Upthrust Questions

Q1.

Figure 15 shows a ball floating in seawater and the same ball floating in fresh water.

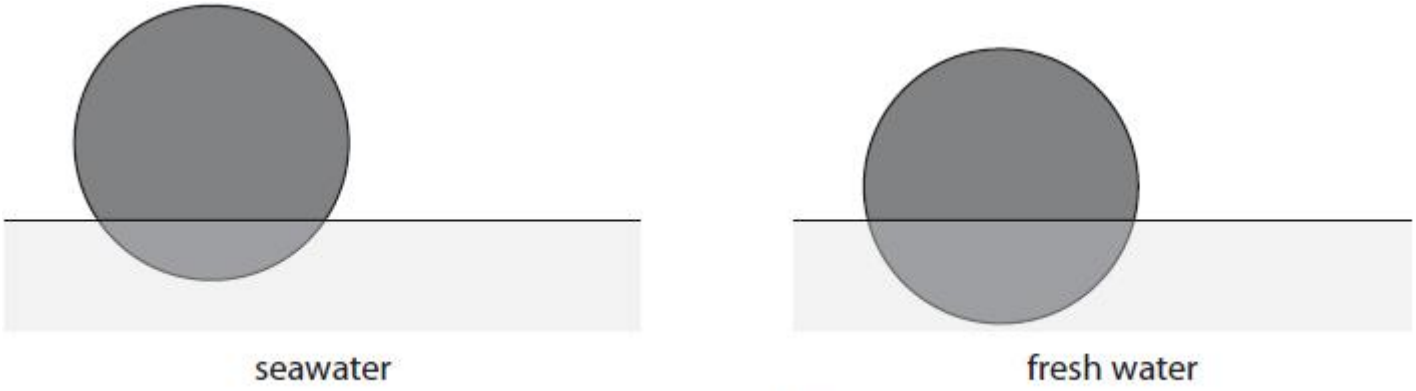


Figure 15

(i) Compare the upthrust on the ball in seawater with the upthrust on the same ball in fresh water.

(1)

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(ii) Explain why there is less of the ball below the surface of the seawater than below the surface of the fresh water.

(3)

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(Total for question = 4 marks)

Q2.

* Figure 26 shows the submarine stationary and submerged at a depth of 10 m.

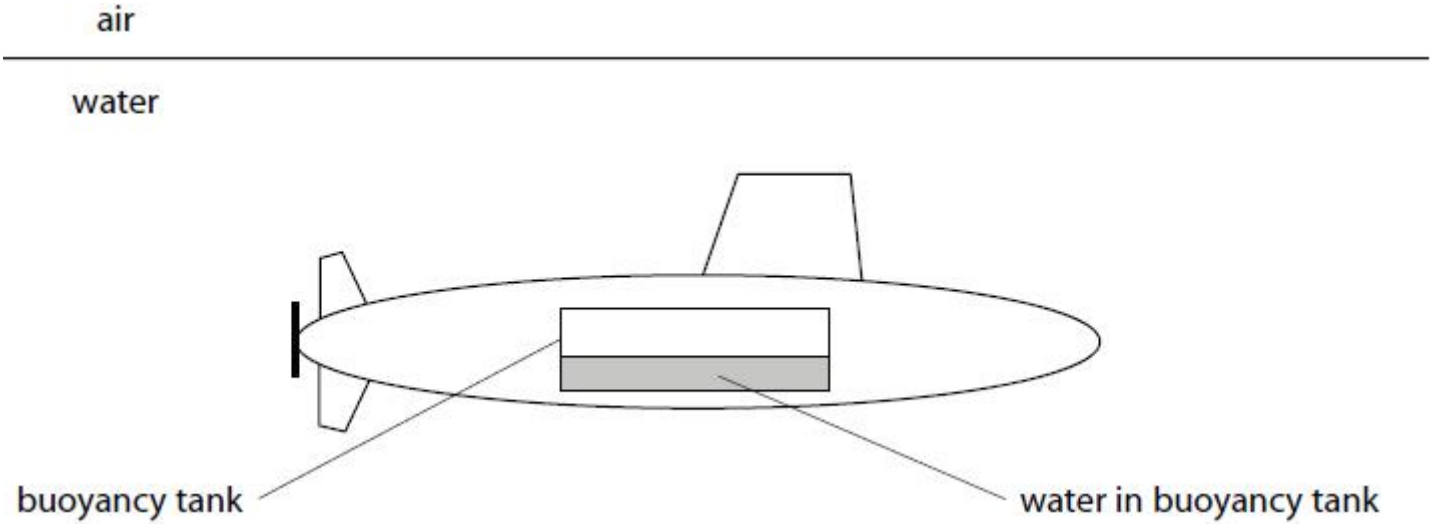


Figure 26

Explain how pumping water into and out of the buoyancy tank affects the depth of the submarine below the surface.

(6)

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(Total for question = 6 marks)

Q3.

*Figure 28 shows a cross-section of a boat floating in water and the same boat with a load inside.

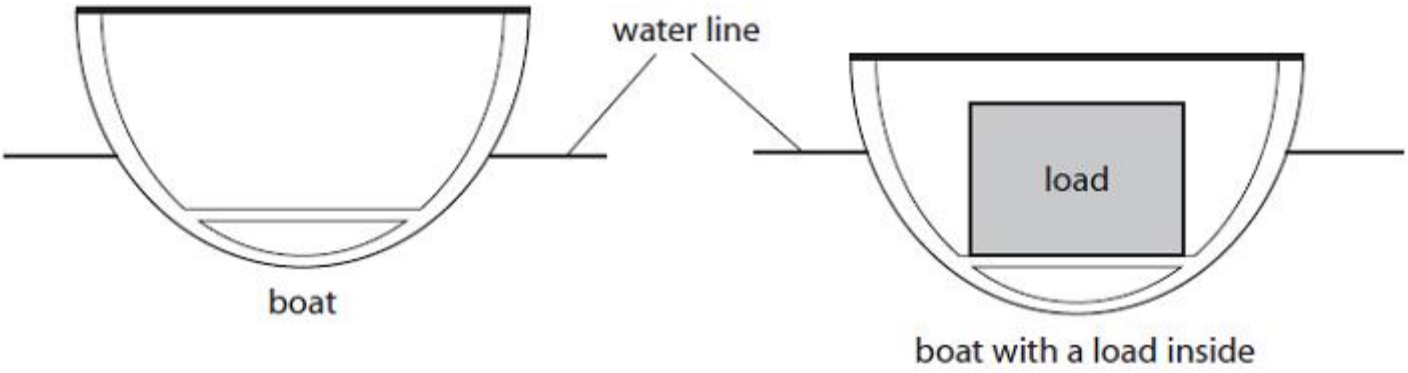


Figure 28

The boat floats lower in the water when there is a load inside the boat.

Explain why the boat floats in water and why the boat floats lower in the water when there is a load inside the boat.

You may add to the diagram to help with your answer.

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(Total for question = 6 marks)

Q4.

Figure 17 shows a crane lifting a concrete block from the bottom of a deep pool of water.
The top of the block is a distance, *h*, below the surface of the water.

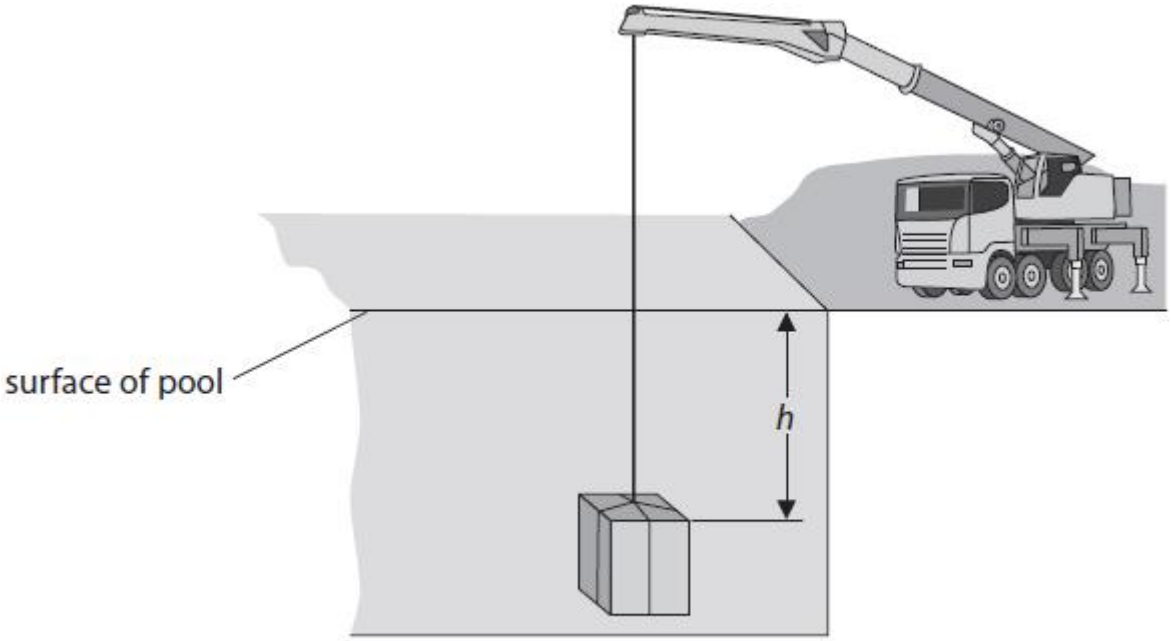


Figure 17

The force on the top of the block due to the water above it is 41 000 N.

The pressure due to the water on the top surface of the block is 66 000 Pa.

(i) Calculate the area of the top surface of the block.

(2)

area of the top surface of the block = ... m^2

(ii) The density of water is 1000 kg/m^3.

Calculate the distance, *h*, between the top of the block and the surface of the water.
Gravitational field strength, *g*, is 10 N/kg.
Use an equation selected from the list of equations at the end of this paper.

(2)

h = ... m

(iii) Explain why there is an upthrust produced by the water on the block.

(2)

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* (iv) The crane raises the block until it is high enough out of the water to be loaded on to a lorry.
The block moves upwards at a constant speed even though the lifting force in the cable changes.
Figure 18 shows the graph of how the lifting force changes while the block is being raised.

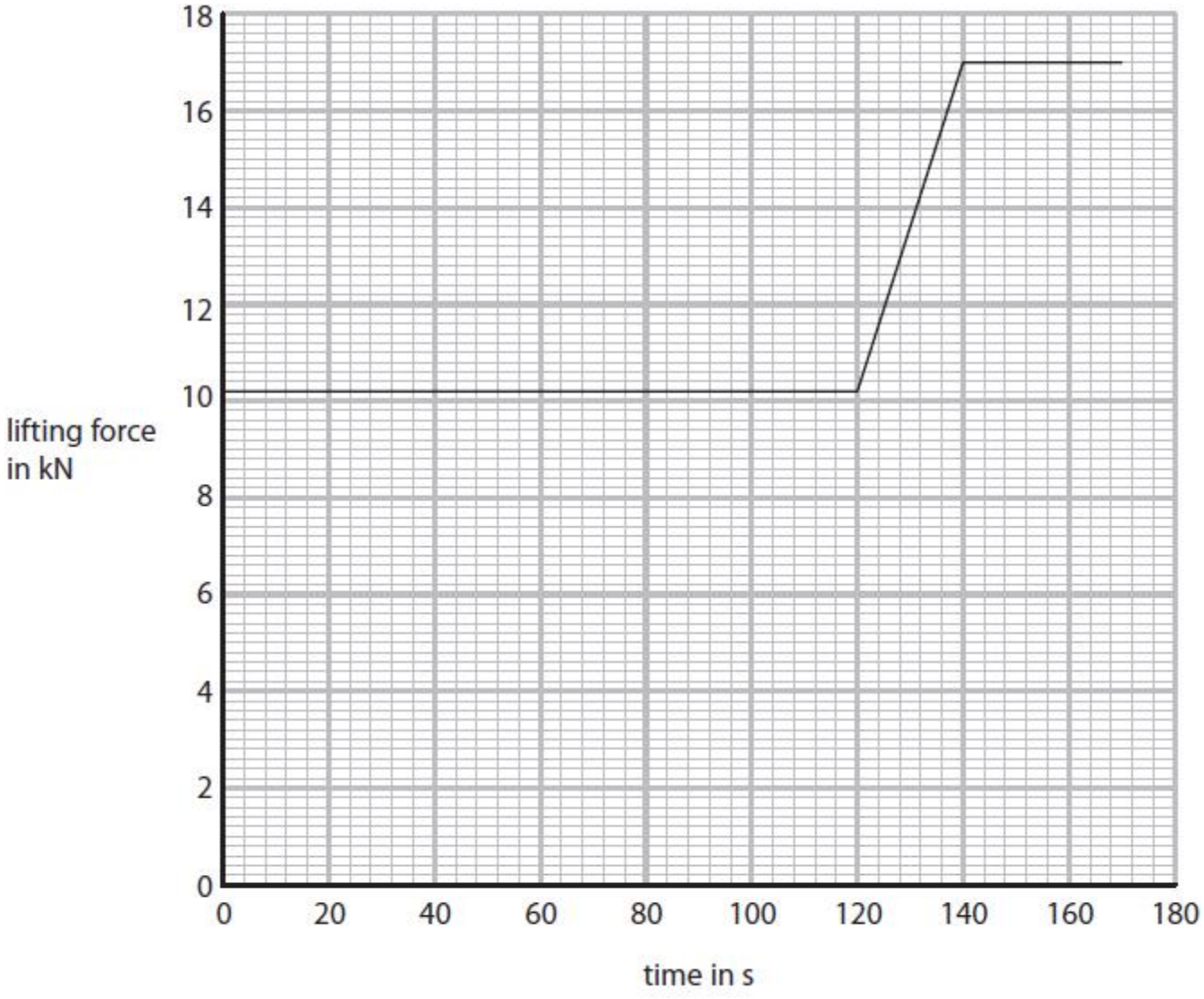


Figure 18

Explain why the lifting force changes as shown on the graph in Figure 18.
Include calculation(s) in your answer.

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(Total for question = 12 marks)