Introduction to Sensors: Quiz questions

Get a 'sense'😉 of what is involved in selecting, implementing and testing sensors

Evaluate steps to take to integrate or build a sensor, test it, do some measurements (determine accuracy, validity, reliability)

Evaluate/reflect

Apply what you learned:
- What kind of questions can be formulated regarding sensors/sensing?
- What can be used to improve an application of sensors in a test environment or prototype?
- What …?
- How …?

Quiz question 1: spot the sensor

In the picture below, there are a few possible sensors indicated. Which of them are (or could be) actual sensors?

1

2

3

4

5

a) 1, 2, 3
b) 2, 3
c) 2, 3, 4
d) 4, 5

Answer:
b) Is most probable. 4 might be a motor with a rotary encoder (which is a sensor also)

Quiz question 2: basic sensor knowledge

A sensor stores data that it collects

a) True
b) False

Answer: false
Explanation: a sensor sends its data to a system such as a PLC or computer and does usually not contain any (permanent) storage.

Quiz question 3: basic sensor knowledge

Monitoring of machines, gears and objects can be achieved by which sensor?

a) Humidity sensor
b) Proximity sensor
c) Touch sensor
d) Pressure sensor

Answer: b
Explanation: Monitoring of machines, gears and objects can be achieved by connected proximity sensors. They are widely used in industries ranging from robotics to machine tools, from measuring instruments to assembly lines, from food sector to chemical industry.

Quiz question 4: basic sensor knowledge

Can you name some advantages and disadvantages of a photoelectric sensor?

(this is an open question, lets discuss this)

Answer:
Advantages: senses all kinds of materials, long life, long sensing range, reliable, fast response time, cost rel. low, diffuse type can detect small objects, retro-reflective type can detect transparent objects, thru beam type has long range & is tolerant to dirty environment.
Disadvantages: optical: lens can get contaminated, sensing range may vary due to color and reflectivity of target, thru beam type requires transmitter (Tx) and receiver (Rx) at two separate locations, retroreflective type requires reflector in addition to Tx/Rx; this makes system installation more complex.

Quiz question 5: basic sensor application

If you would like to count products, What type of sensor would you choose?

a) Humidity sensor
b) Ultrasonic sensor
c) Touch sensor
d) Photoelectric sensor

Answer: b) and d) are both good. A touch sensor is commonly capacitive, and are for instance used in touchscreens (e.g. of your smartphone). That's not something you would choose for this application.

Quiz question 6: know the specs

VCNL4100 allows the proximity detection up to

a) 2 meter

b) 1 meters

c) 0.5 meters

d) 1.5 meters

Answer: b
Explanation: VCNL4100 expands the range of applications by introducing a high-power IR emitter that allows proximity detection up to one meter.

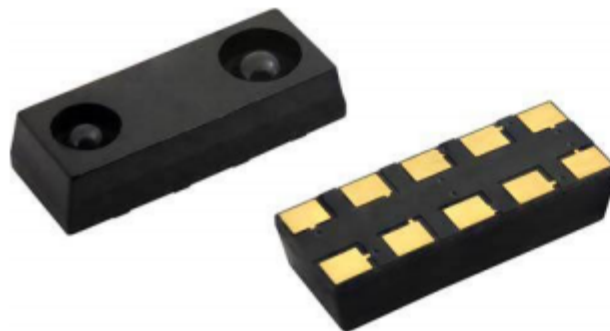Hint: look for *operating range* in the datasheet (Google for "VCNL4100 datasheet")

VISHAY.
www.vishay.com

VCNL4100

Vishay Semiconductors

High Sensitivity Long Distance Proximity and Ambient Light Sensor With I²C Interface

FEATURES
- Package type: surface-mount
- Dimensions (L x W x H in mm): 8.0 x 3.0 x 1.8
- Integrated modules: infrared emitter (IRED), ambient light sensor (ALS), proximity sensor (PS), and signal conditioning IC
- Operates ALS and PS in parallel structure
- Filtron™ technology adoption for robust background light cancellation
- Supports low transmittance (dark) lens design
- Temperature compensation: -40 °C to +85 °C
- Low power consumption I²C (SMBus compatible) interface
- Floor life: 168 h, MSL 3, according to J-STD-020

Pb-free
e4
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

DESCRIPTION
VCNL4100 integrates a high sensitivity long distance proximity sensor (PS), ambient light sensor (ALS), and 940 nm IRED into one small package. It incorporates

Quiz question 7: know the specs

Which protocol is used by the VCNL4100 proximity sensor?

a) CAN
b) SPI
c) IO-link
d) I^{2}C

Answer: d
Explanation: Microcontroller communication is via I^{2}C (I *square* C), where the host can set measurement parameters and request results. If desired, programmable threshold allow the VCNL4100 to interrupt the host once threshold values are crossed, thereby minimizing device polling.

Hint: use the the datasheet
(Google for "VCNL4100 datasheet")

Quiz question 8: know the specs

Does the VCNL4100 proximity sensor contain a temperature sensor?

a) True
b) False

Answer: a
A built-in temperature sensor is used by the signal processing circuit to provide stable outputs across the temperature range -40 C to +85 C.

Hint: use the the datasheet
(Google for "VCNL4100 datasheet")

Quiz question 9: advanced application

Which factors can influence further integration of sensors on the shop floor?

This is an **open question**. Let's discuss this.

Possible answers:
- Increasing amount of information sensors can collect and share.
- Application of RFID sensor technology used in logistics operations improves identification of materials and products, e.g. to allow mass-customization.
- Location sensors allow for (realtime) traffic flow analysis and further optimization of production facilities and logistics
- Smart sensor networks allow for greater independent platforms (e.g. intelligent robots)
- This is not conclusive: think of others!