Kinetic and gravitational potential energy

Physics Paper 1 calculations | AQA Combined Science 8464 and AQA GCSE Physics 8463 | 13 questions, 39 marks

GCSE science calculations

Scan for the solutions

Equations for this topic (cover this box to practise recalling them)

- kinetic energy = 0.5 × mass × (speed)^2 learn this one
- gravitational potential energy = mass × gravitational field strength × height learn this one

Name: _____ **Date:** _____ **Score:** _____ **/ 39**

1 Priya and her bike have a total mass of 80 kg. She cycles at a speed of 6 m/s.

Calculate the kinetic energy of Priya and her bike.

(2 marks)

Answer _____

2 A librarian lifts a book of mass 0.5 kg onto a shelf 1.8 m above the floor.

Gravitational field strength = 9.8 N/kg

Calculate the gain in gravitational potential energy of the book.

(2 marks)

Answer _____

3 A family car has a mass of 1200 kg. It travels along a road at 15 m/s.

Calculate the kinetic energy of the car.

(2 marks)

Answer _____

4 Kofi serves a tennis ball of mass 58 g. The ball leaves his racket at 30 m/s.

Calculate the kinetic energy of the ball.

(3 marks)

Answer _____

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5 In a Year 10 practical, Ellie lifts a 450 g mass from the bench to a height of 80 cm above the bench.

Gravitational field strength = 9.8 N/kg

Calculate the gain in gravitational potential energy of the mass.

(3 marks)

Answer _____

6 An e-scooter and its rider have a total mass of 90 kg. They travel at 18 km/h.

Calculate their kinetic energy.

(3 marks)

Answer _____

7 Tomasz flies a drone of mass 2.0 kg straight upwards. The drone gains 588 J of gravitational potential energy.

Gravitational field strength = 9.8 N/kg

Calculate the height the drone rises.

(3 marks)

Answer _____

8 A bowling ball rolls down a lane at 4 m/s. It has 12 J of kinetic energy.

Calculate the mass of the bowling ball.

(3 marks)

Answer _____

9 **Higher tier**

Aisha bowls a cricket ball of mass 0.16 kg. Just after it leaves her hand the ball has 72 J of kinetic energy.

Calculate the speed of the ball.

(3 marks)

Answer _____

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10 Leon is on a trampoline. His mass is 60 kg. He leaves the trampoline moving straight upwards at 7.0 m/s.

Assume all of his kinetic energy is transferred to gravitational potential energy.
Gravitational field strength = 9.8 N/kg

Calculate the maximum height Leon rises above the trampoline. Show your working.

(4 marks)

Answer _____

11 **Higher tier**

Hamza drops a stone of mass 0.25 kg from a bridge. The stone falls 20 m to the river below.

Ignore air resistance. Gravitational field strength = 9.8 N/kg

Calculate the speed of the stone just before it hits the water. Give your answer to 2 significant figures. Show your working.

(4 marks)

Answer _____

12 A roller coaster car of mass 500 kg starts from rest at the top of a drop. It falls through a vertical height of 45 m. At the bottom of the drop its speed is 25 m/s.

Gravitational field strength = 9.8 N/kg

a. Calculate the gravitational potential energy lost by the car.

b. Calculate the kinetic energy of the car at the bottom of the drop.

c. Calculate the energy dissipated to the surroundings during the drop. Give your answer in kJ to 2 significant figures. Show your working.

(5 marks)

Answer _____

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13 Sami, of mass 55 kg, stands on a skateboard at the top of a ramp. The ramp is 4.0 m long and its top is 1.6 m above the ground.

Gravitational field strength = 9.8 N/kg

Calculate the gravitational potential energy Sami loses as he rolls to the bottom of the ramp.

(2 marks)

Answer _____

End of questions | Total 39 marks

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