17 A boy on a bicycle starts from rest and rolls down a hill inclined at 30° to the horizontal.

The boy and bicycle have a combined mass of 25 kg.

There is a frictional force of 30 N, which is independent of the velocity of the bicycle.

What is the kinetic energy of the boy and the bicycle after rolling 20 m down the slope?

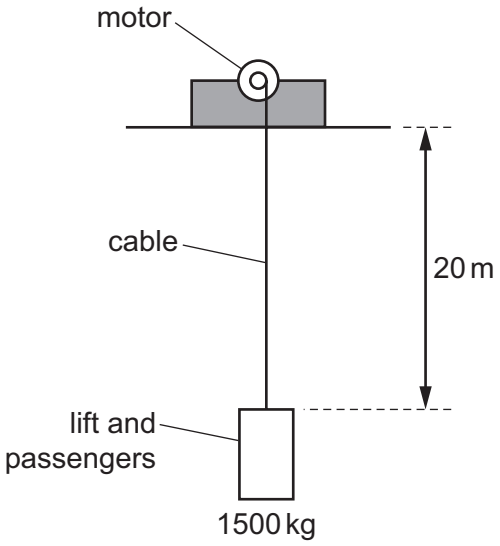
A 1850 J **B** 2450 J **C** 3050 J **D** 3640 J

18 An escalator in an underground station has 250 people standing on it and is moving with a velocity of 4.3 m s^{-1}. The average mass of a person is 78 kg and the angle of the escalator to the horizontal is 40°.

What is the minimum power required to lift these people?

A 54 kW **B** 64 kW **C** 530 kW **D** 630 kW

19 An electric motor operating a lift has an output power of 20 kW.



The lift and passengers have a combined mass of 1500 kg. The motor raises the lift through a distance of 20 m.

How long does it take?

A 6 s **B** 15 s **C** 30 s **D** 60 s

20 A spring balance consists of a spring of length 20.0 cm with a hook attached.

When a fish of mass 3.0 kg is suspended from the hook, the new length of the spring is 27.0 cm.

What is the spring constant of the spring?

A 4.2 N m^{-1} **B** 43 N m^{-1} **C** 110 N m^{-1} **D** 420 N m^{-1}