MR SULLY UNFOLDS PHYSICS ANSWERS

Electrical power, energy and the National Grid

AQA 4.2.4
Electricity · Paper 1
Foundation & Higher

Name _____ Class _____ Date _____

Appliances transfer energy electrically. How much depends on their **power** and how long they are on.

KEY EQUATIONS

P = V I
P = I² R
power (W), p.d. (V), current (A), resistance (Ω)

E = P t
E = Q V
energy (J), time (s), charge (C)

Section A · Recall and calculate

Grade 4–5

1 A toaster draws 4 A from the 230 V mains. Calculate its power. [2]

P = 230 × 4 = 920 W

2 A 60 W lamp is on for 100 s. Calculate the energy transferred. [2]

E = 60 × 100 = 6000 J

3 What is the National Grid? [2]

A system of cables and transformers

linking power stations to consumers (homes, businesses).

Section B · Calculate

Grade 5–6

4 A current of 2 A flows through a 50 Ω resistor. Calculate the power. [2]

P = I²R = 2² × 50 = 200 W

5 A charge of 300 C flows through a lamp with a p.d. of 12 V across it. Calculate the energy transferred. [2]

E = QV = 300 × 12 = 3600 J

6 A 2.5 kW heater is used for 30 minutes. Calculate the energy transferred. [3]

P = 2500 W, t = 30 × 60 = 1800 s

E = Pt = 2500 × 1800

E = 4 500 000 J

Section C · Stretch

Grade 7+

7 A 1150 W kettle runs on 230 V mains. Calculate the current and the resistance of the heating element. [4]

I = P ÷ V = 1150 ÷ 230 = 5 A

R = V ÷ I = 230 ÷ 5

R = 46 Ω

Exam-style question

AQA style

8 Electricity is transmitted across the country through the National Grid.

a Explain why step-up transformers are used to transmit electricity at a very high potential difference. [4]

Step-up transformers increase the p.d. for transmission.

For the same power (P = VI), the current is much lower.

A lower current means less heating of the cables ($P = I^2R$),

so less energy is wasted and the system is more efficient.

b Explain why step-down transformers are used before electricity reaches homes. [1]

To reduce the p.d. to a safe level (about 230 V) for domestic use.

Total: _____ / 22

How confident am I?	Not yet	Nearly	Got it
I can use P = VI and $P = I^2R$	☐	☐	☐
I can use E = Pt and E = QV	☐	☐	☐
I can explain how the National Grid reduces the energy wasted in the cables	☐	☐	☐