

Chemistry

The Nature of Matter

Vocabulary: boiling point, chemical, compound, condensation, density, evaporation, melting, melting point, qualitative, quantitative, solidification, volume

- A descriptive property of a substance is a qualitative property.
- A numerical measurement for a substance is a quantitative property.
- Change of state from solid to liquid is melting which requires (requires/releases) energy.
- Change of state from liquid to solid is solidification which releases energy.
- Change of state from liquid to gas is evaporation which requires energy.
- Change of state from gas to liquid is condensation which releases energy.
- The temperature at which a liquid changes to a gas is its boiling pt.
- The temperature at which a liquid changes to a solid is its melting pt.
- A pure substance, composed of 2 or more types of atoms bonded together is a compound.
- A new substance with new properties is produced in a chemical change.
- The amount of matter in an object is the volume.
- The amount of mass an object has, per unit volume, is its density.

Atoms

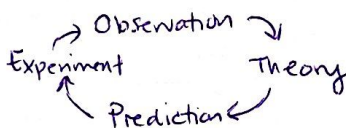
Vocabulary: electrons, groups, ion, negative, neutral, neutrons, nucleus (x2), number (x2), periodic, periods, positive, protons, valence

- Elements are arranged in the periodic table in order of atomic number.
- Columns in the periodic table are groups, while rows are periods.
- The number of protons or the number of electrons is the same as the atomic number.
- The atomic mass is equal to the number of protons and the number of neutrons.
- Protons have a positive charge and are found in the nucleus.
- Neutrons have a neutral charge and are found in the nucleus.
- Electrons have a negative charge and are found outside the nucleus.
- The electrons in the outer shell for an atom are the valence electrons.
- An atom that has gained or lost electrons (and become charged) is called an ion.

22. What are the steps in the cycle of the Scientific Method?

23.

24. Define: *observation* and *inference*. see notes



25. Convert the following:

a) 1500 g = 1.5 kg

b) 4.55 kg = 4550 g

c) 12.0 cm = 0.12 m

d) 1250 mm = 125 cm

e) 0.25 L = 250 mL

26. A sample of metal has a mass of 21.6 g, and a volume of 8.00 cm³. Calculate its density.

GIVEN:

$$m = 21.6 \text{ g}$$

$$V = 8.00 \text{ cm}^3$$

ANALYSIS/SOLUTION:

$$D = \frac{m}{V} = \frac{21.6 \text{ g}}{8.00 \text{ cm}^3}$$

REQUIRED:

$$D = ?$$

$$D = 2.7 \text{ g/cm}^3$$

STATEMENT:

The density of the metal is 2.7 g/cm³

27. Classify the following properties as a *qualitative property* or a *quantitative property*.

a) the substance had a bad odour. qual

b) the boiling point of water is 100°C quan

28. Classify the following as a *physical property* or a *chemical property*.

a) the acid reacts with the metal. chem

b) the boiling point of the alcohol is 79°C. phys

29. Classify the following as a *physical change* or a *chemical change*.

a) souring of milk chem

b) calcium reacts with water to produce hydrogen chem

c) dissolving salt in water phys.

30. Classify each mixture as either a *homogeneous solution (S)* or *heterogeneous mixture (M)*:

a) vinegar S

b) Raisin Bran cereal M

c) oil and water M

31. Classify each of the following as an *element* or a *compound*.

- a) $\text{SO}_2(\text{g})$ compound
 b) $\text{H}_2(\text{g})$ element

32. State the gas being identified in each of the following tests.

options: hydrogen, oxygen, carbon dioxide

- a) A flaming splint is extinguished. CO_2
 b) A flaming splint makes a "popping" sound. H_2
 c) A glowing splint bursts into flame. O_2

33. Describe the composition of each compound by filling in the tables:

a) Compound: NH_3

Type of atom	Number of atoms
nitrogen	1
hydrogen	3

b) Compound: NaNO_3

Type of atom	Number of atoms
Sodium	1
nitrogen	1
oxygen	3

34. An isotope of ^{tin}hydrogen has the following symbol:



- a) What is the atomic number of the isotope? 50 b) Mass number? 119
 c) # protons 50 # electrons 50 # neutrons 69

35. Complete the table to describe the properties of metals and non-metals.

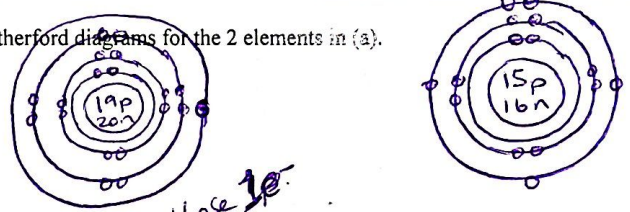
	Metal	Non-metal
state (s/l/g)	S	G
conductivity (high/low)	high	low
malleable? (Y/N)	Y	N
lustrous? (Y/N)	Y	N
side of periodic table	L	R
Forming an ion	loses or gains electrons?	loses or gains electrons?
	positive	negative

36. a) Complete the chart using the Periodic Table.

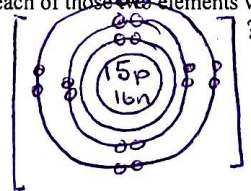
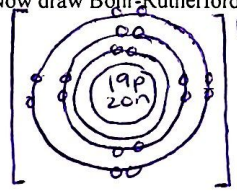
Element	Atomic #	Mass # (round to nearest whole number)	# protons	# electrons	# neutrons = (mass #) - (atomic #)
potassium	19	39	19	19	20
phosphorus	15	31	15	15	16

b) Draw Bohr-Rutherford diagrams for the 2 elements in (a).

Shell	Maximum # e's
1	2
2	8
3	8
4	18



c) Now draw Bohr-Rutherford diagrams to show how each of those two elements would form ions.



37. Fill in the table:

Group Number	Group Name	Unique Properties
1	alkali metals	most reactive metals
2	alkaline earth	very reactive metals
17	halogens	most reactive non-metals
18	noble gases	unreactive

38. Moving from top to bottom within a group, atomic size (increases/decreases). For metals, reactivity (increases/decreases). For non-metals, reactivity (increases/decreases).
39. Moving from left to right in a period, atomic size (increases/decreases). For metals, reactivity (increases/decreases). For non-metals, reactivity (increases/decreases).

Electricity

Static Electricity

Vocabulary: attract, conductor, contact, current, electron, friction, grounding, induction, insulator, negative, repel, shocks, static

40. Static electricity is due to a build up of charge on a substance, while current electricity describes electricity that flows through a substance.
41. A substance that allows electricity to pass through it is a conductor while a substance that does not allow electricity to pass through it is a insulator.
42. The particle that moves around in electricity is an electron, and it has a negative charge.
43. Two methods of producing static charge that require contact are friction and Contact/conduct. One that does not require contact is called induction.
44. The law of electric charges: Like charges repel while opposite charges attract.
45. Electric discharge happen when a static charge is rapidly discharged. Removing a static charge safely is called grounding.

Current Electricity

Vocabulary: amperes, current, ohms, power, renewable, resistance, voltage

46. The rate at which electrons travel through a substance at is called the current, and is measured using the unit amperes.
47. The difference in potential energy between two points is called the voltage.
48. The ability of a substance to slow down the flow of current through it is called its resistance, and is measured using the unit ohms.
49. A renewable form of energy can be replenished quickly.
50. The power rating of an appliance measures the rate at which it consumes energy. It is usually measured in watts.

51. Use the electrostatic series to predict the substance that gains electrons and becomes negatively-charged, and the substance that loses electrons and becomes positively-charged.

Situation	Gains electrons	Loses electrons
a) An acetate rod is rubbed with silk.	<u>Silk</u>	<u>acetate</u>
b) An ebonite rod is rubbed with fur.	<u>ebonite</u>	<u>fur</u>

Material	Charge tendency
human skin	+ (weaker tendency to gain electrons)
rabbit fur	
acetate	
glass	
human hair	
nylon	
wool	
cat fur	
silk	
paper	
cotton	- (stronger tendency to gain electrons)
wood	
amber	
rubber balloon	
vinyl	
polyester	
ebonite	

52. Draw the circuit symbols for:

a) a 2-cell battery

d) ammeter

b) a resistor

e) voltmeter

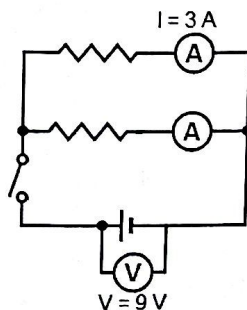
c) a lightbulb

f) switch (open AND closed)

53. What is the total voltage for 3 cells (each 1.5 V) connected in series? 4.5 V

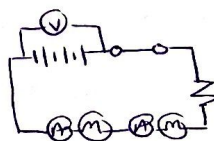
54. Refer to the circuit diagram. Assume the resistors are identical.

- a) How are the loads (bulbs) arranged? parallel
- b) Is the ammeter in series or parallel with the loads? series
- c) Is the voltmeter in series or parallel with the cell? parallel
- d) Is the switch open or closed? Open
- e) What happens to the current going through one resistor if the other is removed? current will ↑
- f) What is the current at the cell? 6 A
- g) What is the voltage drop across each identical load? 9 V



55. a) Using symbols, draw a circuit containing:

- 3-cell battery
- voltmeter across the battery
- switch
- a resistor
- 2 lights in series
- ammeters in series with each light



- b) What happens if one bulb is removed? no current can flow - both bulbs will go out.

56. When loads are added in **series**,
- a) The potential difference for each load increases decreases stays the same
 b) The resistance in the circuit increases decreases stays the same
57. When loads are added in **parallel**,
- c) The potential difference for each load increases decreases stays the same
 d) The resistance in the circuit increases decreases stays the same
 e) The current in each branch of the circuit increases decreases stays the same

58. The current in a circuit is 0.50 A. If the voltage in the circuit is 60 volts what is the resistance? (*Ohm's Law*)

GIVEN:

$$I = 0.50 \text{ A}$$

$$V = 60 \text{ V}$$

REQUIRED:

$$R = ? \Omega$$

ANALYSIS/SOLUTION:

$$V = IR$$

$$R = \frac{V}{I}$$

$$R = \frac{60 \text{ V}}{0.50 \text{ A}} = 120 \Omega$$

STATEMENT:

The resistance is 120 Ω .

59. a) How much energy (in kW-h) does a 900-Watt stove use in a **week** if it is used for 1.5 hours each day?

GIVEN:

$$P = 0.900 \text{ kW}$$

$$t = 1.5 \text{ h} \times 7 \text{ d} = 10.5 \text{ h}$$

REQUIRED:

$$E = ? \text{ kW} \cdot \text{h}$$

ANALYSIS/SOLUTION:

$$E = P \times t$$

$$= (0.900 \text{ kW})(10.5 \text{ h})$$

$$E = 9.45 \text{ kW} \cdot \text{h}$$

STATEMENT:

It uses 9.45 kW·h of energy

b) If the price of electricity is 11 cents per kilowatt-hour, how much would the stove cost for that week?

$$\text{cost} = (9.45 \text{ kW} \cdot \text{h})(11 \text{¢ / kW} \cdot \text{h}) = 103.95 \text{¢}$$

$$(\$1.04)$$

Space

Vocabulary: asteroid, big bang, constellation, Doppler, eclipse, fusion, geo, helio, helium, hydrogen, lunar cycle, meteor, meteorite, meteoroid, phases, planet, red giant, revolution, rotation, solar nebula, Solar System, supernova

60. A planet is an object that orbits the Sun, is spherical, and dominates its orbit.
61. The arrangement of planets and celestial bodies around our Sun is called the Solar system.
62. The moon goes through phases over the course of a month. This cycle is the lunar cycle.
63. Rotation is spinning on an axis, while revolution is orbiting around something.
64. A meteoroid is a piece of rock flying through space. If pulled into Earth's atmosphere it becomes a meteor, and the fragment that reaches Earth is called a meteorite.
65. A(n) asteroid is a large piece of rock that orbits the Sun.
66. A(n) eclipse occurs when the moon, Sun, and Earth are perfectly aligned.
67. The solar nebula (2 words) theory - Describes the formation of our solar system.
68. The big bang (2 words) theory - Describes the formation of our universe.
69. The process that causes stars to produce energy is nuclear fusion.
70. The Earth is in the centre: The geo centric model of the solar system.
71. The Sun is in the centre: The helio centric model of the solar system.
72. A(n) constellation is a pattern formed by stars.
73. A star is made up of the gases hydrogen and helium.
74. The Doppler Effect is responsible for the "red shift" of the galaxies.
75. A supernova is an explosion that signals the "death" of a large star.
76. Medium-sized stars (like our Sun) eventually swell and cool down, forming Red Giant stars.
77. Put the following in order, from smallest (1) to largest (8):
- | | | | |
|----------------------|-----------------------|--------------------|--------------------|
| <u>7</u> Local Group | <u>2</u> asteroid | <u>4</u> planet | <u>5</u> Sun |
| <u>8</u> universe | <u>3</u> dwarf planet | <u>6</u> Milky Way | <u>1</u> meteoroid |

78. Define: astronomical unit; light-year. When is it appropriate to use each unit?

AU - distance from sun \rightarrow Earth. used within solar system

ly - distance light travels in a year. used outside solar system.

79. When do we experience summer in the Northern Hemisphere, and why?

June/July; because Earth's N. Hemisphere is tilted towards the sun.

80. Compare and contrast the geocentric and heliocentric models: what observations can be explained by both models? What observations are in conflict with the geocentric model?

Earth in centre Sun in centre

- retrograde motion
- phases of Venus

81. Identify the types of eclipse shown below:



a) Solar



b) lunar

82. What is **gravity**? Describe the role of gravity in the formation of:

a) the tides c) galaxies see notes.

b) stars d) the orbits of celestial bodies

Ecology

Nutrient Cycling & Energy Flow

Vocabulary: abiotic, biosphere, biotic, carnivore, chain, community, decomposer, ecology, efficiency, energy, herbivore, nitrogen, omnivore, phosphorus, population

83. Ecology is the study of relationships between organisms and organisms and the environment.
84. The region(s) where life exists on Earth. biosphere
85. The non-living factors in the environment. abiotic
86. The living components in an ecosystem. biotic
87. A group of organisms of the same species living in the same area. population
88. All of the living organisms in a certain area. community
89. A plant eater is called a herbivore, and a meat eater is a carnivore.
90. An organism that eats both meat and plants. omnivore
91. An organism that feeds on dead organic material and returns materials to the environment decomposer
92. A food chain is linear representation of feeding relationships.
93. As you proceed through the food chain there is a 10 % loss of energy in each step. This is called the trophic efficiency.
94. Eutrophication is the result of adding too much nitrogen and phosphorus to a lake or pond.

Populations

Vocabulary: carrying capacity, commensalism, exponentially, interspecific, intraspecific, mutualism, parasitism

95. A relationship where one organism benefits and the other is harmed. parasitism
96. A relationship where both organisms benefit. mutualism
97. A relationship where one organism benefits and the other is not affected. commensalism
98. Competition between individuals of the same species is intraspecific. If the individuals are from two different species, the competition is interspecific.
99. When introduced to a new environment, a population will first grow exponentially.
100. The largest population of a species that an environment can support is the carrying capacity

Biodiversity

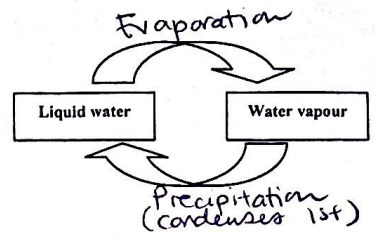
Vocabulary: alien, dominant, keystone, sustainability, invasive

101. Sustainability is a property that describes whether an ecosystem can be maintained indefinitely.
102. A new species that is introduced to an area is called a(n) alien species. If this new species is able to successfully compete with native species for resources, it is called a(n) invasive species.
103. A keystone species is one that plays such an important role that the ecosystem depends on it.
104. A dominant species is the most abundant species in an area.
105. What is **biodiversity**? What are some current threats to biodiversity? see notes.

106. Water cycle

- a) On the diagram, add the labels: precipitation; evaporation
 b) Identify two common forms of precipitation:

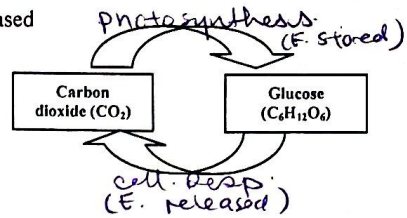
Rain Snow



107. Carbon cycle

- a) On the diagram, add the labels: cellular respiration; photosynthesis
 b) Also on the diagram, add the labels: energy is stored; energy is released
 c) What kind of living organism performs photosynthesis?

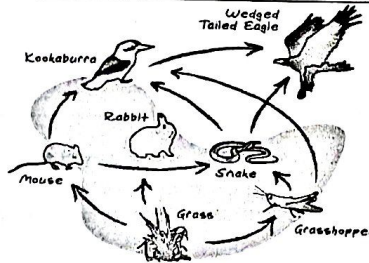
Plant
 d) What kind of living organism performs cellular respiration?
all



108. On the lines, write the word equation for photosynthesis. Why is cellular respiration its complementary process?

carbon dioxide + water + energy → glucose + oxygen

109. Refer to the food web to answer the following questions.



- a) State two examples of herbivores from the food web. grasshopper, mouse, rabbit
 b) State one example of a tertiary consumer from the food web eagle, kookaburra
 d) Classify each based on its trophic level in the food web (producer, primary consumer, top consumer, etc.).
 mouse 1^o consumer
 grass producer
 kookaburra 2^o or 3^o consumer
 wedged-tailed eagle top consumer

f) In which organism would pesticides accumulate at the highest concentration? What do we call this process?

Top consumers

Biomagnification