BTEC
Applied Science

Year 11 into 12

Unit 1: Science Workbook

Name:

Instructions

- Read the information in this booklet. It tells you about the topics you will be studying in Y12 and what GCSE knowledge you need to know and understand to do well next year.
- Work through this booklet and complete all of the activities.
- After you have completed the activities, mark your answers (at the back of the booklet).
- Learn the GCSE content in this booklet and be prepared for a test when you return to school. This will help us to assess how hard you have worked over the summer and whether or not this course is suitable for you.

6th Form Prospectus 2023-2024: Applied Science

Subject : **BTEC L3 National Extended Certificate in Applied Science**

Introduction:

BTEC qualifications are suitable for a wide range of learners. They offer an alternative to more traditional qualifications, combining the best mix of academic and vocational methods of learning. The range of modules offered are practical and theory based, with internal assessed coursework and external examinations. Biology, Chemistry and Physics topics will be covered in Units 1-3. Unit 9 give pupils the opportunity to specialise more in Biology. The modules included are: 'Principles and Applications of Science', 'Practical Scientific Procedures and Techniques', 'Science Investigation Skills' and 'Human Regulation and Reproduction'.

Where Does It Lead?

Undertaking this course and gaining a qualification in BTEC Applied Science will develop and enhance the skills you need to work in specialist laboratory situations. Many Higher Education Institutions accept BTEC at Level 3 as a recognised qualification to enter vocations such as Nursing, Midwifery and more. The BTEC L3 National Extended Certificate in Applied Science is equivalent in size to 1 A Level.

Entry Requirements - What do I need to study this subject?

All candidates must have achieved a level 4 and above in GCSE double award Science.
All candidates must have achieved at least a level 4 in Mathematics.

Course Details:

There are two externally assessed written exams in this course. The remaining units are assessed through a variety of ways internally by the subject teachers. Pupils will be provided with a Turn it in login so all work can be submitted and checked for plagiarism electronically.

Unit number	Unit title	Credits	Year
1	**Principles and Applications of Science** Core Unit Assessment method: Externally assessed exams	90	12
2	**Practical Scientific Procedures and Techniques** Core Unit Assessment method: Internally assessed practical skills and written practical reports.	90	12
3	**Science Investigation Skills** Core Unit Assessment method: Externally assessed exam based on practical skills learnt in this unit.	120	13
9	**Human Regulation and Reproduction** Option Unit Assessment method: Internally assessed written assignments.	60	13

BTEC

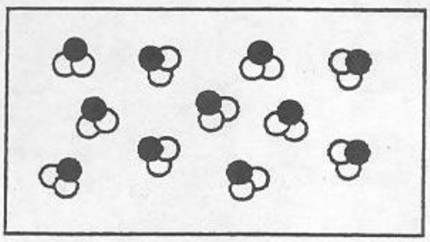
Elements, compounds, mixtures

Key word	Definition
Element •	• Atoms of different elements chemically bonded
Compound •	• Substance with only one sort of atom
Mixture •	• A small group of atoms bonded together
Molecule •	• Different elements or compounds mixed but not joined

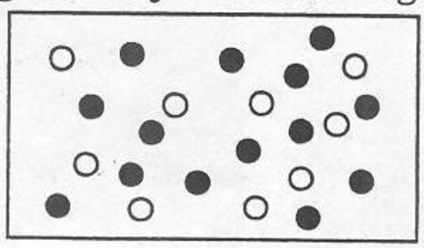
Classify each of the pictures below by placing the correct label in the blanks below:

A= Element
B= Compound
C= Mixture of elements
D= Mixture of compounds
E= Mixture of elements and compounds

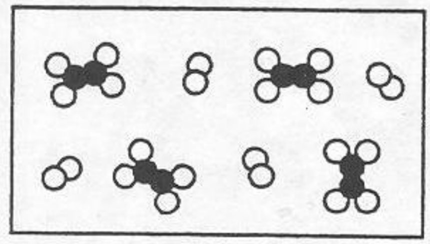
Each circle represents an atom and each different color represents a different kind of atom. If two atoms are touching then they are bonded together.



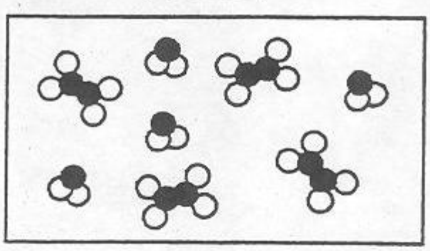
1) ______



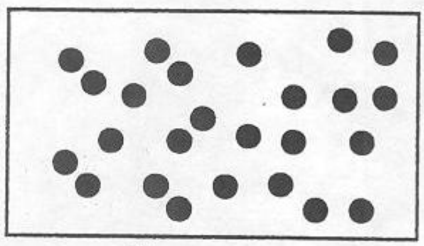
2) ______



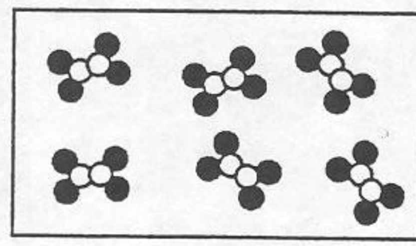
3) ______



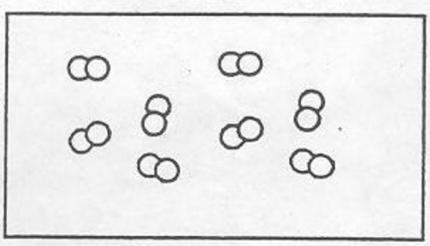
4) ______



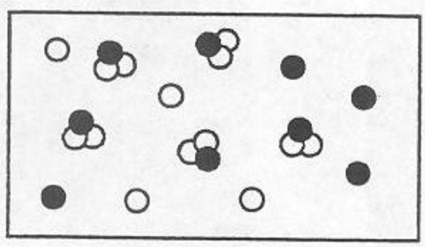
5) ______



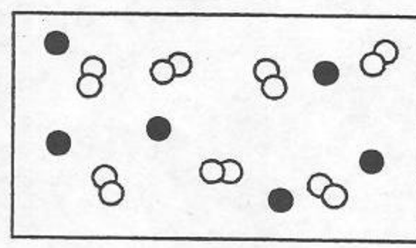
6) ______



7) ______



8) ______



9) ______

substance	element / mixture / compound?
A pure gold coin	
Pure water	
Salty water	
Air	

Hazard Symbols

symbol	name	what it means
		
		
		
		
		

substance	Which hazard symbol?
Dilute hydrochloric acid	
Concentrated sulfuric acid	
Dilute sodium hydroxide	
Hydrogen gas	
Dilute nitric acid	

Acids, bases and pH

Key word	Definition
Acid •	• A base that dissolves in water and has pH greater than 7
Base •	• A substance with a pH less than 7 and provides hydrogen ions in water
Alkali •	• A substance that neutralises acids

pH number	Colour with universal indicator	Colour with litmus	Strong or weak? Acid, alkali or neutral?	Where would you put: water, hydrochloric acid, lemon juice, soap, sodium hydroxide?
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

acid name	formula
hydrochloric acid	
sulfuric acid	
nitric acid	

base name	formula
sodium hydroxide	
copper oxide	
zinc oxide	
copper carbonate	
calcium carbonate	
sodium carbonate	

gas name	formula
hydrogen	
carbon dioxide	

sulfate / nitrate / salt / chloride

- when acids react they always make a __________
- hydrochloric acid makes salts called ___________
- sulfuric acid makes salts called ___________
- nitric acid makes salts called ____________

Salt names

Salts have a first name and a second name:

The first name comes from :

The second name comes from:

what is the name of the salt made?

1. copper oxide with sulfuric acid makes:
2. sodium hydroxide with nitric acid makes:
3. zinc oxide with hydrochloric acid makes:
4. sodium hydroxide with sulfuric acid makes:

acid + alkali (or metal oxide) → _______________ + ________________________

Complete the following word equations:

1. Nitric acid + copper oxide → __________ __________ + water
2. Hydrochloric acid + sodium hydroxide → _________ __________ + _____________
3. Sulfuric acid + potassium oxide → _________ _________ + ________________
4. _____________ + ________________ → lithium chloride + water
5. _____________ + ________________ → sodium nitrate + __________________

Acids with metals and testing for hydrogen

metal + acid → ___________ + _________________

- *complete these word equations:*

1. magnesium + hydrochloric acid → m________ c_________ + h________________
2. calcium + sulfuric acid → c________ s__________ + ________________
3. zinc + hydrochloric acid → ________ __________ + ________________
4. tin + sulfuric acid → ________ ___________ + ________________

the famous hydrogen gas test!

Need to test for hydrogen? Add a burning splint. You will hear a _ _ _ sound

1. **Complete the table (*Hint* – look for the patterns):**

Name of metal	Name of acid		
	Hydrochloric acid	**Nitric acid**	**Sulfuric acid**
Iron	Iron chloride		Iron sulfate
Zinc	Zinc chloride	Zinc nitrate	
Magnesium			Magnesium sulfate

2. **Complete the following word equation:**

(acid + metal → salt + hydrogen)

hydrochloric acid + ____________________ → calcium chloride + hydrogen

____________________ + magnesium → magnesium nitrate + water

Acids with metal carbonates and testing for carbon dioxide

metal carbonate + acid → ______ + ________ + ________ ________

- *complete these word equations:*

1. sodium carbonate + hydrochloric acid → s________ c________ + water + c________ d________
2. calcium carbonate + sulfuric acid → c________ s__________ + ________ + c________ d________
3. copper carbonate + nitric acid → ________ __________ + ___________ + __________ __________
4. calcium carbonate + sulfuric acid → _______ _________ + ___________ + __________ __________

the famous limewater test!

when you bubble <u>carbon dioxide</u> through ***limewater*** it turns ________

1. Complete the table (*Hint* – look for the patterns):

Name of metal carbonate	Name of acid		
	Hydrochloric acid	**Nitric acid**	**Sulfuric acid**
Copper carbonate		Copper nitrate	
Zinc carbonate			Zinc sulfate
Iron carbonate	Iron chloride		

2. Complete the following word equations:

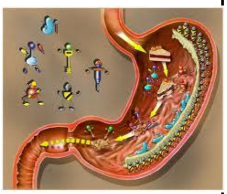
(acid + metal carbonate → salt + water + carbon dioxide)

hydrochloric acid + magnesium carbonate → ____________ + water + carbon dioxide

nitric acid + _______________________ → iron nitrate + water + carbon dioxide

Uses of neutralisation

1. indigestion tablets

			*key words:* neutralise weak base calcium carbonate
The stomach makes acid. This helps to break down food (digest) and kill bacteria.	Indigestion is caused by too much acid in the stomach.	Indigestion tablets contain a ______. They ____________ the extra acid to make the person feel better.	It is important a ______ base is used so it is safe to consume. An example is _______ _________.

2. Reducing acidity of soils

Acidic soil is a problem because:

Farmers get rid of the acid by:

This changes the pH from __ to __.

3. Reducing acidity of lakes

Acidic rain is a problem because:

Scientists get rid of the acid by:

An example equation is:

calcium carbonate + sulfuric acid →

Neutralisation exam question

6 Some indigestion tablets contain calcium carbonate.
The calcium carbonate reacts with hydrochloric acid in the stomach.
Carbon dioxide is one of the products of this reaction.

(a) Describe the chemical test for carbon dioxide.

(2)

....

....

....

....

(b) The reaction in the stomach between hydrochloric acid and calcium carbonate is a neutralisation reaction.
Name the salt formed in the reaction.

(1)

....

(c) Indigestion tablets are coated to stop them reacting before they reach the stomach.
Explain **two** reasons why calcium carbonate is still used to neutralise stomach acid rather than sodium hydroxide.

(4)

1 ....

....

2 ....

....

The periodic table

Key

relative atomic mass **atomic symbol** name atomic (proton) number

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **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						

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Cu and **Cl** have not been rounded to the nearest whole number.

label:

groups

periods

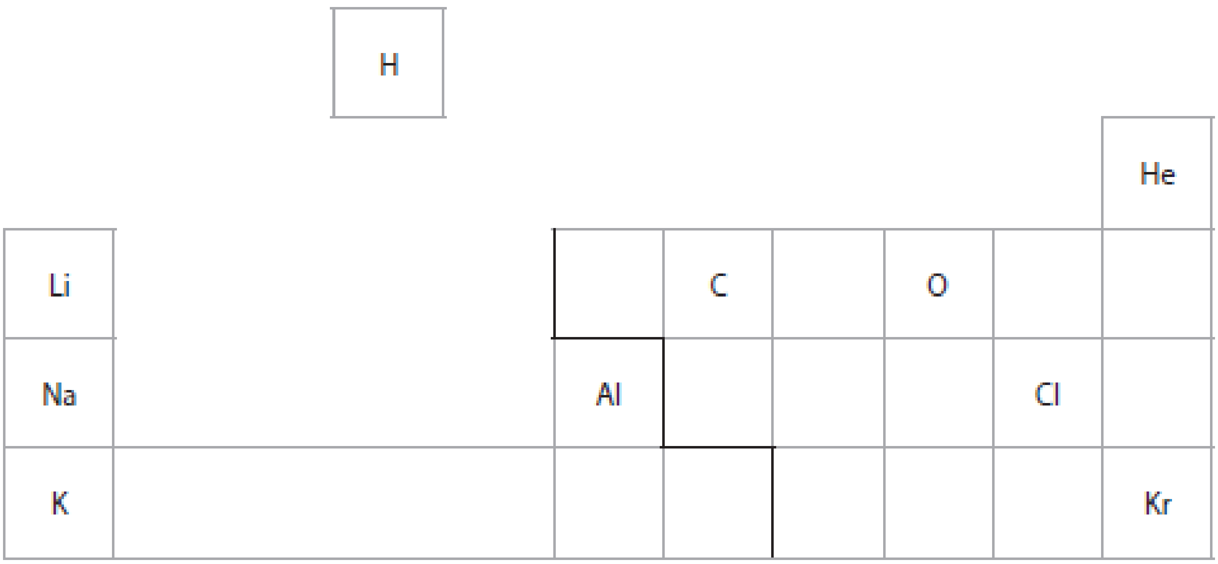
metals

non-metals

key

Periodic table exam question

5 The diagram shows a simple version of the periodic table.
Some elements have been shown.



(a) The element krypton (Kr) is a non-metal.

How can you tell krypton is a non-metal from its position in the periodic table?

(1)

(b) The elements lithium, sodium and potassium are all in Group 1.

Give **two** reasons why these elements are placed in the same group.

(2)

1

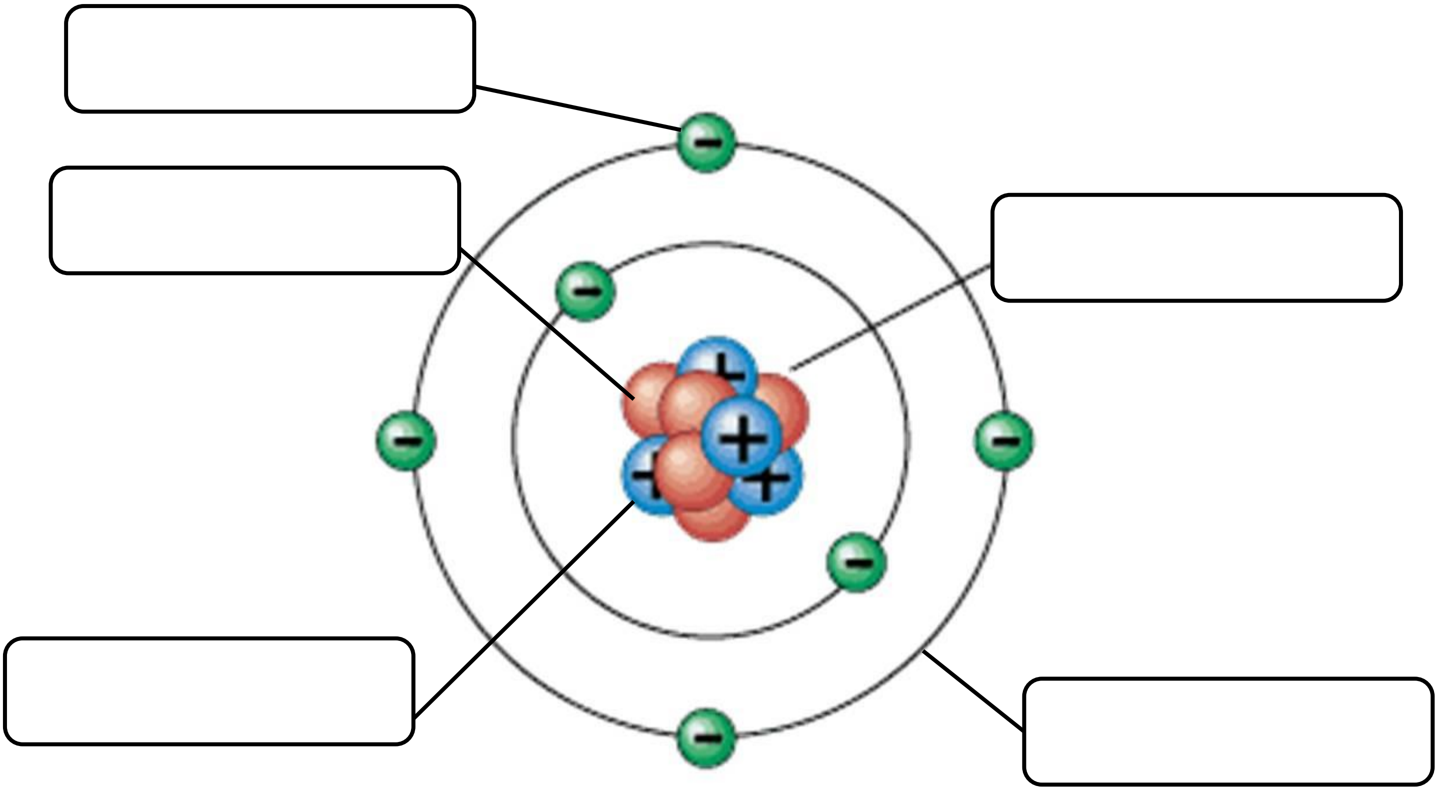
2

(Total for Question 5 = 3 marks)

Structure of the atom

label the diagram with:

proton neutron electron nucleus electron shell (energy level)



How big is the nucleus compared to the whole atom?

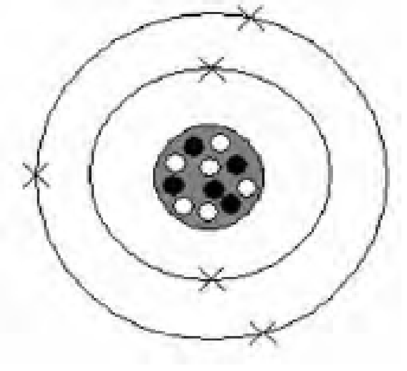
(If the whole atom was a football stadium, the nucleus would be…)

particle	in the nucleus or on a shell?	charge	mass
proton			
neutron			
electron			

Atoms exam question

.

4 The diagram shows the structure of a boron atom.



Key:
Neutron ○
Proton ●
Electron ✕

(a) Give the atomic number of boron.

(1)

....

(b) Below are four statements about the mass of an electron.
Put a cross ☒ in the box next to the correct statement.

(1)

☐ An electron has no mass.

☐ An electron has a much smaller mass than a proton.

☐ An electron has the same mass as a proton.

☐ An electron has a much larger mass than a proton.

Atomic number and mass number

Key word
atomic number •
mass number •
electrons •
number of neutrons •

Definition
• the number of protons AND neutrons
• the number of protons
• mass number – atomic number
• the number of these negative particles matches the number of positive protons

element	Atomic number	Mass number	Number of protons	Number of electrons	Number of neutrons
Hydrogen H					
Helium He					
Lithium Li					
Boron B					
Nitrogen N					
________					

16
O
oxygen
8

Missing words:

Mass

Neutrons

Protons

Symbol

This is the _ _ _ _ _ _ _ for oxygen.

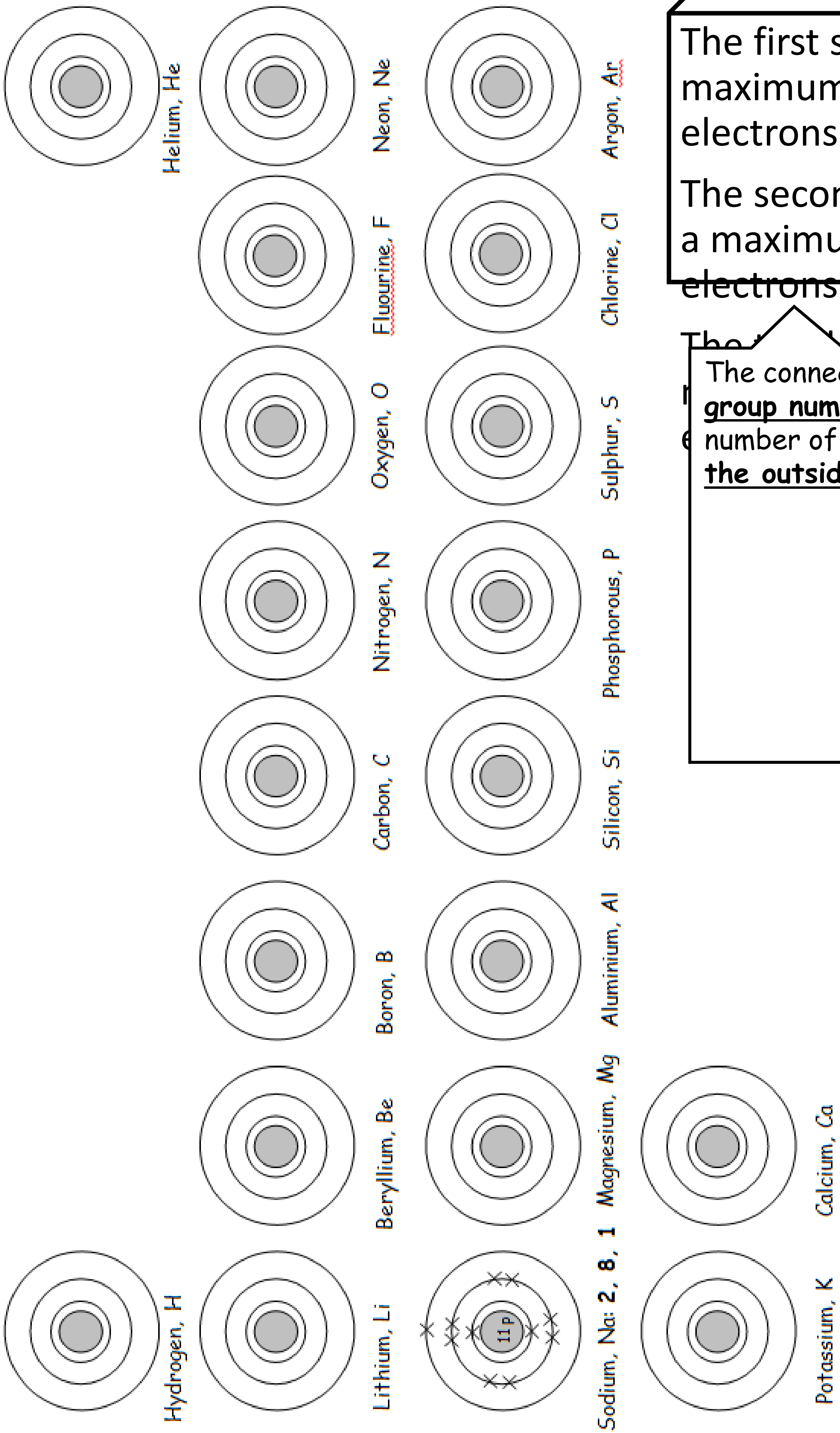
The mass number is 16. This tells you how many protons and

n_ _ _ _ _ _ _ _ the atom has.

The atomic number, is the number of _ _ _ _ _ _ _ _ an atom has.

You can work out the number of neutrons by taking the atomic number away from the _ _ _ _ number.

Electron shells



The first shell fits a maximum of __ electrons

The second shell fits a maximum of __ electrons

The t shell fits a

The connection between **group number** and the number of **electrons on the outside shell** is:

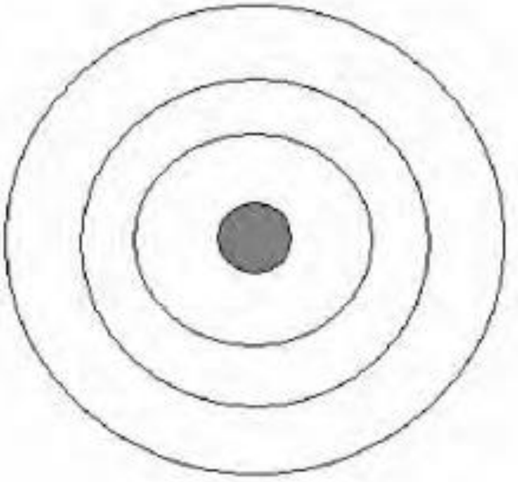
Electron shells exam question

(d) This is how aluminium is shown in the periodic table.

27
Al
13

The diagram below shows the electron shells of an aluminium atom.
Complete the diagram to show the electron configuration of the aluminium atom.
Use X to represent an electron.

(2)



(Total for Question 4 = 6 marks)

Isotopes

An **isotope** is an atom with the SAME number of ______________________ but a DIFFERENT number of ____________________.

${}^{6}_{3}Li$ ${}^{7}_{3}Li$ ${}^{8}_{3}Li$



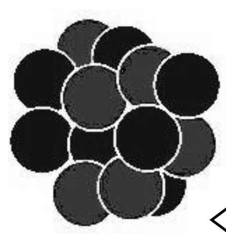
- fill in the table
- why are they isotopes?

number of protons			
number of neutrons			

Relative Atomic Mass is the ___________ mass of the different isotopes taking into account their _______________ (how much of them).

abundance
average

carbon-12
98.9%
6 protons
6 neutrons



carbon-13
1.1%
6 protons
7 neutrons

How to calculate it:

RAM = $\frac{\%}{100}$ x mass   add together for each isotope

RAM = $\frac{98.9}{100}$ x 12 + $\frac{1.1}{100}$ x 13

=   +

= 12.011

Boron occurs naturally as two isotopes, boron-10 and boron-11. Boron contains 20% boron-10 and 80% boron-11.

Calculate the Relative Atomic Mass of boron.

show how to get 10.8

Isotopes Worksheet

1. What is an isotope? ____
____

2. What does the number next to isotopes signify? ____
____

3. How can you tell isotopes apart? ____
____

For each of the following isotopes, write the number of protons, neutrons, and electrons.

	Chromium-58	Chromium-63
# of protons		
# of neutrons		
# of electrons		

	Carbon-12	Carbon-16
# of protons		
# of neutrons		
# of electrons		

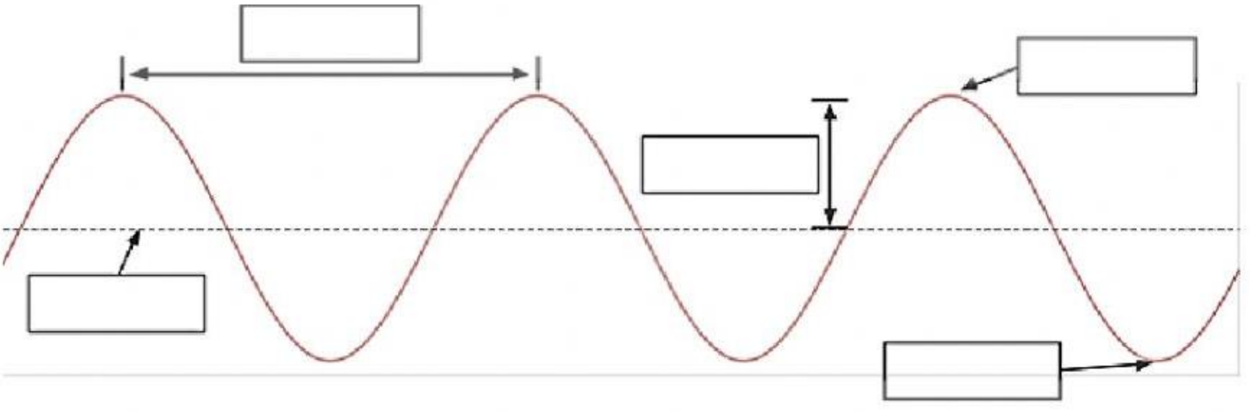
	Nitrogen-15	Nitrogen-20
# of protons		
# of neutrons		
# of electrons		

	Sulfur-23	Sulfur-25
# of protons		
# of neutrons		
# of electrons		

	Sodium-12	Sodium-20
# of protons		
# of neutrons		
# of electrons		

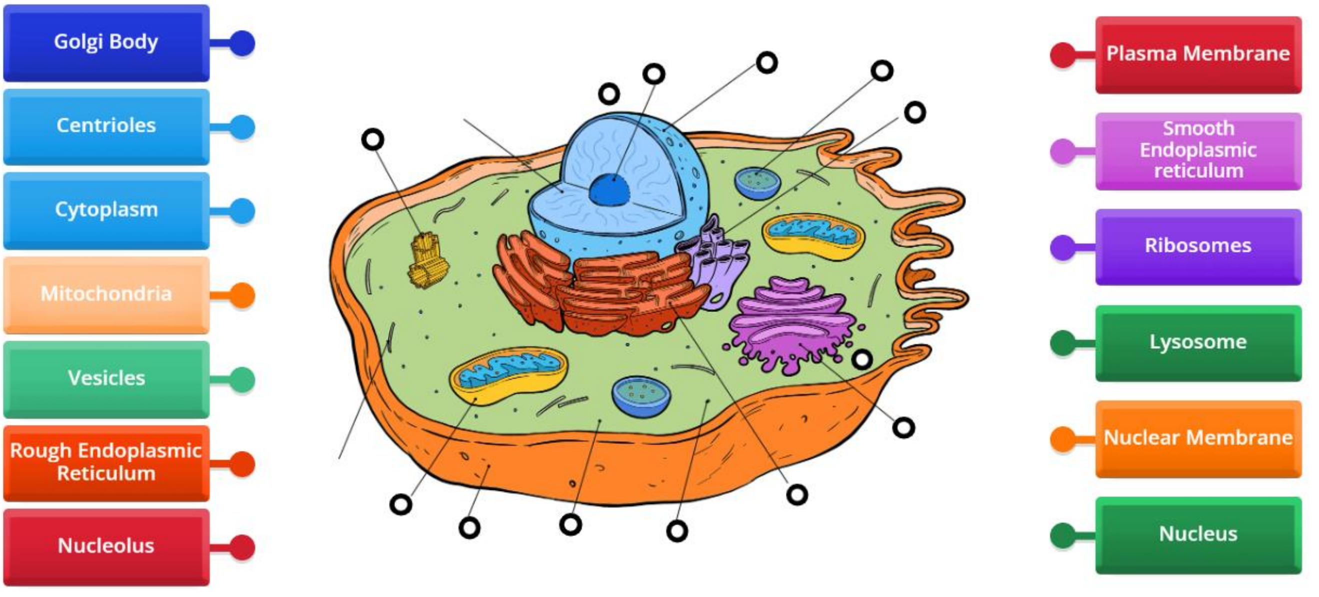
	Selenium-30	Selenium-35
# of protons		
# of neutrons		
# of electrons		

Physics: Properties of a Wave



Task- Label the different parts of a wave

Biology: Cell Biology



Task- Match the label with the organelles