**Script**

Good afternoon, Prof Ravi, Prof Maha and my fellow classmates. Today I will be covering the topic of smoke detectors. The contents I will covering are the 2 types of smoke detectors for home use and how do they work. Then I will compare on these 2 detectors and lastly talk about the MQ2 gas detector which will be highly relevant to us in this module.

I will be covering the photoelectric smoke detector, ionization smoke detector and lastly the MQ2 gas sensor.

Firstly, the photoelectric smoke detector consists of an infrared emitter that emits an infrared ray and there is an infrared sensor that is place such that there is not direct incidence of infrared ray into the infrared sensor. Thus, under normal condition, there will not be any infrared light going into the infrared sensor. However, under the presence of smoke, the infrared light will be scattered due to the presence of steam in smoke. Hence there will be some infrared light entering the infrared sensor. Then infrared sensor will trigger the alarm as it reads a value beyond a certain threshold.

Next, the ionization smoke detector consists of a battery usually a 9V battery that is connected to 2 metal plates and generating electric field. There is also some radioactive matter that is emitting alpha particles directed between the 2 plates. Under normal conditions, these alpha particles hit the air molecules between the 2 plates, and causes air molecules to ionize to ions. Due to the charge of these ions, these ions will flow upwards or downwards depending on the charge and this sets up a current. However, under the presence of smoke, current flow is disrupted since the ions will often lose their charge to the smoke. Thus, we can use this current dip, to sound the alarm as the current dip below a certain point.

Comparing these 2 smoke alarms based on response rate, ionization smoke alarms tend to respond faster to the smoke produced by flaming fires than photoelectric smoke alarms. On the other hand, Photoelectric smoke alarms tend to respond faster to the smoke produced by smoldering fires compared to ionization smoke alarms. Smoldering fire is type of fire that is burning slowly with smoke but no flame. Usually most the fire starts off as a smoldering fire which is why photoelectric smoke alarms are often faster than ionization smoke alarms.

The ionization smoke alarms are also notorious for false alarm. It can be triggered easily by say a burnt toast or the steam coming from the shower. However, the best smoke alarms use both detectors in order to maximize the smoke alarm’s response rate at detecting smoke as the rate of response still greatly depends on the type of fire.

Lastly, I would like to talk about the MQ2 gas sensor. It is actually a gas sensor that can detect combustible gas as well as smoke. However, I will only be focusing on the smoke detection aspect of it. The sensor contains tin dioxide which when heated, oxygen is adsorbed onto the surface due to the presence of donor electrons in tin dioxide. This prevents current flowing through the sensor. However, under the presence of reducing gas in smoke, the amount of adsorbed oxygen on the tin dioxide will decrease, which in turn causes an increase in current flow through the sensor.

The MQ2 is configured such that the output voltage increases with the concentration of these reducing gas. Thus, we can use an Arduino to set a threshold for a certain voltage level, such that when that voltage level is reached, we will activate the alarm.

In my demonstration, I have a RGB LED, a buzzer and a makeshift warning light to work as the alarm and lastly the MQ2 sensor itself.

When there isn’t any smoke, the alarm stays silent. However, under the presence of smoke, the alarm will sound. Moreover, we can adjust the sensitivity of the sensor based on the voltage which allows us to calibrate the sensor to prevent any false alarm.

In conclusion, I have mentioned how photelectric and ionization smoke detectors work. There is no best home smoke detector as it greatly depends on the type of fire. The best alarm consists of both the photoelectric and ionization smoke detection technology. I have also shown you how easy it is to implement a MQ2 gas sensor as a smoke alarm.

Thank you!