Chapter 1 Basic Concepts in the Biology of Aging

Biogerontology: The Study of Biological Aging

1-1 Biogerontology is defined as:

(a) the scientific investigation of the biological processes that occur inside living things as they age.

(b) the study of aging and its associated problems.

(c) the integration of research from fields of biophysics, genetics, evolutionary biology, medicine, and gerontology.

(d) the scientific investigation of the diseases of aging.

1-2 *True or false:* Gerontology is defined as the study of human aging and the problems associated with aging.

1-3 Prior to the beginning of the twentieth century, the primary cause of death in human populations was:

(a) infant mortality.

(b) infectious diseases.

(c) cancer.

(d) heart disease.

1-4 The creation of which two professional societies marked the beginning of organized aging research in the United States?

(a) National Institutes of Health (NIH) and Gerontological Society of America

(b) American Geriatrics Society and National Institutes of Health (NIH)

(c) Gerontological Society of America and American Geriatrics Society

(d) National Institute on Aging (NIA) and American Geriatrics Society

1-5 *Finish the sentence:* Longevity is _____.

1-6 What was the primary reason that the sciences paid so little attention to the mechanisms of aging and longevity prior to the 1930s?

(a) The government did not fund research before 1950.

(b) There were no evolutionary theories supporting the rise of aging in the population.

(c) Aging was an unimportant problem for biologists, because humans had relatively short life spans.

(d) The science of genetics had not yet been established.

1-7 Choose the best definition of life span.

(a) the potential maximum life span of an individual of a species

(b) total length of life of an individual

(c) average length of life in a population

(d) average length of life of the longest lived 10% in a population

1-8 *True or false:* The branch of medicine that deals with the problems and diseases of old age and aging people is called geriatrics.

1-9 The institute within the National Institutes of Health that is responsible for providing funding for aging research is the:

(a) Center for Aging Research.

(b) Gerontological Society of America.

(c) American Geriatrics Society.

(d) National Institute on Aging.

1-10 *True or false:* Wild animals cannot be used as models for aging research because aging does not occur in the wild.

Definitions of Biological Aging

1-11 A definition of aging such as “biological aging is characterized by an increase in mortality rate” is most useful for:

(a) small laboratory animal populations.

(b) large human populations.

(c) wild animal populations.

(d) individuals.

1-12 *True or false:* Genes regulate the aging process.

1-13 What is/are the limitation(s) of functional-based and mortality-based aging definitions?

(a) Neither addresses aging at a cellular level.

(b) Neither addresses aging of a population.

(c) Neither addresses aging events that occur prior to maturation.

(d) Both a and c are correct.

1-14 The stage of the life span during which functional change is generally positive is defined as:

(a) maturity.

(b) senescence.

(c) development.

(d) puberty.

1-15 What characteristic marks the transition from maturity to senescence?

(a) The organism or molecule can no longer reproduce.

(b) The organism or molecule no longer has the capacity to resist the force of entropy.

(c) The organism loses 50% of its function compared with the development stage.

(d) The organism or molecule no longer has the capacity to resist the force of enthalpy.

1-16 *Fill in the blank:* _____ is the post-reproductive period and manifests as negative changes in vitality and function.

1-17 Choose the best statement concerning aging and disease.

(a) Disease occurs in every species that reaches a fixed size.

(b) The process of biological aging abides by the normal laws of physiology; disease does not.

(c) Aging, unlike disease, has been observed only during the past 200 years.

(d) Aging occurs only in animate objects.

1-18 Degradation of the matter in the universe to an ultimate state of inert uniformity is defined as:

(a) enthalpy.

(b) aging.

(c) entropy.

(d) none of the above.

1-19 *True or false:* Definitions of biological aging that are based on mortality are particularly useful in the science of biodemography.

1-20 A period during which function remains at optimal levels or slowly declines defines which stage of aging?

(a) senescence

(b) development

(c) puberty

(d) maturity

A Definition of Aging for the Biology of Aging

1-21 Concerning the definition of aging developed for this book, choose the best answer:

(a) aging is random

(b) aging occurs only to organisms

(c) aging is a purposefully genetic program

(d) aging is intrinsic; it is not affected by the environment

How Biogerontologists Study Aging: The Use of Laboratory Organisms in Human Aging Research

1-22 The evolutionary sequence of events involved in the development of a species or groups of organisms is known as:

(a) genetics.

(b) phenotyping.

(c) phylogeny.

(d) genotyping.

1-23 The sum of all biological events occurring over an organism's life span is called:

(a) life history.

(b) senescence.

(c) aging.

(d) longevity.

1-24 Which of the four basic cell systems is most widely used in biogerontology?

(a) primary cell cultures

(b) replicating cell cultures

(c) cell lines

(d) stem cells

1-25 *True or false:* Primary cell cultures are undifferentiated cells removed directly from their *in vivo* location and maintained in an *in vitro* environment.

1-26 *Fill in the blank:* _____ are mitotic cells that do not have a finite life span; they either are derived from cancerous tumors or are normal cells that have had their internal biochemistry altered in order to make them immortal.

1-27 Stem cells exist in two forms, embryonic and adult. Embryonic stem cells are:

(a) totipotent.

(b) pluripotent.

(c) multipotent.

(d) Both a and b are correct.

1-28 Organisms that have a fixed number of cells when they reach maturity are referred to as:

(a) eutelic.

(b) pluripotent.

(c) rangifera.

(d) sulcipes.

1-29 *True or false:* Without a sophisticated vascular, neural, or endocrine system, yeast tend to be good models for studying environmental factors that affect aging.

1-30 Which of the following is *not* a reason that *C. elegans* makes a good model for the study of aging?

(a) It has a fixed number of cells.

(b) It has a short life span.

(c) It has many different types of cells.

(d) Its genome is compact.

1-31 Which type of organisms or cells may serve as a good model for extended longevity?

(a) insects

(b) aquatic invertebrates

(c) mice and rats

(d) stem cells

1-32 Which insect has found the greatest use in biogerontology?

(a) *S. cerevisiae*

(b) *D. melanogaster*

(c) *C. elegans*

(d) *M. musculus*

1-33 *True or false:* The cost of housing nonhuman primates limits their use in biogerontology.

1-34 Which type of nonhuman primate is the most widely used in biogerontology?

(a) lemurs

(b) marmosets

(c) monkeys

(d) great apes

1.35 *True or false:* Regulations governing the care and treatment of nonhuman primates that are used in research do not differ significantly from those for other types of animals, such as mice and rats.

1-36 The gene involved in Werner syndrome, *wrn*, seems to affect:

(a) intracellular signaling.

(b) DNA repair and maintenance.

(c) membrane fluidity.

(d.) reproductive hormones.

How Biogerontologists Study Aging: Comparative Biogerontology

1-37 The study of wild species that show resistance to aging and extended longevity in environments that are otherwise conducive to short life spans is called:

(a) demography.

(b) comparative biogerontology.

(c) comparative genetics.

(d) biogerontological demography.

1-38 *True or false:* Superior homeostatic control provides a survival advantage that can lead to greater longevity over evolutionary time.

1-39 *Choose the correct answer:* Brain size may predict longevity *between / within* taxonomic groups.

1-40 Which type of animals tend to have high metabolic rates and long life span compared with animals of similar body size?

(a) marsupials

(b) fish

(c) nonhuman primates

(d) birds

1-41 Which two factors most likely contributed to the extended longevity seen in some mammals?

(a) flight

(b) placentas

(c) expanded foraging areas

(d) fur

1-42 Eutherians are:

(a) animals that separate specialized tasks and share care of the young.

(b) animals with placentas.

(c) flightless birds.

(d) upright-walking mammals.

1-43 Some aquatic species, such as sea anemones, live more than 150 years. What factor appears to be closely associated with their extended longevity?

(a) unlimited food source

(b) lack of predation

(c) continual growth

(d) larger range of environmental temperatures and ability to survive in many different types of environmental conditions

1-44 What factor mostly likely set nonhuman primates on a different longevity trajectory from other mammals?

(a) brain size

(b) upright walking

(c) body size

(d) intelligence

1-45 *True or false:* A kilojoule is the amount of energy needed to heat 1 liter of water 1 degree centigrade.

1-46 Of the animals listed below, with similar body size, which one would you expect to have the lowest metabolic rate?

(a) gray squirrel

(b) rabbit

(c) barn owl

(d) Chihuahua

1-47 *True or false:* Nonsocial animals tend to live longer than social animals.

1-48 *Fill in the blank:* The different life spans of the several types of honeybees are closely linked to their _____ schedule.

1-49 *True or false:* The rate-of-living theory of aging suggested that life span is related to metabolic rate.

Answers:

1-1 (a)

1-2 True

1-3 (b)

1-4 (c)

1-5 the potential maximum life span that an individual of a particular species can obtain.

1-6 (c)

1-7 (b)

1-8 True

1-9 (d)

1-10 False

1-11 (b)

1-12 False

1-13 (d)

1-14 (c)

1-15 (b)

1-16 Senescence

1-17 (b)

1-18 (c)

1-19 True

1-20 (d)

1-21 (a)

1-22 (c)

1-23 (a)

1-24 (b)

1-25 False

1-26 Cell lines

1-27 (d)

1-28 (a)

1-29 True

1-30 (c)

1-31 (b)

1-32 (b)

1-33 True

1-34 (c)

1-35 False

1-36 (b)

1-37 (b)

1-38 True

1-39 within

1-40 (d)

1-41 (a) and (d)

1-42 (b)

1-43 (c)

1-44 (d)

1-45 False

1-46 (c)

1-47 False

1-48 reproductive

1-49 True