BHASVIC

Preparation for Chemistry 2017

Name ……

This pack has been put together to help you prepare to study A-level Chemistry with us at BHASVIC. Read it carefully and complete all of the questions. **You need to bring it along every lesson for your first two weeks of lessons in September.**

If you are not sure about an answer then look it up, it is the areas that you are unsure about that you most need to learn.

How about following us on social media to find out more about the department before you arrive?

@SJC_Chemistry

BHASVIC Chemistry

Brady Explains

Independent Study Tasks

Welcome to BHASVIC A-level Chemistry!

We are really looking forward to teaching you next year and helping you be successful. We expect you to work much more independently than when you were doing your GCSEs, so for each topic, we ask you to do some self-study before you come to lessons.

This pack is designed to help you practice the independent study activities we do in chemistry so you feel more confident when you arrive.

Throughout the tasks, we have directed you to useful videos and websites – make sure you use them to help you! It is OK to look up the answers if you get stuck but not OK to leave blanks.

All the videos can be accessed using the QR code or this link to blendspace:

https://www.blendspace.com/lessons/knW8q9un51zoAw/moving-on-day-2015

What do I need for September?

So you can get organised before you arrive, here is a list of the essential items you need for studying Chemistry at BHASVIC.

Items:	Details:
• Basic scientific calculator	Approx. £8, most people have a Casio. This will be fine for any science subjects at BHASVIC.
• Clear 30cm ruler	You need to be able to see through it when drawing lines of best fit and tangents on graphs.
• Small ringbinder	For carrying your current work to and from college
• Large lever arch file and dividers	To organise your notes at home
•	
• A black, blue and red pen	We use a three pen system for homework, so you'll need all three
• Lined paper	

We provide lab coats and safety glasses to use during practical work.

Have a great summer break!
The BHASVIC Chemistry Team

Atoms, Ions and Compounds *Chapter 2, Specification 2.1.1-2.1.2*

These are the learning outcomes **for the whole of the first topic**, some of which will be familiar from GCSE. You will start working on some now and *the ones in italics* will be introduced in lessons in September.

When you finish the pack, tick the appropriate boxes to indicate your progress. Don't worry if you don't feel confident with everything on the list yet.

By the end of the topic you should be able to demonstrate your knowledge and understanding of:

	Learning Outcome	I can **recall** this	I **understand** this	I need to **revisit** this
a.	**isotopes** (atoms of the same element with different numbers of neutrons and different masses)			
b.	***atomic structure*** *(working out numbers of protons, neutrons and electrons for atoms and ions, given the atomic number, mass number and any ionic charge)*			
c.	*explaining:* • ***relative isotopic mass*** *(mass compared with 1/12th mass of carbon-12)* • ***relative atomic mass*** *(weighted mean mass compared with 1/12th mass of carbon-12),* • *the use of the mass of a ^{12}C atom as the standard for atomic masses*			
d.	the use of **mass spectrometry** in: **(i)** determining relative isotopic masses and relative abundances of the isotope, **(ii) calculating the relative atomic mass** of an element from the relative abundances of its isotopes			
e.	• *the use of* ***relative molecular mass****, M_r, and* ***relative formula mass*** • *calculating them from relative atomic masses*			
f.	**writing the formulae of ionic compounds**, including: **(i)** predicting ionic charge from the periodic table **(ii)** recalling the names and formulae for the following ions: NO_3^-, CO_3^{2-}, SO_4^{2-}, OH^-, NH_4^+, Zn^{2+} and Ag^+			
g.	*constructing* ***balanced chemical equations*** *with state symbols (including ionic equations)*			
h.	*explaining and using the terms:* ***(i) amount of substance*** ***(ii) mole*** *(the unit for amount of substance)* ***(iii)*** *the* ***Avogadro constant****, N_A (the number of particles per mole)* ***(iv) molar mass*** *(mass per mole)*			
i	***mole calculations****, involving mass*			

Brady explains … Note Taking

One of our teachers, Brady, has a YouTube channel full of great videos to help you study chemistry. He has made some specifically for you to use while completing this Preparation for Chemistry material. The first one is all about taking notes.

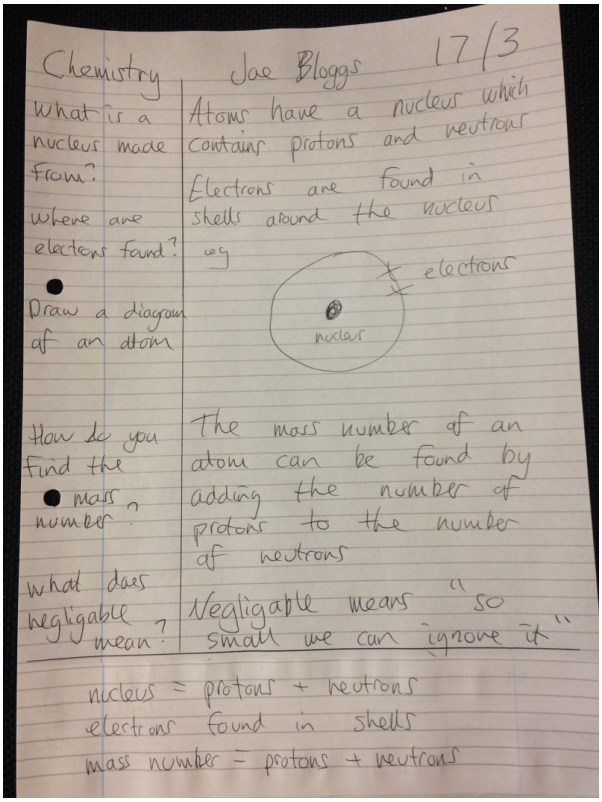
At BHASVIC Chemistry you will be expected to take your own notes in lesson. Having a good system to make sure you get all the important information / examples down is important. **Simply copying out loads of text from the book *does not* work!**

Below is how to effectively take notes from a lesson / your textbook.

1. Split up an A4 page as shown below:

Name	Title	Date
Questions about the notes	Notes	
Key points / summary		

2. Watch the video "Brady Explains How To Find Charges" from **Box 2** on the blendspace link and add notes
3. Now write the questions and key points/summary at the bottom of the page summing up what the page is about



An example of what a completed note page should look like (on a different topic):

Use your notes to help you with the activities later in the pack

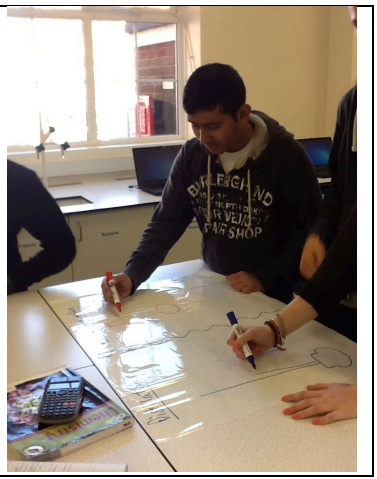
Brady Explains …

- Watch the **Brady Explains video for Moving On Day** from **Box 3** on the blendspace link:

- Think carefuly about what Brady is saying while you are watching it and make notes about the key information

- Label the **periodic table on page 5** carefully. We will be assuming you have this knowledge when you start with us in September.

- Once you have watched the video then **answer the questions on page 6**. If you are not sure of any of the answers then watch the video again. Write all of your answers into the pack.



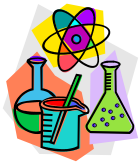
1	2											3	4	5	6	7	0
							1.0 H hydrogen 1										4.0 He helium 2
6.9 Li lithium 3	9.0 Be beryllium 4											10.8 B boron 5	12.0 C carbon 6	14.0 N nitrogen 7	16.0 O oxygen 8	19.0 F fluorine 9	20.2 Ne neon 10
23.0 Na sodium 11	24.3 Mg magnesium 12											27.0 Al aluminium 13	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulfur 16	35.5 Cl chlorine 17	39.9 Ar argon 18
39.1 K potassium 19	40.1 Ca calcium 20	45.0 Sc scandium 21	47.9 Ti titanium 22	50.9 V vanadium 23	52.0 Cr chromium 24	54.9 Mn manganese 25	55.8 Fe iron 26	58.9 Co cobalt 27	58.7 Ni nickel 28	63.5 Cu copper 29	65.4 Zn zinc 30	69.7 Ga gallium 31	72.6 Ge germanium 32	74.9 As arsenic 33	79.0 Se selenium 34	79.9 Br bromine 35	83.8 Kr krypton 36
85.5 Rb rubidium 37	87.6 Sr strontium 38	88.9 Y yttrium 39	91.2 Zr zirconium 40	92.9 Nb niobium 41	95.9 Mo molybdenum 42	[98] Tc technetium 43	101.1 Ru ruthenium 44	102.9 Rh rhodium 45	106.4 Pd palladium 46	107.9 Ag silver 47	112.4 Cd cadmium 48	114.8 In indium 49	118.7 Sn tin 50	121.8 Sb antimony 51	127.6 Te tellurium 52	126.9 I iodine 53	131.3 Xe xenon 54
132.9 Cs caesium 55	137.3 Ba barium 56	138.9 La* lanthanum 57	178.5 Hf hafnium 72	180.9 Ta tantalum 73	183.8 W tungsten 74	186.2 Re rhenium 75	190.2 Os osmium 76	192.2 Ir iridium 77	195.1 Pt platinum 78	197.0 Au gold 79	200.6 Hg mercury 80	204.4 Tl thallium 81	207.2 Pb lead 82	209.0 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

140.1 Ce cerium 58	140.9 Pr praseodymium 59	144.2 Nd neodymium 60	144.9 Pm promethium 61	150.4 Sm samarium 62	152.0 Eu europium 63	157.2 Gd gadolinium 64	158.9 Tb terbium 65	162.5 Dy dysprosium 66	164.9 Ho holmium 67	167.3 Er erbium 68	168.9 Tm thulium 69	173.0 Yb ytterbium 70	175.0 Lu lutetium 71
232.0 Th thorium 90	[231] Pa protactinium 91	238.1 U uranium 92	[237] Np neptunium 93	[242] Pu plutonium 94	[243] Am americium 95	[247] Cm curium 96	[245] Bk berkelium 97	[251] Cf californium 98	[254] Es einsteinium 99	[253] Fm fermium 100	[256] Md mendelevium 101	[254] No nobelium 102	[257] Lr lawrencium 103

Brady Explains Follow up questions



Using your periodic table on p4, answer the following questions:

a. Name four elements from period four

b. Give the symbols for three elements from group seven

c. Write the symbol for an s-block element with a name that starts with P

d. On the Periodic Table, label or colour code the s, p, d and f blocks

e. Is Chlorine a metal or a non-metal? Give a one sentence explanation of your answer.

f. Is Aluminium a metal or a non-metal? Give a one sentence explanation of your answer.

g. Write down the mass number of Lead

h. Write down the proton number of Sulfur

i. Complete the table showing numbers of protons, neutrons and electrons. Think carefully about chlorine and magnesium.

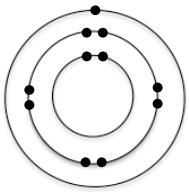
	Hydrogen	Sodium	Magnesium	Carbon	Oxygen	Chlorine
Symbol						
Mass number						
Number of protons						
Number of neutrons						
Number of electrons						

Structure and Bonding

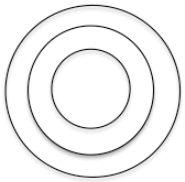
Brady goes over dot-and-cross diagrams in his video. For more help, use any GCSE revision website.

Atomic Structure

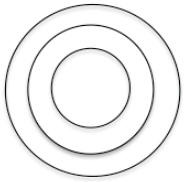
Complete the diagrams below to show the electron arrangement in each atom. The first one has been done for you.



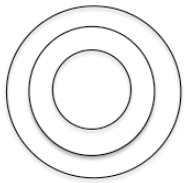
Sodium ion



Magnesium atom



Sulfur atom



Chlorine atom

Ionic Bonding

Complete the sentences below:

Metal atoms form …… ions by ……. one or more electrons.

Non-metal atoms form ……. ions by ……. one or more electrons.

Draw dot-and-cross diagrams to show the ions in the following ionic compounds, showing **outer shell electrons only**,

Sodium Fluoride, NaF

Magnesium Sulfide, MgS

Magnesium Chloride, $MgCl_2$

Sodium Oxide, Na_2O

Potassium nitride, K_3N

Covalent Bonding

Draw dot and cross diagrams to show the covalent bonding in the following molecules. You **only need to show the outer shell** in your diagrams.

Hydrogen molecule, H_2

Methane molecule, CH_4

Ammonia molecule, NH_3

Oxygen molecule, O_2

Carbon dioxide, CO_2

Using Moles Equations

There are 3 moles equations you ***must*** memorise off by heart (you will be using these **most** lessons).

Moles = volume x concentration **moles = $\frac{\text{mass}}{\text{Ar}}$** **moles = $\frac{\text{volume(gas)}}{24}$**

It is also important to be able to re-arrange these equations.
We will use **moles = volume x concentration** as an example

1) Let us rearrange the equation to get **volume =**

In maths, you can do whatever you like to an equation, ***so long as you do the same thing to both sides***

So I will divide both sides by **concentration**

moles = volume x concentration

$$\frac{\text{moles}}{\text{concentration}} = \frac{\text{volume x concentration}}{\text{concentration}}$$

Next, I will cancel the concentrations

$$\frac{\text{moles}}{\text{concentration}} = \frac{\text{volume x } \cancel{\text{concentration}}}{\cancel{\text{concentration}}}$$

$$\frac{\text{moles}}{\text{concentration}} = \text{volume}$$

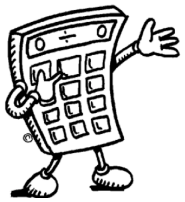
Now let's look at **moles = $\frac{\text{mass}}{\text{Ar}}$**

2) We shall rearrange to get **mass =**

Remember, in maths you can do whatever you like to an equation, ***so long as you do the same thing to both sides***

moles = $\frac{\text{mass}}{\text{Ar}}$

I shall multiply both sides by Ar



moles x Ar = $\frac{\text{mass x Ar}}{\text{Ar}}$

Next, I shall cancel the Ar's

moles x Ar = $\frac{\text{mass x } \cancel{\text{Ar}}}{\cancel{\text{Ar}}}$

moles x Ar = mass

Now you try…

Use your newfound rearranging powers to solve these questions **(*it may interest you to know that all of the values used in these questions are true*).** Show all of your working (you can check your answers at the bottom of the page)

1. In the Hiroshima nuclear bomb, Uranium atoms are broken down to release energy (a lot of energy!). It is estimated that 0.1955 moles of Uranium were used. Find the mass of Uranium used in the Hiroshima nuclear bomb (the Ar of Uranium is 238.1).

2. The average human has a blood volume of 5 dm^3. The official "lethal dose" of ethanol for an average human is 12.4 moles. What would the concentration of ethanol in an average humans blood need to be in order to be fatal?

3. Cyanide is one of the most deadly poisons in the world. Breathing in as little as 0.003846 moles will be fatal. What volume of cyanide gas would kill you?

4. Your stomach contains an average of 0.100 moles of hydrochloric acid (HCl) with a concentration of 0.100 mol dm^{-3}. Find the volume of hydrochloric acid in your stomach.

5. A mysterious element was discovered that had similar properties to lead, but when left in oxygen turned a fantastic pinky-blue colour. Scientists weighed 2 moles of the element and found it had a mass of 418g. Find the Ar of the element and use the periodic table to suggest it's identity.

1) 46.5g 2) 2.48 mol dm^{-3} 3) 0.0923 dm^3 4) 1 dm^3 5) 209- Bismuth

Ionic Compounds: Forming Salts

At A-level, it is important to be confident writing the formulae of salts. Complete the missing formulae and names in the equations below. There some selected answers at the end. You might need to look up the metals in the periodic table to find out what group they are in.

Most people with double science GCSE have done this before but if this is new to you or you just want a reminder, we have made a 6 min animation you can **watch before you start.** Just go to **box 4** on the blendspace link

Metal + Acid Reactions

1	Potassium	+	Hydrochloric acid	→	Potassium chloride	+	Hydrogen
	K	+	HCl	→	_____	+	H_2
2	Barium	+	Sulfuric acid	→	Barium sulfate	+	Hydrogen
	Ba	+	H_2SO_4	→	_____	+	H_2
3	Calcium	+	Hydrochloric acid	→	Calcium chloride	+	Hydrogen
	Ca	+	HCl	→	_____	+	H_2
4	Barium	+	Nitric acid	→	Barium nitrate	+	Hydrogen
	Ba	+	HNO_3	→	_____	+	H_2
5	Strontium	+	Nitric acid	→	_____	+	_____
	Sr	+	HNO_3	→	_____	+	_____

Metal oxide + Acid Reactions

6	Lithium oxide	+	Hydrochloric acid	→	Lithium chloride	+	Water
	Li_2O	+	HCl	→	_____	+	H_2O
7	Magnesium oxide	+	Hydrochloric acid	→	Magnesium chloride	+	Water
	MgO	+	HCl	→	_____	+	H_2O
8	Potassium oxide	+	Sulfuric acid	→	Potassium sulfate	+	Water
	K_2O	+	H_2SO_4	→	_____	+	H_2O
9	Aluminium oxide	+	Sulfuric acid	→	Aluminium sulfate	+	Water
	Al_2O_3	+	H_2SO_4	→	_____	+	H_2O
10	Calcium oxide	+	_____	→	Calcium sulfate	+	_____
	CaO	+	_____	→	_____	+	_____

Selected Answers

$2 - BaSO_4$, $3 - CaCl_2$, $4 - Ba(NO_3)_2$

$8 - K_2SO_4$, $9 - Al_2(SO_4)_3$

Phosphate is PO_4^{3-}

Metal hydroxide + Acid Reactions

11	Sodium hydroxide	+	Nitric acid	→	Sodium nitrate	+	Water
	$NaOH$	+	HNO_3	→	_____	+	H_2O
12	Lithium hydroxide	+	Sulfuric acid	→	Lithium sulfate	+	Water
	$LiOH$	+	H_2SO_4	→	_____	+	H_2O
13	Calcium hydroxide	+	Nitric acid	→	Calcium nitrate	+	Water
	$Ca(OH)_2$	+	HNO_3	→	_____	+	H_2O
14	Calcium hydroxide	+	Phosphoric acid	→	Calcium phosphate	+	Water
	$Ca(OH)_2$	+	H_3PO_4	→	_____	+	H_2O
15	Aluminium hydroxide	+	_____	→	Aluminium nitrate	+	_____
	$Al(OH)_3$	+	_____	→	_____	+	_____

Metal carbonate + Acid Reactions

16	Strontium carbonate	+	Hydrochloric acid	→	Strontium chloride	+	Water + Carbon dioxide
	$SrCO_3$	+	HCl	→	_____	+	$H_2O + CO_2$
17	Lithium carbonate	+	Phosphoric acid	→	Lithium phosphate	+	Water + Carbon dioxide
	Li_2CO_3	+	H_3PO_4	→	_____	+	$H_2O + CO_2$
18	Potassium carbonate	+	Nitric acid	→	Potassium nitrate	+	Water + Carbon dioxide
	K_2CO_3	+	HNO_3	→	_____	+	$H_2O + CO_2$
19	Sodium carbonate	+	Phosphoric acid	→	Sodium phosphate	+	Water + Carbon dioxide
	Na_2CO_3	+	H_3PO_4	→	_____	+	$H_2O + CO_2$
20	Barium carbonate	+	_____	→	Barium chloride	+	_____ + _____
	$BaCO_3$	+	_____	→	_____	+	_____ + _____

Mixed

21	$MgCO_3$	+	HCl	→	_____
22	CaO	+	HNO_3	→	_____
23	Na	+	H_2SO_4	→	_____
24	$Sr(OH)_2$	+	HCl	→	_____
25	Al_2O_3	+	H_3PO_4	→	_____

Task 3: CHALLENGE

Can you balance all these equations?

Mass Spectrometry and Isotopes

Watch the short video on mass spectrometry from **Box 5** on blendspace**.** Some of this material may be new to you, so watch carefully, and when you have finished, answer the questions:

1) What is the definition of an **isotope**?

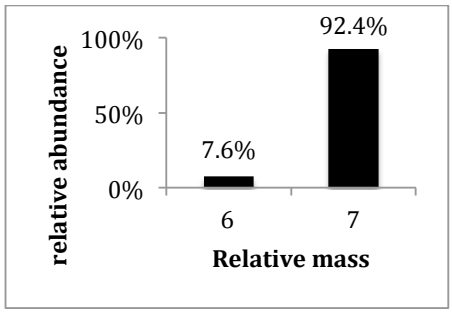
2) Label the diagram to show what each part means:

$^{13}_{6}C$

3) The symbols $^{35}_{17}Cl$ and $^{37}_{17}Cl$ are both used to represent chlorine atoms. Explain why.

4) Equation for working out the relative atomic mass (from the video):

5) Use the graph to work out the relative atomic mass of lithium. Show your working and give your answer to **2 decimal places**



answer: ……..……(to 2 d.p.)

6) Geologists use the amount of different isotopes in rock samples to work out how old they are. The uranium in a sample of rock was found to be 99.3% $^{238}_{92}U$ and 0.7% $^{235}_{92}U$. What is the relative atomic mass of the uranium in the sample?

answer: …….. (to 2 d.p.)