**Chapter 1 Introduction to Physiological Principles**

1) Which Porcelain crabs, those living in cool temperate regions or those living in hot tropical regions, appear to be more vulnerable to global warming and why?

A) Species living in cool temperate regions appear to be more vulnerable because it is harder to adapt to heat than to cold.

B) Species living in cool temperate regions appear to be more vulnerable because these species require cold temperatures to reproduce.

C) Species living in hot regions appear to be more vulnerable because they are living at the edge of their thermal tolerance range and likely have limited ability to adjust their thermal tolerance.

D) Species living in hot regions appear to be less vulnerable because they are already adapted to hot environments.

Answer: C

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2)

Animal physiology is the study of

A)

how structures allow animals to function.

B)

the chemical reactions found in animals.

C)

the genetic lineage seen in the evolution of animals.

D)

migratory patterns of animals.

Answer:

A

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3)

One theme in physiology states that the physiology of an animal is part of its \_\_\_\_\_\_\_\_\_\_, which is based on its \_\_\_\_\_\_\_\_\_\_ and environmental influences.

A)

genotype; ancestry

B)

phenotype; genotype

C)

ancestry; phenotype

D)

phenotype; diet

Answer:

B

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4)

Which of the following statements is true about phenotype?

A)

After an initial development period, phenotype of an organism is static.

B)

Phenotype is affected by organization at the biochemical level only.

C)

Altering phenotype allows an organism to change its physiological response.

D)

Genotype may influence phenotype, but phenotype never affects genotype.

Answer:

C

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5)

One approach, known as \_\_\_\_\_\_\_\_\_\_, says that we can learn about one level of organization by studying the functions at the level below it.

A)

reductionism

B)

emergence

C)

systematics

D)

bioinformatics

Answer:

A

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6)

Surface area to volume ratio influences thermal physiology such that

A)

small animals have a higher surface area to volume ratio, decreasing heat loss.

B)

small animals have a lower surface area to volume ratio, decreasing heat loss.

C)

small animals have a higher surface area to volume ratio, increasing heat loss.

D)

small animals have a lower surface area to volume ratio, increasing heat loss.

Answer:

C

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7)

The scaling coefficient for metabolic rate should be 2/3 is based on

A)

relationships between surface area and volume.

B)

relationships between body mass and volume.

C)

relationships between volume and metabolism.

D)

relationships between metabolism and activity of the animal.

Answer:

A

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8) In physiology, you learned that form reflects function. When comparing the digestive systems of carnivores and herbivores, you observed that

A) carnivores have much larger stomachs than herbivores.

B) carnivores have a much smaller caecum, and a much shorter intestinal tract than herbivores.

C) carnivores have a smaller caecum, but a larger intestinal tract than herbivores.

D) the digestive systems of the two are similar because both are mammals.

Answer: B

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9)

The proximate cause of an organism's unique characteristic can be answered by

A)

studying the animals lineage.

B)

looking for evolutionary advantages of the characteristic.

C)

identifying the genes that regulate the characteristic.

D)

both A and B

Answer:

C

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10)

The term adaptation most commonly refers to

A)

changes within an individual that are irreversible.

B)

changes within an individual that are reversible.

C)

changes within a population seen over time.

D)

changes within an individual that cannot be inherited.

Answer:

C

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11)

Adaptation can change the genetic composition of a population because

A)

environmental stressors favor survival of certain genotypes.

B)

individuals possessing favorable genes tend to produce more offspring.

C)

genes are passed on only if offspring are produced.

D)

all of the above

Answer:

D

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12)

Genetic drift is most likely to occur

A)

due to differences in "fitness" of individuals.

B)

in large populations.

C)

when a large portion of the population is killed, regardless of genetics.

D)

in ocean populations where genes can drift between individuals.

Answer:

C

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13)

Organisms that are closely related to each other will

A)

share some features with all other organisms.

B)

share some features only with organisms from this same group.

C)

have no features in common with any other organism.

D)

both A and B

Answer:

D

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14) The flippers of marine mammals, the legs of dogs, and the wings of birds are examples of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ structures.

A) homologous

B) analogous

C) convergent

D) shared

Answer: A

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15)

Which of the following statements about conformers and regulators is correct?

A)

In a conformer, internal conditions mimic external changes.

B)

In a regulator, internal conditions regulate external changes.

C)

An organism could be a thermo-conformer and an ionoregulator.

D)

both A and C

Answer:

D

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16)

Being a conformer is beneficial because

A)

it's possible to maintain a stable environment.

B)

it consumes less energy than being a regulator.

C)

it allows an organism to live in a wide range of environments that differ from its internal environment.

D)

all of the above

Answer:

B

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17)

Maintaining homeostasis relies on

A)

short-term behavioral changes.

B)

short-term physiological changes.

C)

long term strategies.

D)

all of the above

Answer:

D

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18)

Growing and shedding fur is an example of a physiological change following a

A)

seasonal cycle.

B)

circadian rhythm.

C)

lunar cycle.

D)

diurnal cycle.

Answer:

A

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19)

When maintaining homeostasis, it is important to do all of the following EXCEPT

A)

detect external conditions.

B)

control external conditions.

C)

generate compensatory responses to the changes.

D)

protect vital areas from damaging changes.

Answer:

B

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20)

The set point in a feedback loop is

A)

the point at which the stimulus no longer is required.

B)

the point at which the (effector) organ or gland starts to change the environment.

C)

a range of values for a parameter that the body tries to maintain.

D)

the last step of a series of changes before the body is "set."

Answer:

C

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21)

\_\_\_\_\_\_\_\_\_\_ is/are an example of positive feedback loop control.

A)

Vomiting

B)

Maintaining internal body temperature

C)

Plasma glucose levels

D)

Eating when hungry

Answer:

A

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22)

Acclimatization is a term referring to

A)

irreversible changes in phenotype due to natural environmental variation.

B)

irreversible changes in phenotype due to controlled environmental change.

C)

reversible changes in phenotype due to natural environmental variation.

D)

reversible changes in phenotype due to controlled environmental change.

Answer:

C

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23)

The phenotypic expression of a genotype can be altered by

A)

developmental processes.

B)

environmental conditions.

C)

physiological conditions.

D)

all of the above

Answer:

D

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24)

Polyphenism is a type of phenotypic plasticity that

A)

can be easily reversed when necessary.

B)

occurs only when adults are exposed to certain environmental factors.

C)

is also called developmental plasticity.

D)

all of the above

Answer:

C

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25)

The genetic makeup of an organism, the \_\_\_\_\_\_\_\_\_\_, can be expressed in a variety of ways and has major effects on physiological traits.

Answer:

genotype

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26)

\_\_\_\_\_\_\_\_\_\_ of a population occurs when environmental stressors favor survival of certain genotypes, leading to their increased levels of reproduction.

Answer:

Adaptation

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27)

When a large portion of a population is wiped out and the genetic base is rebuilt from a small group of individuals, then the \_\_\_\_\_\_\_\_\_\_, a type of genetic drift, may result.

Answer:

founder effect

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28) Genetic drift results in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ evolution, which refers to changes in a population that are not due to differences in fitness.

Answer: neutral

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29)

An organism that maintains its internal environment regardless of changes in the external environment is called a \_\_\_\_\_\_\_\_\_\_.

Answer:

regulator

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30)

Physiological processes that change in a predictable pattern on a daily basis are said to follow a \_\_\_\_\_\_\_\_\_\_.

Answer:

circadian rhythm

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31) Metabolism is homeostatically regulated but, during lactation, metabolism has to be adjusted to account for the energetic demands of milk production. This process is referred to as \_\_\_\_\_\_\_\_\_\_\_.

Answer: allostasis

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32)

Factors that generate opposite effects on a pathway are termed \_\_\_\_\_\_\_\_\_\_.

Answer:

antagonistic controls

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33)

Environmental factors can cause \_\_\_\_\_\_\_\_\_\_, or a range of phenotypes from a single genotype.

Answer:

phenotypic plasticity

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34)

An animal that undergoes physiological changes caused by an experimentor regulating environmental variables is said to have \_\_\_\_\_\_\_\_\_\_.

Answer:

acclimated

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35) In research, what are two important features of model organisms? Provide an example of a model organism in physiological research.

Answer: Model organisms are important in physiological/biological research because 1) they have features that are suitable for experimental study and 2) understanding a process in a model organism provides better insight into how processes work in other species. The squid is an excellent model organism because its specialized large neurons allowed physiologists to gain an in-depth understanding of how neurons work in animals.

Porcelain crabs are also a good example of model organisms when it comes to studying environmental adaptations. Many species of these crabs live in very different environments, enabling researchers to compare the physiological adaptations of the different species under different environmental conditions.

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36)

Explain how a cell and molecular physiologist can be a developmental and applied physiologist as well.

Answer:

There are a number of ways to categorize the work that physiologists do. It can be divided by level of organization, processes, or the type of science (pure vs. applied). In this case a physiologist could study the process of development at the cell and molecular level with the purpose of preventing birth defects.

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37)

Explain why it is important to understand chemistry and physics before studying physiology. Be sure to include some examples.

Answer:

Physiology follows the laws of chemistry and physics. Just because an ion is diffusing in a physiological system does not mean it will not interact with other ions or form chemical bonds. Understanding that fluids flow from areas of high to low pressure helps one understand the cardiovascular system as well.

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38)

Explain why a certain mutation in a genome may not continue to be beneficial after an environmental stressor is removed.

Answer:

Expression of certain genes always contains certain costs and benefits. In some cases, expression of a mutated gene may be very costly in some aspects. However, if this mutation allows for survival and reproduction, the benefit outweighs the cost. On the other hand if the environmental stressor is removed, the cost may exceed the benefit. Those individuals with the mutation now lose the advantage because they are "spending" resources on a useless protein rather than one of current benefit.

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39) List the four conditions that are needed for adaptive evolution to occur. Provide one specific example of adaptive evolution.

Answer: 1) There must be variation in a trait among individuals in a population; 2) the trait must be heritable; 3) the trait must increase the fitness of the individuals that possess this trait; and 4) if the environment changes, the trait may no longer be beneficial.

Insecticide resistance is a good example of adaptive evolution. Mosquitoes that are resistant to a specific insecticide have higher fitness in the presence of the insecticide compared to insects without the gene/mutation for resistance.

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40)

How does an organism's body determine whether to utilize short-term or long-term strategies for maintaining homeostasis?

Answer:

It always costs energy to maintain an internal environment that may differ from the external environment. The key question is cost versus benefit. If the difference will last a long time, it will be beneficial to invest more resources early on, which will allow the organism to maintain other functions (e.g. growing fur in winter). On the other hand, if it is a short-term difference (e.g. hot sun at noon), then less expensive measures may be more appropriate.

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41)

How is it possible for a single genotype to generate a broad range of phenotypes?

Answer:

Organisms may have identical genotypes, but depending on their environment, expression of some genes may be more beneficial than others. Thus, environmental factors can regulate which genes are expressed at any one point in time, allowing for different phenotypes (physical expression), from a single set of genes.

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