

## Multiple Choice Questions

# 1.7 Energy, Work & Power

Energy Stores & Transfers / Kinetic Energy / Gravitational Potential Energy / Conservation of Energy / Work / Power / Efficiency / Energy Resources / Energy from the Sun / Energy from Fuels / Energy from Water / Geothermal Energy / Energy from Wind

Easy (10 questions)	/10
Medium (18 questions)	/18
Hard (10 questions)	/10
<b>Total Marks</b>	<b>/38</b>

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# Easy Questions

1 Which energy transfers take place when a log burns in a fire?

- A. Nuclear energy store in the log to chemical energy store in the log.
- B. Nuclear energy store in the log to thermal energy store in the surroundings.
- C. Chemical energy store in the log to thermal energy store in the surroundings.
- D. Thermal energy store in the log to nuclear energy store in the surroundings.

(1 mark)

2 Which row correctly matches an energy store with an example of that store?

	Energy Store	Example
A	kinetic	a car moving at 70 km / h
B	elastic	a box sitting high on a shelf
C	magnetic	compression of springs in a car's suspension
D	chemical	the nuclei of uranium atoms

(1 mark)

3 Which of the following statements is **not** a summary of the law of conservation of energy?

- A. Total energy in = total energy out
- B. There is a finite amount of energy in a closed system that can be transferred from one store to another
- C. The total energy in a system is used up as it is transferred from object to object
- D. Energy cannot be created or destroyed, it can only be transferred from store to store by a transfer pathway

(1 mark)

4 Identify the **incorrect** definition of power.

- A. A force acting over a distance
- B. Work done per unit time
- C. Energy transferred per second
- D. The rate of work done

(1 mark)

5 Identify the correct energy transfer taking place when an electric kettle is boiling water

- A. Chemical energy store → thermal energy store
- B. Thermal energy store → chemical energy store
- C. Thermal energy store → thermal energy store
- D. Nuclear energy store → thermal energy store

(1 mark)

6 Which energy resource does not use the Sun as the source of its energy?

- A. Hydroelectric
- B. Wind
- C. Nuclear
- D. Coal

(1 mark)

**7** Which energy resource involves splitting heavy nuclei?

- A.** Nuclear fission
- B.** Geothermal
- C.** Biomass
- D.** Nuclear fusion

**(1 mark)**

**8** Which energy resource does not release greenhouse gases?

- A.** Oil
- B.** Hydro-electric power
- C.** Biofuel
- D.** Coal

**(1 mark)**

**9** Which disadvantage does not apply to geothermal energy?

- A.** Expensive to build
- B.** Few suitable locations
- C.** Can result in the release of greenhouse gases
- D.** Not reliable

**(1 mark)**

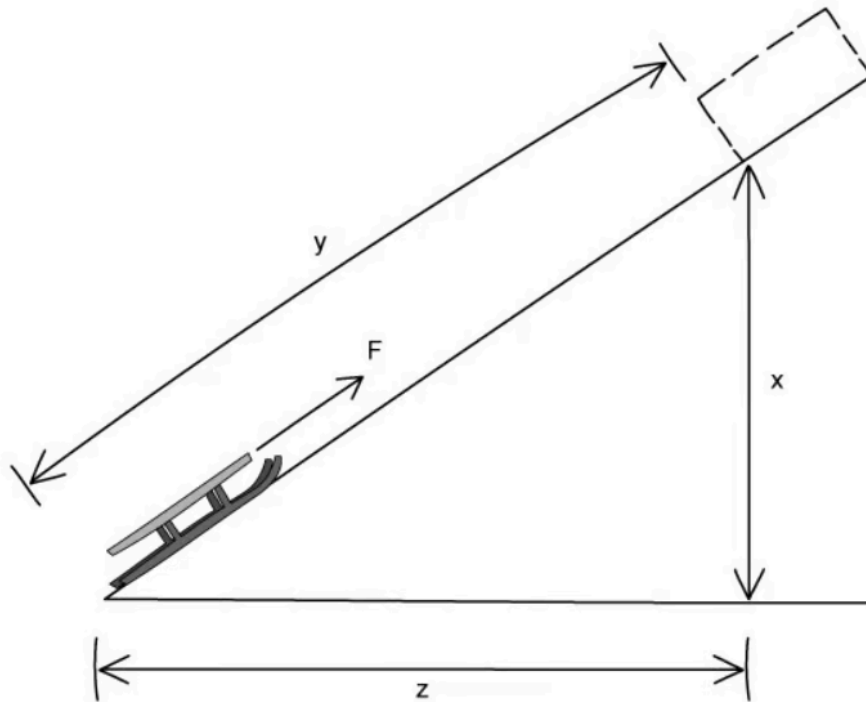
**10** Which energy source relies on radiation from the Sun?

- A.** Fossil fuels
- B.** Nuclear fission
- C.** Tidal power
- D.** Geothermal energy

**(1 mark)**

# Medium Questions

- 1 A sledge is pushed up a hill with a force,  $F$ .



The work done on the sledge depends on the force applied and on a distance moved.

Which distance?

- A.  $x$
- B.  $y$
- C.  $z$
- D.  $x + z$

(1 mark)

- 2 The law of conservation of energy states that energy cannot be created or destroyed, it can only be transferred from one store to another.

Which of the following statements is true?

- A.** The useful energy and wasted energy transferred away from a system will be equal to the total energy transferred to the system.
- B.** The useful energy of a system will be equal to the wasted energy of a system.
- C.** The total energy transferred to a system will be equal to the useful energy transferred away from a system.
- D.** The total energy transferred to a system will be equal to the wasted energy energy transferred away from a system.

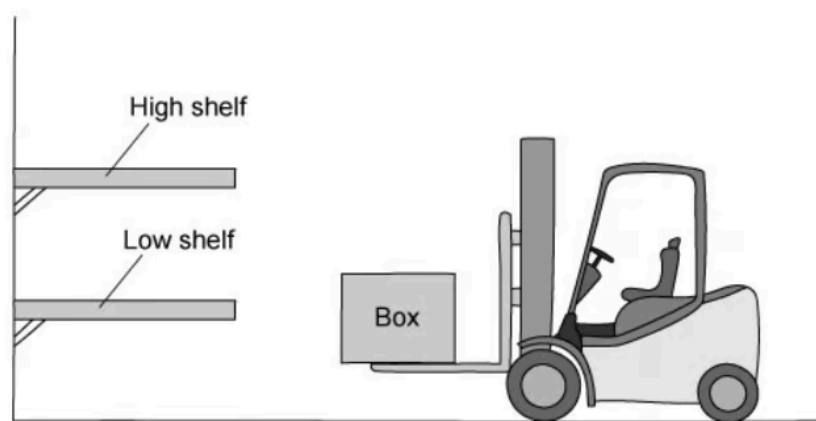
(1 mark)

- 3 Which of the following energy transfers is most efficient?

- A.** Useful energy out = 70%
- B.** Wasted energy out = 45%
- C.** Useful energy out = 35%
- D.** Wasted energy out = 25%

(1 mark)

- 4 A fork lift truck lifts a heavy box onto a shelf.



Which action requires the greatest power output from the fork lift truck.

- A.** Lifting the box from the ground to the high shelf slowly
- B.** Lifting the box from the ground to the high shelf quickly
- C.** Lifting the box from the low shelf to the high shelf quickly
- D.** Lifting the box from the low shelf to the high shelf slowly

**(1 mark)**

- 5** A trolley is pushed with a force that causes it to move a certain distance. It moves in the direction it is pushed.

Which row in the table represents the combination of force and distance that means the smallest amount of work is done on the trolley?

	Force / N	Distance moved / m
<b>A</b>	20	20
<b>B</b>	40	10
<b>C</b>	50	6.0
<b>D</b>	70	4.0

**(1 mark)**

- 6** Four different electric bicycles are driven along a road.

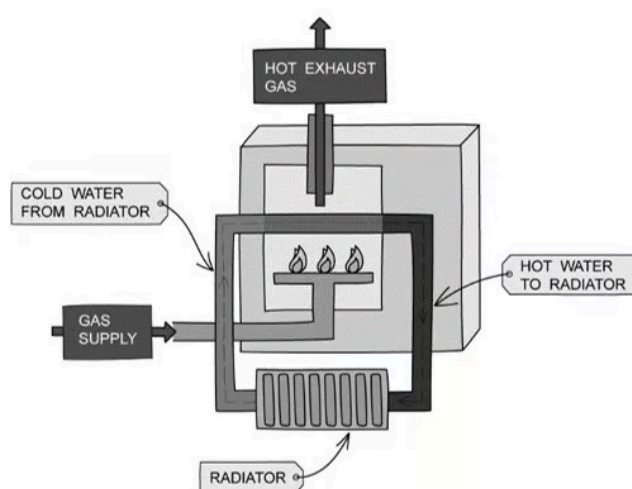
The work done by their motor, and the time taken to do that work is shown in the table below.

Which of the electric bicycles produces the most power?

	Work done / J	Time taken / s
<b>A</b>	10 000	20
<b>B</b>	20 000	40
<b>C</b>	400 000	400
<b>D</b>	2000	1

(1 mark)

- 7 The image below shows a simplified layout of a non-condensing gas boiler that is typically used to heat houses in the United Kingdom.



Which option correctly describes the energy transfers taking place in the boiler?

- A.** Energy from the chemical store of the fuel decreases as the thermal store of the water increases and the thermal store of the surroundings increases
- B.** Energy from the thermal store of the fuel decreases as the nuclear store of the water increases and the thermal store of the surroundings decreases



- C.** Energy from the nuclear store of the fuel decreases as the thermal store of the water increases and the thermal store of the surroundings increases
- D.** Energy from the electrostatic store of the fuel decreases as the chemical store of the water increases and the nuclear store of the surroundings increases

**(1 mark)**

**8** Listed below are some energy resources.

**W** wind powering a turbine

**X** water falling through a hydroelectric turbine

**Y** alcohol made from crops which have been grown for burning in a biomass generator

**Z** uranium for nuclear fission reactors

Which of the resources are renewable?

- A.** W, X and Z
- B.** W and X
- C.** W, X and Y
- D.** W, X, Y and Z

**(1 mark)**

**9** Which statement best describes nuclear fuel as an energy source?

- A.** Reliable & renewable
- B.** Reliable, non-renewable and available for large scale production
- C.** Unreliable, non-renewable and available for large scale production
- D.** Unreliable, renewable & not available for large scale production

**(1 mark)**

**10** Which statement best describes the differences between solar cells and solar panels?

- A.** Solar cells use energy from the sun to heat water and solar panels use energy from the sun to generate electricity
- B.** Solar panels use energy from the sun to heat water and solar cells use energy from the sun to generate electricity
- C.** Solar cells use the kinetic energy of wind to produce electrical power and solar panels use energy from the sun to heat water
- D.** Solar panels use energy from the sun to produce electrical power and solar cells store the excess energy

**(1 mark)**

**11** What feature do geothermal, hydroelectric and nuclear energy sources share?

- A.** Renewable
- B.** Can generate large-scale energy
- C.** Cause rotation in a generator
- D.** Use steam to turn a turbine

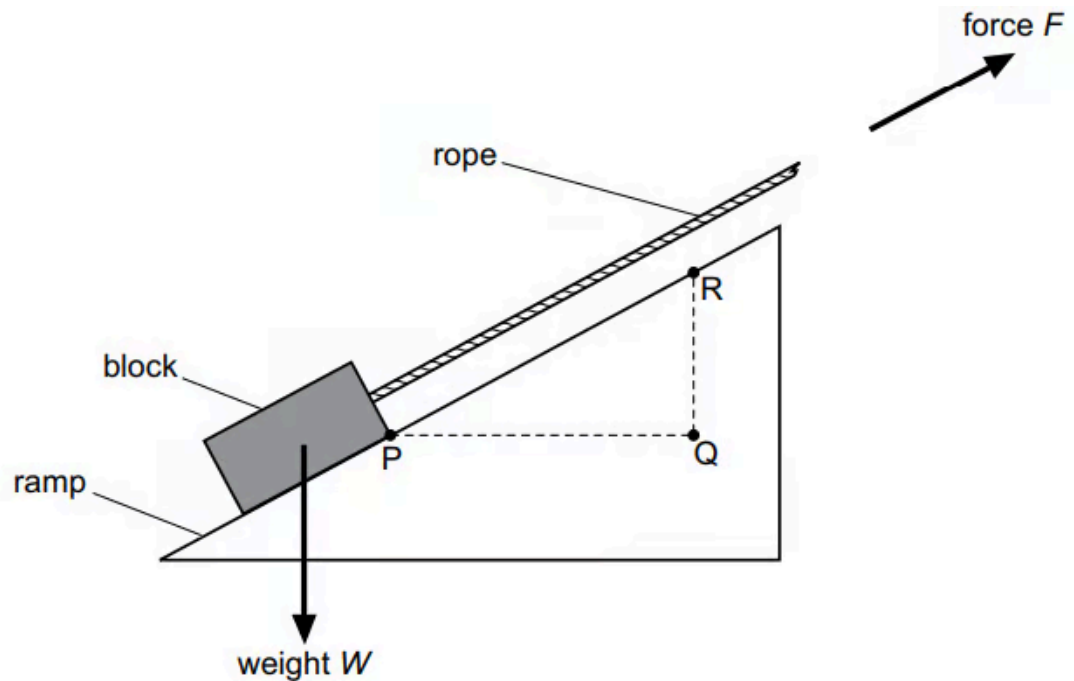
**(1 mark)**

**12** Which statement about nuclear fuel is correct?

- A.** Nuclear waste must be stored for decades
- B.** Nuclear fusion uses steam to turn a turbine which rotates a generator on a large scale
- C.** Nuclear fission provides approximately 70% of the UK's energy
- D.** Nuclear waste must be stored for thousands of years

**(1 mark)**

13 The diagram shows a block being pulled up a ramp by a rope.



The block has weight  $W$  and the rope is pulled with force  $F$ .

The block moves distance  $PR$  and is raised through height  $QR$ .

What is the equation for the work done on the block by the rope?

- A. force  $F \times$  distance  $PR$
- B. force  $F \times$  height  $QR$
- C. weight  $W \times$  distance  $PQ$
- D. weight  $W \times$  distance  $PR$

(1 mark)

14 Which uses a non-renewable energy source?

- A. a geothermal heating system
- B. a nuclear power station
- C. a solar panel
- D. a wind turbine

(1 mark)

15 Which expression gives the efficiency of an a.c. generator?

- A.  $\frac{\text{electrical energy output}}{\text{total energy input}}$
- B.  $\frac{\text{electrical energy output}}{\text{thermal energy output}}$
- C.  $\frac{\text{total energy output}}{\text{electrical energy input}}$
- D.  $\frac{\text{thermal energy output}}{\text{total energy input}}$

(1 mark)

16 The work done by a force  $F$  on a body is calculated by multiplying  $F$  by a quantity  $q$ .

What is  $q$ ?

- A. the distance travelled in the direction of the force
- B. the distance travelled perpendicular to the direction of the force
- C. the velocity in the direction of the force
- D. the velocity in the direction perpendicular to the force

(1 mark)

17 Some solar panels have a total area of  $12 \text{ m}^2$ .

Each  $1.0 \text{ m}^2$  of the panels receives  $0.85 \text{ kJ}$  of energy from the Sun in  $1.0 \text{ s}$

The efficiency of the panels is  $16\%$ .

How much power do they produce?

- A.  $1.6 \text{ kW}$
- B.  $2.2 \text{ kW}$
- C.  $64 \text{ kW}$
- D.  $160 \text{ kW}$

(1 mark)

**18** Which energy transfer takes place in an electric kettle?

- A.** chemical to electrical
- B.** electrical to heat
- C.** electrical to chemical
- D.** heat to electrical

**(1 mark)**

# Hard Questions

- 1 A large truck of mass 5000 kg is travelling at 5.0 m/s.

A motorbike has a mass of 200 kg. Both the truck and the motorbike have the same kinetic energy.

What is the speed of the motorbike?

- A. 25 m/s
- B. 10 m/s
- C. 125 m/s
- D. 2.5 m/s

(1 mark)

- 2 A penny is held at the top of Blackpool tower. The penny is released and falls a distance  $h$  to the ground. It reaches a speed  $v$  as it falls.

As the penny falls, air resistance causes some of the original energy of the penny to be transferred into the air as heat.

Which of the expressions below gives the work done against air resistance?

- A.  $\frac{1}{2} mv^2$
- B.  $mgh + \frac{1}{2} mv^2$
- C.  $mgh - \frac{1}{2} mv^2$
- D.  $mgh$

(1 mark)

3 The diagram below shows a wind turbine.



What is the change in the kinetic energy if the wind speed is reduced by half?

- A.  $E_K = \frac{1}{8}$
- B.  $E_K = \frac{1}{4}$
- C.  $E_K = \frac{1}{2}$
- D. No change

(1 mark)

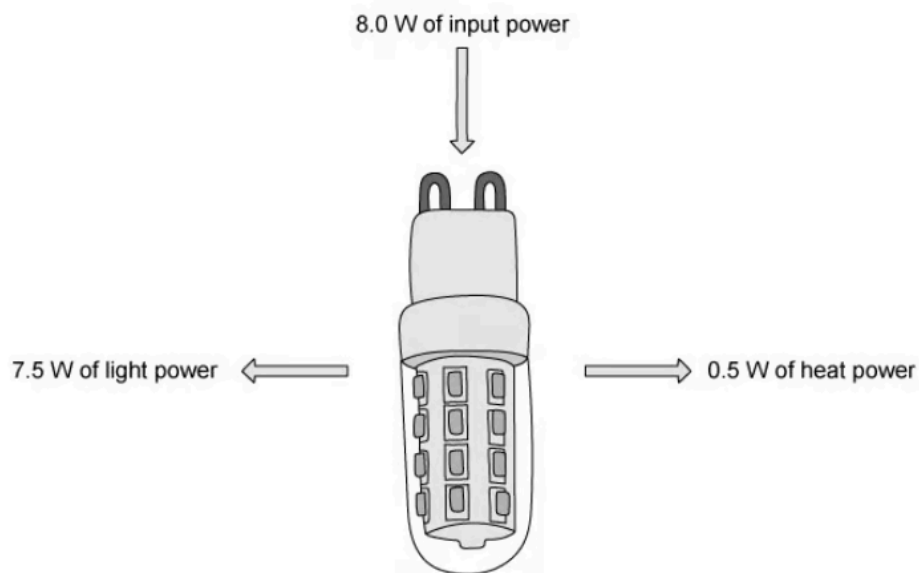
- 4 A crane lifts four pallets of bricks, each of which weigh 5000 N. The crane lifts each pallet a height of 30m. The crane takes 4 minutes to do this.

How much useful power did the crane produce to lift the bricks?

- A. 150 000 W
- B. 625 W
- C. 2500 W
- D. 37 500 W

(1 mark)

- 5 The diagram shows an LED light bulb.



Which expression gives the efficiency of the bulb?

- A.  $\frac{8.0}{0.5} \times 100\%$
- B.  $\frac{7.5}{0.5} \times 100\%$
- C.  $\frac{0.5}{8.0} \times 100\%$



**D.**  $\frac{7.5}{8.0} \times 100\%$

**(1 mark)**

- 6** When plants are grown they take in carbon dioxide from the atmosphere during photosynthesis, but when biofuel is burned it releases carbon dioxide back into the atmosphere.

A company manufacturing biofuels claim that they are carbon neutral.

Why is this claim considered to be controversial?

- A.** Because if the land used to grow the crops had been used to grow food produce instead, the same amount of carbon dioxide would have been removed from the atmosphere but none would have been emitted back into the atmosphere
- B.** Because fertilisers and pesticides are used to grow the crops which are harmful to the environment
- C.** Because the farming of biofuel crops is labour intensive so they cost a lot to produce
- D.** Because farming biofuel crops year on year on the same land depletes the land of soil nutrients

**(1 mark)**

- 7** Which of the following energy sources produce no atmospheric pollution?

- A.** Fossil fuels, bio fuels & nuclear fuel
- B.** Bio fuel, nuclear fuel and wave power
- C.** Nuclear fuel, wave power and solar cells
- D.** Wave power, solar cells & geothermal power

**(1 mark)**

8 Which of the following energy sources cause damage to natural habitats?

- A. Fossil fuels, wave power & hydroelectric dams
- B. Solar power, geothermal energy & nuclear power
- C. Hydroelectric dams, wave power and solar panels
- D. Fossil fuels, solar cells and wind power

(1 mark)

9 It is possible to reduce the harmful effects of burning fossil fuels on the environment without reducing the amount of fossil fuels burned.

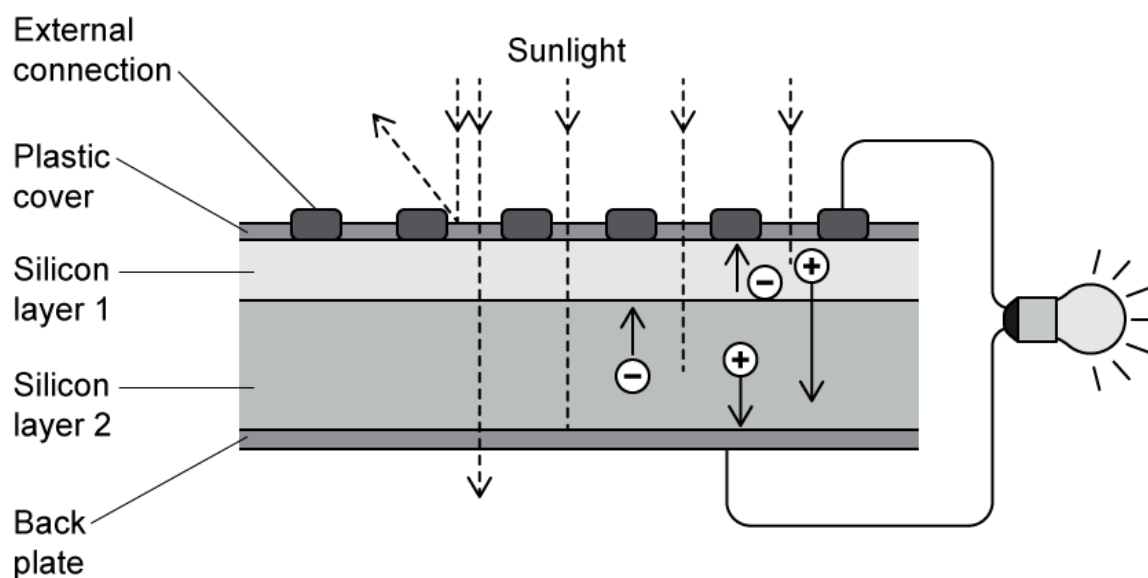
Which of the following suggestions would **not** reduce the harmful effects of burning fossil fuels?

- A. Planting more trees
- B. Investing in carbon capture and sulphur removal technologies
- C. Increasing the efficiency of power stations
- D. Increasing the number of hydroelectric dams

(1 mark)

10 The diagram below shows how a solar cell produces electricity using energy from the sun.

Energy is transferred by radiation to the silicon layer of the solar cell causing charges to move. This movement of charges produces a current.



The efficiency of a solar cell is far below 100%.

Which of the following statements does **not** account for wasted energy?

- A.** Reflection from the external connections and plastic cover
- B.** Absorption by the the external connections, plastic cover & back plate
- C.** Absorption by the charges
- D.** Transmission through the back plate

**(1 mark)**