Advanced Exam Formulas

Advanced and Standard Licence Course Review Questions

Questions with the number in **black** are for Standard licence candidates.

Questions with the number in **black** and **red** are for Advanced licence candidates.

Standard Exam Formulas

<table>
<tr><th>No</th><th>Question</th><th>Answer</th></tr>
<tr><td>1</td><td>Describe how voltage is measured.</td><td></td></tr>
<tr><td>2</td><td>Describe how current is measured.</td><td></td></tr>
<tr><td>3</td><td>Complete the table
<table>
<tr><th>Voltage (E)</th><th>Current (I)</th><th>Resistance (R)</th></tr>
<tr><td>12 V</td><td>2 A</td><td></td></tr>
<tr><td>120 V</td><td></td><td>6 MΩ</td></tr>
<tr><td></td><td>500 mA</td><td>20 Ω</td></tr>
<tr><td>60 V</td><td></td><td>1 KΩ</td></tr>
<tr><td>90 V</td><td>3.3 A</td><td></td></tr>
<tr><td>24 V</td><td></td><td>6 MΩ</td></tr>
<tr><td>6 V</td><td>1000 A</td><td></td></tr>
<tr><td></td><td>3 mA</td><td>3 KΩ</td></tr>
</table></td><td></td></tr>
<tr><td>4</td><td>If doubling the voltage across a resistor doubles the current through the resistor, then
A. the resistor value decreased.
B. the resistor value did not change.
C. the resistor value incresed.
D. It is imposible to calculate.</td><td></td></tr>
<tr><td>5</td><td>If doubling the voltage across a resistor doubles the current through the resistor, then
A. the resistor value decreased.
B. the resistor value did not change.
C. the resistor value incresed.
D. It is imposible to calculate.</td><td></td></tr>
</table>

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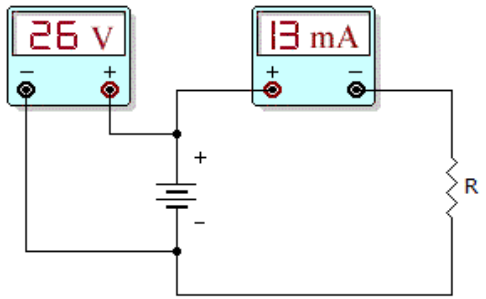
No	Question	Answer
6	If the voltage is increased five times across a fixed value of resistence, what does the current do**?** A. <u>The current increases by a factor of five.</u> B. The current decreases by a factor of five. C. Current stays the same. D. It is imposible to calculate	
7	 What is the resistor value in the given circuit? **IMPORTANT:** Observe the difference in measuring voltage and current. Voltage is measured across the terminals, but current is measured in the circuit	
8	If the voltage doubles across a fixed resistance A.The current is halved B. The resistance doubles C.The current is unchanged D.The current doubles	
9	Ohm's law describes the mathematical relationship between A. ohms, kilohms, and megohms B. resistor size and resistor value C. resistance, voltage, and current D. none of the above	
10	If current through a fixed resistance is halved A. the resistance is halved B. the voltage is halved C. the voltage doubles D. The current cannot change	

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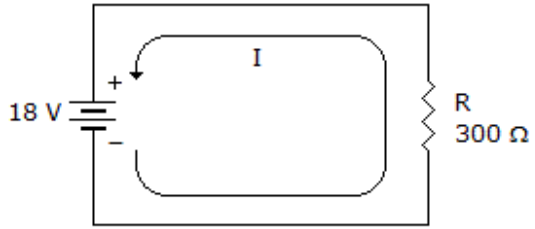
<table>
<tr><th>No</th><th>Question</th><th>Answer</th></tr>
<tr><td>11</td><td>If the voltage in the circuit to the right was cut in half, what would the current equal?
 
</td><td></td></tr>
<tr><td>12</td><td>Describe the difference between conventional current flow and electon flow.</td><td></td></tr>
<tr><td>13</td><td>Complete the table.
<table>
<tr><th>Voltage (E)</th><th>Current (I)</th><th>Resistance (R)</th><th>Power (W)</th></tr>
<tr><td>12 V</td><td>0.75 A</td><td></td><td></td></tr>
<tr><td></td><td>0.4 mA</td><td>110 Ω</td><td></td></tr>
<tr><td></td><td></td><td>10.75 Ω</td><td>60 W</td></tr>
<tr><td>12 kV</td><td></td><td>25 Ω</td><td></td></tr>
<tr><td>2 V</td><td>75 mA</td><td></td><td></td></tr>
<tr><td></td><td>3 A</td><td>1 MΩ</td><td></td></tr>
</table></td><td></td></tr>
<tr><td>14</td><td>What happens to the power level When the voltage, across a fixed load, doubles?
A. the power value increased by 2.
B. the lights go out.
C. the power value increased by 4
D. It is imposible to calculate</td><td></td></tr>
<tr><td>15</td><td>You accidently replace a 15 W bulb with a 5 W bulb in your car. The voltage remains at 12V. What was the current drain originally and after you replaced the bulb?
A. The current increases by a factor of three.
B. The current decreases by a factor of three.
C. Current stays the same.
D. The bulb Will destruct</td><td></td></tr>
</table>

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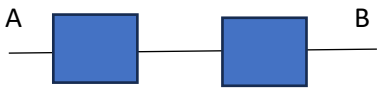
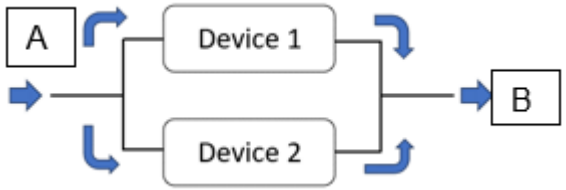
<table>
<tr><th>No</th><th>Question</th><th>Answer</th></tr>
<tr><td>16</td><td>If the energy of 120 joules is applied and this moves 6 coulombs, What is the required voltage?</td><td></td></tr>
<tr><td>17</td><td>If device 1 and 2 are 10 V batteries, What is the potential difference between A and B?
 
</td><td></td></tr>
<tr><td>18</td><td>If device 1 and 2 above are 10 V batteries, What is the potential difference between A and B?
 
</td><td></td></tr>
<tr><td>19</td><td>Complete the following table and indicate the formula you used to get the answer.
<table>
<tr><th>Unit</th><th>Unit</th><th>Answer</th></tr>
<tr><td>12 V</td><td>10 J</td><td></td></tr>
<tr><td>5 A</td><td>20 Q</td><td></td></tr>
<tr><td>5 kJ</td><td>20 seconds</td><td></td></tr>
<tr><td>100 V</td><td>6 Q</td><td></td></tr>
</table></td><td></td></tr>
</table>

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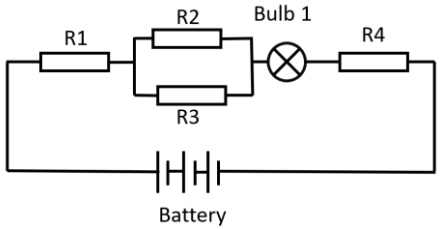
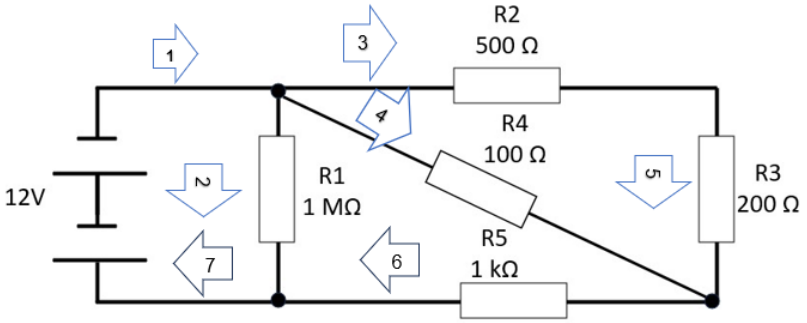
<table>
<tr><th>No</th><th>Question</th><th>Answer</th></tr>
<tr><td>20</td><td>


Complete the table assuming the following values.
<table>
<tr><th>Battery</th><th>Current</th><th>R1</th><th>R2</th><th>R3</th><th>Bulb</th><th>R4</th></tr>
<tr><td>90v</td><td>3A</td><td>4Ω</td><td>40Ω</td><td>40Ω</td><td></td><td>4Ω</td></tr>
<tr><td>12v</td><td></td><td>20 Ω</td><td>100 Ω</td><td>100 Ω</td><td>15 Ω</td><td>10 Ω</td></tr>
<tr><td>60v</td><td>60 mA</td><td>100 Ω</td><td></td><td></td><td>15 Ω</td><td>870 Ω</td></tr>
</table>
</td><td></td></tr>
<tr><td>21</td><td>


Hint: Redraw the equivalent circuit.
<table>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Find the currents for 1 to 7
</td><td></td></tr>
</table>

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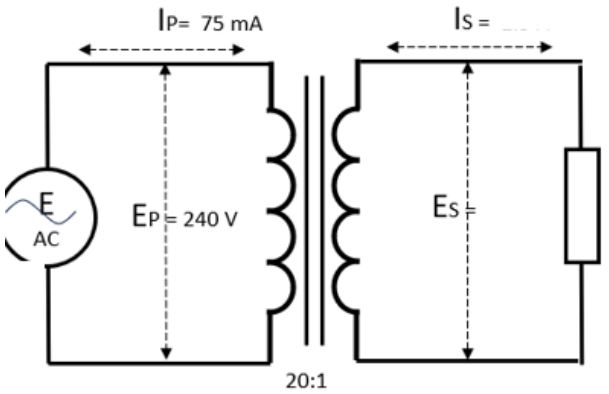
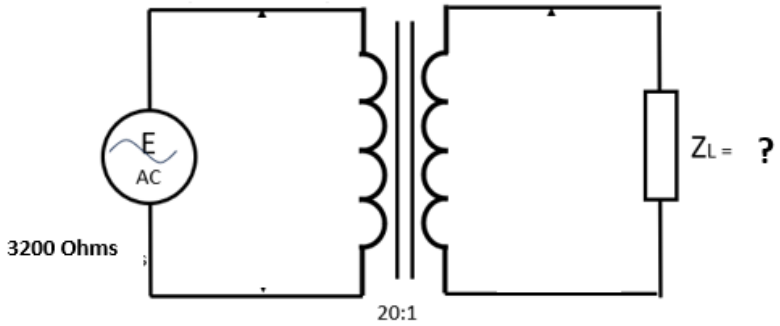
No	Question	Answer
22	 Calculate Is and Es.	
23	 What is ZL?	
24	What is the period of a signal at 144.0MHz?	
25	A tank circuit with an inductor of 15µH and a capacitor of 220nF will oscillate at what frequency?	
26	What is Peak Inverse Voltage (PIV)?	
27	What are the variables in designing a capacitor?	
28	<table><tr><th>C1</th><th>C2</th><th>C3</th><th>C Total</th></tr><tr><td>3 mF</td><td>10 mF</td><td>2 mF</td><td></td></tr><tr><td>6 pF</td><td>3 pF</td><td>1 pF</td><td></td></tr><tr><td>6 nF</td><td>12 nF</td><td>1 nF</td><td></td></tr></table>What is the total capacitance of these capacitors in series?	

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No	Question	Answer
29	<table><tr><th>C1</th><th>C2</th><th>C3</th><th>C Total</th></tr><tr><td>3 mF</td><td>10 mF</td><td>2 mF</td><td></td></tr><tr><td>6 pF</td><td>3 pF</td><td>1 pF</td><td></td></tr><tr><td>6 nF</td><td>12 nF</td><td>1 nF</td><td></td></tr></table> What is the total capacitance of these capacitors in parallel?	
30	Name and describe the four modulation methods used by amateur radio operators.	
31	<table><tr><th>L1</th><th>L2</th><th>L3</th><th>L Total</th></tr><tr><td>16 mH</td><td>15 mH</td><td>21 mH</td><td></td></tr><tr><td>16 pH</td><td>30 pH</td><td>0.1 pH</td><td></td></tr><tr><td>60 nH</td><td>12 nH</td><td>100 nH</td><td></td></tr></table> What is the total inductance of these inductors in parallel?	
32	<table><tr><th>L1</th><th>L2</th><th>L3</th><th>L Total</th></tr><tr><td>16 mH</td><td>15 mH</td><td>21 mH</td><td></td></tr><tr><td>16 pH</td><td>30 pH</td><td>0.1 pH</td><td></td></tr><tr><td>60 nH</td><td>12 nH</td><td>100 nH</td><td></td></tr></table> What is the total inductance of these inductors in series?	
33	What is a filter and why are they used?	
34	What is the reactance of a series tuned circuit at frequency?	
35	What is the inductive reactance (X_L) of a 0.3H inductor at 60Hz?	
36	What is the reactance of a parallel tuned circuit at frequency?	
37	What is the configuration and purpose of the filter shown?	

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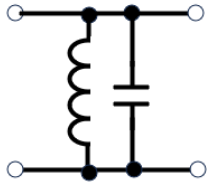
<table>
<tr><th>No</th><th>Question</th><th>Answer</th></tr>
<tr><td>38</td><td>What is the configuration and purpose of the filter shown?
  </td><td></td></tr>
<tr><td>39</td><td>Describe the four basic filter configurations.</td><td></td></tr>
<tr><td>40</td><td>Describe where the cutoff point is for a filter.</td><td></td></tr>
<tr><td>41</td><td>Why is it necessary to be cautious when handling equipment with valves?</td><td></td></tr>
<tr><td>42</td><td>What is the gain of a valve if the change in plate voltage is 50 V and the change in grid voltage is 2 V?</td><td></td></tr>
<tr><td>43</td><td>Write the dB formula to calculate power and voltage.</td><td></td></tr>
<tr><td>44</td><td>Complete the following decibel table. (Use the correct suffixes)
<table>
<tr><th>Input or Reference</th><th>Output</th><th>+- Decibels</th></tr>
<tr><td>dBµV</td><td>171 µV</td><td></td></tr>
<tr><td>12 V</td><td></td><td>- 6 dB</td></tr>
<tr><td>22 µV</td><td>22 mV</td><td></td></tr>
<tr><td></td><td>100 V</td><td>10dB</td></tr>
</table></td><td></td></tr>
<tr><td>45</td><td>Complete the following decibel table. (Use the correct suffixes)
<table>
<tr><th>Input or Reference</th><th>Output</th><th>+- Decibels</th></tr>
<tr><td>0.25 W</td><td>6 W</td><td></td></tr>
<tr><td>1.2 W</td><td></td><td>9.3 dB</td></tr>
<tr><td>dBW</td><td>12 W</td><td></td></tr>
<tr><td>dBm</td><td>171 mW</td><td></td></tr>
</table></td><td></td></tr>
<tr><td>46</td><td>Draw the following diagrams for either NPN or PNP transistors. Common emitter, common base and Common collector.</td><td></td></tr>
<tr><td>47</td><td>What are the characteristics of each configuration?</td><td></td></tr>
<tr><td>48</td><td>Describe the following classes (A, B, AB and C) of amplifiers.</td><td></td></tr>
<tr><td>49</td><td>What is the forward bias of a diode?</td><td></td></tr>
</table>

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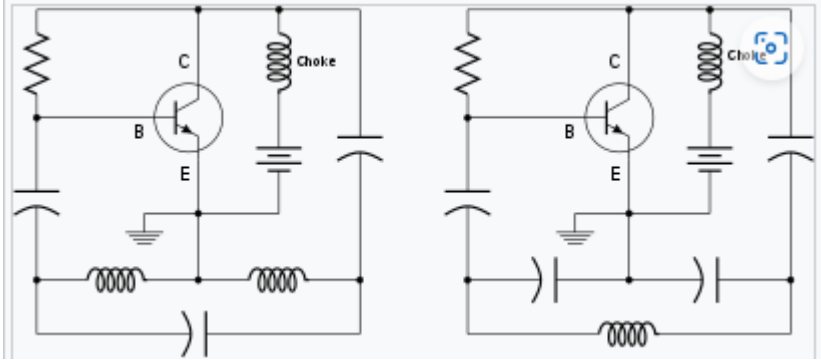
<table>
<tr><th>No</th><th>Question</th><th>Answer</th></tr>
<tr><td>50</td><td>Looking at the pin end of a three-pin plug, identify the terminals.
 </td><td></td></tr>
<tr><td>51</td><td>What is a power supply?</td><td></td></tr>
<tr><td>52</td><td>What is the difference in the output of a half wave rectifier compared to a full wave rectifier?</td><td></td></tr>
<tr><td>53</td><td>Draw the block diagram of a SMPS and name the parts.</td><td></td></tr>
<tr><td>54</td><td>Why is an RCD better than a fuse?</td><td></td></tr>
<tr><td>55</td><td>Complete the following table with regards to 230 V wiring.
<table>
<tr><th>Wire</th><th>Colour</th><th>Voltage to Ground</th></tr>
<tr><td>Active</td><td></td><td></td></tr>
<tr><td>Neutral</td><td></td><td></td></tr>
<tr><td>Earth</td><td></td><td></td></tr>
</table></td><td></td></tr>
<tr><td>56</td><td>What is the main oscillating component in a Pierce oscillator?</td><td></td></tr>
<tr><td>57</td><td>What was the first oscillator in use and why was it called a tickler oscillator?</td><td></td></tr>
<tr><td>58</td><td>What is a PLL?</td><td></td></tr>
<tr><td>59</td><td>Draw the block diagram of a PLL and name the parts.</td><td></td></tr>
<tr><td>60</td><td>Name the two oscillators below.
 
</td><td></td></tr>
<tr><td>61</td><td>What is a BFO?</td><td></td></tr>
<tr><td>62</td><td>What is a VCO?</td><td></td></tr>
<tr><td>63</td><td>What are the three criteria for a receiver? Explain each criterion.</td><td></td></tr>
<tr><td>64</td><td>What is Thermal Noise?</td><td></td></tr>
</table>

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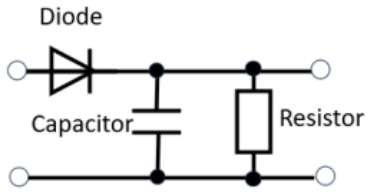
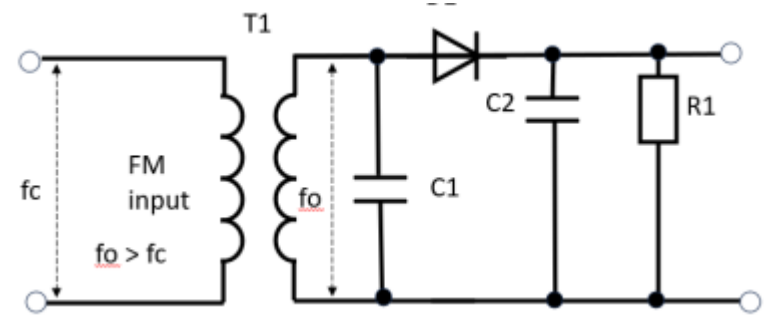
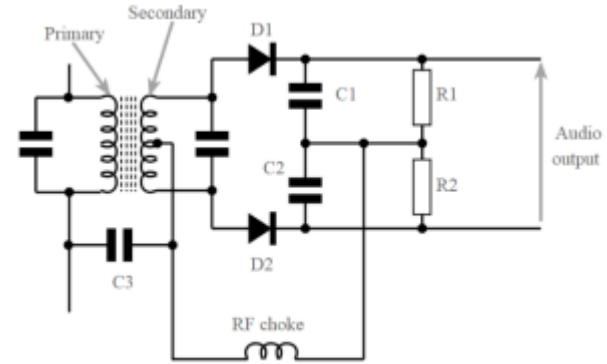
No	Question	Answer
65	What is this circuit and where is it used? 	
66	If the RF signal is fc and the oscillator frequency is fo, what are the two possible frequencies at the output of the mixer?	
67	What is an image frequency?	
68	What is the circuit below and where is it used? 	
69	Below is the circuit of a Foster Seeley discriminator. What is it used for? 	
70	What is an IF frequency and why is it used?	
71	Name the demodulators for AM, CW, FM and SSB.	

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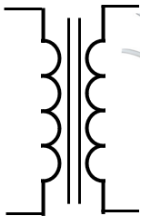
No	Question	Answer
72	What is the signal to noise ratio of a 50uV signal and the noise level of 1uV?	
73	What is an S meter and what level is required for S9?	
74	What is de-emphasis?	.
75	Draw and label a block diagram of an FM receiver.	
76	What is AGC and how does it work?	
77	Draw and label a block diagram of a simple AM transmitter.	
78	Draw an AM carrier wave modulated to 50%, 100% and 150%	
79	What is a balanced modulator and why is it used?	
80	Where would an amateur operator find the frequencies for amateur use?	
81	What does this symbol mean? 	
82	Where would an amateur operator find the modes of operation for each amateur frequency?	
83	What is the ALC?	
84	Calculate the ERP. Transmitter gain = 20dB Cable loss = -2dB Antenna gain = 5dB	
85	What duty cycle does RTTY transmission occupy?	
86	What bandwidth is occupied by a FM signal if a 2KHz tone deviates the carrier by 100KHz?	
87	What are key clicks and chirps?	
88	What is the inductive reactance (X_L) of a 0.1µH capacitor at 144MHz?	
89	What is the Q, for the capacitor above, if the resistance is 100Ohms?	
90	What is the bandwidth of this circuit above. XL of 904Ω and resistance of 100Ω?	

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No	Question	Answer
91	Describe how a dynamic speaker works.	
92	What are ZS, ZO and ZL with regard to transmission impedances?	
93	Name an unbalanced transmission line.	
94	How do you know if an antenna is balanced or unbalanced?	
95	What is a waveguide?	
96	Explain SWR?	
97	Measuring the signal on a transmission line, the maximum is 12V and the minimum is 2 V. What is the SWR?	
98	How do you test the continuity of a transmission line?	
99	From the previous test, you got results of 500 Ω Zo and 100 Ω. ZSc. What is the impedance of the line?	
100	How is a resistor rated?	
101	What is a balun?	
102	Connecting a balanced line of 450 Ω to an unbalanced line of 50 Ω. What is the turns ratio for the balun?	
103	What is frequency deviation?	
104	What is the role of an antenna?	
105	What are the three main groupings of antennas?	
106	What is an isotropic antenna?	
107	You are listening to a broadcast on 100MHz. The IF for your radio is 10MHz and the oscillator is running at 110MHz. What is the image frequency?	
108	What is the wavelength of a signal at 14.2MHz?	
109	Name five types of antennas?	
110	What causes receiver noise?	
111	What is the thermal noise level generated by a 1kΩ resistor at room temperature? Boltzmann's constant (k): 1.38×10^{-23} J/K Temperature (T): 290 K (standard room temperature, approx. 17°C) Resistance (R): 1000 Ω Bandwidth (B): 100 MHz (10^{8} H	
112	What are the three methods of polarisation in an antenna?	
113	What is the critical frequency?	
114	What is the maximum usable frequency?	

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No	Question	Answer
115	Why is the height of an antenna important for an amateur operator?	
116	Explain what a noise floor is?	
117	How do you measure current in a circuit?	
118	What is this symbol?	
119	What is a D to A?	
120	Polarisation of an antenna is related to voltage field or the magnetic field?	
121	Draw a sine wave for the Australian mains power of 23V at 50Hz. Include RMS, Average, peak, peak to peak and period values.	
122	What is the instantaneous voltage value at 50 degrees for the Australian mains power?	
123	What is a capacitance hat on an antenna?	
124	Explain duty cycle in a waveform.	
125	If an antenna undertest resonates at a higher frequency than expected, is the antenna to short or too long?	
126	What is an A to D?	
127	What is the equipment that replaces fuses on mains power and how do they work?	
128	What is the angle of incidence for a radio wave?	
129	Bending radio waves over geometric objects is called……..?	
130	What is a signal to noise ratio?	
131	What ionospheric layer is responsible for most skywave propagation?	
132	What is skip distance and skip zone?	
133	Why is the input impedance of a multimeter important?	
134	List two operator errors the user should consider when making a measurement.	
135	In digital signalling, what do the terms NRZ and RZ mean?	

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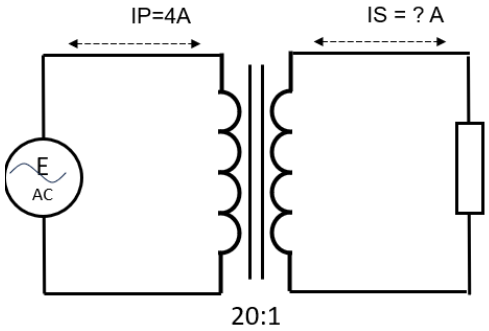
No	Question	Answer
136	What are the two golden rules when using Op amps?	
137	 What is this symbol?	
138	What is an open and closed loop amplifier?	
139	What is Common Mode rejection in Op Amps?	
140	What is EMI?	
141	On which lead of a battery, would the isolation switch be included and why?	
142	Does the power in the carrier of an FM modulated signal remain constant or change with the degree of modulation?	
143	Why does an Op amp have a + Vin and a -Vin?	
144	What is the purpose of having an earth pin on the plug?	
145	How does a fuse work?	
146	What is a discriminator and a detector used for?	
147	An inductor and capacitor each have 250 Ohms of reactance at 1kHz. If they are connected in series, what is their total reactance at 1kHz?	
148	What is EMC?	
149	An inductor and capacitor each have 250 Ohms of reactance at 1kHz. If they are connected in parallel, what is their total reactance at 1kHz?	
150	What is Is? 	

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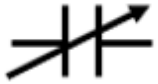
No	Question	Answer
151	What is this symbol? 	

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