Oxford Cambridge and RSA

GCSE Physics B (Twenty First Century Science)

J259/04 Depth in physics (Higher Tier)

Question Set 26

1 The wreck of the ship, Titanic, is a few kilometers below the surface of the sea. In order to reach these depths, a mini-submarine capable of resisting large pressure was used.

The mini-submarine contained a ballast tank, which was flooded with water when the mini-submarine wanted to sink, and was emptied of water when it wanted to rise to the surface of the sea.

(a) Explain, using **forces**, how the mini-submarine could sink.

Use ideas about weight and upthrust in your answer. **[3]**

(b) The Titanic is 3.8 km below the surface of the sea.

Calculate the pressure on the submarine from the water, at the depth of the Titanic.

Use the data sheet.

Give your answer in **MPa**.

The density of seawater = 1025 kg / m^3

Gravitational field strength = 10 N / kg

Pressure = ... MPa **[4]**

Total Marks for Question Set 26: 7

Resource Materials

Question Set No: 26

Equations in Physics

change in internal energy = mass × specific heat capacity × change in temperature

energy to cause a change in state = mass × specific latent heat

for gases: pressure × volume = constant
(for a given mass of gas and at a constant temperature)

$(\text{final speed})^2 - (\text{initial speed})^2 = 2 \times \text{acceleration} \times \text{distance}$

energy stored in a stretched spring = ½ × spring constant × $(\text{extension})^2$

potential difference across primary coil × current in primary coil =
potential difference across secondary coil × current in secondary coil

Higher tier only –

pressure due to a column of liquid = height of column × density of liquid ×

g force = magnetic flux density × current × length of conductor

potential difference across primary coil ÷ potential difference across secondary coil = number of turns in primary coil ÷ number of turns in secondary coil

change in momentum = resultant force × time for which it acts