 7e) no difference, same as in b
- 7f) since it is pointed and since it is a very good conductor and since it is usually at a high place

8ai) 3150 J

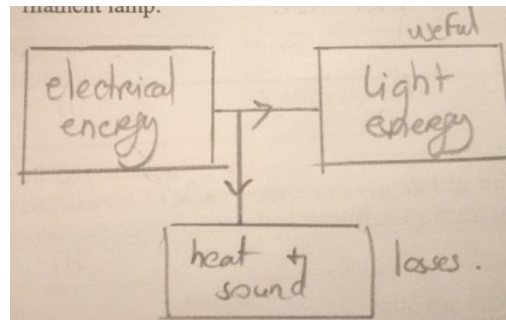
8aii) 525 J/kg°C

8aiii) beaker must be placed on an insulator to stop heat transfer by conduction and it must also be covered by insulation to stop heat transfer by radiation

8aiv) that no energy was lost to the surroundings and that the water was in fact pure water

8b) when air is heated, its temperature rises, leading to a decrease in density, hence the hot air floats on top of the cold air

9a)



9b) 60 J per second

9c) 38.5 kWh

9d) 171.5 kWh more

9e) €30.87

9f) it uses less electrical energy to give the same intensity of light

10a) 0

10b) 0

10c) because it gives both size and direction

10d) 420 Nm

10e) 0.84 m

10f) No, since distance in her case is 0, therefore no turning effect