

**Question One**

**[10 Marks]**

A) Define; Isotopes; Isotopes are atoms with the same number of protons but different number of neutrons. (2)

Sound; It is a mechanical wave produced by vibrating bodies, with velocity in air at 20 °C, about 331 m/s (3)

B) Discuss the Surface Potentials (5)

Electric fields associated with the activities in cells extend all the way to the surface of the animal body. Thus, along the surface of the skin, we can measure electric potentials representing the collective cell activities associated with certain processes in the body. Based on this effect, clinical techniques have been developed to obtain, from the skin surface, information about the activities of the heart (electrocardiography) ECG, the brain (electroencephalography) EEG. And electromyography (EMG).

**Question Two**

**[10 Marks]**

A) Compare between sound and light waves. (In table please). (5)

		Sound waves	Light waves
1	Type of wave	Mechanical	Electromagnetic
2	speed	331 m/s in air	$3 \times 10^8$ m/s
3	Medium	Required to propagate	Not Required to propagate
4	Wave propagation	As compress extraction	As sine wave
5	Medical using	Ultrasound	Laser

B) Calculate the force on perpendicular shoulder, required to topple a person of mass 80 kg, standing with his feet spread 0.8 m apart & the foot shoulder distance 1.5 m. Assume the person does not slide and the weight of the person is equally distributed on both feet. (5)

$$F_a = (mg \times a) / t = 80 \times 9.8 \times 0.4 / 1.5 = 209 \text{ N}$$

**Question Three**

**[10 Marks]**

A) Discuss the cut-off method for blood pressure measurements.

In this technique, a cuff containing an inflatable balloon is placed tightly around the upper arm. The balloon is inflated with a bulb, and the pressure in the balloon is monitored by a pressure gauge. The observer then allows the pressure in the balloon to fall slowly by releasing some of the air.

As the pressure drops, she listens with a stethoscope placed over the artery downstream from the cuff. No sound is heard until the pressure in the balloon decreases to the systolic pressure. Just below this point, the flow is turbulent and is accompanied by a characteristic sound. The pressure recorded at the onset of sound is the systolic blood pressure. As the pressure in the balloon drops further, the artery expands to its normal size, the flow becomes laminar, and the noise disappears. The pressure at which the sound begins to fade is taken as the diastolic pressure.

B) Calculate the pressure variation corresponding to a sound intensity of  $10^{-16} \text{ W/cm}^2$ . (The density of air at 0°C and 1 atm pressure is  $1.29 \times 10^{-3} \text{ g/cm}^3$ ; for the speed of sound use the value  $3.3 \times 10^4 \text{ cm/sec}$ ).

$$I = 10^{-16} \text{ W/cm}^2 \quad P = ?? \quad 1.29 \times 10^{-3} \text{ g/cm}^3 \quad v = 3.3 \times 10^4 \text{ cm/s} \quad I = \frac{P_s^2}{2\rho v}$$

$$P_s = \sqrt{2\rho v I} = \sqrt{2 \times 1.29 \times 10^{-3} \times 3.3 \times 10^4 \times 10^{-16}} = 9.2 \times 10^{-8} \text{ dy/cm}^2$$

**Question Four**

[10 Marks]

A) What are the defects of eye vision and how it can be corrected...?

- 1- Myopia requires a diverging lens to compensate for the excess refraction in the eye.
- 2- Hyperopia also presbyopia is corrected by a converging lens, which adds to the focusing power of the eye.
- 3- The uneven corneal curvature in astigmatism is compensated for by a cylindrical lens, which focuses light along one axis but not along the other.

(B) Explain the radiotherapy methods...?

- 1-Radiation can be used therapeutically. In the treatment of certain types of cancer, an ampule containing radioactive material such as radium or cobalt 60 is implanted near the cancerous growth.
- 2- Certain elements introduced into the body by injection or by mouth tend to concentrate in specific organs. This phenomenon is used to advantage in radiation therapy. Iodine 131 (half-life, 8 days) accumulates in the thyroid and is given for the treatment of hyperthyroidism.
- 3- An externally applied beam of gamma rays or X-rays can also be used to destroy cancerous tumors. The advantage here is that the treatment is administered without surgery.

**Question Five** *Please answer true or false*

(2 X 5)

[10 Marks]

- a) The focusing of the eye (accommodation) is controlled by the eye lens. ✓
- b) The magnitude of the impulsive force is proportional to the collision time. ✗
- c) Most skeletal muscles in the body arrangement provides for greater speed of the limbs. ✓
- d) Half-life is the time interval for all the original radionuclei to undergo 50% transmutation. ✓
- e) The normal diastolic pressure is about 120 mm Hg and the systolic pressure is about 80 mm Hg. ✗

**Question Six** *Please choose the correct answer*

(2 X 5)

[10 Marks]

1. Inside the axon, the positive ions are mostly : a) Potassium ions
2. The magnitude of the frictional force depends on; d) a & b
3. The decibel rating of the  $1.0 \times 10^{-7} \text{ W/cm}^2$  intensity of sound; c) 90 dB
4. In action potential the volte decreases to about: b) -90 mV
5. Person has 1.8 m tall standing 1.5 m from the eye. then the height of the full image at the retina about; c) 1.79 cm