Time 1 ½ hours
Mr. A. Goodison 2nd year Science Test GCS Christmas 2019

Name _____

Answer all questions in the spaces provided.

An image of the international space station. Humans have lived in space since November 2000. The station is used to test spacecraft systems and equipment required for missions to the Moon and Mars

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	Marks	Awarded
1	36	
2	30	
3	12	
4	18	
5	21	
6	33	
7	54	
8	18	
Total	**222**	
Grade descriptor		

Question 1 (36 marks)

2019 marks the 50th anniversary of humans first landing on the Moon. Since then there have been a number of other missions to the Moon.

(a) The diagram below shows the Earth orbiting the Sun. Complete the diagram to show the **shape**, **location** and **motion** of the Moon in the Earth-Sun-Moon system. (9)
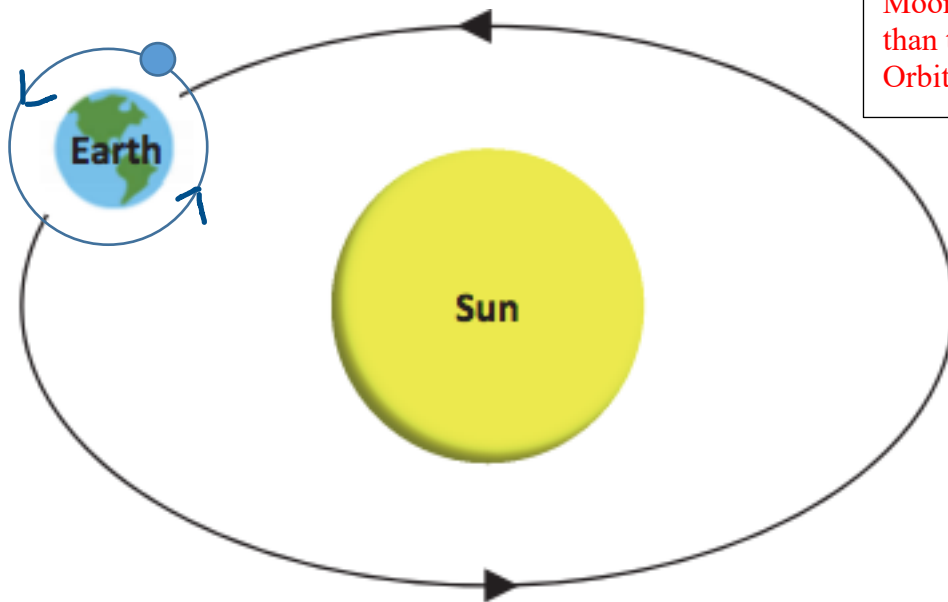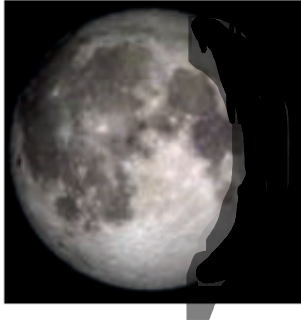
Spherical Moon (3)
Moon closer to Earth than the Sun (3)
Orbit drawn (3)

(b) At the time of the first landing, the Moon was in a waxing crescent phase as seen from Earth.

The images below show different phases of the Moon in sequence, from left to right. Place a tick in the box beneath the image which shows the Moon in a waxing crescent phase. (3)

Shade in the image of the Moon on the left to illustrate the next phase of the Moon in the sequence above. (3)

(c) On January 2nd 2019, the Chinese Chang'e-4 lander touched down on the far side or 'dark side' of the Moon.

Explain why this side of the Moon is never visible from Earth.

The Moon spin (on its axis) (3 marks) at the same rate (in the same time) it takes to orbit the Earth (3 marks) _____(6)

Below is an image of the Earth and Sun (not to scale). The Earth is in two different positions (**A** and **B**) at different times of the year.
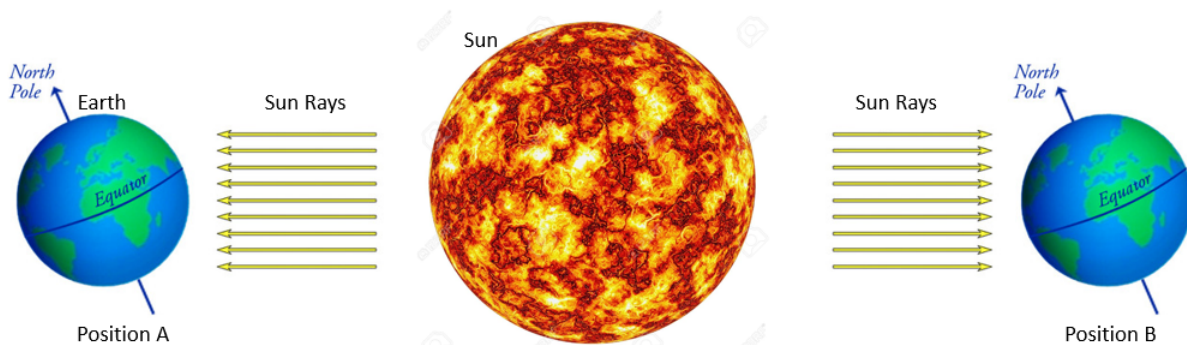

Image: Sun rays striking Earth at different times of the year

Ireland is in the Northern Hemisphere and Australia is in the Southern Hemisphere. What season (either **Summer** or **Winter**) are these countries in for the below questions.

Ireland **season** in position A   Winter (3)

Australia **season** in position A   Summer (3)

Explain your answer

In position A Ireland is tilted away from the Sun (3) (do not accept facing away). This means that the Sun's light rays are hitting Ireland (the northern hemisphere) at an angle, so they are less intense (causing winter). The opposite is true for Australia as it is tilted towards the Sun, causing Summer (in the southern hemisphere) in position A.
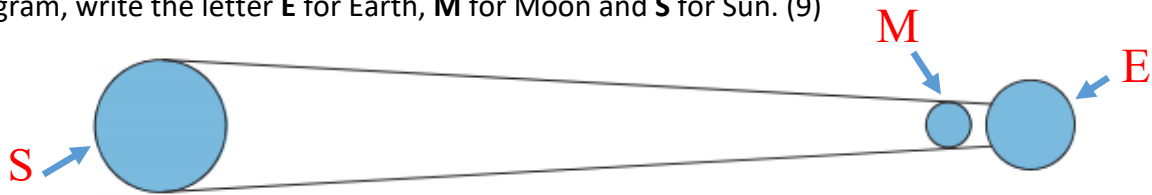
_____(6)

How many months would it take Earth to travel from position A to position B? 6 months (3)

Question 2 (30 marks)

Solar eclipses can happen a few times each year.

(a) The diagram below shows a simple model of a solar eclipse (an eclipse of the Sun). In the diagram, write the letter **E** for Earth, **M** for Moon and **S** for Sun. (9)

M

E

S

(b) Two weeks before or after a solar eclipse sometimes there is a lunar eclipse (an eclipse of the Moon). Draw a labelled diagram to show a model of a lunar eclipse. (9)

Labelled diagram

Sun

Earth

Moon
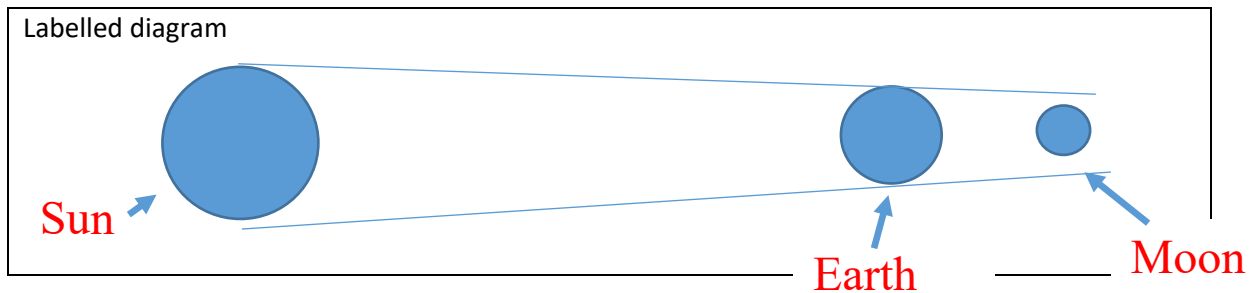
A solar eclipse in March 2015 affected the solar electrical power produced in the German electricity grid.

The graph below shows the solar electrical power produced from Monday to Friday during the week of the solar eclipse.
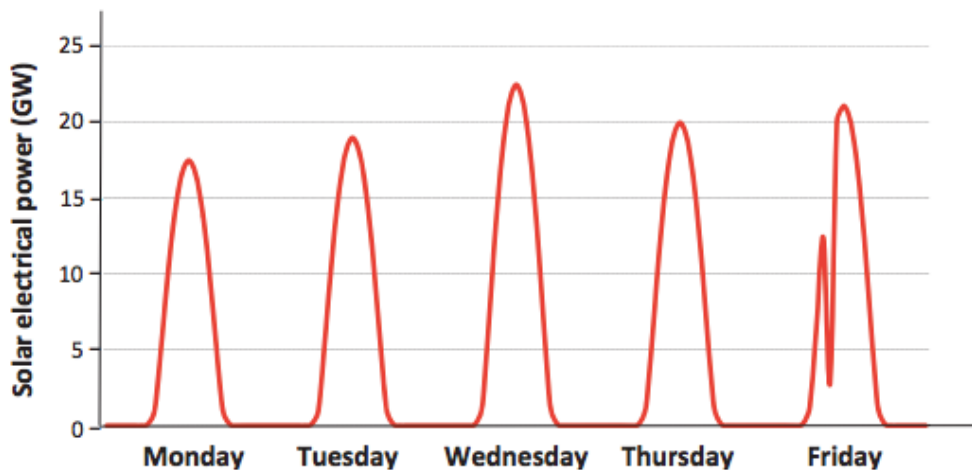
(c) On which day of the week did the solar eclipse occur? Justify your answer.

Friday (3), as there was a sudden drop in solar electrical power (3)

_____(6)

(d) Which was the brightest day of the week? Justify your answer.

Wednesday (3), as the greatest amount of solar electrical power was generated that day (3).

_____(6)

4

Question 3 (12 marks)

The table below shows the melting points and boiling points of four elements. (4 X 3 m)

Element	Melting Point (^oC)	Boiling Point (^oC)
Mercury	-39	357
Copper	1085	2562
Nitrogen	-210	-196
Calcium	842	1484

Answer the following using the table above. Which element in the table is;

    (a) A liquid at 0 ^oC Mercury (3)

    (b) A solid at 1000 ^oC Copper (3)

    (c) A gas at 500° C   Mercury OR Nitrogen (3)

    (d) What state is nitrogen at -200 ^oC Liquid (3)

Question 4 (18 marks)

Ice was removed from a freezer, crushed and placed into a test tube and left in a cold room. The graph shows the change in the temperature of the ice over a period of 40 min. (6 X 3 m)
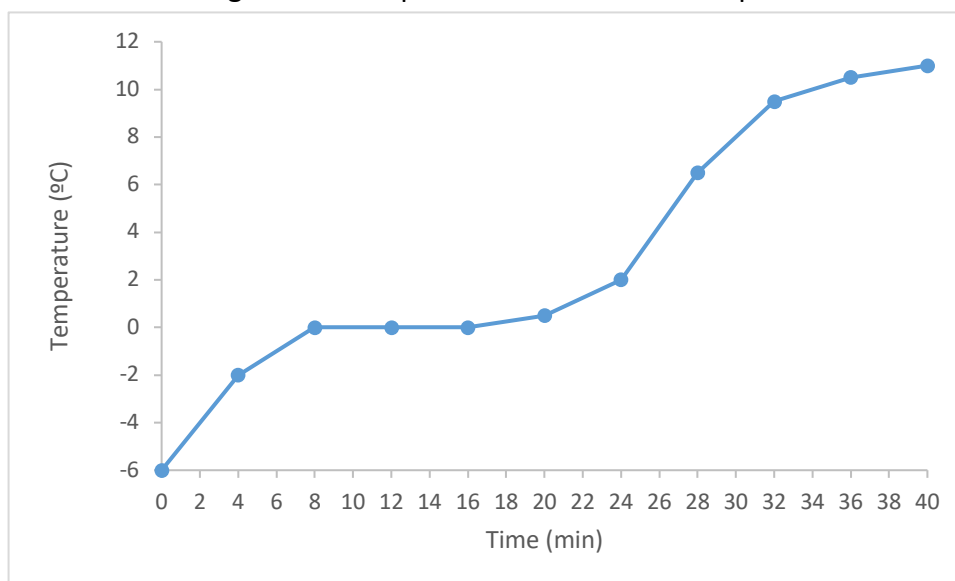
What measuring instrument could be used to measure the temperature? Thermometer (3)

How often was the temperature recorded?   Every 4 min (3)

What is happening to the ice between 0 min and 8 min?   Heating up (3)

What is happening to the ice between 8 min and 16 min?   Melting (3)

The temperature of the test tube and its contents starts to level off towards the end of the experiment. Why do you think that is?

The test tube and water began to reach room temperature so could not increase any further. OR The test tube and water began to reach equilibrium with the room temp. (3).

Using the graph, estimate the temperature of the room: 10 to 12 °C (3)

Question 5 (21 marks)

Below is a bar chart showing the melting points of different substances found in the kitchen.
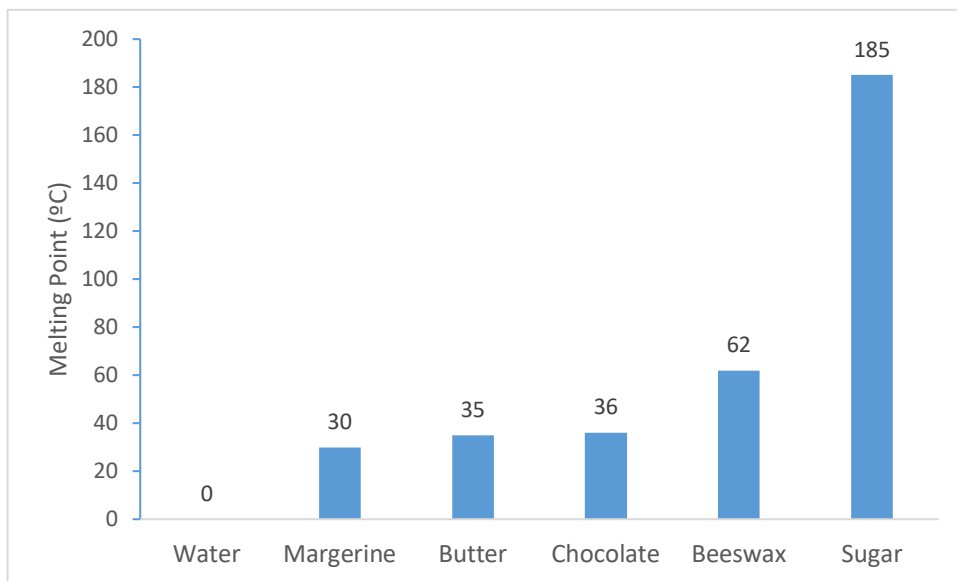
Graph: melting points for various substances

Explain what is meant by "**melting point**":

The temperature (3) at which a solid begins to turn into a liquid (3)

_____(6)

Human body temperature is 37 ^{0}C. **Use the data** from the Graph to say whether butter and/or beeswax would melt in your hand. **Explain your answers**:

   (a) Butter (write "melt" or "would not melt"):_____Melt_____ (3)

Explain:

Butter's melting point is lower than the temperature of the human body

_____(3)

(b) Beeswax (write "melt" or "would not melt"):___Would not melt_____ (3)

Explain:

Beeswax's melting point is at a higher temperature than the human body.

_____(3)

A chocolate biscuit cake is made by melting butter and sugar together, and then adding other ingredients. Using the **Graph** on melting points, what is the **minimum temperature** which the butter and sugar mixture would have to reach to melt both substances?
Answer: _____185°C_____ (3)

Question 6 (33 marks)

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 the mass of salt added to the water is increased then the boiling point of the water will

also increase _____(3)

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

The temperature (3) at which a liquid begins to turn into a gas (3)_____

_____(6)

(c) The laboratory instrument used to measure the mass of the salt is shown in the photograph.

Identify this instrument.   Mass balance OR Electronic balance (3)

(d) In the space below, draw a labelled diagram of the arrangement of the apparatus used to determine the boiling point of water. (9)

Labelled diagram

Thermometer (3)

Beaker (3)

Hotplate OR
Bunsen burner (3)
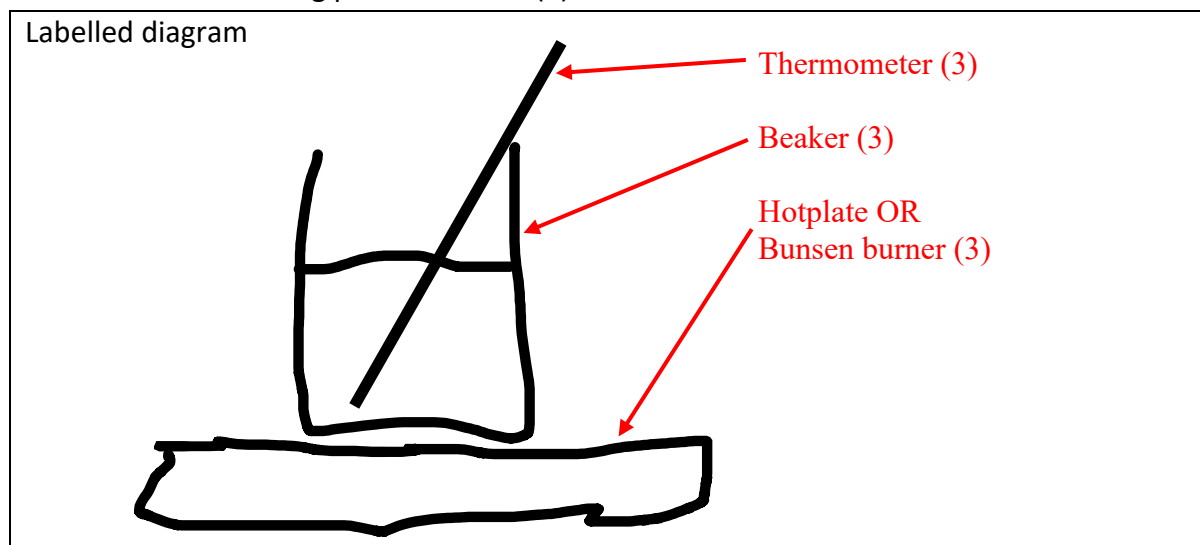
The student collected the following data for the boiling point of the solutions made when various masses of salt were dissolved in 60 cm^3 of water.

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 cm^3 of water. (3)

Calculation

$$\frac{103 + 105 + 104 + 106 + 107}{5} = 105$$

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

To increase the reliability of the experiment OR to spot an outlier in the data

_____(3)

8

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

Yes OR No (consistent with hypothesis given) followed by answer supported by the data.
e.g. Yes, because the data shows that the boiling point of the water does rise as more salt
was added. This is what my hypothesis stated._____

_____(6)

Question 7 (54 marks)

Aluminium reacts with chlorine to form the compound aluminium chloride. This compound often used in deodorant to help reduce sweating by blocking sweat glands. Use the Periodic Table on page 79 of the Formulae and Tables booklet to predict the ratio of aluminium to chlorine in this compound. Hence write the chemical formula for aluminium chloride (12)

Al is in group 3 (3 marks)
Cl is in group 3 (3 marks)

Correct ratio (3 marks)   Al:Cl 1:3
Correct formula (3 marks) $AlCl_3$ (3 marks)
Note that for the correct formula award 12 marks

Formula of Aluminum chloride_____ $AlCl_3$

The elements

Periodic table of the elements

1																		18
1 H 1.008	2												13	14	15	16	17	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	3	4	5	6	7	8	9	10	11	12		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)	

Match each of the following sub-atomic particles to their descriptions in the table below (9)

Electron   **Neutron**   **Proton**

Description	Particle
Positively charged	Proton (3)
Negatively charged	Electron (3)
No charge	Neutron (3)

Which two sub-atomic particles make up the nucleus of an atom? (6)
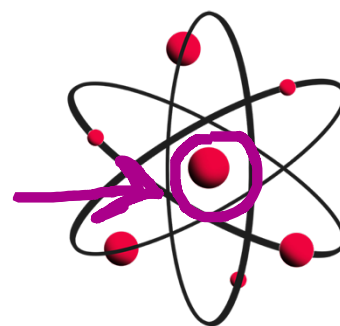
   1. Protons   2. Neutrons

Which two sub-atomic particles have the same mass? (6)

   2. Protons   2. Neutrons

Which sub-atomic particle has the lowest mass? (3)

Answer_____Electron_____

Identify the nucleus of the atom on the right by circling it. (3)

The second image on the right shows the Bohr model of an atom.

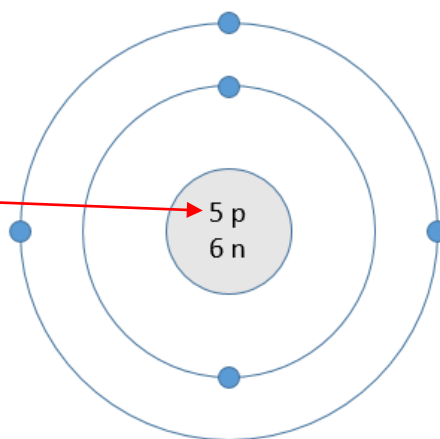State the atomic number of the atom

_____5_____(3)

State the mass number of the atom

_____5 + 6 = 11_____ (3)

What do the dots on the circles outside the nucleus

represent? _____Electrons_____(3)

5 p
6 n

Using the periodic table, identify the element that is made up of this type of atom. Justify your answer

Boron (B) (3 marks), as Boron has an atomic number of 5 which is the same as the atomic

number for this atom (3 marks)_____(6)

Question 8 (18 marks)

Sophie is a Runner and wants to buy the shoe which will give her the most grip.
She sets up an experiment where she is using a newton balance to test the amount of force it takes for the shoe to begin moving.

She gets the following results

Shoe	Nike	Adidas	Asics
Force (N)	3.02	3.42	3.68

Which shoe should she buy so that she has the most grip? Asics_____ (3)

In this experiment what was the:

Cause variable (the thing she changed).   Shoe_____(3)

Effect variable (the thing she measured).   Force OR Friction_____ (3)

Control variable (the things she kept the same).   Surface or shoe size etc ___(3)

What is the force which causes grip?   Friction_____(3)

What is the unit of force?   Newton (N)_____(3)

Well done, and thank you for being a great student and making it a pleasure to be your teacher!
Enjoy Christmas =]

If you have time, try to estimate your grade from this test.

If you are completely finished colour in the below picture