NAME:_____ **PUID:** _____

Week 14 Quiz ANSWERS: Bipolar Transistors
ECE 305: Semiconductor Devices
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Answer the **multiple choice questions** below by choosing the **one, best answer**.

1) The high drain voltage region of a MOSFET is called the saturation region. What is the corresponding region of a BJT called?
   a) The saturation region.
   b) The forward active region.
   c) The reverse active region.
   d) The cut-off region.
   e) The beyond pinch-off region.

2) The low drain voltage region of a MOSFET is called the linear (or ohmic, or triode region) region. What is the corresponding region of a BJT called?
   a) The saturation region.
   b) The forward active region.
   c) The reverse active region.
   d) The cut-off region.
   e) The beyond pinch-off region.

3) How are the PN junctions biased in the forward active region of an NPN BJT?
   a) Emitter-base: forward biased. Base-collector: forward-biased.
   b) Emitter-base: forward biased. Base-collector: reverse-biased.
   c) Emitter-base: reverse biased. Base-collector: forward-biased.
   d) Emitter-base: reverse biased. Base-collector: reverse-biased.
   e) Emitter-base: forward biased. Base-collector: biased in breakdown.

4) How are the PN junctions biased in the forward active region of a PNP BJT?
   a) Emitter-base: forward biased. Base-collector: forward-biased.
   b) Emitter-base: forward biased. Base-collector: reverse-biased.
   c) Emitter-base: reverse biased. Base-collector: forward-biased.
   d) Emitter-base: reverse biased. Base-collector: reverse-biased.
   e) Emitter-base: forward biased. Base-collector: biased in breakdown.

5) Which of the following would be a considered good value of β_{dc} (β_F)?
   a) 0.099.
   b) 0.99.
   c) 1.5.
   d) 5.
   e) 100.

6) Which of the following would be a considered good value of α_{dc} (α_F)?

a) 0.099.
b) 0.99.
c) 1.5.
d) 5.
e) 100.

7) Which of the following would be a considered good value of γ_F?

a) 0.099.
b) 0.99.
c) 1.5.
d) 5.
e) 100.

8) Which of the following would be a considered good value of α_T?

a) 0.099.
b) 0.99.
c) 1.5.
d) 5.
e) 100.

9) Which of the following is the definition of the forward emitter injection efficiency of an **NPN** BJT?

a) $\gamma_F = J_{Ep} \big/ \left(J_{Ep} + J_{En} \right)$.
b) $\gamma_F = J_{En} \big/ \left(J_{Ep} + J_{En} \right)$.
c) $\gamma_F = J_{Cn} \big/ J_{En}$.
d) $\gamma_F = J_{Cp} \big/ J_{Ep}$.
e) $\gamma_F = 1 - J_{Cp} \big/ J_{Ep}$.

10) Which of the following is the definition of the forward emitter injection efficiency of a **PNP** BJT?

a) $\gamma_F = J_{Ep} \big/ \left(J_{Ep} + J_{En} \right)$.
b) $\gamma_F = J_{En} \big/ \left(J_{Ep} + J_{En} \right)$.
c) $\gamma_F = J_{Cn} \big/ J_{En}$.
d) $\gamma_F = J_{Cp} \big/ J_{Ep}$.
e) $\gamma_F = 1 - J_{Cp} \big/ J_{Ep}$.

11) Which of the following is the definition of the base transport factor of an **NPN** BJT?

a) $\alpha_T = J_{Ep} \Big/ \left(J_{Ep} + J_{En} \right)$.

b) $\alpha_T = J_{En} \Big/ \left(J_{Ep} + J_{En} \right)$.

c) $\alpha_T = J_{Cn} \Big/ J_{En}$ **.**

d) $\alpha_T = J_{Cp} \Big/ J_{Ep}$.

e) $\alpha_T = 1 - J_{Cp} \Big/ J_{Ep}$

12) Which of the following is the definition of the base transport factor of a **PNP** BJT?

a) $\alpha_T = J_{Ep} \Big/ \left(J_{Ep} + J_{En} \right)$.

b) $\alpha_T = J_{En} \Big/ \left(J_{Ep} + J_{En} \right)$.

c) $\alpha_T = J_{Cn} \Big/ J_{En}$.

d) $\alpha_T = J_{Cp} \Big/ J_{Ep}$ **.**

e) $\alpha_T = 1 - J_{Cp} \Big/ J_{Ep}$.