

6.1 Energy Conservation

Question Paper

Course	CIE A Level Physics (9702) 2019-2021
Section	6. Work, Energy & Power
Topic	6.1 Energy Conservation
Difficulty	Medium

Time allowed: 10

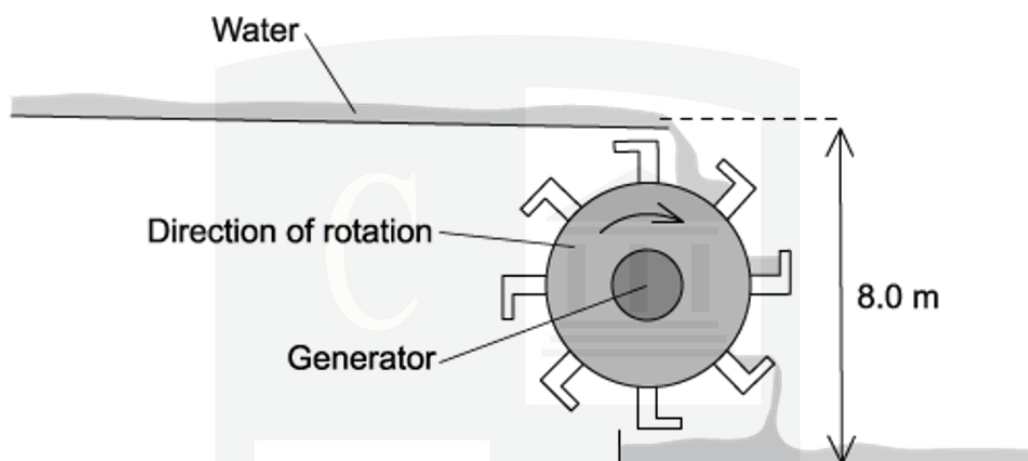
Score: /9

Percentage: /100

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Question 1

The diagram shows the design of a water wheel which drives a generator to produce electrical energy. The flow rate of the water is 200 kg s^{-1} . The generator supplies a current of 32 A at a voltage of 230 V .



Ignoring any changes in kinetic energy of the water, what is the efficiency of the system?

- A** 14 % **B** 16 % **C** 22 % **D** 47 %

[1 mark]

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Question 2

A bungee jumper has 24 kJ of gravitational potential energy at the top of his jump. He is attached to an elastic rope which starts to stretch after a short time of free fall. Assume that energy loss through air resistance is negligible.

	GPE / kJ	EPE / kJ	KE / kJ
Top	24	0	0
Bottom	0	24	0

What are the possible values when the jumper is half-way down?

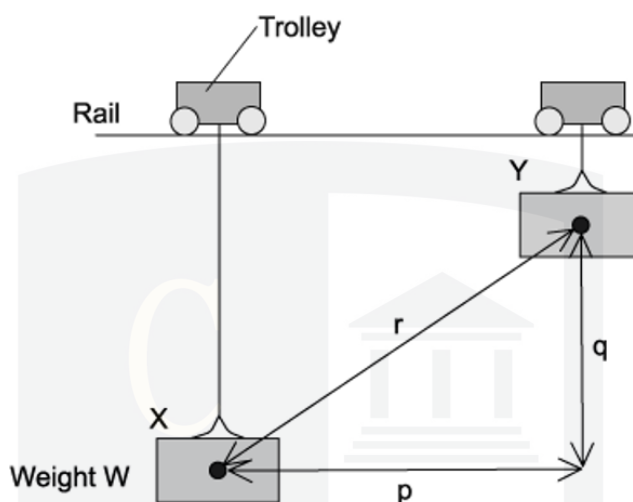
	GPE / kJ	EPE / kJ	KE / kJ
A	12	10	2
B	12	8	4
C	8	8	8
D	12	2	10

[1 mark]

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Question 3

A weight W hangs from a trolley that runs along a rail. The trolley moves horizontally through a distance p and simultaneously raises the weight through a height q .



As a result, the weight moves through a distance r from X to Y . It starts and finishes at rest.

How much work is done on the weight during this process?

A Wp

B $W(p + q)$

C Wq

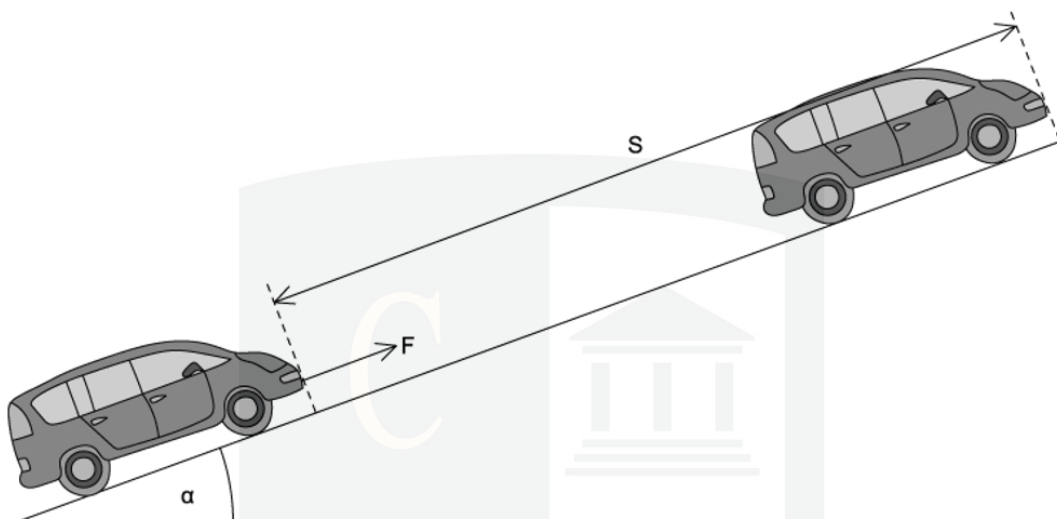
D Wr

[1 mark]

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Question 4

A constant force F , acting on a car of mass m , moves the car up a slope through a distance s at constant velocity v . The angle of the slope to the horizontal is α .



Which expression gives the efficiency of the process?

- A** $\frac{mgs \sin \alpha}{Fv}$ **B** $\frac{mv}{Fs}$ **C** $\frac{mv^2}{2Fs}$ **D** $\frac{mg \sin \alpha}{F}$

[1 mark]

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Question 5

The data below are taken from a test of a petrol engine for a motor car.

power output	150 kW
fuel consumption	20 litres per hour
energy content of fuel	40 MJ per litre

Which expression will evaluate the efficiency of the engine?

- A**
$$\frac{150 \times 10^3}{40 \times 10^6 \times 20 \times 60 \times 60}$$
- B**
$$\frac{150 \times 10^3 \times 60 \times 60}{20 \times 40 \times 10^6}$$
- C**
$$\frac{150 \times 10^3 \times 40 \times 10^6 \times 20}{60 \times 60}$$
- D**
$$\frac{150 \times 10^3 \times 20}{40 \times 10^6 \times 60 \times 60}$$

[1 mark]

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Question 6

The first column in the table gives four examples of work being done. The second column gives more detail of the action.

Which row is **not** correct?

	example	Detail
A	a girl dives from a diving board into a swimming pool	work is done by the girl against gravity as she falls
B	a man pushes a car along a level road	work is done by the man against friction
C	an electron is accelerated towards a positively-charged plate	work is done on the electron by the electric field of the plate
D	a piston is pushed outwards as a gas expands	work is done on the atmosphere by the gas

[1 mark]

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Question 7

Initially, four identical uniform blocks, each of mass m and thickness h , are spread on a table.



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** $10 mgh$

[1 mark]

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Question 8

Trains supply coal to a power station. The table below gives quantities describing the operation of the power station.

	symbol	unit
power station output	P	W
number of trains per day	N	
mass of coal on a train	M	kg
energy from 1 kg of coal	J	J
number of seconds in one day	S	s

Which expression gives efficiency of the power station?

A

$$\frac{PS}{NMJ}$$

B

$$\frac{PSN}{MJ}$$

C

$$\frac{NMJ}{PS}$$

D

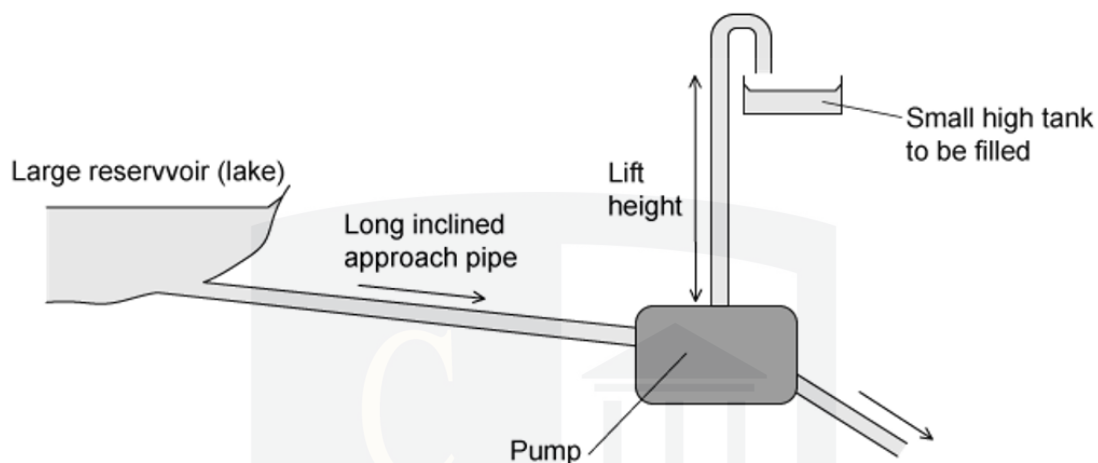
$$\frac{NM}{PSJ}$$

[1 mark]

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Question 9

The diagram shows a pump called a hydraulic ram



In one such pump the long approach pipe holds 500 kg of water. A valve shuts when the speed of this water reaches 2.0 m s^{-1} and the kinetic energy of this water is used to lift a small quantity of water by a height of 15 m.

The efficiency of the pump is 10%.

Which mass of water could be lifted 15 m?

- A** 0.15 kg **B** 0.68 kg **C** 1.5 kg **D** 6.8 kg

[1 mark]

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