Midterm Exam Study Guide

Students may bring in a 3.5x5" index card with notes, double-sided, otherwise this is closed-book, closed notes.

To prepare for this exam, reread all of your notes and pdfs, as that is where questions will be drawn from. Questions in yellow have been added since the study guide was first published.

Expect questions on:

1. the applications of IoT
2. C++ - including IO with std::cout, std::cin and printf(); variable declaration; functions (ncluding prototypes and implementations); namespaces; .h versus .cpp; arrays; global versus local variables (including the use of static, extern); pass-by-reference
3. Electrical concepts: electrostatic force, valence and free electrons; closed v. open circuits; cathode v. anode
4. Ohm's Law - including calculating resistance in series **and** parallel and a combination thereof; voltage drops; and voltage divider circuits
5. Power Law - including calculating power being expended through a particular component
6. the significance of, and the difference between voltage, current, resistance and power
7. how batteries, switches, resistors, phjotoresistors,, diodes, LEDs, speakers, and the TMP36 work and the symbols that represent them on a schematic.
8. resistor color coding
9. draw an external pull-up resistor.
10. how to read a schematic, and create a breadboard (on paper) that matches a schematic
11. digital IO: digitalRead(), digitalWrite(), pinMode() -- what they do, how to use them, what values (if any) they return
12. how to write information to the console using Serial.printf()
13. strategies to prevent a button push from being detected multiple times
14. Time.now()
15. how to generate random doubles and random ints
16. analog versus digital - what are the differences? Be able to classify a particular measurement as one or the other
17. analog IO: analogRead(), analogWrite() -- what they do, how to use them, what values (if any) they return
18. what is pulse width modulation? what is duty cycle? how do you set pulse width modulation?
19. write the code to make an LED turn on with 25% brightness; 100% brightness; 10% brightness (round)
20. what pins can be used for analog input? analog output? digital input? digital output? PWM?
21. analog IO (especially I) - what pinMode() to use; the difference between analogRead() and analogWrite(); the value returned by analogRead(); the values you can write
22. write the code to print the current brightness; temperature; status of a switch (open or closed)
23. Particle.variable(), Particle.function() - what they are, how to fetch Particle variables and how to invoke Particle functions
24. types that can be used with Particle.variable() ; signatures of functions appropriate for Particle.function()
25. XMLHttpRequest -- what is it, what is it good for?
26. JSON - objects, arrays, syntax
27. Contents of GET, POST, DELETE, TRACE methods (head and body)

28. Particle.publish(), Particle.subscribe() - purpose, syntax; explain the difference between PRIVATE and PUBLIC; between ALL_DEVICES and MY_DEVICES (and where they are used). What is the signature of the method handler passed into Particle.subscribe()?
29. write code to publish an event, with a specific name and a specific value
30. URLs associated with Particle.variable() and Particle.function() -- api.particle.io/v1/device/... etc.
31. how to construct a GET or POST message to fetch the value of a Particle variable or invoke a Particle function