



Discussion / Activity 1

Suggested Answers

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Cell Division

1.

a) Name the chemical which carries genetic information?

DNA.

b) In which part of a cell is this information kept?

Nucleus.

2.

a) What is “cell differentiation”?

The process in which cells take on different functions (blood, muscle, etc) by following different parts of the genetic instructions.

b) If you analysed the genetic information in a muscle cell and compared it to the information in a nerve cell from the same person, how would they compare?

They would be identical.

3. What is the purpose of mitosis cell division in:

a) a unicellular life-form?

Reproduction.

b) a multicellular living thing?

Growth and replacement of cells.

4.

a) What is the first step in the process of mitosis?

The DNA is duplicated.

b) How do the 2 “daughter cells” formed by mitosis compare to each other:

i) in size?

About the same.

ii) genetically?

Identical.

c) How do the “daughter cells” formed by mitosis compare to the “parent cell”:

i) in size?

About half as big.

ii) genetically?

Identical.



Discussion / Activity 2

Suggested Answers

Sexual & Asexual Reproduction

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1. In asexual reproduction:

- a) how many parents are required? **One only.**
 b) what is the cell division process involved? **Mitosis.**
 c) how do the offspring compare to each other (and the parent) genetically?
They are all genetically identical.

2. In sexual reproduction:

- a) how many parents are required? **Two.**
 b) what is the cell division process involved? **Meiosis.**
 c) how do the offspring compare to each other (and the parent) genetically?
They are all different.

3. Explain the importance of meiosis in sexual reproduction.

Meiosis produces egg or sperm cells with only half the number of chromosomes, so at fertilisation the correct number of chromosomes is restored in offspring.

4.
 a) What is a chromosome?
A thread-like structure in the nucleus of cells, visible during cell division.
 b) What is a gene?
A unit of inheritance which controls a particular trait. e.g. eye colour.
 c) What are genes made from? **Each gene is a molecule of DNA.**

5.
 a) Outline how a person's sex is determined by the "sex chromosomes".
**If you get 2 X-chromosomes you develop as a female (XX).
 Males receive one X and one y-chromosome (Xy).**
 b) Explain how the sex of a baby is determined by its father. **Sperm cells contain either X
 OR y. If X-sperm fertilises = XX = girl. If y-sperm = Xy = boy.**



Discussion / Activity 3

Suggested Answers

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Genetics

1.

a) What is Genetics?

The scientific study of inheritance.

b) Name the person who discovered the basics of genetics.

Gregor Mendel.

c) What living things did he use in his experiments?

Garden peas.

d) Outline what he did to carry out one of his experiments.

He crossed “pure-breeding” plants with opposite traits (e.g. tall and dwarf) and carefully noted the traits in the offspring.

e) What did he always find in the “F₁” of the experiment?

All the offspring had the trait of one parent (“dominant” trait), with none resembling the other (“recessive” trait).

f) What did he always find in the “F₂” of the experiment?

When the F₁ were self-pollinated, the offspring showed a ratio of 3:1 of the dominant : recessive types.

2. What is meant by:

a) a dominant gene compared to a recessive gene.

If an organism inherits a gene for each of two opposite traits, the dominant one is expressed and not the recessive. Recessive is only expressed when no dominant gene is present.

b) being homozygous for a trait compared to being heterozygous.

Homozygous = 2 of the same genes present. Heterozygous = different genes present, such as when an organism has one dominant gene & one recessive gene for a trait.



Discussion / Activity 4

Suggested Answers

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Fossils & Earth History

1. What is a fossil? In what type of rocks are they commonly found?

The remains, imprint or traces of living things from past ages.

They are usually found in sedimentary rocks.

2.

a) Outline the principle involved in “relative dating” of fossils.

Older sediments are always lower down in rock layers, so fossils in one place can be placed in order. Then fossils can be matched-up (correlated) with other areas.

b) What technology can be used to measure the absolute age of rocks?

Measurement of radio-activity in the rocks.

3. Describe the general patterns that become apparent when a large number of fossils are studied in time order.

Younger fossils resemble modern creatures. Older fossils are more and more unlike modern types. Ancient fossils are generally small and simple creatures.

The general pattern is a trend from simple creatures towards the more complex variety of today.



Discussion / Activity 5

Suggested Answers

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Evidence for Evolution

1. Human art evolves. The design of motor cars evolves. Life on Earth has evolved. What does it mean when something “evolves”.

Evolution means a sequence of changes that follow a particular pattern.

2. Outline how the general trend in fossils shows us that life has evolved.

Fossils show a sequence changes from simple life-forms (very unlike modern types) towards the complex modern types.

3. What are “transitional fossils” and what evidence of evolution do they give?

A fossil that is “in-between” 2 different types. It gives us a glimpse of one of the stages in the evolution of one type into another.

4. What does “selective breeding” of plants & animals by humans show?

It shows that a species can be changed into new forms.

5.

a) What is meant by the “pentadactyl limb” of vertebrate animals?

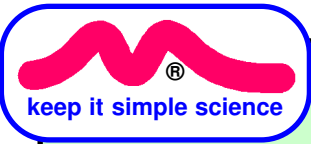
The 5-fingered bone structure of the limbs of mammals, birds, reptiles, etc.

b) How does this (and other examples of comparative anatomy) give evidence of evolution?

It suggests that all these vertebrates evolved from a common ancestor which had that bone structure.

c) What other comparison between living things shows similar evidence.

All living things have basic similarities in their cell chemistry and genetic code. This suggests evolution from a common ancestor.



Discussion / Activity 6

Suggested Answers

Evolutionary Theory

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Make a summary statement of Darwin's Theory of Evolution, in 5 clear points.

- 1. All living things produce far more offspring than can possibly survive.**
- 2. In every species there is variation; each individual is different.**
- 3. The factors of the environment select which individuals survive and which ones don't. This is "Natural Selection". (The factors include diseases, predators, climate, food supply, etc.)**
- 4. The survivors breed and pass on to their offspring the characteristics which helped them to survive.**
- 5. The next generation is slightly different in the proportion of "survival traits". Over generations, the species changes as different traits become predominant and other traits become less common.**

Note that evolution does NOT involve any individual changing during its life. The changes are in the proportions of the next generation which have the selected "survival traits".