

Question One

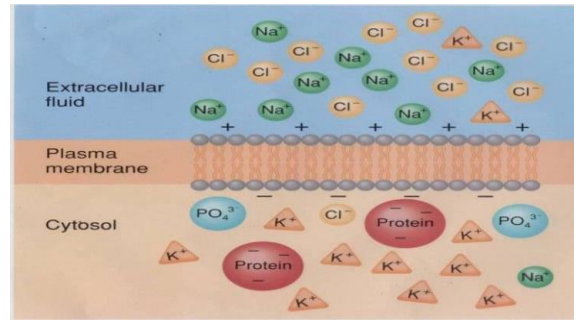
[10 Marks]

A) Define; Atomic mass number – Light.

Atomic mass; is the total number of neutrons plus the number of protons inside the nucleus

B) Explain the Electrical Potentials in the Axon...?

The inside of the axon is filled with an ionic fluid that is separated from the surrounding body fluid by a thin membrane (Fig.). The external fluid is similar to sea water. Its ionic solutes are mostly positive sodium ions and negative chlorine ions. Inside the axon, the positive ions are mostly potassium ions, and the negative ions are mostly large negatively charged organic molecules.



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In the resting condition, when the axon is not conducting an electrical pulse, the axon membrane is highly permeable to potassium and only slightly permeable to sodium ions. The membrane is impermeable to the large organic ions.

Thus, while sodium ions cannot easily leak in, potassium ions can certainly leak out of the axon. However, as the potassium ions leak out of the axon, they leave behind the large negative ions, which cannot follow them through the membrane. As a result, a negative potential is produced inside the axon with respect to the outside.

Question Two

[10 Marks]

A) What are the types of neurons...?

Neurons divided into three classes: sensory neurons, motor neurons, and interneurons.

B) Person 1.8 m tall standing 1.5 m from the eye. What is the height of the full image at the retina?

$$\text{Height of image} = 180 \times 1.5 / 150.5 = 1.79 \text{ cm}$$

Question Three

[10 Marks]

A) Discusses the defects of eye vision and its corrections.

The common defects in vision of the eye are myopia, hyperopia, astigmatism, and presbyopia. The relaxed normal eye focuses parallel light onto the retina.

- 1- In the myopic eye the lens system focuses the parallel light in front of the retina. This misfocusing is usually caused by an elongated eyeball or an excessive curvature of the cornea.
- 2- In hyperopia the problem is reversed. Parallel light is focused behind the retina. The problem here is caused by an eyeball that is shorter than normal or by the inadequate focusing power of the eye. Hyperopia is, thus, similar to presbyopia.
- 3- Astigmatism is a defect caused by a nonspherical cornea. One of the lines is always out of focus, resulting in distorted vision.

All three of these defects can be corrected by lenses placed in front of the eye. Myopia requires a diverging lens to compensate for the excess refraction in the eye. Hyperopia is corrected by a converging lens, which adds to the focusing power of the eye.

The uneven corneal curvature in astigmatism is compensated for by a cylindrical lens.

B) Excited atom has energies different between initial & the final state 0.663×10^{-18} J. What is their emitted photon frequency (Planck's constant = 6.63×10^{-34} J.sec)

$$f = \frac{\text{Energy of photon}}{\text{Planck constant}} = \frac{E_i - E_f}{h} = 0.663 \times 10^{-18} \text{ J} / 6.63 \times 10^{-34} \text{ J.sec} = 10^{15} \text{ J}$$

Question Four

[10 Marks]

A) What are methods of radioactive decay...?

radioactive decay by three categories:

- (1) Alpha (α) particles, which are high-speed helium nuclei ($2z + 2N$).
- (2) Beta (β) particles, which are very high-speed electrons (e).
- (3) Gamma (γ) rays, which are highly energetic photons.

(B) Explain the ionizing radiation applications in medicine.

1- X ray can be used in medical imaging.

2- Ionizing 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.

3- 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.

4- 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 cornea. X
- b) Photon emitted from atoms in an excited level is called spontaneous emission. ✓
- c) The rate at which nucleic acids are manufactured by the cell is evaluated by ^{15}N . X
- d) Half-life is the time interval for all the original radionuclei to undergo transmutation. X
- e) Radioactive isotopes can be produced bombarding certain stable elements with another element. X

Question Six *Please choose the correct answer*

(2 X 5)

[10 Marks]

1. Inside the axon, the negativities ions are mostly :
a) Potassium ions b) Chlorine ions **c) Charged organic molecules** d) Sodium ions
2. The Chromium -52 atom, contain 24 electrons, the number of neutrons in the nucleus will be;
a) 24 b) 26 **c) 28** d) 30
3. Only the ----- radioactive elements occur naturally in the Earth's crust.
a) Long-lived b) Short-lived c) Uranium d) Radium
4. In action potential the volte decreases to about:
a) 30 mV **b) -90 mV** c) -70 mV d) 40 mV
5. The squid, is preferred to obtained information about signal transmission due to:
a) Larger neuron diameter b) Highly sensitive axon **c) Larger axon diameter**
d) Smaller neuron diameter