

# Science 9



## Complete Workbook

- ★ Aligned with Alberta curriculum
- ★ Contains practice questions and answers

2020 EDITION

## TABLE OF CONTENTS

<b>Unit 1: Biological Diversity</b>	<b>2</b>
<b>Unit 2: Matter and Chemical Change</b>	<b>15</b>
<b>Unit 3: Environmental Chemistry</b>	<b>23</b>
<b>Unit 4: Electrical Principles &amp; Technologies</b>	<b>27</b>
<b>Unit 5: Space Exploration</b>	<b>36</b>
<b>Answers</b>	<b>44</b>

### Unit 1: Biological Diversity

- Two different species of rabbits inhabit a forest, and both like to eat the same kind of vegetation. One of the species is more aggressive than the other however, and over time most of the less aggressive species are driven away to look for food elsewhere.  
This is an example of
  - inheritance
  - evolution
  - biodiversity
  - competition
- Which of the following is **not** a part of an animal cell?
  - Nucleus
  - Cell wall
  - Cell membrane
  - Mitochondria
- Some organisms may use asexual reproduction instead of sexual reproduction when:
  - conditions do not favour sexual reproduction
  - a suitable mate is not available
  - when resources are scarce
  - all of the above
- \_\_\_\_\_ diversity is beneficial to an ecosystem.
  - increased
  - decreased
  - semi-permeable
  - condensed
- In which of the following cells does mitosis **not** take place?
  - sperm
  - skin
  - liver
  - bone
- The primary function of chloroplasts in plant cells is:
  - The site of photosynthesis
  - To provide protein for the plant
  - To regulate gas exchange
  - The housing for DNA
- Biodiversity can be defined as
  - the study of the interaction between animals and their environment
  - competition between different organisms ensures that only those with stronger traits survive
  - the ability of animals and plants to adapt to their environment
  - the number and variety of organisms found within a region
- The green pigment found in plant cells that is necessary for photosynthesis is called:
  - Chloroplast
  - Chlorophyll
  - Parenchyma
  - Collenchyma
- Which of the following are in the correct order?
  - species, kingdom, order
  - family, kingdom, species
  - kingdom, species, phyla
  - kingdom, family, species
- Diversity means:
  - becoming extinct
  - dying
  - living in the same place
  - differences

11. Meiosis takes place in:
  - A) Somatic cells
  - B) Gametes
  - C) All cells in the human body
  - D) Only in skin cells
12. During prophase:
  - A) Chromosomes shorten and thicken
  - B) DNA strands are copied
  - C) Cytoplasm is copied
  - D) Reproduction takes place
13. Biodiversity can be defined as
  - A) the study of the interaction between animals and their environment
  - B) competition between different organisms ensures that only those with stronger traits survive
  - C) the ability of animals and plants to adapt to their environment
  - D) the number and variety of organisms found within a region
14. The structure of DNA was discovered by which two scientists?
  - A) Holmes and Watson
  - B) Bohr and Rutherford
  - C) Crick and Watson
  - D) Mendel and Darwin
15. Which of the following organelles is **not** found in animal cells?
  - A) Mitochondria
  - B) Chloroplasts
  - C) Ribosomes
  - D) Nuclei
16. If you cut a leaf of an African violet plant and let it root in water, this is an example of:
  - A) vegetative reproduction
  - B) spore production
  - C) budding
  - D) binary fission
17. The best definition of mitosis is the process by which cells:
  - A) reproduce sexually
  - B) reproduce themselves
  - C) produce food
  - D) produce energy
18. An embryo is defined as the:
  - A) same stage of development as a zygote
  - B) fertilized egg stage of development
  - C) stage of development after a zygote
  - D) stage of development after a fetus
19. How many strands of DNA are found in a chromosome?
  - A) one
  - B) two
  - C) two or more
  - D) any number
20. Your height and your weight are examples of
  - A) continuous variations
  - B) discrete variations
  - C) biodiversity
  - D) behavioural adaptations
21. \_\_\_\_\_ is the maintenance of populations of wild organisms within their natural ecosystems.
  - A) Seed banks
  - B) Ex-situ Conservation
  - C) In-situ conservation
  - D) Zoos

22.



Coral reefs have been referred to as "the amazons of the oceans" because of their richness in diversity. Like the Amazon rainforest, coral reefs "feed off themselves" to make use of limited resources. This means that living things in a coral reef have to interact through symbiosis.

Both rainforests and coral reefs have a high diversity index. Why is it that a tropical region would have the most diversity?

- A) Those regions have the least competition.
- B) People don't cause disturbance in tropical regions.
- C) The abundance of rain and warmth helps a wide range of plants and animals to survive.
- D) These areas have the richest soils.

23. Animals usually choose a mate based on which of the following factors?

- A) Physical traits

- B) Geographic location
- C) Genetic variation
- D) Heredity factors

24. What is one of the disadvantages of specialization?

- A) It causes the biological diversity of an area to go down.
- B) Specialists are not as well suited to their environment as generalists.
- C) In developing better ways of obtaining resources from a specific environment, they can become less capable of obtaining these resources if the environment changes.
- D) It allows for a greater number of organisms to inhabit an area, making it more difficult for them to find food.

25.

The Remora is a long, slender fish, which has a sucker attached to the end of one of its fins. It uses this sucker to attach to larger fish and turtles. Besides getting a free ride, the Remora can also pick up bits of food that its host is feeding on. The Remora does not harm these hosts.

The sucker on the Remora's fin is an example of a

- A) parasite
- B) structural adaptation
- C) natural selection
- D) gene

26. Which form of reproduction is best in a changing environment?  
A) sexual reproduction  
B) asexual reproduction  
C) binary fission  
D) vegetative reproduction
27. Which of the following is most likely to be *heritable*, or able to be passed from parent to offspring by genetics?  
A) favorite food  
B) hair length  
C) native language  
D) eye color
28. The green pigment found in plant cells that is necessary for photosynthesis is called:  
A) Chloroplast  
B) Chlorophyll  
C) Parenchyma  
D) Collenchyma
29. DNA stands for:  
A) deoxyribonucleic acid  
B) deoxyribonucleic acid  
C) di-oxiribonucleic acid  
D) di Oxygen ribose acid
30. What are the roles of heredity and the environment in a person's eye colour?  
A) heredity plays a role, but environment does not  
B) environment plays a role, but heredity does not  
C) both heredity and environment play a role  
D) neither heredity nor environment play a role
31. Which of the following are an example of discrete variation in genetics?  
A) weight  
B) skin color  
C) height  
D) blood type
32. Biodiversity can be defined as  
A) the study of the interaction between animals and their environment  
B) competition between different organisms ensures that only those with stronger traits survive  
C) the ability of animals and plants to adapt to their environment  
D) the number and variety of organisms found within a region
33. DNA stands for:  
A) deoxyribonucleic acid  
B) deoxyribonucleic acid  
C) di-oxiribonucleic acid  
D) di Oxygen ribose acid
34. How is a polar bear's ecological niche different from a human's niche?  
A) the polar bear lives at colder temperatures than humans  
B) the polar bear has fur and humans don't  
C) humans have bigger brains  
D) both polar bears and humans eat meat
35. The primary function of chloroplasts in plant cells is:  
A) The site of photosynthesis  
B) To provide protein for the plant  
C) To regulate gas exchange  
D) The housing for DNA
36. During prophase:  
A) Chromosomes shorten and thicken  
B) DNA strands are copied  
C) Cytoplasm is copied  
D) Reproduction takes place

37. In Canada, generally the organisms which survive the best are those which have a broad niche. What is one of the reasons why this might be so?
- A) There is a reliable source of food year round.
  - B) They need to be able to adapt to the extremes of temperature experienced and the variations in food supply.
  - C) There is not a great deal of food to support them, so competition is fierce.
  - D) They need to specialize in order to survive.
38. Coral reefs have been referred to as "the amazons of the oceans" because of their richness in diversity. Like the Amazon rainforest, coral reefs "feed off themselves" to make use of limited resources. This means that living things in a coral reef have to interact through symbiosis. Clownfish can find shelter from larger fish within sea anemones, because they are the only fish that are not stung by the tentacles. In exchange, the sea anemones are given better water circulation because the clownfish fan their fins while swimming about. Clownfish are often harvested from the wild to be included in private aquarium displays. Why would this be unfavorable to the coral reef?
- A) More food is available for the remaining clownfish.
  - B) The anemones are no longer protected by the clownfish.
  - C) It breaks the symbiotic relationship with the sea anemone.
  - D) The pet stores will breed clownfish in captivity.

39. You may have heard about the extinction of the dodo bird. It was first discovered in 1581, by visitors to the island of Mauritius, where this flightless bird quickly got the reputation as being stupid and unfit. Many were killed or their nests destroyed, both by man and by animals that man brought with him. Within 100 years, the last one was killed, but people at the time thought that since it was so ill-prepared for survival, it became extinct as evolution would expect.

It turned out that the bird wasn't stupid and unfit at all. It had no natural predators on the island, and as a result had no fear of man. Thousands were killed as they happily walked up to humans. As well, it wasn't particularly unfit either. It is true that it couldn't fly, but an analysis of dodo leg bones indicate that it could actually run quite fast. The extinction of the dodo was therefore apparently caused by:

- A) extirpation
  - B) natural selection
  - C) artificial selection
  - D) the introduction of non-native species to its habitat
40. Which of the following are in the correct order?
- A) species, kingdom, order
  - B) family, kingdom, species
  - C) kingdom, species, phyla
  - D) kingdom, family, species

41. The structure of DNA can best be described as a:
- A) corkscrew
  - B) helix
  - C) double helix
  - D) spiral
42. Which of the following is **not** an example of a method by which people try to minimize the loss of a species diversity?
- A) Desert areas near El Minya in Egypt are irrigated, so that the land can support dairy cows.
  - B) The Millennium Seed Bank project of the Royal Botanic Gardens in rural England holds seed samples from over 25,000 species of plants, including samples from all wild plants in the British Isles.
  - C) The Canadian Science Centre for Human and Animal Health in Winnipeg houses a number of various deadly viruses that can be used for research.
  - D) The Pittsburgh Zoo participates in a national breeding program for the endangered Siberian Tiger
43. Ribosomes are the site of:
- A) Protein synthesis
  - B) Mitosis
  - C) Meiosis
  - D) Reproduction
44. Which of the following are in the correct order?
- A) species, kingdom, order
  - B) family, kingdom, species
  - C) kingdom, species, phyla
  - D) kingdom, family, species
45. Which of the following is not present in DNA?
- A) cytosine
  - B) guanine
  - C) bovine
  - D) thymine
46. The best definition for the term asexual reproduction is the process by which organisms reproduce:
- A) with another organism
  - B) to produce genetically different offspring
  - C) without another organism
  - D) to increase genetic diversity
47. Which of the following is true about a species?
- A) members of the same species can reproduce together
  - B) species never become extinct
  - C) there are more species in the Arctic than in a tropical rain forest
  - D) there are more species now than there were in the past
48. Asexual reproduction differs from sexual reproduction because it:
- A) does not use all the cells of the body
  - B) uses only gamete cells
  - C) does not involve an exchange of genetic material
  - D) involves an exchange of genetic material

49.

In the last half of the 1990s, Yellowstone National Park in the United States started a program to try and re-introduce wolves to the area. Several wolves were captured near Fort Saint John in British Columbia, acclimatized in special pens in Yellowstone, and then released.

Long before, wolves had been native to the area, but until they were recently introduced, they had disappeared. This is an example of

- A) extinction
- B) extirpation
- C) heredity
- D) diversity within a species

50. How does variability help a species survive?

- A) variability limits the number of babies that are born
- B) if all individuals of a species are identical, they can outsmart their enemies
- C) if individuals are different, then there is a possibility that some individuals will survive if something harmful happens
- D) when there is variability, individuals can change whenever something harmful happens

51. Which is an advantage of asexual reproduction?

- A) it results in offspring that are more

easily able to adapt to changing conditions

- B) reproduction can occur rapidly
- C) offspring will show characteristics of both parents
- D) variations in a species can happen more readily

52. When an organism is cloned the resulting offspring:

- A) have more than one parent
- B) have more genetic diversity than non-cloned offspring
- C) are genetically identical to the original organism
- D) is more likely to live longer than offspring conceived the natural way

53. Which of the following are in the correct order?

- A) species, kingdom, order
- B) family, kingdom, species
- C) kingdom, species, phyla
- D) kingdom, family, species

54. The structure of DNA was discovered by which two scientists?

- A) Holmes and Watson
- B) Bohr and Rutherford
- C) Crick and Watson
- D) Mendel and Darwin

55. How many chromosomes are there in the nucleus of a human egg cell?

- A) 3
- B) 22
- C) 46
- D) 23

56. If you visited a prairie slough, what would you probably find?
- A) zebras, deer, and frogs
  - B) mosquitoes, ducks, and grass
  - C) dogs, cats, and mice
  - D) water, clouds, and a restaurant
57. A community is made up of
- A) different populations
  - B) members of the same family
  - C) animals only
  - D) plants only
58. Geneticist's study:
- A) Animals
  - B) Biology
  - C) Plants
  - D) DNA
59. Which of the following are an example of continuous variation in genetics?
- A) blood type
  - B) height
  - C) right- or left-handedness
  - D) whether you can roll your tongue
60. Which of the following would best illustrate an example of natural selection?
- A) over time, mosquitos become more resistant to insecticide
  - B) salmon are prevented from reaching their spawning grounds by a dam which is constructed in a river
  - C) a farmer keeps some eggs back from chickens which lay the most, in order to hatch them
  - D) researchers create a type of wheat that develops and matures faster, for use in colder climates
61. What is the difference between sexual and asexual reproduction?
- A) sexual reproduction results in more offspring
  - B) asexual reproduction requires only one parent
  - C) both result in natural selection
  - D) sexual reproduction requires no parents
62. The green pigment found in plant cells that is necessary for photosynthesis is called:
- A) Chloroplast
  - B) Chlorophyll
  - C) Parenchyma
  - D) Collenchyma
63. An organism's niche can be described by
- A) how an organism can change to adapt to its surroundings
  - B) where an organism lives and what it does
  - C) what type of food an organism eats
  - D) what kind of predators an organism has

64.

B = Black Allele b = White Allele		Father's Alleles (Black Cat)	
		B	b
Mother's Alleles (Black Cat)	B	BB	Bb
	b	bB	bb

If black fur colour is a dominant trait in cats, what percent of offspring from the two black cats in the table are predicted to have a white coat?

- A) 25%
- B) 50%
- C) 75%
- D) 0%
65. DNA is found in
- A) all the cells of the human body
- B) only the gamete cells
- C) only the somatic cells
- D) only the germ cells
66. Genes are to chromosomes like
- A) beads are to a necklace
- B) the Sun is to planets
- C) arms are to legs
- D) dogs are to cats

67. In plant reproduction, the function of the petals of a flower is:
- A) attracting of insects for pollination
- B) preventing insects from destroying the seeds
- C) allowing the plant to be seen easily
- D) attracting plants of the opposite sex
68. As you walk through a grassy park, you notice lots of young tree shoots trying to grow out of the grass. Looking around, you see an aspen forest at the edge of the park. These new shoots are most likely:
- A) Spores
- B) New sprouts from seeds planted in the grass
- C) Suckers
- D) Runners
69. If you cut a leaf of an African violet plant and let it root in water, this is an example of:
- A) vegetative propagation
- B) spore production
- C) budding
- D) binary fission
70. When an animal dies, \_\_\_\_\_ like \_\_\_\_\_ break down the animal and return the nutrients to the environment.
- A) scavengers, worms
- B) decomposers, worms
- C) decomposers, ravens
- D) scavengers, mushrooms

71. Two different species of rabbits inhabit a forest, and both like to eat the same kind of vegetation. One of the species is more aggressive than the other however, and over time most of the less aggressive species are driven away to look for food elsewhere.  
This is an example of  
A) inheritance  
B) evolution  
C) biodiversity  
D) competition
72. What is the process by which sperm is harvested from a bull, and inserted into many female cows?  
A) In-vitro fertilization  
B) Cross-pollination  
C) Asexual reproduction  
D) Artificial insemination
73. Garden worms and slugs are examples of  
A) mammals  
B) zygotes  
C) hermaphrodites  
D) mutants
74. \_\_\_\_\_ is the maintenance of populations of wild organisms within their natural ecosystems.  
A) Seed banks  
B) Ex-situ Conservation  
C) In-situ conservation  
D) Zoos
75. A fertilized human egg is called a(n):  
A) Ovum  
B) Zygote  
C) Embryo  
D) Baby
76. In the cell the genetic material is found in the:  
A) cytoplasm  
B) ribosomes  
C) mitochondria  
D) nucleus
77. Which of the following is an example of variation within a species?  
A) A variety of finches in the Galápagos Islands that had different styles of beaks.  
B) Different students in a classroom have blue, brown, or green eyes.  
C) A forest consists of pine, spruce, and poplar trees.  
D) Black bears and grizzly bears share a meadow.
78. Coral reefs have been referred to as "the amazons of the oceans" because of their richness in diversity. Like the Amazon rainforest, coral reefs "feed off themselves" to make use of limited resources. This means that living things in a coral reef have to interact through symbiosis.  
Clownfish can find shelter from larger fish within sea anemones, because they are the only fish that are not stung by the tentacles. In exchange, the sea anemones are given better water circulation because the clownfish fan their fins while swimming about.  
What type of symbiosis is represented by the clownfish and the sea anemone?  
A) Commensalism  
B) Parasitism  
C) Mutualism  
D) Both A and C

79. In plant reproduction, the function of the petals of a flower is:
- A) attracting of insects for pollination
  - B) preventing insects from destroying the seeds
  - C) allowing the plant to be seen easily
  - D) attracting plants of the opposite sex
80. Geneticist's study:
- A) Animals
  - B) Biology
  - C) Plants
  - D) DNA
81. What can cause a species to become extinct?
- A) an increase in its food supply
  - B) a rain storm
  - C) human influences
  - D) lightning
82. DNA is found in
- A) all the cells of the human body
  - B) only the gamete cells
  - C) only the somatic cells
  - D) only the germ cells
83. How does variability help a species survive?
- A) variability limits the number of babies that are born
  - B) if all individuals of a species are identical, they can outsmart their enemies
  - C) if individuals are different, then there is a possibility that some individuals will survive if something harmful happens
  - D) when there is variability, individuals can change whenever something harmful happens
84. Biologists use the term *diversity index* to compare the diversity of species in an area with the total number of organisms. Which ecosystem would you suspect to have the highest diversity index?
- A) a desert
  - B) a prairie
  - C) a stream
  - D) a rainforest
85. Cancer cells are often caused by normal cells undergoing changes to their DNA that causes them to divide rapidly and develop abnormally. These changes are known as:
- A) mutations
  - B) heredity
  - C) asexual reproduction
  - D) discrete variation
86. Coral reefs have been referred to as "the amazons of the oceans" because of their richness in diversity. Like the Amazon rainforest, coral reefs "feed off themselves" to make use of limited resources. This means that living things in a coral reef have to interact through symbiosis. Both rainforests and coral reefs have a high diversity index. Why is it that a tropical region would have the most diversity?
- A) Those regions have the least competition.
  - B) People don't cause disturbance in tropical regions.
  - C) The abundance of rain and warmth helps a wide range of plants and animals to survive.
  - D) These areas have the richest soils.

87. Refer to the information in question 6. Clownfish can find shelter from larger fish within sea anemones, because they are the only fish that are not stung by the tentacles. In exchange, the sea anemones are given better water circulation because the clownfish fan their fins while swimming about. Clownfish are often harvested from the wild to be included in private aquarium displays. Why would this be unfavorable to the coral reef?
- A) More food is available for the remaining clownfish.
  - B) The anemones are no longer protected by the clownfish.
  - C) It breaks the symbiotic relationship with the sea anemone.
  - D) The pet stores will breed clownfish in captivity.
88. Individuals in a population are all \_\_\_\_\_
- A) in the same family
  - B) of the same species
  - C) going to become extinct
  - D) genetically identical
89. In Canada, generally the organisms which survive the best are those which have a broad niche. What is one of the reasons why this might be so?
- A) There is a reliable source of food year round.
  - B) They need to be able to adapt to the extremes of temperature experienced and the variations in food supply.
  - C) There is not a great deal of food to support them, so competition is fierce.
  - D) They need to specialize in order to survive.
90. Prokaryote cells are:
- A) arranged to maximize light absorption
  - B) arranged to maximize gas exchange
  - C) simple cells which do not contain a nucleus
91. Genes are to chromosomes like
- A) beads are to a necklace
  - B) the Sun is to planets
  - C) arms are to legs
  - D) dogs are to cats
92. The structure of DNA was discovered by which two scientists?
- A) Holmes and Watson
  - B) Bohr and Rutherford
  - C) Crick and Watson
  - D) Mendel and Darwin
93. Coral reefs have been referred to as "the amazons of the oceans" because of their richness in diversity. Like the Amazon rainforest, coral reefs "feed off themselves" to make use of limited resources. This means that living things in a coral reef have to interact through symbiosis
- Clownfish can find shelter from larger fish within sea anemones, because they are the only fish that are not stung by the tentacles. In exchange, the sea anemones are given better water circulation because the clownfish fan their fins while swimming about. What type of symbiosis is represented by the clownfish and the sea anemone?
- A) Commensalism
  - B) Parasitism
  - C) Mutualism
  - D) Both A and C

94. Meiosis takes place in:
- A) Somatic cells
  - B) Gametes
  - C) All cells in the human body
  - D) Only in skin cells
95. How many strands of DNA are found in a chromosome?
- A) one
  - B) two
  - C) two or more
  - D) any number
96. In the cell the genetic material is found in the:
- A) cytoplasm
  - B) ribosomes
  - C) mitochondria
  - D) nucleus
97. Vegetative propagation is a type of \_\_\_\_\_ reproduction that results in \_\_\_\_\_ individuals.
- A) asexual, different
  - B) sexual, different
  - C) sexual, identical
  - D) asexual, identical
98. One of the most important reasons that diversity within a species is useful, is to ensure that
- A) at least some members of the species can more easily adapt to changing conditions
  - B) there are a large number of individuals of that species to feed their predators
  - C) their habitat remains relatively unchanged
  - D) individuals within the species can tell each other apart
99. The Remora is a long, slender fish, which has a sucker attached to the end of one of its fins. It uses this sucker to

attach to larger fish and turtles. Besides getting a free ride, the Remora can also pick up bits of food that its host is feeding on. The Remora does not harm these hosts. What kind of symbiotic relationship is there between the Remora and its host?

- A) parasitism
  - B) partitioning
  - C) variable
  - D) commensalism
100. When the Europeans colonized Australia 200 years ago, they brought with them many animals that were not native to the area. But the natural predators that these animals had to contend with in their original homeland were not to be found in Australia, so in many cases, their numbers multiplied out of control. For example, rabbits were not native to Australia, but now the current population is estimated at more than 500 million. This introduction of non-native species is sometimes appropriately termed "biotic pollution". Why is this undesirable?
- A) introducing non-native species increases the biological diversity of an area
  - B) introducing non-native species to an environment adds more diversity within the species
  - C) introducing non-native species to an environment results in a larger gene pool
  - D) non-native species like the rabbits can destroy the habitat and eat the food of native species

## Unit 2: Matter and Chemical Change

1. What will increase the rate of a chemical reaction?
  - A) Increasing the temperature and concentration of reactants
  - B) Decreasing the temperature and concentration of reactants
  - C) Decreasing the temperature and adding a catalyst
  - D) Increasing the temperature and decreasing the concentration of reactants

2.

Ammonium Phosphate, a lawn fertilizer, has the following formula:  $(\text{NH}_4)_3\text{PO}_4(s)$

The package tells you that it is a 10-10-00 fertilizer. What elements in the formula is it referring to in this 6-digit analysis?

- A) Nitrogen, Hydrogen
  - B) Nitrogen, Phosphorus
  - C) Phosphorus, Hydrogen
  - D) Phosphorus, Oxygen
3. Gold, silver, copper, tin, and aluminum are all \_\_\_\_\_ and \_\_\_\_\_.
    - A) Metals, elements
    - B) Compounds, elements
    - C) Metals, cells
    - D) Compounds, cells

4.

Baking soda is a common ingredient found in most kitchens. It has a chemical name of sodium bicarbonate, and a chemical formula of  $\text{NaHCO}_3$ . In a small sample of baking soda, 300 hydrogen atoms can be found.

How many molecules of baking soda are in the sample?

- A) 900
- B) 300
- C) 600
- D) 1800

5.

In December of 2000, Russian scientists announced that in their laboratory they had created the largest atom known. Called Ununhexium, it was reported to have an atomic number of 116 and an atomic mass of 292.

How many electrons can be found in Ununhexium?

- A) 116
- B) 176
- C) 292
- D) 408

6. Refer to the information in question 5. How many neutrons can be found in Ununhexium?

- A) 116
- B) 176
- C) 292
- D) 408

7. A student dissolves an unknown substance in distilled water and finds that the resulting solution is electrically conductive. From this observation, the student can conclude that the unknown substance
- A) is a molecular compound
  - B) is an ionic compound
  - C) cannot be classified; further experiments are required
  - D) is a metal

8. What does the following WHMIS symbol mean?



- A) somewhat poisonous
  - B) biohazardous
  - C) corrosive
  - D) highly reactive
9. An ionic compound is formed by:
- A) atoms sharing electrons
  - B) atoms of the same type
  - C) atoms transferring electrons to each other
  - D) atoms sharing protons
10. You have an unknown sample of a chemical compound that has a high melting point and conducts electricity when dissolved in water. What is your sample most likely to be?
- A) A molecular compound
  - B) An ionic compound
  - C) Nothing can be concluded from the information given
  - D) Both A and B
11. Which of the following is not an achievement of the alchemists?
- A) plaster of Paris
  - B) beakers, filters and lab equipment

- C) hydrochloric acid
- D) discovery of the first sub-atomic particle

12.

Baking soda is a common ingredient found in most kitchens. It has a chemical name of sodium bicarbonate, and a chemical formula of  $\text{NaHCO}_3$ .

In a small sample of baking soda, 300 hydrogen atoms can be found.

How many atoms of oxygen would be found in the same sample?

- A) 150
  - B) 300
  - C) 600
  - D) 900
13. What is an important difference between corrosion and combustion?
- A) combustion requires oxygen where corrosion does not
  - B) corrosion requires oxygen where combustion does not
  - C) combustion takes place quickly and is very exothermic
  - D) corrosion takes place quickly and is very exothermic
14. Iron (III) Oxide would contain the
- A)  $\text{Fe}^{3+}$  ion
  - B)  $\text{Fe}^{3-}$  ion
  - C)  $^{3-}\text{Fe}$  ion
  - D)  $^{3+}\text{Fe}$  ion

15. What does the following WHMIS symbol mean?



- A) somewhat poisonous  
 B) biohazardous  
 C) corrosive  
 D) highly reactive
16. A group of students is trying to classify an unknown liquid. They pour it through a filter and see that a residue is left behind. Based on this information, the liquid was most likely a/an
- A) pure substance  
 B) solution  
 C) heterogeneous mixture  
 D) emulsifying agent
17. Calcium has an ion charge of 2+, while chlorine has an ion charge of 1-. Which of the following is the correct chemical formula for calcium chloride?
- A)  $\text{Ca}_2\text{Cl}$   
 B)  $\text{CaCl}_2$   
 C)  $\text{Ca}_2\text{Cl}_2$   
 D)  $\text{CaCl}$
18. Sodium has an ion charge of 1+, while oxygen has an ion charge of 2-. Which of the following is the correct chemical formula for sodium oxide?
- A)  $\text{Na}_2\text{O}$   
 B)  $\text{NaO}_2$   
 C)  $\text{Na}_2\text{O}_2$   
 D)  $\text{NaO}$
19. If you had a 1 litre container of water vapour, a 1 litre container of ice, and a 1 litre container of liquid water, which container would you expect to contain the least number of molecules?
- A) the container of water vapour  
 B) the container of ice  
 C) the container of liquid water

D) they would all hold the same number of molecules since the containers are the same size

20. Gold, silver, copper, tin, and aluminum are all \_\_\_\_\_ and \_\_\_\_\_.
- A) Metals, elements  
 B) Compounds, elements  
 C) Metals, cells  
 D) Compounds, cells

2	17	1-
8	Cl	
7		
	35.45	

21. Which number on the diagram represents the atomic number of chlorine?
- A) 35.45  
 B) 17  
 C) 2  
 D) 1
22. In an experiment, a metal is placed in an unknown liquid solution. A chemical reaction occurs and gas is observed to bubble vigorously from the metal. When the metal is removed from the liquid, it is found to have thousands of small holes pitted into it. How would the mass of the metal and liquid together compare before the experiment with the mass of the metal, liquid, and gas produced after the experiment?
- A) the masses would be the same  
 B) there would be more total mass after the reaction had completed  
 C) there would be slightly less mass after the reaction had completed  
 D) there would be a great deal less mass after the reaction had completed

23. Which of the following is the most accurate description of the structure of an atom?
- A) Protons and neutrons are found clustered together in a small nucleus, and electrons are found in "electron clouds" around the atom, where the electrons are less likely to be further from the nucleus than closer to it.
  - B) Protons and neutrons are clumped together in a nucleus, and electrons orbit the nucleus like tiny planets in a solar system.
  - C) Negatively charged electrons are normally embedded in a positively charged mass, the two of which together comprise the atom.
  - D) Atoms are like round and hard billiard balls, far too small to see with even a conventional microscope.
24. A chemist finds that if she heats  $\text{KClO}_3$  to a very high temperature, it will start to decompose, though very slowly. If a small amount of  $\text{MnO}_2$  is added, the decomposition occurs much faster and the  $\text{KClO}_3$  doesn't have to be heated to as high of a temperature. In this experiment, the  $\text{MnO}_2$  acts as
- A) an inhibitor
  - B) a catalyst
  - C) an endothermic chemical
  - D) an exothermic chemical
25. Which of the following will slow down the rate of a chemical reaction?
- A) increasing the concentration of the reactants
  - B) stirring the reactants
  - C) heating up the reactants
  - D) cooling down the reactants
26. Ammonium Phosphate, a lawn fertilizer, has the following formula:  $(\text{NH}_4)_3\text{PO}_4$ . According to this formula, how many atoms of hydrogen would be in one molecule of ammonium phosphate?
- A) 4
  - B) 3
  - C) 12
  - D) 1
27. Which of the following properties is **not** a typical characteristic of a metal?
- A) shiny
  - B) brittle
  - C) good conductor of heat
  - D) good conductor of electricity
28. Gold, silver, copper, tin, and aluminum are all \_\_\_\_\_ and \_\_\_\_\_.
- A) Metals, elements
  - B) Compounds, elements
  - C) Metals, cells
  - D) Compounds, cells
29. Carbon dioxide gas has the chemical formula  $\text{CO}_2$ . How many atoms of oxygen are required to make 100 molecules of carbon dioxide?
- A) 50
  - B) 100
  - C) 200
  - D) 300
30. A scientist determines that an unknown solid cannot be broken down into a simpler substance through a chemical change. From this observation, she can conclude that the substance is
- A) a compound
  - B) a metal
  - C) an element
  - D) caustic

31. A group of students is trying to classify an unknown liquid. They pour it through a filter and see that a residue is left behind. Based on this information, the liquid was most likely a/an

- A) pure substance
- B) solution
- C) heterogeneous mixture
- D) emulsifying agent

32. What does the following WHMIS symbol mean?



- A) somewhat poisonous
- B) biohazardous
- C) corrosive
- D) highly reactive

33. What would the chemical formula for carbon tetrachloride be?

- A) C4Cl
- B) C<sub>4</sub>Cl
- C) CCl<sub>4</sub>
- D) CTCI

34. When added to a compost bin, which of these items **will not** decompose in less than six months?

- A) Cotton Fabric
- B) Paper towel
- C) Orange Peel
- D) Wool Fabric

35. A poisonous gas has the chemical formula CO. What is its chemical name?

- A) carbon monoxide
- B) carbon dioxide
- C) monocarbon monoxide
- D) carbon oxygen

36. Seawater would most appropriately be considered a

- A) colloid
- B) pure substance
- C) mechanical mixture
- D) solution

37. The periods of the periodic table:

- A) are arranged by columns of elements with similar properties
- B) contain all metals
- C) are represented by rows of elements of increasing atomic number
- D) contain all gases

38. Which of the following is not an achievement of the alchemists?

- A) plaster of Paris
- B) beakers, filters and lab equipment
- C) hydrochloric acid
- D) discovery of the first sub-atomic particle

39. Calcium has an ion charge of 2+, while chlorine has an ion charge of 1-. Which of the following is the correct chemical formula for calcium chloride?

- A) Ca<sub>2</sub>Cl
- B) CaCl<sub>2</sub>
- C) Ca<sub>2</sub>Cl<sub>2</sub>
- D) CaCl

40. From a periodic table, you observe that phosphorus has an atomic number of 15 and a mass number of 31

How many electrons would you find in an atom of phosphorus?

- A) 14
- B) 15
- C) 16
- D) 31

41. NaOH is formed from
- One atom of sodium, one atom of oxygen, and one atom of hydrogen
  - One atom of nickel, one atom of oxygen, and one atom of hydrogen
  - One atom of namibium, one atom of oxygen, and one atom of hydrogen
  - Two atoms of oxygen and hydrogen, and one atom of namibium
42. Ammonium Phosphate, a lawn fertilizer, has the following formula:  $(\text{NH}_4)_3\text{PO}_4$ . The package tells you that it is a 10-10-00 fertilizer. What elements in the formula is it referring to in this 6-digit analysis?
- Nitrogen, Hydrogen
  - Nitrogen, Phosphorus
  - Phosphorus, Hydrogen
  - Phosphorus, Oxygen
43. A common ingredient in fertilizers is ammonia,  $\text{NH}_3$ . What is its chemical name?
- nitrogen hydride
  - nitrogen trihydride
  - trinitrogen hydride
  - nitrogen trihydrogen
44. From a periodic table, you observe that phosphorus has an atomic number of 15 and a mass number of 31. How many electrons would you find in an atom of phosphorus?
- 14
  - 15
  - 16
  - 31

45. Seawater would most appropriately be considered a
- colloid
  - pure substance
  - mechanical mixture
  - solution
46. Baking soda is a common ingredient found in most kitchens. It has a chemical name of sodium bicarbonate, and a chemical formula of  $\text{NaHCO}_3$ .

In a small sample of baking soda, 300 hydrogen atoms can be found.

How many atoms of sodium are in the sample?

- 900
  - 300
  - 600
  - 1800
47. Which of the following properties is **not** a typical characteristic of a metal?
- shiny
  - brittle
  - good conductor of heat
  - good conductor of electricity



48. What hazards are associated with this butane fuel bottle when it is full, according to the specific household hazard symbols?
- Oxidizing, Compressed Gas
  - Flammable, Compressed gas
  - Oxidizing, Explosive
  - Flammable, Explosive

49. Keita was observing dry ice at room temperature. The dry ice quickly steamed and then disappeared. Since Keita has not observed the dry ice in a liquid state, he assumed it had changed directly from a solid to a gas. A change in state from a solid to a gas is known as
- A) vaporization
  - B) deposition
  - C) fusion
  - D) sublimation

50. How many hydrogen atoms are required to make 10 molecules of  $H_2O$ ?
- A) Ten
  - B) Twenty
  - C) Five
  - D) Zero

51. A precipitate is **NOT**
- A) A solid
  - B) Something that can be formed in a chemical reaction
  - C) A puddle of rain water
  - D) Something that can be easily weighed

52. What does the following WHMIS symbol mean?



- A) compressed gas
  - B) flammable substance
  - C) oxidizing substance
  - D) highly poisonous
53. Iron (III) Oxide would contain the
- A)  $Fe^{3+}$  ion
  - B)  $Fe^{3-}$  ion
  - C)  $^{3-}Fe$  ion
  - D)  $^{3+}Fe$  ion

54.

A student finds the following substances stored in bottles:

- Salt
- Iron
- Water
- Baking Soda
- Silver
- Vinegar
- Oxygen
- Carbon

Which of these substances are compounds?

- A) water, vinegar, and oxygen
  - B) iron, silver, salt, and carbon
  - C) iron, silver, oxygen, and carbon
  - D) salt, water, baking soda, and vinegar
55. In December of 2000, Russian scientists announced that in their laboratory they had created the largest atom known. Called Ununhexium, it was reported to have an atomic number of 116 and an atomic mass of 292. How many protons can be found in Ununhexium?
- A) 116
  - B) 176
  - C) 292
  - D) 408

56. What is the name of the process by which water can be broken down into oxygen and hydrogen through the use of electricity?
- A) electroplating
  - B) electrolysis
  - C) compounding
  - D) definite composition

57.

Baking soda is a common ingredient found in most kitchens. It has a chemical name of sodium bicarbonate, and a chemical formula of  $\text{NaHCO}_3$ .

In a small sample of baking soda, 300 hydrogen atoms can be found.

How many molecules of baking soda are in the sample?

- A) 900
  - B) 300
  - C) 600
  - D) 1800
58. If you see the formation of bubbles in a liquid, what can you conclude?
- A) A chemical change is happening
  - B) A physical change is happening
  - C) Could be A or B

D) Is neither A or B

59. Which of the following could NOT be classified as matter?
- A) Lava
  - B) Iron
  - C) Light
  - D) Grass
60. A group of students is trying to classify an unknown liquid. They pour it through a filter and see that a residue is left behind. Based on this information, the liquid was most likely a/an
- A) pure substance
  - B) solution
  - C) heterogeneous mixture
  - D) emulsifying agent

### Unit 3: Environmental Chemistry

- Petra poured 100 mL of distilled water into a beaker and tested to find the pH of the water to be 7.0. Then she placed a straw into the beaker and gently blew air bubbles through the straw for 5 minutes. When she removed the straw she tested the solution and found the pH changed to
  - 6.0
  - 2.3
  - 8.2
  - 10.1
- All living organisms need a steady supply of nutrients to grow, create energy, and remain healthy. For humans, we can find most of these elements in the soil around us. The most efficient way to harvest these elements from the earth for human consumption is through
  - osmosis
  - mining
  - absorption by plants
  - composting
- Different people respond to environmental toxins in different ways. Toxicity is commonly referred to by a substance's LD50. LD50 is the amount of the substance needed to kill
  - 500 people in one area
  - someone in 5 minutes
  - 50 people
  - 50% of a given population
- When oxygen combines with \_\_\_\_\_, major air pollutants are formed.
  - Acids and bases
  - Carbon dioxide and carbon monoxide
  - Sulfur and nitrogen
  - Smog and ozone
- Even though much of the rainfall measured in Alberta has a pH of less than 6.0, the pH of most lakes and streams in Alberta remains alkaline. This is likely because
  - rain water is absorbed into the ground and does not reach the lakes and streams
  - limestone is abundant at the bottom of local lakes and streams
  - evaporation keeps the acidic rain from remaining on the ground for long periods of time
  - acid precipitation is neutralized by freezing and thawing
- Many cities have established a bylaw that prohibits the washing of cars in residential driveways. Which of the following would you likely observe as a result of reduced driveway car washing?
  - Any river running through these cities would become clearer
  - Less algal growth in the city rivers where storm sewers feed into them
  - Less oxygen in the city rivers
  - More worms in the the city rivers where storm sewers feed into them
- Which living organism is able to fix nitrogen gas?
  - A special kind of aquatic plant
  - A human
  - A certain type of bacteria

D) Lightning

8. All organisms require many elements and compounds that are necessary for or contribute to growth, metabolism, and general functioning. The **main** term for all of these items is
- A) nutrients
  - B) vitamins
  - C) phosphates
  - D) minerals

9. If five people were to consume one of the items listed at the same quantities as the others, who would experience the highest lethal dose?

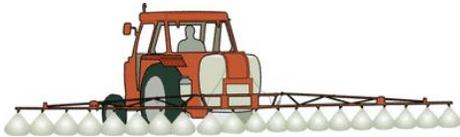
Pers on	Toxin name	Approximate LD50s (in ppm)
A	dioxin	0.04
B	nicotine	0.9
C	chlordan	36.0
D	dieldren	81.0
E	botulinum	0.00000002

- A) person E
- B) person D
- C) person A
- D) person C

10. When eating different foods, your tongue can be used to distinguish acids from bases. Basic foods will often taste
- A) sweet
  - B) bitter
  - C) sour
  - D) salty
11. A container of ice cream is labelled to contain 6% milk fat. If you eat 200 grams of this ice cream, you would be consuming
- A) 1 gram of milk fat
  - B) 12 grams of milk fat
  - C) 24 grams of milk fat
  - D) 120 grams of milk fat
12. When the pH of a water system drops below 4.6, fish begin to die. An Ontario environmentalist tests the pH of a pond, and finds the pH to be 4.5. Which of the following substances could be used to increase the pH back to a healthy level of 5.5 while causing minimal damage to the pond?
- A) tomato juice
  - B) milk
  - C) bleach
  - D) lime
13. When eating different foods, your tongue can be used to distinguish acids from bases. Basic foods will often taste
- A) sweet
  - B) bitter
  - C) sour

D) salty

14.



Farmer Norm seeds 500 hectares of farmland each year. Norm has been working this land for 50 years and has seen a 35% increase in yield on the land since he began farming. Currently, Norm uses the most modern farming practices.

In the spring he takes about 14 days to seed his crops, and in the fall he can harvest his crops in about 21 days.

From the information above, which of the following **cannot** be inferred?

- A) Norm uses machinery to harvest crops.
- B) Norm makes more money each year.
- C) Modern fertilizing techniques are being employed.
- D) Norm uses machinery to seed the

crops.

15.



This is a pond.

As you walk past the pond, you notice an awful smell in the air, as though you were walking past an uncleaned outhouse. You look at the pond and see that it is covered in algae.

What is a probable cause of the smell?

- A) decomposing algae
- B) algae releasing sulfur dioxide into the air as part of photosynthesis
- C) algae releasing oxygen into the air as part of photosynthesis
- D) chlorine added to the pond to kill the algae

16. Refer to the information in question 5.

A large amount of algae has started to grow in this pond. Environmentalists call this phenomenon an:

- A) algal boom
- B) algal bloom
- C) algal flower
- D) algal swampification

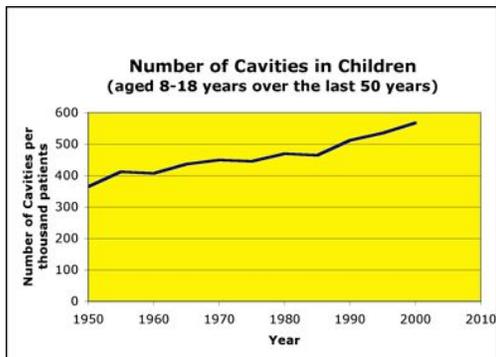
17. When eating different foods, your tongue can be used to distinguish acids from bases. Acidic foods will often taste

- A) sweet

- B) bitter
- C) sour
- D) salty

18.

The fluoridation of drinking water debate continues in Canada. In a recent newspaper article, the following graph and statement appeared.



**Fluoride has been added to our drinking water since the early 1980s! Does it really work?**

From the data presented in the graph, the **best** inference is that

- A) the average number of cavities per child is increasing

B) cavities in teeth can no longer be prevented by fluoride

C) children are not drinking enough water

D) there is not enough fluoride in the drinking water supply

19. When oxygen combines with \_\_\_\_\_, major air pollutants are formed.

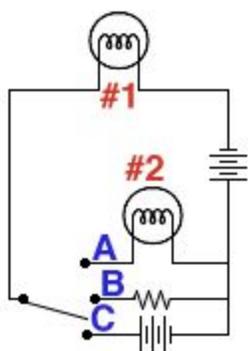
- A) Acids and bases
- B) Carbon dioxide and carbon monoxide
- C) Sulfur and nitrogen
- D) Smog and ozone

20. You used wood treated with a special chemical that prevents rotting, to build a fence around your garden. The chemical has been known to cause cancer. You are concerned that the vegetables grown in your garden are not safe to eat. The process by which the chemical gets from the wood fence to the soil in the garden is known as

- A) Erosion
- B) Corrosion
- C) Osmosis
- D) Leaching

**Unit 4: Electrical Principles & Technologies**

1. Briana has been experimenting with electric circuits. She brought her circuit to school to demonstrate to her class the different scenarios that can occur.



If Briana

moves the switch to contact A,  
 A) bulb #1 will be bright and bulb #2 will be dim  
 B) bulb #1 and #2 will be of equal brightness  
 C) bulb #1 will not light and bulb #2 will be bright  
 D) bulb #1 will be dim and bulb #2 will not light

2. Which of the following supplies the most voltage?  
 A) Solar panel in a calculator  
 B) Car battery  
 C) The socket you plug your stove into  
 D) A sewing machine
3. Your family's Wii console needs 250 W to work. One Saturday, the Wii stayed on for 5 hours. How many KwH were used?  
 A) 0.25 KwH

- B) 1000 KwH
- C) 1.25 KwH
- D) 1.025 KwH

4. The chemical reactions in a rechargeable battery can be \_\_\_\_\_.

- A) Controlled
- B) Reversed
- C) Neutralized
- D) Acidified

5. Jonathan turns on his stereo system to listen to his latest CD purchase. When his brother's favorite song comes on, he yells from the other room for Jonathan to turn up the volume. The volume controller is a  
 A) conductor  
 B) switch  
 C) thermocouple  
 D) variable resistor

6. Many parents decide to get their baby's first pair of shoes bronzed. The process takes a regular pair of shoes and coats them with a bronze finish.



What is the name of the process that bronzes the shoes?

- A) Electroplating
- B) Electrolysis
- C) Super conduction
- D) Short circuitry

7.

Fraser noticed that his digital camera had stopped working. He tested the batteries to discover that they were no longer functioning.



What would be the best thing for Fraser to do with the dead batteries?

- A) Deposit them in a second-hand store donation box.
  - B) Deposit them in a battery recycling box.
  - C) Flush them down the toilet.
  - D) Throw them in the garbage.
8. All of the following are considered to be laws of static electricity **except**
- A) like charges repel
  - B) unlike charges attract
  - C) ungrounded objects are always charged
  - D) charged objects attract neutral objects
9. A static charge is different than an electrical current because
- A) there is no continual flow of electrons in a static charge
  - B) there is a continual flow of electrons

in a static charge

C) a static charge is negative, whereas an electrical current is positive

D) a static charge is positive, whereas an electrical current is negative

10. An electrical inspector for new housing developments routinely inspects electrical panels. Last Friday, he came across a panel that contained a 20A circuit breaker in a circuit rated for a 15A breaker. This is a safety concern because
- A) high amp circuit breakers allow more voltage into the circuit
  - B) increased electrical current could damage electronics
  - C) increased electrical current may cause the wires to overheat
  - D) static electricity will build up with the home
11. How could you tell if a sample of water was pure or had dissolved minerals in it?
- A) Test its pH
  - B) Test its conductivity
  - C) Test its superconductivity
  - D) Look for white deposits on the bottom of the container



12. While completing a safety check of your home you notice that, just like most North American homes, each of your outlets have \_\_\_\_\_ Volts of electricity and a frequency of \_\_\_\_\_ Hz.
- A) 230 V, 60 Hz
  - B) 120 V, 50 Hz
  - C) 230 V, 50 Hz
  - D) 120 V, 60 Hz

13.

Fraser noticed that his digital camera had stopped working. He tested the batteries to discover that they were no longer functioning.



The camera contains 2 AA rechargeable batteries. How much voltage does the camera use?

- A) AC 24 volts
- B) AC 2.4 volts
- C) DC 2.4 volts
- D) DC 24 volts

14. In the middle of winter, when the air is dry, Dan loves to taunt his younger sister Nicki, with static electricity. He would rub his feet along the carpet to build up a charge and then touch his unsuspecting sister with his index



finger. If Dan was positively charged compared to Nicki, he would have

- A) lost protons
  - B) gained protons
  - C) gained electrons
  - D) lost electrons
15. While blow drying your hair one morning, you ask yourself how much power your blowdryer is using. You do know that it's using 120V and 10A. With that information, you conclude that it is using watts of power.
- A) 1200 W (x)
  - B) 130 W (+)
  - C) 110 W (-)
  - D) 12 W (÷)

16. If a household appliance has an energy rating of 70 kWh when used for 5 hours, how much power is required?
- A) 350 kW
  - B) 65 kW
  - C) 14 kW
  - D) 75 kW

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- A) high amp circuit breakers allow more voltage into the circuit
  - B) increased electrical current could damage electronics
  - C) increased electrical current may cause the wires to overheat
  - D) static electricity will build up with the home

18. "Green power" is a term that electricity providers use when they mean that electricity is generated by wind or other nonpolluting resources. This is much more environmentally friendly than the more traditional method of generating electricity by burning coal.



The traditional method of burning coal involves transforming \_\_\_\_\_ energy into electrical energy, whereas wind power involves transforming

\_\_\_\_\_ energy into electrical energy.

- A) mechanical, chemical
  - B) chemical, mechanical
  - C) chemical, physical
  - D) physical, chemical
19. Refer to the information in question 8. Which of the following is NOT a reason green power is more environmentally friendly?
- A) Green power uses renewable resources
  - B) Green power can involve the cutting down of trees
  - C) There is no pollution from sulfur emissions when green power is used
  - D) There is less accumulation of carbon dioxide in the atmosphere when green power is used
20. What is required to get electricity from a high voltage power line to the low voltage required in your house?
- A) A step up armature
  - B) A thermocouple
  - C) A motor
  - D) A step down transformer

21. While blow drying your hair one morning, you ask yourself how much power your blowdryer is using. You do know that it's using 120V and 10A. With that information, you conclude that it is using watts of power.

- A) 1200 W (x)
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- C) increased electrical current may cause the wires to overheat
- D) static electricity will build up with the home

23. The chemical reactions in a rechargeable battery can be \_\_\_\_\_.

- A) Controlled
- B) Reversed
- C) Neutralized
- D) Acidified



24. While completing a safety check of your home you notice that, just like most North American homes, each of your outlets have \_\_\_\_\_ Volts of electricity and a frequency of \_\_\_\_\_ Hz.

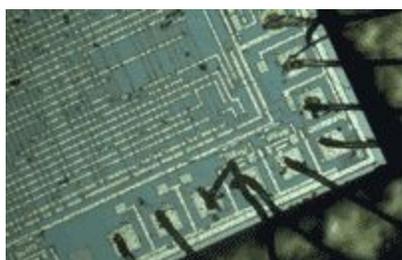
- A) 230 V, 60 Hz
- B) 120 V, 50 Hz
- C) 230 V, 50 Hz
- D) 120 V, 60 Hz

25. Your family's Wii console needs 250 W to work. One Saturday, the Wii stayed on for 5 hours. How many Kwh were used?

- A) 0.25 Kwh
- B) 1000 Kwh
- C) 1.25 Kwh
- D) 1.025 Kwh

26.

Semiconductors revolutionized the computer industry. They are used extensively to produce computer microchips. Semiconductors are materials with electrical conductivity midway between that of conductors and insulators.



The material that is most commonly used as a semiconductor is

- A) carbon
- B) salt water
- C) silicon
- D) porcelain

27.

A hydroponics system grows plants without soil. Pots are filled with sterile growth mediums such as vermiculite, perlite and zeolite. To provide nutrients for growth, a water-based fertilizer containing nitrogen, phosphorus and potassium is applied through the bottom of the pots.

This single hydroponics unit uses 3 different types of fluorescent lamps to provide the blue, yellow, and red coloured light necessary to

stimulate plant growth. Their wattage is listed below:

Lamp Colour	Wattage	Watts of energy converted to light
Yellow	34	9
Red	40	4
Blue	40	6

What percent efficiency is achieved by the yellow lamp?

- A) 10%
- B) 15%
- C) 9%
- D) 26%

28. Refer to the information in question 7. What percent efficiency is achieved by the red lamp?

- A) 10%
- B) 15%
- C) 9%
- D) 26%

29. Bob uses two 40 W lightbulbs for seven hours a day for one week. Bob's power company charges him \$0.20 per kWh. How much will Bob pay to the power company for using the two light bulbs for one week?

- A) \$0.78
- B) \$1.96
- C) \$0.39
- D) \$0.28

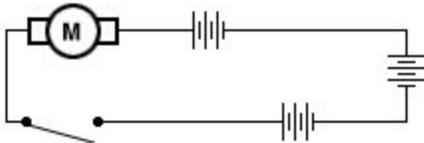
30. A car battery, a lemon, and your body all contain \_\_\_\_\_ which allow the flow of electricity.

- A) Cells
- B) Nutrients
- C) Electrolytes
- D) Positrons

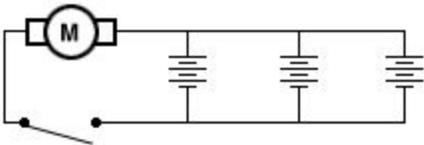
31. All of the following are considered to be laws of static electricity **except**
- A) like charges repel
  - B) unlike charges attract
  - C) ungrounded objects are always charged
  - D) charged objects attract neutral objects
32. Robert received a kit to build a remote-controlled airplane for his birthday. When building the radio controller, Robert had to decide how to arrange the circuit to produce the maximum voltage available from three identical batteries.

If instead he would rather provide power to the motor for the longest period of time when the switch is closed, the schematic diagram he should use is

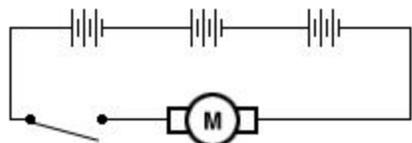
A)



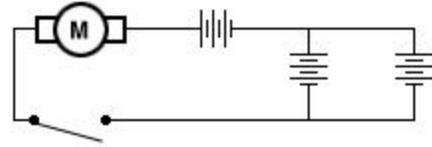
B)



C)



D)



33. An electrical inspector for new housing developments routinely inspects electrical panels. Last Friday, he came across a panel that contained a 20A circuit breaker in a circuit rated for a 15A breaker. This is a safety concern because
- A) high amp circuit breakers allow more voltage into the circuit
  - B) increased electrical current could damage electronics
  - C) increased electrical current may cause the wires to overheat
  - D) static electricity will build up with the home
34. Fraser noticed that his digital camera had stopped working. He tested the batteries to discover that they were no longer functioning. The battery had the letters Ni-Cd printed on the side. Ni-Cd stands for:
- A) Nickel-cadmium
  - B) Nickel-copper
  - C) Nickel-metal-hydride
  - D) Nickel-magnesium
35. Opposite charges \_\_\_\_\_, and like charges \_\_\_\_\_.
- A) generate static, neutralize
  - B) neutralize, generate static
  - C) repel each other, attract each other
  - D) attract each other, repel each other

36. How does an electromagnet keep spinning in a motor?  
 A) By continuously stopping and starting the current  
 B) By running the current through a magnet  
 C) By electromagnetic induction  
 D) By reversing the current
37. A hydroponics system grows plants without soil. Pots are filled with sterile growth mediums such as vermiculite, perlite and zeolite. To provide nutrients for growth, a water-based fertilizer containing nitrogen, phosphorus and potassium is applied through the bottom of the pots.

This single hydroponics unit uses 3 different types of fluorescent lamps to provide the blue, yellow, and red coloured light necessary to stimulate plant growth. Their wattage is listed below

Lamp Colour	Wattage	Watts of energy converted to light
Yellow	34	9
Red	40	4
Blue	40	6

When all the lamps are lit, the growth chamber is at its brightest. If one of each colour of lamp is used for 1 hour, how many joules of energy are needed?

- A) 410.4 J

- B) 410,400 J  
 C) 41.04 J  
 D) 4,104,000 J

38. Refer to the information in question 7. During the afternoon, only the blue and red lamps are used, to simulate daytime light conditions. If the blue and red lamps are used for 1 hour, how many joules of energy are needed?  
 A) 28.8 J  
 B) 28,800 J  
 C) 288,000 J  
 D) 2,880,000 J



39. After an exhausting gym class, you race to the water fountain for a drink only to get your face and gym strip soaked by the high-pressure spray released by the fountain. As you consider the possibility of bringing a water bottle to school next time, you realize that this is similar to an electrical circuit with a  
 A) high toxicity  
 B) high resistance  
 C) high voltage  
 D) high hertz

40. Resistance is measured with a/an
- A) resistor
  - B) diode
  - C) ohm
  - D) ohmmeter

**Unit 5: Space Exploration**

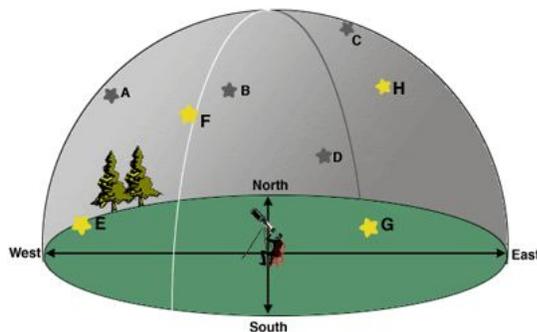
1. Which of the following is NOT true about the Sun?
  - A) It is the smallest star in the universe
  - B) It is a hot, glowing ball of helium and hydrogen gas
  - C) It is closer to Earth than it is to Pluto
  - D) It can become a red giant

2.



As an ambulance nears you, you hear an increase in the pitch of the siren. As it passes, the pitch decreases. This change in pitch is caused by the

- A) gravitational pull of the ambulance
  - B) the Andres Effect
  - C) malfunction of your ears
  - D) the Doppler Effect
3. Mr. Troden was out one evening studying the stars. He made a chart and recorded the time, altitude and azimuth for each star.

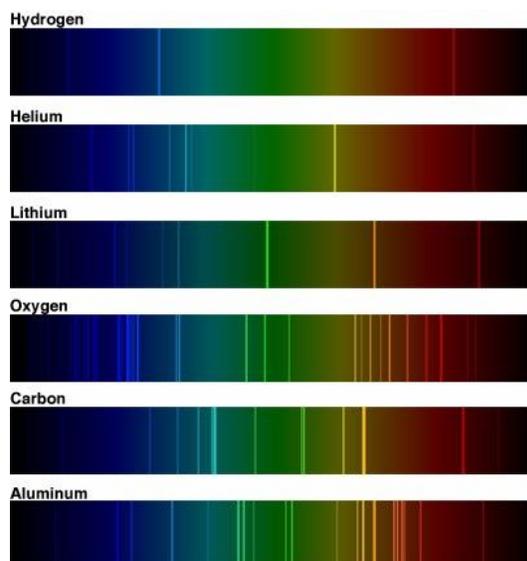


The star that will set on the horizon before any of the others is

- A) star D
  - B) star G
  - C) star C
  - D) star E
4. In 2006, a dispute arose over whether Pluto should still be considered a planet and whether three other celestial objects should be added to the list of existing planets. How many planets are now officially considered to be in our solar system, since the resolution reached on August 24, 2006?
- A) 8
  - B) 9
  - C) 11
  - D) 12
5. Refer to the information in question 4. What type of celestial object is Pluto now considered to be, since the resolution reached on August 24, 2006?
- A) protostar
  - B) star
  - C) planet
  - D) dwarf planet
6. Refer to the information in question 4. Before the dispute (between 1930 and 2006), how many planets were considered to be part of the solar system?
- A) 6
  - B) 7
  - C) 9
  - D) 11

7.

Mrs. MacKinnon provided her class with a reference to emission spectral lines to allow her students to analyze the elemental composition of different light sources.



The light source which produced the spectrum below is composed of



- A) hydrogen, oxygen, and aluminum
- B) lithium, aluminum, and helium
- C) carbon, helium, and oxygen
- D) oxygen and aluminum

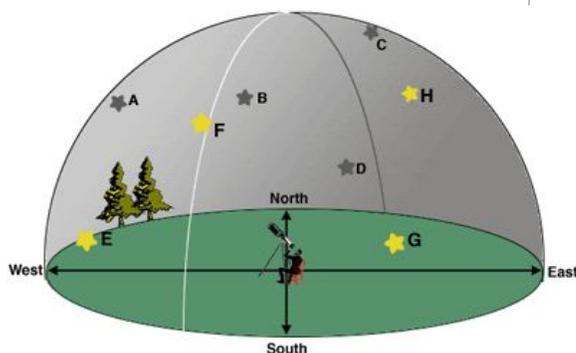
8. Norene loves to take astrophotos. In order to take these photos, she has to leave the shutter on her camera open for long lengths of time. Recently, she took a picture of a star trail in the northern hemisphere by leaving her shutter open for 20 minutes. As we stand in our

backyards and look at the stars and planets, our perspective is **best** described as

- A) heliocentric, B) selenocentric, C) geocentric, D) celestial

9. The electromagnetic spectrum is made up of
- A) visible light only
  - B) electromagnetic polarity
  - C) only the radiation that we can see
  - D) many different kinds of electromagnetic energy
10. For over 2000 years, many believed that the geocentric model was completely accurate. After some closer observation by Copernicus and continuation of theories by Galileo, they noticed that one major detail of the theory made no sense. What was the new theory?
- A) The geocentric model involved elliptical orbits, which was not accurate. With Copernicus and Galileo's research they discovered circular orbits were more accurate.
  - B) The geocentric model involved circular orbits, which was not accurate. With Copernicus and Galileo's research they discovered elliptical orbits were more accurate.
  - C) It was claimed that the earth was at the centre of the universe. Upon further research, they discovered that it was actually the sun in the middle of our universe.
  - D) It was claimed that the sun was at the centre of the universe. Upon further research, they discovered that it was actually the earth in the centre of our universe.

11. The Hubble Space Telescope is different from conventional telescopes because
- A) it orbits the Earth
  - B) it is a refracting telescope
  - C) it doesn't work in bad weather
  - D) it needs a nuclear reactor to operate
12. Mr. Troden was out one evening studying the stars. He made a chart and recorded the time, altitude and azimuth for each star.



The altitude of star C is **best** estimated to be

- A)  $30^\circ$
  - B)  $70^\circ$
  - C)  $85^\circ$
  - D)  $110^\circ$
13. Refer to the information in question 2. The star that is found to the northwest at  $45^\circ$  above the horizon is **best** represented by
- A) star A
  - B) star B
  - C) star E
  - D) star F
14. For over 2000 years, many believed that the geocentric model was completely accurate. After some closer observation by Copernicus and continuation of theories by Galileo, they noticed that one major detail of the theory made no sense. What was the new theory?

A) The geocentric model involved elliptical orbits, which was not accurate. With Copernicus and Galileo's research they discovered circular orbits were more accurate.

B) The geocentric model involved circular orbits, which was not accurate. With Copernicus and Galileo's research they discovered elliptical orbits were more accurate.

C) It was claimed that the earth was at the centre of the universe. Upon further research, they discovered that it was actually the sun in the middle of our universe.

D) It was claimed that the sun was at the centre of the universe. Upon further research, they discovered that it was actually the earth in the centre of our universe.

15. While using the Doppler effect and spectroscopy, a redshift means:
- A) The light source is moving away from the observer, the wave lengths become more spread out.
  - B) The light source is moving closer to the observer, the wave lengths are becoming compressed.
  - C) The light source is moving away from the observer, the wave lengths are becoming compressed.
  - D) The light source is moving closer to the observer, the wave lengths are becoming more spread out.

16. Because of the information relayed by Mars space probes, scientists now know much more about Mars' rock and surface formations, and activity in its atmosphere. As a result, they now have more concrete information about the existence of life on this planet.

The Mars space probes contributed directly to which scientific process?

- A) Hypothesis
- B) Observations/Data
- C) Discussion/Interpretation
- D) Sources of error

17. Why is Mars called the "Red Planet"?

- A) Because it is so hot
- B) Because it is so cold
- C) Because it is surrounded by a massive cloud of helium and hydrogen
- D) Because of the iron oxides on the planet's surface

18. Which of the following have Canadians NOT done?

- A) Walked on the moon
- B) Put astronauts into space
- C) Launched satellites
- D) Contributed to the International Space Station

19. Ancient civilizations came to know certain patterns of stars in the sky by name. They imagined the patterns to represent various objects which made finding them easier. These patterns are commonly referred to as

- A) star trails
- B) planetary orbits
- C) celestial bodies
- D) constellations

20. A spacecraft's payload includes

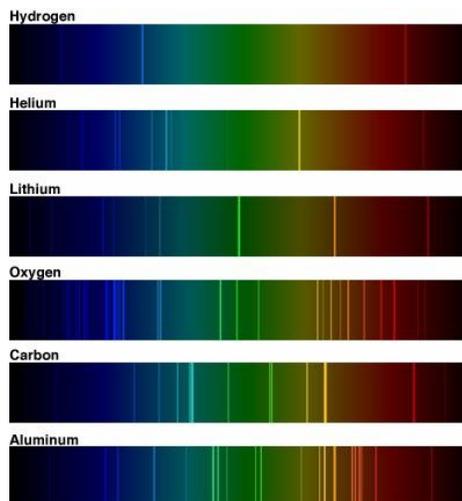
- A) fuel

- B) its engine
- C) a combustion chamber
- D) astronauts

21. All the planets and satellites in our Solar System obey what Isaac Newton called the law of universal gravitation. This law explains how

- A) orbits are elliptical
- B) the Sun has no gravitational pull
- C) objects move in a straight line at a constant speed
- D) objects rotate around their axis

22. Mrs. MacKinnon provided her class with a reference to emission spectral lines to allow her students to analyze the elemental composition of different light sources.



The light source which produced the spectrum below is composed of



- A) hydrogen, carbon, and helium
- B) oxygen, aluminum, and helium
- C) carbon, hydrogen, and oxygen
- D) oxygen, aluminum, lithium

23. Place the following planets in the order they occur starting with the closest to the Sun.

- Earth
- Venus
- Mars

- A) Earth, Mars, Venus
- B) Mars, Earth, Venus
- C) Venus, Mars, Earth
- D) Venus, Earth, Mars

24. Blue light has a higher frequency than red light. A Blue shift represents a celestial light source that is \_\_\_\_\_ Earth.

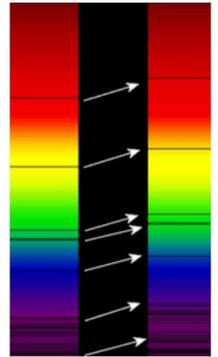
- A) moving away from
- B) moving beside
- C) rotating around
- D) moving towards

25. Triangulation involves using \_\_\_\_\_ to determine a distance without directly measuring it.

- A) Electromagnetic energy
- B) Angles
- C) Rectangles
- D) Algebra

26.

In this diagram, the left side shows the spectral lines that are produced by the Sun. The right side shows the spectral lines of "Star X".



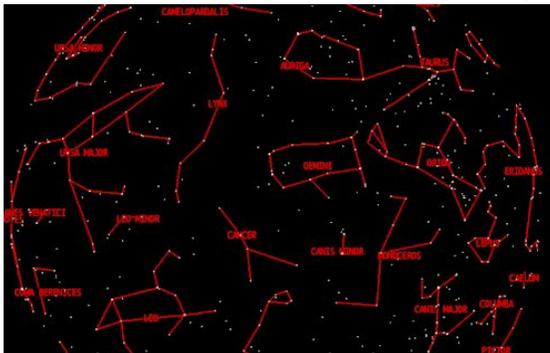
Star X is demonstrating a/an

- A) redshift
- B) blueshift
- C) greenshift
- D) upshift

27. Refer to the information in question 6. If Red light has a lower frequency than blue light, Star X is \_\_\_\_\_ Earth.

- A) moving away from
- B) moving beside
- C) rotating around
- D) moving towards

28. Dominic has been studying the patterns in the night sky. He has used the following chart to help identify objects.



The Big Dipper is found in the constellation of

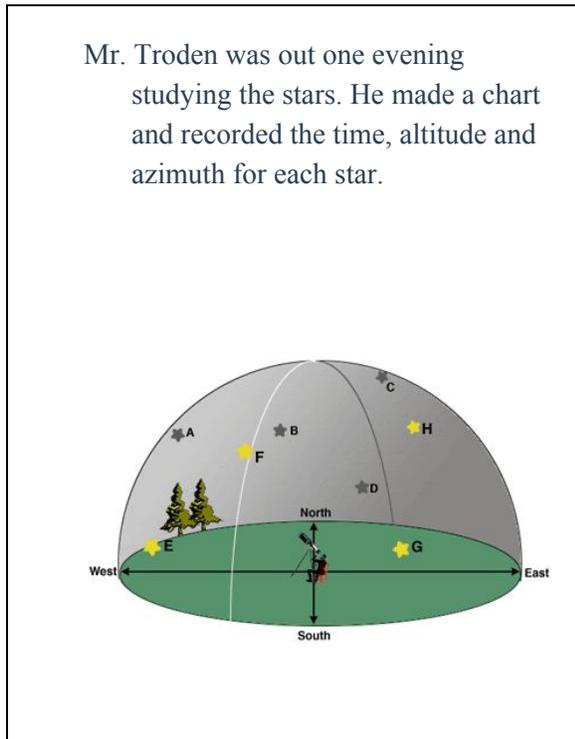
- A) Leo
  - B) Orion
  - C) Ursa Major
  - D) Ursa Minor
29. To effectively launch an object into space, it has to have enough speed to overcome
- A) The Sun's gravity
  - B) Atmospheric pressure
  - C) The Earth's gravity
  - D) Reverse trajectory
30. As an ambulance nears you, you hear an increase in the pitch of the siren. As it passes, the pitch decreases. This change in pitch is caused by the
- A) gravitational pull of the ambulance

- B) the Andres Effect
- C) malfunction of your ears
- D) the Doppler Effect

31. Pingualuit Lake in Northern Quebec is a large, circular body of water that has no tributaries feeding into it or drainage routes out of it, and is embedded into pure bedrock. It has been suggested that this lake gets all of its water from precipitation. Although incredibly clear, these waters are low in nutrients and consequently, little life exists here. Of the few life forms that you will find, there is a fish that is a peculiar type of Arctic Char. It has an overgrown head and extraordinarily thin body. What was the most probable cause of the lake's creation?
- A) Spring run-off from nearby mountains
  - B) The impact of a massive meteorite
  - C) Gravitational collapse
  - D) Both A and C
32. In 2006, a dispute arose over whether Pluto should still be considered a planet and whether three other celestial objects should be added to the list of existing planets. Before the dispute (between 1930 and 2006), how many planets were considered to be part of the solar system?
- A) 6
  - B) 7
  - C) 9
  - D) 11

33. Refer to the information in question 2.  
Which planet is considered to be furthest from the Sun, since the resolution reached on August 24, 2006?
- A) Uranus
  - B) Neptune
  - C) Xena
  - D) 2003 EL61

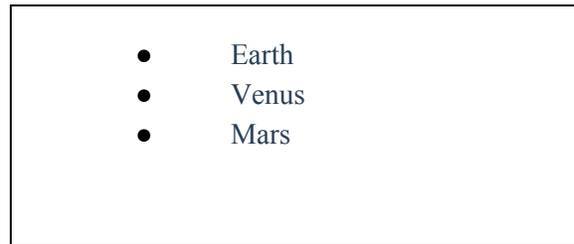
34.



The star that is found to the northwest at  $45^\circ$  above the horizon is **best** represented by

- A) star A
  - B) star B
  - C) star E
  - D) star F
35. Place the following planets in the order they occur starting with the closest to

the Sun.



- A) Earth, Mars, Venus
- B) Mars, Earth, Venus
- C) Venus, Mars, Earth
- D) Venus, Earth, Mars

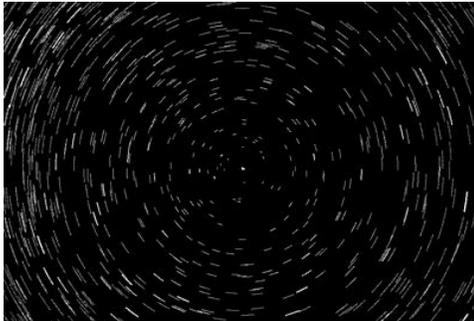
36. What technology can be used to determine someone's location?

- A) Hubble telescope
- B) Global Positioning System
- C) Radio interferometry
- D) Carbon dating

37. Which of the following is NOT true about the Sun?

- A) It is the smallest star in the universe
- B) It is a hot, glowing ball of helium and hydrogen gas
- C) It is closer to Earth than it is to Pluto
- D) It can become a red giant

38. Norene loves to take astrophotos. In order to take these photos, she has to leave the shutter on her camera open for long lengths of time. Recently, she took a picture of a star trail in the northern hemisphere by leaving her shutter open for 20 minutes.



What direction was Norene's camera pointed when she took this picture?

- A) north
  - B) south
  - C) east
  - D) west
39. Place the following planets in the order they occur starting with the closest to the Sun.

- Jupiter
- Mars
- Neptune

- A) Jupiter, Mars, Neptune
- B) Mars, Jupiter, Neptune
- C) Neptune, Mars, Jupiter
- D) Neptune, Jupiter, Mars

40. While using the Doppler effect and spectroscopy, a redshift means:
- A) The light source is moving away from the observer, the wave lengths become more spread out.
  - B) The light source is moving closer to the observer, the wave lengths are becoming compressed.
  - C) The light source is moving away from the observer, the wave lengths are becoming compressed.
  - D) The light source is moving closer to the observer, the wave lengths are becoming more spread out.

**Answers**

**Unit 1: Biological Diversity**

1. D
2. B
3. D
4. A
5. A
6. A
7. D
8. B
9. D
10. D
11. B
12. A
13. D
14. C
15. B
16. A
17. B
18. C
19. A
20. A
21. C
22. C
23. A
24. C
25. B
26. A
27. D
28. B
29. B
30. A
31. D
32. D
33. B

34. A
35. A
36. A
37. B
38. C
39. D
40. D
41. C
42. A
43. A
44. D
45. C
46. C
47. A
48. C
49. B
50. C
51. B
52. C
53. D
54. C
55. D
56. B
57. A
58. D
59. B
60. A
61. B
62. B
63. B
64. A
65. A
66. A
67. A
68. C
69. A
70. B
71. D
72. D

- 73. C
- 74. C
- 75. B
- 76. D
- 77. B
- 78. C
- 79. A
- 80. D
- 81. C
- 82. A
- 83. C
- 84. D
- 85. A
- 86. C
- 87. C
- 88. B
- 89. B
- 90. C
- 91. A
- 92. C
- 93. C
- 94. B
- 95. A
- 96. D
- 97. D
- 98. A
- 99. D
- 100. D

**Unit 2: Matter and Chemical Change**

- 1. A
- 2. B
- 3. A
- 4. B
- 5. A
- 6. B
- 7. B

- 8. C
- 9. C
- 10. B
- 11. D
- 12. D
- 13. C
- 14. A
- 15. C
- 16. C
- 17. B
- 18. A
- 19. A
- 20. A
- 21. B
- 22. A
- 23. A
- 24. B
- 25. D
- 26. C
- 27. B
- 28. A
- 29. C
- 30. C

**Unit 3: Environmental Chemistry**

- 1. A
- 2. C
- 3. D
- 4. C
- 5. B
- 6. B
- 7. C
- 8. A
- 9. A
- 10. B
- 11. B
- 12. D
- 13. B
- 14. B
- 15. A
- 16. B

- 17. C
- 18. A
- 19. C
- 20. D

**Unit 4: Electrical Principles & Technologies**

- 1. B
- 2. C
- 3. C
- 4. B
- 5. D
- 6. A
- 7. B
- 8. C
- 9. A
- 10. C
- 11. B
- 12. D
- 13. C
- 14. D
- 15. A
- 16. C
- 17. C
- 18. B
- 19. B
- 20. D
- 21. A
- 22. C
- 23. B
- 24. D
- 25. C
- 26. C
- 27. D
- 28. A
- 29. A
- 30. C
- 31. C
- 32. B
- 33. C
- 34. A

- 35. D
- 36. D
- 37. B
- 38. C
- 39. C
- 40. D

**Unit 5: Space Exploration**

- 1. A
- 2. D
- 3. D
- 4. A
- 5. D
- 6. C
- 7. B
- 8. C
- 9. D
- 10. C
- 11. A
- 12. B
- 13. A
- 14. C
- 15. A
- 16. B
- 17. D
- 18. A
- 19. D
- 20. D
- 21. A
- 22. A
- 23. D
- 24. D
- 25. B
- 26. A
- 27. A
- 28. C
- 29. C

- 30. D
- 31. B
- 32. C
- 33. B
- 34. A
- 35. D
- 36. B
- 37. A
- 38. A
- 39. B
- 40. A