

Energy, Work & Power

Question Paper

| | |
|------------|----------------------------|
| Course | CIE IGCSE Physics |
| Section | 1. Motion, Forces & Energy |
| Topic | Energy, Work & Power |
| Difficulty | Medium |

Time Allowed 50

Score /39

Percentage /100

Question 1a

Extended tier only

Fig. 3.1 shows a model of a wind turbine used to demonstrate the use of wind to generate electricity. The wind is blowing towards the model, as shown.

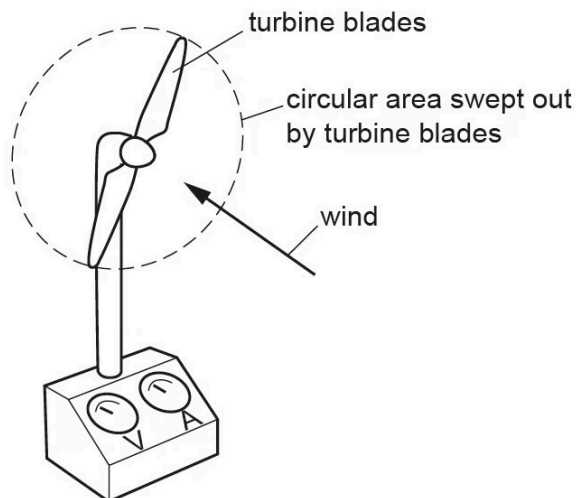


Fig. 3.1

The mass of air passing through the circular area swept out by the turbine blades each second is 7.5 kg. The energy in the kinetic store of the air that passes through this circular area each second is 240 J.

- (i) Calculate the speed of the air.

speed = [3]

- (ii) The moving air drives a generator. State the input power of the air passing through the turbine blades.

input power = [1]
[4 marks]

Question 1b**Extended tier only**

The output current of the generator is 2.0 A. The output potential difference (p.d.) of the generator is 11 V.

- (i) Calculate the output power of the generator.

output power = [2]

- (ii) Calculate the efficiency of the wind turbine.

efficiency = % [2]
[4 marks]

Question 1c

The density of air is 1.3 kg / m^3 .

Calculate the volume of air passing through the circular area swept out by the turbine blades each second.

[2 marks]

Question 2a**Extended tier only**

A force is used to move an object from the Earth's surface to a greater height.

Explain why the energy in the gravitational potential store of the object increases.

[1 mark]**Question 2b****Extended tier only**

Fig. 2.1 shows a train moving up towards the top of a mountain.

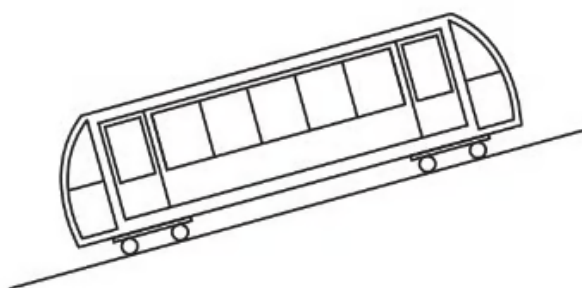


Fig. 2.1

The train transports 80 passengers, each of average mass 65 kg, through a vertical height of 1600 m.

Calculate the increase in energy stored in the gravitational potential store of the passengers.

increase in energy =

[2 marks]

Question 2c**Extended tier only**

The engine of the train has a power of 1500 kW. The time taken to reach the top of the mountain is 30 minutes.

Calculate the efficiency of the engine in raising the 80 passengers 1600 m to the top of the mountain.

efficiency =

[4 marks]

Question 3a

State what is meant by the principle of conservation of energy.

[1 mark]

Question 3b

Extended tier only

Fig. 3.1 shows a girl throwing a heavy ball.

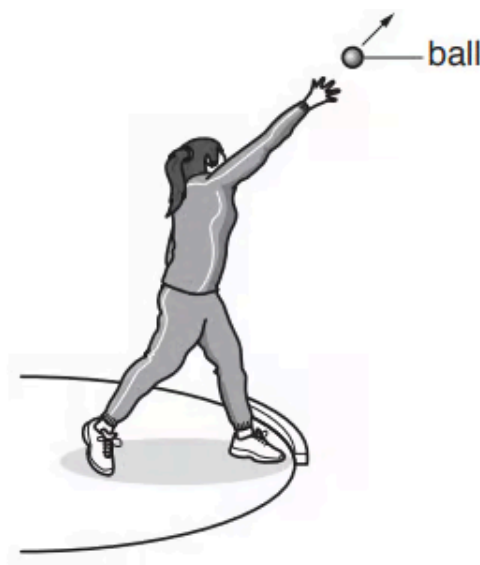


Fig. 3.1

- (i) State the energy transfers that take place from when the girl begins to exert a force on the ball until the ball hits the ground and stops moving. [2]
- (ii) The mass of the ball is 4.0 kg. The girl exerts a force on the ball for 0.60 s. The speed of the ball increases from 0 m/s to 12 m/s before it leaves the girl's hand.

Calculate:

1. the momentum of the ball on leaving the girl's hand

momentum =[2]

2. the average resultant force exerted on the ball.

average resultant force =[2]

[6 marks]

Question 4a**Extended tier only**

Fig. 3.1 shows an aircraft on the deck of an aircraft carrier.

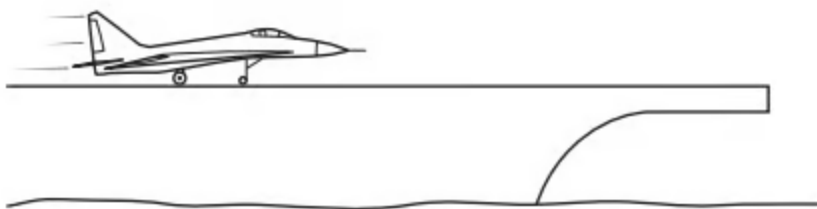


Fig. 3.1

The aircraft accelerates from rest along the deck. At take-off, the aircraft has a speed of 75 m/s.

The mass of the aircraft is 9500 kg.

Calculate the energy in the kinetic store of the aircraft at take-off.

energy =
[3 marks]

Question 4b

On an aircraft carrier, a catapult provides an accelerating force on the aircraft. The catapult provides a constant force for a distance of 150 m along the deck.

Calculate the resultant force on the aircraft as it accelerates. Assume that all of the kinetic energy at take-off is from the work done on the aircraft by the catapult.

force =
[2 marks]

Question 5a

An electric kettle contains water at a temperature of 19 °C. The kettle has a power rating of 3.0 kW and is switched on for 3.5 minutes.

Calculate the energy supplied to the kettle by the electricity supply.

energy =
[3 marks]

Question 5b**Extended tier only**

At 3.5 minutes, the temperature of the water reaches $100\text{ }^{\circ}\text{C}$. The volume of the water in the kettle is 1700 cm^3 and its density is 1.0 g/cm^3 . The specific heat capacity of water is $4200\text{ J/(kg }^{\circ}\text{C)}$.

Calculate the energy gained by the water.

energy =

[5 marks]

Question 5c**Extended tier only**

Calculate the efficiency of the kettle.

efficiency =

[2 marks]



Head to www.savemyexams.com for more awesome resources