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MATRIC No: 18/ENGG08/005

DEPT: BIOMEDICAL ENGINEERING

BME 311 ASSIGNMENT

1.) SENSORS FOR BIOMEDICAL APPLICATIONS.

A sensor (also called a transducer, meter, detector or gage) is an electronic instrument that has the ability measure output which might be in the form of optical, electrical, chemical or mechanical signals (even biological signals).

For Biomedical applications, sensors are classified into physical, chemical and bio sensors. Physical sensors used to measure body temperature, blood pressure and others, Chemical sensors can be used to ~~measure~~ detect the concentration of body liquid such as pH value and others and Bio sensors is used to sense enzymes, DNA, RNA, etc.

THE APPLICATIONS AND EXAMPLES:

In the field of medicine, biomedical sensors can be used to gain biological data on the state of a particular biological system. eg before a surgical operation, a doctor requires the body temperature and blood pressure of a patient and hence, employs the use of a blood pressure sensor and clinical thermometer.

Another application, is in the monitoring of heart frequency after an operation.

Further more, ptt sensors can be used to detect atmospheric conditions to improve living environment.

~~SOME EXAMPLES OF~~ Some examples of these sensors are: Oxygen sensor for blood, Heart sound sensor, Fetus heart sound sensor, blood flow sensor, respiration sensor, Blood pressure sensor, etc.

ACTUATORS FOR BIOMEDICAL APPLICATIONS

An actuator is a device that receives control input (electrical signal) and generates a change in the physical system by producing force, heat, motion amongst others.

THE APPLICATIONS AND EXAMPLES:

Smart actuators can be applied in biomedical field e.g. in a drug delivery system (using a controlled micropump) that requires drugs to be supplied at particular times.

Also, microgrippers that are actuated can aid tumor removal.

Another application, is the use of piezo electrical actuators to drive a motor for making a cut or drilling a hole during surgery.

It should be noted that smart actuators are an integration of various elements such as sensors, processors, and communicators within an actuator element. In the field of biomedical engineering they are used in changing over / transforming different types of energy.

Some examples of smart actuators in biomedical application include: Nitinol, Ventilators, smart pill, laser techniques, dialysis machine, amongst others.

2) Compon

2) COMPONENTS OF A BASIC MEASURING INSTRUMENT.

These include:

- (i) Primary sensing element
 - (ii) Variable-Conversion element
 - (iii) Variable-Manipulation element.
- Others are!

(iv) Data-transmission element

(v) Data-presentation element

(vi) Data storage/feedback element

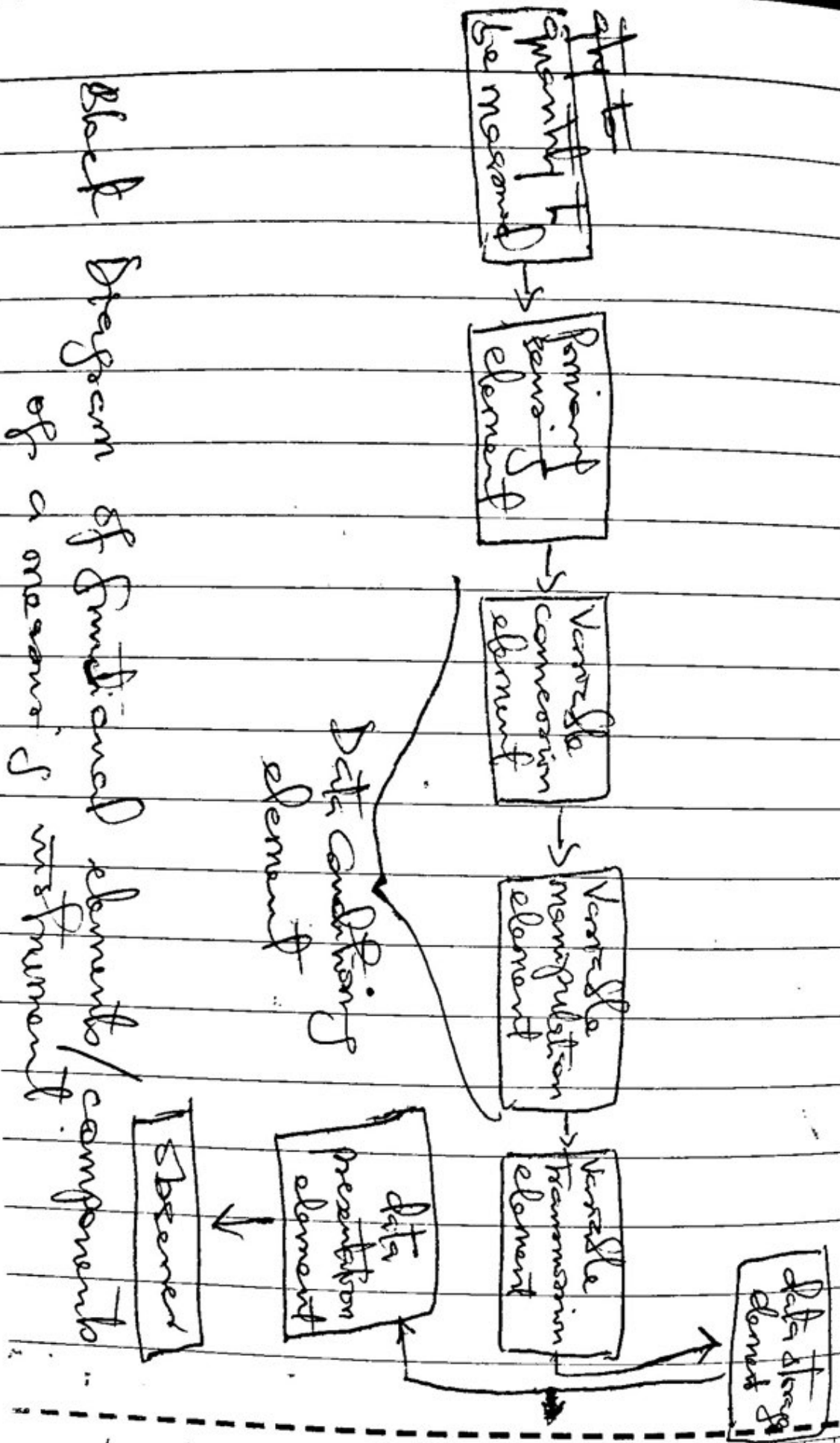
~~(vii) Signal conditioning element~~

(viii) Signal conditioning element

(i) Primary sensing element: This is the element that initially receives energy from the measured medium and generates an output depending in some on the quantity being measured. The output is a physical quantity such as voltage or displacement.

(ii) Data-presentation element

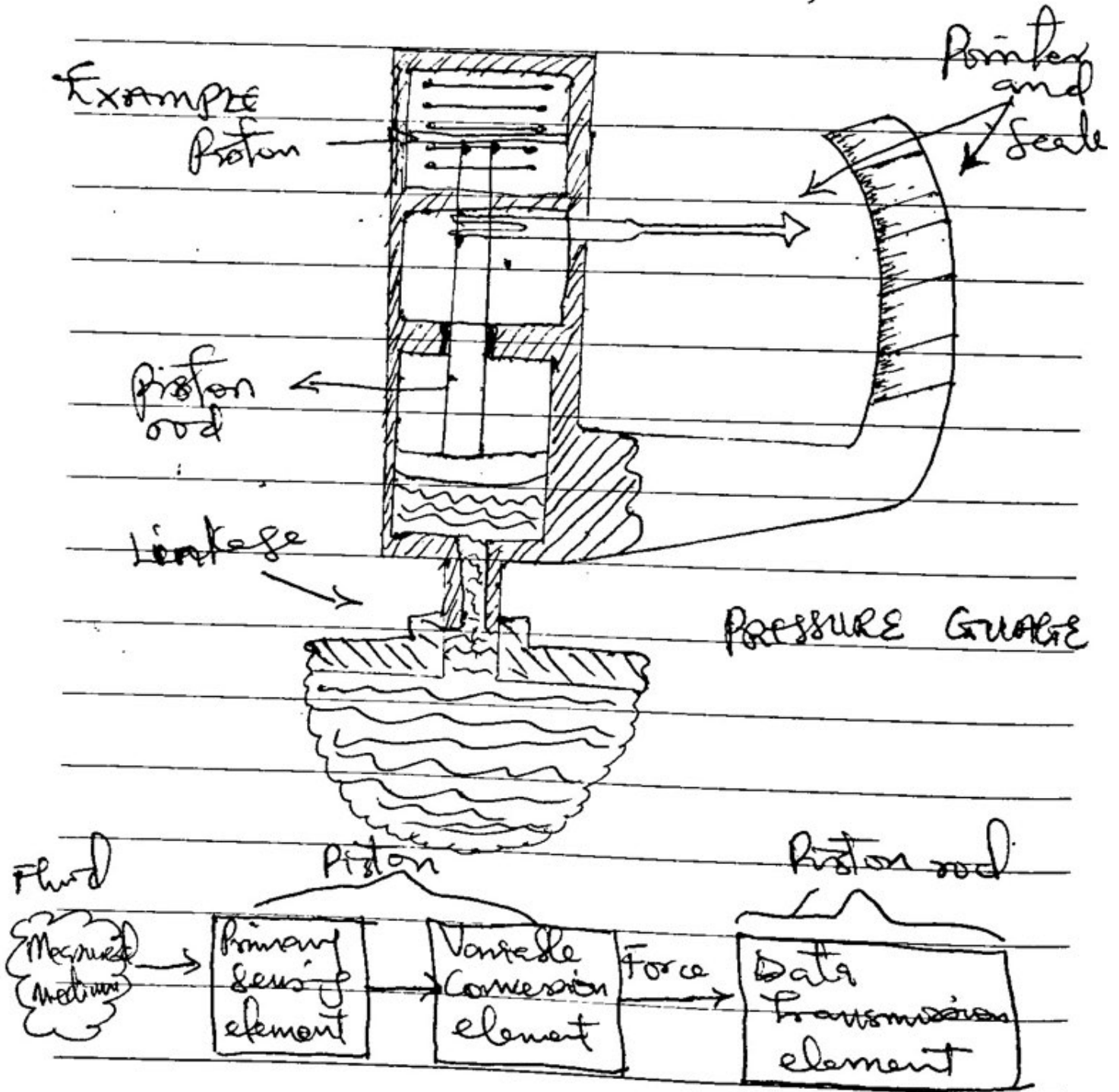
If the data about the measured quantity is to be communicated to a human being for monitoring, control, or analysis, it must be interpretable by one of the human senses. Hence, data presentation could be analog or digital.

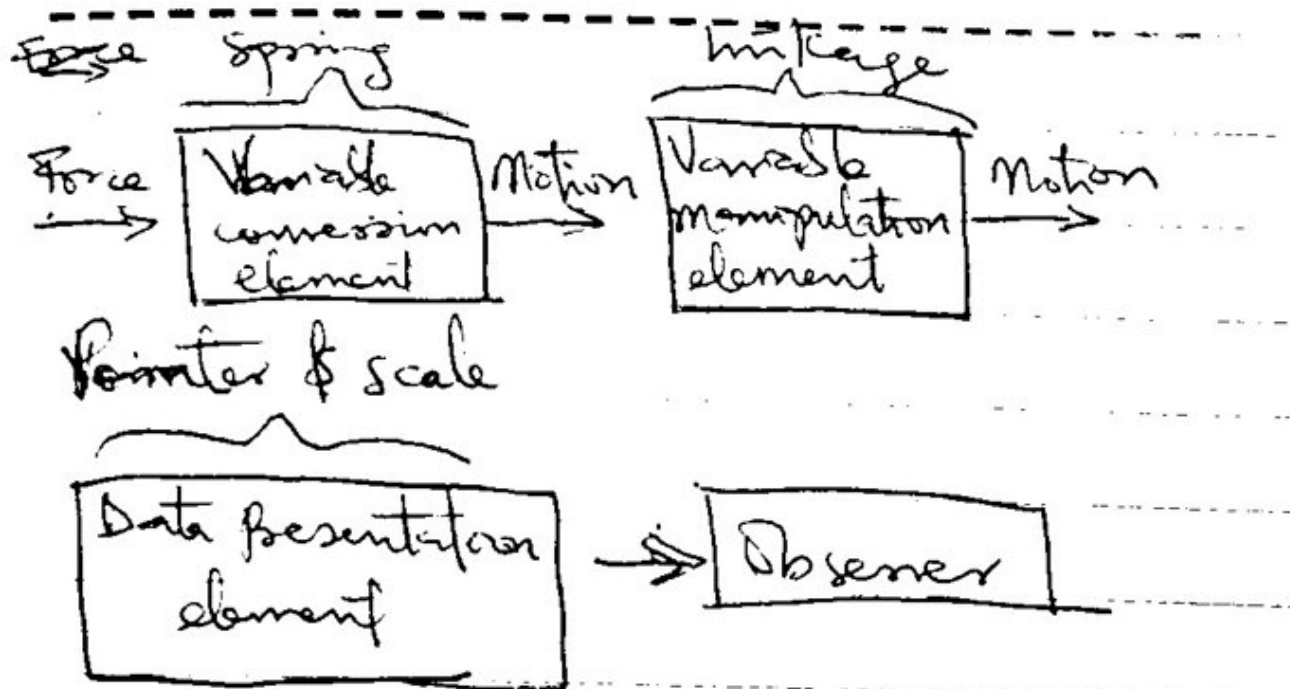


Block Diagram of Functional elements/ components of a message's instrument

(v.) Data Storage / Playback Element

Some applications need a distinct data storage / playback which can easily recreate the stored data upon command



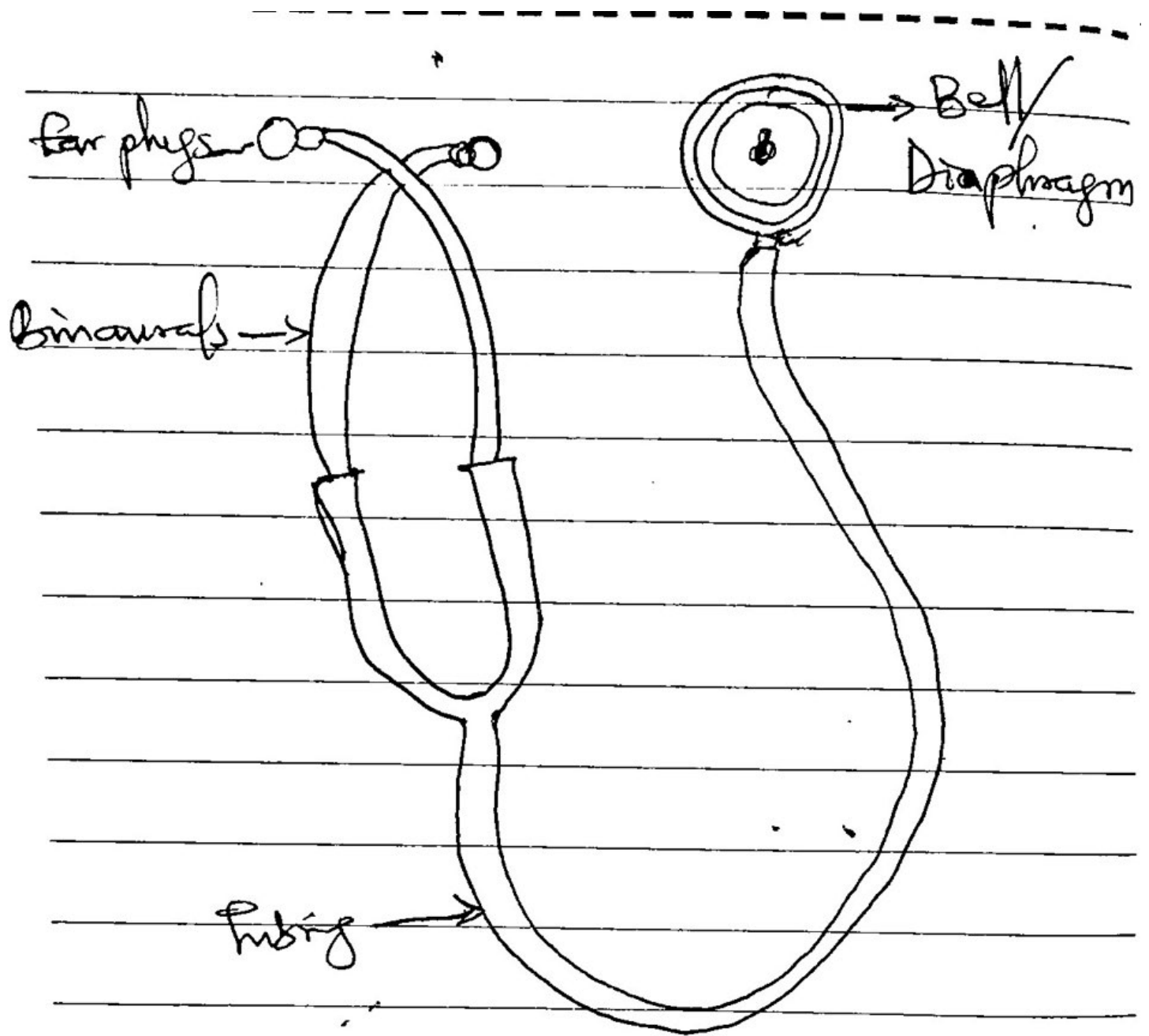


3.) CASE STUDIES OF MEDICAL MEASUREMENT INSTRUMENTS.

BRIEF CASE STUDY OF A STETHOSCOPE.

A stethoscope is a medical instrument that is used to listen to sounds produced in the body, especially those that emanate from the heart and lungs. Stethoscopes are made up of two flexible rubber tubes running from a valve to the earpieces. The valve also connects the tubes to the chest piece.

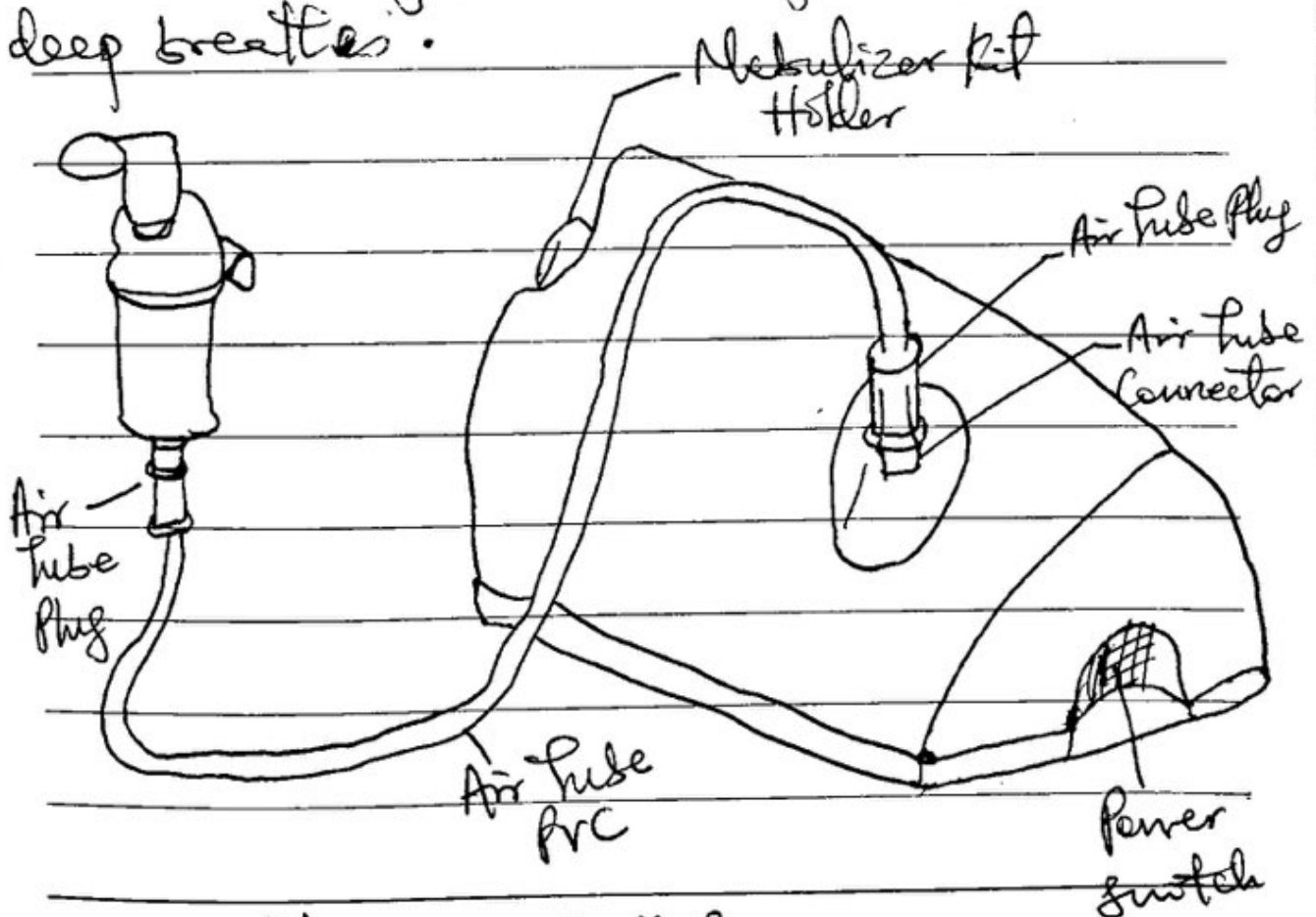
In using the stethoscope, a doctor or medical practitioner places the instrument on the chest of the patient after which some sort of vibration will occur as a result of the sound waves generated from the patient's body. The diaphragm then picks up the vibration which is sent across through the tube and then the earpiece (to enable the doctor hear the sound).



STETHOSCOPE

BRIEF CASE STUDY OF A NEBULIZER

A nebulizer is a small machine that can turn liquid medicine into a mist. It is usually used by patients with asthma or other lung diseases. The patient sits with the machine and breathes in slowly through a connected mouthpiece. It takes 10 to 15 minutes for the medicine to go into the lungs, so the patient takes deep breathes.



NEBULIZER KIT