www.smartexamresources.

1 Fig. 3.1 shows an insect called a pond skater.

Pond skaters spread their weight over their 6 legs so that they can move over the surface of water.

Fig. 3.1

(a) The pond skater has a mass of 0.25 g and is stationary on the surface of the water.

(i) Use the values in the list to complete the sentences about the pond skater.

The gravitational field strength, *g*, is 10 N / kg.

You can use each value once, more than once or not at all.

0 N **0.0025 kg** **0.0025 N** **0.25 g** **0.25 kg** **2.5 N**

The weight of the pond skater is ..... .

The force acting upwards on the pond skater by the water is ..... .

The resultant force acting on the pond skater is ..... .

[2]

(ii) The pond skater stands on all 6 legs, with the foot of each leg making contact with the surface of the water.

The area of each foot is $1.2 \times 10^{-7}\,m^2$.

Calculate the pressure exerted by each foot on the surface of the water.

pressure = ... Pa [2]

MARK SCHEME:

(a)(i)	0.0025 N ; 0.0025 N **and** 0 (N) ;	**2**
(a)(ii)	(P =) F / A **or** 0.0025 / ($6 \times 1.2 \times 10^{-7}$) ; (P =) 3500 (Pa) ;	**2**

www.smartexamresources.com

2 Fig. 9.1 shows a person sitting in an inflatable raft.

Fig. 9.1

(b) The combined weight of the raft and the person is 1100 N. The raft exerts a pressure of 500 Pa on the surface of the water.

(i) Calculate the area of raft in contact with the water.

area = ... m^2 [2]

www.smartexamresources.

MARK SCHEME:

(A =) F÷ P or 1100÷ 500 ; 2.2 (m^2) ;	**2**

www.smartexamresources.

3 Fig. 3.1 shows a man in a canoe on a lake.

The combined mass of the man and the canoe is 120 kg.

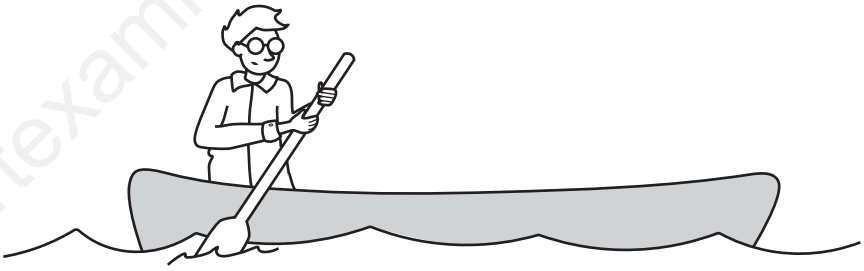


Fig. 3.1

The canoe exerts a pressure of 0.5 kPa on the surface of the water.

Calculate the area of canoe in contact with the surface of the water.

The gravitational field strength, *g*, is 10 N / kg.

area = ... m^2 [3]

www.smartexamresources.

MARK SCHEME:

	(W =) mg or 120 × 10 or 1200 (N) ; (A =) W / P or 1200 / 500 ; 2.4 (m^2) ;	**3**

www.smartexamresources.com

4 Fig. 3.1 shows a simple turbine, similar to those used in a nuclear power station.

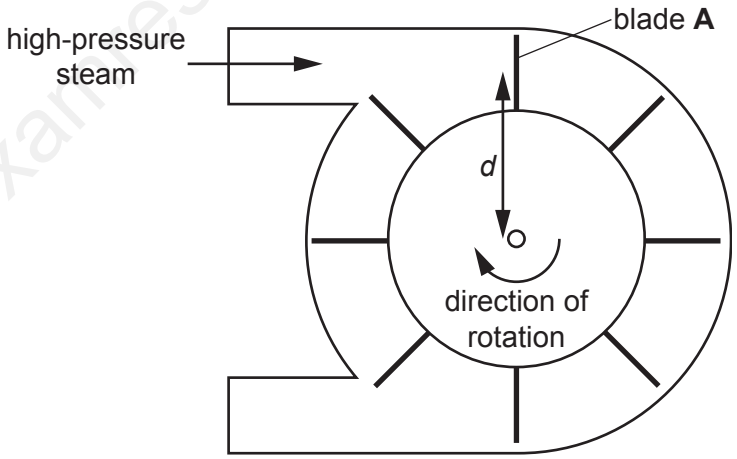


Fig. 3.1

(i) The high-pressure steam is at a pressure of 1.8×10^7 Pa.

Blade **A** has a surface area of $0.12\,m^2$.

Show that the force acting on blade **A** is 2.2×10^6 N.

[1]

www.smartexamresources.

MARK SCHEME:

$1.8 \times 10^7 \times 0.12$;	**1**

www.smartexamresources.com

5 Fig. 3.1 shows a man in a canoe on a lake.

The combined mass of the man and the canoe is 120 kg.

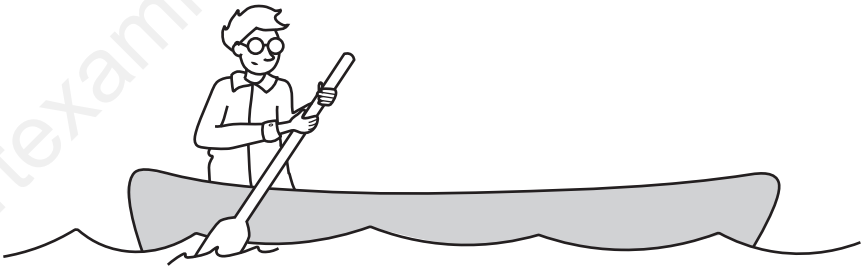


Fig. 3.1

(a) The canoe moves at a speed of 4.0 m/s.

(i) Calculate the kinetic energy of the man and the canoe.

kinetic energy = ... J [2]

(ii) The canoe takes 5.0 s to slow down to a speed of 0.5 m/s.

Calculate the constant deceleration of the canoe.

deceleration = ... m/s^2 [3]

(iii) On Fig. 3.2 draw a speed–time graph to show the canoe's deceleration.

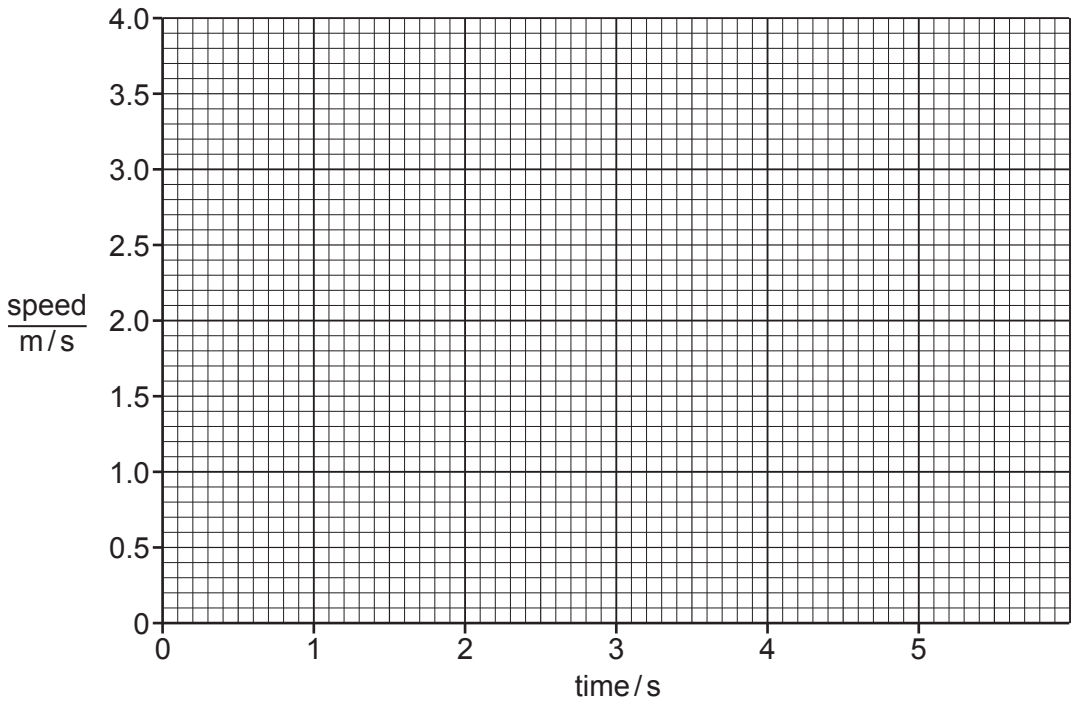


Fig. 3.2

[1]

(b) The canoe exerts a pressure of 0.5 kPa on the surface of the water.

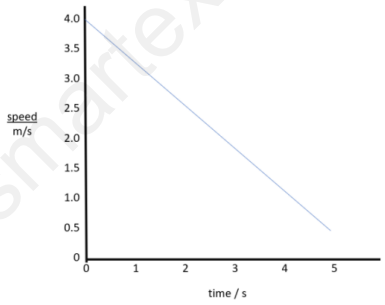
Calculate the area of canoe in contact with the surface of the water.

The gravitational field strength, *g*, is 10 N / kg.

area = ... m^2 [3]

www.smartexamresources.

MARK SCHEME:

Question	Answer	Marks
3(a)(i)	(KE =) ½ mv^2 or ½ × 120 × 4^2 ; 960 (J) ;	2
3(a)(ii)	(Δv =) 3.5 (m / s) ; (a =) Δv / t or 3.5 / 5.0 ; 0.7 (m / s^2) ;	3
3(a)(iii)	 ;	1
3(b)	(W =) mg or 120 × 10 or 1200 (N) ; (A =) W / P or 1200 / 500 ; 2.4 (m^2) ;	3

www.smartexamresources.com