

Gr 9 Science PAT

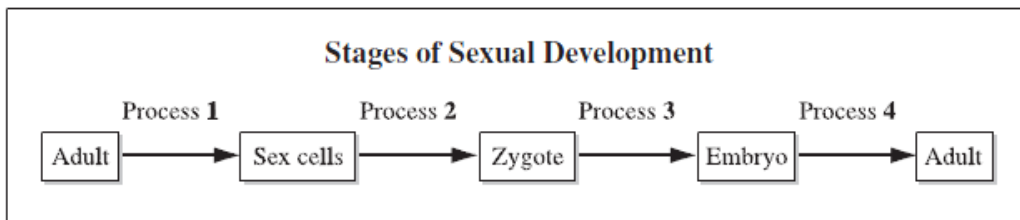
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Subject: «subject»
Date: «date»

1

One **advantage** of asexual reproduction is that it

- A. leads to greater variation within a species
- B. allows offspring to adapt to environmental changes quickly
- C. leads to long-term bonds between the offspring and the parent
- D. allows a population to grow substantially over a short period of time

2



In the flowchart above, the stage at which fertilization takes place is labelled

- A. Process 1
- B. Process 2
- C. Process 3
- D. Process 4

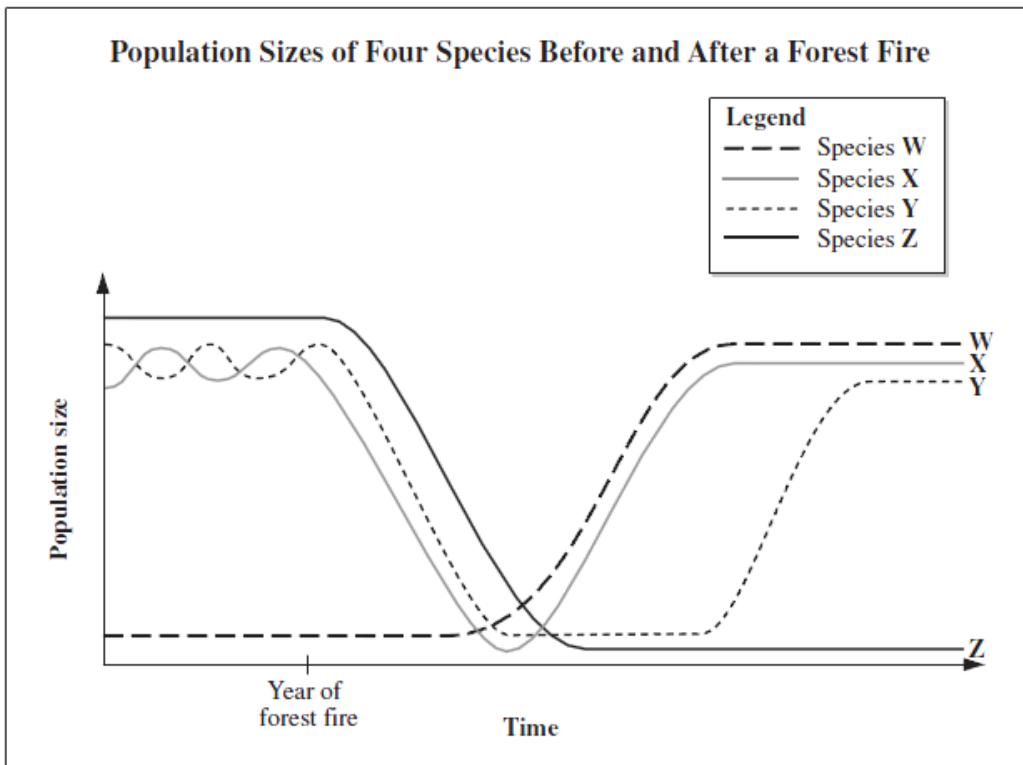
3

- Wolves prey on elk.
- Elk consume willow shrubs.
- Willow shrubs along stream banks provide shade.
- Bull trout require cool water temperatures.

Which of the following changes is **most likely** to occur as a result of a decreased wolf population?

- A. A decreased number of elk
- B. A decreased number of bull trout
- C. An increased number of willow shrubs
- D. An increased number of predators of wolves

4



Given the trends on the graph shown above, which species has the broadest niche?

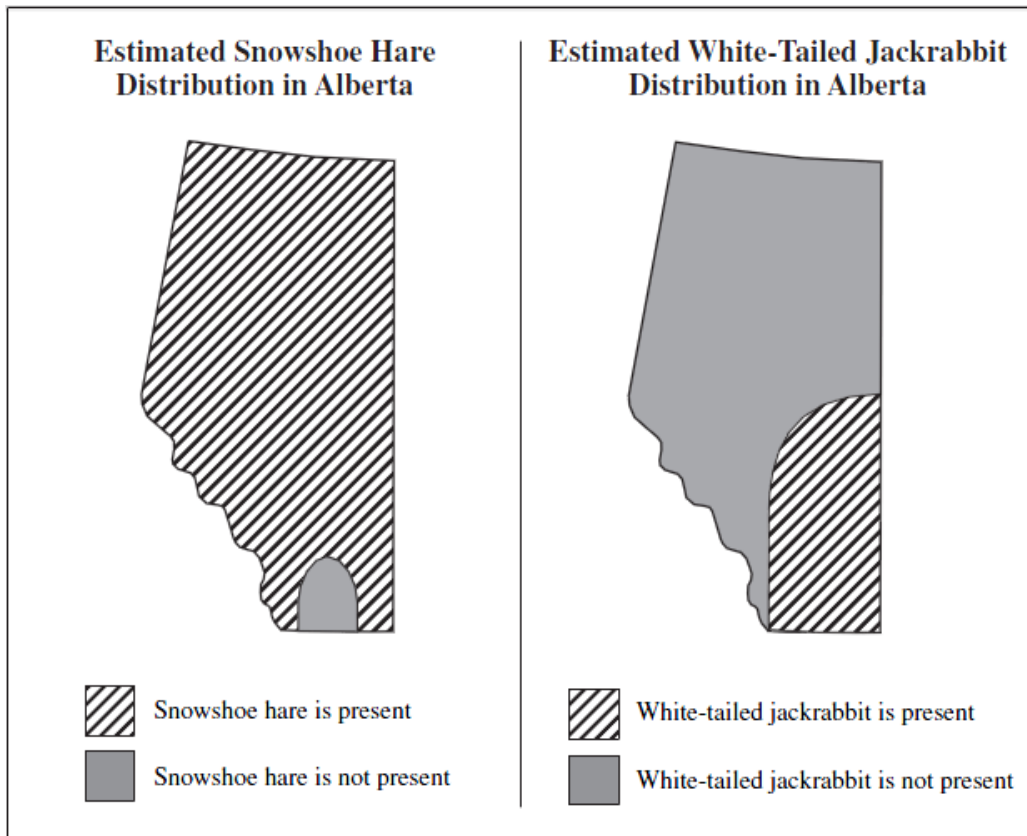
- A. W
- B. X
- C. Y
- D. Z

5

Which of the following human traits is influenced by environmental factors?

- A. Mass
- B. Blood type
- C. Colour-blindness
- D. Ability to roll tongue

6



According to the information above, the white-tailed jackrabbit has a *i* niche and is a better example of a *ii* species than the snowshoe hare.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	broader	generalist
B.	broader	specialist
C.	narrower	generalist
D.	narrower	specialist

7



Which of the following countries contains the most biological diversity?

- A. United States
- B. Argentina
- C. Canada
- D. Brazil

8

A man and a woman who both have brown hair have three children. Two of the children have brown hair and one child has blonde hair.

The gene that codes for brown hair (B) is dominant to the gene that codes for blonde hair (b).

The gene pair combinations of the man and the woman are most likely

- A. bb and bb
 - B. Bb and Bb
 - C. BB and Bb
 - D. BB and BB
-

9

Which part of a cell carries information about heritable traits?

- A. A cell wall
- B. A chloroplast
- C. A chromosome
- D. A cell membrane

10

Human cells normally have 46 chromosomes. Klinefelter syndrome results when human cells have 47 chromosomes.

Klinefelter syndrome is the result of a defect that occurs during

- A. mitosis
- B. meiosis
- C. artificial selection
- D. asexual reproduction

11

Numerical Response

Use the following code to indicate the type of variation that is associated with each of the human traits listed below.

1 = Discrete variation
2 = Continuous variation

Variation: _____
Trait: Gender Height Hand size

12

In most corrosion and combustion reactions, i is a ii .

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	oxygen	reactant
B.	oxygen	product
C.	water	reactant
D.	water	product

13

Element	Melting Point (°C)	Boiling Point (°C)	Colour	Conductivity	Malleability
1	962	2 162	Lustrous silver	Good conductor	Very malleable
2	-218	-183	Colourless	Good insulator	Not malleable
3	115	445	Yellow	?	Not malleable
4	1 064	2 856	Lustrous yellow	?	Very malleable

Which of the following statements describes the conductivity of elements 3 and 4?

- A. Both elements are good insulators.
- B. Both elements are good conductors.
- C. Element 3 is a good conductor and element 4 is a good insulator.
- D. Element 3 is a good insulator and element 4 is a good conductor.

14

What is the chemical name of a molecular substance that is composed of one carbon atom and four chlorine atoms?

- A. Carbon tetrachlorine
- B. Carbon tetrachloride
- C. Carbon chlorine
- D. Carbon chloride

15

1 1.01 H hydrogen 1+, 1-																	2 4.00 He helium -
3 6.94 Li lithium 1+	4 9.01 Be beryllium 2+	5 10.81 B boron -	6 12.01 C carbon -	7 14.01 N nitrogen 3-	8 16.00 O oxygen 2-	9 19.00 F fluorine 1-	10 20.18 Ne neon -	11 22.99 Na sodium 1+	12 24.31 Mg magnesium 2+	13 26.98 Al aluminum 3+	14 28.09 Si silicon -	15 30.97 P phosphorus 3-	16 32.07 S sulfur 2-	17 35.45 Cl chlorine 1-	18 39.95 Ar argon -		

Legend for Elements

Solid	Gas
-------	-----

Note: The legend denotes the states of elements at a temperature of 25 °C.

Key

Atomic number	3	6.94	Atomic molar mass
Symbol	Li	1+	Common ion charges (most common first)
	lithium		Name

Which of the following statements about helium, neon, and argon is true?

- They have the same number of protons.
- They have the same number of neutrons.
- They are solids at a temperature of 25 °C.
- They react with other substances in a similar way.

16

1 1.01 H hydrogen 1+, 1-																	2 4.00 He helium
3 6.94 Li lithium 1+	4 9.01 Be beryllium 2+	5 10.81 B boron	6 12.01 C carbon	7 14.01 N nitrogen 3-	8 16.00 O oxygen 2-	9 19.00 F fluorine 1-	10 20.18 Ne neon										
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Solid	Gas
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Atomic number	3	6.94	Atomic molar mass
Symbol	Li	1+	Common ion charges (most common first)
	lithium		Name

Which of the following rows identifies both the elements and number of atoms that are present in one molecule of $C_6H_{12}O_6$?

Row	Elements	Number of Atoms
A.	Carbon, helium, and oxygen	12
B.	Carbon, helium, and oxygen	24
C.	Carbon, hydrogen, and oxygen	12
D.	Carbon, hydrogen, and oxygen	24

17

Which of the following events is an example of a chemical change?

- A. Liquid nitrogen evaporates.
- B. A candle burns.
- C. Water boils.
- D. Ice melts.

18

When two *i* elements are combined, *ii* compound is formed.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	metallic	an ionic
B.	metallic	a molecular
C.	non-metallic	an ionic
D.	non-metallic	a molecular

19

Which of the following substances is a solution?

- A. Acid rain
- B. Table salt
- C. Helium gas
- D. Baking soda

20

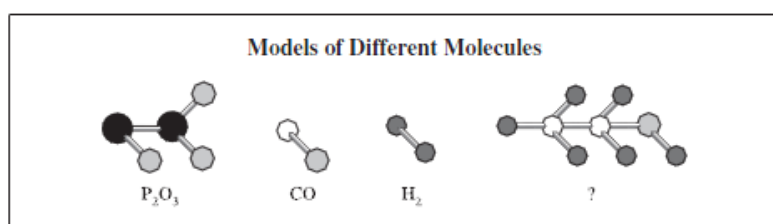
A student tests the reactivity of four metals by placing a piece of each metal into hydrochloric acid. Each piece has an initial mass of 40 g. The student records her observations in the following table.

Metal	Initial acid concentration (g/L)	Temperature of solution after metal reacts with hydrochloric acid (°C)	Mass of metal after it reacts with hydrochloric acid (g)
1	200	28	18
2	200	29	32
3	200	42	14
4	200	35	20

The information in the table shows that the metal that reacts **most readily** with hydrochloric acid is

- A. 1
- B. 2
- C. 3
- D. 4

21



The chemical formula for the unknown molecule shown above is

- A. P_2H_5OH
- B. P_2H_5CH
- C. C_2H_5OH
- D. O_2H_5CH

22

Numerical Response

A student burns a piece of magnesium that has a mass of 70.2 g and makes the following observations.

- Heat is generated.
- An intense white light is emitted.
- A mass of 130.8 g of white magnesium oxide ash is produced.

The mass of oxygen that reacts in the chemical reaction described above is _____ g.

(Record your answer in the numerical-response section on the answer sheet.)

23

Which of the following substances is inorganic?

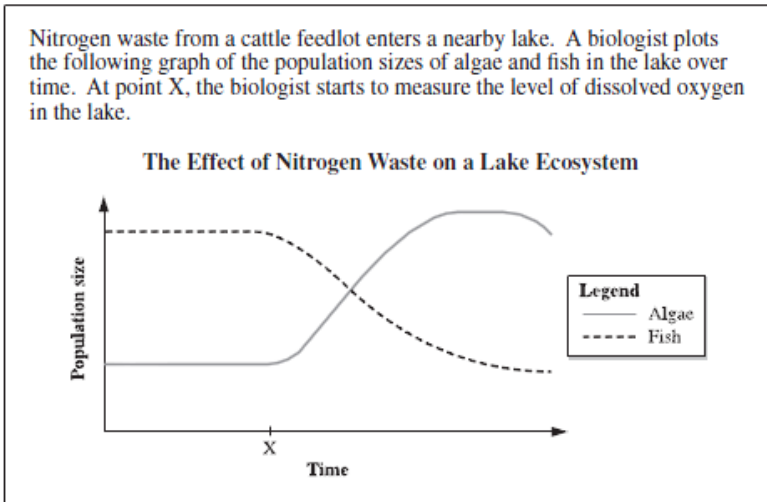
- A. Table salt
- B. Peanut oil
- C. Orange juice
- D. Brown sugar

24

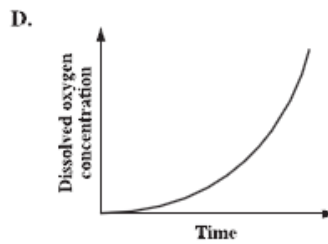
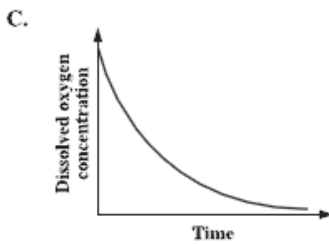
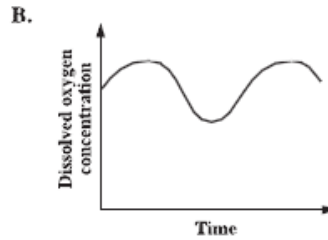
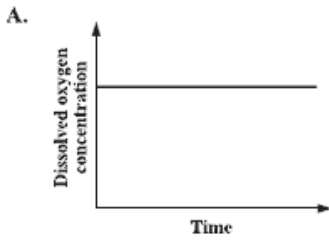
Which of the following statements **best** defines the term LD_{50} ?

- A. LD_{50} is the proportion of the first 50 organisms in a test population that dies when exposed to a particular substance.
- B. LD_{50} is the proportion of the first 50 organisms in a test population that becomes sick when exposed to a particular substance.
- C. LD_{50} is the concentration of a substance administered to a test population that kills half the organisms in the test population.
- D. LD_{50} is the concentration of a substance administered to a test population that makes half the organisms in the test population sick.

Nitrogen waste from a cattle feedlot enters a nearby lake. A biologist plots the following graph of the population sizes of algae and fish in the lake over time. At point X, the biologist starts to measure the level of dissolved oxygen in the lake.



Which of the following graphs shows the dissolved oxygen concentration that the biologist measures in the lake?



The following three brands of fertilizer are administered to three seedlings in a controlled experiment.

Before the administration of the fertilizers, each seedling had similar root growth and three leaves. None of the seedlings had developed flowers.

Composition of Three Brands of Fertilizer

Brand	Major Components		
	Nitrogen (%)	Phosphorous (%)	Potassium (%)
W	7	15	17
X	10	24	5
Y	13	5	10

At the end of a two-month growth period, the following observations are made.

Characteristics of Three Plants Fertilized with Three Brands of Fertilizer

Plant	Brand of Fertilizer	Number of Flowers	Length of Roots (cm)	Number of Leaves
1	W	15	9	6
2	X	5	14	11
3	Y	10	4	16

What is the manipulated variable in the experiment above?

- A. The overall growth of the plants
- B. The length of time that each plant grows
- C. The amount of water that the plants receive
- D. The brand of fertilizer that is used on each plant

27

Which of the following substances can be synthesized by plants?

- A. Silicon
- B. Sulfur
- C. Sugar
- D. Salt

28

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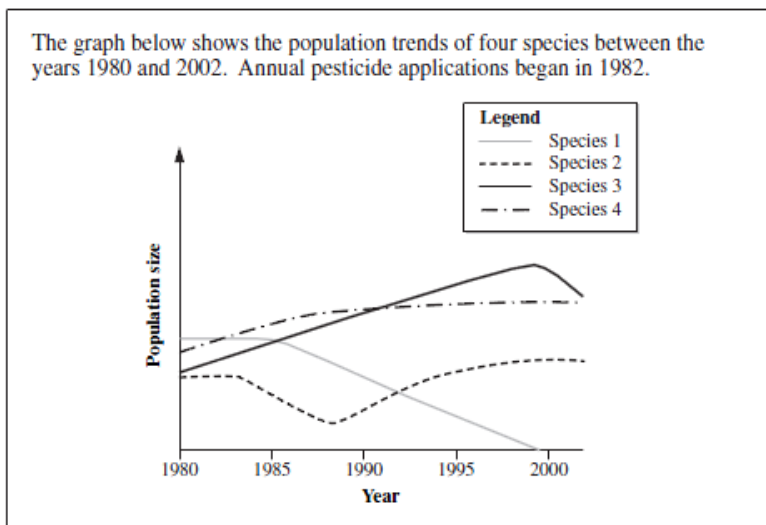
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Plant	Brand of Fertilizer	Number of Flowers	Length of Roots (cm)	Number of Leaves
1	W	15	9	6
2	X	5	14	11
3	Y	10	4	16

Which of the following conclusions is supported by the results of the experiment?

- A. Nitrogen promotes leaf growth, and potassium promotes flower growth.
- B. Nitrogen promotes leaf growth, and potassium promotes root growth.
- C. Nitrogen promotes root growth, and phosphorous promotes flower growth.
- D. Nitrogen promotes root growth, and phosphorous promotes leaf growth.

29

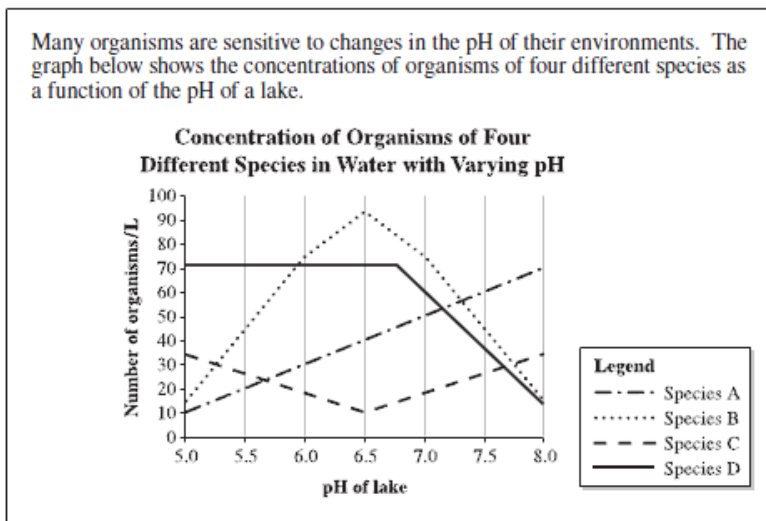


Which of the following inferences is supported by the information in the graph above?

- A. Species 1 became resistant to pesticide use.
- B. Species 2 became resistant to pesticide use.
- C. Species 3 was affected most by pesticide use.
- D. Species 4 was affected most by pesticide use.

30

Many organisms are sensitive to changes in the pH of their environments. The graph below shows the concentrations of organisms of four different species as a function of the pH of a lake.



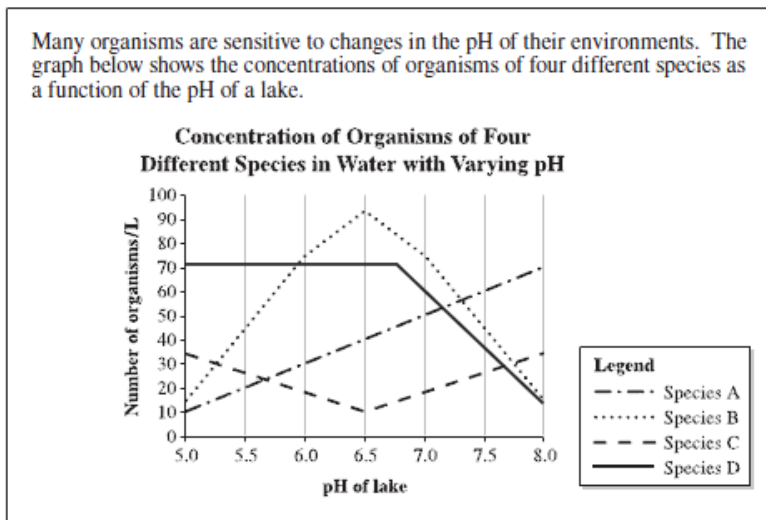
According to the information in the graph, which of the species is most sensitive to changes in the pH of the lake?

- A. Species A
- B. Species B
- C. Species C
- D. Species D

31

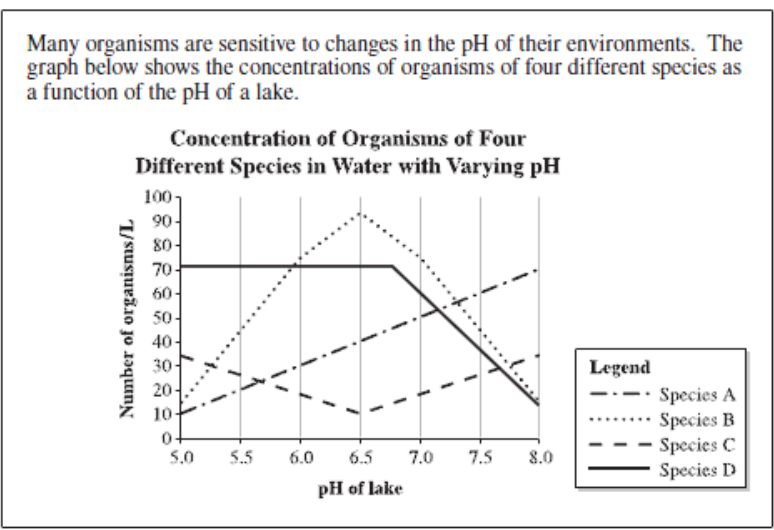
Which species has the fewest number of organisms present in lake water that has a neutral pH?

- A. Species A
- B. Species B
- C. Species C
- D. Species D



32 If acid rain falls into the lake and changes the pH of the water from 6.3 to 5.0, then the species that will increase in concentration is

- A. species A
- B. species B
- C. species C
- D. species D



33

Joe watches television for 6.00 hours (21 600 seconds). The input power rating of his television is 200 W. The electrical energy consumed by any electrical device can be calculated using the following formula.

$$E = P \cdot t$$

E = Energy (in joules)
 P = Power (in watts)
 t = Time (in seconds)

The total electrical energy consumed by Joe's television is

- A. 33.3 J
 - B. 108 J
 - C. 1.20 kJ
 - D. 4.32 MJ
-

**Test Results Showing the Effects of
Seven Different Liquids on Red and Blue Litmus Paper**

	Test I	Test II
Liquid	One drop of liquid is placed on red litmus paper	One drop of liquid is placed on blue litmus paper
Lemon juice	No colour change	Turns red
Ammonia	Turns blue	No colour change
Water	No colour change	No colour change
Liquid W	No colour change	Turns red
Liquid X	Turns blue	No colour change
Liquid Y	No colour change	Turns red
Liquid Z	No colour change	No colour change

For each of the liquids given below, use the number 1 to indicate if the liquid is an acid, the number 2 to indicate if the liquid is neutral, and the number 3 to indicate if the liquid is a base.

Number: _____
Liquid: Liquid W Liquid X Liquid Y Liquid Z

(Record all **four digits** of your answer in the numerical-response section on the answer sheet.)

35

When clothes are removed from a clothes dryer, sparks can be seen as the clothes are separated. These sparks are a result of

- A. current electricity
- B. an electrical discharge
- C. a buildup of neutral atoms
- D. anti-static sheets absorbing neutral charges

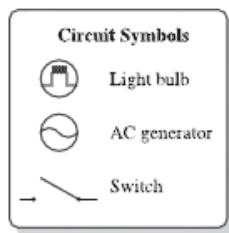
36

Which of the following modifications to an electromagnet will increase its strength?

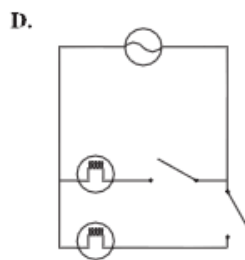
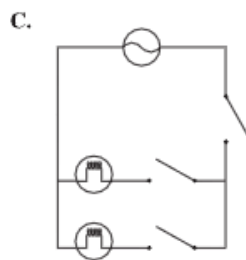
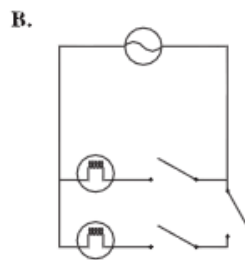
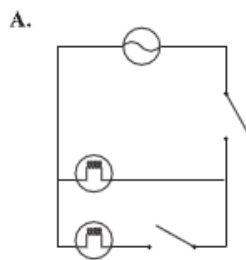
- A. Using a larger iron core
- B. Using fewer coils of copper wire
- C. Increasing the resistance of the iron core
- D. Decreasing the current passing through the coils of copper wire

37

A garage is equipped with two lights and a generator, which are wired in parallel. Each light can be controlled separately, and there is a switch that can turn off both lights at once.



Which of the following diagrams represents the circuit described above?



38

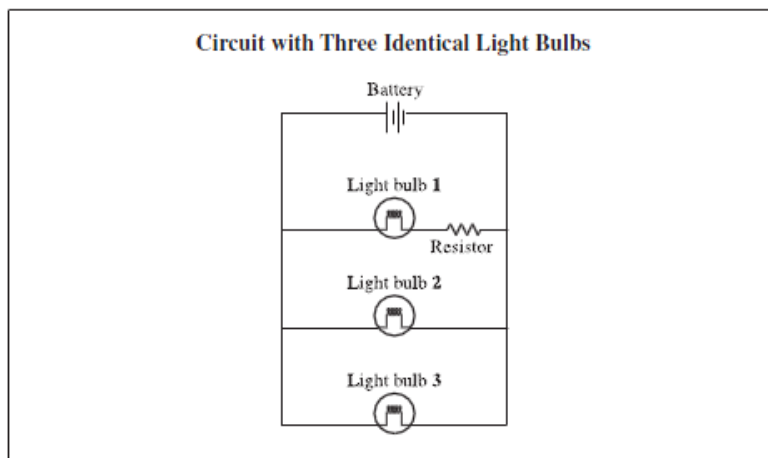
Regional Electrical Energy Generation (GW-h) by Resource, 1999–2002

Year	Coal	Natural Gas	Hydro	Wind	Biomass and Waste	Total
1999	40 276.7	12 126.2	1 453.3	183.1	255.2	54 294.5
2000	40 459.2	15 219.9	1 756.3	71.9	273.8	57 781.1
2001	41 713.3	18 792.9	1 675.4	323.2	282.3	62 787.1
2002	42 541.8	19 462.1	2 188.2	64.6	335.5	64 592.2

Which of the following statements is supported by the data in the table above?

- A. The combined production of energy from renewable and non-renewable resources decreases yearly.
 - B. The combined production of energy from renewable and non-renewable resources increases yearly.
 - C. As the generation of electrical energy from non-renewable resources increases, the generation of electrical energy from renewable resources decreases.
 - D. As the generation of electrical energy from renewable resources increases, the generation of electrical energy from non-renewable resources decreases.
-

39



Which of the following statements predicts the relative brightness of each of the three light bulbs in the circuit shown above?

- A. Light bulb 1 is dimmer than light bulb 2, which is dimmer than light bulb 3.
- B. Light bulb 1 is brighter than light bulb 2, which is brighter than light bulb 3.
- C. Light bulb 1 is dimmer than light bulbs 2 and 3, which both have the same brightness.
- D. Light bulb 1 is brighter than light bulbs 2 and 3, which both have the same brightness.

40

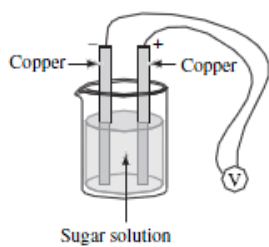
Numerical Response

In order to produce 100 000 J of heat energy, a hot plate consumes 800 000 J of electrical energy.

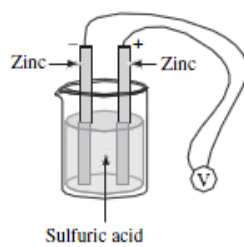
To the nearest tenth of a percentage, the efficiency of the hot plate is _____ %.

41 Which of the following wet cells would produce the **highest** voltage?

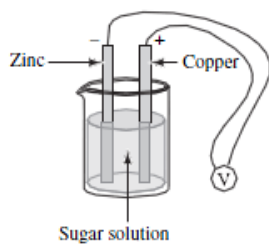
A.



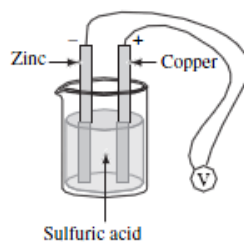
B.



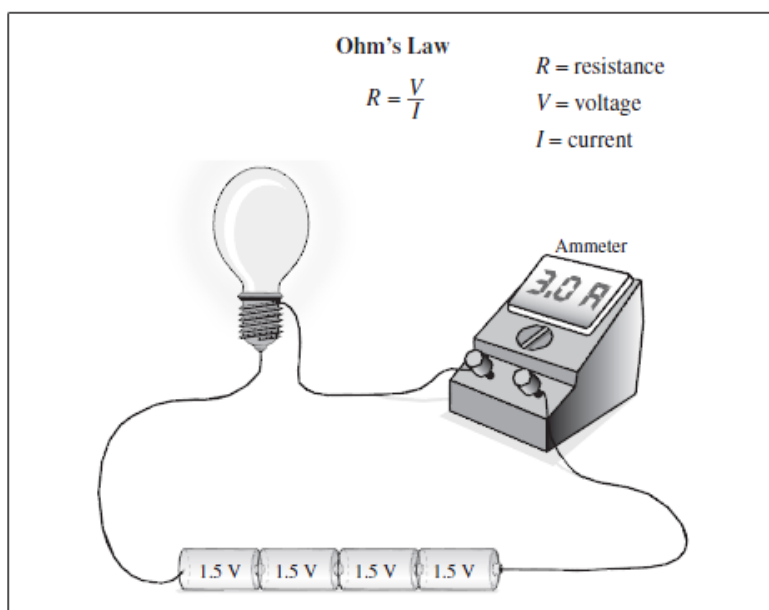
C.



D.



42



The resistance in the circuit shown above is

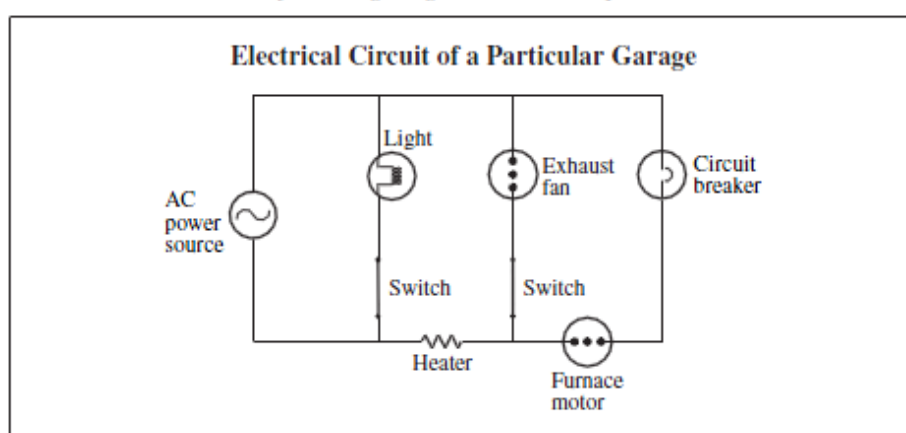
- A. 2Ω
- B. 3Ω
- C. 4Ω
- D. 6Ω

43

Tungsten is used as a filament in some light bulbs because it

- A. allows electrons to flow easily
- B. allows protons to flow easily
- C. resists the flow of electrons
- D. resists the flow of protons

44



Which component in the circuit shown above is protected by the circuit breaker when both switches are closed?

- A. Furnace motor
- B. Exhaust fan
- C. Heater
- D. Light

45

Astronauts on the International Space Station recycle the water that they use, purify dirty water when necessary, and recover water from the humidity of the air within the station.

To manage their water requirements aboard the space station, astronauts do **not** need

- A. processes to purify drinking water
- B. containers to store large quantities of water
- C. a system to recover moisture from inside the space station
- D. solar panels to provide electrical power for the water recycling process

46

Which of the following planets is considered to be terrestrial?

- A. Saturn
- B. Jupiter
- C. Uranus
- D. Mercury

47

When satellites become obsolete, they are typically guided back into the atmosphere where they are destroyed. However, in January 2007, China used a ground-based missile to destroy one of its obsolete satellites that was orbiting Earth.

If other nations were to use satellite-destruction practices similar to China's, then the **most likely** result would be that

- A. space program costs could decrease
 - B. shuttles could be targeted by missiles
 - C. space junk would decrease, making space exploration easy
 - D. space junk would increase, making space exploration difficult
-

48

A total eclipse of the sun is caused by

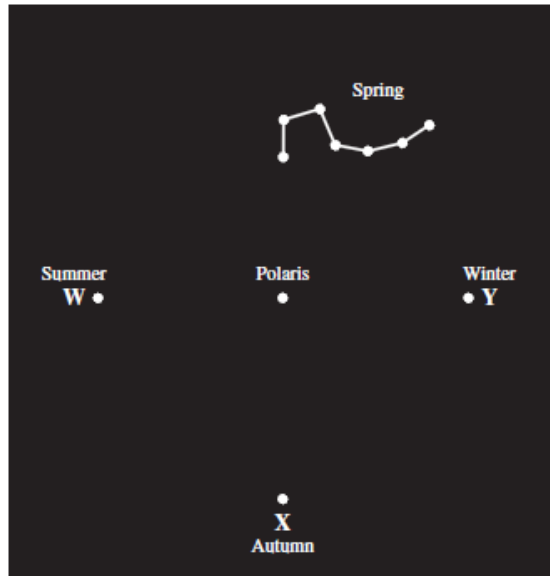
- A. Earth passing between the sun and the moon
- B. Earth spinning on its axis
- C. the moon passing between the sun and Earth
- D. the moon spinning on its axis

49

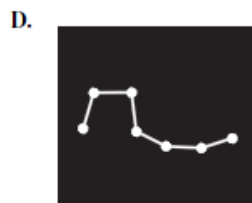
Polaris (the North Star) is directly above Earth's geographic North Pole and is the only star in the sky that does not appear to move.

The diagram below shows the location of the Big Dipper relative to Polaris on a spring evening. The locations of the Big Dipper at the same time of day in the summer, autumn, and winter are represented by positions W, X, and Y respectively.

Seasonal Positions of the Big Dipper



Which of the following diagrams shows the orientation of the Big Dipper when viewed on an autumn evening at position X?



50

The Hubble Space Telescope produces clearer images than similar telescopes that are used on Earth because

- A. the Hubble Space Telescope is travelling in a geosynchronous orbit
- B. the Hubble Space Telescope is closer to the stars that it is viewing
- C. there is no interference from Earth's atmosphere in space
- D. there is no air pressure in space

51

From a specific point, a star can be found using the coordinates below.

Altitude = 32°
Azimuth = 45°

Peggy wants to find this star in the night sky.

To physically locate the star, Peggy must face north, turn *i* , and look *ii* above the horizon.

The statement above is completed by the information in row

Row	<i>i</i>	<i>ii</i>
A.	clockwise 45°	32°
B.	counterclockwise 45°	32°
C.	clockwise 32°	45°
D.	counterclockwise 32°	45°

Numerical Response**Parts of the Universe**

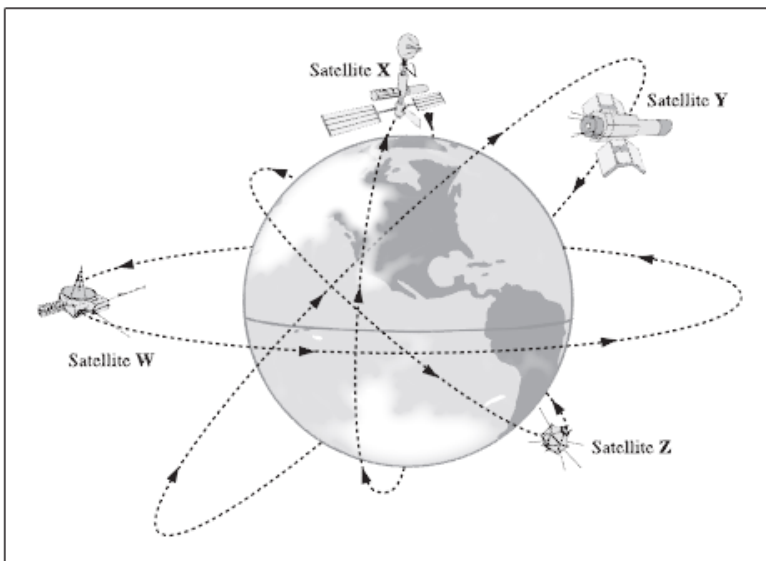
- 1 Earth
- 2 Milky Way
- 3 Solar system
- 4 Sun

List the parts of the universe given above in order from the part with the smallest diameter to the part with the largest diameter.

**Smallest
diameter**

**Largest
diameter**

53



Which pair of satellites in the diagram above can transmit signals over the greatest area of Earth's surface?

- A. Satellites W and Y
- B. Satellites W and Z
- C. Satellites X and Y
- D. Satellites X and Z

54

Astronomers can use a spectroscope to

- A. determine the composition of stars
- B. map the location of celestial bodies in the sky
- C. observe celestial bodies that were previously invisible
- D. see images in space that are not distorted by Earth's atmosphere

55

The best baseline for triangulation to determine the distance between the unknown star and the sun shown above will be established when Earth is in positions W and

- A. V
- B. X
- C. Y
- D. Z

