

1964:

In normal metabolism, the glucose concentration of the blood tends to remain constant (within a range of 80 to 120 milligrams per hundred milliliters). Discuss the role of each of the following in maintaining this homeostatic condition:

- the kidneys
- the islands of Langerhans
- the pituitary gland

1966:

Irritability of responsiveness to stimuli is a common characteristic of living organisms. Among many others these responses include:

- Geotropic responses in plants
- Simple reflex responses in animals

Discuss each of these responses. Your answer should include a description of:

- the responses
- an experiment which will demonstrate the responses
- the mechanisms involved in the responses

1975:

The immune response of organisms involves antigens, antibodies, and other factors. Describe the immune response and discuss its role in three of the following phenomena:

- blood transfusions
- Rh incompatibility
- tissue transplants

1984:

Discuss the sources and actions of each of the following pairs of hormones in humans and describe the feedback mechanisms that control their release.

- Insulin..glucagon
- Parathyroid hormone..calcitonin
- Thyrotropin (TSH) ..thyroxine ( $T_4$ )

1986:

Beginning at the presynaptic membrane of the neuromuscular junction, describe the physical and biochemical events involved in the contraction of a skeletal muscle fiber. Include the structure of the fiber in your discussion.

1992:

Biological recognition is important in many processes at the molecular, cellular, and organismal levels. Select three of the following, and for each of the three that you have chosen, explain how the process of recognition occurs and give an example.

- Neurotransmitters are recognized in the synapse.
- Antigens trigger antibody responses.
- Nucleic acids are complementary.
- Target cells respond to specific hormones.

1993: Many physiological changes occur during exercise.

- Design a controlled experiment to test the hypothesis that an exercise session causes short-term increases in heart rate and breathing rate in humans.
- Explain how at least three organ systems are affected by this increased physical activity **and discuss interactions** among these systems.

1996:

Structure and function are related in the various organ systems of animals.

Select two of the following four organ systems in vertebrates:

- respiratory
- digestive
- excretory
- nervous

For each of the two systems you choose, discuss the structure and function of two adaptations that aid in the transport or exchange of molecules (or ions). Be sure to related structure to function in each example.

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