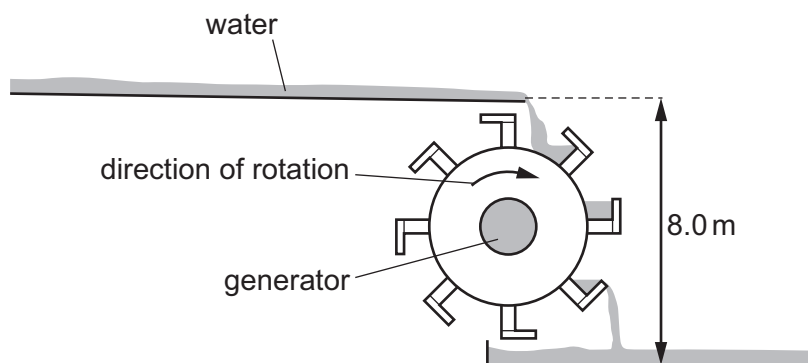
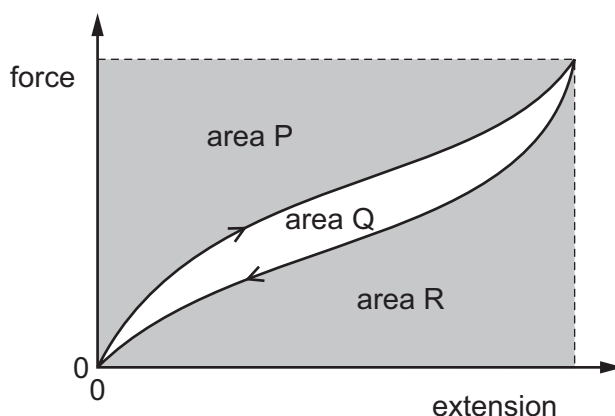


- 19 The diagram shows the design of a water wheel which drives a generator to produce electrical power. The flow rate of the water is  $200 \text{ kg s}^{-1}$ . The generator supplies a current of  $32 \text{ A}$  at a voltage of  $230 \text{ V}$ .



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  $0.20 \text{ mm}^2$  hangs vertically from a fixed point. A load of  $84 \text{ N}$  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  $1.4 \times 10^5 \text{ Pa}$   
 B  $1.4 \times 10^8 \text{ Pa}$   
 C  $1.4 \times 10^9 \text{ Pa}$   
 D  $1.4 \times 10^{11} \text{ Pa}$