

1st Year Science, Summer 2023

Student Name _____

Answer all questions in the spaces provided.

Periodic table of the elements

1											18																				
1 H 1.008											2 He 4.003																				
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18														
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95														
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.41	31 Ga 69.72	32 Ge 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80														
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (97.90)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3														
55 Cs 132.9	56 Ba 137.3	57 La 138.9	58 Ce 140.1	59 Pr 140.9	60 Nd 145.0	61 Pm (144.9)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209.0)	85 At (210.0)	86 Rn (222.0)
87 Fr (223.0)	88 Ra (226.0)	89 Ac (227.0)	104 Rf (261.1)	105 Db (262.1)	106 Sg (266.6)	107 Bh (264.1)	108 Hs (277.0)	109 Mt (268.1)	110 Ds (271.0)	111 Rg (272.2)	112 Uub (285.0)	113 Uut* (284.0)	114 Uuq (289.0)	115 Uup* (288.0)	116 Uuh (289.0)	117 Uus* (288.0)	118 Uuo (293.0)														

Good luck!

Question	Marks	Awarded
Total	62	
Grade descriptor		

Junior Cycle	
Percentage	Grade Descriptor
≥ 90 to 100	Distinction
≥ 75 and < 90	Higher Merit
≥ 55 and < 75	Merit
≥ 40 and < 55	Achieved
≥ 20 and < 40	Partially Achieved
≥ 0 and < 20	Not Graded (NG)

Question 1

a) Using the following list of celestial bodies, complete the following definitions. (4)

Solar system, galaxy, star, asteroid.

A _____ is made up of a **star** and all of the objects that **orbit around it**.

A _____ is a large ball of gas that gives off **heat and light**.

A _____ is a collection of many **millions of stars**.

A _____ is a small object composed of rock. Too small to be a planet.

What is the difference between a moon and a planet? (2)

Question 2

Read the article below and answer the questions that follow.

What's This Big Bang All About?

In 1927, an astronomer named Georges Lemaître had a big idea. He said that a very long time ago, the universe started as just a single point. He said the universe stretched and expanded to get as big as it is now, and that it could keep on stretching.

Henrietta Swan Leavitt made perhaps the most important discovery in the history of astronomy. She studied a particular type of star which allowed astronomers to measure the size of the universe. Edwin Hubble used her work to measure the distance of galaxies. He noticed that all other galaxies were moving away from us. This means that the universe is expanding and is evidence to support the big bang theory.



Henrietta Swan Leavitt

The Big Bang theory predicts that the early universe was a very hot place and that as it expands, would then cool, and give out a type of energy called radiation that is left over from the Big Bang, called the "cosmic microwave background". This cosmic microwave background radiation is additional evidence to support the big bang theory. The estimated age of the universe is 13.8 billion years old.

Source: Adapted from NASA.gov

(a) Why was Henrietta Swan Leavitt's work so important? (1)

(b) What did Edwin Hubble observe about galaxies? (1)

(c) What is the estimated age of the universe? (1)

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(d) Outline two pieces of evidence mentioned in the article that support the big bang model. (2)

Question 3

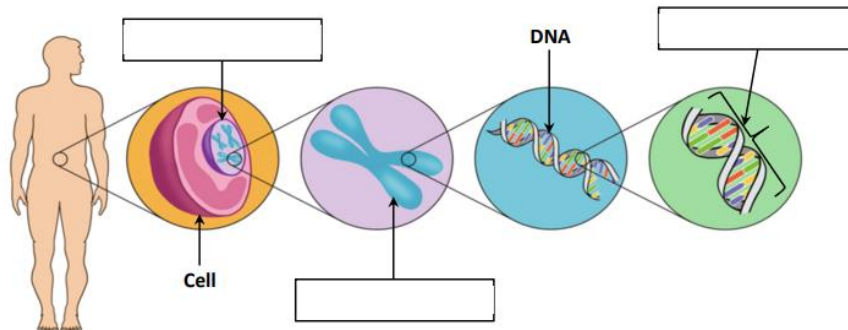
The diagram illustrates the organisation of genetic information within human cells. Some of the labels are missing.

a) Use each of the words listed below to complete the labels on the diagram below. (3)

Chromosome

Nucleus

Gene



(b) Name an instrument which could be used in the laboratory to view human cells. (1)

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A normal human brain cell contains 46 chromosomes. Answer questions (c) and (d) by putting a tick (✓) in the correct box. (1)

(c) How many chromosomes are present in a human sperm cell?

23 46 69 92

(d) The sperm cell fertilises an egg cell. How many chromosomes should be present in the resulting zygote? (1)

23 46 69 92

Question 4

Coat colour in a breed of dog is controlled by a single gene. There are two possible versions (alleles) of this gene – black coat (B) and white coat (b). The gene for black coat is dominant to the gene for white coat.



In their cells, dogs contain two versions of the gene for coat colour. Possible pairs are BB (black), Bb (black) and bb (white).

The table below illustrates a genetic cross between a male dog with genotype Bb and a female dog with genotype bb. The table is incomplete.

(e) Complete the table by writing the two possible genotypes of the offspring that could result from this cross. You may do a punnet square to help you. (2)

	Male dog	Female dog
Parent genotype	(Bb)	(bb)
Sex cells produced	(B) or (b)	(b)
Offspring genotype	() or ()	

(f) What is the probability of the offspring having a black coat? Put a tick (✓) in the correct box. (1)

0% 25% 50% 75% 100%

(g) If a different male dog, with genotype BB, was bred with the same female dog, what would be the probability of their offspring having a black coat? Put a tick (✓) in the correct box. (1)

0% 25% 50% 75% 100%

Question 5

The theory of evolution by natural selection describes how organisms evolve and change over generations. (a) A student made the following statements about the theory of evolution by natural selection. Indicate if each of the statements is true or false by putting a tick (✓) in the correct column. (2)

Statement	True	False
Evolution involves genetic mutations		
Natural selection is based on competition.		
Natural selection involves survival of the weakest		

Organisms can evolve and adapt, making them better suited to their environment. The organisms pictured below have adaptations that help them survive in their habitats. A fox is an omnivore (an animal that eats plant and animal matter). A rose bush is an autotroph (an organism that makes its own food).



Fox



Rose bush

(b) Describe one way a fox is adapted to help it survive in its habitat. (1)

(c) Describe one way a rose bush is adapted to help it survive in its habitat. (1)

Question 6

Use the words below to fill the blanks of the paragraph. (4)

Dissolve Solution Water Soluble Sugar Sand Insoluble

Some substances _____ when you mix them with _____ to make a transparent liquid called a _____

Substances that dissolve in water are called _____ substances. Substances that do not dissolve in water are called _____ substances.

Examples of some soluble substances are _____ and salt.

Examples of some insoluble substances are _____ and steel.

2. Filtration is used to separate an insoluble substance (eg. sand) from water. Draw a labelled diagram of how you would use filtration to separate a solution of sand and water. (4)

Question 7

Katie was asked to investigate what effect temperature has on the mass of salt which will dissolve in 100 cm³ of water. She gave her hypothesis which is below:

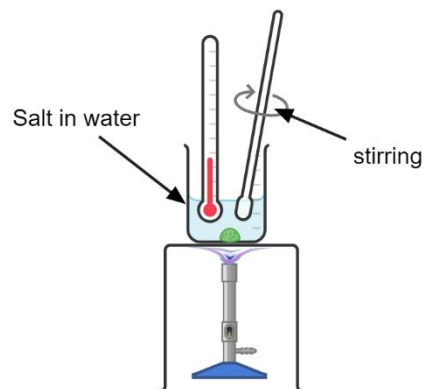
Hypothesis: "If I **increase** the **temperature** of the water, then I think the **mass of salt dissolved** in the water will increase.

(a) The independent variable is the variable Katie will change. What is the independent variable in this experiment? (1)

_____ (1)

The diagram of how Katie heated the solution is shown.

(b) Name the instrument in the diagram that is used to measure temperature. _____ (1)



(c) Name the device in the diagram used to heat the water

(1)

Temperature (°C)	Mass of salt dissolved in 100 cm ³ of water
20	36.0 g
30	36.6 g
40	37.2 g
50	37.8 g
60	40.4 g

Katie collected the following data on the right.

(d) Does the data in the table support Katie's hypothesis? Explain your answer using the data in the table. (2)

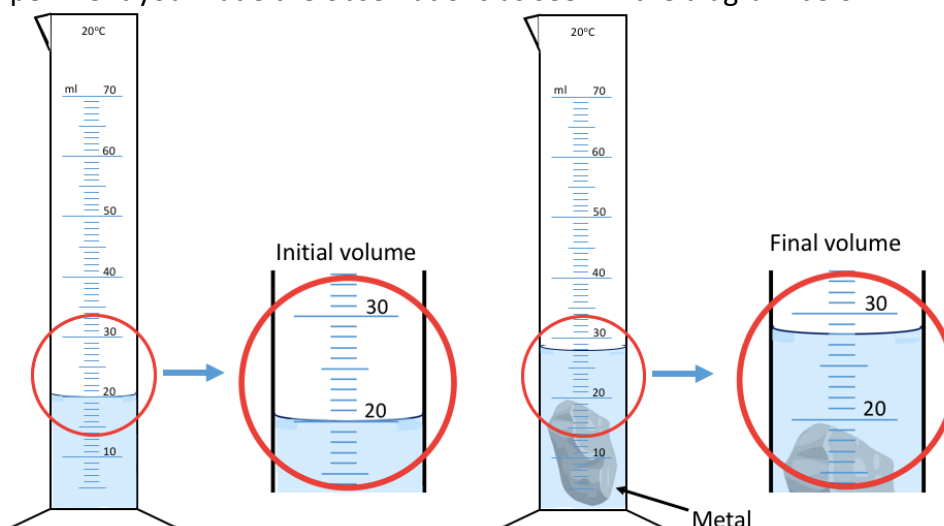
(f) Give a safety precaution when using a Bunsen burner in the lab. (1)

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(g) Identify one piece of evidence in the table to show what the investigations were compared fairly. (1)

Question 8

Emma wants to find the **volume** of an irregular shaped piece of metal using a graduated cylinder. During the experiment you made the observations as seen in the diagram below.



Study the diagram above for measuring the volume of the metal carefully.

a) After the metal was added, what was the final volume? _____ (1)

b) Show that the volume of the metal is 8 cm³ _____ (1)

Afterwards, Emma then measured the **mass** of the metal to be **62.4 g**. She now wants to calculate the density to identify the type of metal is made of.

Use the correct formula to calculate the density of the metal. **Include the unit in your answer. The mass of the metal is 62.4 g and the volume is 8 cm³** (3)

Calculation	Forces and materials
$F = -ks$	Hooke's law
$\sigma = \frac{F}{A}$	stress
$\varepsilon = \frac{\Delta l}{l}$	strain
$E = \frac{\sigma}{\varepsilon}$	Young's modulus
$\rho = \frac{m}{V}$	density
$\mu = \frac{F}{R}$	coefficient of friction
$p = \frac{F}{A}$	pressure

The densities of different metals are given in the table on the right.

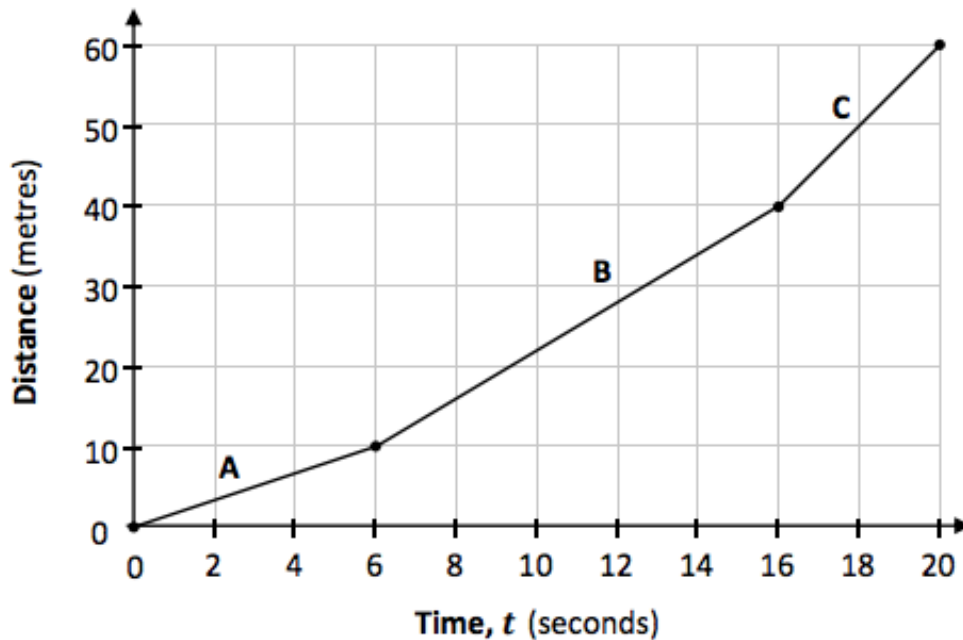
Metal	Density (g/cm ³)
Copper	8.9
Iron	7.8
Lead	11.3
Steel	8.0
Silver	10.5
Mercury	13.5

Using the density, you calculated, identify what type of metal it is. (1)

Using the data in the table, explain why a steel hammer would float on liquid mercury. (2)

Question 9

Martin took part in a 60 metre race. The graph below shows his distance-time graph. The graph is in three sections, labelled A, B, and C



(a) How many seconds did it take Martin to finish the race? _____ (1)

(b) What distance had Martin travelled after 16 seconds? _____ (1)

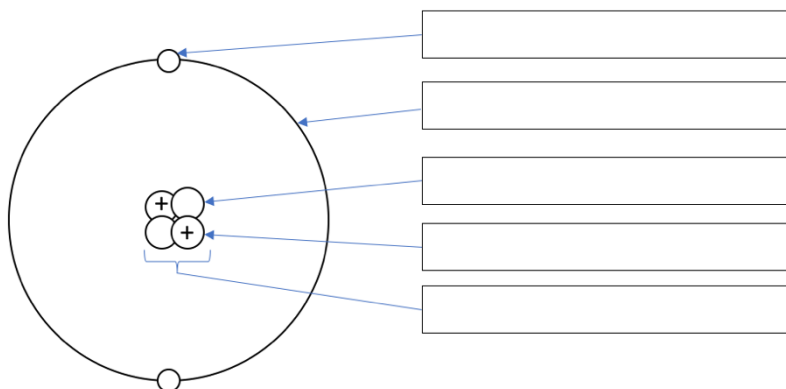
(c) Which was Martin's fastest section (A, B, or C) of the race? Justify your answer. (2)

(d) Find Martin's speed during his fastest section of the race, include the units in your answer. (3)

Question 10

Label the parts of the atom below with the correct word. (3)

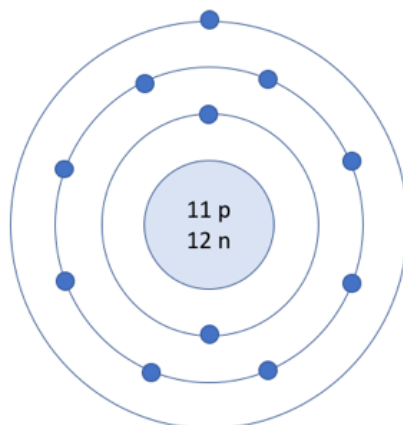
Proton **Neutron**
Electron **Nucleus**
Energy-level (or shell)



Which sub-atomic particle has a negative charge? Answer _____ (1)

Question 11

The image below shows the Bohr model of an atom.



(a) State the atomic number of the atom _____ (1)

(b) State the mass number of the atom _____ (1)

(c) Using the periodic table (on the front of this exam) to identify the element (by name or symbol) that is made up of this type of atom. Answer: _____ (1)

Thank you for being the best students. It has been a pleasure to do science with you this year.

Enjoy the summer and see you in 2nd year!

If you are finished early work on the wordsearch and colouring page provided.

Atoms and molecules

J N Q T H A J V C I P S L L Z O H J P N M F U V
 H Y O Y C O I E I H B A P U S U T I R C O M E D
 Q D W N Y O S L O B M Y S L A C I M E H C E D H
 A B I L Q P O S I T I V E C H A R G E R G N G E
 P B X J W D P Z T T C U N E U T R O N A Z V U K
 X Z S H P E L E C T R O N Y L K J A Z Q U U Z H
 P M R Q T I H J H O W B Z C T I M U I O V J B E
 O K R P Q F N K A Y H Y L Q T Z C P H U O J A V
 R C E G R A H C E V I T S O P I K Z U I R E S A
 B C W F E F L P L H P X M H M A J I F H C R S F
 I N F A U Y W R M T D F O R K H T T O R K F A S
 T N D Y Q R Q I Z S Y C T M B J O V A H S H M I
 A B X B Z K E S T F U T K Y K Q T Y H P E G C A
 L A O R E L A I G L V E Q D J N E T F M L G I Q
 S E F S E C I U K H H R L B V F A R N X U T M H
 F H M M B Y Z A K H I G V C L Q T T Z C C Y O Z
 U J E A Y L J K P O V F J E U A O I Y G E C T C
 V N H T C G D R T K C X F N Z N M U D G L Y A V
 T C Y E O I F M N B L P S Q Q I S G J T O Q U D
 R Z N E G A T I V E C H A R G E X N R U M Q X O
 P E R I O D I C T A B L E Q U E I C N U I H X T
 G M B L T I D F F G E U X O N C U O O X I P N U
 P X C K D Y M S B Z G R R X E P J U A I R P R C
 E F C F F F Q T D Q J E M Q H P R O T O N R K J

positive charge
 chemical symbol
 periodic table
 nucleus
 democritus

negative charge
 atomic mass
 positive charge
 neutron
 molecules

element
 orbitals
 electron
 proton
 Atoms

