28 Marking scheme: Worksheet (A2)

1 **a** $T = \dfrac{1}{f}$ [1]

0.1 s [1]

b **i** $t = 0$, 0.05 and 0.15 [1]

ii $t = \dfrac{1}{4}$ of a period [1]

$t = 0.025$ s [1]

iii $t = 0.075$ s [1]

iv $t = \dfrac{1}{\sqrt{2}} = \sin(20\pi t)$ [1]

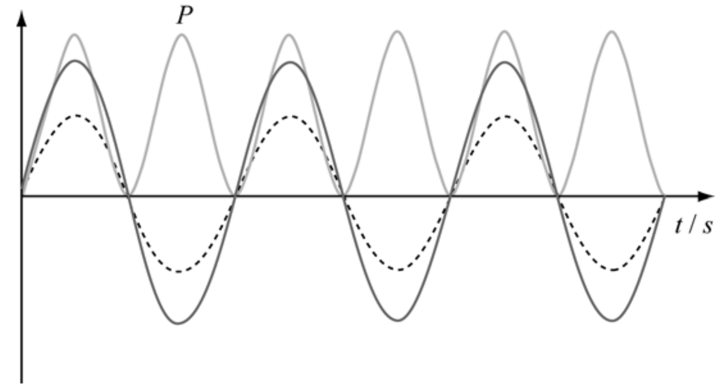
$t = 0.0125$ s [1]

2 **a** Corresponding parts of each wave occur at the same time. [1]

b Power P always positive. [1]

Two peaks for P in time taken for one peak of I and V. [1]

Sinusoidal shape above axis. [1]



3 **a** **i** $I = \dfrac{P}{V} = \dfrac{690}{230}$ [1]

$I_{rms} = 3.0$ A [1]

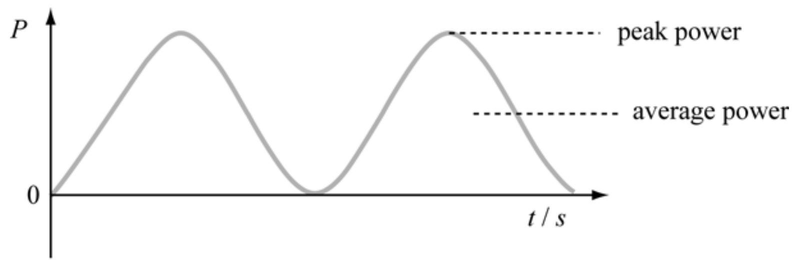
ii $I_{peak} = 3\sqrt{2} = 4.2$ A [1]

iii $V_{peak} = 230\sqrt{2} = 325$ V [1]

b Correct shape all above axis. [1]

Two cycles shown (i.e. one cycle of current waveform). [1]

Peak and average power marked. [1]



4 **a** a.c. [1]
Current is positive and negative OR current flows one way, then the opposite way. [1]

b Voltage switches between +2 and –2 V. Power is $\frac{V^2}{R}$, so it has the same value for both positive and negative values of the voltage. [1]

c **i** 2 V [1]
ii 2 V [1]

5 Average power $= \left(\frac{2.5}{\sqrt{2}}\right) \times \left(\frac{6}{\sqrt{2}}\right)$ [1]
$= 7.5$ W [1]

6 **a** **i** Period = 80 ms = 0.080 s [1]
$f = \frac{1}{T} = 12.5$ Hz [1]

ii Peak voltage = 4.5 V [1]
r.m.s. voltage $= \frac{4.5}{\sqrt{2}} = 3.2$ V [1]

b $V_0 = 4.5$ V [1]
$\omega = 2\pi f = 2\pi \times 12.5 = 78.5\ \text{s}^{-1} \approx 79\ \text{s}^{-1}$ [1]

7 **a** $I = \frac{P}{V} = \frac{24}{6}$ [1]
$I = 4.0$ A [1]

b $V_p = 6 \times \frac{1150}{30}$ [1]
$V_p = 230$ V [1]

c $I_p = \frac{24}{230}$ or $I_p = \frac{30 \times 4}{1150}$ [1]
$I_p = 0.10$ A [1]

d Maximum p.d. $= 6\sqrt{2}$ [1]
maximum p.d. = 8.5 V [1]

e Heat is still produced inside the wires even if it cannot be conducted to the outside. The wires may melt if they cannot lose the heat. [1]

8 **a** Number of turns on the primary $= \frac{115}{230} \times 500 = 1000$ turns [1]

b $I_s = \frac{V_s}{R} = \frac{115}{5000} = 0.023$ A r.m.s. [1]

c $I_p = 0.023 \times \frac{500}{1000} = 0.0125\ \text{A} \approx 0.013$ A r.m.s. [1]

d Peak voltage $= 115\sqrt{2} = 162$ V [1]
so the cables will break down. [1]

9 **a** $I = \frac{P}{V} = \frac{1000}{100} = 10$ A r.m.s. [1]
$P = I^2R = 10^2 \times 5 = 500$ W [1]

b At high voltages the current is less for the same power. [1]
Power lost in cable $= I^2R$ so power lost is less. [1]

