Name: _____ **Date:** _____

Section: _____

Na-K Pump Activity

The Cell's Ion Pump

Phase 1: ENGAGE (2 minutes)

Getting Started: Open peebedu.com and navigate to Sodium-Potassium Pump Interactive

Look at the cell membrane with its special pump.

The Challenge: Cells keep sodium (Na^+) and potassium (K^+) at different levels inside vs outside.

Quick Check:

- More Na^+: INSIDE / OUTSIDE the cell
- More K^+: INSIDE / OUTSIDE the cell

Phase 2: EXPLORE (7 minutes)

Run the Pump

Click to operate the pump through its cycle.

What Happens:

Step 1 - Loading:

- _____ sodium ions attach from inside
- ATP binds to the pump

Step 2 - Shape Change:

- ATP breaks down (loses energy)
- Pump opens to: INSIDE / OUTSIDE
- Sodium ions: STAY / LEAVE

Step 3 - New Cargo:

- _____ potassium ions attach from outside
- Pump still facing: INSIDE / OUTSIDE

Step 4 - Return:

- Pump opens to: INSIDE / OUTSIDE
- Potassium ions: STAY / LEAVE

The Pattern: Each cycle moves _____ Na^+ out and _____ K^+ in.

Energy Check:

- Without ATP, the pump: WORKS / STOPS

Phase 3: EXPLAIN (4 minutes)

How It Works

Active Transport: Unlike diffusion, this pump:

The Energy Source: ATP provides energy for:

- Changing pump _____

Why 3:2?

Moving 3 Na^+ out but only 2 K^+ in creates:

- More _____ charge outside

Cell Functions: This gradient powers:

- Nerve impulses
- Muscle contractions
- Nutrient uptake

Phase 4: ELABORATE (1 minute)

Real Examples

Heart Medicine: Some heart drugs partially block this pump. Result: Heart muscle contracts more strongly. Why? _____

Nerve Poison: Some toxins completely block the pump. Result: Paralysis Why? _____

Phase 5: EVALUATE (1 minute)

Check Understanding

The pump needs ATP because:

Per cycle, the pump creates:

- Net movement of _____ charge outside

Exit Question: Why is this pump so important that cells use 30% of their ATP on it? _____