Name:______________________________Date:______________Class:________________

Student Worksheet

Lab-on-a-Slab 2: Build Your Slab

Safety
Wear glasses and gloves. Do not eat or drink iodine or luminol—they are poisonous if ingested. Mild acidic and alkaline solutions can cause skin irritation.

Introduction:
In this lab, you will design a lab-on-a-slab that helps diagnose a mystery patient.

Materials
- various pieces of wire
- wire cutters
- tweezers
- pliers
- styrofoam plate
- permanent marker
- agar gel
- piece of plastic wrap
- sensor pads in containers, 4 of each shape; keep them organized
- 4 pipettes
- distilled water in a small cup as a control
- samples from 3 patients
- 4 hole punch reinforcement rings

Question: How can you use capillary action to do several tests on one small sample?

Make a Prediction:

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Procedure:

1. In the box above, draw your design that shows where you will place three different sensor pads for testing a sample. The sensor pads are small pieces of filter paper soaked in an indicator chemical. You will need to direct the liquid towards each separate sensor pad. You will use a starch test (circular sensor), a pH test (square sensor), and a peroxide test (triangular sensor). Clearly label it so someone else can understand what it is designed to do.

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2. Shape your wire using wire cutters, tweezers, or pliers. Make 4 copies of the same design to test 4 different samples on the same plate. Label your plate with your name, using a marker.
3. Pour agar gel into the plate. Adjust design with tweezers if necessary. Cover with plastic wrap and let it set overnight.
4. Carefully remove the agar gel. Trim the agar with a knife to separate each of the 4 copies. Remove the wires with tweezers.
5. Place the sensor pads on all four copies of your lab-on-a-slab.
6. Using a pipette, add one or two drops of water as a blank control to the start area of ***one*** of your channels and record the results of the sensor pads.
7. Repeat step 6 with samples from Patient A, Patient B, and Patient C. Be sure to use a fresh pipette for each sample.
8. Assign a diagnosis to each result (e.g., as seen in the chart below, an alkaline sample with starch but no peroxide would have 'alkaline starchosis').

Diagnosis	pH	Starch	Peroxide
acidic oxidosis	Red = acidic	pale brown = NO	Blue glow = YES
acidic starchosis	Red = acidic	blue-black = YES	no glow = NO
alkaline oxidosis	Blue = alkaline	pale brown = NO	Blue glow = YES
alkaline starchosis	Blue = alkaline	blue-black = YES	no glow = NO

Record Your Observations: [Label unclear results as "more testing needed" under Diagnosis.]

	Starch	pH	Peroxide	Diagnosis
Control = water				
Patient A				
Patient B				
Patient C				

Analyze the Results:

Do your results agree with other groups? What should you do about results that don't agree?

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Draw Conclusions:

1. The group *Doctors Without Borders* often work in war zones, poor nations, or remote areas without electricity. How might a pre-made sensor chip help them? Why might you want to make it smaller?

2. If air is drawn over a liquid in a channel, a combination of lasers and nanoparticles can detect the 'smell' of TNT, RDX, Semtex, and other high-explosives. Why might soldiers patrolling a war zone want a small device that does this?

3. What other substances might people/companies be interested in 'sniffing' for? What locations might use a device like a chemical nose?

4. Thinking about these uses, what are the strengths and weaknesses of your lab-on-a-chip? What ideas for improvement do you have?

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