**2017 q6**

**In a bungee jump, Henry falls while attached to an elastic cord.**

**When the cord stops Henry’s fall, he then oscillates up and down. During the bungee jump, gravitational potential energy is converted into kinetic energy and then into elastic potential energy.**

**State the principle of conservation of energy.**

The Principle of conservation energy states that energy can neither be created nor destroyed, but that it can be converted from one form into another.

**Derive the expression *v2=u2+2as* for uniform accelerated motion.**



square both sides





But 

therefore: 

**The cord is 32 m long and Henry, of mass 60 kg, falls from rest while attached. Calculate his speed when he has fallen 16 m. (21)**

as potential energy is lost, kinetic energy is gained, and

*kinetic energy gained = potential energy lost*

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**A stretched elastic cord obeys Hooke’s law and the weight attached to the cord oscillates with simple harmonic motion. State Hooke’s law. What is meant by simple harmonic motion?**

**Hooke's Law** states the restoring force on a spring is proportional to the extension of the spring

**Simple harmonic motion:** Any motion where the acceleration (a) of a particle is proportional to its distance (s) from an equilibrium position is simple harmonic motion:

a ∝ -s

**The elastic constant of the cord is 250 N m–1. Calculate the length the cord would have if Henry was suspended at rest. (15)**

Henry

Restoring force (F)

Extension (s)

*32 m*

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**Total length: **

**After the end of the fall, Henry oscillates with simple harmonic motion.**

**The maximum displacement from his rest position is 1.2 metres.**

**Calculate (*i*) his maximum acceleration as he oscillates and (*ii*) his period of oscillation.**

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To find *a,* we need to know *ω*

 (Hooke)

⇒ 

 

Compare with a = -ω2s

Which shows ****

Acceleration at *s = 1.2m:*

* (towards the equilibrium position\_*

*Period of oscillation, T*

**

**Draw a diagram to show the forces acting on Henry when he is at his lowest point. (20)**

weight

Restoring force

**(*acceleration due to gravity, g = 9.8 m s–2*)**