

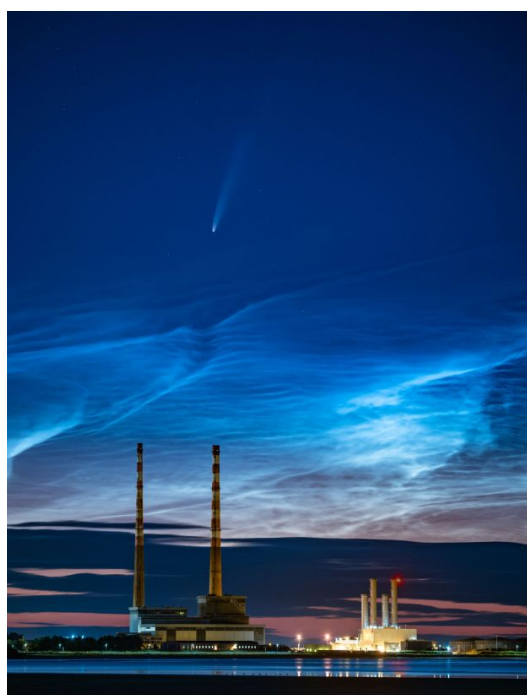
3rd Year Science, Christmas 2021

Time allowed: Double class

Mr. A. Goodison

Student Name _____

Answer all questions in the spaces provided.



Good luck!

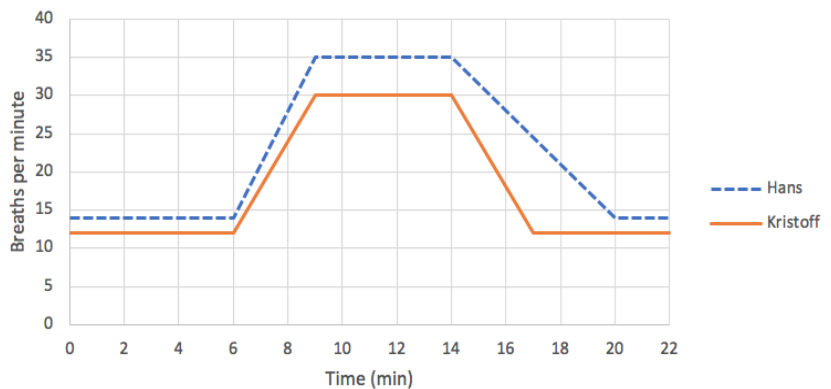
An image of comet Neowise captured over Dublin Bay taken by Antonio Martin Carrillo on the 12th of July 2020.

Question	Marks	Awarded
Total	80	
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 (5 marks)

The graph shows the breath rate for Hans and Kristoff during the same exercise.



(a) At what time did these two people start exercising? **6 minutes** (1)

(b) Which person has the greatest breath rate during exercise?

Hans (1)

(c) After Hans stopped exercising, how many minutes did it take for his breath rate to return to normal? (1)

20 min – 14 min = 6 minutes

(d) Who is more likely to be the fitter person? Explain your answer. (2)

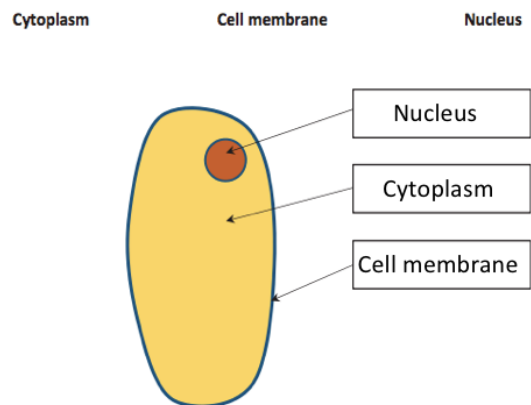
Kristoff, he has a lower breath rate and it took him less time for his breath rate to return to normal

Question 2 (7 marks)

(a) The diagram shows a cell. Use the words provided to label the parts of the cell (3)

(b) Do you think the diagram is an animal or plant cell? Justify your answer. (2)

I think it is an animal cell because it has no cell wall, no chloroplast, no large vacuole (any one reason)



(c) Complete the table to give the function of the following cell structures. (2)

Cell structure	Function
Nucleus	Contains DNA and controls the activities of the cell
Chloroplast	Responsible for photosynthesis

Question 3 (6 marks)

(a) Describe one difference between sexual and asexual reproduction. (2)

Sexual reproduction involves two parents while asexual involves only one.

OR compares fertilisation, gametes, offspring being identical, mixing of DNA (any one)

(b) Dogs reproduce by sexual reproduction. The gene for a black dog (B) is dominant over the gene for a white dog (w). Complete a genetic cross (Punnett square) between a female dog with the genotype Bw and a male dog with the genotype (Bw). (1)

$ \begin{array}{cc} & B & w \\ B & BB & Bw \\ w & Bw & ww \end{array} $

- | | | |
|----------------------------------------------------------------------------------|-----|-----|
| (c) What is the chance that each puppy will carry the gene for white fur? | 75% | (1) |
| (d) What is the chance that each puppy will carry the gene for black fur? | 75% | (1) |
| (e) What is the chance that each puppy will be white? | 25% | (1) |

Question 4 **(6 marks)**

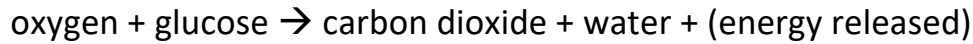
Outline the theory of evolution by natural selection. (6)

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 next generation. Over a long period of time a new species may form.
Any 3 (2 marks each)

Question 5**(17 marks)**

Read the below passage and answer the questions.

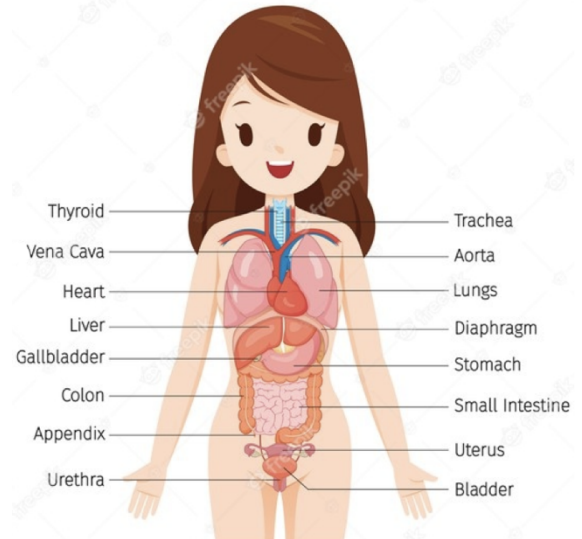
Respiration is a chemical reaction which allows us to release the chemical energy contained within the food we eat. The word equation for respiration is below



The image, on the right, shows many of the organs which humans contain. The respiratory (breathing) system, digestive system and circulatory system all work closely together so that respiration can happen within each cell our bodies are made of.

Food is made of nutrients which need to be broken down (digested) so that the body can use them. Glucose is a nutrient which is found in many foods.

Digestion happens in two ways, physical digestion and chemical digestion.



(a) Give an example of where physical digestion occurs. (1)

In the mouth when the teeth crush food OR Stomach when the food is churned

(b) Give an example of where chemical digestion occurs. (1)

Mouth: When the enzymes in saliva break down food. OR Stomach when the acid breaks down food

(c) When the food is digested and the glucose has been extracted from the food, the glucose must enter the blood. In what part of the digestive system are nutrients, like glucose, absorbed into the blood? (1)

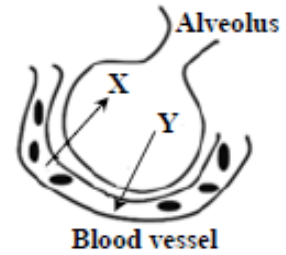
Small intestine

(d) Oxygen is also needed for respiration and is taken from the air. Describe what happens in the respiratory (breathing) system when a person breathes in. (3)

When a person inhales the diaphragm lowers. This decreases the pressure inside the lungs. The lungs expand and air is taken in. Air travels down the trachea into the lungs. Once the air has entered the lungs it goes into tiny air sacks called alveoli. This is where diffusion happens. Oxygen leaves the lungs and enters the blood While carbon dioxide leaves the blood and enters the lungs or alveoli.

(Any 3 one mark each)

(e) During gaseous exchange in the lungs, gas **X** leaves the blood vessel and enters the alveolus and lungs. At the same time, gas **Y** leaves the lungs and enters the blood vessel.



Name gas **X**. **Carbon Dioxide (CO₂)** _____ (1)

Name gas **Y**. **Oxygen (O₂)** _____ (1)

(f) What organ pumps the blood around the body? (1)

The heart

(g) What is the function of red blood cells? (1)

To transport oxygen around the body

(h) The circulatory system is made up of large blood vessels like arteries and veins, but the glucose and oxygen must enter the smallest blood vessels to pass into the cell. Name this type of blood vessel. (1)

Capillaries

(i) What cell structure (organelle) allows the glucose and oxygen to pass into the cell? (1)

Cell membrane

(j) Once the glucose and oxygen enter the cell respiration will take place. What cell structure (organelle) is responsible for respiration? (1)

The mitochondria

(k) Why is respiration described as both a biological and chemical process? (2)

Biological process: Because it happens inside of living things (organisms)

Chemical process: Because new substances are formed (carbon dioxide and water)

(l) The blood receives carbon dioxide from the cell as this is a waste product of respiration. This blood will then return to the lungs to pick up more oxygen once again.

Explain why some of the blood vessels connected to the heart are usually coloured red and some of them are coloured blue? (2)

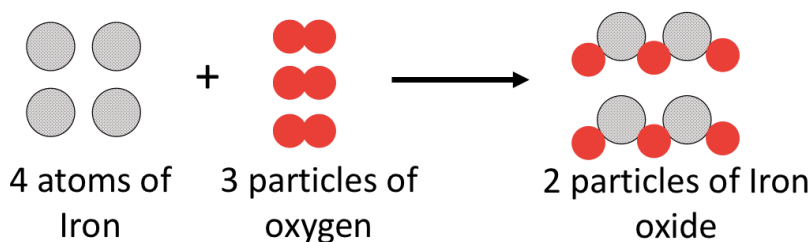
Red represent oxygenated blood (high in oxygen)

Blue indicate deoxygenated blood (low in oxygen)

Question 6

(4 marks)

Rusting is caused by iron (Fe) reacting with oxygen (O₂) in the air to form iron oxide or rust (Fe₂O₃). The diagram below represents the reaction.



(a) Explain why this reaction is described as a chemical change (1)

Because a new type of particle is formed. OR Because a new substance is formed.
OR Because chemical bonds between atoms have been broken, rearranged and formed.

(b) How many oxygen atoms are in one particle of iron oxide? (1)

Three

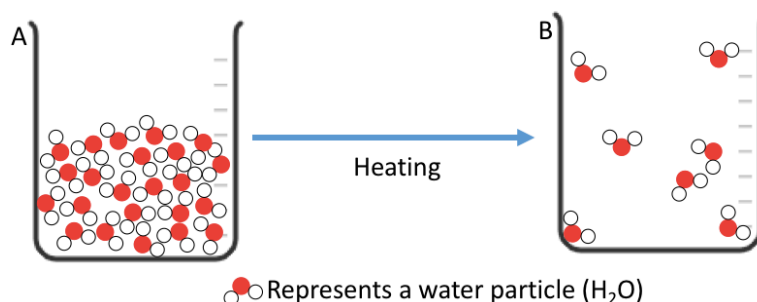
(c) Mass is conserved (the same) during this reaction. From the diagram, what evidence is there for this? (2)

Because the total number of atoms before the chemical reaction is the same as the total number of atoms after the chemical change

Question 7

(6 marks)

The below diagram represents a beaker of water being heated until all of the water has changed state.



(a) What is this change of state called? (1)

Evaporation OR Vaporisation

(b) In what state of matter (solid, liquid or gas) are the water particles in beaker B? Justify your answer. (2)

Gas, because the particles are all spread far apart and randomly arranged

(c) Is this a physical or chemical change? Justify your answer. (2)

Physical change no new type of particle is formed.

OR Physical change as no new substance is formed.

(d) Mass does not appear to be conserved (the same) during this change of state. Suggest a reason why. (1)

The beaker is open to the air so the water particles are free to escape.

Question 8 (4 marks)

Use the following terms to fill in the blanks of the paragraphs. (4)

Temperature, surface area, concentration, catalyst

- a) Increasing the **Temperature** _____ of the reactants means the particles will have more energy and will move about more. This will cause more collisions and give the particles more energy for an effective collision.
- b) Increasing the **Surface area** _____ means more reactant particles will be exposed. This means there will be more collisions between reactants causing the products to form at a faster rate.
- c) Increasing the **Concentration** _____ of reactants means there will be more particles and hence more collisions. This will cause the products to form at a faster rate
- d) Adding a **Catalyst** _____ decreases the amount of energy needed for an effective collision. Therefore, more collisions will be effective and cause the products to form at a faster rate.

Question 9 (13 marks)

Hydrochloric acid is a liquid and magnesium (solid) react to form bubbles of hydrogen gas.

A student was asked to investigate what effect temperature had on the rate of reaction between hydrochloric acid (HCl) and magnesium (Mg).

(a) Write a suitable hypothesis for this investigation. (2)

If I increase the temperature then I think the rate of reaction will increase.

(b) What is the independent variable for the experiment? (1)

Temperature

(c) What is the dependent variable for the experiment? (1)

Rate of reaction

(d) Give a control variable for the experiment? (1)

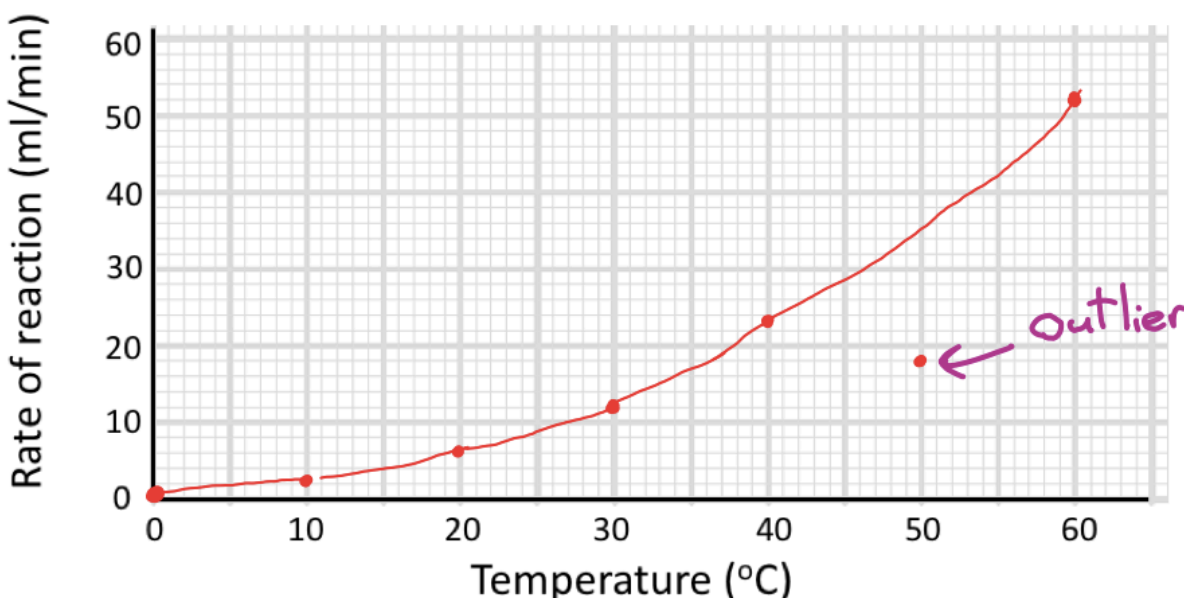
Surface area OR concentration or reactants

(e) What laboratory instrument could have been used to measure the temperature during the experiment? (1)

Thermometer

(f) The student collected the following data for the volume of gas produced per minute at various temperatures. Plot the data on the graph paper provided. Put the temperature on the x-axis. (4)

Temperature (°C)	0	10	20	30	40	50	60
Rate of reaction (Volume of gas produced per minute (ml/min))	0	2	6	12	23	18	52



(g) One of the recorded volumes of gas produced per minute is an outlier (is inconsistent) with the others. Which one? (1)

The rate of reaction for the temperature of 50°C

(h) Does the data support the hypothesis you wrote? Explain your answer. (1)

Yes, when the outlier is ignored the rate of reaction increases as the temperature increases

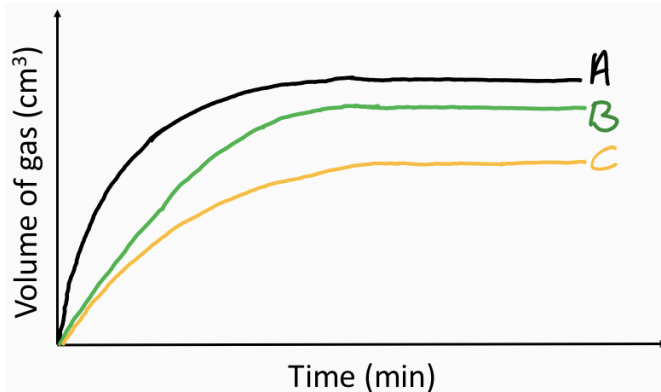
(i) Give one advantage of using a graph to present data. (1)

Outliers are easier to spot. OR Trends in the data are easier to see. Or Large amounts of data can be presented easily.

Question 10

(4 marks)

Hydrogen peroxide is a liquid which undergoes a reaction with the catalyst manganese dioxide (solid) to produce oxygen gas. Three experiments (A, B and C) of this reaction are recorded in the graph below. Study the graph and answer the following questions.



(a) Which curve (A, B or C) had the fastest rate of reaction at the beginning? Justify your answer (2)

A, because the slope is steeper than B and C.

(b) Which curve (A, B or C) had the most reactants (eg. more hydrogen peroxide)? Justify your answer. (1)

A, because a greater volume of gas was produced when the reaction was finished.

(c) How could you test for the oxygen gas which is produced? (1)

Place a glowing wooden splint into the container of the gas. If it relights oxygen is present. OR oxygen will relight a glowing wooden splint

Question 11

(8 marks)

Read the following passage and answer the questions below.

Not all of the answers are found in the passage.

Weather disasters are striking the world four to five times frequently (more often) and causing seven times more damage than in the 1970s, the United Nations weather agency has reported.

“We are going to see more climate extremes because of climate change, and these negative trends in climate will continue for the coming decades.” Petteri Taalas, secretary-general of the WMO (world meteorological organisation), told a news conference.

In the 1970s, the world averaged about 711 weather disasters a year but from 2000 to 2009 that was up to 3,536 a year, or nearly 10 a day, according to the report, which used data from the Centre for Research on the Epidemiology of Disasters in Belgium.

What is driving the destruction is that more people are moving into dangerous areas as climate change is making weather disasters stronger and more frequent, UN disaster and weather officials said.

Adapted from The Journal, 'Weather disasters soar in number and cost over past 50 years' 1st Sept 2021.

(a) Compared to the 1970's how much more damage are weather disasters causing? (1)

Seven times more damage

(b) Between 2000 and 2009 how many weather disasters was averaged per year? (1)

3,536

(c) What is causing this increase in storm intensity and frequency? (1)

Climate change

(d) Name a human activity which has led to global warming and climate change. (1)

Burning fossil fuels. Eg for electricity and for driving cars

(e) Give an example of one greenhouse gas which humans are releasing into the atmosphere. (1)

Carbon dioxide/(CO₂) OR methane/(CH₄)

(f) Name a human activity which releases the greenhouse gas you mentioned in part (e) which is causing climate change. (1)

CO₂: Burning fossil fuels. Methane: cattle farming OR landfill dumps

(f) How do greenhouse gases cause global warming? (1)

They trap the heat in the atmosphere, causing the global temperatures to increase.

(g) Electrical energy can be produced using renewable and non-renewable sources. Identify two renewable sources of energy from the list below by placing a tick (✓) in each of the correct boxes. (1)

Oil

Solar

Wind

Natural gas

Finished!

Thank you for your hard work. I am very privileged and proud to be your science teacher!