DESIGN YOUR OWN LAB-GROWN MEAT PROCESS

Can you build an efficient process and still achieve a net environmental gain?

YOUR CHALLENGE

You are designing a process to grow meat from animal cells in a large reactor. The cells need nutrients, oxygen and the right conditions to grow.

HOW TO PLAY

1. Go through each of the four categories.
2. Pick the option you think will make the best production process.
3. Flip your chosen cards to reveal the environmental points.
4. **Add the points together. Finish above 0 to achieve a NET ENVIRONMENTAL GAIN and WIN A PRIZE!**

YOUR FOUR DESIGN DECISIONS

COST	CELL GROWTH	NUTRIENT SUPPLY	PRODUCTION LOCATION

COST

How will you keep production costs down?

Manufacture new equipment from cheap raw materials	**-2 ENVIRONMENTAL POINTS** Highly energy intensive. Materials are often not ethically sourced in accordance with environmental protection acts.
Refurbish existing equipment instead of buying new equipment	**+2 ENVIRONMENTAL POINTS** Less new equipment needs to be manufactured.
Use new larger equipment to produce larger batches so each kg of meat is cheaper	**+1 ENVIRONMENTAL POINT** Equipment and energy are used more efficiently per kg of product.
Use the cheapest electricity sources available	**-1 ENVIRONMENTAL POINT** It may come from more carbon-intensive energy sources.

CELL GROWTH

How will you reach the number of cells you need?

Use cells that grow faster	**+2 ENVIRONMENTAL POINTS** The reactor needs to run for less time.
Increase the oxygen supplied to the cells	**-1 ENVIRONMENTAL POINT** Supplying more oxygen requires additional energy.
Use several reactors at the same time	**-2 ENVIRONMENTAL POINTS** More equipment needs to be powered at once.
Give the cells more time to reach the target naturally	**0 ENVIRONMENTAL POINTS** Uses no extra equipment, but the reactor runs for longer.

NUTRIENT SUPPLY

How will you add nutrients to the cells?

Add all nutrients assumed to be required at the start	**0 ENVIRONMENTAL POINTS** Simple, but some nutrients may be left unused.
Add nutrients at fixed times during growth	**+1 ENVIRONMENTAL POINT** Spreads nutrient use out and can reduce waste.
Use sensors to add nutrients only when the cells are running low	**+2 ENVIRONMENTAL POINTS** Avoids adding more nutrients than the cells need.
Add lots of extra nutrients at the start so that the cells never run out	**-2 ENVIRONMENTAL POINTS** Uses more raw materials and can leave lots of unused nutrients.

PRODUCTION LOCATION

Where will you make the lab-grown meat?

One large factory supplying the whole country	**-1 ENVIRONMENTAL POINT** The final product may need to travel long distances.
Several smaller factories around the country	**+1 ENVIRONMENTAL POINT** Products can be made closer to consumers.
Build the factory somewhere with easy access to low-carbon electricity	**+2 ENVIRONMENTAL POINTS** Production can use a lower-carbon energy supply.
Produce overseas where manufacturing is cheapest	**-2 ENVIRONMENTAL POINTS** The product may need long-distance transport before reaching consumers.