Year 11

Physics booklet

Topic 1 – Radioactivity

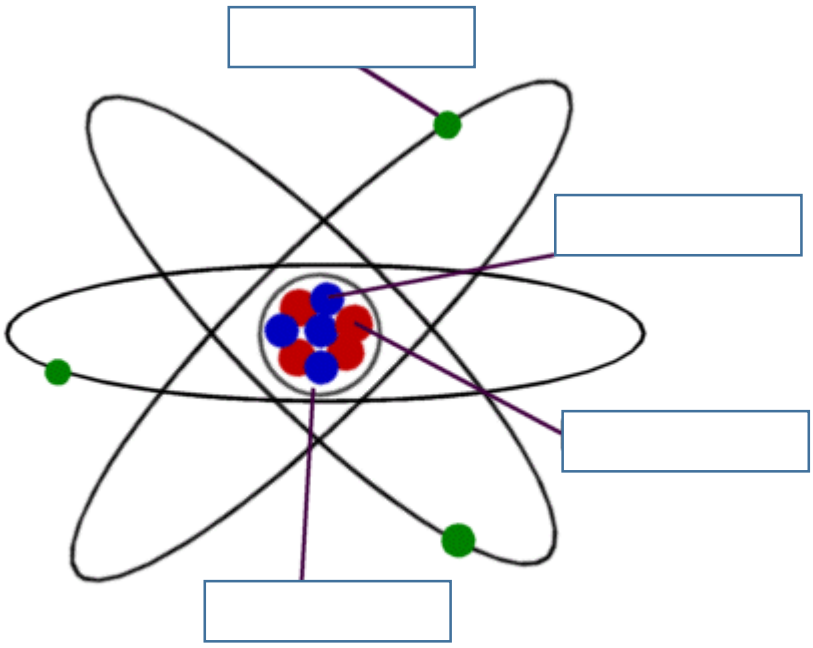
Name: _____

Radioactivity

Give a definition for each of these key words:

Atom	
Nucleus	
Energy level	
Mass number	
Atomic number	
Ionization	
Alpha scattering experiment	
Radioactive decay	
Alpha particle	
Beta particle	
Gamma ray	
Half life	
Contamination	
Irradiation	

Label the parts of the atom



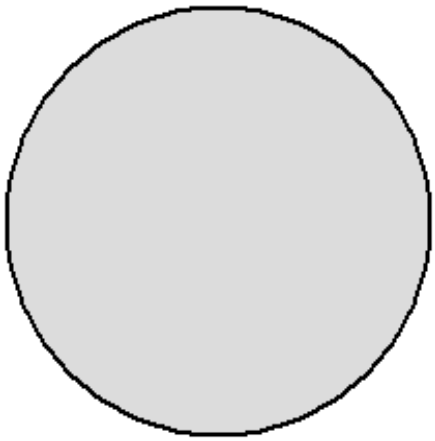
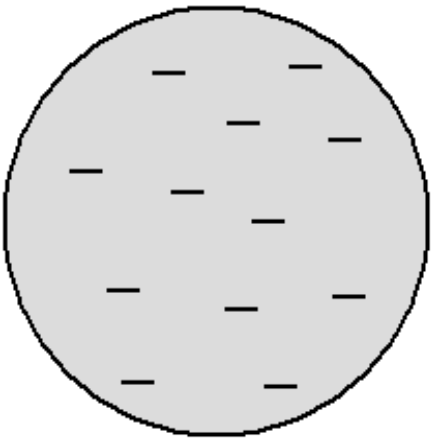
Complete the table below.

Particle	Relative Charge	Relative Mass	Where is it found?

Complete the table for the first 5 elements of the periodic table

Number	Name	Symbol	Protons	Neutron	Electrons	Atomic Number	Mass Number
1	Hydrogen	H					
2	Helium	He					
3	Lithium	Li					
4	Beryllium	Be					
5	Boron	B					

There are several models of the atom.

		
The Solid Sphere Model	The Plum Pudding Model	The Nuclear Model

The Solid Sphere model assumed that the atom was a solid ball like a snooker or golf ball.
The Plum Pudding model describes the atoms as a positive 'dough' with negative charges scattered through it at random.
Describe and draw the nuclear model of the atom.

_____

_____

_____

_____

Isotopes are different versions of the same element. They all have the same number of _____ but a different number of _____

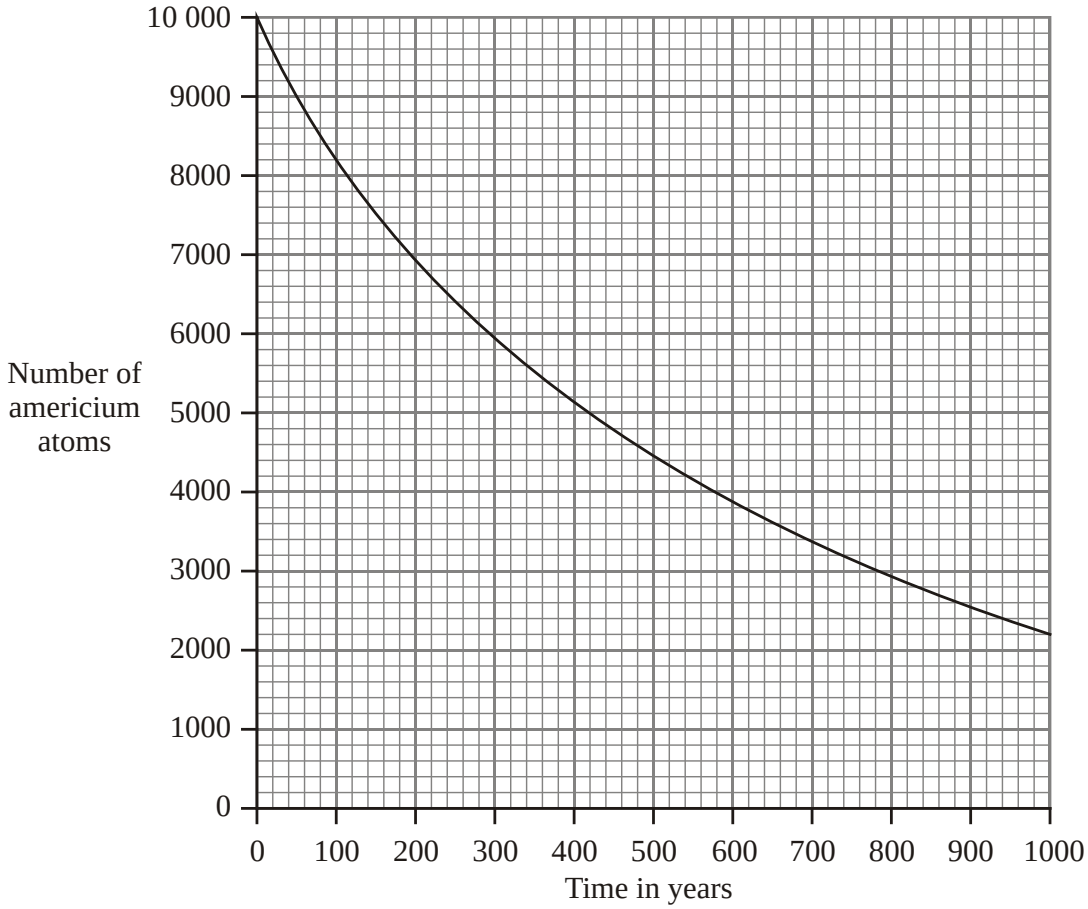
Calculate the number of protons, neutrons and electrons of these isotopes

Isotope	$^{233}_{92}U$	$^{235}_{92}U$	$^{238}_{92}U$	$^{12}_{6}C$	$^{13}_{6}C$	$^{14}_{6}C$
Protons						
Neutrons						
Electrons						

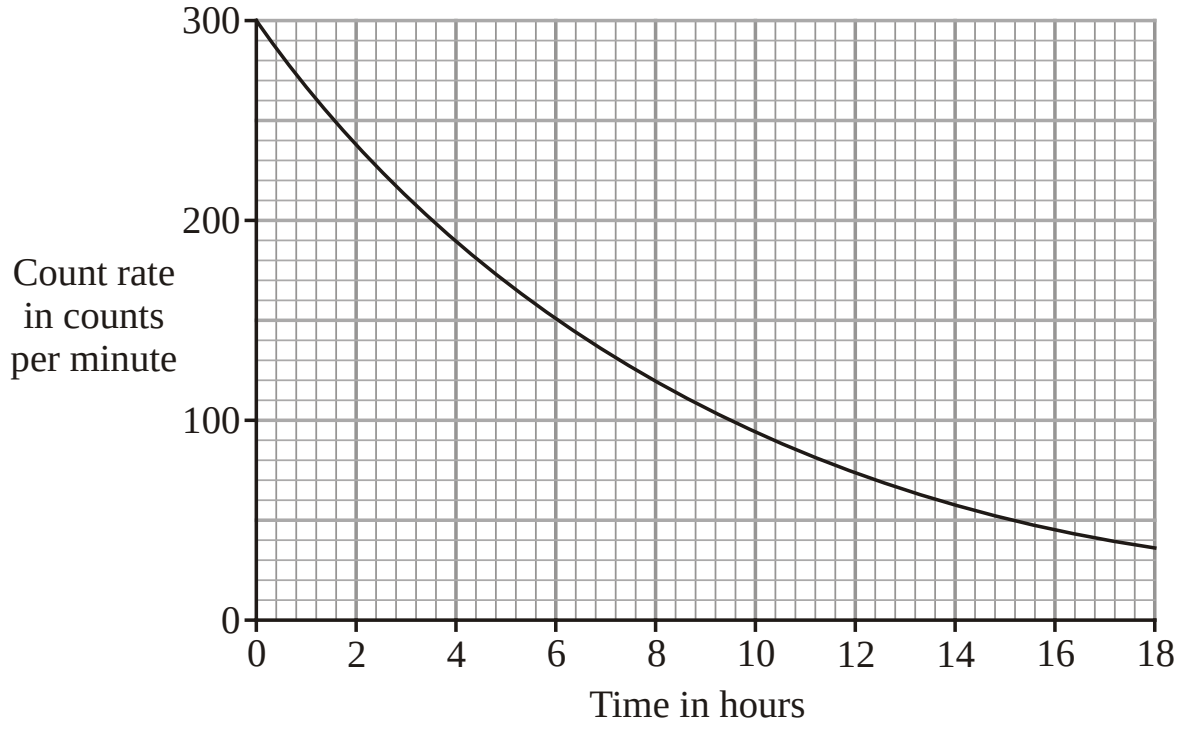
Isotope	$^{35}_{17}Cl$	$^{37}_{17}Cl$	$^{54}_{26}Fe$	$^{56}_{26}Fe$	$^{197}_{79}Au$	$^{195}_{79}Au$
Protons						
Neutrons						
Electrons						

Here is experimental data obtained from other radioactive isotopes. Use the skills you have learnt to find the half lives of the following radioactive isotopes. It is expected that you take more than one measurement and that an average is calculated.

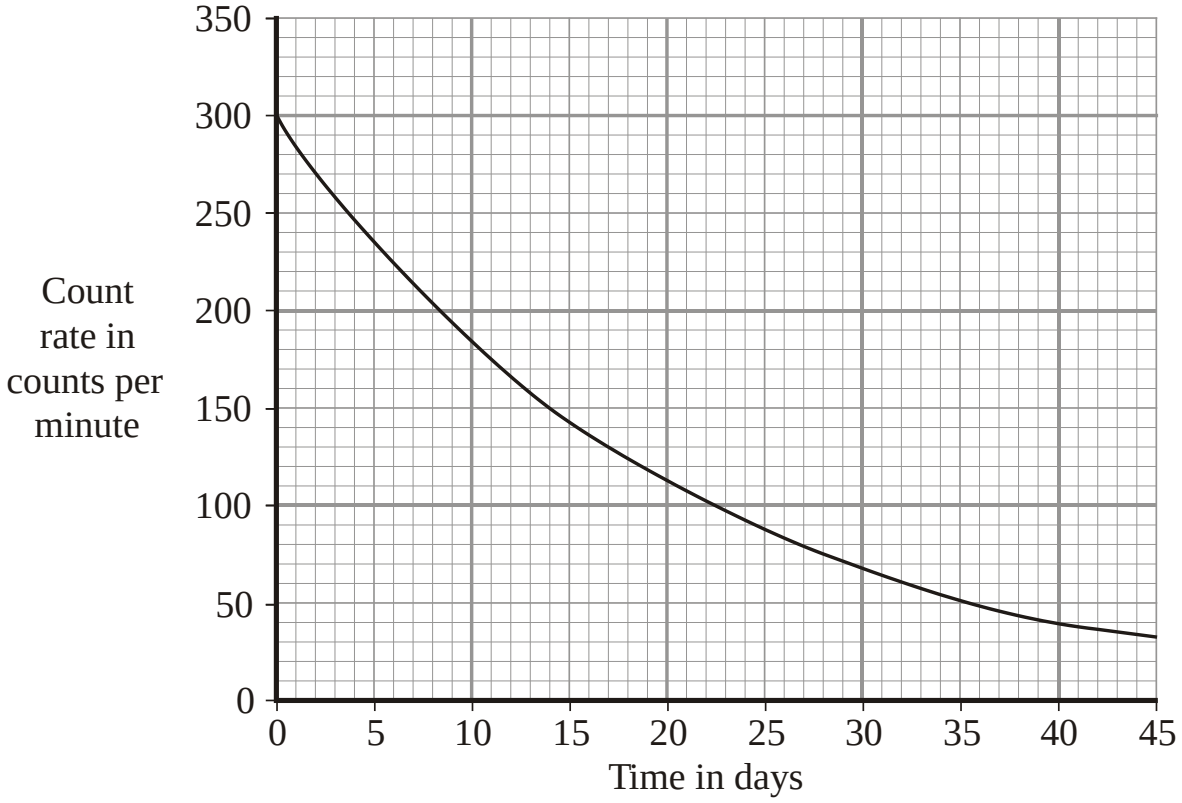
Americium 241



Technetium 99



Phosphorous 32



Isotope	$^{241}_{95}Am$	$^{99}_{43}Tc$	$^{32}_{15}P$
Protons			
Neutrons			
Electrons			

What is the half-life of Americium 241? You can draw on the graphs and write your calculations here.

What is the half-life of Technetium 99?

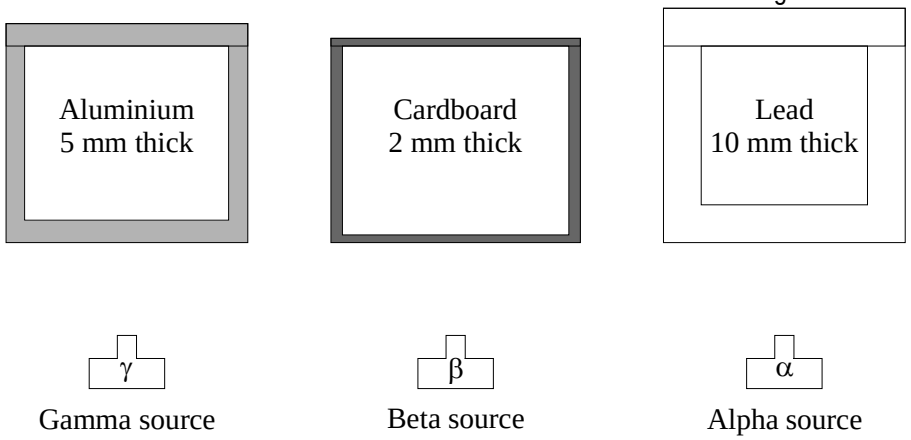
What is the half-life of Phosphorous 32

Complete these tables about the different types of radiation.

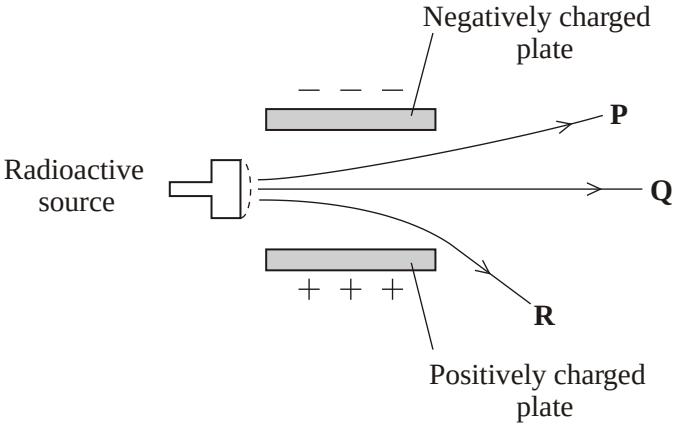
Type of Radiation	What is it? What is it made from?	Diagram
Alpha		
Beta		
Gamma		

Type of Radiation	Relative Charge	Relative Mass	Ionising Power	Deflected by EM Field?	What is it stopped by?
Alpha					
Beta					
Gamma					

Draw lines to show which source should be stored in each box so that the risk of radiation leakage is a minimum



A radioactive source emits alpha, beta and gamma radiation. The diagram shows what happens to the radiation as it passes between two charged plates.



Identify which types of radiation P, Q and R are.

P		Q		R	

Alpha decay: complete the following equations

$$^{238}_{}U \rightarrow {}^{234}_{90}Th + \quad He$$

$$^{}_{88}Ra \rightarrow {}^{218}_{86}Rn + \quad He$$

$$^{208}_{84}Po \rightarrow \quad Pb + \quad He$$

Beta decay: complete the following equations

$$^{234}_{90}Th \rightarrow {}^{234}Pa + {}^{0}_{-1}e$$

$$^{131}_{53}I \rightarrow {}_{54}Xe + {}^{0}_{-1}e$$

$$^{6}_{2}He \rightarrow \ Li + {}^{0}_{-1}e$$

Alpha or beta decay? You decide which is which:

$^{201}_{79}Au$ decays to $^{201}_{80}Hg$

$^{231}_{91}Pa$ decays to $^{227}_{89}Ac$

$^{185}_{79}Au$ decays to $^{181}_{77}Ir$

$^{52}_{26}Fe$ decays to $^{52}_{27}Co$