

1)

A ball is thrown vertically upwards.

Neglecting air resistance, which statement is correct?

- A** The kinetic energy of the ball is greatest at the greatest height attained.
- B** By the principle of conservation of energy, the total energy of the ball is constant throughout its motion.
- C** By the principle of conservation of momentum, the momentum of the ball is constant throughout its motion.
- D** The potential energy of the ball increases uniformly with time during the ascent.

2)

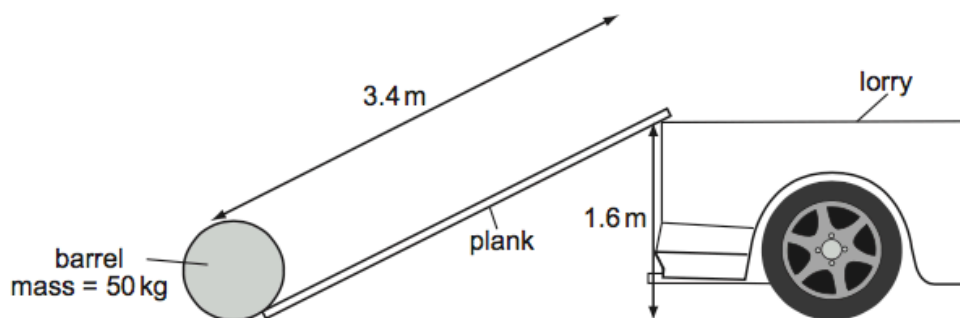
Car X is travelling at half the speed of car Y. Car X has twice the mass of car Y.

Which statement is correct?

- A** Car X has half the kinetic energy of car Y.
- B** Car X has one quarter of the kinetic energy of car Y.
- C** Car X has twice the kinetic energy of car Y.
- D** The two cars have the same kinetic energy.

3)

A barrel of mass 50 kg is loaded onto the back of a lorry 1.6 m high by pushing it up a smooth plank 3.4 m long.



What is the minimum work done?

- A** 80 J
- B** 170 J
- C** 780 J
- D** 1700 J

4)

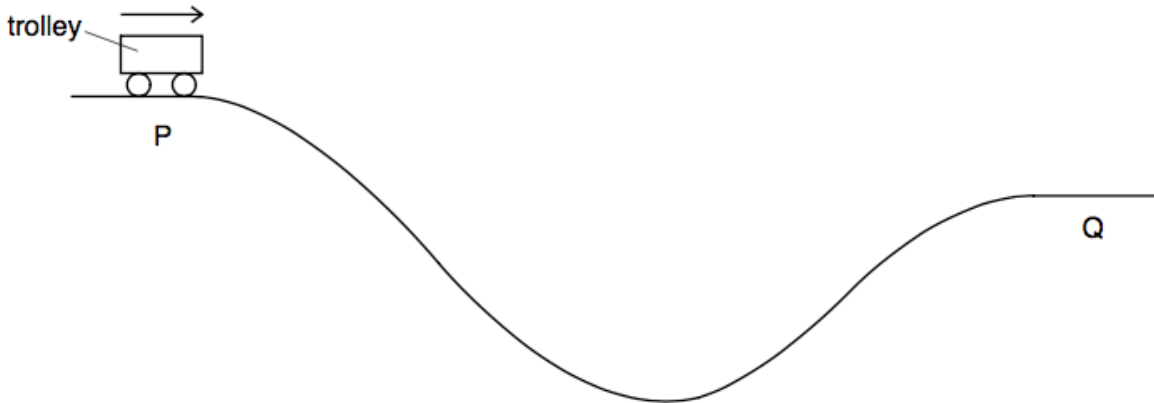
The kinetic energy of a particle is increased by a factor of 4.

By what factor does its speed increase?

- A** 2
- B** 4
- C** 8
- D** 16

5)

A trolley runs from P to Q along a track. At Q its potential energy is 50 kJ less than at P.



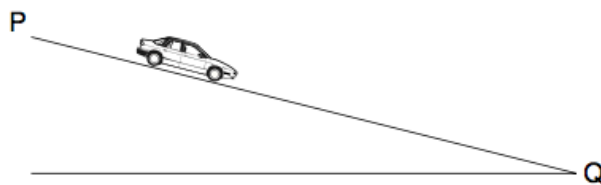
At P, the kinetic energy of the trolley is 5 kJ. Between P and Q the work the trolley does against friction is 10 kJ.

What is the kinetic energy of the trolley at Q?

- A 35 kJ
- B 45 kJ
- C 55 kJ
- D 65 kJ

6)

A car driver adjusts the pressure on a car's brakes so that the car travels at constant speed down a hill from P to Q.



The magnitude of the change in the car's kinetic energy is ΔE_k . The magnitude of the change in its gravitational potential energy is ΔE_p .

Which statement is correct?

- A $\Delta E_k > \Delta E_p$
- B $\Delta E_k = \Delta E_p$
- C $\Delta E_p > \Delta E_k > 0$
- D $\Delta E_k = 0$

7)

A horizontal force of 90 N is used to push a box across a horizontal floor. The frictional force on the box is 50 N.

What is the gain in kinetic energy of the box when it is moved through a distance of 6.0 m?

- A** 240 J **B** 300 J **C** 540 J **D** 840 J

8)

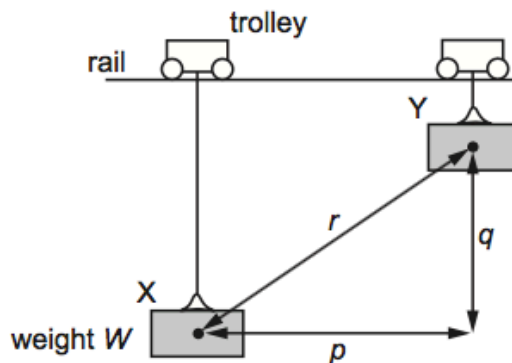
A twig from a tree drops from a 200 m high cliff on to a beach below. During its fall, 40% of the twig's energy is converted into thermal energy.

What is the speed with which the twig hits the beach?

- A** 35 m s⁻¹ **B** 40 m s⁻¹ **C** 49 m s⁻¹ **D** 63 m s⁻¹

9)

A weight W hangs from a trolley that runs along a rail. The trolley moves horizontally through a distance p and simultaneously raises the weight through a height q .



As a result, the weight moves through a distance r from X to Y . It starts and finishes at rest.

How much work is done on the weight during this process?

- A** Wp **B** $W(p + q)$ **C** Wq **D** Wr

10)

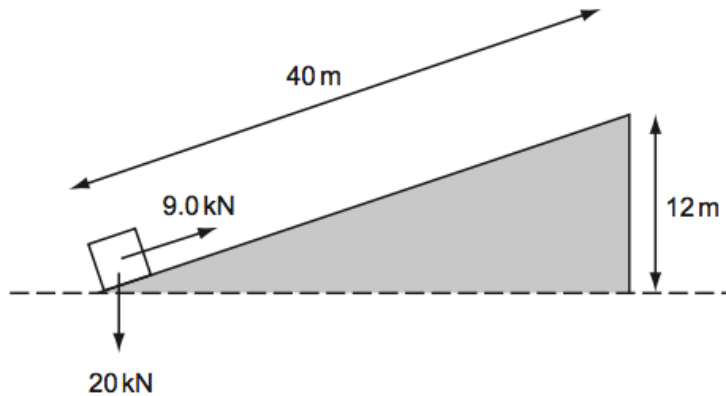
A motorist travelling at 10 m s⁻¹ can bring his car to rest in a distance of 10 m.

If he had been travelling at 30 m s⁻¹, in what distance could he bring the car to rest using the same braking force?

- A** 17 m **B** 30 m **C** 52 m **D** 90 m

11)

A constant force of 9.0 kN, parallel to an inclined plane, moves a body of weight 20 kN through a distance of 40 m along the plane at constant speed. The body gains 12 m in height, as shown.



How much of the work done is dissipated as heat?

- A** 120 kJ **B** 240 kJ **C** 360 kJ **D** 600 kJ

12)

An Olympic athlete of mass 80 kg competes in a 100 m race.

What is the best estimate of his mean kinetic energy during the race?

- A** 4×10^2 J **B** 4×10^3 J **C** 4×10^4 J **D** 4×10^5 J

13)

A concrete cube of side 0.50 m and uniform density $2.0 \times 10^3 \text{ kg m}^{-3}$ is lifted 3.0 m vertically by a crane.

What is the change in potential energy of the cube?

- A** 0.75 kJ **B** 7.4 kJ **C** 29 kJ **D** 470 kJ

14)

A car with a total mass of 1400 kg is travelling at 30 m s^{-1} .

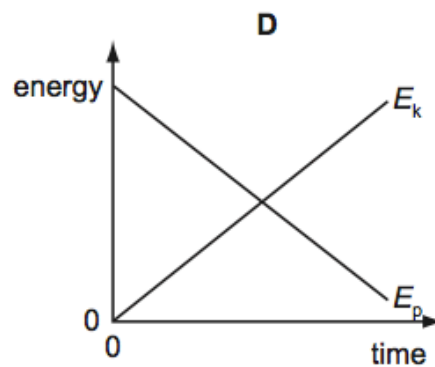
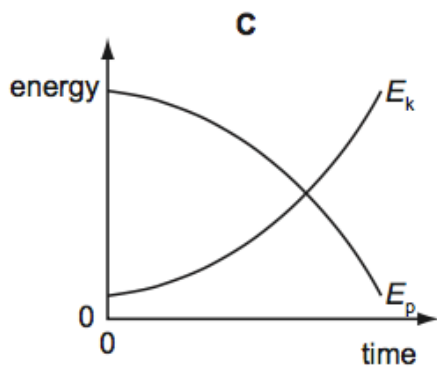
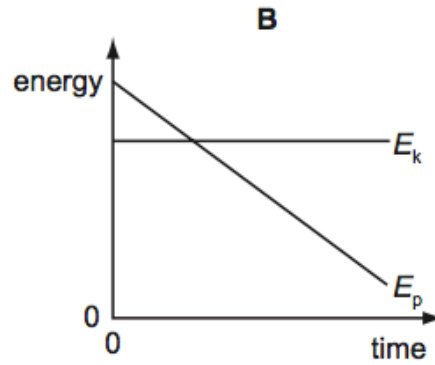
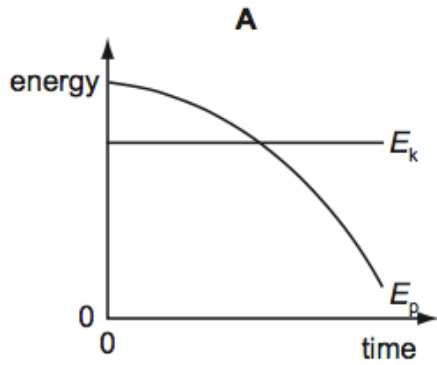
What is the kinetic energy of the car?

- A** 21 kJ **B** 42 kJ **C** 630 kJ **D** 1260 kJ

15)

A steel ball is falling at constant speed in oil.

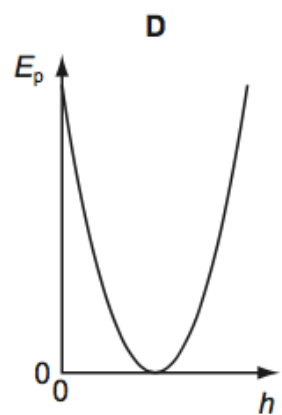
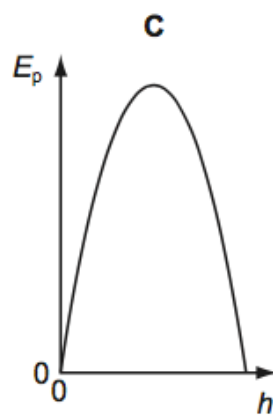
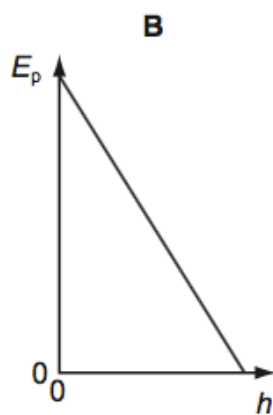
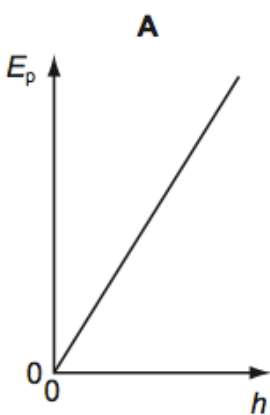
Which graph shows the variation with time of the gravitational potential energy E_p and the kinetic energy E_k of the ball?



16)

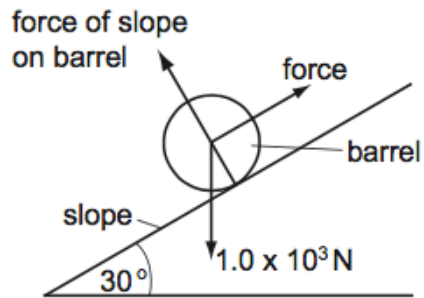
An object is thrown into the air.

Which graph shows how the potential energy E_p of the object varies with height h above the ground?



17)

The diagram shows a barrel of weight $1.0 \times 10^3 \text{ N}$ on a frictionless slope inclined at 30° to the horizontal.



A force is applied to the barrel to move it up the slope at constant speed. The force is parallel to the slope.

What is the work done in moving the barrel a distance of 5.0 m up the slope?

- A** $1.0 \times 10^4 \text{ J}$ **B** $2.5 \times 10^3 \text{ J}$ **C** $4.3 \times 10^3 \text{ J}$ **D** $5.0 \times 10^3 \text{ J}$