Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

(a) 6.5×10^{10} Pa ✓ **1**

(b) $\text{kg m}^{-1} \text{s}^{-2}$ ✓ **1**

(c) Direction of movement of particles in transverse wave perpendicular to energy propagation direction ✓ **1**

Parallel for longitudinal ✓ **1**

(d) $\rho_1 c_1 = \rho_2 c_2$ ✓

$E = \rho c^2$ or $\rho c = \frac{E}{c}$ seen **1**

$\left[\frac{E_1}{c_1} = \frac{E_2}{c_2}\right]$ **1**

(e) $\left[\frac{\rho_x}{\rho_y} = \frac{c_y}{c_x}\right.$ and $c_x = 2c_y$]

0.5 ✓ **1**

(f) speed of the wave in seawater is less than speed of the wave in glass ✓ **1**

argument to show that ${}_{water}n_{glass} < 1$ ✓ **1**

so tir could be observed when wave moves from water to glass ✓ **1**

[10]

Q2.

(a) Max GPE of block = $Mgh = 0.46 \times 9.81 \times 0.63 = 2.84$ J ✓

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The first mark is for working out the GPE of the block

1

Initial KE of block = ½ Mv^2 = 2.84 J

Initial speed of block v^2 = (2 × 2.84) / 0.46

v = 3.51 ms^{-1} ✓

The second mark is for working out the speed of the block initially

1

momentum lost by pellet = momentum gained by block

= Mv = 0.46 × 3.51 = 1.61 kg m s^{-1} ✓

The third mark is for working out the momentum of the block (and therefore pellet)

1

Speed of pellet = 1.58 / m = 1.58 / 8.8 × 10^{-3} = 180 ms^{-1} (183) ✓

The final mark is for the speed of the pellet

1

At each step the mark is for the method rather than the calculated answer

Allow one consequential error in the final answer

(b) As pellet rebounds, change in momentum of pellet greater and therefore the change in momentum of the block is greater ✓

Ignore any discussion of air resistance

1

Initial speed of block is greater ✓

1

(Mass stays the same)

Initial KE of block greater ✓

1

Therefore height reached by steel block is greater than with wooden block ✓

1

(c) Calculation of steel method will need to assume that collision is elastic so that change of momentum can be calculated ✓

1

This is unlikely due to deformation of bullet, production of sound etc. ✓

1

And therefore steel method unlikely to produce accurate results.

[10]

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