1. Which of the following semiconductor devices emits coherent light?
a) LED
b) Phototransistor
c) LASER diode
d) Photodiode

Answer: c) LASER diode
Explanation: LASER diodes emit coherent light due to stimulated emission, unlike LEDs which emit incoherent light.

2. What is the primary mechanism responsible for light emission in an LED?
a) Spontaneous emission
b) Stimulated emission
c) Avalanche breakdown
d) Tunneling effect

Answer: a) Spontaneous emission
Explanation: LEDs emit light through spontaneous emission as a result of electron-hole recombination in the semiconductor junction.

3. Which optical detector operates based on the principle of internal photoelectric effect?
a) Photodiode
b) Phototransistor
c) Avalanche photodiode
d) PIN photodiode

Answer: a) Photodiode

Explanation: Photodiodes operate based on the internal photoelectric effect, where incident photons create electron-hole pairs in the semiconductor.

4. Which optical detector exhibits internal amplification through impact ionization?
a) Phototransistor
b) PIN photodiode
c) Avalanche photodiode
d) Photodetector

Answer: c) Avalanche photodiode
Explanation: Avalanche photodiodes utilize impact ionization to internally amplify the generated photocurrent, improving sensitivity.

5. What is the primary source of noise in a photodetector?
a) Thermal noise
b) Shot noise
c) Dark current
d) Johnson noise

Answer: b) Shot noise
Explanation: Shot noise, arising from the statistical nature of photon arrival, is the primary source of noise in photodetectors.

6. Which optical detector exhibits the fastest response time?
a) Photodiode
b) Phototransistor
c) PIN photodiode

d) Avalanche photodiode

Answer: a) Photodiode
Explanation: Photodiodes typically have the fastest response time among optical detectors due to their simple structure and direct photodetection mechanism.

7. Which optical device can act both as a light emitter and a photodetector?
a) Photodiode
b) Phototransistor
c) LED
d) Laser diode

Answer: c) LED
Explanation: LEDs can function as both light emitters and photodetectors when reverse biased, detecting incident light through the photovoltaic effect.

8. Which optical detector structure offers higher sensitivity for low light levels?
a) PIN photodiode
b) Avalanche photodiode
c) Phototransistor
d) Photodetector

Answer: b) Avalanche photodiode
Explanation: Avalanche photodiodes offer higher sensitivity for low light levels due to their internal gain mechanism via avalanche multiplication.

9. Which optical source requires optical feedback for stimulated emission?
a) LED

b) Phototransistor
c) LASER diode
d) Photodiode

Answer: c) LASER diode
Explanation: LASER diodes require optical feedback to achieve stimulated emission and generate coherent light.

10. Which optical detector exhibits a nonlinear response to incident light intensity?
a) Photodiode
b) Phototransistor
c) PIN photodiode
d) Avalanche photodiode

Answer: d) Avalanche photodiode
Explanation: Avalanche photodiodes exhibit a nonlinear response to incident light intensity due to the avalanche multiplication process, leading to internal amplification.

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