Revision term 3

EOT TERM 3

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Al Bahya school

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Number of Main Questions عدد الأسئلة الأساسية	Part (1) - 6
	Part (2) - 10
	Part (3) - 4
Marks per Main Question الدرجات لكل سؤال أساسي	Part (1) - 5
	Part (2) - 5
	Part (3) - 5
****Number of Bonus Questions عدد الأسئلة الإضافية	2
Marks per Bonus Question الدرجات لكل سؤال إضافي	5
*** Type of All Questions نوع كافة الأسئلة	Part(1 and 2) MCQ
	Part (3) FRQ
* Maximum Overall Grade الدرجة القصوى الممكنة*	110
Exam Duration - مدة الامتحان	150 minutes

What are traits?

Your characteristics are what make you unique. They could be things like hair color or height. These characteristics are called traits. How a trait appears, or is expressed, is the trait's **phenotype** (FEE nuh tipe). Traits such as eye color have many different types, but some traits have only two types.

Want more information?
Go online to read more about inheritance of traits.

Understanding Traits

By a show of hands, determine how many students in your class have each type of trait below. Write your observations in your Science Notebook.

Student Traits		
Trait	**Type 1**	**Type 2**
Earlobes	 Unattached	 Attached
Thumbs	 Curved	 Straight
Interlacing fingers	 Left thumb over right thumb	 Right thumb over left thumb

What do you think determines the types of traits you have?

Answers may vary. Sample answer: I think that my traits are inherited from my family. I look like my parents because they share some of my characteristics.

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You have just observed a variety of traits within your classroom. These traits were passed to your classmates from their parents. **Heredity,** the passing of traits from parents to offspring, is complex. For example, you might have straight thumbs, but both of your parents have curved thumbs.

1) Which of the following is NOT an example of a trait?

- **A)** eye color
- **B)** ear shape
- **C)** species
- **D)** body height

Correct Answer

C) species

Select the best option from the drop-down menu.

Look at this family!

Both children have golden hair color like their mother.

Hair color is an example of a [trait ✓] offsprings inherit from their parents.



4) The study of _____ is called genetics.

- **A)** heredity
- **B)** dominance
- **C)** pea plants
- **D)** mutations

Correct Answer

A) heredity

5) Passing of traits from parents to offspring is _____.

Correct Answer

heredity

Reappearing Traits As you observed, some of the offspring had white flowers, even though both parents had purple flowers. The results were similar each time Mendel cross-pollinated two purple-flowering hybrid plants. The trait that had disappeared in the first generation always reappeared in the second generation.

Did the same result happen when Mendel cross-pollinated pea plants for other traits? Let's find out.

Look Both Ways Before Crossing the Seed

Mendel counted and recorded the traits of offspring from many experiments in which he cross-pollinated hybrid plants. Data from these experiments are shown below.

Results of Hybrid Crosses

Characteristic of Hybrid Parent	Trait and Number of Offspring	Trait and Number of Offspring	Trait Comparison
Flower Color (purple x purple)	 Purple 705	 White 224	$\frac{705}{224} = \frac{3.15}{1}$
Seed Color (yellow x yellow)	 Yellow 6,022	 Green 2,001	$\frac{6,022}{2,001} = \frac{3.01}{1}$
Seed Shape (round x round)	 Round 5474	 Wrinkled 1,850	$\frac{5474}{1,850} = \frac{2.96}{1}$
Pod Shape (smooth x smooth)	 Smooth 882	 Bumpy 299	$\frac{882}{299} = \frac{2.95}{1}$

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1. **MATH Connection** Calculate the relationship of purple to white flowers, yellow to green seeds, round to wrinkled seeds, and smooth to bumpy pods by dividing the higher number by the lower number. Record the answers in the table above.

2. What patterns do you notice in Mendel's data?

Students should notice that in each comparison, one trait is seen approximately three times more often than the other.

2) Bird A has the genotype *ll* for bill length, and Bird B is *LL*. The bills of their offspring would be:



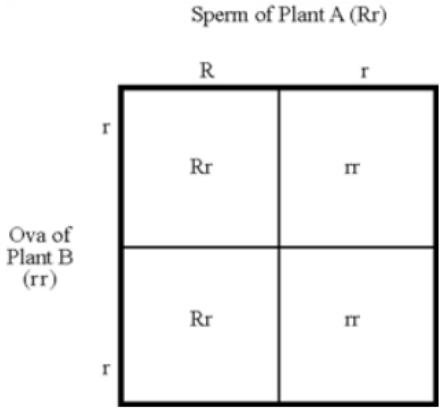
Bird A Bird B

- **A)** long in 100% of the offspring.
- **B)** short in 100% of the offspring.
- **C)** long in 50% of the offspring.
- **D)** short in 75% of the offspring.

Correct Answer

A) long in 100% of the offspring.

6) A florist has one kind of plant that usually has red flowers (the dominant trait), but sometimes has white flowers (the recessive trait). If she crosses plants A and B as shown here, 50% of the offspring will have red flowers.

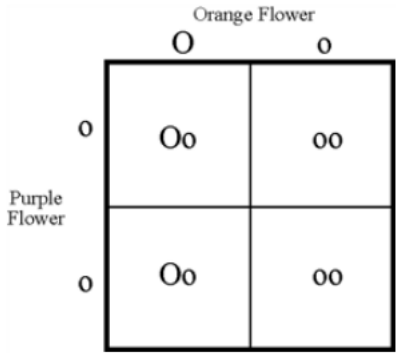


- True
- False

Correct Answer

True

7) A heterozygous orange-flowered plant is crossed with a homozygous purple-flowered plant. If orange is a dominant allele and purple is recessive, what color ratio will the flowers of the offspring plants have?



- **A)** 1 purple: 3 orange
- **B)** 4 purple: 0 orange
- **C)** 2 purple: 2 orange
- **D)** 0 purple: 4 orange

Correct Answer

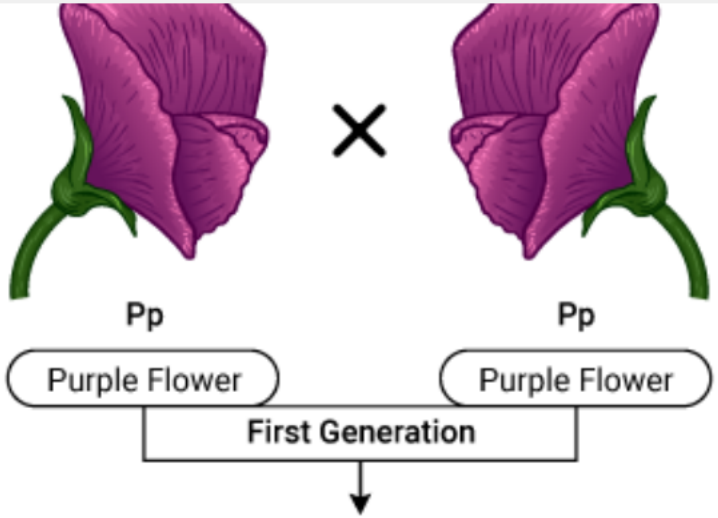
C) 2 purple: 2 orange

) A scientist crossed two fruit flies in a lab. She was studying the transmission of the alleles that affect wing shape. The dominant allele, *C*, is the allele for curly wings, and the recessive allele, *c*, is the allele for straight wings. She knew that one of the parent flies was heterozygous and had curly wings (*Cc*). Half of the offspring from the cross had curly wings, and the other half had straight wings. Identify the genotype and phenotype of the second parent fly. State the evidence that supports your response.

Explanation

The second parent fly has the genotype (*cc*) and straight wings. The evidence that supports this is that half of the offspring had straight wings. For that to happen, half of the offspring had to receive a recessive allele from both parents. When one of the parents is heterozygous, the other parent must be homozygous recessive for this to occur.

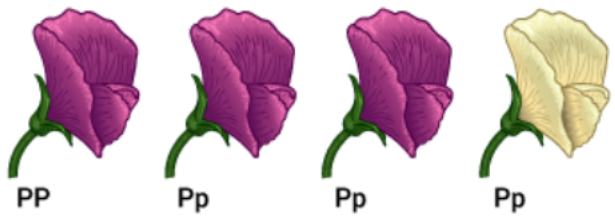
In these flowers, purple is the dominant allele represented by "P" and white is the recessive allele represented by "p".
Two hybrid purple plants from the first generation were crossed together to produce the second generation.



Hybrid plants are heterozygous for the gene coding for leaf color having the genotype Pp.

Which of the following would correctly represent the genotypes of the second generation?

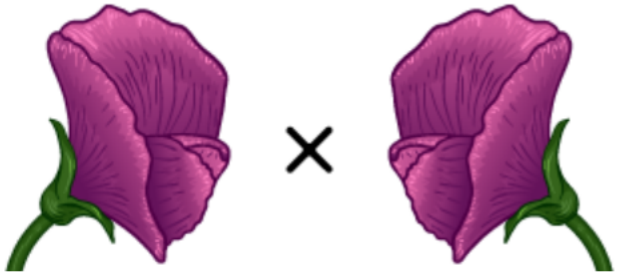




Select the correct answer.

When two hybrid purple flowers reproduce, they produce offsprings in the following ratio:

3 purple: 1 white.



Which of the following correctly represents the ratio produced by this cross?









What controls traits?

When other scientists studied the parts of a cell and combined Mendel's work with their work, Mendel's factors were more clearly understood. Scientists discovered that inside each cell is a nucleus that contains threadlike structures called chromosomes. Over time, scientists learned that chromosomes contain genetic information that controls traits. We now know that Mendel's "factors" are parts of chromosomes and that each cell in offspring contains chromosomes from both parents. These chromosomes exist as pairs—one chromosome from each parent.

Scientists have discovered that each chromosome can have information about hundreds or even thousands of traits.

- A **gene** (JEEN) is a section on a chromosome that has genetic information for one trait. The genes on each chromosome can be the same or different, such as purple or white for pea flower color.
- The different forms of a gene are called **alleles** (uh LEELs).
- The two alleles that control the phenotype of a trait are called the trait's **genotype.**

Scientists use symbols to represent the alleles in a genotype, as shown in the table below. In genetics, uppercase letters represent dominant alleles and lowercase letters represent recessive alleles. The table shows the possible genotypes for both round and wrinkled seeds phenotypes.

Drag and drop the correct option.

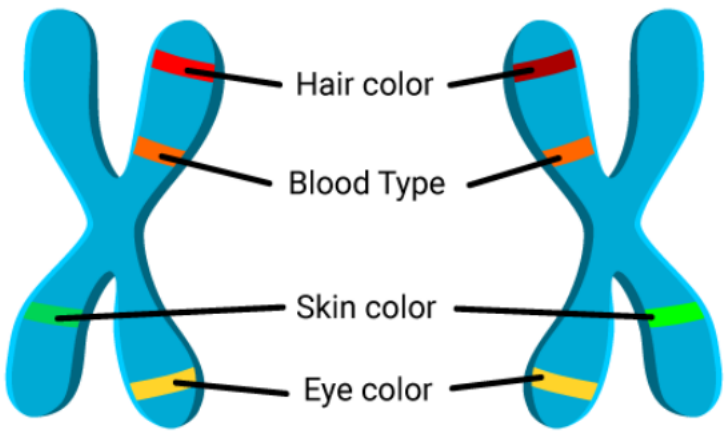
Drag the best option to correctly complete the title of the table.

Genotypes ✓ of Six Different Pea Plants					
1	2	3	4	5	6
bb	YY	Ee	ff	Rr	AA

Drag and drop the best option to complete the sentence.

Genes ✓ are short sections of DNA that determine the different phenotypes of the living organism.

Nucleus | Alleles | Chromosomes



Phenotype and Genotype			
Phenotypes (observed traits)	 **Round**		 **Wrinkled**
Genotypes (alleles of a gene)	Homozygous dominant (*RR*)	Heterozygous (*Rr*)	Homozygous recessive (*rr*)

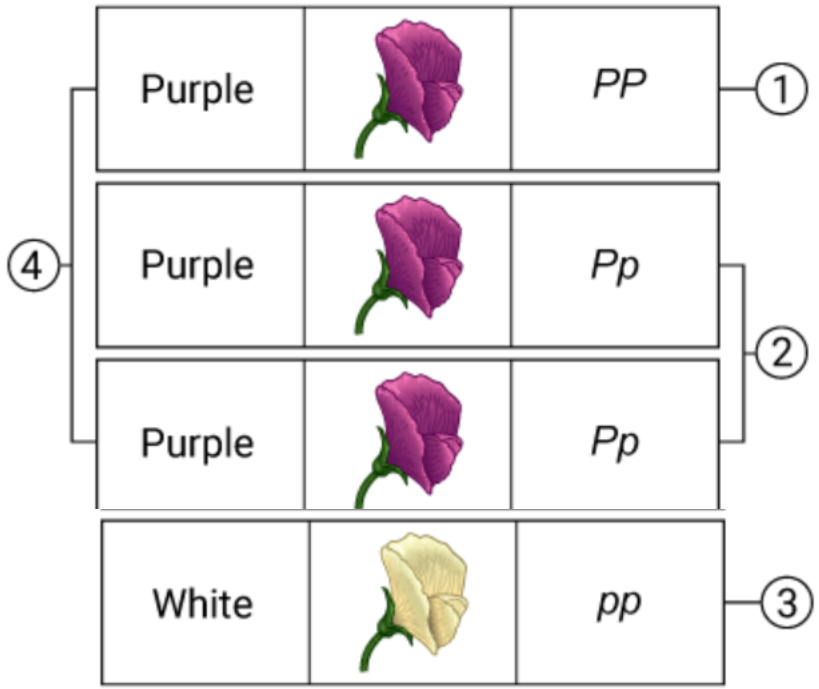
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A round seed can have two genotypes—*RR* and *Rr*. Both genotypes have a round phenotype. A wrinkled seed can have only one genotype—*rr*.

- When the two alleles of a gene are the same, its genotype is **homozygous.**
- Both *RR* and *rr* are homozygous genotypes.
- If the two alleles of a gene are different, its genotype is **heterozygous.**
- *Rr* is a heterozygous genotype.

Drag and drop the best option.

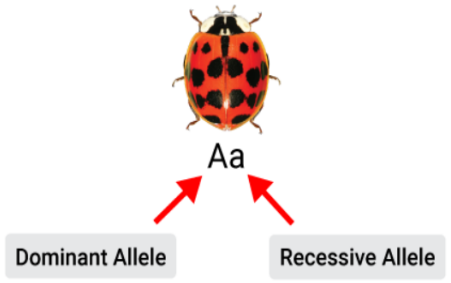
Homozygous - Dominant trait:	1 ✓
Homozygous - Recessive trait:	3 ✓
Heterozygous - Dominant trait:	2 ✓
Heterozygous - Recessive trait:	does not apply ✓



Drag and drop the correct option.

In those lady bugs, "A" is the dominant allele and "a" is the recessive allele for a trait.

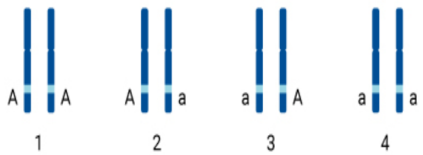
Drag the option to complete the genotype of each lady bug as indicated.



Homozygous Dominant	Homozygous Recessive	Heterozygous
		
A A ✓	A aa ✓	A a ✓

Select the correct answer.

Which of these genotypes are homozygous?



Three-Dimensional Thinking

2. A tree produces seeds in pods when wind-borne pollen from another tree of the same species reaches the flowers. Each seed contains genetic information so the seed can grow into an adult tree. Which do you predict would be the effect of this process?

   A The tree produces a large number of genetically diverse offspring.

   B The tree produces a large number of genetically identical offspring.

   C The tree produces a small number of offspring that are identical to the female parent.

   D The tree produces a small number of offspring that are identical to the male parent.

Hydras are organisms that live in freshwater environments. They have a tubelike body and a mouth at one end. Around the mouth are stinging tentacles that help to capture food. Depending on the conditions, hydras can reproduce sexually or asexually.



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3. Based on your observations, which statement best explains what is happening to the hydra in the figure above?

   A The hydra is reproducing asexually by budding a new hydra.

   B The hydra is reproducing asexually by splitting in two.

   C The hydra is reproducing sexually by grafting to another hydra.

   D The hydra is reproducing sexually by releasing sex cells into the water.

2. **A–Correct.** B, C, and D are incorrect, as the offspring will be genetically diverse.

3. **A–Correct.** B, C, and D are incorrect, as the hydra is reproducing asexually, and by budding, not fission.

Select the correct answer from the drop-down menu.

Budding is a type of asexual reproduction in which the offspring grows from the [the body ✓] of its parent.

1) Asexual reproduction involves two parent organisms.

- ○ True
- ○ False

Correct Answer

False

4) In _____, an offspring grows from a piece of its parent.

- ○ **A)** fission
- ○ **B)** budding
- ○ **C)** regeneration
- ○ **D)** sexual reproduction

Correct Answer

C) regeneration

8) Which of the following is NOT a disadvantage of asexual reproduction?

- ○ **A)** do not need a mate
- ○ **B)** little genetic variation
- ○ **C)** mutations can occur
- ○ **D)** all susceptible to same disease

Correct Answer

A) do not need a mate

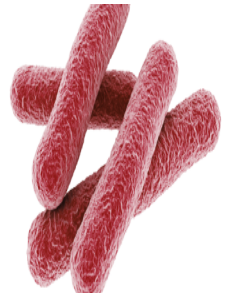
Select the correct answer.

What do we call the type of reproduction in which a new plant grows from a part of its parent plant?



- budding
- vegetative ✓
- sexual
- regeneration

Why is there little genetic variation in the population among organisms that reproduce asexually?



- Offspring of the same species will look alike regardless if they inherit the genes of either parent.
- An offspring inherits its genes from other organisms of the same type.
- Mutation causes the genes of the offspring to change and look like the genes of its parent.
- An offspring inherits all of its genes from one parent only. ✓

There are advantages and disadvantages for organisms that reproduce asexually. Which of the following is correct?

Advantage	Disadvantage
An organism can reproduce without having to find a mate.	Harmful mutations will pass from the parent to its offspring.

Advantage	Disadvantage
Offspring are copies of their parents with the same genetic information.	It takes only one parent to produce offspring.

Advantage	Disadvantage
The offspring inherit all of their genetic information from one parent	Asexual reproduction is a quick process.

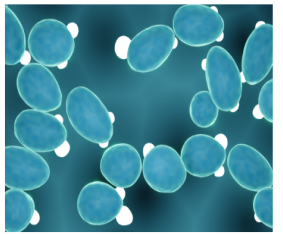
Advantage	Disadvantage
There will be little genetic variation in the population.	It allows some organisms to produce many offspring quickly.

Which of the following does **NOT** represents a budding type of reproduction?









The Spider

Mating Dance

Meet Norman Platnick, a scientist studying spiders.

Norman Platnick is fascinated by all spider species—from the dwarf tarantula-like spiders of Panama to the blind spiders of New Zealand. These are just two of the over 1,800 species he's discovered worldwide.

How does Platnick identify new species? One way is the pedipalps. Every spider has two pedipalps, but they vary in shape and size among the over 46,000 species. Pedipalps look like legs but function more like antennae and mouthparts. Male spiders use their pedipalps to aid in reproduction.

Getting Ready When a male spider is ready to mate, he places a drop of sperm onto a sheet of silk he constructs. Then he dips his pedipalps into the drop to draw up the sperm.

Finding a Mate The male finds a female of the same species by touch or by sensing certain chemicals she releases.

Courting and Mating Males of some species court a female with a special dance. For other species, a male might present a female with a gift, such as a fly wrapped in silk. During mating, the male uses his pedipalps to transfer sperm to the female.

What happens to the male after mating? That depends on the species. Some are eaten by the female, while others move on to find new mates.

▲ Spiders reproduce sexually, so each offspring has a unique combination of genes from its parents. Over many generations, this genetic variation has led to the incredible diversity of spiders in the world today.

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◀ Norman Platnick is an arachnologist (uh rak NAH luh just) at the American Museum of Natural History. Arachnologists are scientists who study spiders.

It's Your Turn

Research Select a species of spider and research its mating rituals. What does a male do to court a female? What is the role of the female? What happens to the spiderlings after they hatch? Use images to illustrate a report on your research.

their written responses.

Word Bank

chemicals **species** **offspring** **genes** **variation**

1. *How does a male spider find a mate?* Sample response: Male spiders find mates by sensing certain chemicals released by the females. They also find mates by touch.

2. *There are more than 40,000 known species of spiders. How does sexual reproduction lead to genetic variation?* Sample response: Spiders reproduce sexually, so each offspring has a new and unique combination of genes. With each generation, there is more genetic variation in the population, which leads to species diversity.

PRACTICE QUESTIONS

- What is the purpose of the mating dance performed by male spiders?
- a) To find food
- b) To attract prey
- c) To communicate with other spiders
- d) To attract a female mate

- How do male spiders typically communicate their interest to female spiders during the mating dance?
- a) By making loud vocal sounds
- b) By releasing a strong scent
- c) By performing a specific pattern of movements
- d) By offering food as a gift

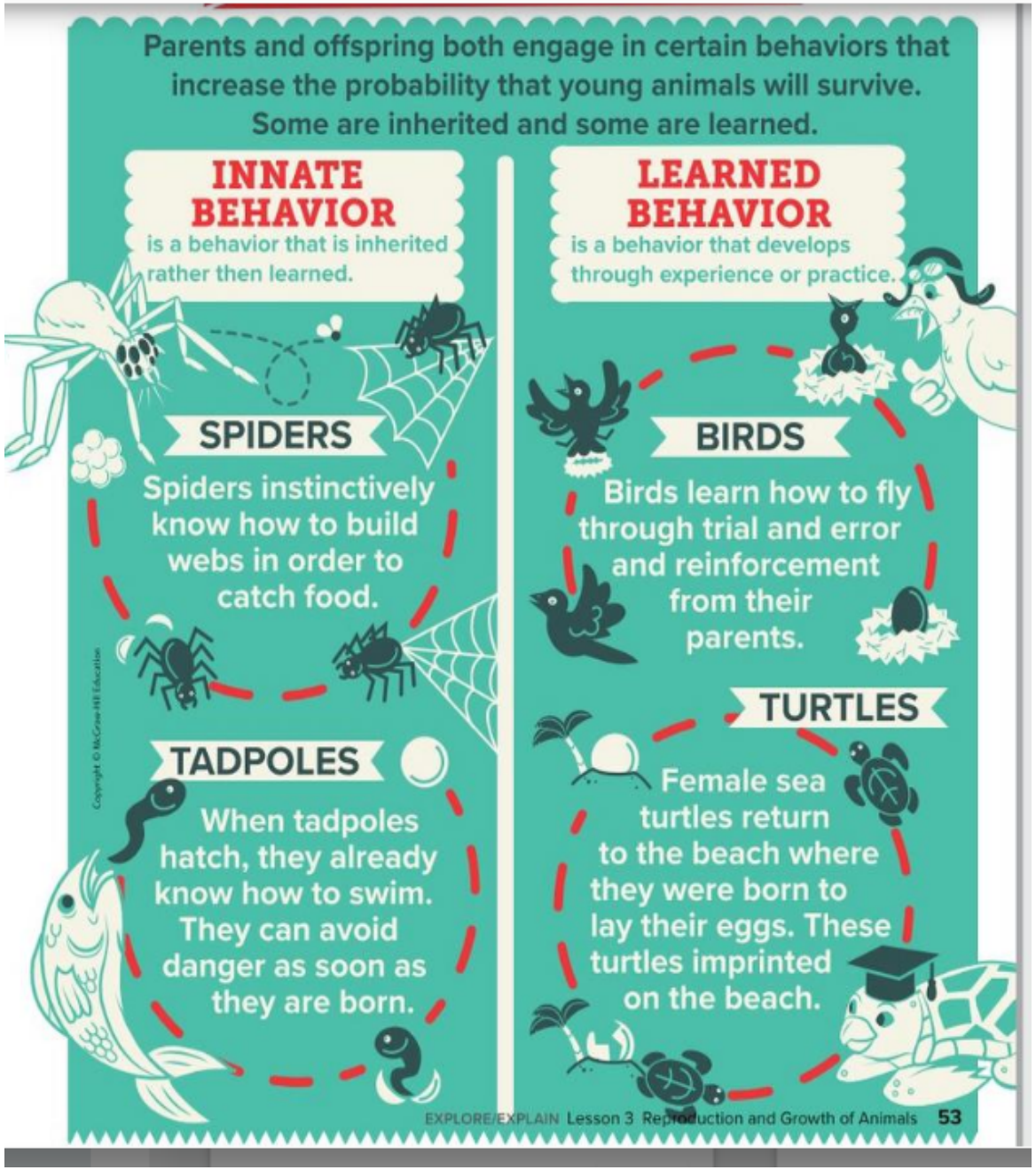
PRACTICE QUESTIONS

Q. Which of the following statements is true about spider mating dances?

- a) Only female spiders perform the mating dance.
- b) The mating dance is performed by spiders of all species.
- c) The mating dance is primarily performed by male spiders.
- d) The mating dance is a solitary behavior and not influenced by other spiders.

- Q. What is the primary purpose of a male spider using its pedipalps and gifting behavior, such as offering a fly wrapped in silk, during courtship?

- a) To protect itself from predators
- b) To build a nest for the female spider
- c) To ensure successful mating and reproductive success
- d) To mark its territory and establish dominance over other males



ASK: What is an innate behavior? a behavior that is inherited rather than learned

ASK: What is a learned behavior? a behavior that develops through experience or practice

ASK: What is a benefit of innate behavior? Students might suggest that young animals know how to do innate behaviors as soon as they are born, so they can protect them or help them survive even if the animals are very young or no other animals are around to teach them.

ASK: What is a benefit of learned behavior? Students might suggest that learned behavior allows for animals to adapt to unique environments or situations.

3) Innate behavior increases the survival of young animals because it allows an animal to respond to a stimulus without choosing the proper response.

- ○ True
- ○ False

Correct Answer

True

6) Tadpoles survive hatching in water because they are born knowing how to swim. This is an example of _____.

- ○ **A)** learned behavior
- ○ **B)** innate behavior
- ○ **C)** social behavior
- ○ **D)** none of the above

Correct Answer

B) innate behavior

Baby whales are born in water tail first. Immediately afterwards, the mother whale pushes the baby to the surface for its first breath. What kind of behavior is this?

ANSWER INNATE BEHAVIOUR

Which of the following represents an innate behavior for birds?



Blue Jays can learn to tell which food can be eaten by watching the reaction of other birds try.



Baby birds chirp loudly for food when they are hungry. ✓



Snowy Egret learns to attract and catch fish by stretching out its wings



Baby birds learn and practice how to fly.



a spider building a web



a butterfly flying and finding food

The figures show that most invertebrates like spiders and butterflies have innate behaviors. ✓

Which of the following is **NOT** true about innate behavior?

- Innate behaviors are inherited.
- Innate behaviors help animals survive.
- Innate behaviors help the animal respond to the stimulus.
- Innate behaviors are learned from other animals. ✓

Three-Dimensional Thinking

In order to attract a mate, male peacocks fan out their colorful feathers and dance. Females tend to choose males that have larger displays of feathers and feathers with more eyespots. The peahen then builds her nest by scraping a hole in the ground in a hidden area. Once the chicks hatch, the peahen stays close to them, teaching them what foods to eat and defending them from predators.

2. Which of the following is a courtship behavior that increases the probability of successful reproduction for the peacock?

   A fanning feathers
   B nest building
   C protecting from predators
   D all of the above

Observe the hamsters' environment below.



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3. Which of the following is NOT an environmental factor that would affect the hamsters' growth?

   A the amount of food the hamster is given
   B gene for fur color
   C the amount of time spent on the exercise wheel
   D interactions with other hamsters

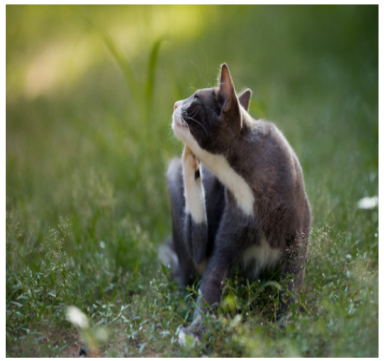
2. A—Correct. B and C are not courtship behaviors, so D must also be incorrect.

3. B—Correct. A, C, and D are all environmental factors.

Drag and drop the correct option to complete the sentences.

Look at this cat scratching. Cats scratch to remove parasites that are hiding in their fur.

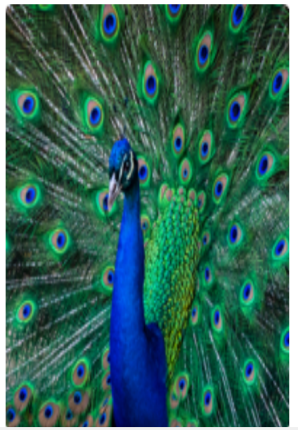
Parasites are [environmental ✓] factors that may affect the growth and survival of animals.



Drag and drop the correct option to complete the sentence.

This peacock [displays beauty ✓] to attract a mate.

displays strength | displays competition | displays ability



4) Which animal behavior attracts mates by competing with members of the same species?

- **A)** aggression
- **B)** submission
- **C)** territory
- **D)** courtship

Correct Answer

D) courtship

Male peacocks display their tails as they strut before females. Classify this behavior. Then, develop an argument that this behavior is related to successful reproduction in this species

Male peacocks displaying their tails is courtship behavior. This behavior affects the reproductive success of the species because it helps the male attract a mate. Organisms that cannot attract a mate cannot successfully reproduce, so this behavior is directly related to reproductive success of the species.

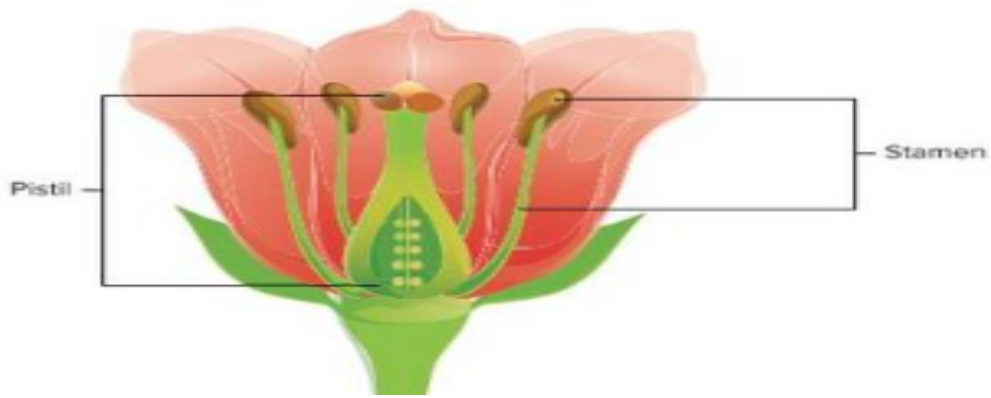
Types of Plant Reproduction Some plants reproduce sexually, some plants reproduce asexually, and some plants can reproduce in both ways. Asexual reproduction occurs when a portion of a plant develops into a separate new plant. Sexual reproduction occurs when a plant's male reproductive cell (sperm) combines with a plant's female reproductive cell (egg). The way a plant reproduces depends on the structures it has.



These hens and chicks can reproduce without seeds, or asexually. New "chicks" can grow from the stolons on the main "hen" plant.

Seedless Plants Not all plants grow from seeds. The first land plants to inhabit Earth most likely were seedless plants—plants that grow from spores, not from seeds. Mosses and ferns are examples of seedless plants found on Earth today.

Seed Plants There are two groups of seed plants—flowerless seed plants and flowering seed plants. Both produce seeds that result from sexual reproduction. The plants produce pollen grains, which contain sperm. They also produce female structures, which contain one or more eggs. **Pollination** occurs when pollen grains land on a female plant structure of the same species. If the pollen joins with an egg, fertilization occurs and a seed develops. In nonflowering plants, the pollen is produced by the male cone, and the eggs are contained within the female cone. In flowering plants, the female reproductive organ is the pistil, and the male reproductive organ is the stamen.



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Aspect	Seed Plants	Seedless Plants
Definition	Plants that reproduce through the formation of seeds.	Plants that reproduce without the formation of seeds.
Reproduction Mechanism	Reproduce via the dispersal and germination of seeds.	Reproduce through other means, such as spores or vegetative propagation.
Examples	Flowering plants (angiosperms) and conifers (gymnosperms).	Ferns, mosses, and liverworts.
Importance	Dominant group of plants on Earth; vital for ecosystem functioning.	Important in early stages of plant evolution; contribute to biodiversity.
Adaptability	Seeds provide protection and adaptability to various environments.	Relatively less adaptability due to limited dispersal methods.
Reproductive Structures	Flowers, fruits, and cones.	Spores or specialized structures like rhizomes or runners.
Role of Water	Water is not always required for fertilization.	Often require water for the movement of reproductive cells.
Reproductive Efficiency	Efficient reproduction due to the production and dispersal of numerous seeds.	Less efficient reproduction with limited spore production or vegetative propagation.

1) Seedless plants grow from _____.

Correct Answer

spores

3) Which part of a flower is the male reproductive organ?

- **A)** ovary
- **B)** pistil
- **C)** stamen
- **D)** sepal

Correct Answer

C) stamen

5) _____ are plant structures that are colorful and may have specific odors to attract pollinators.

Correct Answer

Flowers

Which of the following is **NOT** a similarity between seed and seedless plants?

- In both, a sperm fertilizes an egg.
- In both, new offspring are produced.
- In both, sperm is carried to the female part of plant through bees. ✓
- Both can reproduce sexually.

Select the correct answer.

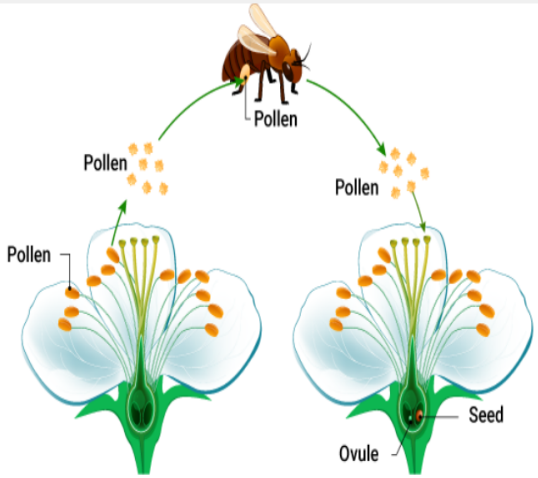
Which of the following are ways through which sperm can reach the egg in both seed plants and seedless plants?

- bees only
- water only
- bees, water, and wind ✓
- wind only

Drag and drop the correct options to complete the sentences.

The bee is transferring pollen ✓ from the male part of a plant to the female part of the plant.

This process is called pollination ✓.



- What is the primary mode of reproduction in seed plants?
- a) Spore dispersal
- b) Vegetative propagation
- c) Seed dispersal and germination
- d) Pollination and fertilization

- Which type of reproduction contributes to increased genetic diversity and adaptation to changing environments?
- a) Asexual reproduction in flowering plants
- b) Sexual reproduction in flowering plants
- c) Seedless reproduction in plants
- d) None of the above

- What is the main advantage of sexual reproduction in flowering plants?
- a) Rapid reproduction and colonization of new areas
- b) Production of genetically identical offspring
- c) Increased genetic diversity and adaptability
- d) Independence from pollinators

Questions pg 72

- Which type of reproduction involves the fusion of male and female gametes?
- a) Sexual reproduction in flowering plants
- b) Asexual reproduction in flowering plants
- c) Seedless reproduction in plants
- d) None of the above

- What is a characteristic of sexual reproduction in flowering plants?
- a) Offspring are genetically identical to the parent plant.
- b) It does not require the involvement of pollinators.
- c) It results in increased genetic diversity.
- d) It only occurs in seed plants.

Questions pg 72

- Which of the following is an example of asexual reproduction in flowering plants?
- a) Production of seeds in angiosperms
- b) Formation of bulbs or tubers
- c) Pollination and fertilization
- d) Germination of seeds

- Seed plants include which of the following groups?
- a) Flowering plants and conifers
- b) Ferns and mosses
- c) Liverworts and gymnosperms
- d) Algae and lichens

Seeds on the Move

There are several factors that influence how seeds travel from place to place.

How they get there:

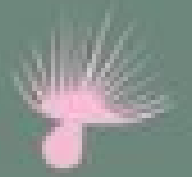
WIND

These seeds are light, small and/or have special structures to help them "fly," such as:

parachutes



dandelion



milkweed

propellers



maple

WATER

These seeds have special structures that help them stay afloat, such as:

fiberous husks



coconut

floats in water



water lily

waterproof outer layer



mangrove

ANIMALS

These seeds are eaten and deposited, or have hooks that attach to fur or feathers, such as:

hitchhikers



beggar-ticks

juicy fruits



blackberry

carry outs



acorn

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ASK: What characteristics help a seed get dispersed by wind? small size, light weight, structures that catch the wind

ASK: What characteristics help a seed get dispersed by water? structures that help them float and protect them from water

ASK: What characteristics help a seed get dispersed by animals? hooks that attach to fur or feathers, ease of being carried, juicy fruits

4) Which is the most likely description of a seed that is dispersed by wind?

- **A)** It can float.
- **B)** It has a thick, hard shell.
- **C)** It has a waterproof coating.
- **D)** It is small and light.

Correct Answer

D) It is small and light.

Which of the following is **NOT** true about seed dispersal in this plant?



- Special structures help the seeds travel by the wind.
- Seeds will die when dispersed by wind. ✓

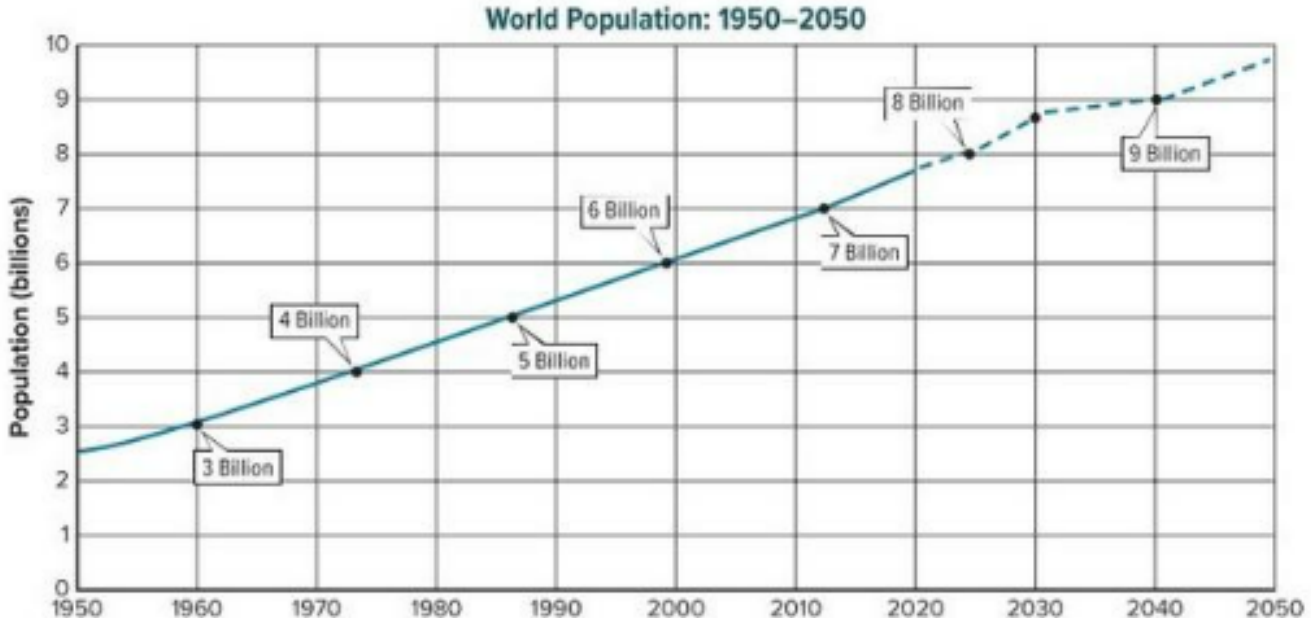
Select the correct answer.

Which of the following does **NOT** play a role in seed dispersal?

- wind
- water
- sunlight ✓
- animals

How does a growing population impact Earth?

Scientists estimate that there were about 300 million humans on Earth a thousand years ago. Today there are more than 7 billion humans on Earth, as shown below. By 2050, there could be over 9 billion.



Impact on Land- U4M1L1 page 10

Impact on Land- U4M1L1 page 10

Typically as the human population increases, so does the consumption of natural resources. A **natural resource** is something from Earth that living things use to meet their needs. Every human being needs certain things, such as food, clean water, and shelter, to survive. As the human population grows, people need to build more houses and roads and clear more land for crops. Land itself is a resource. How does a growing population impact land as a resource?



Impact on Land- U4M1L1 page 14

ENVIRONMENTAL Connection Next, research how cutting old growth forests of North America's Pacific Northwest impacts the northern spotted owl and ultimately the biodiversity and viability of this natural system. Record your findings below.

Humans are cutting down forests for resources. More resources are needed as populations increase. Cutting down forests results in the destruction of habitats. If a species depends on a certain environment to live successfully, and that environment is destroyed, the species will not flourish. This results in a decline of the species and throws off the balance of the ecosystem.



Impact on Land- U4M1L1 page 14

Impact of Deforestation As you calculated in the previous activity, a significant amount of forests have been reduced globally. An increased need for resources produced by trees, or the land on which the trees grow, has led to a decrease in the amount of forests.

What's the impact? Deforestation leads to loss of animal habitats, which can lead to the endangerment or extinction of a species. In tropical rain forests—complex ecosystems that can take hundreds of years to replace—deforestation is a serious problem. Tropical rain forests are home to an estimated 50 percent of all species on Earth.

In addition, deforestation affects the atmosphere. Trees remove carbon dioxide from the atmosphere during photosynthesis. Rates of photosynthesis decrease when large areas of trees are cut down, and more carbon dioxide remains in the atmosphere.

People also clear land for development and agriculture. Let's investigate the impact of agriculture on land resources.

learn more about the impacts of landfills and hazardous waste.

Landfills	Hazardous Waste
	
About 34 percent of our trash is recycled and composted. About 11 percent is burned, and the remaining 55 percent is placed in landfills. Landfills are areas where trash is buried. Since many materials do not decompose in landfills, or they decompose slowly, landfills fill with garbage, and new ones must be built. Locating an acceptable area to build a landfill can be difficult. Type of soil, the depth to groundwater, and neighborhood concerns must be considered.	Some trash cannot be placed in landfills because it contains harmful substances that can affect soil, air, and water quality. This trash is called hazardous waste. The substances in hazardous waste also can affect the health of humans and other living things. Both industries and households generate hazardous waste. For example, hazardous waste from the medical industry includes used needles and bandages. Household hazardous waste includes used motor oil and batteries.

Impact on Land-
U4M1L1 page 2
1

- What is hazardous waste?
- a) Waste materials that are flammable or explosive
- b) Waste materials that are biodegradable and eco-friendly
- c) Waste materials that are easily recyclable
- d) Waste materials that pose a risk to human health or the environment

- How can hazardous waste impact the environment?
- a) By reducing air pollution and improving air quality
- b) By enhancing soil fertility and promoting plant growth
- c) By contaminating soil, water, and air with toxic substances
- d) By supporting the growth of beneficial bacteria and microorganisms

- Which of the following is an example of hazardous waste?
- a) Compostable food waste
- b) Plastic bottles for recycling
- c) Used batteries containing toxic chemicals
- d) Glass containers for reuse

1) Which describes a step people can take to help minimize the effects of using land for agriculture?

- **A)** use more land for farms
- **B)** increase the number of different pesticides used
- **C)** remove crops quickly to increase erosion of soil
- **D)** plant crops that attract many different kinds of insects

Correct Answer

D) plant crops that attract many different kinds of insects

2) Which is NOT a negative consequence of clearing land during deforestation?

- **A)** increase in the number of endangered species
- **B)** increase in the amount of photosynthesis
- **C)** increase in the amount of carbon dioxide in the atmosphere
- **D)** increase in the chance of flooding in an area.

Correct Answer

B) increase in the amount of photosynthesis

7) Urbanization is caused by an increase in population. Which describes an effect of urbanization on land?

- ○ **A)** More land will be available for farming.
- ○ **B)** More land will be used to build houses.
- ○ **C)** More land will be used to grow trees.
- ○ **D)** More land will be available for animal habitat.

Correct Answer

B) More land will be used to build houses.

Which of the following human activities have a negative impact on land?

- ☐ cleaning trash from forests and lakes
- ☑ clearing land to build houses ✓
- ☐ protecting forests
- ☑ cutting down trees ✓

Which of the following is a way humans use land as a resource?

- ◉ Humans grow crops as a source of food. ✓
- ○ Humans use chemicals to kill insects.
- ○ Humans throw trash into water to pollute it.
- ○ Humans burn trash to pollute the air.

Which of the following is **NOT** true about deforestation?

- Deforestation affects air quality because the trees removed no longer take in carbon dioxide.
- Deforestation protects animal habitats. ✓
- Deforestation removes plant roots so soil erodes easily.
- Deforestation is a human activity.

Which of the following pairs are mismatched?

- Mining - air, water, and noise pollution
- Deforestation - habitat protection ✓
- Agriculture - food production
- Urbanization - habitat destruction

PRACTICE QUESTIONS

- What is the definition of land resources?
- a) The availability of land for construction purposes
- b) The total area of land within a country's borders
- c) Natural resources found within the earth's crust
- d) The various features and capabilities of land that are valuable to humans

- What does land use refer to?
- a) The total area of land within a country's borders
- b) The process of converting agricultural land into urban areas
- c) The different ways in which land is utilized or managed
- d) The measurement of land productivity and fertility

PRACTICE QUESTIONS

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PRACTICE QUESTIONS

- How does a growing population impact land resources?
- a) It leads to the depletion of natural resources.
- b) It increases the availability of land for agriculture.
- c) It has no effect on land resources.
- d) It decreases the demand for land resources.

- Which of the following is a consequence of land resource depletion due to population growth?
- a) Increased biodiversity and ecosystem health.
- b) Improved soil fertility and agricultural productivity.
- c) Loss of natural habitats and biodiversity.
- d) Decreased water scarcity and improved water quality

Impact on Water- U4M1L2 pag e 25

Reduce, Reuse, Recycle Developed countries such as the United States use more natural resources than other regions. Ways to conserve resources include reducing the use of materials, and reusing and recycling materials.

Reusing an item means finding another use for it instead of throwing it away. Using material again is called recycling. When you recycle wastes such as glass, paper, plastic, steel, or tires, you help conserve Earth's land resources. You can use yard waste and vegetable scraps to make rich compost for gardening, reducing the need for synthetic fertilizers. Compost is a mix of decayed organic material, bacteria, other organisms, and small amounts of water. Reducing means limiting the amount used initially.

The human population explosion already has had an effect on the environment and the organisms that inhabit Earth. It's unlikely that the population will begin to decline in the near future. To make up for this, resources must be used wisely. Conserving resources by reducing, reusing, and recycling is an important way that you can make a difference.

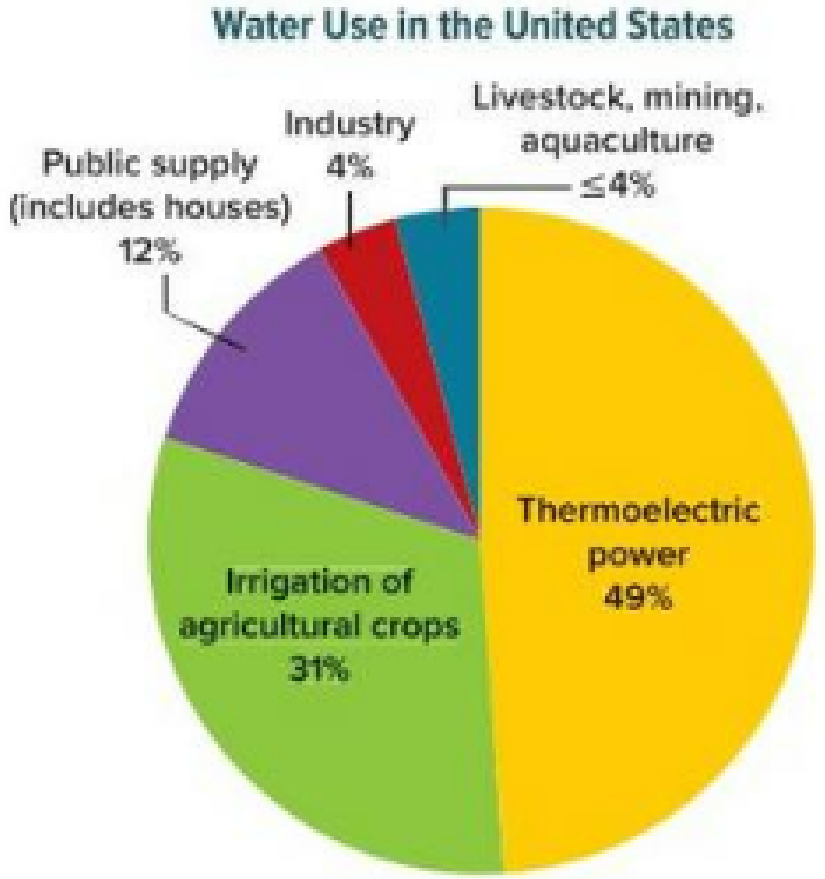


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Impact on Water-U4M1L2 page 39

Human Water Usage As the human population increases, so does its impact on water usage. Humans also use water in ways that other organisms do not. People wash cars, do laundry, and use water for agriculture, recreation, and transportation. Household activities, however, make up only a small part of human water use. As shown to the right, most water in the United States is used by power plants. The water is used to generate electricity and to cool equipment. The use of water as a resource impacts the environment in many different ways.

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Impact on Water U4M1L2 page 41

Changing the Flow of Surface Water People worldwide depend on sources of freshwater for their water supplies. Another method to obtain water is through dams. Streams and rivers are often dammed to create reservoirs that store water.

The large concrete structure shown to the right is the Hoover Dam in Nevada. The dam was built to control water flow and flooding along the Colorado River. Notice the large reservoir, Lake Mead, behind the dam. Freshwater from Lake Mead is used for recreational purposes, drinking water, irrigation, and hydroelectric power.

But dams can also have negative consequences on the environment and the biodiversity of ecosystems around the river. Dams can increase the rate of erosion along the banks of the streams. They also act as a geographic barrier for migratory fish. Because of dams, some rivers, such as the Colorado River, are nearly dry before they reach the ocean.



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4) Which describes an effect of laws like the U.S. Clean Water Act and the Safe Drinking Water Act?

- **A)** They have helped people to eliminate water pollution.
- **B)** They are a step toward reducing water pollution.
- **C)** They result in an increase in water pollution.
- **D)** They cause a decrease in the amount of water on Earth.

Correct Answer

B) They are a step toward reducing water pollution.

5) Which correctly describes something that can have both a positive and negative impact on the environment?

- **A)** building a dam
- **B)** picking up litter
- **C)** decreasing the use of chemical fertilizers
- **D)** using less water at home

Correct Answer

A) building a dam

6) The Great Pacific Garbage Patch is a large area of floating trash in the Pacific Ocean that is caused, in part, by ocean currents. Which is a step people can take to minimize its effect on Earth's water?

- **A)** use satellites to measure its size
- **B)** measure ocean currents to predict where it will go
- **C)** design new and better ways to recycle
- **D)** work harder to prevent oil spills.

Correct Answer

C) design new and better ways to recycle

- to create a source of groundwater
- to create an area where children can play
- to decrease the amount of freshwater
- to generate electricity ✓

How does the structure of a dam change the flow of surface water?

- A dam is a method used to water crops.
- A dam is a place where groundwater is stored and not used.
- A dam is an empty space created underground due to the removal of groundwater.
- A dam is a type of barrier or wall used to store flowing surface water. ✓

How does an increasing population impact groundwater?



- It has a variable impact on groundwater.
- It decreases the amount of groundwater available. ✓
- It has no impact on groundwater.
- It increases the amount of groundwater available.

What is the **MAIN** advantage of building dams?



- Dams will affect the ecosystems around them in a positive way.
- The water collected in dams will not be used and considered wasted water.
- Collected water in dams will be used to generate electricity. ✓
- People will come and look at the collected water for fun.

What is the purpose of water conservation?
a) To increase water consumption rates
b) To ensure an unlimited supply of water for future generations
c) To deplete natural water sources
d) To promote water pollution

- Which of the following is an example of the "reduce" principle?
- a) Throwing away plastic bottles after one use
- b) Buying single-use plastic utensils instead of reusable ones
- c) Using a refillable water bottle instead of buying disposable ones
- d) Purchasing new clothes frequently without considering the old ones

- What does the "reuse" principle encourage?
- a) Using items for a single purpose and then discarding them
- b) Repurposing or finding new uses for items to extend their lifespan
- c) Recycling materials to create new products
- d) Increasing consumption and buying more items than necessary

- Which of the following is an example of the "recycle" principle?
- a) Donating used clothes to a local charity
- b) Repairing a broken electronic device instead of buying a new one
- c) Sorting and separating waste into different recycling bins
- d) Throwing away plastic bottles in the regular trash bin

- Which of the following activities uses the largest amount of water in households?
- a) Showering and bathing
- b) Flushing toilets
- c) Washing dishes
- d) Watering the garden

- How can individuals reduce their water usage in daily life?
- a) Taking longer showers to save water
- b) Leaving the tap running while brushing teeth
- c) Fixing leaks and dripping faucets
- d) Watering the garden during peak sunlight hours

- What is the main cause of water scarcity in many regions?
- a) Insufficient rainfall
- b) Excessive water conservation efforts
- c) Industrial water usage
- d) Inefficient irrigation practices

PRACTICE QUESTIONS

- How does practicing the "reduce, reuse, and recycle" principles benefit the environment?
- a) It increases pollution and waste generation
- b) It conserves natural resources and reduces landfill waste
- c) It promotes excessive consumption and resource depletion
- d) It has no impact on the environment

- Which of the following is an example of recycling?
- a) Donating old books to a local library
- b) Repurposing glass jars for storage containers
- c) Composting organic waste for fertilizing gardens
- d) Melting plastic bottles to create new plastic products

Impact on the atmosphere- U4M1L3 page 66

CFCs In the 1970s, scientists suggested that CFCs could destroy ozone in the upper atmosphere. Studies revealed a thinning of the ozone layer, particularly over Antarctica.

All of the CFCs in the atmosphere are a result of human activity. CFCs are released from products such as old refrigerators and air conditioners, and propellants in aerosol cans. Ozone in the upper atmosphere absorbs harmful UV rays from the Sun. CFCs react with sunlight and destroy ozone molecules. As a result, the ozone layer thins and more UV rays reach Earth's surface. This, in turn, can harm the tissues of plants and animals.

While CFCs indirectly harm organisms, another form of pollution has a direct effect on Earth's biosphere. Let's explore.



Impact on the atmosphere-U4M1L3 page 66

- Impact on the atmosphere-U4M1L3 page 66

How would you describe the atmosphere in the above locations? What might cause the differences you observed?

The air appears clear in the photo on the left, and smoky in the photo on the right; dust and smoke from industrial processes.

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Particulate Matter The mix of both solid and liquid particles in the air is called **particulate matter.** Solid particles include smoke, dust, and dirt. These particles enter the air from natural processes, such as volcanic eruptions and forest fires. Human activities, such as burning fossil fuels at power plants and in vehicles, also release particulate matter. Inhaling particulates can cause asthma, bronchitis, and lead to heart attacks. It can also interfere with the processes of cellular respiration and photosynthesis in plants.



Impact on the atmosphere- U4M1L3 page 68

How would you describe the state of the trees in the two photos?

Students should note that the trees appear dead or in poor health in the photo on the right.

Acid Precipitation The trees you observed above were affected by acid precipitation. **Acid precipitation** is rain or snow that has a lower pH than that of normal rainwater. The pH of normal rainwater is about 5.6.

Acid precipitation forms when gases containing nitrogen and sulfur react with water, oxygen, and other chemicals in the atmosphere. Although volcanoes and marshes add sulfur gases to the atmosphere, burning fossil fuels is a major source of sulfur emissions. Acid rain can pollute soil and harm trees and other plants. When it falls into lakes and rivers, it can harm fish and other organisms. Many living things cannot survive if the pH of water or soil becomes too low.

Now that you understand the causes and effects of acid precipitation, see if your region experiences this type of air pollution. In the following lab, you will test the rainwater around your home.



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3) Which is NOT a result of acid precipitation?

- **A)** It can harm fish and other organisms.
- **B)** It can pollute soil killing trees and other plants.
- **C)** It can increase the chance of asthma attacks.
- **D)** It can damage buildings and statues made of some types of rocks.

Correct Answer

C) It can increase the chance of asthma attacks.

4) Decreasing the use of fossil fuels like coal and oil will decrease all of the forms of air pollution except:

- **A)** particulate matter
- **B)** photochemical smog
- **C)** acid precipitation
- **D)** CFCs

Correct Answer

D) CFCs

6) Photochemical smog is caused when nitrogen and carbon react in sunlight. Which describes a way humans can decrease the amount of photochemical smog?

- **A)** pass laws to eliminate CFCs
- **B)** use sources of energy other than fossil fuels
- **C)** increase the amount of particulate matter in the air
- **D)** decrease the amount of ozone in the atmosphere

Correct Answer

B) use sources of energy other than fossil fuels

7) What is happening in the picture?



8) Plants need light from the sun in order to go through photosynthesis. Which type of air pollution would most likely decrease the amount of sunlight a plant can absorb?

- **A)** acid precipitation
- **B)** CFCs
- **C)** particulate matter
- **D)** carbon dioxide

Correct Answer

C) particulate matter

A)Sunlight is reacting with waste gases produced by cellular respiration from the trees to produce chemical smog

. B) Sunlight is reacting with waste gases produced by cellular respiration from the trees and by vehicles burning fossil fuels to produce chemical smog.

C) Sunlight is reacting with water vapor produced by vehicles burning fossil fuels to produce photochemical smog.

D) Sunlight is reacting with waste gases produced by vehicles burning fossil fuels to produce photochemical smog.

Correct Answer D) Sunlight is reacting with waste gases produced by vehicles burning fossil fuels to produce photochemical smog.

9) There is a town by a small lake. People come to fish in the lake and hike around its shores. Write a letter to the town's government. Describe why the town should care about acid precipitation. Include what causes acid precipitation in your response.

Acid precipitation is caused when gases containing nitrogen and sulfur react with water, oxygen, and other chemicals in the atmosphere. Acid rain can harm trees and plants, and decrease the pH of lakes, harming fish. People would not want to visit the town if acid rain has a large effect on the lake.

- What is the primary environmental impact of CFCs?
- a) Depletion of the ozone layer
- b) Acid rain formation
- c) Global warming
- d) Soil erosion

- How do CFCs contribute to the depletion of the ozone layer?
- a) By trapping heat in the atmosphere
- b) By releasing greenhouse gases
- c) By breaking down ozone molecules
- d) By causing deforestation

- What are some of the negative consequences of ozone layer depletion?
- a) Increased risk of skin cancer and eye damage
- b) Improved air quality and reduced pollution
- c) Enhanced agricultural productivity
- d) Preservation of biodiversity

- What is acid precipitation?
- a) Rainfall that is slightly acidic in nature
- b) Rainfall that contains high amounts of carbon dioxide
- c) Rainfall that is polluted by chemical emissions
- d) Rainfall that occurs in areas with high humidity

- What is the primary cause of acid precipitation?
- a) Industrial emissions releasing sulfur dioxide and nitrogen oxides
- b) Natural volcanic activity
- c) Excessive deforestation
- d) Increased sunlight exposure

- How does acid precipitation affect the environment?
- a) It improves soil fertility and promotes plant growth
- b) It enhances the biodiversity of aquatic ecosystems
- c) It damages forests, soils, and aquatic habitats
- d) It reduces air pollution and improves air quality

How does acid precipitation affect living things and the pH of water and soil?

- (●) Acid precipitation decreases the pH of water and soil and causes harm to plants and animals. ✓
- ( ) Acid precipitation neither affects the pH of water and soil nor harms plants and animals.
- ( ) Acid precipitation harms plants and animals but does not affect the pH of water and soil
- ( ) Acid precipitation harms plants and animals by increasing the pH of water and soil

Drag and drop the best option to complete the sentence.

Ozone ✓ is(are) one of the main substances that make up smog.

Nitrogen | Carbon compounds | Oxygen

Which of the following reduces the formation of smog and air pollution?

- ( ) power plants
- ( ) factories
- ( ) car fumes
- (●) renewable energy ✓

Which of the following human activities does **NOT** release carbon and nitrogen compounds that cause smog?

- Going to work in cars that release CO_2 into the air.
- Producing more plastic in factories instead of recycling.
- ◉ Generating electricity using the Sun's energy and the wind. ✓
- Burning fossil fuels in power plants to generate electricity.

Select the best option from the drop-down menu.

Smog forms when gases that are released from burning [fossil fuels ✓] react with sunlight.



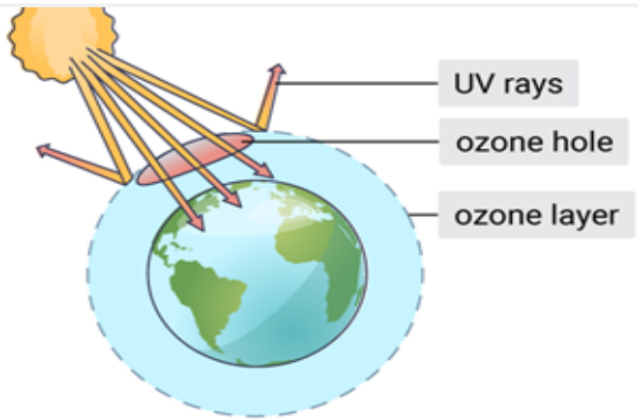
Select the correct answer.

Which of the following is **NOT** an essential factor in the formation of smog?

- nitrogen compounds
- acid ✓
- a layer of cool air
- sunlight

Select the correct answer.

Which of the following is **NOT** an effect of CFCs on the ozone layer and living things?



- harms plant and animal tissues
- destroys the ozone layer
- allows more harmful UV light from the Sun to reach Earth
- thickens the ozone layer ✓

Which of the following does **NOT** cause particulate matter pollution?

- [ ] sandstorms
- [x] adding green spaces ✓
- [x] public transits ✓
- [ ] volcanic eruptions
- [ ] car fumes
- [ ] forest fires

What happens when nitrogen and carbon compounds in the air react with sunlight?

- ( ) They increase the amount of water in the air.
- (•) They form photochemical smog. ✓
- ( ) They produce oxygen gas.
- ( ) They produce ozone gas.

Select the best option from the drop-down menu.

Particulate matter ✓ ⌄ is(are) the harmful mix of solid and liquid particles in the air which causes air pollution.

PRACTICE QUESTIONS

- What is particulate matter?
- a) Tiny solid particles found in the air
- b) Chemical gases emitted from factories
- c) Microorganisms present in soil
- d) Sediments found in bodies of water

- How can particulate matter affect human health?
- a) It has no impact on human health
- b) It can cause respiratory problems and lung damage
- c) It enhances the immune system and prevents diseases
- d) It promotes healthy skin and hair growth

Impact on climate- U4M1L4 page 86

Scientific Consensus As you just investigated in *For the Record*, temperature records show that Earth is getting warmer. Climate scientists have been studying this change and the possible causes of it. Studies show that these changes are due to an increase in greenhouse gases in Earth's atmosphere.



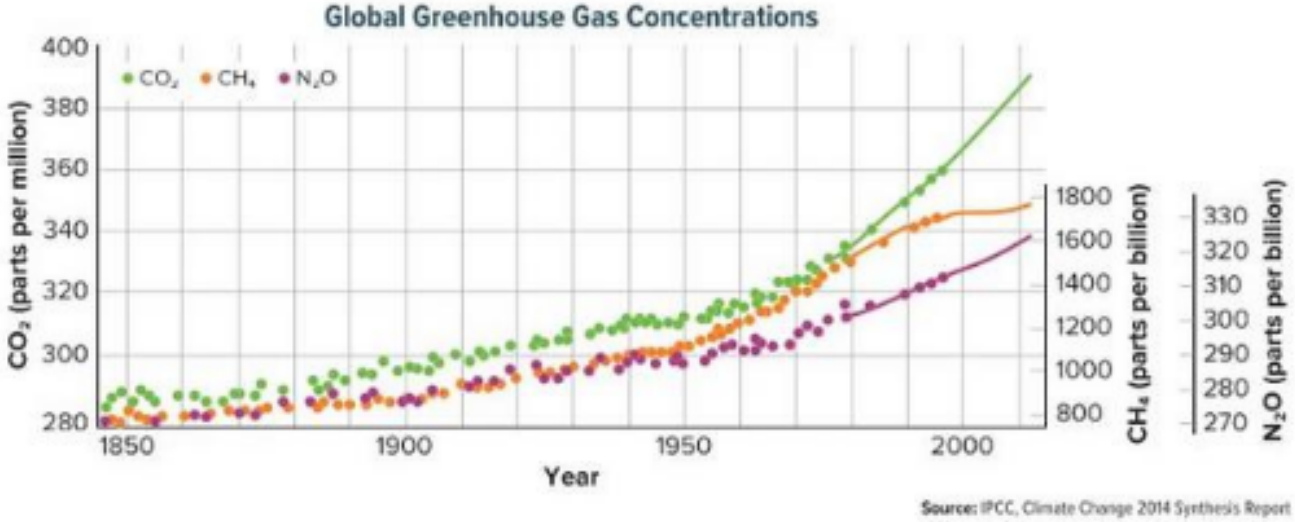
What are greenhouse gases and how do they affect climate?

Gases in the atmosphere that absorb Earth's outgoing infrared radiation are called **greenhouse gases.** Carbon dioxide (CO_2) is an important greenhouse gas. Other greenhouse gases include methane (CH_4) and nitrous oxide (N_2O). What is happening to greenhouse gas concentrations in the atmosphere?

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Greenhouse Gases

Study the graph of atmospheric greenhouse gas levels determined from ice core data (dots) and from direct atmospheric measurements (lines).



Source: IPCC, Climate Change 2014 Synthesis Report

Copyright © McGraw-Hill Education NASA image by Reto Stöckli, based on data from NASA and NOAA

1. What has happened to the levels of CO_2, CH_4, and N_2O in the atmosphere over the last century?

Over the recent past, globally averaged greenhouse gas concentrations in the atmosphere have increased.

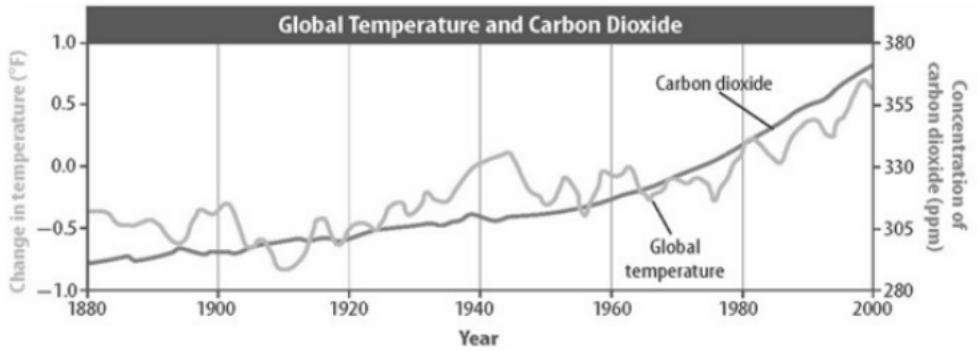
2. What is one question that you have about the data? Record your question in your Science Notebook.

PRACTICE QUESTIONS

- What are greenhouse gases?
- a) Gases released during volcanic eruptions
- b) Gases emitted from factories and vehicles
- c) Gases produced by burning fossil fuels
- d) Gases that trap heat in the Earth's atmosphere

- How do greenhouse gases impact the environment?
- a) They promote the growth of plants and trees
- b) They reduce air pollution and improve air quality
- c) They cause global warming and climate change
- d) They contribute to the depletion of the ozone layer

5) Examine the graph. What do the data show about the change in global temperature?



- **A)** global temperature has decreased over time, and carbon dioxide levels have quickly increased
- **B)** global temperature has varied over time, and carbon dioxide levels have decreased
- **C)** global temperature and carbon dioxide levels have slowly increased over time
- **D)** global temperature has quickly increased, and carbon dioxide level have slowly increased

Correct Answer

C) global temperature and carbon dioxide levels have slowly increased over time

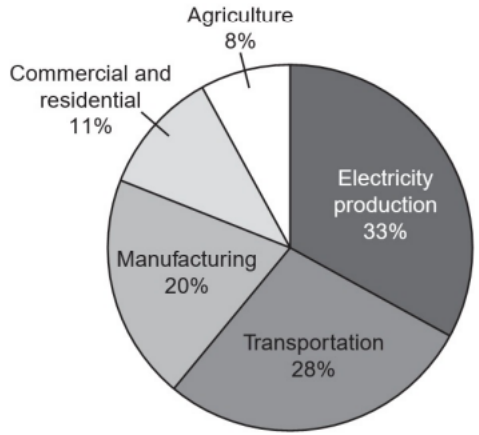
6) Which of the following is a way a 13 year old in America can help control greenhouse gases?

- **A)** plant trees
- **B)** recycle aluminum cans
- **C)** turn off electronics that are not in use
- **D)** all of the above

Correct Answer

D) all of the above

7) The pie chart shows the percentage contributed by each source of all greenhouse gas emissions in the United States.



What action would have the greatest impact on reducing the amount of greenhouse gas emissions?

- **A)** Restrict the amount of livestock grown and sold for meat.

  Rationale: Agriculture accounts for only 8% of greenhouse gases; so, reducing the amount of livestock that produce greenhouse gases would be only a minor improvement.

- **B)** Tax fossil fuels purchased at gas stations more than clean-burning fuels.

  Rationale: Burning fossil fuels is a large contributor of greenhouse gases, but electricity production contributes an even greater amount.

- **C)** Install solar cells on homes and businesses to generate and store energy.

  Rationale: Electricity production is responsible for the greatest amount of greenhouse gases, so reducing its effects would have the greatest impact. Solar cells use the Sun to produce energy; therefore, there are no emissions.

- **D)** Reduce the number of goods produced for consumers and pass laws requiring people to recycle.

  Rationale: The manufacturing of goods purchased by consumers creates emissions. Recycling those goods would reduce emissions, but the manufacturing of those goods is not the biggest contributor of greenhouse gases.

Correct Answer

A) Restrict the amount of livestock grown and sold for meat.

- Which of the following is a greenhouse gas?
- a) Oxygen (O_2)
- b) Nitrogen (N_2)
- c) Carbon dioxide (CO_2)
- d) Hydrogen (H_2)

- What is the primary source of greenhouse gas emissions?
- a) Natural geological processes
- b) Volcanic activity
- c) Human activities, such as burning fossil fuels
- d) Emissions from plants and trees

- What are the consequences of increased greenhouse gas emissions?
- a) Reduced biodiversity and species extinction
- b) Enhanced soil fertility and agricultural productivity
- c) Rising sea levels and more frequent extreme weather events
- d) Improved water quality and increased availability

PRACTICE QUESTIONS

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