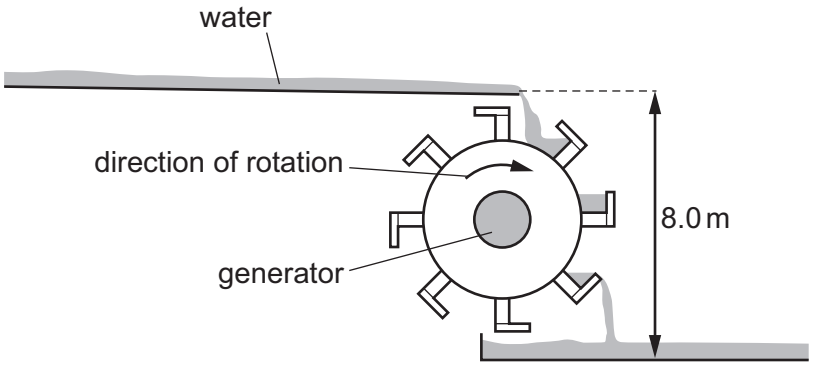
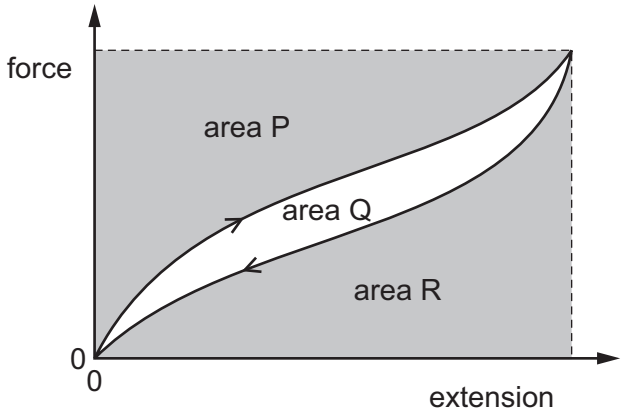
19 The diagram shows the design of a water wheel which drives a generator to produce electrical power. The flow rate of the water is $200\,kg\,s^{-1}$. The generator supplies a current of 32 A at a voltage of 230 V.



Ignoring any changes in kinetic energy of the water, what is the efficiency of the system?

A 14% **B** 16% **C** 22% **D** 47%

20 The diagram shows the force-extension graph for a sample of material. The sample is stretched and then returns to its original length.



Which area represents the work done to stretch the sample?

A P + Q **B** P only **C** Q + R **D** R only

21 A metal wire of cross-sectional area $0.20\,mm^2$ hangs vertically from a fixed point. A load of 84 N is then attached to the lower end of the wire. The wire obeys Hooke's law and increases in length by 0.30%.

What is the Young modulus of the metal of the wire?

A $1.4 \times 10^5\,Pa$

B $1.4 \times 10^8\,Pa$

C $1.4 \times 10^9\,Pa$

D $1.4 \times 10^{11}\,Pa$