# QUIZ 6

* Which of the following is true for an NPN BJT operating in the forward-active region ?

1. **All of these**
2. The base current consists primarily of holes injected from the base into the emitter
3. Some base current flows to replace holes which are lost as electrons diffusing across the base recombine
4. The emitter current consists primarily of electrons injected from the emitter into the base
5. The collector current consists primarily of electrons injected from the emitter into the base

* Which of the following is true for an NPN BJT operating in the forward-active region ?

1. None of these
2. The collector current consists primarily of electrons injected from the collector into the base
3. The base current consists primarily of electrons injected from the emitter into the base
4. Some base current flows to replace electrons which are lost as holes diffusing across the base recombine
5. **The emitter current consists primarily of electrons injected from the emitter into the base**

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2. The emitter current consists primarily of holes injected from the base into the emitter
3. **Some base current flows to replace holes which are lost as electrons diffusing across the base recombine**
4. None of these
5. The collector current consists primarily of electrons injected from the collector into the base

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3. The collector current consists primarily of electrons injected from the collector into the base
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3. The emitter current consists primarily of holes injected from the base into the emitter
4. The base current consists primarily of electrons injected from the emitter into the base
5. All of these

* Which of the following is true for an NPN BJT operating in the forward-active region ?

1. The collector current consists primarily of electrons injected from the collector into the base
2. The emitter current consists primarily of holes injected from the base into the emitter
3. The base current consists primarily of electrons injected from the emitter into the base
4. **None of these**
5. Some base current flows to replace electrons which are lost as holes diffusing across the base recombine

* A PNP BJT with Vbe > 0 and Vbc < 0 is operating in cutoff.

**FALSE**

* A BJT with it’s base-emitter junction reverse biased and it’s base-collector junction reverse biased is in :

1. **Cutoff**
2. Reverse-Active
3. Forward-Active
4. Saturation
5. None of these

* The small slope in the Ic versus Vce curves for a BJT in the forward-active region is caused by the “base-width modulation” effect.

**TRUE**

* For a BJT operating in saturation, which of the following is true?

1. The base-collector junction can be forward biased by about 400mV before the collector current starts to decrease
2. The common-emitter current gain, β , is much smaller than in the forward-active region
3. The collector current stays nearly constant as the base current is increased
4. The output resistance, ro , is much smaller than in the forward-active region
5. **All of these**

* For a BJT operating in saturation, which of the following is true?

1. The common-emitter current gain, β , is much larger than in the forward-active region
2. The collector current increases linearly as the base current is increased
3. All of these
4. The output resistance, ro , is much larger than in the forward-active region
5. **The base-collector junction can be forward biased by about 400mV before the collector current starts to decrease**

* For a BJT operating in saturation, which of the following is true?

1. **The collector current stays nearly constant as the base current is increased**
2. The common-emitter current gain, β , is much larger than in the forward-active region
3. The output resistance, ro , is much larger than in the forward-active region
4. The base-collector junction can be forward biased by about 200mV before the collector current starts to decrease
5. None of these

* For a BJT operating in saturation, which of the following is true?

1. The collector current increases linearly as the base current is increased
2. **The output resistance, ro , is much smaller than in the forward-active region**
3. The common-emitter current gain, β , is much larger than in the forward-active region
4. All of these
5. The base-collector junction can be forward biased by about 200mV before the collector current starts to decrease

* For a BJT operating in saturation, which of the following is true?

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2. The common-emitter current gain, β , is much larger than in the forward-active region
3. The output resistance, ro , is much larger than in the forward-active region
4. The collector current increases linearly as the base current is increased
5. **None of these**

* The base-emitter and base-collector junctions in a BJT must be very close to each other to obtain good performance.

**TRUE**

* For a PNP BJT operating in the reverse-active region, which of the following is true?

1. Current flows into the emitter and out of the collector
2. **Current flows out of the emitter and into the collector**
3. Current flows into the emitter and into the collector
4. Current flows out of the emitter and out of the collector
5. None of these

* The Ebers-Moll equations can be used to calculate the currents flowing in a BJT, but only in some regions of operation.

**FALSE**

* An PNP BJT operating in the saturation region has :

1. **Vbe < 0 and Vbc < 0**
2. Vbe < 0 and Vbc > 0
3. Vbe > 0 and Vbc < 0
4. Vbe > 0 and Vbc > 0
5. None of these

* The Ebers-Moll equations can be used to calculate the currents flowing in a BJT in all regions of operation.

**TRUE**

* An PNP BJT operating in the cutoff region has :

1. **Vbe > 0 and Vbc > 0**
2. None of these
3. Vbe < 0 and Vbc < 0
4. Vbe < 0 and Vbc > 0
5. Vbe > 0 and Vbc < 0

* In the forward-active region the collector current of an NPN BJT consists of electrons injected from the emitter into the base, which then diffuse across the base and are collected by the collector.

**TRUE**

* If an NPN BJT at 25°C with a constant collector current of 100μA has a Vbe voltage of 760mV, then what will Vbe be for this same BJT at 100°C ?

1. None of these
2. 820mV
3. 700mV
4. **610mV**
5. 910mV

* In the forward-active region the emitter current of an NPN BJT consists of electrons injected from the emitter into the base and holes injected from the base into the emitter.

**TRUE**

* An NPN BJT operating in the forward-active region has :

1. Vbe > 0 and Vbc > 0
2. **Vbe > 0 and Vbc < 0**
3. None of these
4. Vbe < 0 and Vbc > 0
5. Vbe < 0 and Vbc < 0

* A PNP BJT with Vbe < 0 and Vbc > 0 is operating in the forward-active region.

**TRUE**

* For a PNP BJT operating in the forward-active region, which of the following is true?

1. **Current flows into the emitter and out of the collector**
2. Current flows out of the emitter and out of the collector
3. Current flows out of the emitter and into the collector
4. Current flows into the emitter and into the collector
5. None of these

* In saturation the current gain of a BJT is lower, and is often referred to as the “forced beta”.

**TRUE**

* Which of the following is true for a PNP BJT ?

1. The base current consists of mostly electrons
2. **All of these**
3. Current flows primarily because of holes injected into the base
4. Current flows when either Vbe or Vbc are negative voltages
5. An N-type base is sandwiched between a P-type emitter and a P-type collector

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* Which of the following is true for a PNP BJT ?

1. Current flows when either Vbe or Vbc are positive voltages
2. Current flows primarily because of electrons injected into the base
3. **The base current consists of mostly electrons**
4. A P-type base is sandwiched between an N-type emitter and an N-type collector
5. None of these

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5. **An N-type base is sandwiched between a P-type emitter and a P-type collector**

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3. A P-type base is sandwiched between an N-type emitter and an N-type collector
4. Current flows when either Vbe or Vbc are positive voltages
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* Which of the following is true for a PNP BJT ?

1. The base current consists of mostly holes
2. A P-type base is sandwiched between an N-type emitter and an N-type collector
3. **None of these**
4. Current flows primarily because of electrons injected into the base
5. Current flows when either Vbe or Vbc are positive voltages

* To keep the base current small for an NPN BJT in the forward-active region, the doping in the base must be much smaller than the doping in the emitter in order to minimize the number of holes injected from the base into the emitter.

**TRUE**

* If the base-emitter junction of a BJT is forward biased and the base-collector junction is forward biased, then the BJT is operating in the saturation region of operation.

**TRUE**

* Which of the following is true for an NPN BJT ?

1. **All of these**
2. Current flows when either Vbe or Vbc are positive voltages
3. The base current consists of mostly holes
4. Current flows primarily because of electrons injected into the base
5. A P-type base is sandwiched between an N-type emitter and an N-type collector

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3. All of these
4. **The base current consists of mostly holes**
5. Current flows primarily because of holes injected into the base

* Which of the following is true for an NPN BJT ?

1. **Current flows primarily because of electrons injected into the base**
2. Current flows when either Vbe or Vbc are negative voltages
3. All of these
4. An N-type base is sandwiched between a P-type emitter and a P-type collector
5. The base current consists of mostly electrons

* Which of the following is true for an NPN BJT ?

1. **A P-type base is sandwiched between an N-type emitter and an N-type collector**
2. None of these
3. The base current consists of mostly electrons
4. Current flows primarily because of holes injected into the base
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* Which of the following is true for an NPN BJT ?

1. The base current consists of mostly electrons
2. An N-type base is sandwiched between a P-type emitter and a P-type collector
3. **None of these**
4. Current flows when either Vbe or Vbc are negative voltages
5. Current flows primarily because of holes injected into the base

* To keep the base current small for a BJT in the forward-active region, the base must be wide to minimize recombination in the base, and the doping in the emitter must be much smaller than the doping in the base to minimize the number of carriers injected from the base into the emitter.

**FALSE**

* Which of the following is true for a PNP BJT operating in the forward-active region ?

1. The base current consists primarily of electrons injected from the base into the emitter
2. Some base current flows to replace electrons which are lost as holes diffusing across the base recombine
3. The emitter current consists primarily of holes injected from the emitter into the base
4. **All of these**
5. The collector current consists primarily of holes injected from the emitter into the base

* Which of the following is true for a PNP BJT operating in the forward-active region ?

1. **Some base current flows to replace electrons which are lost as holes diffusing across the base recombine**
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1. The collector current consists primarily of holes injected from the collector into the base
2. All of these
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4. **The emitter current consists primarily of holes injected from the emitter into the base**
5. The base current consists primarily of holes injected from the emitter into the base

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4. The emitter current consists primarily of electrons injected from the base into the emitter
5. None of these

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1. The collector current consists primarily of holes injected from the collector into the base
2. Some base current flows to replace holes which are lost as electrons diffusing across the base recombine
3. The base current consists primarily of holes injected from the emitter into the base
4. **None of these**
5. The emitter current consists primarily of electrons injected from the base into the emitter

* If the base-emitter or base-collector junctions in a BJT are reverse biased by too high of a voltage, these PN junctions will break down and current will flow just like any other PN junction.

**TRUE**

* Which of the following is true in modern bipolar junction transistors?

1. The minority carrier concentration in the base decreases almost linearly from the emitter to the collector
2. The base is kept narrow to minimize recombination in the base
3. **All of these**
4. The emitter doping is much higher than the base doping to minimize the number of carriers injected from the base into the emitter
5. Carriers diffuse across the base and are collected by the collector

* Which of the following is true in modern bipolar junction transistors?

1. **The emitter doping is much higher than the base doping to minimize the number of carriers injected from the base into the emitter**
2. The minority carrier concentration in the base decreases exponentially from the emitter to the collector
3. All of these
4. The base is kept wide to minimize recombination in the base
5. Carriers diffuse across the base and are collected by the emitter

* Which of the following is true in modern bipolar junction transistors?

1. Carriers diffuse across the base and are collected by the emitter
2. None of these
3. The minority carrier concentration in the base decreases exponentially from the emitter to the collector
4. The base doping is much higher than the emitter doping to minimize the number of carriers injected from the base into the emitter
5. **The base is kept narrow to minimize recombination in the base**

* Which of the following is true in modern bipolar junction transistors?

1. The base doping is much higher than the emitter doping to minimize the number of carriers injected from the base into the emitter
2. **Carriers diffuse across the base and are collected by the collector**
3. None of these
4. The base is kept wide to minimize recombination in the base
5. The minority carrier concentration in the base decreases exponentially from the emitter to the collector

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3. **None of these**
4. The base is kept wide to minimize recombination in the base
5. The minority carrier concentration in the base decreases exponentially from the emitter to the collector

* A BJT with it’s base-emitter junction forward biased and it’s base-collector junction forward biased is in :

1. **Saturation**
2. Cutoff
3. Reverse-Active
4. Forward-Active
5. None of these

* As the reverse bias across the base-collector junction in a BJT increases, the width of the base increases which causes the collector current to increase.

**FALSE**

* For an NPN BJT operating in the reverse-active region, which of the following is true?

1. Current flows into the collector and into the emitter
2. None of these
3. **Current flows out of the collector and into the emitter**
4. Current flows out of the collector and out of the emitter
5. Current flows into the collector and out of the emitter

* A PNP BJT with Vbe < 0 and Vbc < 0 is operating in the forward-active region.

**FALSE**

* An NPN BJT with Vbe > 0 and Vbc < 0 is operating in saturation.

**FALSE**

* The arrow on the emitter of a BJT symbol points in the direction that current flows when the transistor is in the forward-active region.

**TRUE**

* For a BJT operating in saturation, typically the base-collector junction must be forward biased by about 700mV before the current gain of the transistor starts to decrease.

**FALSE**

* A PNP BJT with Vbe < 0 and Vbc > 0 is operating in saturation.

**FALSE**

* In the forward-active region the collector current of an NPN BJT consists of holes injected from the emitter into the base, which then diffuse across the base and are collected by the collector.

**FALSE**

* Typically the base-collector junction in a BJT is more heavily doped, so it will break down at a lower reverse bias voltage (e.g., < 10V).

**FALSE**

* An NPN BJT with Vbe < 0 and Vbc > 0 is operating in the reverse-active region.

**TRUE**

* An NPN BJT with Vbe < 0 and Vbc < 0 is operating in cutoff.

**TRUE**

* As |Vce| increases for a BJT in the forward active region, “base-width modulation” causes :

1. The width of the base-collector depletion region to increase
2. **All of these**
3. The collector current for the BJT to increase
4. The output resistance, ro , to decrease
5. The width of the base to decrease

* As |Vce| increases for a BJT in the forward active region, “base-width modulation” causes :

1. The width of the base-collector depletion region to decrease
2. None of these
3. **The output resistance, ro , to decrease**
4. The collector current for the BJT to decrease
5. The width of the base to increase

* As |Vce| increases for a BJT in the forward active region, “base-width modulation” causes :

1. The output resistance, ro , to increase
2. The width of the base-collector depletion region to decrease
3. The width of the base to increase
4. All of these
5. **The collector current for the BJT to increase**

* As |Vce| increases for a BJT in the forward active region, “base-width modulation” causes :

1. None of these
2. **The width of the base-collector depletion region to increase**
3. The width of the base to increase
4. The collector current for the BJT to decrease
5. The output resistance, ro , to increase

* As |Vce| increases for a BJT in the forward active region, “base-width modulation” causes :

1. **The width of the base to decrease**
2. The output resistance, ro , to increase
3. The collector current for the BJT to decrease
4. The width of the base-collector depletion region to decrease
5. All of these

* As |Vce| increases for a BJT in the forward active region, “base-width modulation” causes :

1. The collector current for the BJT to decrease
2. The output resistance, ro , to increase
3. The width of the base-collector depletion region to decrease
4. **None of these**
5. The width of the base to increase

* An NPN BJT with Vbe > 0 and Vbc < 0 is operating in the forward-active region.

**TRUE**

* If an NPN BJT at 300°K with a constant collector current of 1mA has a Vbe voltage of 780mV, then what will Vbe be for this same BJT if the collector current is decreased to 100μA?

1. 780mV
2. 840mV
3. None of these
4. **720mV**
5. 660mV

* For bipolar transistors the “edge of saturation” is typically assumed to be when Vce drops to about 200mV.

**FALSE**

* If both the base-emitter and base-collector PN junctions are reverse biased, then the BJT operates in saturation.

**FALSE**

* In the forward-active region, current flows out of the base of an NPN BJT.

**FALSE**

* A PNP BJT with Vbe < 0 and Vbc < 0 is operating in saturation.

**TRUE**

* An NPN BJT with Vbe < 0 and Vbc > 0 is operating in cutoff.

**FALSE**

* An PNP BJT operating in the forward-active region has :

1. None of these
2. Vbe > 0 and Vbc > 0
3. Vbe < 0 and Vbc < 0
4. Vbe > 0 and Vbc < 0
5. **Vbe < 0 and Vbc > 0**

* In the forward-active region the emitter current of a PNP BJT consists of electrons injected from the emitter into the base and holes injected from the base into the emitter.

**FALSE**

* The “base-width modulation” effect in BJTs is caused by the widening of the depletion region surrounding the base-emitter junction as the forward bias across it increases with increasing Vbe.

**FALSE**

* If an NPN BJT at 75°C with a constant collector current of 100μA has a Vbe voltage of 770mV, then what will Vbe be for this same BJT at 50°C ?

1. 720mV
2. 620mV
3. **820mV**
4. None of these
5. 670mV

* A BJT can not be constructed by taking 2 discrete diodes and connecting them in series.

**TRUE**

* To keep the base current small for an NPN BJT in the forward-active region, the base must be narrow in order to minimize the number of electrons which recombine as they diffuse across the base.

**TRUE**

* In the forward-active region, current flows into the collector of an NPN BJT.

**TRUE**

* The forward-active region of operation for BJTs is the region most often used, except when building an amplifier.

**FALSE**

* An NPN BJT operating in the reverse-active region has :

1. **Vbe < 0 and Vbc > 0**
2. Vbe > 0 and Vbc > 0
3. None of these
4. Vbe > 0 and Vbc < 0
5. Vbe < 0 and Vbc < 0

* To forward bias the base-emitter junction in an PNP BJT requires applying a positive Vbe voltage.

**FALSE**

* PNP BJTs have a p-type base sandwiched between an n-type emitter and an n-type collector.

**FALSE**

* To keep the base current small for a PNP BJT in the forward-active region, the base must be narrow in order to minimize the number of holes which recombine as they diffuse across the base.

**TRUE**

* As the Vce for a BJT increases, the width of the base decreases which causes the collector current to increase.

**TRUE**

* For an NPN BJT operating in the forward-active region, which of the following is true?

1. Current flows into the collector and into the emitter
2. **Current flows into the collector and out of the emitter**
3. Current flows out of the collector and into the emitter
4. None of these
5. Current flows out of the collector and out of the emitter

* The arrow on the emitter of a BJT symbol points in the direction that current flows when the transistor is in the reverse-active region.

**FALSE**

* A BJT with 10x the emitter area of a smaller BJT will have 1/10 the collector current of the smaller BJT at the same bias voltage.

**FALSE**

* To keep the base current small for an NPN BJT in the forward-active region, the doping in the base must be much smaller than the doping in the emitter in order to minimize the number of electrons which recombine as they diffuse across the base.

**FALSE**

* The “base-width modulation” effect in BJTs is similar to “channel-length modulation” in MOSFETs, and designers cannot correct for either effect.

**FALSE**

* A plot of the collector current versus Vbe for a BJT looks the same as the I-V plot for a diode, since Ic is controlled by the voltage from collector to emitter.

**FALSE**

* If the base-emitter junction of a BJT is reverse biased and the base-collector junction is reverse biased, then the BJT is operating in the cutoff region of operation.

**TRUE**

* Just like any PN junction, the reverse bias leakage currents for a BJT will increase as temperature increases.

**TRUE**

* An NPN BJT operating in the cutoff region has :

1. Vbe > 0 and Vbc < 0
2. Vbe > 0 and Vbc > 0
3. **Vbe < 0 and Vbc < 0**
4. None of these
5. Vbe < 0 and Vbc > 0

* In the forward-active region, current flows out of the emitter of an NPN BJT.

**TRUE**

* On the circuit symbol used for a PNP, the arrow on the emitter points out of the BJT.

**FALSE**

* A BJT with it’s base-emitter junction reverse biased and it’s base-collector junction forward biased is in :

1. Forward-Active
2. None of these
3. **Reverse-Active**
4. Saturation
5. Cutoff

* The saturation region of operation for bipolar transistors is similar to the triode region of operation for MOSFETs.

**TRUE**

* For an NPN BJT operating in the cutoff region, which of the following is true?

1. Current flows into the collector and into the emitter
2. Current flows out of the collector and into the emitter
3. Current flows into the collector and out of the emitter
4. **None of these**
5. Current flows out of the collector and out of the emitter

* In the forward-active region, current flows into the base of a PNP BJT.

**FALSE**

* A BJT with it’s base-emitter junction forward biased and it’s base-collector junction reverse biased is in :

1. None of these
2. Cutoff
3. **Forward-Active**
4. Saturation
5. Reverse-Active

* To keep the base current small for a PNP BJT in the forward-active region, the doping in the emitter must be much smaller than the doping in the base in order to minimize the number of electrons injected from the base into the emitter.

**FALSE**

* If an NPN BJT at 300°K with a constant collector current of 10μA has a Vbe voltage of 620mV, then what will Vbe be for this same BJT if the collector current is increased to 1mA?

1. None of these
2. 680mV
3. **740mV**
4. 560mV
5. 800mV

* In the forward-active region, current flows out of the collector of a PNP BJT.

**TRUE**

* An PNP BJT operating in the reverse-active region has :

1. Vbe < 0 and Vbc < 0
2. Vbe > 0 and Vbc > 0
3. None of these
4. **Vbe > 0 and Vbc < 0**
5. Vbe < 0 and Vbc > 0

* If both the base-emitter and base-collector PN junctions are forward biased, then the BJT operates in saturation.

**TRUE**

* For a PNP BJT operating in the cutoff region, which of the following is true?

1. **None of these**
2. Current flows out of the emitter and out of the collector
3. Current flows into the emitter and into the collector
4. Current flows out of the emitter and into the collector
5. Current flows into the emitter and out of the collector

* If the base-emitter junction of a BJT is reverse biased and the base-collector junction is forward biased, then the BJT is operating in the forward-active region of operation.

**FALSE**

* If the base-emitter or base-collector junctions in a BJT are reverse biased by too high of a voltage, these PN junctions will shut down and zero current will flow.

**FALSE**

* For a BJT each PN junction can be either forward or reverse biased, which gives 2 possible regions of operation.

**FALSE**

* If two bipolar transistors have the same bias voltages, then the BJT with the larger emitter area will have a larger collector current.

**TRUE**

* As the base width of a BJT increases, the common-emitter current gain β of the transistor will decrease.

**TRUE**

* In the forward-active region the base current of a PNP BJT consists of holes injected from the base into the emitter and electrons which recombine in the base.

**FALSE**

* PNP BJTs have an n-type base sandwiched between a p-type emitter and a p-type collector.

**TRUE**

* An NPN BJT operating in the saturation region has :

1. **Vbe > 0 and Vbc > 0**
2. Vbe > 0 and Vbc < 0
3. Vbe < 0 and Vbc < 0
4. None of these
5. Vbe < 0 and Vbc > 0

* As temperature increases, the value of Vbe required to get the same collector current in a BJT drops by −2 mV/°C, the same as for a diode.

**TRUE**

* Typically the base-emitter junction in a BJT is more lightly doped, so it will break down at a higher reverse bias voltage (e.g., > 10V).

**FALSE**

* As the base width of a BJT increases, the common-emitter current gain β of the transistor will increase.

**FALSE**

* In the forward-active region, current flows out of the base of a PNP BJT.

**TRUE**

* In the forward-active region the emitter current of an NPN BJT consists of holes injected from the emitter into the base and electrons injected from the base into the emitter.

**FALSE**

* If the base-emitter junction of a BJT is reverse biased and the base-collector junction is forward biased, then the BJT is operating in the cutoff region of operation.

**FALSE**

* To keep the base current small for a PNP BJT in the forward-active region, the doping in the emitter must be much larger than the doping in the base in order to minimize the number of electrons injected from the base into the emitter.

**TRUE**

* The saturation current for a bipolar transistor is directly proportional to the area of the emitter.

**TRUE**

* To keep the base current small for a BJT in the forward-active region, the base must be narrow to minimize recombination in the base, and the doping in the emitter must be much larger than the doping in the base to minimize the number of carriers injected from the base into the emitter.

**TRUE**

* Typically the base-emitter junction in a BJT is more heavily doped, so it will break down at a lower reverse bias voltage (e.g., < 10V).

**TRUE**

* The currents which flow in a BJT are controlled by the bias voltages applied across the PN junctions.

**TRUE**

* A plot of the collector current versus Vbe for a BJT looks the same as the I-V plot for a diode, since Ic is controlled by the voltage across the base-emitter junction.

**TRUE**

* A simplified model for a bipolar transistor deep in saturation uses a battery of about 200mV between the collector and emitter.

**TRUE**

* To keep the base current small for an NPN BJT in the forward-active region, the base must be narrow in order to minimize the number of holes injected from the base into the emitter.

**FALSE**

* On the circuit symbol used for an NPN, the arrow on the emitter points out of the BJT.

**TRUE**

* On the circuit symbol used for a PNP, the arrow on the emitter points into the BJT.

**TRUE**

* For a BJT in saturation both the current gain and output resistance are much lower, so this is not a good region to operate in for amplifiers.

**TRUE**

* In the forward-active region, current flows out of the emitter of a PNP BJT.

**FALSE**

* To forward bias the base-emitter junction in an NPN BJT requires applying a negative Vbe voltage.

**FALSE**

* A BJT can be constructed by taking 2 discrete diodes and connecting them in series.

**FALSE**

* Current flows in a BJT due to the movement of electrons, but not holes.

**FALSE**

* A BJT with a smaller emitter area than a second BJT will require a higher Vbe voltage to conduct the same collector current as the second BJT.

**TRUE**

* An NPN BJT with Vbe > 0 and Vbc > 0 is operating in saturation.

**TRUE**

* A BJT with half the emitter area of another BJT will have half the collector current of the other BJT at the same bias voltage.

**TRUE**

* If the base-emitter junction of a BJT is reverse biased and the base-collector junction is forward biased, then the BJT is operating in the saturation region of operation.

**FALSE**

* A PNP BJT with Vbe < 0 and Vbc > 0 is operating in the reverse-active region.

**FALSE**

* If the base-emitter junction of a BJT is forward biased and the base-collector junction is reverse biased, then the BJT is operating in the reverse-active region of operation.

**FALSE**

* If the base-emitter junction of a BJT is reverse biased and the base-collector junction is forward biased, then the BJT is operating in the reverse-active region of operation.

**TRUE**

* In the forward-active region, current flows into the emitter of a PNP BJT.

**TRUE**

* The saturation region of operation for bipolar transistors is similar to the saturation region of operation for MOSFETs.

**FALSE**

* To achieve good performance the width of the base of a bipolar transistor must be kept very narrow.

**TRUE**

* NPN BJTs have a p-type base sandwiched between an n-type emitter and an n-type collector.

**TRUE**

* On the circuit symbol used for a BJT, the arrow on the emitter always points from the P-side of the junction to the N-side.

**TRUE**

* If two bipolar transistors have the same bias voltages, then the BJT with the larger emitter area will have a smaller collector current.

**FALSE**

* The “base-width modulation” effect in BJTs is caused by the widening of the depletion region surrounding the base-collector junction as the reverse bias across it increases with increasing Vce.

**TRUE**

* The saturation current for a bipolar transistor is inversely proportional to the area of the emitter.

**FALSE**

* For a BJT each PN junction can be either forward or reverse biased, which gives 4 possible regions of operation.

**TRUE**

* An NPN BJT with Vbe > 0 and Vbc < 0 is operating in the reverse-active region

**FALSE**

* To forward bias the base-emitter junction in an NPN BJT requires applying a positive Vbe voltage.

**TRUE**

* The small slope in the Ic versus Vce curves for a BJT in the saturation region is caused by the “base-width modulation” effect.

**FALSE**

* When the base-emitter and base-collector junctions in a BJT are reverse biased, small reverse saturation currents still flow just like any other PN junction.

**TRUE**

* In the forward-active region the emitter current of a PNP BJT consists of holes injected from the emitter into the base and electrons injected from the base into the emitter.

**TRUE**

* A BJT with half the emitter area of another BJT will have twice the collector current of the other BJT at the same bias voltage.

**FALSE**

* A BJT with a larger emitter area than a second BJT will require a higher Vbe voltage to conduct the same collector current as the second BJT.

**FALSE**

* As the base width of a BJT increases, the common-base current gain α of the transistor will decrease.

**TRUE**

* In the forward-active region, current flows into the base of an NPN BJT.

**TRUE**

* A simplified model for a bipolar transistor deep in saturation uses a battery of about 400mV between the collector and emitter.

**FALSE**

* The currents which flow in a BJT are controlled by the electric field between the collector and the emitter.

**FALSE**

* As temperature increases, the value of Vbe required to get the same collector current in a BJT increases by +2 mV/°C, the same as for a diode.

**FALSE**

* To keep the base current small for a PNP BJT in the forward-active region, the base must be narrow in order to minimize the number of electrons injected from the base into the emitter.

**FALSE**

* For bipolar transistors the “edge of saturation” is typically assumed to be when Vce drops to about 300mV.

**TRUE**

* On the circuit symbol used for a BJT, the arrow on the emitter always points from the N-side of the junction to the P-side.

**FALSE**

* The forward-active region of operation for BJTs is the region most often used to build amplifiers.

**TRUE**

* Typically the base-collector junction in a BJT is more lightly doped, so it will break down at a higher reverse bias voltage (e.g., > 10V).

**TRUE**

* The base-emitter and base-collector junctions in a BJT must be kept far apart in order to obtain good performance.

**FALSE**

* In the forward-active region the base current of an NPN BJT consists of electrons injected from the base into the emitter and holes which recombine in the base.

**FALSE**

* The forward-active region of operation for bipolar transistors is similar to the triode region of operation for MOSFETs.

**FALSE**

* A PNP BJT with Vbe > 0 and Vbc > 0 is operating in cutoff.

**TRUE**

* As the reverse bias across the base-collector junction in a BJT increases, the width of the base decreases which causes the collector current to increase.

**TRUE**

* As the base width of a BJT increases, the common-base current gain α of the transistor will increase.

**FALSE**

* Just like any PN junction, the reverse bias leakage currents for a BJT will decrease as temperature increases.

**FALSE**

* In the forward-active region, current flows into the collector of a PNP BJT.

**FALSE**

* If the base-emitter junction of a BJT is forward biased and the base-collector junction is reverse biased, then the BJT is operating in the forward-active region of operation.

**TRUE**

* Current flows in a BJT due to the movement of both holes and electrons.

**TRUE**

* To forward bias the base-emitter junction in an PNP BJT requires applying a negative Vbe voltage.

**TRUE**

* In the forward-active region the base current of a PNP BJT consists of electrons injected from the base into the emitter and holes which recombine in the base.

**TRUE**

* A PNP BJT with Vbe > 0 and Vbc < 0 is operating in the reverse-active region.

**TRUE**

* The forward-active region of operation for bipolar transistors is similar to the saturation region of operation for MOSFETs.

**TRUE**

* In saturation the current gain of a BJT is higher, and is often referred to as the “forced beta”.

**FALSE**

* As the Vce for a BJT increases, the width of the base decreases which causes the collector current to decrease.

**FALSE**

* For a BJT in saturation both the current gain and output resistance are much higher, so this is a good region to operate in for amplifiers.

**FALSE**

* In the forward-active region the collector current of an PNP BJT consists of electrons injected from the emitter into the base, which then diffuse across the base and are collected by the collector.

**FALSE**

* In the forward-active region the collector current of an PNP BJT consists of holes injected from the emitter into the base, which then diffuse across the base and are collected by the collector.

**TRUE**

* In the forward-active region the base current of an NPN BJT consists of holes injected from the base into the emitter and electrons which recombine in the base.

**TRUE**

* The “base-width modulation” effect in BJTs is similar to “channel-length modulation” in MOSFETs, except that designers can increase the channel length of an FET to reduce this effect, but cannot change the base-width of a BJT.

**TRUE**

* NPN BJTs have an n-type emitter sandwiched between a p-type base and an n-type collector.

**FALSE**

* In the forward-active region, current flows into the emitter of an NPN BJT.

**FALSE**

* When the base-emitter and base-collector junctions in a BJT are reverse biased, zero current will flow.

**FALSE**

* An NPN BJT with Vbe > 0 and Vbc > 0 is operating in the forward-active region.

**FALSE**

* A BJT with 10x the emitter area of a smaller BJT will have 10x the collector current of the smaller BJT at the same bias voltage.

**TRUE**

* For a BJT operating in saturation, typically the base-collector junction must be forward biased by about 400mV before the current gain of the transistor starts to decrease.

**TRUE**

* In the forward-active region, current flows out of the collector of an NPN BJT.

**FALSE**

* To achieve good performance the width of the base of a bipolar transistor must be kept very wide.

**FALSE**

# Quiz 7

* BJT amplifiers use DC bias circuits to keep the transistors “off” so they don’t waste power until the input signal changes.

**FALSE**

* MOSFET amplifiers use DC bias circuits to keep the transistors “on” so they can respond to small variations in the input signal.

**TRUE**

* BJT amplifiers use DC bias circuits to keep the transistors “on” so they can respond to small variations in the input signal.

**TRUE**

* On integrated circuits the DC biasing of BJTs is usually done using resistors and capacitors, since transistor current sources are too expensive.

**FALSE**

* On printed circuit boards the DC biasing of MOSFETs is usually done using transistor current sources, since large resistors and capacitors are too expensive.

**FALSE**

* On printed circuit boards the DC biasing of BJTs is usually done using resistors to set the DC voltage levels and currents, and capacitors to separate the DC levels between different circuits.

**TRUE**

* To get a stable bias point as the β of a BJT varies, it is a good idea to set the bias current flowing through the base bias resistors to the same value as the base current.

**FALSE**

* On integrated circuits the DC biasing of BJTs is usually done using transistor current sources since large resistors and capacitors are too expensive.

**TRUE**

* On printed circuit boards the DC biasing of BJTs is usually done using transistor current sources, since large resistors and capacitors are too expensive.

**FALSE**

* On integrated circuits the DC biasing of MOSFETs is usually done using transistor current sources since large resistors and capacitors are too expensive.

**TRUE**

* To get a stable bias point as the β of a BJT varies, it is a good idea to set the bias current flowing through the base bias resistors to at least 10x the base current.

**TRUE**

* For a BJT amplifier where the collector is used as the output, it is usually a good idea to bias the collector at the same voltage as the base in order to get a symmetric output voltage swing.

**FALSE**

* For a BJT amplifier where the collector is used as the output, it is usually a good idea to bias the collector voltage about halfway between the base bias voltage and the positive power supply in order to get a symmetric output voltage swing.

**TRUE**

* On printed circuit boards the DC biasing of MOSFETs is usually done using resistors to set the DC voltage levels and currents, and capacitors to separate the DC levels between different circuits.

**TRUE**

* On integrated circuits the DC biasing of MOSFETs is usually done using resistors and capacitors, since transistor current sources are too expensive.

**FALSE**

* MOSFET amplifiers use DC bias circuits to keep the transistors “off” so they don’t waste power until the input signal changes.

**FALSE**

# QUIZ 8

* When calculating the resistance looking into the drain of a MOSFET, a resistance in the source will increase ro by multiplying it by (1+gmRS).

**TRUE**

* When calculating the resistance looking into the drain of a MOSFET, a resistance in the source will decrease ro by dividing it by (1+gmRS).

**FALSE**

* For a MOS common-gate amplifier, which of the following is true ?

1. NMOS and PMOS FETs use the same circuit topologies
2. The output signal is measured at the drain
3. The gate is used by both the input and output ports
4. **All of these**
5. The input signal is applied to the source

* For a MOS common-gate amplifier, which of the following is true ?

1. The drain is used by both the input and output ports
2. NMOS and PMOS FETs use different circuit topologies
3. The output signal is measured at the gate
4. All of these
5. **The input signal is applied to the source**

* For a MOS common-gate amplifier, which of the following is true ?

1. None of these
2. The source is used by both the input and output ports
3. NMOS and PMOS FETs use different circuit topologies
4. **The output signal is measured at the drain**
5. The input signal is applied to the gate

* For a MOS common-gate amplifier, which of the following is true ?

1. The input signal is applied to the drain
2. The output signal is measured at the source
3. **The gate is used by both the input and output ports**
4. NMOS and PMOS FETs use different circuit topologies
5. All of these

* For a MOS common-gate amplifier, which of the following is true ?

1. The output signal is measured at the source
2. The input signal is applied to the gate
3. None of these
4. **NMOS and PMOS FETs use the same circuit topologies**
5. The drain is used by both the input and output ports

* For a MOS common-gate amplifier, which of the following is true ?

1. The output signal is measured at the source
2. **None of these**
3. The input signal is applied to the gate
4. The drain is used by both the input and output ports
5. NMOS and PMOS FETs use different circuit topologies

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////

* For a MOS common-gate amplifier, which of the following is true ?

1. **All of these**
2. The input resistance is typically low
3. The output resistance is typically high
4. The voltage gain is positive
5. The voltage gain is typically high

* For a MOS common-gate amplifier, which of the following is true ?

1. The voltage gain is typically low
2. The output resistance is typically low
3. The input resistance is typically high
4. **The voltage gain is positive**
5. None of these

* For a MOS common-gate amplifier, which of the following is true ?

1. **The output resistance is typically high**
2. The input resistance is typically high
3. None of these
4. The voltage gain is typically low
5. The voltage gain is negative

* For a MOS common-gate amplifier, which of the following is true ?

1. **The voltage gain is typically high**
2. All of these
3. The output resistance is typically low
4. The input resistance is typically high
5. The voltage gain is negative

* For a MOS common-gate amplifier, which of the following is true ?

1. **The input resistance is typically low**
2. The voltage gain is negative
3. The output resistance is typically low
4. All of these
5. The voltage gain is typically low

* For a MOS common-gate amplifier, which of the following is true ?

1. The output resistance is typically low
2. The voltage gain is typically low
3. The voltage gain is negative
4. The input resistance is typically high
5. **None of these**

* Ideally, the input resistance for a transresistance amplifier would be zero.

**TRUE**

* For a source-follower MOS amplifier, the input is applied to the source and the output is measured at the drain.

**False**

* For a MOS common-drain amplifier, which of the following is true ?

1. The input resistance is typically high
2. The output resistance is typically low
3. The voltage gain is typically low
4. The voltage gain is positive
5. **All of these**

* For a MOS common-drain amplifier, which of the following is true ?

1. None of these
2. The input resistance is typically low
3. **The voltage gain is typically low**
4. The voltage gain is negative
5. The output resistance is typically high

* For a MOS common-drain amplifier, which of the following is true ?

1. The voltage gain is typically high
2. The voltage gain is negative
3. The output resistance is typically high
4. **The input resistance is typically high**
5. None of these

* For a MOS common-drain amplifier, which of the following is true ?

1. All of these
2. The output resistance is typically high
3. The voltage gain is typically high
4. **The voltage gain is positive**
5. The input resistance is typically low

* For a MOS common-drain amplifier, which of the following is true ?

1. The voltage gain is typically high
2. The voltage gain is negative
3. **The output resistance is typically low**
4. The input resistance is typically low
5. All of these

* For a MOS common-drain amplifier, which of the following is true ?

1. The input resistance is typically low
2. **None of these**
3. The voltage gain is negative
4. The voltage gain is typically high
5. The output resistance is typically high

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////

* For a MOS common-drain amplifier, which of the following is true ?

1. The input signal is applied to the gate
2. The output signal is measured at the source
3. The drain is used by both the input and output ports
4. The same circuit topologies are used for both NMOS and PMOS FETs
5. **All of these**

* For a MOS common-drain amplifier, which of the following is true ?

1. The output signal is measured at the gate
2. **The drain is used by both the input and output ports**
3. Different circuit topologies are used for NMOS than for PMOS FETs
4. The input signal is applied to the source
5. None of these

* For a MOS common-drain amplifier, which of the following is true ?

1. Different circuit topologies are used for NMOS than for PMOS FETs
2. The gate is used by both the input and output ports
3. All of these
4. The input signal is applied to the drain
5. **The output signal is measured at the source**

* For a MOS common-drain amplifier, which of the following is true ?

1. All of these
2. **The same circuit topologies are used for both NMOS and PMOS FETs**
3. The gate is used by both the input and output ports
4. The input signal is applied to the source
5. The output signal is measured at the drain

* For a MOS common-drain amplifier, which of the following is true ?

1. The source is used by both the input and output ports
2. Different circuit topologies are used for NMOS than for PMOS FETs
3. **The input signal is applied to the gate**
4. None of these
5. The output signal is measured at the drain

* For a MOS common-drain amplifier, which of the following is true ?

1. **None of these**
2. The input signal is applied to the source
3. The gate is used by both the input and output ports
4. Different circuit topologies are used for NMOS than for PMOS FETs
5. The output signal is measured at the drain

* For a common-drain MOS amplifier, the input is applied to the gate and the output is measured at the drain.

**FALSE**

* The output resistance in a transconductance amplifier model is used to determine the signal lost due to the voltage division between the load resistance and the output resistance of the amplifier.

**FALSE**

* When calculating the resistance looking into the collector of a BJT, a resistance in the emitter will decrease ro by dividing it by (1+gmRE).

**FALSE**

* Transistor amplifier characteristics depend more on the circuit topology than on the type of device used.

**TRUE**

* The gain of a common-emitter BJT amplifier can be estimated by the ratio of the bias voltage across the base resistor to the bias voltage across the emitter resistor.

**FALSE**

* A common-base BJT amplifier and a common-emitter BJT amplifier which use the same transistors, bias currents, and resistor sizes will have the same gain except the common-emitter amplifier gain will be negative.

**TRUE**

* For a MOS common-source amplifier, which of the following is true ?

1. The voltage gain is typically high
2. The input resistance is typically high
3. **All of these**
4. The output resistance is typically high
5. The voltage gain is negative

* For a MOS common-source amplifier, which of the following is true ?

1. **The input resistance is typically high**
2. None of these
3. The output resistance is typically low
4. The voltage gain is typically low
5. The voltage gain is positive

* For a MOS common-source amplifier, which of the following is true ?

1. **The output resistance is typically high**
2. The input resistance is typically low
3. The voltage gain is typically low
4. All of these
5. The voltage gain is positive

* For a MOS common-source amplifier, which of the following is true ?

1. The voltage gain is positive
2. None of these
3. The output resistance is typically low
4. The input resistance is typically low
5. **The voltage gain is typically high**

* For a MOS common-source amplifier, which of the following is true ?

1. **The voltage gain is negative**
2. The voltage gain is typically low
3. The output resistance is typically low
4. All of these
5. The input resistance is typically low

* For a MOS common-source amplifier, which of the following is true ?

1. **None of these**
2. The voltage gain is typically low
3. The input resistance is typically low
4. The voltage gain is positive
5. The output resistance is typically low

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* For a MOS common-source amplifier, which of the following is true ?

1. The source is used by both the input and output ports
2. The output signal is measured at the drain
3. The same circuit topologies are used for both NMOS and PMOS FETs
4. **All of these**
5. The input signal is applied to the gate

* For a MOS common-source amplifier, which of the following is true ?

1. The output signal is measured at the gate
2. Different circuit topologies are used for NMOS than for PMOS FETs
3. None of these
4. The input signal is applied to the drain
5. **The source is used by both the input and output ports**

* For a MOS common-source amplifier, which of the following is true ?

1. The output signal is measured at the source
2. The drain is used by both the input and output ports
3. Different circuit topologies are used for NMOS than for PMOS FETs
4. **The input signal is applied to the gate**
5. None of these

* For a MOS common-source amplifier, which of the following is true ?

1. All of these
2. Different circuit topologies are used for NMOS than for PMOS FETs
3. **The output signal is measured at the drain**
4. The gate is used by both the input and output ports
5. The input signal is applied to the source

* For a MOS common-source amplifier, which of the following is true ?

1. The gate is used by both the input and output ports
2. The output signal is measured at the source
3. The input signal is applied to the drain
4. **None of these**
5. Different circuit topologies are used for NMOS than for PMOS FETs

* The input resistance for a common-emitter amplifier is the same as the input resistance for a common-base amplifier.

**FALSE**

* The input resistance for a common-source amplifier is the same as the input resistance for a common-drain amplifier.

**TRUE**

* For a BJT common-emitter amplifier, which of the following is true ?

1. The same circuit topologies are used for both NPNs and PNPs
2. **All of these**
3. The emitter is used by both the input and output ports
4. The output signal is measured at the collector
5. The input signal is applied to the base

* For a BJT common-emitter amplifier, which of the following is true ?

1. The output signal is measured at the base
2. **The emitter is used by both the input and output ports**
3. Different circuit topologies are used for NPNs than for PNPs
4. None of these
5. The input signal is applied to the collector

* For a BJT common-emitter amplifier, which of the following is true ?

1. The output signal is measured at the emitter
2. **The same circuit topologies are used for both NPNs and PNPs**
3. The input signal is applied to the collector
4. All of these
5. The base is used by both the input and output ports

* For a BJT common-emitter amplifier, which of the following is true ?

1. All of these
2. The base is used by both the input and output ports
3. The input signal is applied to the emitter
4. Different circuit topologies are used for NPNs than for PNPs
5. **The output signal is measured at the collector**

* For a BJT common-emitter amplifier, which of the following is true ?

1. The output signal is measured at the emitter
2. Different circuit topologies are used for NPNs than for PNPs
3. None of these
4. **The input signal is applied to the base**
5. The collector is used by both the input and output ports

* For a BJT common-emitter amplifier, which of the following is true ?

1. The output signal is measured at the emitter
2. The input signal is applied to the collector
3. **None of these**
4. The base is used by both the input and output ports
5. Different circuit topologies are used for NPNs than for PNPs

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////

* For a BJT common-emitter amplifier, which of the following is true ?

1. **All of these**
2. The output resistance is typically high
3. The voltage gain is typically high
4. The input resistance is typically high
5. The voltage gain is negative

* For a BJT common-emitter amplifier, which of the following is true ?

1. All of these
2. The input resistance is typically low
3. The voltage gain is typically low
4. The voltage gain is positive
5. **The output resistance is typically high**

* For a BJT common-emitter amplifier, which of the following is true ?

1. The output resistance is typically low
2. The voltage gain is typically low
3. **The input resistance is typically high**
4. None of these
5. The voltage gain is positive

* For a BJT common-emitter amplifier, which of the following is true ?

1. **The voltage gain is negative**
2. All of these
3. The voltage gain is typically low
4. The input resistance is typically low
5. The output resistance is typically low

* For a BJT common-emitter amplifier, which of the following is true ?

1. None of these
2. **The voltage gain is typically high**
3. The input resistance is typically low
4. The voltage gain is positive
5. The output resistance is typically low

* For a BJT common-emitter amplifier, which of the following is true ?

1. The output resistance is typically low
2. The voltage gain is positive
3. **None of these**
4. The voltage gain is typically low
5. The input resistance is typically low

* For a common-gate MOS amplifier, the input is applied to the gate and the output is measured at the drain.

**FALSE**

* The input resistance in a transresistance amplifier model is used to determine the signal lost due to the voltage division between the source resistance and the input resistance of the amplifier.

**FALSE**

* Transresistance amplifiers need to have low input resistance and high output resistance.

**FALSE**

* A common-base BJT amplifier and a common-emitter BJT amplifier which use the same transistors, bias currents, and resistor sizes will have the same gain except the common-base amplifier gain will be negative.

**FALSE**

* When finding the resistance “looking into” a node, all independent current sources should be replaced with open circuits.

**TRUE**

* The collector of a BJT makes a poor input.

**TRUE**

* For a BJT emitter-follower amplifier, which of the following is true ?

1. NPNs and PNPs use the same circuit topologies
2. The input signal is applied to the base
3. The collector is used by both the input and output ports
4. **All of these**
5. The output signal is measured at the emitter

* For a BJT emitter-follower amplifier, which of the following is true ?

1. The output signal is measured at the base
2. NPNs and PNPs use different circuit topologies
3. The input signal is applied to the emitter
4. All of these
5. **The collector is used by both the input and output ports**

* For a BJT emitter-follower amplifier, which of the following is true ?

1. The output signal is measured at the collector
2. The emitter is used by both the input and output ports
3. NPNs and PNPs use different circuit topologies
4. All of these
5. **The input signal is applied to the base**

* For a BJT emitter-follower amplifier, which of the following is true ?

1. The base is used by both the input and output ports
2. The input signal is applied to the emitter
3. None of these
4. The output signal is measured at the collector
5. **NPNs and PNPs use the same circuit topologies**

* For a BJT emitter-follower amplifier, which of the following is true ?

1. NPNs and PNPs use different circuit topologies
2. The base is used by both the input and output ports
3. **The output signal is measured at the emitter**
4. None of these
5. The input signal is applied to the collector

* For a BJT emitter-follower amplifier, which of the following is true ?

1. The base is used by both the input and output ports
2. **None of these**
3. The input signal is applied to the emitter
4. NPNs and PNPs use different circuit topologies
5. The output signal is measured at the collector

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* For a BJT emitter-follower amplifier, which of the following is true ?

1. The input resistance is typically high
2. **All of these**
3. The voltage gain is positive
4. The voltage gain is typically low
5. The output resistance is typically low

* For a BJT emitter-follower amplifier, which of the following is true ?

1. The output resistance is typically high
2. **The voltage gain is positive**
3. None of these
4. The input resistance is typically low
5. The voltage gain is typically high

* For a BJT emitter-follower amplifier, which of the following is true ?

1. The voltage gain is typically high
2. The voltage gain is negative
3. **The output resistance is typically low**
4. None of these
5. The input resistance is typically low

* For a BJT emitter-follower amplifier, which of the following is true ?

1. The voltage gain is negative
2. The output resistance is typically high
3. All of these
4. The voltage gain is typically high
5. **The input resistance is typically high**

* For a BJT emitter-follower amplifier, which of the following is true ?

1. **The voltage gain is typically low**
2. The input resistance is typically low
3. The voltage gain is negative
4. All of these
5. The output resistance is typically high

* For a BJT emitter-follower amplifier, which of the following is true ?

1. The input resistance is typically low
2. The voltage gain is typically high
3. The output resistance is typically high
4. The voltage gain is negative
5. **None of these**

* Voltage amplifiers need to have high input resistance and low output resistance.

**TRUE**

* The output resistance in a transconductance amplifier model is used to determine the signal lost due to the current division between the load resistance and the output resistance of the amplifier.

**TRUE**

* For a BJT common-base amplifier, which of the following is true ?

1. The output resistance is typically high
2. The voltage gain is typically high
3. The input resistance is typically low
4. **All of these**
5. The voltage gain is positive

* For a BJT common-base amplifier, which of the following is true ?

1. None of these
2. **The voltage gain is positive**
3. The voltage gain is typically low
4. The input resistance is typically high
5. The output resistance is typically low

* For a BJT common-base amplifier, which of the following is true ?

1. The voltage gain is negative
2. **The voltage gain is typically high**
3. The output resistance is typically low
4. All of these
5. The input resistance is typically high

* For a BJT common-base amplifier, which of the following is true ?

1. **The input resistance is typically low**
2. The voltage gain is typically low
3. The output resistance is typically low
4. The voltage gain is negative
5. All of these

* For a BJT common-base amplifier, which of the following is true ?

1. The voltage gain is typically low
2. **The output resistance is typically high**
3. The voltage gain is negative
4. The input resistance is typically high
5. None of these

* For a BJT common-base amplifier, which of the following is true ?

1. The output resistance is typically low
2. The voltage gain is typically low
3. The voltage gain is negative
4. **None of these**
5. The input resistance is typically high

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* For a BJT common-base amplifier, which of the following is true ?

1. **All of these**
2. The input signal is applied to the emitter
3. NPNs and PNPs use the same circuit topologies
4. The output signal is measured at the collector
5. The base is used by both the input and output ports

* For a BJT common-base amplifier, which of the following is true ?

1. The collector is used by both the input and output ports
2. The input signal is applied to the base
3. The output signal is measured at the emitter
4. None of these
5. **NPNs and PNPs use the same circuit topologies**

* For a BJT common-base amplifier, which of the following is true ?

1. NPNs and PNPs use different circuit topologies
2. The output signal is measured at the emitter
3. All of these
4. **The base is used by both the input and output ports**
5. The input signal is applied to the collector

* For a BJT common-base amplifier, which of the following is true ?

1. **The input signal is applied to the emitter**
2. NPNs and PNPs use different circuit topologies
3. All of these
4. The collector is used by both the input and output ports
5. The output signal is measured at the base

* For a BJT common-base amplifier, which of the following is true ?

1. NPNs and PNPs use different circuit topologies
2. None of these
3. **The output signal is measured at the collector**
4. The input signal is applied to the base
5. The emitter is used by both the input and output ports

* For a BJT common-base amplifier, which of the following is true ?

1. The output signal is measured at the emitter
2. NPNs and PNPs use different circuit topologies
3. The collector is used by both the input and output ports
4. **None of these**
5. The input signal is applied to the base

* Current amplifiers need to have low input resistance and high output resistance.

**TRUE**

* For a common-gate MOS amplifier, the input is applied to the source and the output is measured at the drain.

**TRUE**

* The base resistance in the BJT hybrid-pi model, rπ , increases as the collector current increases.

**FALSE**

* The resistance looking into the gate of a MOSFET is typically high.

**TRUE**

* BJT common-collector and MOSFET common-drain amplifiers are very similar.

**TRUE**

* The gain of a common-source MOSFET amplifier can be estimated by the ratio of the source resistor to the gate resistor.

**FALSE**

* For a MOS source-follower amplifier, which of the following is true ?

1. The voltage gain is typically low
2. **All of these**
3. The output resistance is typically low
4. The voltage gain is positive
5. The input resistance is typically high

* For a MOS source-follower amplifier, which of the following is true ?

1. The input resistance is typically low
2. All of these
3. The output resistance is typically high
4. The voltage gain is negative
5. **The voltage gain is typically low**

* For a MOS source-follower amplifier, which of the following is true ?

1. The input resistance is typically low
2. The voltage gain is typically high
3. The output resistance is typically high
4. None of these
5. **The voltage gain is positive**

* For a MOS source-follower amplifier, which of the following is true ?

1. None of these
2. The voltage gain is typically high
3. The input resistance is typically low
4. The voltage gain is negative
5. **The output resistance is typically low**

* For a MOS source-follower amplifier, which of the following is true ?

1. All of these
2. The output resistance is typically high
3. The voltage gain is negative
4. **The input resistance is typically high**
5. The voltage gain is typically high

* For a MOS source-follower amplifier, which of the following is true ?

1. **None of these**
2. The input resistance is typically low
3. The voltage gain is negative
4. The output resistance is typically high
5. The voltage gain is typically high

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* For a MOS source-follower amplifier, which of the following is true ?

1. The output signal is measured at the source
2. The input signal is applied to the gate
3. **All of these**
4. The drain is used by both the input and output ports
5. NMOS and PMOS FETs use the same circuit topologies

* For a MOS source-follower amplifier, which of the following is true ?

1. All of these
2. **The drain is used by both the input and output ports**
3. The output signal is measured at the gate
4. NMOS and PMOS FETs use different circuit topologies
5. The input signal is applied to the source

* For a MOS source-follower amplifier, which of the following is true ?

1. **The output signal is measured at the source**
2. The gate is used by both the input and output ports
3. The input signal is applied to the drain
4. None of these
5. NMOS and PMOS FETs use different circuit topologies

* For a MOS source-follower amplifier, which of the following is true ?

1. The output signal is measured at the drain
2. The source is used by both the input and output ports
3. All of these
4. NMOS and PMOS FETs use different circuit topologies
5. **The input signal is applied to the gate**

* For a MOS source-follower amplifier, which of the following is true ?

1. The gate is used by both the input and output ports
2. **NMOS and PMOS FETs use the same circuit topologies**
3. The input signal is applied to the source
4. The output signal is measured at the drain
5. None of these

* For a MOS source-follower amplifier, which of the following is true ?

1. **None of these**
2. The gate is used by both the input and output ports
3. The input signal is applied to the source
4. NMOS and PMOS FETs use different circuit topologies
5. The output signal is measured at the drain

* When finding the resistance “looking into” a node, a current source Ix can be applied and the voltage, Vx, across this source found. Then the resistance is equal to Ix/Vx.

**FALSE**

* The base of a BJT makes a poor output.

**TRUE**

* Ideally, the input resistance for a transresistance amplifier would be infinite.

**FALSE**

* For a common-collector BJT amplifier, the input is applied to the base and the output is measured at the emitter.

**TRUE**

* For an emitter-follower BJT amplifier, the input is applied to the emitter and the output is measured at the collector.

**FALSE**

* The input resistance for a common-collector amplifier is the same as the input resistance for a common-base amplifier.

**FALSE**

* Considering the typical input and output resistances, which of the following MOS amplifier types is well suited to be used as a current amplifier ?

1. Source-follower
2. Common-source
3. **Common-gate**
4. None of these
5. Common-drain

* The resistance looking into the collector of a BJT is typically low.

**FALSE**

* BJT common-emitter and MOSFET common-source amplifiers are very similar.

**TRUE**

* The gain of a common-gate MOSFET amplifier can be estimated by the ratio of the drain resistor to the gate resistor.

**FALSE**

* FETs are typically capable of providing higher transconductance values than BJTs.

**FALSE**

* Considering the typical input and output resistances, which of the following MOS amplifier types is well suited to be used as a transresistance amplifier ?

1. Common-gate
2. Common-source
3. **None of these**
4. Source-follower
5. Common-drain

* When calculating the resistance looking into the base of a BJT, any resistance in the emitter should be “reflected up” into the base by multiplying by (β+1).

**TRUE**

* The input resistance for a common-source amplifier is the same as the input resistance for a common-gate amplifier.

**FALSE**

* Ideally, the output resistance for a current amplifier would be zero.

**FALSE**

* The collector of a BJT makes a poor output.

**FALSE**

* The maximum possible gain for a source-follower MOSFET amplifier is 1.

**TRUE**

* Ideally, the output resistance for a transconductance amplifier would be infinite.

**TRUE**

* For a BJT common-collector amplifier, which of the following is true ?

1. The input signal is applied to the base
2. The output signal is measured at the emitter
3. The collector is used by both the input and output ports
4. **All of these**
5. The same circuit topologies are used for both NPNs and PNPs

* For a BJT common-collector amplifier, which of the following is true ?

1. The output signal is measured at the base
2. The input signal is applied to the emitter
3. None of these
4. Different circuit topologies are used for NPNs than for PNPs
5. **The collector is used by both the input and output ports**

* For a BJT common-collector amplifier, which of the following is true ?

1. All of these
2. The base is used by both the input and output ports
3. The output signal is measured at the collector
4. The input signal is applied to the emitter
5. **The same circuit topologies are used for both NPNs and PNPs**

* For a BJT common-collector amplifier, which of the following is true ?

1. All of these
2. **The output signal is measured at the emitter**
3. The base is used by both the input and output ports
4. Different circuit topologies are used for NPNs than for PNPs
5. The input signal is applied to the collector

* For a BJT common-collector amplifier, which of the following is true ?

1. Different circuit topologies are used for NPNs than for PNPs
2. The output signal is measured at the collector
3. None of these
4. **The input signal is applied to the base**
5. The emitter is used by both the input and output ports

* For a BJT common-collector amplifier, which of the following is true ?

1. Different circuit topologies are used for NPNs than for PNPs
2. The input signal is applied to the emitter
3. The output signal is measured at the collector
4. **None of these**
5. The base is used by both the input and output ports

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* For a BJT common-collector amplifier, which of the following is true ?

1. **All of these**
2. The voltage gain is typically low
3. The voltage gain is positive
4. The input resistance is typically high
5. The output resistance is typically low

* For a BJT common-collector amplifier, which of the following is true ?

1. The voltage gain is typically high
2. All of these
3. The output resistance is typically high
4. **The voltage gain is positive**
5. The input resistance is typically low

* For a BJT common-collector amplifier, which of the following is true ?

1. None of these
2. The voltage gain is typically high
3. **The input resistance is typically high**
4. The output resistance is typically high
5. The voltage gain is negative

* For a BJT common-collector amplifier, which of the following is true ?

1. The input resistance is typically low
2. All of these
3. The voltage gain is typically high
4. The voltage gain is negative
5. **The output resistance is typically low**

* For a BJT common-collector amplifier, which of the following is true ?

1. The input resistance is typically low
2. The output resistance is typically high
3. The voltage gain is negative
4. None of these
5. **The voltage gain is typically low**

* For a BJT common-collector amplifier, which of the following is true ?

1. The input resistance is typically low
2. The voltage gain is typically high
3. The output resistance is typically high
4. **None of these**
5. The voltage gain is negative

* Since current normally flows out of the emitter of a PNP, the emitter is usually drawn pointing down towards the negative power supply.

**FALSE**

* Current amplifiers are typically modeled using a two-port with a Thevenin’s equivalent at the output.

**FALSE**

* The output resistance for a common-drain amplifier is the same as the input resistance for a common-source amplifier.

**FALSE**

* Current amplifiers need to have low input resistance and low output resistance.

**FALSE**

* BJT amplifiers are typically capable of providing higher voltage gain than FET amplifiers.

**TRUE**

* Considering the typical input and output resistances, a BJT common-collector is well suited to be which of the following types of amplifiers ?

1. None of these
2. Transconductance amplifier
3. Transresistance amplifier
4. **Voltage amplifier**
5. Current amplifier

* The gain of a common-base BJT amplifier can be estimated by the ratio of the bias voltage across the collector resistor to the bias voltage across the base resistor.

**FALSE**

* For a common-base BJT amplifier, the input is applied to the emitter and the output is measured at the collector.

**TRUE**

* Ideally, the output resistance for a voltage amplifier would be infinite.

**FALSE**

* Ideally, the input resistance for a voltage amplifier would be infinite.

**TRUE**

* The output resistance for a common-source amplifier is the same as the output resistance for a common-gate amplifier.

**TRUE**

* Since most amplifiers are intentionally designed to be bidirectional, the two-port model for an amplifier needs to include a term to model the gain from the output back to the input.

**FALSE**

* The input resistance for a common-base amplifier is the same as the output resistance for a common-emitter amplifier.

**FALSE**

* The gain of a common-base BJT amplifier can be estimated by the ratio of the bias voltage across the collector resistor to the bias voltage across the emitter resistor.

**TRUE**

* BJT common-emitter and MOSFET common-drain amplifiers are very similar.

**FALSE**

* Since two-port models for amplifiers need 4 terminals but real transistors only use 3 terminals, one terminal of the transistor is shared between the input and output ports in a two-port model for a transistor amplifier.

**TRUE**

* The resistance looking into the base of a BJT is typically low.

**FALSE**

* Since current normally flows into the emitter of a NPN, the emitter is usually drawn pointing up towards the positive power supply.

**FALSE**

* The drain of a MOSFET makes a poor output.

**FALSE**

* When calculating the resistance looking into the base of a BJT, any resistance in the emitter should be “reflected up” into the base by dividing by (β+1).

**FALSE**

* Transconductance amplifiers need to have high input resistance and high output resistance.

**TRUE**

* The input resistance for a common-drain amplifier is the same as the input resistance for a common-source amplifier.

**TRUE**

* The maximum possible gain for a common-emitter BJT amplifier is 1.

**FALSE**

* The gain of a common-emitter BJT amplifier can be estimated by the ratio of the collector resistor to the emitter resistor.

**TRUE**

* The input resistance for a common-emitter amplifier is the same as the input resistance for a common-collector amplifier.

**TRUE**

* The output resistance for a common-base amplifier is the same as the output resistance for a common-collector amplifier.

**FALSE**

* The output resistance for a common-emitter amplifier is the same as the output resistance for a common-collector amplifier.

**FALSE**

* BJTs are typically capable of providing higher transconductance values than FETs.

**TRUE**

* Since current normally flows out of the emitter of a NPN, the emitter is usually drawn pointing down towards the negative power supply.

**TRUE**

* The gain of a common-emitter BJT amplifier can be estimated by the ratio of the bias voltage across the collector resistor to the bias voltage across the emitter resistor.

**TRUE**

* Since two-port models for amplifiers need 3 terminals but real transistors use 4 terminals, one terminal of the transistor is shared between the input and output ports in a two-port model for a transistor amplifier.

**FALSE**

* Transresistance amplifiers are typically modeled using a two-port with a Norton’s equivalent at the output.

**FALSE**

* Which of the following BJT amplifier types is most similar to a MOS common-gate amplifier ?

1. **Common-base**
2. None of these
3. Common-emitter
4. Common-collector
5. All of these

* Since current normally flows out of the source of a NMOS FET, the source is usually drawn pointing down towards the negative power supply.

**TRUE**

* For a common-emitter BJT amplifier, the input is applied to the base and the output is measured at the emitter.

**FALSE**

* All three MOS amplifier types (CS, CG, CD) are identical when the input and output are disconnected.

**TRUE**

* Which of the following MOS amplifier types is most similar to a BJT common-base amplifier ?

1. All of these
2. Common-drain
3. None of these
4. **Common-gate**
5. Common-source

* Since current normally flows into the emitter of a PNP, the emitter is usually drawn pointing up towards the positive power supply.

**TRUE**

* The gain of a common-gate MOSFET amplifier can be estimated by the ratio of the bias voltage across the drain resistor to the bias voltage across the gate resistor.

**FALSE**

* For a common-source MOS amplifier, the input is applied to the gate and the output is measured at the source.

**FALSE**

* For a source-follower MOS amplifier, the input is applied to the gate and the output is measured at the source.

**TRUE**

* Since most amplifiers are intentionally designed to be unilateral, the two-port model for an amplifier does not typically include a term to model the gain from the output back to the input.

**TRUE**

* The output resistance for a common-gate amplifier is the same as the output resistance for a common-source amplifier.

**TRUE**

* The output resistance for a common-collector amplifier is the same as the input resistance for a common-emitter amplifier.

**FALSE**

* Considering the typical input and output resistances, which of the following BJT amplifier types is well suited to be used as a current amplifier ?

1. Common-emitter
2. None of these
3. Emitter-follower
4. **Common-base**
5. Common-collector

* When finding the resistance “looking into” a node, all independent voltage sources should be replaced with short circuits.

**TRUE**

* BJTs are typically capable of providing lower output resistances than FETs.

**TRUE**

* The gate of a MOSFET makes a poor input.

**FALSE**

* When finding the resistance “looking into” a node, all independent voltage sources should be replaced with open circuits.

**FALSE**

* Considering the typical input and output resistances, a BJT common-base is well suited to be which of the following types of amplifiers ?

1. Transconductance amplifier
2. All of these
3. **Current amplifier**
4. Transresistance amplifier
5. Voltage amplifier

* Ideally, the output resistance for a transconductance amplifier would be zero.

**FALSE**

* All three BJT amplifier types (CE, CB, CC) are identical when the input and output are disconnected.

**TRUE**

* Considering the typical input and output resistances, a BJT emitter-follower is well suited to be which of the following types of amplifiers ?

1. Transresistance amplifier
2. Current amplifier
3. **Voltage amplifier**
4. All of these
5. Transconductance amplifier

* The input resistance in a transconductance amplifier model is used to determine the signal lost due to the current division between the source resistance and the input resistance of the amplifier.

**FALSE**

* The gain of a common-base BJT amplifier can be estimated by the ratio of the collector resistor to the base resistor.

**FALSE**

* Ideally, the output resistance for a current amplifier would be infinite.

**TRUE**

* As the resistance in the source of a MOSFET is increased, the resistance looking into the drain reaches a maximum value of ro(1+β).

**FALSE**

* Current amplifiers are typically modeled using a two-port with a Norton’s equivalent at the output.

**TRUE**

* Since current normally flows into the source of a PMOS FET, the source is usually drawn pointing up towards the positive power supply.

**TRUE**

* When finding the resistance “looking into” a node, all independent current sources should be replaced with short circuits.

**FALSE**

* The gain of a common-base BJT amplifier can be estimated by the ratio of the collector resistor to the emitter resistor.

**TRUE**

* Considering the typical input and output resistances, a MOS common-gate is well suited to be which of the following types of amplifiers ?

1. Transresistance amplifier
2. **Current amplifier**
3. Voltage amplifier
4. Transconductance amplifier
5. All of these

* For a common-source MOS amplifier, the input is applied to the gate and the output is measured at the drain.

**TRUE**

* The input resistance in a voltage amplifier model is used to determine the signal lost due to the voltage division between the source resistance and the input resistance of the amplifier.

**TRUE**

* Considering the typical input and output resistances, a BJT common-emitter is well suited to be which of the following types of amplifiers ?

1. None of these
2. Transresistance amplifier
3. Voltage amplifier
4. Current amplifier
5. **Transconductance amplifier**

* The output resistance for a common-base amplifier is the same as the output resistance for a common-emitter amplifier.

**TRUE**

* The output resistance in a current amplifier model is used to determine the signal lost due to the voltage division between the load resistance and the output resistance of the amplifier.

**FALSE**

* For an emitter-follower BJT amplifier, the input is applied to the base and the output is measured at the emitter.

**TRUE**

* The resistance looking into the emitter of a BJT is typically low.

**TRUE**

* Transresistance amplifiers are typically modeled using a two-port with a Thevenin’s equivalent at the output.

**TRUE**

* Transistor amplifier characteristics depend more on the type of device than on the circuit topology used.

**FALSE**

* Considering the typical input and output resistances, which of the following BJT amplifier types is well suited to be used as a voltage amplifier ?

1. None of these
2. **Emitter-follower**
3. Common-emitter
4. Common-base
5. All of these

* Considering the typical input and output resistances, which of the following BJT amplifier types is well suited to be used as a voltage amplifier ?

1. Common-base
2. Common-emitter
3. None of these
4. **Common-collector**
5. All of these

* The type of transistor amplifier used is completely determined by where the power supplies are connected.

**FALSE**

* When calculating the resistance looking into the collector of a BJT, a resistance in the emitter will increase ro by multiplying it by (1+gmRE).

**TRUE**

* Considering the typical input and output resistances, which of the following MOS amplifier types is well suited to be used as a voltage amplifier ?

1. None of these
2. Common-gate
3. **Source-follower**
4. Common-source
5. All of these

* Considering the typical input and output resistances, which of the following MOS amplifier types is well suited to be used as a voltage amplifier ?

1. None of these
2. **Common-drain**
3. Common-gate
4. All of these
5. Common-source

* Transconductance amplifiers are typically modeled using a two-port with a Thevenin’s equivalent at the output.

**FALSE**

* When finding the resistance “looking into” a node, a voltage source Vx can be applied and the current, Ix, which flows in this source found. Then the resistance is equal to Vx/Ix.

**TRUE**

* The gain of a common-source MOSFET amplifier can be estimated by the ratio of the drain resistor to the source resistor.

**TRUE**

* Ideally, the output resistance for a transresistance amplifier would be infinite.

**FALSE**

* Ideally, the input resistance for a transconductance amplifier would be zero.

**FALSE**

* Ideally, the input resistance for a current amplifier would be zero.

**TRUE**

* Ideally, the output resistance for a transresistance amplifier would be zero.

**TRUE**

* BJT common-base and MOSFET common-drain amplifiers are very similar.

**FALSE**

* The resistance looking into the emitter of a BJT is typically high.

**FALSE**

* Voltage amplifiers need to have high input resistance and high output resistance.

**FALSE**

* The resistance looking into the drain of a MOSFET is typically high.

**TRUE**

* The output resistance in a voltage amplifier model is used to determine the signal lost due to the voltage division between the load resistance and the output resistance of the amplifier.

**TRUE**

* The output resistance for a common-gate amplifier is the same as the output resistance for a common-drain amplifier.

**FALSE**

* Ideally, the input resistance for a transconductance amplifier would be infinite.

**TRUE**

* A common-gate MOSFET amplifier and a common-source MOSFET amplifier which use the same transistors, bias currents, and resistor sizes will have the same gain except the common-gate amplifier gain will be negative.

**FALSE**

* Since current normally flows into the source of a NMOS FET, the source is usually drawn pointing up towards the positive power supply.

**FALSE**

* Which of the following BJT amplifier types is most similar to a MOS source-follower amplifier ?

1. Common-emitter
2. None of these
3. **Common-collector**
4. All of these
5. Common-base

* When finding the resistance “looking into” a node, a voltage source Vx can be applied and the current, Ix, which flows in this source found. Then the resistance is equal to Ix/Vx.

**FALSE**

* he gain of a common-gate MOSFET amplifier can be estimated by the ratio of the bias voltage across the drain resistor to the bias voltage across the source resistor.

**TRUE**

* For a common-emitter BJT amplifier, the input is applied to the base and the output is measured at the collector.

**TRUE**

* For a common-base BJT amplifier, the input is applied to the base and the output is measured at the collector.

**FALSE**

* The base of a BJT makes a poor input.

**FALSE**

* The input resistance in a voltage amplifier model is used to determine the signal lost due to the current division between the source resistance and the input resistance of the amplifier.

**FALSE**

* The gain of a common-gate MOSFET amplifier can be estimated by the ratio of the drain resistor to the source resistor.

**TRUE**

* Transconductance amplifiers need to have high input resistance and low output resistance.

**FALSE**

* Ideally, the input resistance for a current amplifier would be infinite.

**FALSE**

* As the resistance in the emitter of a BJT is increased, the resistance looking into the collector continues to increase without bound and is always approximately equal to ro(1+gmRE).

**FALSE**

* The resistance looking into the gate of a MOSFET is typically low.

**FALSE**

* Considering the typical input and output resistances, a MOS common-source is well suited to be which of the following types of amplifiers ?

1. None of these
2. **Transconductance amplifier**
3. Voltage amplifier
4. Current amplifier
5. Transresistance amplifier

* The output resistance for a common-source amplifier is the same as the output resistance for a common-drain amplifier.

**FALSE**

* The input resistance for a common-gate amplifier is the same as the output resistance for a common-drain amplifier.

**TRUE**

* Which of the following MOS amplifier types is most similar to a BJT emitter-follower amplifier ?

1. **Common-drain**
2. All of these
3. Common-source
4. None of these
5. Common-gate

* The maximum possible gain for a common-source MOSFET amplifier is 1.

**FALSE**

* The input resistance for a common-base amplifier is the same as the output resistance for a common-collector amplifier.

**TRUE**

* Considering the typical input and output resistances, a MOS common-drain is well suited to be which of the following types of amplifiers ?

1. **Voltage amplifier**
2. Transconductance amplifier
3. None of these
4. Transresistance amplifier
5. Current amplifier

* Transconductance amplifiers are typically modeled using a two-port with a Norton’s equivalent at the output.

**TRUE**

* The output resistance for a common-collector amplifier is the same as the input resistance for a common-base amplifier.

**TRUE**

* Which of the following BJT amplifier types is most similar to a MOS common-drain amplifier ?

1. None of these
2. Common-emitter
3. Common-base
4. **Common-collector**
5. All of these

* The drain of a MOSFET makes a poor input.

**TRUE**

* FET amplifiers are typically capable of providing higher voltage gain than BJT amplifiers.

**FALSE**

* BJTs are typically capable of providing higher output resistances than FETs.

**FALSE**

* The output resistance in a transresistance amplifier model is used to determine the signal lost due to the voltage division between the load resistance and the output resistance of the amplifier.

**TRUE**

* The base resistance in the BJT hybrid-pi model, rπ , decreases as the collector current increases.

**TRUE**

* The gate of a MOSFET makes a poor output.

**TRUE**

* For a common-drain MOS amplifier, the input is applied to the gate and the output is measured at the source.

**TRUE**

* As the resistance in the source of a MOSFET is increased, the resistance looking into the drain continues to increase without bound and is always approximately equal to ro(1+gmRS).

**TRUE**

* The input resistance in a transconductance amplifier model is used to determine the signal lost due to the voltage division between the source resistance and the input resistance of the amplifier.

**TRUE**

* The resistance looking into the source of a MOSFET is typically low.

**TRUE**

* The input resistance in a transresistance amplifier model is used to determine the signal lost due to the current division between the source resistance and the input resistance of the amplifier.

**TRUE**

* The input resistance for a common-gate amplifier is the same as the output resistance for a common-source amplifier.

**FALSE**

* The maximum possible gain for a common-collector BJT amplifier is 1.

**TRUE**

* Voltage amplifiers are typically modeled using a two-port with a Thevenin’s equivalent at the output.

**TRUE**

* FETs are typically capable of providing lower output resistances than BJTs.

**FALSE**

* FETs are typically capable of providing higher output resistances than BJTs.

**TRUE**

* All three MOS amplifier types (CS, CG, CD) are identical when the input and output are applied.

**FALSE**

* A common-gate MOSFET amplifier and a common-source MOSFET amplifier which use the same transistors, bias currents, and resistor sizes will have the same gain except the common-source amplifier gain will be negative.

**TRUE**

* All three BJT amplifier types (CE, CB, CC) are identical when the input and output are applied.

**FALSE**

* The output resistance in a voltage amplifier model is used to determine the signal lost due to the current division between the load resistance and the output resistance of the amplifier.

**FALSE**

* BJT common-collector and MOSFET common-emitter amplifiers are very similar.

**FALSE**

* The output resistance in a transresistance amplifier model is used to determine the signal lost due to the current division between the load resistance and the output resistance of the amplifier.

**FALSE**

* Which of the following BJT amplifier types is most similar to a MOS common-source amplifier ?

1. Common-base
2. None of these
3. All of these
4. **Common-emitter**
5. Common-collector

* When calculating the resistance looking into the emitter of a BJT, any resistance in the base should be “reflected down” into the emitter by dividing by (β+1).

**TRUE**

* When finding the resistance “looking into” a node, a current source Ix can be applied and the voltage, Vx, across this source found. Then the resistance is equal to Vx/Ix.

**TRUE**

* The input resistance for a common-collector amplifier is the same as the input resistance for a common-emitter amplifier.

**TRUE**

* As the resistance in the emitter of a BJT is increased, the resistance looking into the collector reaches a maximum value of ro(1+β).

**TRUE**

* The output resistance in a current amplifier model is used to determine the signal lost due to the current division between the load resistance and the output resistance of the amplifier.

**TRUE**

* Since current normally flows out of the source of a PMOS FET, the source is usually drawn pointing down towards the negative power supply.

**FALSE**

* The output resistance for a common-emitter amplifier is the same as the output resistance for a common-base amplifier.

**TRUE**

* The input resistance in a current amplifier model is used to determine the signal lost due to the current division between the source resistance and the input resistance of the amplifier.

**TRUE**

* The gain of a common-source MOSFET amplifier can be estimated by the ratio of the bias voltage across the drain resistor to the bias voltage across the source resistor.

**TRUE**

* The resistance looking into the drain of a MOSFET is typically low.

**FALSE**

* The gain of a common-source MOSFET amplifier can be estimated by the ratio of the bias voltage across the gate resistor to the bias voltage across the source resistor.

**FALSE**

* The type of transistor amplifier used is completely determined by where the input signal is applied and where the output signal is measured.

**TRUE**

* Ideally, the output resistance for a voltage amplifier would be zero.

**TRUE**

* BJT common-base and MOSFET common-gate amplifiers are very similar.

**TRUE**

* The input resistance for a common-drain amplifier is the same as the input resistance for a common-gate amplifier.

**FALSE**

* Transresistance amplifiers need to have low input resistance and low output resistance.

**TRUE**

* The resistance looking into the source of a MOSFET is typically high.

**FALSE**

* Ideally, the input resistance for a voltage amplifier would be zero.

**FALSE**

* For a common-collector BJT amplifier, the input is applied to the base and the output is measured at the collector.

**FALSE**

* The resistance looking into the base of a BJT can be high, depending on the bias current and the size of the emitter resistor used.

**TRUE**

* The input resistance in a current amplifier model is used to determine the signal lost due to the voltage division between the source resistance and the input resistance of the amplifier.

**FALSE**

* The output resistance for a common-drain amplifier is the same as the input resistance for a common-gate amplifier.

**TRUE**

* Which of the following MOS amplifier types is most similar to a BJT common-collector amplifier ?

1. All of these
2. **Common-drain**
3. None of these
4. Common-gate
5. Common-source

* The gain of a common-emitter BJT amplifier can be estimated by the ratio of the emitter resistor to the base resistor.

**FALSE**

* When calculating the resistance looking into the emitter of a BJT, any resistance in the base should be “reflected down” into the emitter by multiplying by (β+1).

**FALSE**

* The resistance looking into the collector of a BJT is typically high.

**TRUE**

* Considering the typical input and output resistances, which of the following BJT amplifier types is well suited to be used as a transresistance amplifier ?

1. Emitter-follower
2. Common-collector
3. Common-emitter
4. **None of these**
5. Common-base

* Considering the typical input and output resistances, which of the following BJT amplifier types is well suited to be used as a transconductance amplifier ?

1. **Common-emitter**
2. Emitter-follower
3. Common-base
4. None of these
5. Common-collector

* Voltage amplifiers are typically modeled using a two-port with a Norton’s equivalent at the output.

**FALSE**

* Considering the typical input and output resistances, a MOS source-follower is well suited to be which of the following types of amplifiers ?

1. Current amplifier
2. Transresistance amplifier
3. **Voltage amplifier**
4. All of these
5. Transconductance amplifier

* Considering the typical input and output resistances, which of the following MOS amplifier types is well suited to be used as a transconductance amplifier ?

1. **Common-source**
2. Common-drain
3. Source-follower
4. Common-gate
5. None of these

* Which of the following MOS amplifier types is most similar to a BJT common-emitter amplifier ?

1. All of these
2. **Common-source**
3. None of these
4. Common-gate
5. Common-drain