

4.2 Work power and resources

Name: _____ Class: _____ Date: _____

Total: 22 marks

Objective

Cover work and power (4.11–4.17) and energy resources (4.18P–4.19P): $W = Fd$, $GPE = mgh$, $KE = \frac{1}{2}mv^2$, power as rate of transfer, and the (P) methods of large-scale electricity generation. Original IGCSE-level practice.

1 Key knowledge and worked examples

■ Four equations, one idea

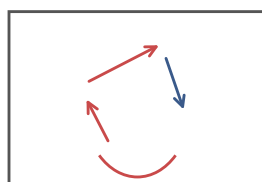
$$W = Fd \quad GPE = mgh \quad KE = \frac{1}{2}mv^2 \quad P = W/t$$

Worked check. A 60 kg runner sprints at 8 m/s: $KE = \frac{1}{2} \times 60 \times 64 = 1920 \text{ J}$. Climbing 4 m of stairs at $g = 10 \text{ N/kg}$ gains $GPE = 60 \times 10 \times 4 = 2400 \text{ J}$; doing it in 5 s, power = $2400/5 = 480 \text{ W}$.

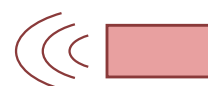
conduction: heat passes along a solid; particles vibrate and pass energy to neighbours



metals conduct best



convection: hot fluid rises, cooler fluid sinks — a circulating current



radiation: infrared waves need no medium; dark, dull surfaces emit and absorb best

■ (P) Generation table

Wind and hydroelectric (kinetic/gravitational → electrical), geothermal (thermal), solar heating (thermal), solar cells (light), fossil fuels (chemical), nuclear (nuclear store) — each with reliability, cost and environmental trade-offs.

2 Practice

2.1 Calculate the work done by a 25 N force over 8 m. [2]

2.2 Calculate the GPE gained by a 3 kg parcel lifted 2 m ($g = 10 \text{ N/kg}$). [2]

2.3 Calculate the KE of a 0.5 kg ball at 6 m/s. [2]

2.4 A machine does 900 J of work in 6 s. Calculate its power. [2]

2.5 (P) Name one renewable and one non-renewable resource. [2]

3 Exam-style questions

3.1 A 50 kg cyclist freewheels from rest down a 5 m drop. Calculate the GPE lost and, ignoring friction, the speed at the bottom ($g = 10 \text{ N/kg}$). [4]

3.2 A crane lifts a 200 kg beam 12 m in 20 s at steady speed. Calculate the work done and the crane's useful power ($g = 10 \text{ N/kg}$). [4]

3.3 (P) Compare fossil-fuel and wind generation, giving one advantage and one disadvantage of each. [4]
