Energy, work and power – 2022 June O Level 5054

1. June/2022/Paper_11/No.8

A stone falls at terminal velocity in air.

What is equal to the change in gravitational potential energy of the stone?

A the change in kinetic energy

B the change in temperature of the stone

C the friction between the stone and the air

D the thermal energy produced

2. June/2022/Paper_11/No.9

Water in a river is used to turn a turbine as the water flows downstream.

How is this type of power source described?

A hydroelectric

B tidal

C geothermal

D nuclear

3. June/2022/Paper_11/No.10

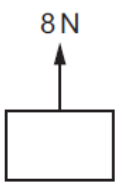
A load is pulled by a rope attached to a motor. The resultant force exerted by the rope on the load is shown in the diagrams.

In each diagram, the load moves in the direction of the force shown and takes 10 s to travel 1.0 m.

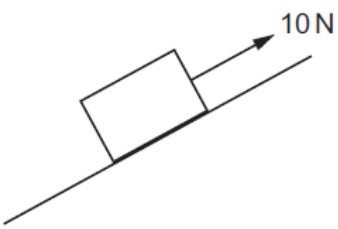
In which diagram does the motor work with the greatest power?

A

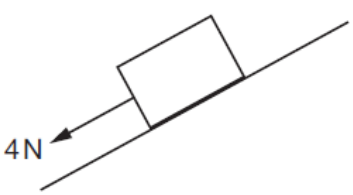
B



C



D



4. June/2022/Paper_11/No.11

The total energy incident in 1.0 s on a group of solar panels is 120 J / m^2.

The group of solar panels converts 720 J of light energy to 120 J of useful electrical energy in 1.0 s.

What is the total surface area of the panels and what is the efficiency of the system?

	total surface area of solar panels / m^2	efficiency / %
A	6.0	17
B	0.17	6.0
C	6.0	6.0
D	0.17	17

5. June/2022/Paper_12/No.13

Which device provides a continuous, steady energy output for the longest time?

A a nuclear reactor

B a solar panel

C a 1.5 V cell

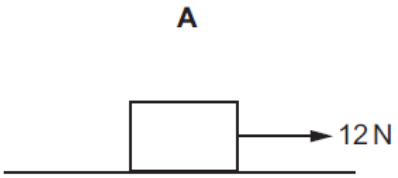
D a wind generator

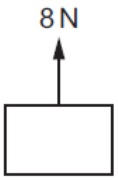
6. June/2022/Paper_12/No.14

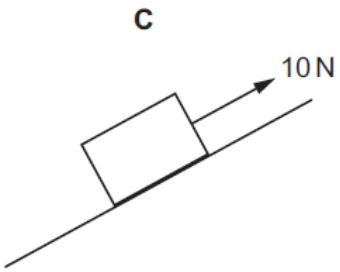
A load is pulled by a rope attached to a motor. The resultant force exerted by the rope on the load is shown in the diagrams.

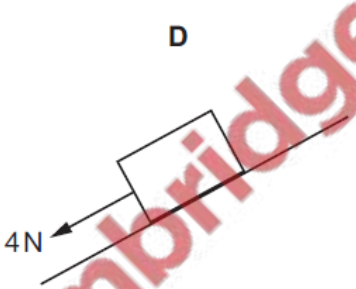
In each diagram, the load moves in the direction of the force shown and takes 10 s to travel 1.0 m.

In which diagram does the motor work with the greatest power?









7. June/2022/Paper_12/No.15

The electrical energy supplied to a kettle is 600 kJ.

Of this energy, 45 kJ is transferred to the surroundings and 15 kJ is used to heat the casing of the kettle.

The remaining energy is used to heat the water.

What is the efficiency of the kettle?

A 0.10 **B** 0.90 **C** 0.925 **D** 0.975

8. June/2022/Paper_21/No.2

Fig. 2.1 shows a wind turbine.

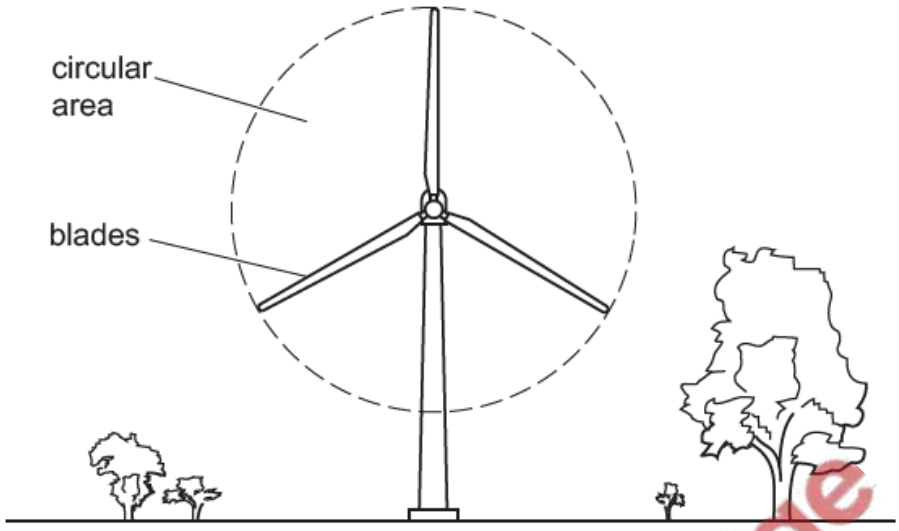


Fig. 2.1

(a) The wind blows directly towards the turbine with a speed of 12 m/s.

In one second, 60 000 kg of air passes through the circular area swept out by the blades.

Calculate the kinetic energy of this mass of air.

kinetic energy = ... [3]

(b) A wind turbine releases no carbon dioxide into the atmosphere while generating electricity. Compared with a coal-fired power station, this is an advantage of using a wind turbine.

(i) State **one** reason why it is important to reduce the amount of carbon dioxide produced.

.....

..... [1]

(ii) Suggest **one** advantage of using a coal-fired power station compared with a wind turbine.

.....

..... [1]

(c) A coal-fired power station releases 0.96 kg of carbon dioxide when it generates 1.0 kWh of electrical energy.

(i) Define the kilowatt-hour (kWh).

.....

..... [1]

(ii) Calculate the mass of carbon dioxide saved when the wind turbine has a power output of 2000 kW and operates for 12 hours.

mass = ... [1]

(d) Wind energy is a form of renewable energy.

State the name of **one** other form of renewable energy.

..... [1]

[Total: 8]

9. June/2022/Paper_22/No.2(a , b)

Fig. 2.1 shows a long cardboard tube, sealed at both ends, which contains many small pieces of metal.

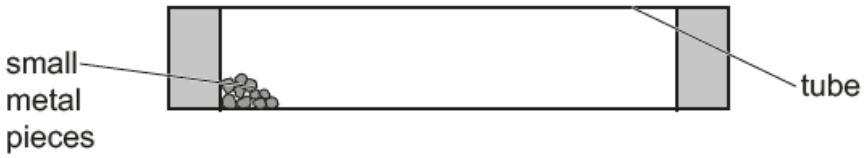


Fig. 2.1

The tube is turned vertically so that the pieces of metal fall from one end to the other.
The temperature of the pieces increases as a result of the fall.

During the fall, the gravitational potential energy of the metal pieces is transferred to other forms of energy.

(a) State **two** forms of energy to which the gravitational potential energy is transferred.

.....

..... [2]

(b) The pieces fall an average distance of 1.2 m during one turn. The total mass of the metal pieces is 150 g.

(i) Calculate the loss in the gravitational potential energy of the pieces as they fall once.

The gravitational field strength g is 10 N/kg.

loss in gravitational potential energy = ... [2]

(ii) A student turns the tube quickly. After the small metal pieces have fallen from one end to the other 80 times, their temperature has increased by 7.0 °C.

Determine the specific heat capacity of the metal.

specific heat capacity = ... [3]

(iii) The student repeats the experiment, turning the tube more slowly.

Suggest why a different temperature increase is obtained.

.....

..... [1]

[Total: 8]