Work, Energy and Power – 2023 IGCSE Physics 0625

1. Nov/2023/Paper_ 0625/11,21/No.8

A cyclist travels down a hill from rest at point X without pedalling.

The cyclist applies his brakes and the cycle stops at point Y.

Which energy transfers have taken place between X and Y?

A gravitational potential → kinetic → internal (thermal)

B gravitational potential → internal (thermal) → kinetic

C kinetic → gravitational potential → internal (thermal)

D kinetic → internal (thermal) → gravitational potential

2. Nov/2023/Paper_ 0625/11/No.10

A pump does 460 000 J of work to raise water to fill a tank. It takes 7 minutes to fill the tank.

What is the power of the pump?

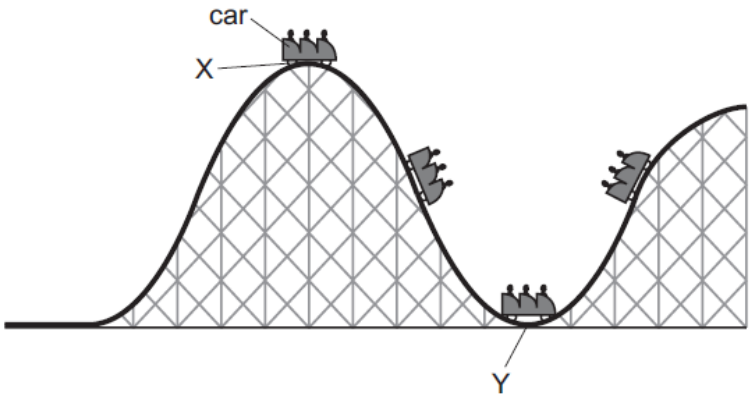
A 1.1 kW **B** 66 kW **C** 3200 kW **D** 190 000 kW

PapaCambridge

3. Nov/2023/Paper_ 0625/12,22/No.8

The diagram shows part of a rollercoaster ride with the car at different positions.

The car runs freely down from position X to position Y and up the hill on the other side.



What happens to the energy in the kinetic store and the gravitational potential store of the car as it moves from position X to position Y?

	energy in kinetic store	energy in gravitational potential store
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

4. Nov/2023/Paper_ 0625/12/No.10

An electric car is charged overnight. In 8.0 hours, 180 MJ of energy is transferred.

What is the power of the charger?

A 6.3 kW **B** 380 kW **C** 23 MW **D** 1400 MW

5. Nov/2023/Paper_ 0625/13/No.10

A microwave oven is rated at 900 watts.

Which statement correctly describes the meaning of this value?

A 900 joules are transferred every second.

B 900 amperes are transferred every second.

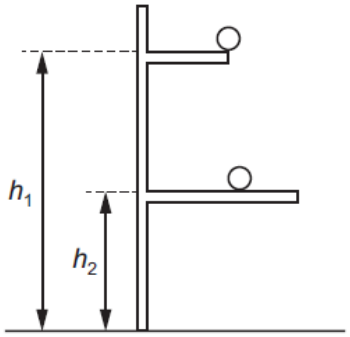
C 900 volts are transferred every second.

D 900 ohms are transferred every second.

PapaCambridge

6. Nov/2023/Paper_ 0625/21/No.9

An object of mass m falls from a higher shelf to a lower shelf.



How much gravitational potential energy does the object lose?

A mgh_2 **B** $\left(\frac{m}{g}\right)h_2$ **C** $\left(\frac{m}{g}\right)(h_1 - h_2)$ **D** $mg(h_1 - h_2)$

7. Nov/2023/Paper_ 0625/21/No.10

A pump does 460 000 J of work to raise water to fill a tank. It takes 7 minutes to fill the tank.

What is the power of the pump?

A 1.1 kW **B** 66 kW **C** 3200 kW **D** 190 000 kW

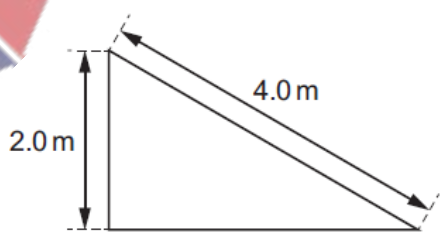
8. Nov/2023/Paper_ 0625/22/No.9

A box is initially at rest at the top of a rough slope.

The box slides down the slope.

The weight of the box is 20 N.

The slope is 4.0 m long and 2.0 m high.



The box does 10 J of work against friction as it slides down the slope.

What is the speed of the box as it reaches the bottom of the slope?

A 5.4 m/s **B** 6.3 m/s **C** 7.1 m/s **D** 9.5 m/s

PapaCambridge

9. Nov/2023/Paper_ 0625/22/No.10

An electric car is charged overnight. In 8.0 hours, 180 MJ of energy is transferred.

What is the power of the charger?

A 6.3 kW **B** 380 kW **C** 23 MW **D** 1400 MW

10. Nov/2023/Paper_ 0625/23/No.4

The mass of air hitting the blades of a wind turbine each second is 1.5×10^4 kg.

The speed of the air is 4.0 m / s.

The density of air is 1.2 kg / m^3.

Which row gives the volume of the air hitting the blades each second and the kinetic energy of the air hitting the blades each second?

	volume of air each second / m^3	kinetic energy each second / J
A	13 000	72 000
B	13 000	120 000
C	18 000	72 000
D	18 000	120 000

11. Nov/2023/Paper_ 0625/23/No.9

A boy uses a rope to pull an object of mass *m* up a slope.

The rope is parallel to the slope.

The tension in the rope is constant and of value *F*.

The object moves a distance *d* along the slope and rises through a height *h*.

How much work is done by the boy?

A $F \times d$

B $F \times h$

C $m \times g \times h \times d$

D $m \times g \times h^2$

PapaCambridge

12. Nov/2023/Paper_ 0625/23/No.10

A microwave oven is rated at 900 watts.

Which statement correctly describes the meaning of this value?

A 900 joules are transferred every second.

B 900 amperes are transferred every second.

C 900 volts are transferred every second.

D 900 ohms are transferred every second.

PapaCambridge

(a) State the principle of conservation of energy.

..... [1]

(b) Fig. 2.1 shows the energy flow diagram for a car powered by a petrol engine.

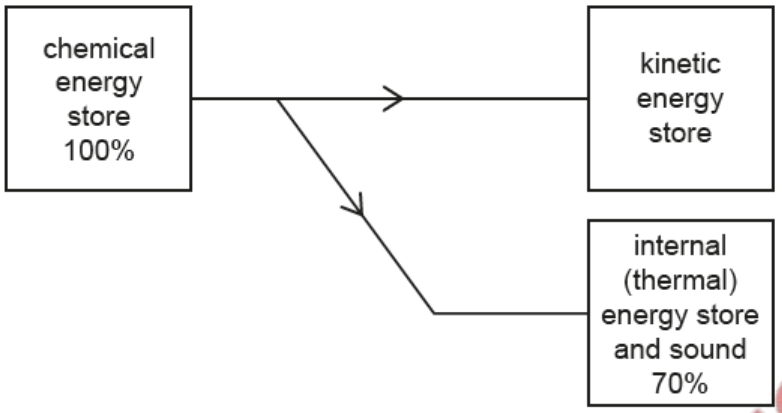


Fig. 2.1

(i) Using the information in Fig. 2.1, calculate the percentage of energy transferred from the chemical store to the kinetic store.

percentage = ... % [2]

(ii) Fig. 2.2 shows the energy flow diagram for an electric car. The electric car is driven by an electric motor which is powered by a battery.

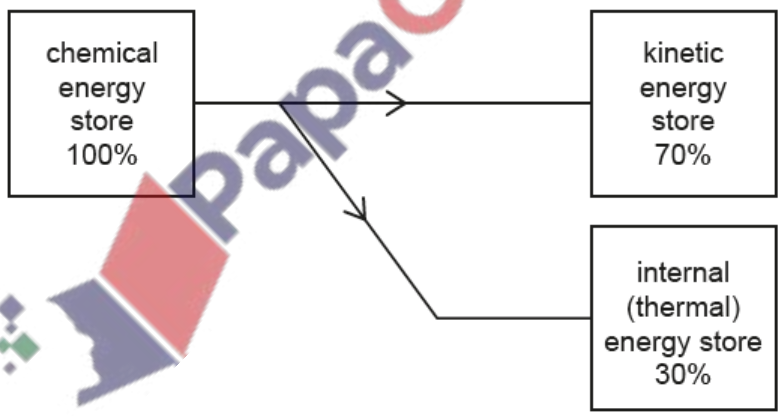


Fig. 2.2

PapaCambridge

Using the information in Fig. 2.1 and Fig. 2.2, state which car is more efficient. Give a reason for your answer.

car .....

reason .....

.....

[1]

[Total: 4]

PapaCambridge

14. Nov/2023/Paper_ 0625/32/No.4

A student holds a pile of books. The mass of the books is 3.2 kg.

(a) Calculate the weight of the books.

weight = ... N [2]

(b) The student carries the books from the bottom to the top of the stairs shown in Fig. 4.1.

The vertical height of the stairs is 4.5 m.

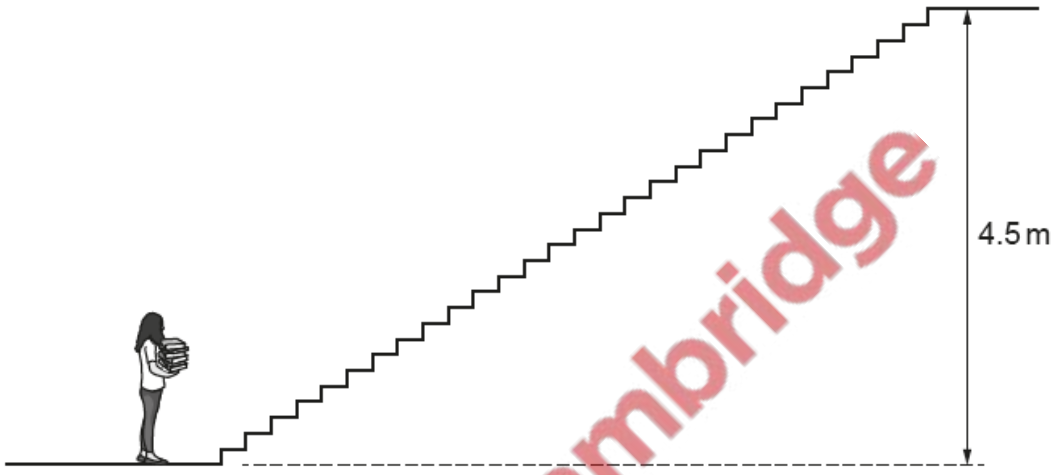


Fig. 4.1

(i) Show that the work done on the books when they are carried to the top of the stairs is approximately 140 J.

[3]

(ii) Determine the gravitational potential energy gained by the books.

Give a reason for your answer.

gravitational potential energy = ... J

reason .....

[2]

[Total: 7]

PapaCambridge

15. Nov/2023/Paper_ 0625/33/No.2

A farmer uses a rope to lift a barrel of fruit from the ground to a platform, as shown in Fig. 2.1.

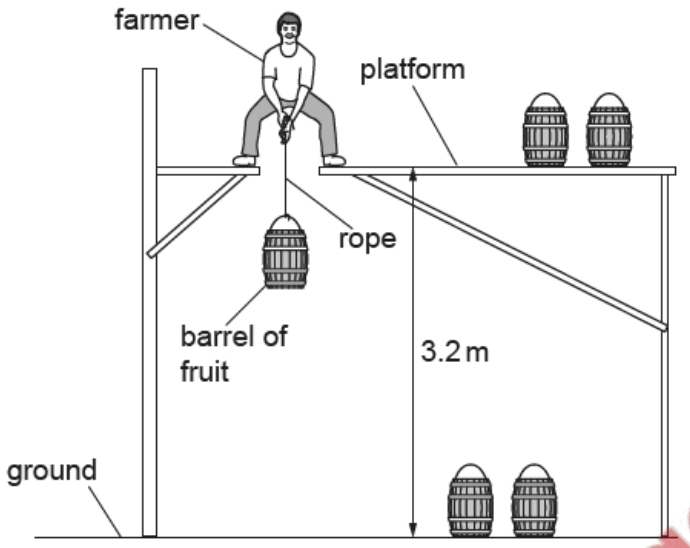


Fig. 2.1

(a) The farmer lifts the barrel of fruit at a constant speed.

(i) State the energy store of the barrel of fruit that increases as the barrel rises.

..... [1]

(ii) The weight of the barrel of fruit is 140 N.

Show that the work done on the barrel of fruit in lifting it from the ground to the platform is approximately 450 J.

[2]

PapaCambridge

(b) The farmer wants to make the process faster. He buys a machine to lift the barrels of fruit.

(i) The output power of the machine is 75 W.

The work done in lifting a barrel of fruit onto the platform is 450 J.

Calculate the time taken for the machine to lift a barrel of fruit onto the platform.

time = ... s [3]

(ii) The machine uses an electric motor. The farmer installs some wind turbines to supply electrical power for the farm.

Suggest **one** environmental reason for using wind turbines rather than using a diesel (fossil fuel) generator.

.....

..... [1]

[Total: 7]

PapaCambridge

16. Nov/2023/Paper_ 0625/41/No.1

A girl holds a rubber ball out of a window of a tall building. The mass of the ball is 0.20 kg. The ball is at rest 10 m above a concrete path.

(a) Calculate the gravitational potential energy of the ball relative to the concrete path.

gravitational potential energy = ... [2]

(b) The girl releases the ball and it falls towards the path. The ball strikes the path and bounces vertically upwards.

Fig. 1.1 shows the ball falling towards the path.

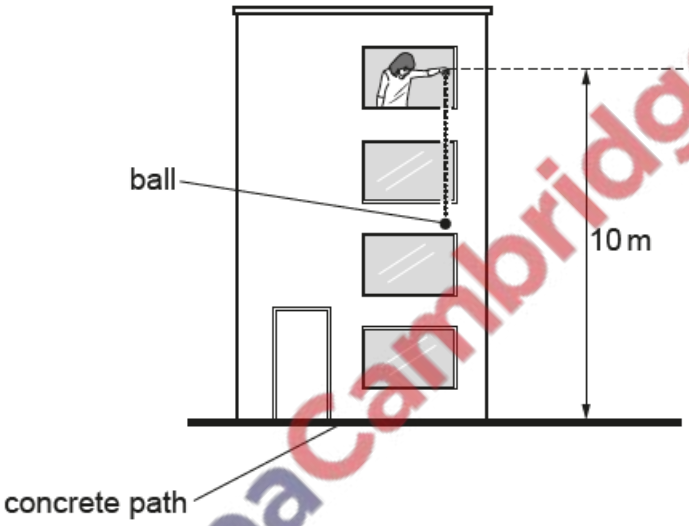


Fig. 1.1

The speed of the ball immediately **before** it strikes the path is 14 m/s.

The speed of the ball immediately **after** it strikes the path is 12 m/s.

(i) Calculate the kinetic energy of the ball immediately **after** it strikes the concrete path.

kinetic energy = ... [2]

PapaCambridge

(ii) Show that the change in momentum of the ball when it bounces off the path is 5.2 kg m/s.

[3]

(iii) The ball is in contact with the path for 0.25 s.

Calculate the average resultant force on the ball when it is in contact with the path.

force = ... [2]

[Total: 9]

17. June/2023/Paper_0625/11/No.10

Which row about the change of energy in the energy store must be correct?

	process	energy store	change of energy in store
A	water pumped up to a high-altitude dam	gravitational potential energy of water	increases
B	water pumped up to a high-altitude dam	kinetic energy of water	decreases
C	air passes through a wind turbine	gravitational potential energy of air	increases
D	air passes through a wind turbine	kinetic energy of air	increases

18. June/2023/Paper_0625/11/No.11

A rock of weight 50 N falls a vertical distance of 7.0 m from rest.

What is the change in the gravitational potential energy store of the rock?

A decrease of 7.1 J

B decrease of 350 J

C increase of 7.1 J

D increase of 350 J

PapaCambridge

19. June/2023/Paper_0625/11/No.12

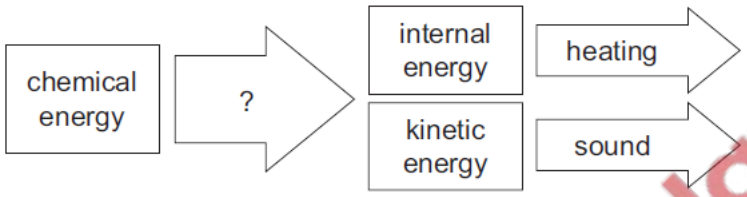
A child runs up a set of stairs four times. The time taken for each run is recorded.

Which time is measured when the child's useful power is greatest?

A 10 s **B** 20 s **C** 30 s **D** 40 s

20. June/2023/Paper_0625/12/No.10

The diagram shows the energy stores for a mobile (cell) phone and how the energy is transferred between stores.



What describes how the chemical energy is transferred?

A electrical work done

B mechanical work done

C electromagnetic waves

D sound waves

21. June/2023/Paper_0625/12/No.11

A moving object is brought to rest by a resistive force of 50 N over a distance of 5.0 m.

What is the work done by the force?

A 0.10 J **B** 10 J **C** 55 J **D** 250 J

22. June/2023/Paper_0625/12/No.12

Which two physical quantities must be used to calculate the power developed by a student running up a flight of steps?

A force exerted and the vertical height of the steps only

B force exerted and the time taken only

C work done and the vertical height of the steps only

D work done and the time taken only

PapaCambridge

23. June/2023/Paper_0625/13/No.10

A bicycle braking system transfers energy from a kinetic energy store to an internal energy store.

A motor converts energy from a chemical energy store (battery) to a kinetic energy store.

What enables these energy transfers?

	braking system	motor
A	electrical work	mechanical work
B	electrical work	electrical work
C	mechanical work	mechanical work
D	mechanical work	electrical work

24. June/2023/Paper_0625/13/No.11

A toy car is pushed a distance of 2.4 m with a force equal to 460 N.

How much energy is transferred?

A 190 J **B** 190 W **C** 1100 J **D** 1100 W

25. June/2023/Paper_0625/13/No.12

The engine of a motor vehicle develops a large power.

Which statement is correct?

A The driving force acting on the vehicle must be large.

B The engine must have a very large volume.

C The engine must transfer large amounts of energy each second.

D The vehicle must be very fast.

26. June/2023/Paper_0625/21/No.10

Which row about the change of energy in the energy store must be correct?

	process	energy store	change of energy in store
A	water pumped up to a high-altitude dam	gravitational potential energy of water	increases
B	water pumped up to a high-altitude dam	kinetic energy of water	decreases
C	air passes through a wind turbine	gravitational potential energy of air	increases
D	air passes through a wind turbine	kinetic energy of air	increases

PapaCambridge

27. June/2023/Paper_0625/21/No.11

A woman of mass 50 kg has 81 J of kinetic energy.

What is her speed?

A 1.3 m/s **B** 1.6 m/s **C** 1.8 m/s **D** 3.2 m/s

28. June/2023/Paper_0625/21/No.12

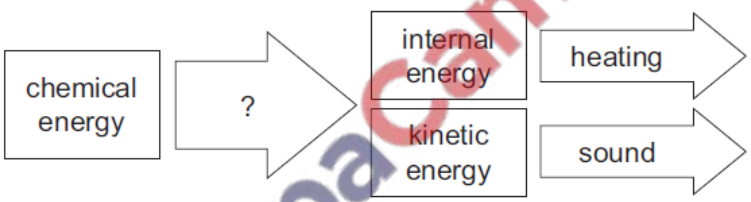
A child runs up a set of stairs four times. The time taken for each run is recorded.

Which time is measured when the child's useful power is greatest?

A 10 s **B** 20 s **C** 30 s **D** 40 s

29. June/2023/Paper_0625/22/No.10

The diagram shows the energy stores for a mobile (cell) phone and how the energy is transferred between stores.



What describes how the chemical energy is transferred?

A electrical work done

B mechanical work done

C electromagnetic waves

D sound waves

30. June/2023/Paper_0625/22/No.11

A wind turbine is 30% efficient and has an output of 2.5 MW of electrical power.

What is the power input to the turbine?

A 0.75 MW **B** 8.3 MW **C** 75 MW **D** 83 MW

PapaCambridge

31. June/2023/Paper_0625/23/No.10

A bicycle braking system transfers energy from a kinetic energy store to an internal energy store.

A motor converts energy from a chemical energy store (battery) to a kinetic energy store.

What enables these energy transfers?

	braking system	motor
A	electrical work	mechanical work
B	electrical work	electrical work
C	mechanical work	mechanical work
D	mechanical work	electrical work

32. June/2023/Paper_0625/23/No.12

The engine of a motor vehicle develops a large power.

Which statement is correct?

A The driving force acting on the vehicle must be large.

B The engine must have a very large volume.

C The engine must transfer large amounts of energy each second.

D The vehicle must be very fast.

PapaCambridge

33. June/2023/Paper_0625/31/No.4

A student uses an electric motor to lift a load. Fig. 4.1 shows the arrangement.

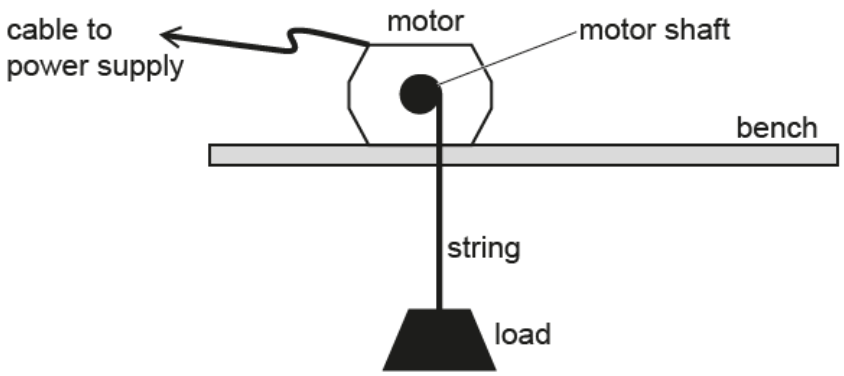


Fig. 4.1 (not to scale)

(a) **(i)** The motor exerts a force of 25 N on the load. It lifts the load a vertical distance of 2.0 m.

Calculate the work done by the motor on the load.

work done on the load = ... J [3]

(ii) State the useful energy output of the electric motor when it lifts the load 2.0 m.

useful energy output = ... J [1]

(iii) The useful energy output of the motor is less than the energy input to the motor.

Explain why the useful energy output is less than the energy input.

.....

..... [2]

(b) The student uses the motor to lift a different load. The motor does 80 J of work when it lifts this load. It takes 5.0 s to lift the load.

Calculate the power output of the electric motor.

power output = ... W [3]

[Total: 9]

PapaCambridge

34. June/2023/Paper_0625/32/No.3(a, b)

A student has a battery-powered torch. Fig. 3.1 shows the torch.

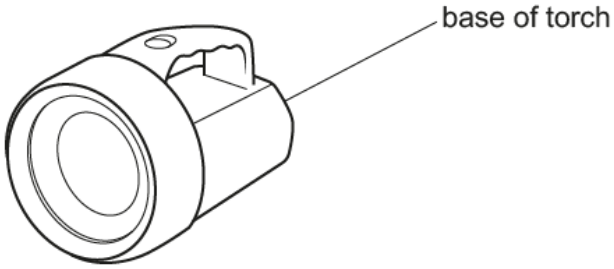


Fig. 3.1

(a) Fig. 3.2 shows the energy transfers when the torch is switched on. The diagram is incomplete.

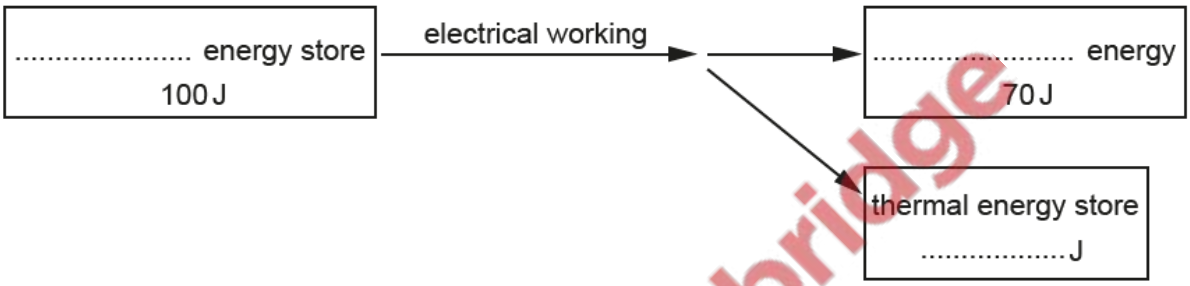


Fig. 3.2

Show the energy transfers in the torch by completing the labels on Fig. 3.2. [3]

(b) The weight of the torch is 8.5 N. The student lifts the torch a vertical distance of 0.80 m to place it on a shelf.

Calculate the work done on the torch by the student.

work done = ... J [3]

PapaCambridge