INTRO TO SCIENCE 10

1. List the steps of the Scientific Method.

Hypothesis, Materials, Procedure, Data, Observations, Conclusions

1. What is the difference between a dependent and independent variable?

Independent Variable: the variable that is being manipulated, or controlled

Dependent Variable: the variable being observed, which changes as a result of the independent variable.

1. Identify what the following symbols mean.

Left to Right: Poison, Flammable, Explosive, Corrosive

Top to Bottom: DANGER, WARNING, CAUTION

ASTRONOMY UNIT

1. Describe the difference between a heliocentric and a geocentric worldview.

Heliocentric: A solar system, or worldview, with the sun at the centre.

Geocentric: A solar system or worldview, with the earth at the centre.

1. What are the three competing theories for how the Universe will end?

The Big Rip: As the universe expands, gravity can’t hold particles together and molecule and even atoms, start to get torn apart. The universe ends with even space-time getting torn apart.

The Big Freeze: The Universe expands at an ever-accelerating rate, until there is not enough energy to generate heat and light, and ultimately, the universe is dead and dark, expanding forever.

The Big Crunch: The Universe eventually stops expanding and snaps backwards, with all matter coming closer together until it forms a tiny, super dense and super hot, particle. The thought is that this will trigger another Big Bang, and the Universe will start again.

1. What was happening at the following moments in time?
	1. Just before the Big Bang

There was no space, no time, nothing

* 1. At the instant of the Big Bang

An incredible hot and dense speck of matter expanded outward

* 1. In the moments just after the Big Bang

Rapid expansion, matter and energy separate, the first atoms are formed.

* 1. 300 000 years after the Big Bang

The Universe stops being cloudy and becomes transparent, the first photons of light are formed.

* 1. 400 million years after the Big Bang

The first stars are formed and the universe begins resembling what it looks like today.

1. What is Hubble’s Law?

Universe are expanding away from us, and the Universes that are further away are expanding away from us at a greater rate than those close to us.

1. What are the 3 proofs of the Big Bang Theory?
2. Expanding galaxies – everything is moving away from everything else, speaking to a point in the past where things were closer together.
3. Cosmic Microwave Background Radiation. Leftover heat signature from the initial moments of the Big Bang. We can measure the leftover heat from 13 billion years ago and map it to figure out where the first stars and galaxies were formed.
4. Presence of Light elements. Calculations say our Universe should be made up mostly of Hydrogen and Helium and that is exactly what has been measured.
5. What is meant by Red-Shifted and Blue-Shifted light?

As something that produces light (stars/galaxies) are moving away from us, the light waves from that object are stretched as they make their way towards us. This stretching of the light waves shifts the light it produces towards the red end of the spectrum.

 A blue shifted object is moving towards us, compressing the light waves and moving the light towards the blue end of the spectrum.

1. What are the primary elements in the Universe and what is the rough % of these elements in the Universe?

Hydrogen – 75%, Helium 24%, everything else, 1%

BIOLOGY UNIT

1. Describe the overall structure of DNA, the 4 nitrogenous base pairs and how they combine with one another.

Sugars and phosphates make up the ladders, and base pairs make up the ladder rungs, forming a double helix.

 Adenine bonds with Thymine, Guanine bonds with Cytosine.

1. How many chromosomes does a regular body cell have? How many does a gamete have?

Somatic (body) cell – 23 pairs of chromosomes, or 46 total chromosomes.

Gamete (sex) cell – 23 chromosomes.

1. Describe (or draw) the process of Meiosis.
2. How does a gene differ from an allele?

Gene represent a stretch of DNA that codes for a specific trait, like hair colour, eye colour, etc. Alleles represent different variations to that code, so that there are many different shades of eye colour possible.

1. For each of the following write whether it is homozygous dominant, heterozygous or homozygous recessive.

AA-homo dom Ff-hetero Aa-heter gg- homo rec.

GG-homo dom Pp-hetero Ii-hetero tt-homo rec..

TT-homo dom Tt-heter0 aa-homo rec Oo-hetero

PUNNETT SQUARES

1. Flower color P P

|  |  |
| --- | --- |
| PP | PP |
| PP | PP |

a. Purple is dominant (P) P

b. White is recessive (p)

c. A PP father and a PP mother P

d. What color(s) are the parents? Purple

e. What color(s) are the children? Purple

1. Seed color y y

|  |  |
| --- | --- |
| yy  | yy  |
| yy  | yy  |

a. Yellow is dominant (Y) y

b. Green is recessive (y)

c. A yy father and a yy mother y

d. What color(s) are the parents? Green

e. What color(s) are the children? Green

1. Seed shape R R

|  |  |
| --- | --- |
| Rr | Rr |
|  Rr | Rr |

a. Round is dominant (R) r

b. Wrinkled is recessive (r)

c. An RR father and an rr mother r

d. What shape(s) are the parents? Father = round, Mother = wrinkled

e. What shape(s) are the children? Children = all round.

1. Describe (or draw) the following mutations on a chromosome level:
	1. Inversion – a segment of DNA is flipped in reverse order during copying
	2. Deletion – a segment of DNA is simply deleted during copying
	3. Translocation-DNA is exchanged between non-homologous chromosomes.
	4. Non-Disjunction-failure of chromosomes to properly separate during mitosis/meiosis.
	5. Duplication – a segment of DNA is doubled during copying
2. What is a mutagen?

A mutagen is any agent that causes mutations to occur.. It can be chemical, physical or biological.

1. What is the difference between spontaneous versus induced mutations?

Spontaneous mutations occur naturally all the time, and induced mutations are ones that are caused by exposure to very specific mutagenic agents.

CHEMISTRY UNIT

1. List 3 alkali metals and 3 alkaline earth metals.

Alkali – Sodium, Potassium, Lithium

Alkaline Earth – Magneisum, Calcium, Beryillium

1. Calculate the number of Neutrons for Elements number 12 and 23.

#12 – Magnesium, 12 neutrons #23 – Vanadium – 28 neutrons

1. Draw a Bohr diagram for Carbon.
2. What is the difference between an ionic bond and a covalent bond?

Ionic bonds have electron transfer and bond a metal with a non-metal

Covalent bonds share electrons and bond a non-metal with a non-metal.

1. Name the following ionic compounds

CaO \_\_Calcium Oxide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CaBr2 \_\_\_Calcium Bromide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ba3P2 \_\_\_\_Beryllium Phosphide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Write the formula for the following ionic compounds

magnesium fluoride \_\_\_MgF2\_\_\_\_\_\_\_\_\_

silver oxide \_\_\_\_\_Ag20\_\_\_\_\_\_\_\_\_\_

aluminum bromide \_\_\_\_\_AlBr3\_\_\_\_\_\_\_\_\_\_

1. Write the formula for the following multivalent compounds

mercury (I) oxide \_\_\_\_\_\_\_\_\_\_Hg20\_\_\_\_\_\_\_\_

gold (III) chloride \_\_\_\_\_\_ AuCl3\_\_\_\_\_\_\_\_\_\_\_\_

nickel (III) bromide \_\_\_\_ NiBr3\_\_\_\_\_\_\_\_\_\_\_

1. Write the name of the following multivalent compounds

TiO2 \_\_\_\_\_\_\_\_ titanium (IV) oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

PbI2 \_\_\_\_\_\_\_ lead (II) iodide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

HgO \_\_\_\_\_\_\_ mercury (II) oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Write the formula of the following polyatomic compounds

sodium chlorate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

sodium sulphate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

potassium sulphite \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Write the name of the following polyatomic compounds

H2SO4 \_\_\_\_\_hydrogen sulfate\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

NaNO3 \_\_\_sodium nitrate\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Fe2(CO3)3 \_\_\_\_iron carbonate\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Name the following covalent compounds

NF3 \_\_\_\_\_\_\_Nitrogen triflouride\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

P2O5 \_\_\_\_\_\_\_Diphosphorous pentaoxide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

OBr2 \_\_\_\_\_\_Oxygen dibromide\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Write the formula of the following covalent compounds

carbon disulfide \_\_\_\_\_\_\_CS2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

dinitrogen trisulfide \_\_\_\_\_N2S3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

sulfur dioxide \_\_\_\_\_\_\_\_SO2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Balance the following equations

KNO3 → KNO2 + O2 2KNO3 → 2KNO2 + O2

Zn + CuSO4 → Cu + ZnSO4 No coefficients needed

Al + H2SO4 → H2 + Al2(SO4)3 2Al + 3H2SO4 → 3H2 + Al2(SO4)3

1. **Classify** each of the following reactions as synthesis (S), decomposition (D), single replacement (SR), double replacement (DR), neutralization (N), or combustion (C). Place the correct letter representing the reaction type in the space provided.

|  |  |
| --- | --- |
| Balanced Chemical Equation | Type of Reaction |
| 1. N2 + F2 → NF3 | S |
| 2. KClO3 → KCl + O2 | D |
| 3. C12H22O11 + O2 → CO2 + H2O | C |
| 4. CuSO4 + Fe → Fe2(SO4)3 + Cu | SR |
| 5. MgF2 + Li2CO3 → MgCO3 + LiF | DR |
| 6. H3PO4 + NH4OH → H2O + (NH4)3PO4 | N |

1. What does the Law of Conservation of Mass state?

The mass of reactants must equal the mass of products

PHYSICS UNIT

1. What does the Law of Conservation of Energy state?

Energy is neither created nor destroyed, it is merely transformed.

1. Potential energy can be broken down into 3 different kinds of Potential Energy. What are they?

Chemical, Gravitational, Elastic

1. A train is travelling at 24m/s. How much distance will it travel in 38 seconds?

  V = D/T D = T x V D = 38s / 24m/s D = 912m

1. A baseball travels in the air for 3.4 seconds. It lands 124 meters away. What is the baseball’s velocity?

V = D/T V = 124m / 3.4s V = 36.47m/s

1. A basejumper off the Chief is falling at 68m/s. He must pull his chute after 220meters. How many seconds will it take him to cover that distance?

V = D/T T = D/V T = 220m / 68m/s T = 3.24s

1. What is the potential energy of a rock climber who is 173meters above the ground, who weighs 52kg?

PE = m x g x h PE = 52kg x 9.81 x 173m PE = 88 250.76J

1. How high in the air is a bird with a mass of 2 kg and a gravitational potential energy of 47J?

PE = m x g x h H = PE / (m x g) H = 47J / (2 x 9.81) H = 2.40m

1. An Frisbee weighing 850g is travelling at 12m/s. What is its kinetic energy?

KE = 0.5 x m x v2 KE = 0.5 x .850kg x 122 KE = 61.2J

1. A bungee jumper stretches their bungee cord 52meters, and the spring factor of the cord is 21kg/s2. What is their Potential Energyelastic?

PE = 0.5 x k x X2  PE = 0.5 x 21 x 522 PE = 28 392J

1. A basketball is shot from the 3-point line. The ball weighs 1.3kg and has 18.8J of Kinetic Energy. What is its velocity?

KE = 0.5 x m x v2 v2 = KE / (0.5 x m) V = square root of KE / (0.5 x m) V = 5.38m/s