

# 40 Lecture - PHY301

## Important Subjective

### What is a tunnel diode?

A tunnel diode is a type of semiconductor diode that exhibits negative resistance in its voltage-current characteristic curve.

### How does a tunnel diode work?

A tunnel diode works on the principle of quantum mechanics, where electrons can tunnel through a potential barrier without having enough energy to overcome it. This results in a negative resistance region in the diode's characteristic curve.

### What is the main advantage of a tunnel diode?

The main advantage of a tunnel diode is its high switching speed, which makes it useful in high-frequency applications such as oscillators and amplifiers.

### What is the negative resistance region in a tunnel diode's characteristic curve?

The negative resistance region in a tunnel diode's characteristic curve is a region where an increase in voltage results in a decrease in current. This is the opposite of the normal behavior of a resistor, where an increase in voltage results in an increase in current.

### What is the doping concentration of a tunnel diode?

The doping concentration of a tunnel diode is much higher than that of a normal p-n junction diode. This high doping concentration results in a very thin depletion region, which is necessary for the tunneling effect to occur.

### What is the voltage range of a tunnel diode?

The voltage range of a tunnel diode is typically between 0.1 V and 0.3 V. This is the range where the negative resistance region occurs.

### What are the applications of a tunnel diode?

Tunnel diodes are used in high-frequency applications such as oscillators, amplifiers, and microwave detectors. They are also used in digital circuits, where their high switching speed is an advantage.

How is a tunnel diode different from a regular diode?

A tunnel diode differs from a regular diode in that it exhibits a negative resistance region in its characteristic curve, whereas a regular diode does not. This negative resistance region is due to the tunneling effect, which occurs when electrons tunnel through a potential barrier.

What is the symbol of a tunnel diode?

The symbol of a tunnel diode is similar to that of a regular diode, with an arrow pointing in the direction of the forward current flow. However, the tunnel diode symbol also includes a small 'T' to indicate that it is a tunnel diode.

What is the temperature range of a tunnel diode?

The temperature range of a tunnel diode is typically between  $-50^{\circ}\text{C}$  and  $150^{\circ}\text{C}$ , depending on the specific type of diode. It is important to operate a tunnel diode within its specified temperature range to ensure proper operation.