#	Question	Answer(s)
1	did prof just say circuits are on the midterm exam?	Nope, circuits will not be on midterm 1.
2	will the content covered in this lecture be on the midterm?	Nope, it will not be on midterm 1.
3	Will the review session be recorded? Or any alternate times for those who have lab during that time?	Review session will be recorded
4	is there a regular required lab next week?	Yes, there believe there is still imaging 3
5	how would Imaging Labs/labs be tested on an exam??	The concepts from lab are in scope for the exam, as they line up with lecture and homework, but we're not going to ask you to physically build or code anything.
6	will numpy be on the exam?	> we're not going to ask you to physically build or code anything.
7	If I did the software version for imaging I, do I have to review the hardware version for the midterm?	Not a bad idea to, but we're not going to ask you to build anything or ask any circuits questions, etc.
8	will there by any coding questions on MT1	no
9	just to clarify, we can write on a tablet like an ipad for the midterm	You may write on a tablet, so long as its screen is in view of the camera when working (just like physical sheets) and the submission still follows the pre-prepared answer sheet format. No other uncovered screens or tablets are permitted in the room. See more details at https://docs.google.com/document/d/10pnWwxyZ40nlpbCM4aOYTxXOjc36sIQaMx9m8zyaR8w/e
10	Are there any requirements for the cheatsheet other than one 8x11 back and front and no sharing?	It must be handwritten.
11	are exams cumulative, like will the final exam have stuff from both module 1 and 2	All the concepts we are studying are cumulative, i.e. we will use module 1 content in module 2, so effectively the exams are knowledge cumulative
12	Do we get to redo our midterms? Out of how many points will it be?	You will be able to redo the midterms for some clobber points. Final point total is TBD
13	Will we review diagonalization today?	yes
14	prof waller should teach eecs 16b :0	:) she sometimes does
15	will there ever be coding on exams?	No coding problem on midterm 1
16	Will we be needing a copy of Spice for this class?	No, all the circuit analysis we will do can be done with just numpy
17	is working at a research lab sort of like a paid internship?	Pay depends on the lab unfortunately, but as an undergrad, the experience working with these teams is invaluable.
18	Do we talk about fuses and how they work in this class?	No, but if you want to learn more about them and their applications, we're happy to tell you in OH :)
19	For resistance, does that say material property?	yes
20	could I get some clarifiaction on what voltage is?	In our water analogy, its like some pressure difference between two points in pipe
21	What's the difference between Voltage and Current?	In our water analogy, voltage is like pressure between two different points in the pipe. Current is the flow / speed of the water through the pipe.
22	what is water in this case, because voltage is pushing the water, current is fllow, and resistance stops voltage right? or am I totally off lol	Water will be the charge. The charge flow (charge per unit time) is the current. Resistance tries to stop the flow (current).
23	is voltage dependent on the difference in concentration of electron?	Not directly, there are some other factors that would be involved there, and we will generally only think about that when working with capacitors.
24	"a wire has no resistance" does that mean the resistance of a wire is negligable?	Yes we will ignore the resistance of a wire unless otherwise stated.
25	why voltage always zero again?	live answered
26	what materials are the resistors that we usually work with made out of?	Typically carbon, metal, or metal-oxide film
27	I didn't quite catch, why is V_el = 0?	The flow of water is not impeded at all, so no pressure can build up. so V_el = 0
28	so like the velocity is basically even across the whole thing, so V_el = 0?	The flow of water is not impeded at all, so no pressure can build up. so V_el = 0
29	don't you need a potential difference for the current to flow though? how's the voltage zero then?	Since there is no resistance, we don't need any potential difference (or think about we just need a infinitely tiny potential difference) to make the current flow.
30	The current always goes towards the negative side of the voltage correct?	For resistors, yes. We will define a full convention for this
31	so voltage mesured at a single point will always be 0?	Voltage always has to be measured as a difference between two points.
32	sorry I kind of missed why the right side is positive voltage and left side is negative voltage is it always like that?	A voltage is always defined as a difference between two points, so we have to define some positive side and negative side. On the example, we picked the left to be positive and right to be negative.
33	what was the definition for resistors again?	a resistor is something that has this linear relationship between the voltage drop across it and the current through it
34	is it proportional to 1/R or exactly 1/R	It is exactly 1/R
35	less resistance = more current for less voltage?	Less R = more I for the *same* V
36	The screen switched quickly. What was the last line? "R -> ... -> Infinity ..."	
37	is the resistance of air super high or something?	Yes it is very high
38	what is the V for open circuit?	V can be anything
39	if current goes from positive volage to negative, shouldn't I on the right side be 0 in the diagram above, not left side...?	Each side the current should be 0
40	What does dual of a wire mean?	A wire has 0 voltage, any current. An open circuit has 0 current, any voltage
41	what happens if you use a 10V battery on a device that requires 20V	Typically the device will not work.
42	Would V element just be the value of the voltage? Like 5V?	Yes Vel = Vs
43	Do you always travel in the - side first?	Our labeling convention is current Iel flow from + to - of the Vel. We will cover this convention soon.
44	is Vs always positive?	For a source we will define the + and - terminals in the diagram, if Vs is negative it means the actual voltage direction is different from the + and - in the diagram
45	what happens if you use a 20V battery on a device that requires 10V	It really depends on the circuit. Often it will break, but sometimes it will work.

46	Wouldn’t we say that the current flows + to -? even though electrons flow the opposite	generally yes
47	Does current souce exist in real life ?	We have to build specialized lab machines to do it, but its possible.
48	what is an example of a current source?	There aren't many common examples. Mostly we have specialized lab equipment to do it for us.
49	What's an example of a current source?	There aren't many common examples. Mostly we have specialized lab equipment to do it for us.
50	what properties of the batteries determine its voltage?	Basically determined by the material and the chemical reaction inside.
51	is red positive or negative by convention?	Positive
52	What does the ground node graph look like?	The ground nodes doesn't have an IV relationship. It only defines a single node, so we don't have a voltage drop. We just call it "0V" by convention.
53	What is the difference between + and -?	'+ and - help us define the direction of the voltage
54	what does the box represents?	The box is an arbitrary circuit element, sometimes called a branch.
55	Wait so current now flows from negative to positive?	From positive to negative in the element
56	Like in the circuit not the battery	
57	How does passive sign convention work when the voltage is negative?	Convention still applies, since its only relative to the + and - terminals.
58	doesn't current move the other way around? from - to +?	yea, it exits - and goes towards the +. Thats what the passive sign convention says
59	What does the el subscript refer to? What makes I_el , V_el different from a generic I , V?	el stands for element
60	what is the defiition of node?	its like all the piece of the wire which have the same voltage.
61	Whats the difference between node and branch?	In short, nodes are the wires with the same voltage, branches are the elements between nodes. You can refer to the lecture notes for more details.
62	do we count ground as a branch?	No, ground is a node
63	how many branches would we say the previous example had?	The previous example had 5 branches, represented by the 5 boxes
64	Shouldn’t the definition of nodes and branches be switched? At least thats how it feels from the trees we learned in 61a	Nodes are where the connections all meet. Branches are connections between nodes. This actually does match the broader defintion of trees and graphs, but we won't get into that in this class.
65	is the definition of nodes and branches here the same as from graph theory or are they just called that?	They are pretty similar, but here we apply special laws and properties in circuits to them.
66	is there a definitive + or -? it seems that we can arbitrarily define the directions	For most elements, the + and - are arbitrary. We will develop some general principles to make it look nice though.
67	How is it looping in this case? Isn’t v1 going from negative to positive?	The loop is not dependent on the direction of the signs. A loop is based on a path through branches / circuit elements. The signs will define the direction we write the KVL equation.
68	is it V1 V2 V3 and not VVV	It should have been -V1 + V2 + V3 = 0
69	In KVL, is a ‘loop’ any closed path in the circuit? can we go through elements more than once (eg. back and forth) as long as we end up where we started?	Yes, any closed loop. No we cannot go through the same element twice.
70	Why must sum of KVL be 0?	If you start from one node, travel in a loop and go back to the starting point, you should go back to the same voltage.
71	how did I1 just go through the negative terminal of V1? i though it had to go from positive to negative?	This does get tricky. The loop does go through the - terminal of the resistors. But by PSC, the resistors current goes through the + terminal. So we say that the loop current i_loop is equal to -i_R1, the negative of the resistor current.
72	how come the voltage at branch 1 didn’t go by passive sign convention on the last slide?	This does get tricky. The loop does go through the - terminal of the resistors. But by PSC, the resistors current goes through the + terminal. So we say that the loop current i_loop is equal to -i_R1, the negative of the resistor current.
73	isnt Is wrong?	That's corret by the passive sign convention. Even thought that's a voltage source, we will still apply the passive sign convention.
74	how did we get I5 + I3 = o?	I meant 0
75	why is I3 + I5 = 0 again?	We have a node at that bottom right corner. so this satisfies KCL for that node.
76	don’t the current and voltage have to flow + to - terminals?	By passive sign convention, yes.
77	why is the I5 negative	This follows from our KCL equation at the node, I3 + I5 = 0
78	do the current going in and out of a battery be the same?	yes
79	how do you know the direction of the loop?	live answered
80	Whats the difference between KVL and KCL	