

Team Number:   C   School & Team Name: \_\_\_\_\_

Student Names: \_\_\_\_\_

## CHECK-IN

### Construction & Competition Parameters:

|   |   |             |  |
|---|---|-------------|--|
| T | F | 3.a.        | Device is built using a microcontroller or microcontroller board, a display, LED lights, and a participant-built sensor/probe. The sensor produces a voltage which varies according to the concentration of the water. WiFi/Internet connection is not used at any time during competition.  |
| T | F | 3.b.        | The sensor is student constructed from fundamental electronic components such as resistors, capacitors, wire, and DIP package integrated circuits. All circuits are assembled on a breadboard. No preassembled integrated circuit PCB boards are used. The sensor and wires/cables, together, are $\geq 30.0$ cm in length, and narrow enough to fit through an opening of 7.0 cm and the end is immersible up to 5.0 cm in water. |
| T | F | 3.d.        | The Device has a digital display that clearly shows voltage, and the salt concentration in ppm to the nearest unit value. If a laptop is used for display purposes, it is not used for the Written Test portion.   |
| T | F | 3.e.        | The Device is able to indicate the specific concentration zone using three separate LEDs – one red, one green, and one blue. RGB LEDs, if used, is wired for only one color.   |
| T | F | 3.f.        | Teams do not use electrical outlets at any time during the competition. If the Device is not powered by a connected laptop or calculator, the Device is powered by commercially available batteries. Multiple batteries (connected in series or parallel) have total input $\leq 12$ V as calculated using each battery's voltage (as labeled by the manufacturer), and the expected voltage output to the probe $\leq 3.3$ volts. |
| T | F | 3.g.        | Device is clearly labeled with the team's name and team number.  |
| T | F | 5.Part I.a. | Once participants enter the event area, they do not leave or receive outside assistance, materials, or communication.  |

**1. T    F    DEVICE MEETS ALL CONSTRUCTION & COMPETITION PARAMETERS ABOVE**

### DESIGN LOG (MAX 4 POINTS EACH)

|              |          |  |
|--------------|----------|--|
| <u>  2  </u> | 4.b.i.   | A top-down photograph of the Device with labels identifying all the components and detailing their functions. This section should also include a brief summary explaining how the Device was constructed.  |
| <u>  3  </u> | 4.b.ii.  | A data table with at least 10 trials showing the sensor voltage reading versus the corresponding ppm using their fixed resistor(s) in the voltage divider. If multiple fixed resistors are tried, data and graphs of all potential resistors are included. |
| <u>  4  </u> | 4.b.iii. | Scatter-plot graph of this data with concentration in ppm on the Y-axis and voltage on the X-axis.   |
| <u>  5  </u> | 4.b.iv.  | Function graph of mathematical model supported by the data overlaid on a scatter-plot of the data.   |
| <u>  6  </u> | 4.b.v.   | Equation of the above mathematical model used to convert measured voltage to the corresponding concentration in ppm highlighted for easy identification  |
| <u>  7  </u> | 4.b.vi.  | Printout of program with code highlighted showing this exact mathematical equation or its code implementation converting voltage to concentration in PPM.  |
| <u>  8  </u> | 4.b.vii. | On the same program printout, the code that will illuminate the appropriate LED(s) according to their assigned concentration ranges is highlighted   |

### STATION 1    STATION 2    STATION 3    STATION 4    ← **DEVICE TESTING (2 MINUTES PER STATION)**

|                    |                    |  |                    |   |
|--------------------|--------------------|--|--------------------|---|
| <u>  9  </u>       | <u> 12 </u>        | <u> 15 </u>  | <u> 18 </u>        | Voltage to the nearest whole number displayed by the Device |
| <u> 10 </u>        | <u> 13 </u>        | <u> 16 </u>  | <u> 19 </u>        | Concentration (ppm) to the nearest whole number displayed   |
| <u> 11 </u>        | <u> 14 </u>        | <u> 17 </u>  | <u> 20 </u>        | Actual concentration in ppm                                 |
| <u> 11 </u> T    F | <u> 14 </u> T    F | <u> 17 </u> T    F   | <u> 20 </u> T    F | Team has correct LED color                                  |
| <u> 21 </u>        | 6.b.i.             | Absolute Error Multiplier (Regional = 20, State = 30, National = 40) |                    |   |

### WRITTEN TEST

|               |         |   |
|---------------|---------|---|
| <u> 22 </u>   | 6.b.iv. | Written Test (maximum 30 points)            |
| <u> 24 </u> : | 6.c.    | Duration to complete written test (min:sec) |

**23. T    F    General Rule: The team is disqualified. (Notify the team and their coach as soon as possible.)**