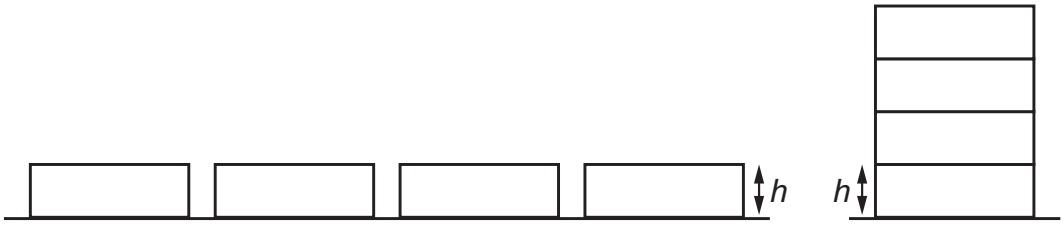
A-Level Physics: **s25 13**

16 Four identical uniform blocks are spread on a table. Each block has mass *m* and thickness *h*.



The acceleration of free fall is *g*.

How much work is done on the blocks in stacking them on top of one another?

A 3*mgh** **B** 6*mgh** **C** 8*mgh** **D** 10*mgh*

A-Level Physics: **s25 14**

16 In which situation is the least amount of energy transferred?

A A student and a motorcycle of total mass 80 kg come to rest from a speed of 2.0 m s^{-1}.

B A student of mass 50 kg falls a vertical distance of 2.0 m.

C A student pushes a car with a horizontal force of 70 N for a horizontal distance of 2.0 m.

D A student switches on a 70 W lamp for 20 s.

A-Level Physics: **m25 12**

17 A turbine at a hydroelectric power station is situated at a vertical distance of 30 m below the level of the surface of a large lake. The water passes through the turbine at a rate of 340 m^3 per minute.

The overall efficiency of the turbine and generator system is 90%. The density of water is 1000 kg m^{-3}.

What is the useful power output of the power station?

A 0.15 MW **B** 1.5 MW **C** 1.7 MW **D** 90 MW

18 A projectile is launched at 45° to the horizontal with initial kinetic energy *E*.

Assuming air resistance to be negligible, what will be the kinetic energy of the projectile when it reaches its highest point?

A 0.50*E** **B** 0.71*E** **C** 0.87*E** **D** *E*

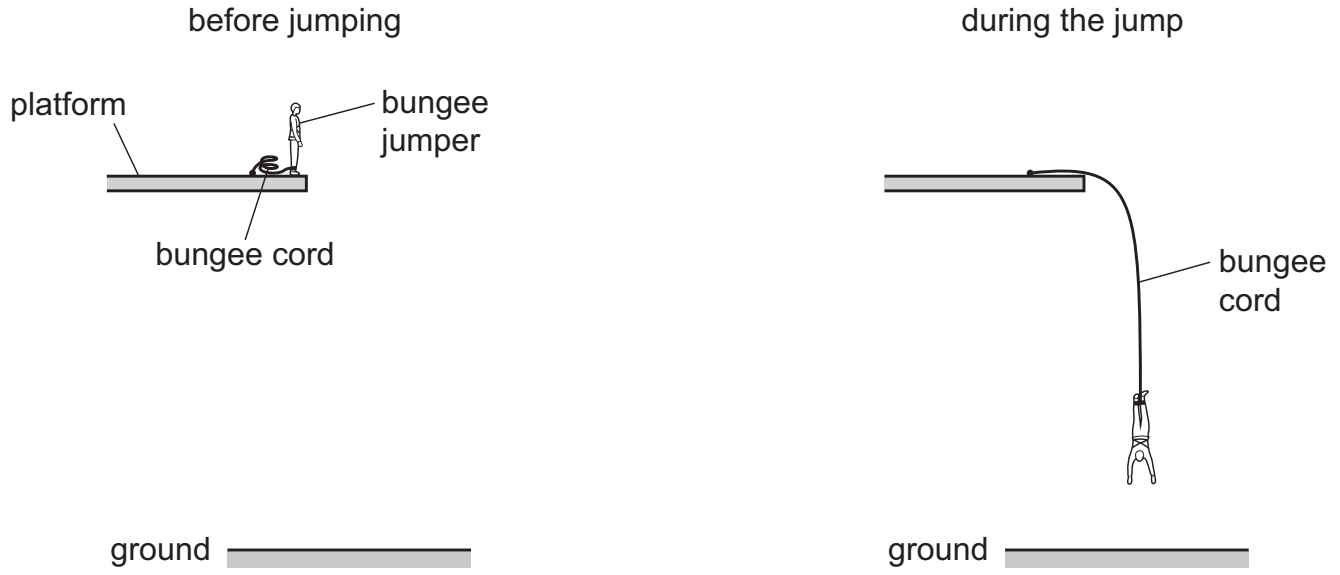
A-Level Physics: **w25 11**

17 An object with a mass of 100 g falls a vertical distance of 10 m.

What is the change in the gravitational potential energy of the object?

A 1 J **B** 10 J **C** 100 J **D** 10 000 J

18 A bungee jumper jumps from a platform and is decelerated by an elastic bungee cord, as shown.



NOT TO SCALE

When the jumper makes the jump, his initial gravitational potential energy relative to the ground is converted into his kinetic energy and into elastic potential energy in the cord.

At which part of the jump are all three types of energy non-zero?

A on the platform before the jump

B on the way down before the cord has started to extend

C on the way down as he decelerates

D at the bottom of the jump when he is stationary

19 A sailboat is pushed by the wind at a constant velocity *v* across a lake.

The force of the wind and the velocity of the sailboat are in the same direction.

Which additional information is required to determine the work done per unit time by the wind acting on the sailboat?

A the force exerted by the wind

B the distance travelled by the sailboat per unit time

C the total energy input to the sailboat by the wind

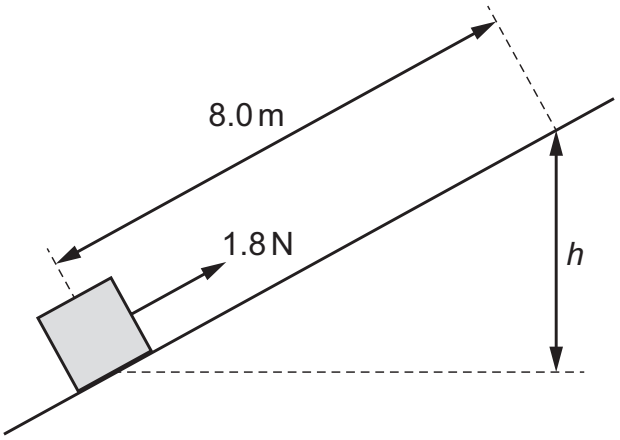
D the weight of the sailboat

17 A student attempts to derive the formula for kinetic energy E_K. She begins by considering an object of mass m that is initially at rest. A constant force F applied to the object causes it to accelerate to final velocity v in displacement s. The kinetic energy gained by the object is equal to the work done on the object by the force F.

Which equation does the student **not** need in order to derive the formula for E_K?

A $F = ma$ **B** $W = Fs$ **C** $E = \frac{1}{2}Fs$ **D** $v^2 = u^2 + 2as$

19 The diagram shows a block on a slope.



A constant force of 1.8 N in a direction parallel to the slope is exerted on the block. This causes the block to move along the slope at a constant speed.

The block moves a distance of 8.0 m along the slope and gains height h. The work done against the frictional force acting on the block is 4.8 J.

The weight of the block is 4.0 N.

What is the value of h?

A 1.2 m **B** 2.4 m **C** 3.6 m **D** 4.8 m

20 The motor of a crane lifts a load of mass 600 kg. The load rises vertically at a constant speed of 12 m per minute.

What is the useful power output of the motor?

A 0.12 kW **B** 1.2 kW **C** 7.2 kW **D** 71 kW