

'50 Years To Net-Zero'

a) Using arithmetic series formula:

$$S_{51} = \frac{51}{2} [(2 \times 800) - (50 \times 12)]$$

$$S_{51} = 25500$$

Allow full marks for the correct answer obtained using the area of a trapezium, with a and b values -0.5 and 50.5 , respectively.

[2 marks]

b) at the start of the trial $y = 800$ when $x = 0$

y decreases by 12 per year (x) therefore $y = 800 - 12x$ (as needed)

[1 mark]

$$c) 0.1x^2 - x = 800 - 12x$$

$$(1) x^2 + 110x - 8000 = 0$$

$$(x + 160)(x - 50) = 0$$

$$x \neq 160$$

therefore $x = 50$ and the country achieves their goal.

[3 marks]

d) $\int_{10}^T 0.1x^2 - x =$ total emissions sequestered

$25500 + 200(T - 50) =$ total emissions released for no contribution to global warming:

$$25500 + 200(T - 50) = \int_{10}^T 0.1x^2 - x$$

$$15500 + 200T = \left[\frac{1}{30}x^3 - \frac{1}{2}x^2 \right]_{10}^T$$

$$0 = \frac{T^3}{30} - \frac{T^2}{2} - 200T - \frac{46450}{3}$$

Solving for T :

$$T = 109(3. s. f.)$$

[5 marks]