An athlete of mass 64 kg is bouncing up and down on a trampoline.

At one moment, the athlete is stationary on the stretched surface of the trampoline. Fig. 3.1 shows the athlete at this moment.

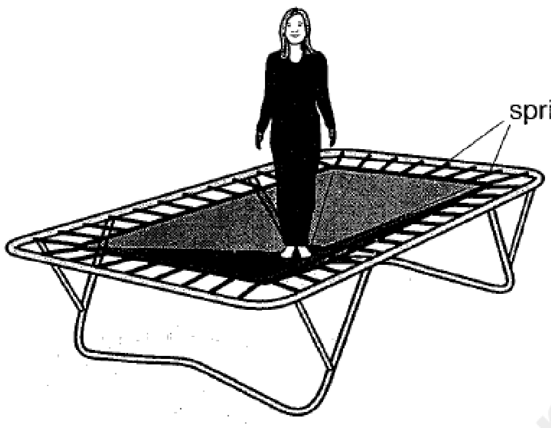

Fig. 3.1

(a) State the form of energy stored due to the stretching of the surface of the trampoline.

Strain / elastic (potential) (energy)

(b) The stretched surface of the trampoline begins to contract. The athlete is pushed vertically upwards and she accelerates. At time *t*, when her upwards velocity is 6.0 m/s, she loses contact with the surface.

(i) Calculate her kinetic energy at time *t*.

$(KE = \frac{1}{2} mv^2$

$= 1/2 \times 64 \times 6^2$

$= 1152 J$

$= 1200 J$

(ii) Calculate the maximum possible distance she can travel upwards after time *t*.

$k.e. = p.e = mgh$

$1200 = 64 \times 10 \times h$

$h = 1152/640$

$= 1.8 m$

(iii) In practice, she travels upwards through a slightly smaller distance than the distance calculated in **(ii)**.

Suggest why this is so.

Friction with air is the reason for this difference

(c) The trampoline springs are tested. An extension-load graph is plotted for one spring. Fig. 3.2 is the graph.

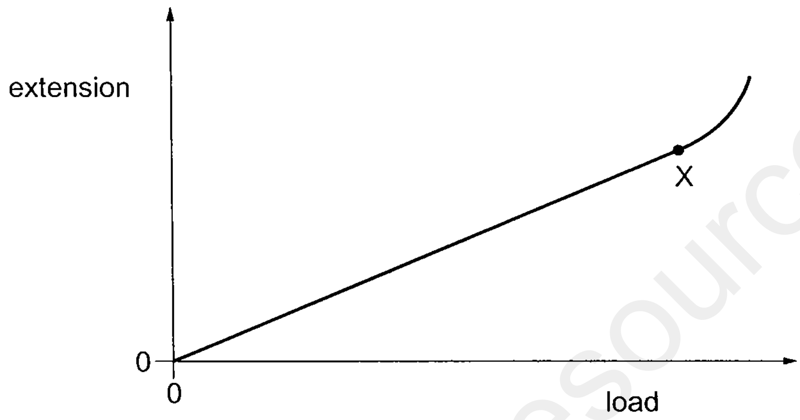

Fig. 3.2

(i) State the name of the point X.

limit of proportionality

(ii) State the name of the law that the spring obeys between the origin of the graph and point X.

Hooke's law