

**Astronomy and Chemistry - ANSWER KEY**

- \_\_\_\_\_ 1. The correct order of smallest to largest objects in the universe is...
- A. Earth, Moon, Sun, Solar system, Galaxy, Galaxy cluster
  - B. Sun, Earth, Moon, Galaxy, Solar system, Galaxy cluster
  - C. Moon, Earth, Sun, Galaxy, Solar system, Galaxy cluster
  - D. Moon, Earth, Sun, Solar system, Galaxy, Galaxy cluster
- \_\_\_\_\_ 2. The correct order of closest to farthest from Earth is...
- A. Pluto, Moon, Alpha Centauri, Sun
  - B. Moon, Sun, Pluto, Alpha Centauri
  - C. Moon, Pluto, Sun, Alpha Centauri
  - D. Sun, Moon, Pluto, Alpha Centauri
- \_\_\_\_\_ 3. A light year is
- A. the distance between the Earth and the sun
  - B. the length of time it takes light to reach the Earth from the sun
  - C. the distance light travels in one year
  - D. the size of the universe
- \_\_\_\_\_ 4. If the nearest star is 4.2 light-years away then
- A. the light we see left the star 4.2 years ago.
  - B. the star is 4.2 million au away.
  - C. the star must have formed 4.2 billion years ago.
  - D. all of these.
- \_\_\_\_\_ 5. Which electromagnetic (EM) radiation is the most harmful to us.
- A. x-rays
  - B. gamma rays
  - C. UV
  - D. infrared
- \_\_\_\_\_ 6. Which region of the electromagnetic spectrum is associated with heat?
- A. microwave
  - B. infrared
  - C. visible
  - D. ultraviolet
- \_\_\_\_\_ 7. Which of the following produces a suntan?
- A. infrared
  - B. microwaves
  - C. x-rays
  - D. ultraviolet
- \_\_\_\_\_ 8. Which of the following is not one of the colors of the visible light spectrum?
- A. red
  - B. brown
  - C. green
  - D. violet

- \_\_\_\_\_ 9. The correct order from smallest to largest wavelength is...
- A. ultraviolet, infrared, x-ray, microwave, visible light, gamma ray
  - B. microwave, infrared, visible light, ultraviolet, x-ray, gamma ray
  - C. gamma ray, x-ray, ultraviolet, visible light, infrared, microwave
  - D. visible light, gamma ray, ultraviolet, microwave, infrared, x-ray
- \_\_\_\_\_ 10. The sudden change in pitch of a car horn as a car passes by is called what?
- A. Hindenberg Effect
  - B. Mercury Mission Effect
  - C. Doppler Effect
  - D. Placebo Effect
- \_\_\_\_\_ 11. Fusion is the process where
- A. heavy atoms fuse to form lighter atoms.
  - B. one atom splits into two smaller atoms.
  - C. large atoms fuse to create even bigger atoms.
  - D. light atoms fuse to create heavy atoms.
- \_\_\_\_\_ 12. Elements heavier than iron are produced when:
- A. low mass stars add mass to become high mass stars.
  - B. low mass stars fuse with each other
  - C. high mass stars explode or become supernovae.
  - D. high mass stars fuse with lower mass stars
- \_\_\_\_\_ 13. Which of the following is true about a nebula?
- A. They are the middle stage of a star's life cycle.
  - B. They are the beginning or end of a star's life cycle.
  - C. They are composed of energy
  - D. They formed immediately after the Big Bang
- \_\_\_\_\_ 14. The event that marks the end of a small to medium stars life before becoming a white dwarf is
- A. a supernova.
  - B. the exhaustion of hydrogen in the core.
  - C. fusion stops.
  - D. a helium flash.
- \_\_\_\_\_ 15. The event that marks a protostars evolution to a star is
- A. when helium begins to fuse.
  - B. when the temperature reaches 100 million degrees C.
  - C. the accretion of gas and dust.
  - D. the core temperature reaches 15 million degrees C.
- \_\_\_\_\_ 16. Which sequence represents the possible life cycle of a massive star.
- A. nebula, protostar, red giant, white dwarf, neutron star
  - B. nebula, star, red giant, supernova, black hole
  - C. protostar, star, supernova, black hole, neutron star
  - D. nebula, protostar, star, red giant, supernova, neutron star

- \_\_\_\_\_ 17. Which sequence represents the life cycle of a small to medium star?
- A. nebula, protostar, red giant, main sequence(star), supernova
  - B. nebula, protostar, main sequence, white dwarf, red giant
  - C. nebula, protostar, main sequence, red giant, white dwarf
  - D. nebula, protostar, main sequence, white dwarf, black hole
- \_\_\_\_\_ 18. What determines the way a massive star dies?
- A. mass
  - B. B. luminosity
  - C. C. surface temperature
  - D. D. color
- \_\_\_\_\_ 19. According to the big bang theory, about how old is the universe?
- A. about 100-150 million years.
  - B. about 13-14 billion years.
  - C. about 500 billion years.
  - D. the big bang theory does not predict the age of the universe.
- \_\_\_\_\_ 20. The Big Bang Theory describes:
- A. nuclear fission
  - B. how our universe came into being
  - C. supernova explosions
  - D. formation of our solar system
- \_\_\_\_\_ 21. Which of the following is an observation that supports the Big Bang Theory?
- A. spiral galaxies are expanding
  - B. stars in most galaxies are blue
  - C. planetary systems orbit the center of galaxies
  - D. most galaxies are moving apart from one another
- \_\_\_\_\_ 22. Our Sun and Solar System
- A. formed from different nebulas at different times.
  - B. formed from the same nebula at different times.
  - C. formed from different nebulas at the same time.
  - D. formed from the same nebula at the same time.
- \_\_\_\_\_ 23. The solar system originated
- A. about 500 million years ago
  - C. about 50 billion years ago
  - B. about 5 billion years ago
  - D. about 500 billion years ago
- \_\_\_\_\_ 24. What is (are) the major difference(s) between Jovian and terrestrial planets?
- A. terrestrial planets have larger diameters.
  - B. terrestrial planets are composed of denser materials.
  - C. Jovian planets are younger.
  - D. (b) and (c).

- \_\_\_\_\_ 25. In our solar system, which of the following planets is not a member of the Gas Giants?
- A. Jupiter
  - C. Mars
  - B. Saturn
  - D. Neptune

## Chemistry

### *Atoms*

- |   |                  |  |
|---|------------------|--|
| E | 26. Proton       | A. A negatively charged particle found outside the nucleus |
| C | 27. Neutron      | B. Contains protons and neutrons in an atom                |
| A | 28. Electron     | C. A neutral particle found in the nucleus                 |
| B | 29. Nucleus      | D. Contains electrons                                      |
| D | 30. Energy Level | E. A positively charged particle found in the nucleus      |

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### *Groups*

- |   |                           |   |
|---|---------------------------|---|
| D | 31. Alkali Metals         | F. Non-reactive and colorless                     |
| C | 32. Alkaline Earth Metals | G. Contain elements that produce a magnetic field |
| B | 33. Transition Metals     | H. Have 2 valence electrons                       |
| E | 34. Halogens              | I. Explode when in contact with water             |
| A | 35. Noble Gases           | J. Very reactive and form salts                   |

- 
- |   |                      |   |
|---|----------------------|---|
| E | 36. ion              | A. an atom with more or less neutrons                 |
| A | 37. isotope          | B. elements that naturally bond to themselves         |
| C | 38. ionic bond       | C. the attraction of a positive and a negative atom   |
| F | 39. covalent bond    | D. the amount of electrons an atom has lost or gained |
| D | 40. Oxidation number | E. an atom with more or less electrons                |
| B | 41. Diatomic element | F. the sharing of electrons between atoms             |

- \_\_\_\_\_ 42. A row on the Periodic table is called \_\_\_\_\_ and contains....
- A. a period; elements with the same number of energy levels
  - B. a group; elements with the same number of valence electrons
  - C. a row; non related groups of elements
  - D. nothing; all metals

- \_\_\_\_\_ 43. A column on the Periodic table is called \_\_\_\_\_ and contains....
- A. a period; elements with the same number of energy levels
  - B. a group; elements with the same number of valence electrons
  - C. a column; non related groups of elements
  - D. nothing; all metals

- \_\_\_\_\_ 44. Valence electrons are
- A. found in the 1st energy level of an atom
  - B. found in the outer energy level of an atom
  - C. found in the nucleus
  - D. found in all energy levels of an atom

- \_\_\_\_\_ 45. Why is hydrogen in group 1?
- A. It is a metal
  - B. It reacts with water
  - C. It has 1 valence electron
  - D. It is a gas
- \_\_\_\_\_ 46. Helium is different from the other Noble Gases because it
- A. has no valence electrons
  - B. has 2 valence electrons
  - C. does not have a full outer shell
  - D. is very reactive
- \_\_\_\_\_ 47. Which number on the Periodic Table of Elements is the same as the number of protons and electrons of the atom?
- A. Atomic mass
  - B. Period number
  - C. Group number
  - D. Atomic number
- \_\_\_\_\_ 48. How can you determine the number of neutrons an atom has on the Periodic Table?
- A. Add the number of protons and electrons
  - B. Subtract the number of protons from the atomic mass
  - C. Subtract the number of electrons from the atomic number
  - D. Add the number of protons to the atomic mass

### **Climate and Energy – ANSWER KEY**

#### **1. Which of the following is an example of a feedback loop?**

- a. Cooling climate causes an ice age which causes animals to migrate further south.
- b. A volcanic eruption sends ash in the air which falls on the land making it better for growing crops.
- c. Plants take in CO<sub>2</sub> and water which is changed through photosynthesis to sugar and oxygen.
- d. Warming increases snow and ice melt, leading to less reflection, causing more warming.

#### **2. Which one best explains why coastal city San Diego, California is warmer than Seattle?**

- a. San Diego is closer to the equator than Seattle.
- b. San Diego is at a higher elevation than Seattle.
- c. San Diego is a larger city than Seattle.
- d. San Diego more directly by water.

#### **3. Why does the earth have seasons?**

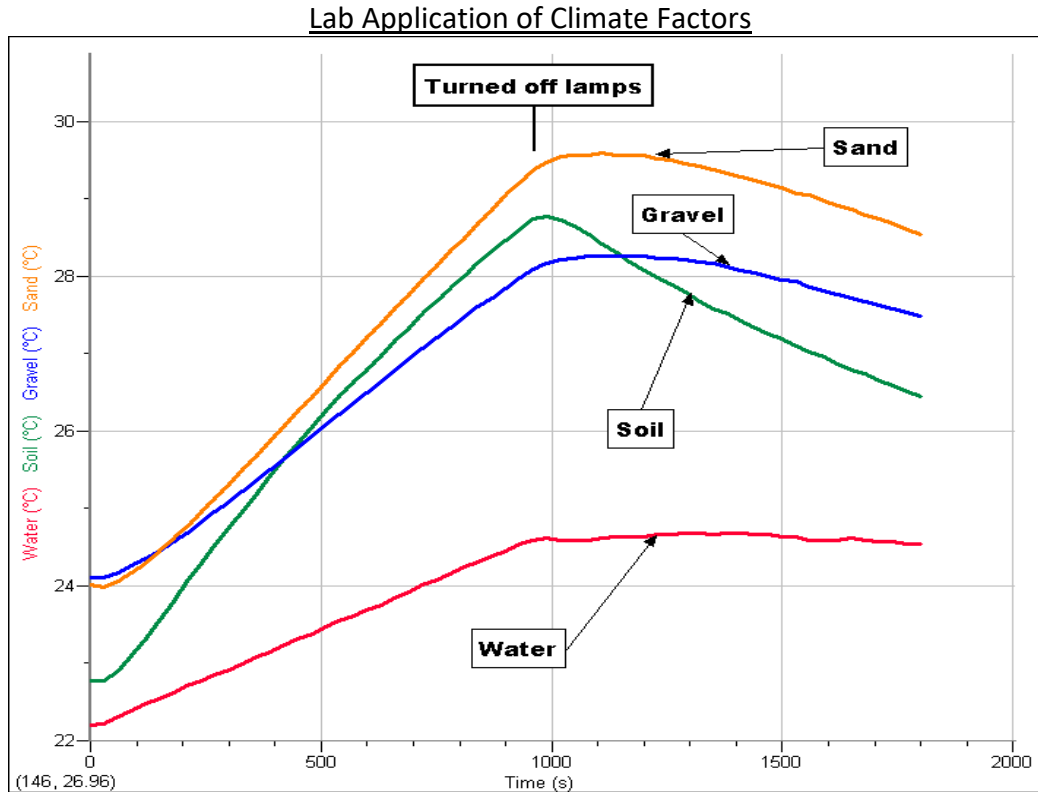
- a. The distance between the earth and the sun varies.
- b. The orbital speed of the earth fluctuates.
- c. The sun's energy output changes.
- d. The earth's axis is tilted and the earth orbits the sun.

4. **As climate cools, ice sheets grow larger and more ice reflects more solar radiation, so the earth absorbs less heat, so the earth cools, so more ice forms. This is an example of:**
- the Coriolis Effect.
  - the Greenhouse Effect.
  - a climate proxy.
  - a feedback loop.**
5. **Why do the poles receive less solar energy than the equator?**
- The poles are closer to the sun.
  - The poles are farther from the sun.
  - The poles receive less direct sunlight than the equator.**
  - The poles receive more direct sunlight than the equator.
6. **What do the earth's orbit and axis variations (Milankovitch Cycles) cause?**
- The global climate to go in and out of ice ages.**
  - The global temperature to increase at a steady rate.
  - The global climate to experience a decrease in oxygen.
  - The global temperature to stay steady for the last million years.
7. **Which of the following four statements best describes ocean water's effect on climate?**
- Ocean water transfers heat from the equator to the higher latitudes.**
  - Ocean water reduces the salinity of colder areas of the ocean.
  - Ocean water transfers heat from the higher latitudes to the equator.
  - Ocean water has no effect on transfer of heat.
8. **Three of the following gases are considered greenhouse gases. Which one is NOT?**
- water vapor (H<sub>2</sub>O)
  - carbon dioxide (CO<sub>2</sub>)
  - oxygen (O<sub>2</sub>)**
  - methane (CH<sub>4</sub>)
9. **Which of the following statements about carbon dioxide in the atmosphere and global temperatures is supported by evidence?**
- An increase in CO<sub>2</sub> (carbon dioxide) causes an increase in temperature.**
  - An increase in CO<sub>2</sub> (carbon dioxide) causes a decrease in temperature.
  - An increase in temperature causes a decrease in CO<sub>2</sub> (carbon dioxide).
  - There is no relationship between CO<sub>2</sub> (carbon dioxide) and temperature.
10. **Which of the following activities will reduce the amount of carbon dioxide added to the atmosphere?**
- Planting trees
  - Buying a car that uses fewer gallons of gasoline per mile driven
  - Walking or bicycling to school instead of driving
  - All of the above.**

**11. What is the carbon cycle? (ES2B-Level 2)**

- a. Layers of CO<sub>2</sub> gas found in ice cores.
- b. The amount of CO<sub>2</sub> absorbed by plants.
- c. A circular carbon formation found in sedimentary rocks.
- d. The movement of carbon atoms over time through different reservoirs.

Read the following experiment and answer questions 17-21.



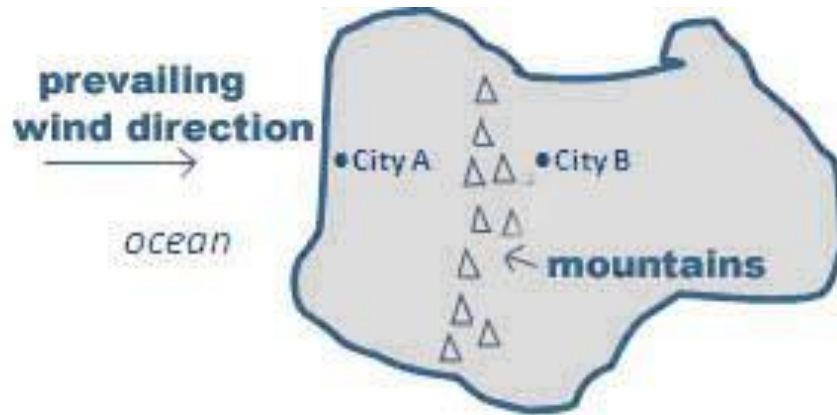
Jack and Anna live in different parts of the United States; they have been discussing the differences of the climate in their regions. Anna lives on the coast of California and Jack lives in New Mexico, which is surrounded by desert. They decide to perform an experiment to compare the heating and cooling of materials they find around them. They decide to test the heating and cooling rates of water, sand, soil, and gravel.

They put 50 ml of each substance in a separate beaker and placed the beakers 1 foot away from the light source. A thermometer was placed in each container to record the temperatures. They turned the light on and recorded the temperatures each minute for 15 minutes. They turned the light off and again recorded the temperatures each minute for 15 minutes. A graph of her data is shown above.

**12. Apply the experiment (above) to climate factors. If we compared two cities at the same latitude and elevation, which city would have the most extreme temperature changes during the course of a year?**

- a. a coastal location
- b. an inland location in a desert
- c. a location in a temperate rain forest
- d. location on the Greenland ice sheet

Look at the map below. City A is next to the ocean. City B is in the middle of the continent. Mountains separate the two cities. The cities are at the same latitude and elevation.



13. Which of the following is true?

- a. City A would have warmer summers and cooler winters than City B.
- b. City A would have cooler summers and warmer winters than City B.
- c. City A and City B would have the same climates year-round.
- d. The climates of the two cities cannot be compared with the information in the map.

14. Which city would probably have the most rainfall per year?

- a. City A
- b. City B
- c. City A and City B would have the same amount of rainfall
- d. It cannot be determined from the map which city has the most rainfall.

15. Increased levels of greenhouse gases in the atmosphere result in: (ES2B-Level 3)

- a. greater reflection of ultraviolet radiation (light energy) back into space.
- b. greater absorption of infrared radiation (heat energy) by the atmosphere.
- c. destruction of the atmosphere.
- d. destruction of the ozone layer.

16. Which of the following sample source allows us to study the oldest paleoclimates?

- a. tree rings
- b. thermometers
- c. ice core samples
- d. crop growing records

17. Which of the following is a way that atmospheric carbon is removed from the atmosphere?

- a. respiration of plants and animals
- b. cutting down trees in forests
- c. photosynthesis by plants
- d. volcanic eruptions



18. Which of the following is a factor that causes ice ages?

- a. phases of the moon
- b. changes in Earth's orbit
- c. the number of sunspots
- d. the number of near-Earth asteroids

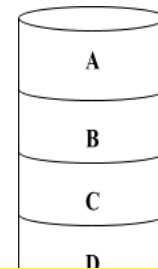
19. Which of the following statements about global temperatures is true?

- a. Global temperature has cooled and warmed several times over the past 400,000 years.
- b. Global temperature has been warming steadily for the past 400,000 years.
- c. Global temperature has been cooling steadily for the past 400,000 years.
- d. Global temperature has only started changing in the past 400,000 years.

20. Which of the following processes release carbon dioxide to the air?

- a. photosynthesis
- b. ocean absorption.
- c. burial in sediment (dirt)
- d. burning of fossil fuels

A Pollen Core Sample was collected from a nearby lake. Layer A was at the top of the sample, nearest the lake surface.



21. Which layer is composed of the oldest sediment?

- a. A
- b. B
- c. C
- d. D

22. Why is pollen useful for determining past climate?

- a. Different types of pollen come from different types of climates.
- b. If temperature changes, plants change the type of pollen they produce.
- c. Pollen is microscopic so people won't destroy the evidence.
- d. If temperature changes, plants change the amount of pollen they produce.

### Energy

23. Which of the following is an energy transformation found in a **hydroelectric** power plant?

- a. Mechanical energy from the steam to mechanical energy in the turbines
- b. Mechanical energy from the turbine to electrical energy in the generator
- c. Electrical energy from the generator to mechanical energy in the penstock
- d. Gravitational potential energy from the turbine to electrical energy in the generator

24. Which of the following is an energy transformation found in a **coal power** plant?

- a. Sound energy in the generator to electrical energy in the turbine
- b. Thermal energy from the fire to thermal energy in the water
- c. Gravitational potential energy to mechanical energy in the water
- d. Chemical potential energy in the coal to thermal energy in the coal

25. What energy resource generates the most electricity in Washington?

- a. fossil fuels (coal, natural gas, oil)
- b. hydroelectric power (dams)
- c. nuclear power
- d. wind

26. What energy resource generates the most electricity in the US?

- a. fossil fuels (coal, natural gas, oil)
- b. hydroelectric power (dams)
- c. nuclear power
- d. wind

27. In a generator, \_\_\_\_\_ energy is the input and \_\_\_\_\_ energy is the output.

- a. Electrical, mechanical
- b. Chemical, electrical
- c. Mechanical, electrical
- d. Electrical, chemical

28. In a motor, \_\_\_\_\_ energy is the input and \_\_\_\_\_ energy is the output.

- a. Electrical, mechanical
- b. Chemical, electrical
- c. Mechanical, electrical
- d. Electrical, chemical

29. Electrical current is the movement of which of the following?

- a. Atoms
- b. Electrons
- c. Protons
- d. Neutrons

A toy car is set on a track at the top of a hill and released. It moves down the hill and then stops at the bottom.



30. At the **top** of the hill, the car's motion energy is...

- a. equal to the car's gravitational potential energy
- b. highest and the car's gravitational potential energy is lowest
- c. lowest and the car's gravitational potential energy is highest
- d. transformed into thermal energy

31. When is the car's gravitational potential energy the lowest?

- a. in the middle of the hill
- b. at its highest point
- c. resting on the ground
- d. halfway down the hill

32. Which statement is true when the car is halfway down the track?

- a. The car has only kinetic energy
- b. The car has only gravitational potential energy
- c. The car has lost half of its energy
- d. The car has both kinetic energy and gravitational potential energy.

33. Which of the following is **disadvantage** of both wind & solar power?

- a. They are both expensive to build & maintain
- b. They are both unreliable (the power source is not available all the time)
- c. They are non-renewable
- d. They take a long time to build

34. Which of the following is true about renewable resources?

- a. They can be replaced, faster that we can use them.
- b. They are formed slowly by geologic processes.
- c. They can only be used in sunny, tropical regions.
- d. They provide most of the world's energy resources.

35. Which of the following energy resources does NOT produce carbon dioxide?

- a. Coal
- b. Biomass
- c. Natural Gas
- d. Nuclear

36. Which of the following is a nonrenewable resource?

- a. Hydroelectric
- b. Geothermal
- c. Wind
- d. Coal