2 **(a)** Define acceleration.

....

.... [1]

(b) An Olympic diver stands on a platform above a pool of water, as shown in Fig. 2.1.

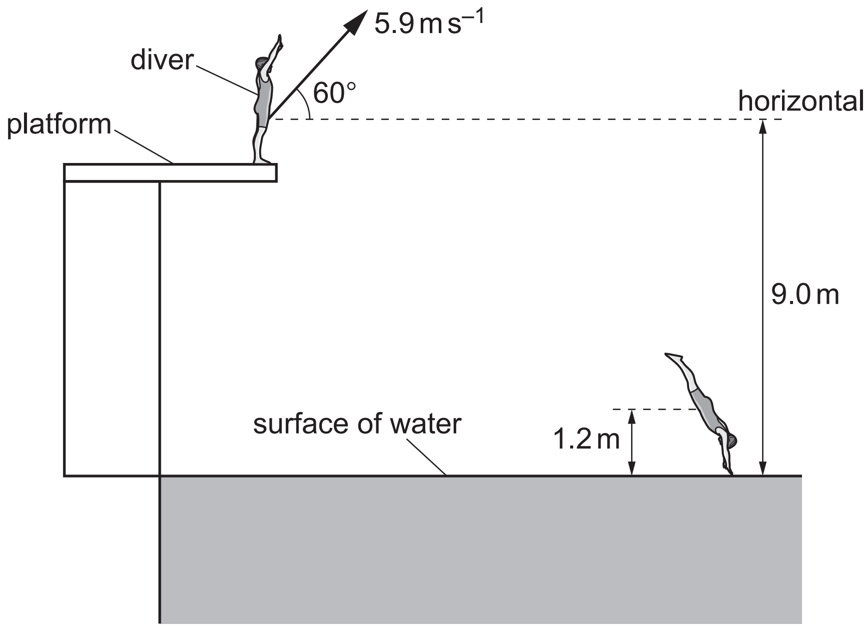

Fig. 2.1 (not to scale)

When the diver is on the platform his centre of gravity is a vertical height of 9.0 m above the surface of the water. The diver jumps from the platform with a velocity of $5.9\,\text{m}\,\text{s}^{-1}$ at an angle of 60° to the horizontal.

Air resistance is negligible.

When the diver hits the surface of the water, his centre of gravity is a vertical height of 1.2 m above the surface of the water.

Calculate the speed of the diver at the instant he hits the surface of the water.

speed = ... $\text{m}\,\text{s}^{-1}$ [3]

(c) The diver in **(b)** enters the water and decelerates.

(i) Describe and explain the variation of the viscous drag force acting on the diver in the water as he moves downwards.

....

....

....

.... [2]

(ii) The diver has a volume of $7.5 \times 10^{-2}\,m^3$. The density of the water is $1.0 \times 10^3\,kg\,m^{-3}$.

Show that the upthrust acting on the diver when he is entirely underwater is 740 N.

[1]

(iii) At a particular instant when the diver is entirely underwater his horizontal velocity is zero. The viscous drag force acting on him at this instant is 950 N vertically upwards. The diver has mass 78 kg.

Determine the magnitude and direction of the acceleration of the diver.

acceleration = ... $m\,s^{-2}$

direction ....

[4]

[Total: 11]