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Courses » Fundamentals of semiconductor devices

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## Unit 6 - Applications of p-n junctions and details of metal-semiconductor junction

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### Course outline

How to access the portal

Basics of semiconductor physics

Equilibrium carrier concentration

Carrier transport

p-n junction

Applications of p-n junctions and details of metal-semiconductor junction

- Application of p-n junctions
- Breakdown of junction and C-V profiling
- Introduction to Schottky junction
- Schottky

### week 5 assignment

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2019-03-06, 23:59 IST.**

1) Which of the following criteria must be true in order to get a good Ohmic contact to a semiconductor? **1 point**

- Choose a metal with a high Schottky barrier height.
- Use a lightly doped semiconductor.
- Introduce defects into the semiconductor to lower its lifetime.
- Dope the semiconductor very heavily.

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*Dope the semiconductor very heavily.*

2) Under forward bias, how does current in a Schottky diode compared to PN junction diode? **1 point**

- The SD current is much larger than the PN junction current due to majority carrier transport.
- The SD current is much larger than the PN junction current due to minority carrier transport.
- The SD current is much smaller than the PN junction current due to minority carrier transport.
- The PN junction current is much higher than SD diode current due to minority and majority carrier transport.

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*The SD current is much larger than the PN junction current due to majority carrier transport.*

3) You are given a metal semiconductor junction at room temperature in which the work function of the metal is equal to the electron affinity of the semiconductor plus  $3k_B T$  (i.e.  $\Phi_M = \chi +$  **1 point**

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basics of  
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None of the above

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*n-type*

4) In above question (Q3) what is the numerical value of  $V_{bi}$ ..?

**1 point**

0.5 eV

0 eV

1.2 eV

0.8 eV

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*0 eV*

5) Consider a switch X is made of Schottky diode and a switch Y is made of P-N junction diode, which of the following statement is true?

**1 point**

X will have large reverse current, high on current and fast transient response compared to Y.

X will have low reverse current, high on current and fast transient response compared to Y.

X will have low reverse current, high on current and slow transient response compared to Y.

None of the above

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*X will have large reverse current, high on current and fast transient response compared to Y.*

6) What is the mechanism of current transport in a Schottky diode under forward bias condition?

**1 point**

Drift and Diffusion of majority carriers

Tunneling of majority carriers

Thermionic emission of minority carriers

Thermionic emission of majority carriers.

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*Thermionic emission of majority carriers.*

7) LED is usually operated in \_\_\_\_\_ while photo-detector (with good performance i.e. good current) is operated in \_\_\_\_\_ respectively.

**1 point**

Forward bias, Forward bias

Forward bias, Reverse bias

Reverse bias, Forward bias

Reverse bias, Reverse bias

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*Forward bias, Reverse bias*

8) Which of the following is false about Zener breakdown?

**1 point**

- It requires a junction between heavily doped p and n regions i.e. p+/n+ junction
- It can occur in a junction with highly doped p side and very lightly doped n-side i.e. p+/n junction
- It occurs due to tunneling of carriers across the junction
- It occurs due to very high electric field established across the p-n junction

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*It can occur in a junction with highly doped p side and very lightly doped n-side i.e. p+/n junction*

9) P-N junction made of which of these materials give the highest avalanche breakdown voltage?

**1 point**

- Gallium arsenide
- Gallium nitride
- Beta-Gallium oxide
- Silicon carbide

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*Beta-Gallium oxide*

10) The capacitance of a p+-n junction \_\_\_\_\_ when the reverse bias across it increases while the capacitance of a n+-p junction \_\_\_\_\_ as the reverse bias across the junction decreases.

**1 point**

- Decreases, increases
- Increases, decreases
- Decreases, decreases
- Increases, increases

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*Decreases, increases*

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