7 **(a)** A sinusoidal alternating voltage has a root-mean-square (r.m.s.) potential difference (p.d.) of 4.2 V and a frequency of 50 kHz.

(i) The alternating voltage is applied across a resistor of resistance 760 Ω.

By considering the peak voltage, show that the maximum power dissipated by the resistor is 46 mW.

[2]

(ii) On Fig. 7.1, draw a smooth curve to show how the power P dissipated in the resistor varies with time t between $t = 0$ and $t = 40\,\mu s$. Assume that $P = 0$ when $t = 0$.

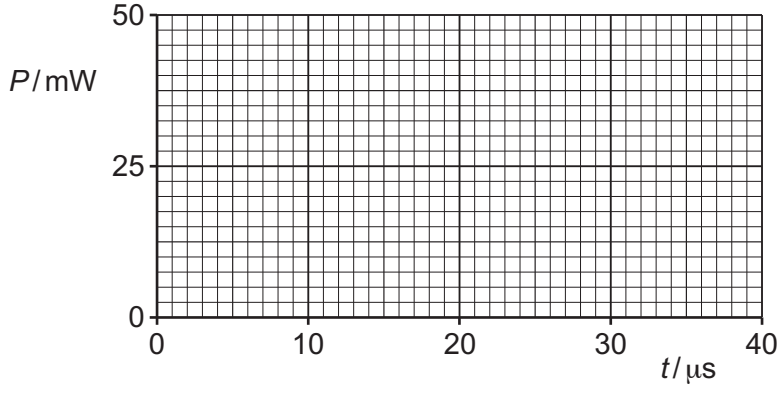

Fig. 7.1

[3]

(iii) Use your line in **(a)(ii)** to explain why the mean power dissipated in the resistor is 23 mW.

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.....

..... [1]

(b) The alternating voltage in **(a)** is now applied to a piezoelectric crystal in air.

(i) Explain what happens to the air surrounding the crystal.

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.....

.....

..... [3]

(ii) A second piezoelectric crystal is placed in the air near to the first crystal.

Explain the effect of the surrounding air in **(b)(i)** on the second crystal.

..... [1]

[Total: 10]