

3rd Year Science, Christmas 2020

Mr. A. Goodison

Student Name _____

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	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*	114 Uuq (289.0)	115 Uup*	116 Uuh (289.0)	117 Uus*	118 Uuo (293.0)

Question	Marks	Awarded
1	4	
2	6	
3	4	
4	8	
5	6	
6	3	
7	10	
8	12	
9	6	
10	9	
11	5	
12	6	
Total	79	
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 (BW1)

Read the following passage and answer the questions.

Jellyfish are known for drifting in ocean currents—but one type of jellyfish is very different.

Golden Jellyfish pack a remote island lake which is located in the Pacific Ocean. Golden Jellyfish spend much of their lives on the move during a daily journey that follows the Sun across the sky. Each morning at around 6 am, when the Sun rises, they begin to swim toward the light. They follow the sunlight until they nearly reach the shore—stopping just before the shadows caused by trees. They repeat this journey every day.



Golden jellyfish need this light to survive. The Sunlight is used by a special plant called algae which live inside the body of the jellyfish. The process of photosynthesis allows the algae to make food using sunlight, for itself and the jellyfish.

(a) What lives inside the Golden Jellyfish?

algae (1)

(b) Why does the golden jellyfish follow the light from the Sun?

To survive. It needs sunlight so that photosynthesis can take place, which will provide food for the algae and the jelly fish. (1)

(c) What is the cell structure that can be found in plant cells that allows photosynthesis to

take place? Chloroplasts (1)

(d) In order for the jellyfish to swim, its cells must release energy from the food the algae

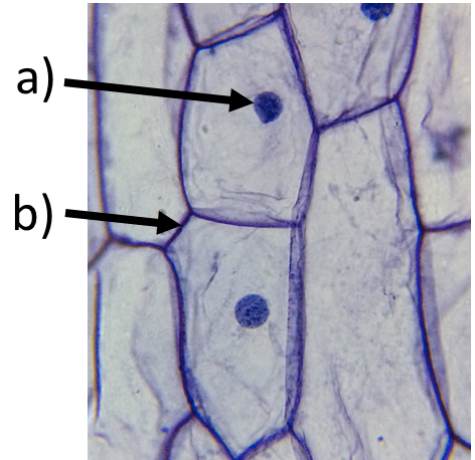
provide. In what part of the cell does respiration happen so that the energy is released from the food? Mitochondria (1)

Question 2 (BW1)

The image on the right show onion cells.

(a) Name the instrument used to view cells:

Microscope (1)



(b) Using the diagram name the part labelled a) and give its function.

Name: Nucleus

(1)

Function: Controls the activities of the cell and also contains DNA. (1)

(c) Using the diagram name the part labelled b) and give its function. (Hint: it is **not** the cell membrane)

Name: Cell wall (1)

Function: Provides structure, protection and support to the cell (1)

(d) What is the function of the cell membrane?

Controls what substances may enter and leave the cell. Eg. Oxygen, glucose, carbon dioxide (1)

Question 3 (BW2 & BW3)

(a) Describe one difference between sexual and asexual reproduction.

Sexual: involves sex cells (gametes) / two parents / genetic variation / fertilisation [accept opposite for asexual]

(1)

(b) Outline the theory of evolution by natural selection.

As species reproduce they produce many offspring, this is called **overpopulation**. Due to random **genetic mutations** in DNA there is **variation between members of a species**. Due to limited resources available **competition** takes place and only the fittest offspring, which is the best suited to their environment, will survive. This is called **survival of the fittest**. The surviving organism is more likely to reproduce, and **pass on these beneficial genes to the offspring**. Over a long period of time a **new species may form**.

(Any three of the highlighted terms)

(3)

Question 4 (BW4)

The arrow on the diagram shows the direction the blood is flowing at that point in the heart.

(a) Write the letter **G** in the diagram at a place where the blood **gains oxygen** (1)

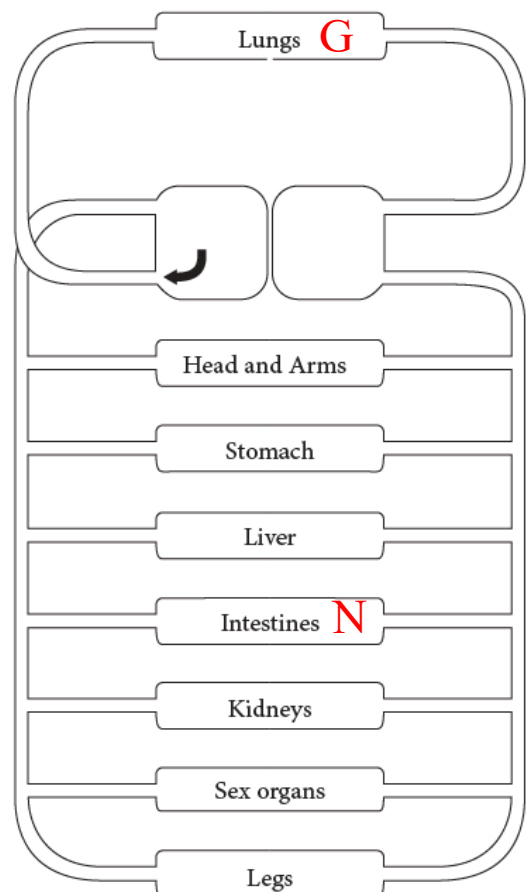
(b) Write the letter **N** in the diagram at a place where the blood takes **in nutrients**. (1)

(c) Give one function of the liver

Produces enzymes to help digest food

Any other valid answer

(1)



(d) Name one lifestyle choice that could cause your resting pulse rate to *decrease* over time.
Regular exercise, don't smoke, eat a healthy diet, any valid answer

(1)

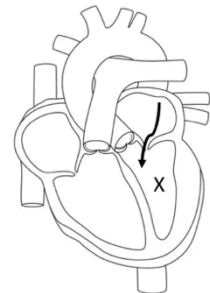
(e) What is the function of red blood cells?

To transport oxygen around the body (1)

(f) Describe one function of the circulatory system which does not involve the transport of substances around the body. White blood cells fight infection and disease OR the blood helps regulate the body temperature OR platelets clot the blood (1)

(g) The chamber of the heart marked X pumps blood around the body and generates a pulse. Name chamber X.

Left ventricle (1)



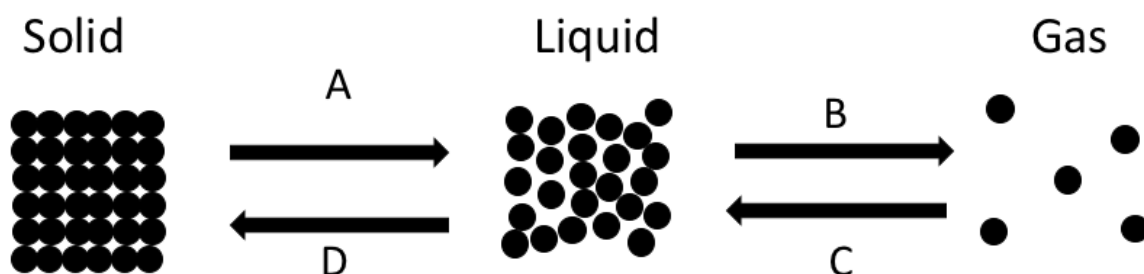
(h) The body needs both nutrients and oxygen for a process called respiration. Describe what happens during respiration.

Oxygen is combined with glucose to form carbon dioxide and water. This releases the energy which was stored in the glucose. The word equation for this is below.

Oxygen + glucose -> carbon dioxide + water + energy (1)

Question 5 (CW2)

Use the diagram below to name the changes of state. One part is already completed (3)



A: melting	B: Evaporation
C: condensing	D: freezing/solidification

Describe the motion of the atoms/particles when the temperature is increased.

The particles move/vibrate/jiggle more quickly (1)

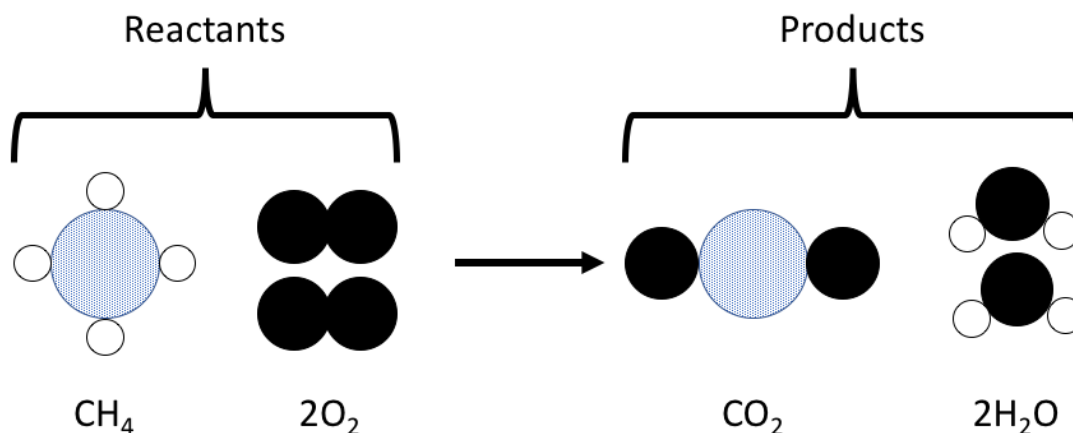
From the following separating techniques (listed 1-4) choose the most appropriate in each case. **Options. 1. Filtration, 2. Evaporation, 3. Distillation, 4. Chromatography**

(e) To separate a soluble substance (eg. salt) from water use Evaporation OR Distillation (1)

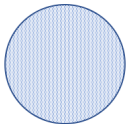


(f) To separate an insoluble substance (eg. Sand) from water use Filtration (1)

Question 6 (CW2)

Natural gas contains methane (CH_4). Methane is a fuel. Methane burns in oxygen to produce carbon dioxide and water. The diagram below represents the reaction.



(a) Count the number of each type of atom in the products to complete the table below (1)

Element	Type of atom	Number of atoms in reactants	Number of atoms in products
Carbon		1	1
Hydrogen		4	4
Oxygen		4	4

(b) Mass is conserved (the same) during this reaction. What evidence is there for this?

The same number of atoms (circles) in both the reactants and products.

(1)

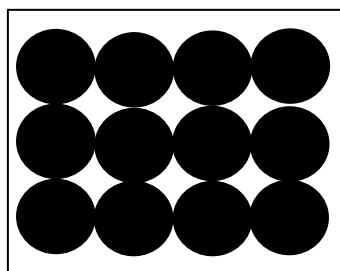
(c) The burning of methane is an example of a chemical change. Describe one difference between a physical change and a chemical change.

In a chemical change a new substance is formed. This does not happen for a physical change. OR During a chemical change chemical bonds are broken to rearrange atoms. No chemical bonds are broken between atoms in a physical change. (1)

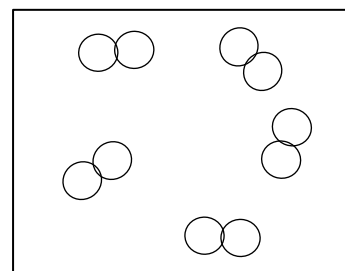
Question 8 (CW2, CW5)

The diagrams on the right show the arrangement of particles in the elements aluminium and chlorine at room temperature.

Aluminium



Chlorine



(a) What evidence is there in the diagrams to support the classification of these substances as elements?

Both diagrams contain only one type of atom/particle _____ (1)

(b) Which of these elements is a solid at room temperature? Justify your answer.

Aluminium (1 mark), because the atoms/particles are arranged in a regular pattern and are very close together (1 mark) _____ (2)

(c) Aluminium reacts with chlorine to form the compound aluminium chloride. Use the Periodic Table (on the front cover of this test) to predict the ratio of aluminium to chlorine in this compound. Hence write the chemical formula for aluminium chloride. (4)

Aluminium (Al) is in group 3 (1 mark)

Chlorine (Cl) is in group 7 (1 mark)

Ratio of Al:Cl is 1:3 (1 mark)

Formula is AlCl_3 (full marks)

Elements can be classified as metals or non-metals. The table shows some of the properties of three elements from the Periodic Table. Use this table to answer the following questions.

	Melting point ($^{\circ}\text{C}$)	Boiling point ($^{\circ}\text{C}$)	Conductor of electricity
Element 1	1538	2862	Yes
Element 2	-7	59	No
Element 3	-101	-34	No

(d) Which element (1, 2, or 3) is most likely to be a metal? Justify your answer.

Element 1 as it has a high boiling and melting point. OR as it conducts electricity.

_____ (2)

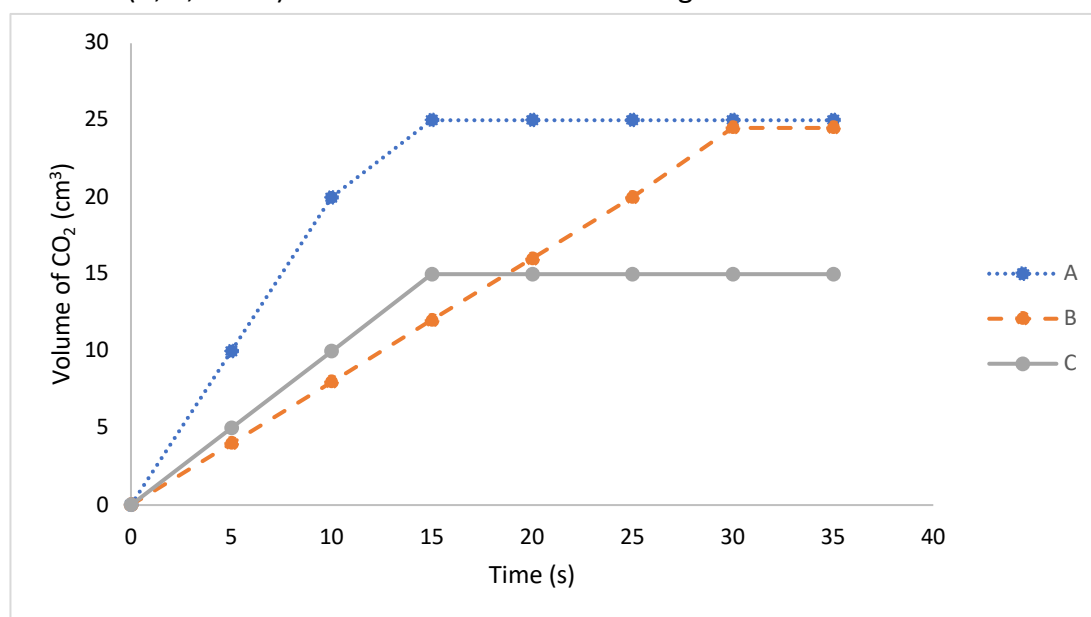
(e) Which element (1, 2, or 3) is a liquid at room temperature (20 °C)? Justify your answer

Element 2 as at 20°C it is a liquid above its melting point (-7°C) and below its boiling point (59°C)

_____ (3)

Question 9 (CW7)

When bread soda (solid) and vinegar (liquid) react, carbon dioxide (gas) is released. The graph below shows the volume of carbon dioxide released against time for three different experiments (A, B, and C) between bread soda and vinegar.



(a) At the start of the reaction, which experiment, A, B, or C, showed the greatest rate of reaction? Justify your answer.

A, because it has the steepest slope OR A, because within the first 5 minutes of the reaction

A produced the most CO₂ gas (10 cm³)

_____ (2)

(b) In which case, A, B, or C, was the least mass of bread soda used? Justify your answer.

C, because when the reaction stopped C produced the least amount of CO₂ gas (15 cm³)

_____ (2)

(c) In which case, A, B, or C, do you think the lowest temperature might have been used?

Justify your answer.

B, because B has the least steep slope. This means that it had the smallest rate of reaction.

A high temp increases the rate of reaction while a low temp decreases the rate of reaction.

_____ (2)

Question 10 (CW6)

- Sodium chloride (table salt) is a white crystalline solid.
- Water is a solvent with a boiling point of 100 °C.

Sodium chloride can dissolve in water. A student was asked to investigate what effect adding salt has on the boiling point of water.

(a) Write a suitable hypothesis for this investigation.

If I add more salt to the water, then I think the temperature the water boils at will (increase or decrease or stay the same [any one]) _____ (1)

(b) What is meant by the boiling point of a substance?

The temperature at which all of the particles in a liquid start evaporating at the same time OR The temperature at which a liquid turns to gas throughout _____ (1)

(c) The laboratory instrument used to measure the mass of the salt is shown in the photograph. Identify this instrument. Mass balance _____ (1)

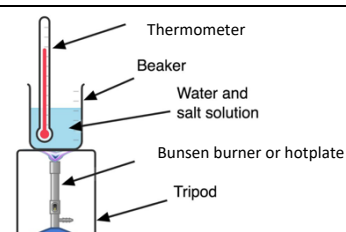


(d) In the space below, draw a labelled diagram of the arrangement of the apparatus used to determine the boiling point of water. (3)

Labelled heat source (hotplate or Bunsen burner) (1 mark)

Labelled container with liquid (over the heat source) (1 mark)

Thermometer in the water and salt solution (1 mark)



The student collected the following data for the boiling point of the solutions made when various masses of salt were dissolved in 60 cm³ of water

Mass of salt (g)	Boiling point (°C)					Average boiling point (°C)
0	100	101	100	100	102	100.6
2	101	104	101	100	103	101.8
4	103	105	104	106	107	
6	106	108	107	107	108	107.2
8	108	110	109	111	110	109.6

(e) Calculate the average boiling point when 4 g of salt was dissolved in 60 cm³ of water (1)

105°C

(f) Suggest a reason why the student repeated the investigation five times for each mass of salt used.

To increase reliability. OR to increase accuracy. OR to make it easier to spot outliers in the data.

(1)

(g) Does the data support the hypothesis you wrote in part (a)? Explain your answer.

Yes or No linked to part (a) with a valid explanation

(1)

Question 11 (CW8 & CW9)

A student carried out an experiment to investigate the reaction between an acid and a base. A pH indicator and a thermometer were used to monitor changes in pH and temperature during the reaction.

(a) Name a **pH indicator** the student could have used during this investigation.

Litmus / universal indicator etc _____ (1)

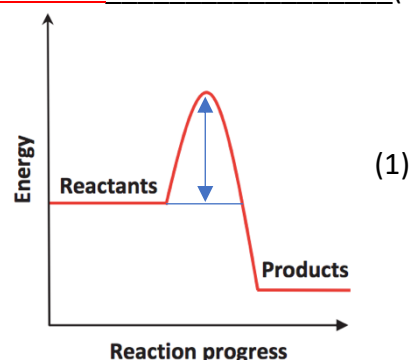
(b) What **colour** is this indicator when placed in acid? Correct colour linked to (a) eg red (1)

(c) When an acid and a base react, they neutralise each other to produce a neutral solution.

(d) On the pH scale, what number represents a **neutral** solution? 7 _____ (1)

(e) The student noted a rise in temperature as the acid-base reaction took place. Is this an example of an **endothermic** or an **exothermic** reaction? exothermic _____ (1)

(f) The diagram shows an energy profile diagram for the reaction between an acid and a base. On the diagram, clearly show the **activation energy** for this reaction.



Question 12 (BW9)

Read the following passage and answer the questions. Some, but not all, of the answers can be found in the text.

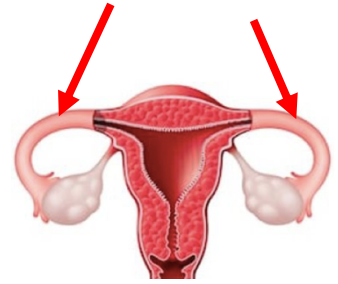
In vitro fertilisation (IVF) is one of several techniques available to help people with fertility problems have a baby. During IVF, an egg is removed from the woman's ovaries and fertilised with sperm in a laboratory. The fertilised egg, called an embryo, is then returned to the woman's womb to grow and develop.

Between 2014 and 2016 the percentage of IVF treatments that resulted in a live birth was:

- 29% for women under 35
 - 23% for women aged 35 to 37
 - 15% for women aged 38 to 39
 - 9% for women aged 40 to 42
 - 3% for women aged 43 to 44
 - 2% for women aged over 44
- (source: NHS)

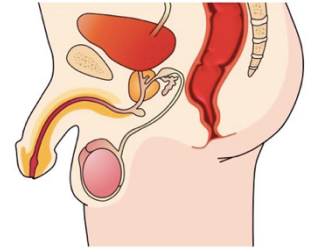
Maintaining a healthy weight and avoiding alcohol, smoking and caffeine may improve your chances of having a baby and is particularly recommended during IVF treatment.

IVF is not without risk. An ectopic pregnancy – where the embryo implants in the fallopian tubes, rather than in the womb, may occur. While multiple births (such as twins or triplets) is at an increased risk. This poses a danger to both the mother and the children.



(a) Clearly draw an arrow to a fallopian tube in the diagram (1)

(b) Name the male sex cell: sperm cell (1)



(c) What is the function of the womb?

This is the location of implantation. OR The Foetus (baby) grows here. (1)

(d) Name one lifestyle factor which can affect your fertility.

Exercise OR alcohol OR smoking Or caffeine (1)

(e) **Without IVF**, in what part of the human reproductive system does fertilisation usually occur? The fallopian tube (1)

(f) Do you agree or disagree with the use of IVF to treat infertility? Explain your answer.

Accept any reasonable answer. (1)

Extra writing space

Happy Christmas to the best students!

