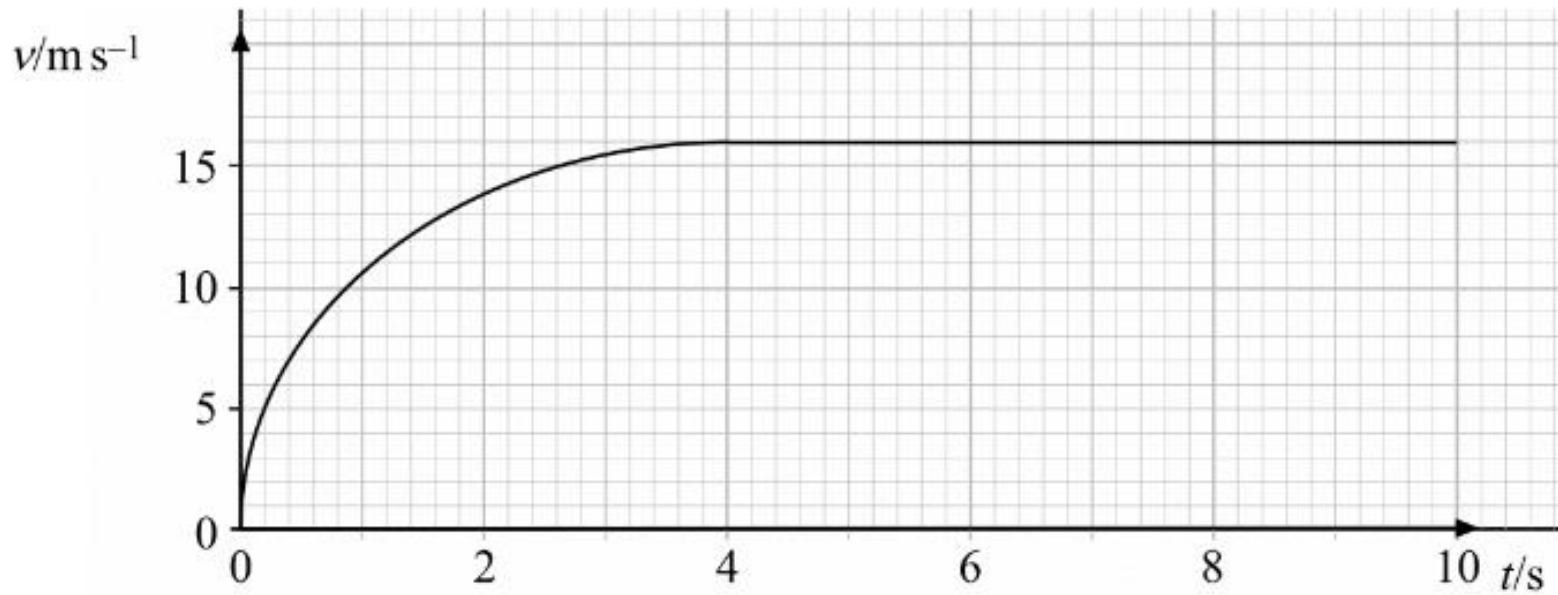


Test Review for Motion 6

Q1



- (a) Describe, without calculation, how the *resultant* force acting on the car varies over this 10 second interval.
- (b) Calculate the maximum kinetic energy of the car.

Q1 continued

- (c) At some time later, when the car is travelling at a steady speed of 30 m s^{-1} , the useful power developed by the engine is 20 kW . Calculate the driving force required to maintain this speed.

Q2

A car accelerates at a steady rate of 2.5 m s^{-2} along a straight, level road. The mass of the car is $1.3 \times 10^3 \text{ kg}$.

- (a) Calculate the magnitude of the resultant force acting on the car.

Q2 continued

- (b) When the accelerating car reaches a speed of 2.2 m s^{-1} , the total force opposing the motion of the car is 410 N .

Calculate

- (i) the driving force provided by the wheels,

- (ii) the power delivered to the wheels of the car.

Q2

Explain how the total force opposing the motion of the car is affected when it is travelling up a hill.

Q4

A packing case is being lifted vertically at a constant speed by a cable attached to a crane. The packing case has a mass of 640 kg.

(a) With reference to one of Newton's laws of motion, explain why the tension, T , in the cable must be equal to the weight of the packing case.

(b) The packing case is lifted through a vertical height of 8.0 m in 4.5 s.

Calculate

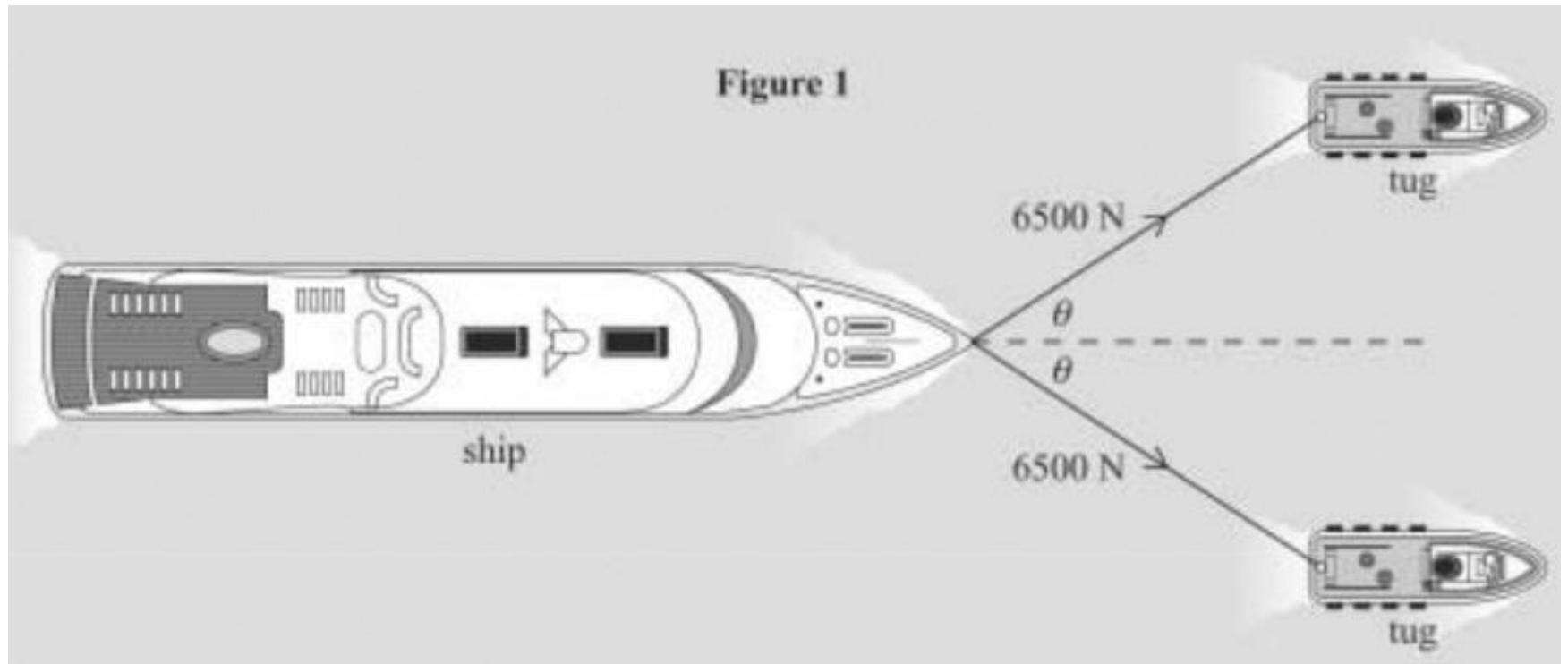
(i) the work done on the packing case,

Q4 continued

- (ii) the power output of the crane in this situation.

Q5

Figure 1



- (a) The tension in each cable is 6500 N and the ship is moving at a constant speed of 1.5 m s^{-1} . When θ is equal to 35° , calculate
- the resultant force exerted on the ship by the cables,

Q5 continued

- (ii) the work done by the tension in the cables in one minute.

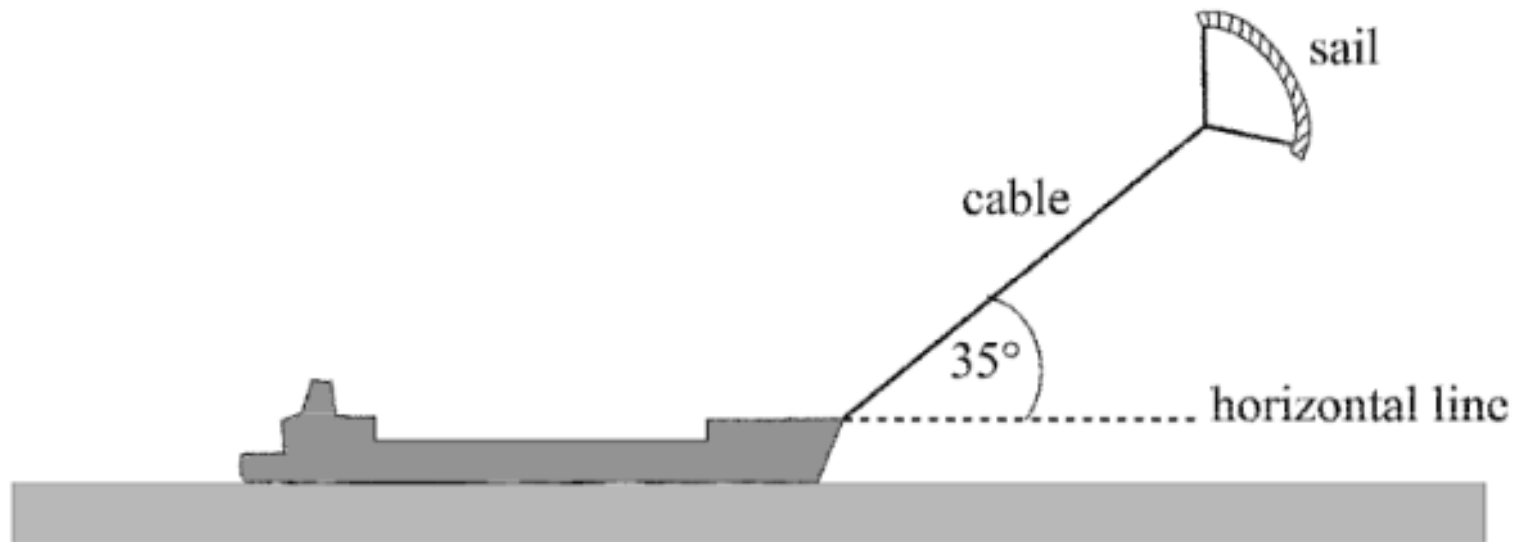
Q6 continued

- (iii) Explain why the power calculated by the athlete is likely to be less than the power actually developed.

Q7

Figure 1 shows a ship fitted with a sail attached to a cable. The force of the wind on the sail assists the driving force of the ship's propellers.

Figure 1



The cable exerts a steady force of 2.8 kN on the ship at an angle of 35° above a horizontal line.

Q7 continued

- (b) (i) Calculate the horizontal and vertical components of this force.
- (ii) The ship is moving at a constant velocity of 8.3 m s^{-1} and the horizontal component of the force of the cable on the ship acts in the direction in which the ship is moving.
Calculate the power provided by the wind to this ship, stating an appropriate unit.

Q8

(a) A cricketer throws a ball vertically upwards so that the ball leaves his hands at a speed of 25 m s^{-1} . If air resistance can be neglected, calculate

(i) the maximum height reached by the ball,

(ii) the time taken to reach maximum height,

Q8 continued

(iii) the speed of the ball when it is at 50% of the maximum height.

(b) When catching the ball, the cricketer moves his hands for a short distance in the direction of travel of the ball as it makes contact with his hands. Explain why this technique results in less force being exerted on the cricketer's hands.

Q9

A car accelerates at a steady rate of 2.5 m s^{-2} along a straight, level road. The mass of the car is $1.3 \times 10^3 \text{ kg}$.

(a) Calculate the magnitude of the resultant force acting on the car.

(b) When the accelerating car reaches a speed of 2.2 m s^{-1} , the total force opposing the motion of the car is 410 N .

Calculate

(i) the driving force provided by the wheels,

Q9 continued

- (ii) the power delivered to the wheels of the car.

Q10 continued

- (c) The ball has a mass of 0.45 kg and is in contact with the wall for 0.10 s. For the period of time the ball is in contact with the wall,
- (i) calculate the average acceleration of the ball.

 - (ii) calculate the average force acting on the ball.

 - (iii) state the direction of the average force acting on the ball.