

**Energy Transfers (GPE and KE)**

**Use ideas about energy transfers to solve the following problems.**

1. A stone of mass 2 kg is thrown vertically downwards with an initial speed of 10 m/s from the top of a tower of height 100 m.

Calculate the speed with which the stone hits the ground.

Ignore air resistance.

2. In each of the following parts (a) to (d), an object is thrown vertically downwards from the top of a tower.

In each case calculate the speed with which the object hits the ground. Ignore air resistance.

	Mass of the Object	Height of the Tower	Initial Downward Velocity
(a)	3 kg	200 m	5 m/s
(b)	500 g	150 m	15 m/s
(c)	1.5 kg	200 m	8 m/s
(d)	2 kg	120 m	12 m/s

3. A ball of mass 2 kg is released from rest from the top of a tower of height 150 m.

Ignoring air resistance, calculate the speed with which the object hits the ground.

Explain whether the speed calculated above would be higher, lower or the same if air resistance is taken in to consideration.

4. A helicopter hovering at a height of 400 m above the ground drops a parcel of weight 120 N.

(a) Calculate the mass of the parcel.

(b) Calculate the speed with which the parcel hits the ground. State the assumption you made in calculating this speed.

5. In each of the following parts (a) to (d), an object is either dropped or thrown vertically downwards from a height.

Ignoring air resistance, find the missing values.

	Mass of the object	Starting height	Initial downward velocity	Speed of impact with the ground
(a)	2 kg		5 m/s	10 m/s
(b)	500 g	10 m		20 m/s
(c)	4 kg		8 m/s	30 m/s
(d)	2 kg	200 m		70 m/s

6. In each of the following cases an object is thrown vertically upwards from the ground level.

Determine the maximum height reached above the ground by each of the objects. Assume that there is no air resistance.

- (a) Mass = 3 kg            Initial upwards velocity = 10 m/s  
(b) Mass = 2 kg            Initial upwards velocity = 15 m/s  
(c) Mass = 400 g          Initial upwards velocity = 20 m/s  
(d) Mass = 1.5 kg          Initial upwards velocity = 12 m/s

7. A ball of mass 200 g is thrown vertically upwards with a speed of 10 m/s from the ground level.

At what height above the ground will its speed be 6 m/s?

State the assumption you made in calculating your answer.

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