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| **Started on** | Wednesday, 13 December 2017, 5:49 PM |
| **State** | Finished |
| **Completed on** | Wednesday, 13 December 2017, 7:03 PM |
| **Time taken** | 1 hour 14 mins |
| **Grade** | **43.00** out of 106.00 (**41**%) |

**Question 1**

Correct

Mark 2.00 out of 2.00

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

Select one:

- a. The base is kept narrow to minimize recombination in the base
- b. Carriers diffuse across the base and are collected by the collector
- c. The emitter doping is much higher than the base doping to minimize the number of carriers injected from the base into the emitter
- d. All of these ✓
- e. The minority carrier concentration in the base decreases almost linearly from the emitter to the collector

The correct answer is: All of these

**Correct**

Marks for this submission: 2.00/2.00.

**Question 2**

Correct

Mark 1.00 out of 2.00

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

Select one:

- a. All of these ✓
- b. The collector current consists primarily of electrons injected from the emitter into the base
- c. The emitter current consists primarily of electrons injected from the emitter into the base
- d. Some base current flows to replace holes which are lost as electrons diffusing across the base recombine
- e. The base current consists primarily of holes injected from the base into the emitter

The correct answer is: All of these

**Correct**

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.00/2.00**.

**Question 3**

Correct

Mark 1.00 out of 2.00

An NPN BJT operating in the saturation region has :

Select one:

- a. None of these
- b. Vbe > 0 and Vbc > 0 ✓
- c. Vbe > 0 and Vbc < 0
- d. Vbe < 0 and Vbc < 0
- e. Vbe < 0 and Vbc > 0

The correct answer is: Vbe > 0 and Vbc > 0

**Correct**

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.00/2.00**.

**Question 4**

Correct

Mark 1.00 out of 2.00

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

Select one:

- a. The collector current increases linearly as the base current is increased
- b. The base-collector junction can be forward biased by about 200mV before the collector current starts to decrease
- c. The common-emitter current gain, β , is much larger than in the forward-active region
- d. The output resistance, ro , is much smaller than in the forward-active region ✓
- e. All of these

The correct answer is: The output resistance, ro , is much smaller than in the forward-active region

**Correct**

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.00/2.00**.

**Question 5**

Correct

Mark 1.00 out of 2.00

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

Select one:

- a. The width of the base to increase
- b. The output resistance, ro , to increase
- c. The width of the base-collector depletion region to increase ✓
- d. The collector current for the BJT to decrease
- e. None of these

The correct answer is: The width of the base-collector depletion region to increase

**Correct**

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.00/2.00**.

**Question 6**

Correct

Mark 1.00 out of 2.00

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 ?

Select one:

- a. 720mV
- b. 620mV
- c. None of these
- d. 670mV
- e. 820mV ✓

The correct answer is: 820mV

**Correct**

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **1.00/2.00**.

**Question 7**

Correct

Mark 2.00 out of 2.00

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

Select one:

- a. The output signal is measured at the collector
- b. The base is used by both the input and output ports
- c. The same circuit topologies are used for both NPNs and PNPs ✓
- d. The input signal is applied to the emitter
- e. All of these

The correct answer is: The same circuit topologies are used for both NPNs and PNPs

**Correct**

Marks for this submission: 2.00/2.00.

**Question 8**

Correct

Mark 2.00 out of 2.00

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

Select one:

- a. The base is used by both the input and output ports
- b. The output signal is measured at the emitter ✓
- c. All of these
- d. Different circuit topologies are used for NPNs than for PNPs
- e. The input signal is applied to the collector

The correct answer is: The output signal is measured at the emitter

**Correct**

Marks for this submission: 2.00/2.00.

**Question 9**

Correct

Mark 2.00 out of 2.00

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

Select one:

- a. All of these
- b. The input resistance is typically low ✓
- c. The output resistance is typically low
- d. The voltage gain is typically low
- e. The voltage gain is negative

The correct answer is: The input resistance is typically low

**Correct**

Marks for this submission: 2.00/2.00.

**Question 10**

Correct

Mark 2.00 out of 2.00

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

Select one:

- a. The voltage gain is negative
- b. All of these
- c. The output resistance is typically low
- d. The input resistance is typically high
- e. The voltage gain is typically high ✓

The correct answer is: The voltage gain is typically high

**Correct**

Marks for this submission: 2.00/2.00.

**Question 11**

Correct

Mark 2.00 out of 2.00

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

Select one:

- True
- False ✓

The correct answer is 'False'.

**Correct**

Marks for this submission: 2.00/2.00.

**Question 12**

Correct

Mark 0.00 out of 2.00

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

Select one:

- True
- False ✓

The correct answer is 'False'.

**Correct**

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **0.00/2.00**.

**Question 13**

Correct

Mark 2.00 out of 2.00

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.

Select one:

- True ✓
- False

The correct answer is 'True'.

**Correct**

Marks for this submission: 2.00/2.00.

**Question 14**

Correct

Mark 0.00 out of 2.00

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.

Select one:

- True ✓
- False

The correct answer is 'True'.

**Correct**

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **0.00/2.00**.

**Question 15**

Correct

Mark 0.00 out of 2.00

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

Select one:

- True ✓
- False

The correct answer is 'True'.

**Correct**

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **0.00/2.00**.

**Question 16**

Correct

Mark 2.00 out of 2.00

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

Select one:

- True ✓
- False

The correct answer is 'True'.

**Correct**

Marks for this submission: 2.00/2.00.

**Question 17**

Correct

Mark 0.00 out of 2.00

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.

Select one:

- True ✓
- False

The correct answer is 'True'.

**Correct**

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **0.00/2.00**.

**Question 18**

Correct

Mark 0.00 out of 2.00

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

Select one:

- True
- False ✓

The correct answer is 'False'.

**Correct**

Marks for this submission: 2.00/2.00. Accounting for previous tries, this gives **0.00/2.00**.

**Question 19**

Correct

Mark 2.00 out of 2.00

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

Select one:

- True
- False ✓

The correct answer is 'False'.

**Correct**

Marks for this submission: 2.00/2.00.

**Question 20**

Correct

Mark 2.00 out of 2.00

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

Select one:

- True
- False ✓

The correct answer is 'False'.

**Correct**

Marks for this submission: 2.00/2.00.

**Question 21**

Correct

Mark 6.00 out of 6.00

What is the open-circuit voltage gain, μf, in V/V for an NPN BJT operating in the forward-active region at 27° C with Ic = 756μA? Use: β = 127, VA = 75V and Vt = kT/q = 26mV.

Answer: 2883.93

The correct answer is: 2884.62

**Correct**

Marks for this submission: 6.00/6.00.

**Question 22**

Not answered

Mark 0.00 out of 6.00

What is the device transconductance, gm, in mA/V for an NMOS FET operating in saturation with Id = 200μA ? Use: W/L = 50 and k'n = 100μA/V^2. Neglect the effects of channel-length modulation and body effect.

Answer:

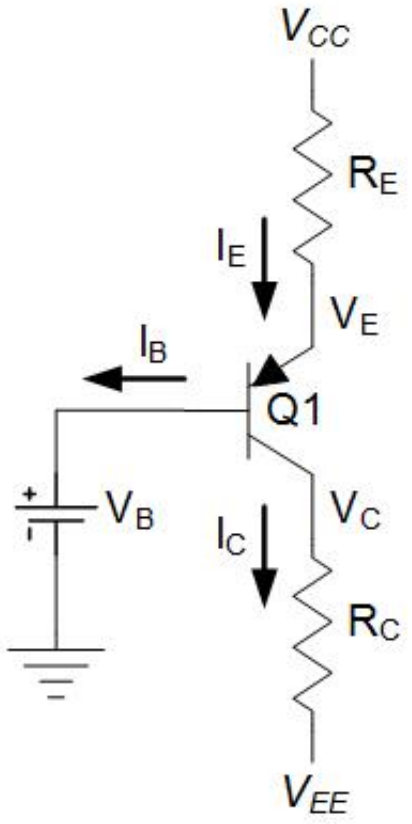
The correct answer is: 1.41

**Question 23**

Correct

Mark 6.00 out of 6.00

For the BJT bias circuit shown, what is the emitter voltage, Ve, in volts? Use Vcc = 8V, Vee = -7V, Vb = -2.6V, Rc = 4.9kΩ, and Re = 5.9kΩ. Assume that the transistor is in the forward-active region, with β = 48 and |Vbe(on)| = 0.7V. Neglect the effects of base-width modulation.




Answer: -1.9

The correct answer is: -1.9

**Correct**

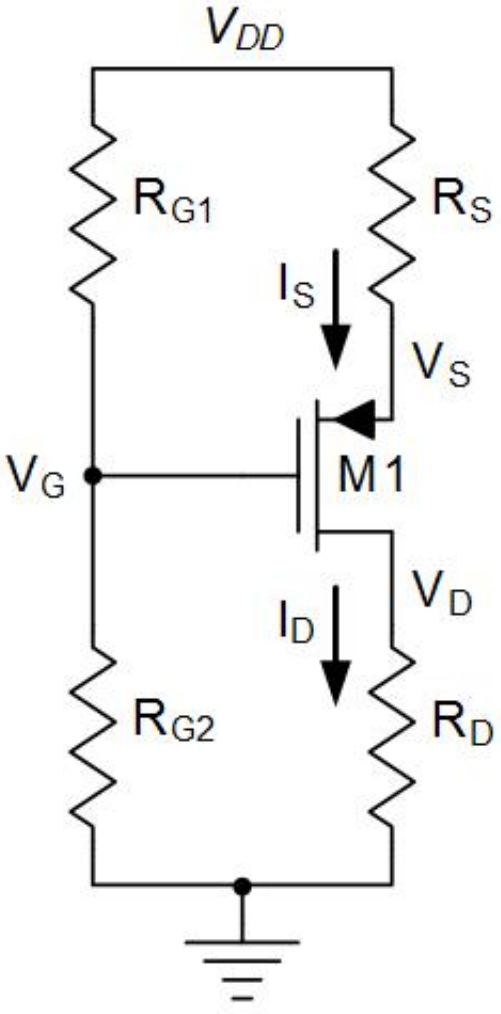
Marks for this submission: 6.00/6.00.

**Question 24**

Correct

Mark 6.00 out of 6.00

For the MOSFET bias circuit shown, what is the source current, Is, in milliamps? Assume that the transistor is in the saturation region, and use: Vdd = 11V, Rg1 = 41.7kΩ, Rg2 = 59.8kΩ, Rd = 1.0kΩ, Rs = 8.2kΩ, Vt = -0.7V, and |Von| = 0.18. (Remember that |Von| = |Vov| = |Vgs|-|Vt|) Neglect the effect of channel-length modulation and body effect.




Answer: .444

The correct answer is: 0.44

**Correct**

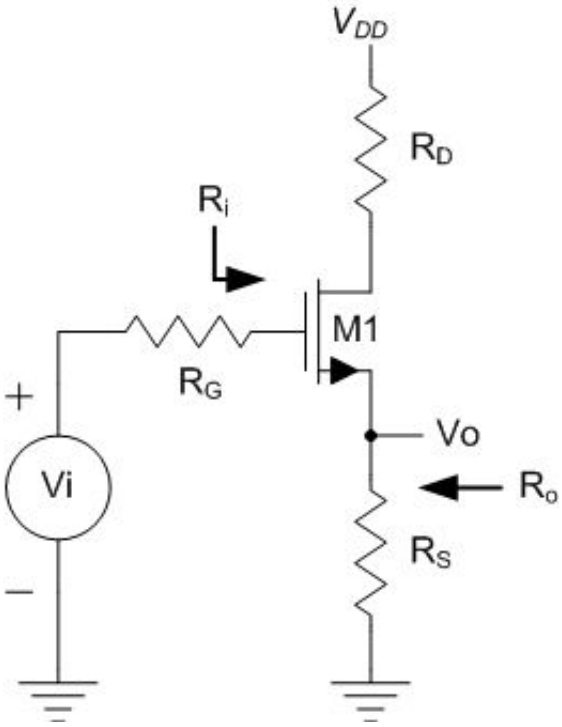
Marks for this submission: 6.00/6.00.

**Question 25**

Incorrect

Mark 0.00 out of 6.00

What is the low frequency voltage gain for the amplifier shown at 27° C with Rd = 16.5kΩ, Rs = 0.6kΩ and Rg = 3.9kΩ ? Use: W/L = 17, Id = 328μA, VTN = 0.5V, k'n = 100μA/V^2. Neglect the effect of channel-length modulation and body effect.




Answer: 0.24 ✗

The correct answer is: 0.388

**Incorrect**

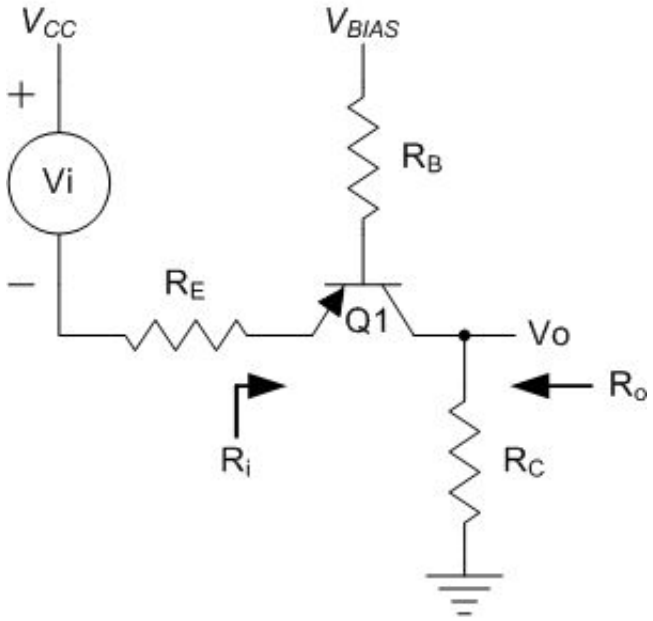
Marks for this submission: 0.00/6.00.

**Question 26**

Not answered

Mark 0.00 out of 6.00

What is the low frequency voltage gain for the amplifier shown at 27° C with Rc = 24.3kΩ, Re = 0.1kΩ and Rb = 0.5kΩ ? Use: Ic = 305μA, β = 32, and Vt = kT/q = 26mV. Neglect the effect of base-width modulation.




Answer:

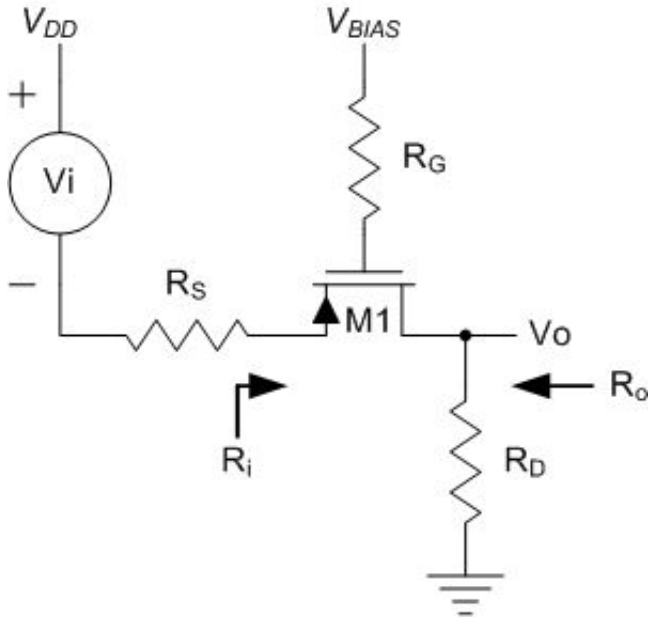
The correct answer is: 119.12

**Question 27**

Not answered

Mark 0.00 out of 6.00

What is the low frequency input resistance, Ri, in Ω for the amplifier shown at 27° C with Rd = 15.6kΩ, Rs = 0.4kΩ and Rg = 4.8kΩ ? Use: W/L = 53, Id = 248μA, VTP = -0.5V, k'n = 40μA/V^2. Neglect the effect of channel-length modulation and body effect.




Answer:

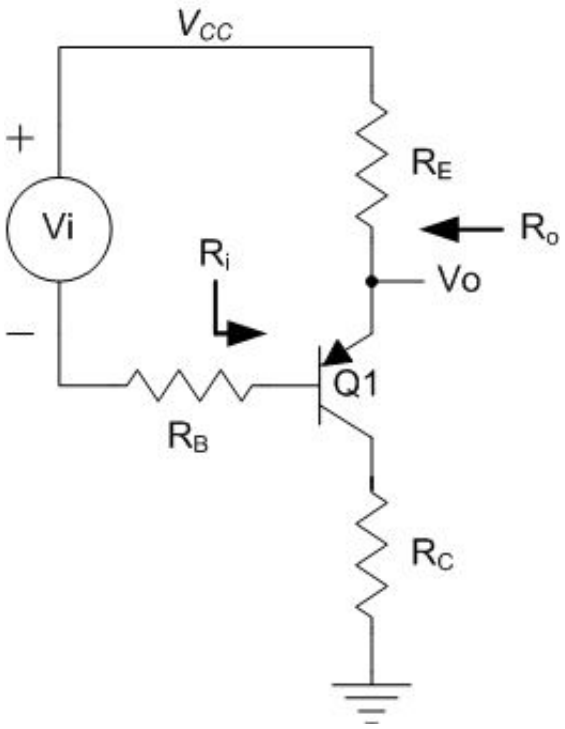
The correct answer is: 975.2

**Question 28**

Not answered

Mark 0.00 out of 6.00

What is the low frequency input resistance, Ri, in kΩ for the amplifier shown at 27° C with Rc = 47.0kΩ, Re = 0.6kΩ and Rb = 0.5kΩ ? Use: Ic = 282μA, β = 20, and Vt = kT/q = 26mV. Neglect the effect of base-width modulation.




Answer:

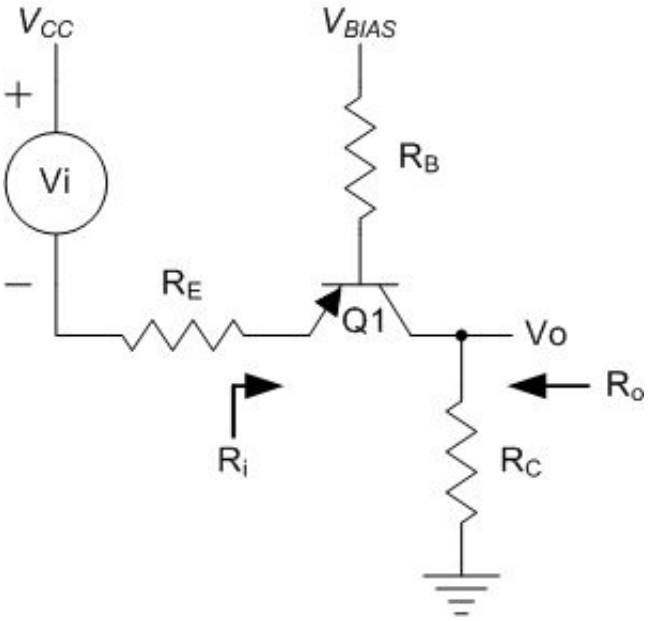
The correct answer is: 14.4

**Question 29**

Not answered

Mark 0.00 out of 6.00

What is the low frequency output resistance, Ro, in kΩ for the amplifier shown at 27° C with Rc = 79.3kΩ, Re = 0.1kΩ and Rb = 0.6kΩ ? Use: Ic = 270μA, β = 41, VA = 10V, and Vt = kT/q = 26mV. Use the "short-cut approach" discussed in class.




Answer:

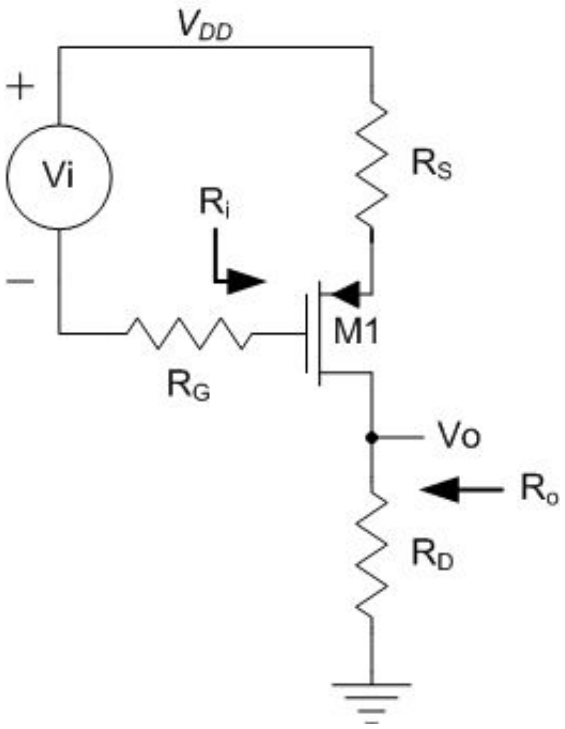
The correct answer is: 38.7

**Question 30**

Not answered

Mark 0.00 out of 6.00

What is the low frequency output resistance, Ro, in kΩ for the amplifier shown at 27° C with Rd = 98.5kΩ, Rs = 0.9kΩ and Rg = 3.8kΩ. Use: W/L = 16, Id = 520μA, VTP = -0.5V, k'p = 40μA/V^2, λ = 0.10 Neglect body effect.




Answer:

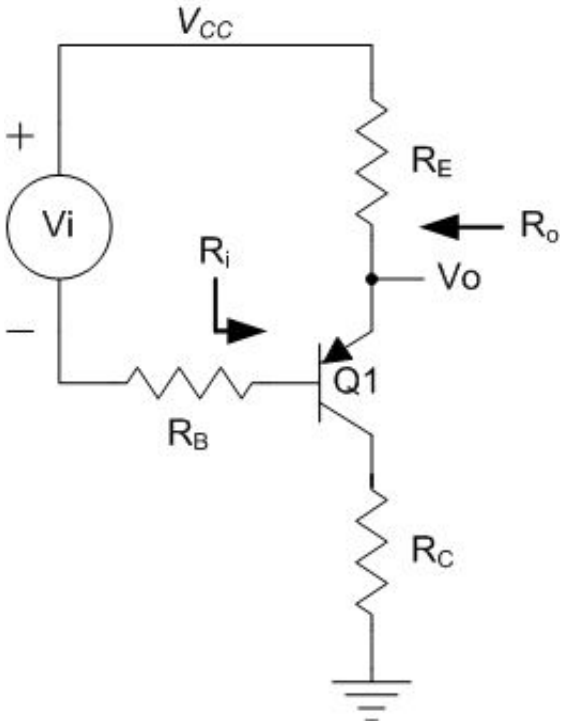
The correct answer is: 24.9

**Question 31**

Not answered

Mark 0.00 out of 6.00

Estimate the maximum low frequency voltage gain for the amplifier shown at 27° C with Rc = 43.3kΩ, Re = 2.9kΩ and Rb = 0.4kΩ.




Answer:

The correct answer is: 1.000