Worksheet

Name: _____

Task

You are an electronics manufacturing company, and the first step in creating your device is to make the circuit board. You want to focus on the sustainability of your product, so that begins with designing the circuit board. Your team wants you to design two circuits using different materials to consider the tradeoffs between each.

Assemble **two** circuits using each of the materials in front of you, **carbon paint** and **copper tape**, that satisfy the following constraints.

1. The circuit must light up exactly **1** LED
2. The circuit path must cover at least **20 squares** of distance
3. The circuit must fit within the board

Your goal is to create a circuit that satisfies the constraints while having the least carbon cost.

Embodied Carbon

Choose one from the following and calculate the carbon cost:

1. Material Extraction – *Gathering materials from the Earth*
2. Processing – *Converting raw materials into a form you can work with*
3. Distribution – *Transporting materials from the factory to the user*

Production

Material	**Length** (squares)	**Cost** ($g/in.$)	**Subtotal**
Carbon Paint	_____ $sq.$	6.5 $g/sq.$	_____ g CO_2e
Copper Tape	_____ $sq.$	50 $g/sq.$	_____ g CO_2e
Total Cost			_____ g CO_2e

Disposal – Estimated to be $20\ g$ CO_2e

Embodied Carbon – Carbon Paint: _____ g

Embodied Carbon – Copper Tape: _____ g

Operational Carbon

Operational carbon is dependent on battery output:

$$C_{operational} = 0.45 * V_{battery} * mAh_{battery}$$

Operational Carbon = 0.45 * _____$V_{battery}$ * _____ $mAh_{battery}$ = _____ g CO_2e

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Total Carbon Cost = $C_{embodied}$ + $C_{operational}$

Carbon Paint Total: _____ + _____ = _____ CO_2e

Copper Tape Total: _____ + _____ = _____ CO_2e
