Surname: _____

Forename: _____

Bring this completed pack with you to your first lesson with each chemistry teacher

Science at Nobel

A-Level Chemistry

Summer Bridging Pack

GCSE		
Subject	**Grade requirement for A-level**	**Grade achieved**
Biology	6	
Chemistry	6	
Physics	6	
Combined Sci	7-6	
Maths	6	
English literature	5	
English language	5	
Average points score	5.8	

Contents

Introduction

This bridging work is designed to help you bridge the gap between your GCSE Science studies and the AS/A Level Chemistry course. It includes a list of topics from GCSE that will be helpful for you to review and practice, in order to underpin your studies In sixth form

Why do bridging work?
What it takes to be successful at GCSE is different from being successful at A-level. Although you have fewer subjects you will be expected to master skills at post 16 at a higher level and the detail, depth and volume of work are more demanding.

Bridging work should help you gauge whether the subject is for you. We would rather you study courses that interest you and you are sufficiently qualified to study.

This booklet is designed to recap GCSE knowledge you will need to be successful in A-Level Chemistry as well as introduce simple topics that you will cover in more detail throughout the course. These should give you an idea of the course as well as your suitability for it.

This completed pack will sit at the front of you're a-level chemistry folder for you and your teacher to refer to when needed.

Is the bridging work assessed?
In September, your teachers will check that you have completed all the tasks in this pack. You will complete a multiple-choice Quiz on Microsoft Form for homework. Based on this, your teacher(s) may request to review your bridging work in more detail.

Bridging work also assesses your work ethic and so that your teachers pick up on students which show a poor work ethic and support them accordingly.

Completion of this pack
You are expected to complete all the sections in this pack. If you get stuck, use your problem-solving skills to get 'unstuck'. You should use resources such as:

- The Hub
- Wakelet
- Physics and Maths Tutor
- FreeScienceLessons
- Primrose Kitten
- Cognito
- YouTube
- textbooks
- peers/family

If you have exhausted these options, you can email a chemistry teacher with your specific question(s).

Links

- The Hub Year 11 https://nobelhertssch.sharepoint.com/sites/NS_Subjects_CHM/Year%2011/Forms/AllItems.aspx
- The Hub Year 10 https://nobelhertssch.sharepoint.com/sites/NS_Subjects_CHM/Year%2010/Forms/AllItems.aspx
- Wakelet Triple Chemistry https://wakelet.com/wake/EnTjDeoo-uVPn32bcVv0m
- Wakelet GCSE Science Videos https://wakelet.com/wake/NceavkRW6ZbxkoCeLKQVk
- Physics and Maths Tutor https://www.physicsandmathstutor.com/
- FreeScienceLessons https://www.youtube.com/channel/UCqbOeHaAUXw9Il7sBVG3_bw https://www.freesciencelessons.co.uk/
- Primrose Kitten https://www.youtube.com/channel/UCBgvmal8AR4QIK2e0EfJwaA https://www.primrosekitten.com/
- Cognito https://www.youtube.com/@Cognitoedu https://cognitoedu.org/home.html
- Kerboodle (online textbook) https://www.kerboodle.com/users/login?user_return_to=%2Fapp

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Extracts from A-level Data Sheet

Molar gas volume = $24.0\,dm^3\,mol^{-1}$ at room temperature and pressure, RTP

Avogadro constant, $N_A = 6.02 \times 10^{23}\,mol^{-1}$

Specific heat capacity of water, $c = 4.18\,J\,g^{-1}\,K^{-1}$

Ionic product of water, $K_w = 1.00 \times 10^{-14}\,mol^2\,dm^{-6}$ at 298 K

1 tonne = 10^6 g

Arrhenius equation: $k = Ae^{-E_a/RT}$ or $\ln k = -E_a/RT + \ln A$

Gas constant, $R = 8.314\,J\,mol^{-1}\,K^{-1}$

The Periodic Table of the Elements

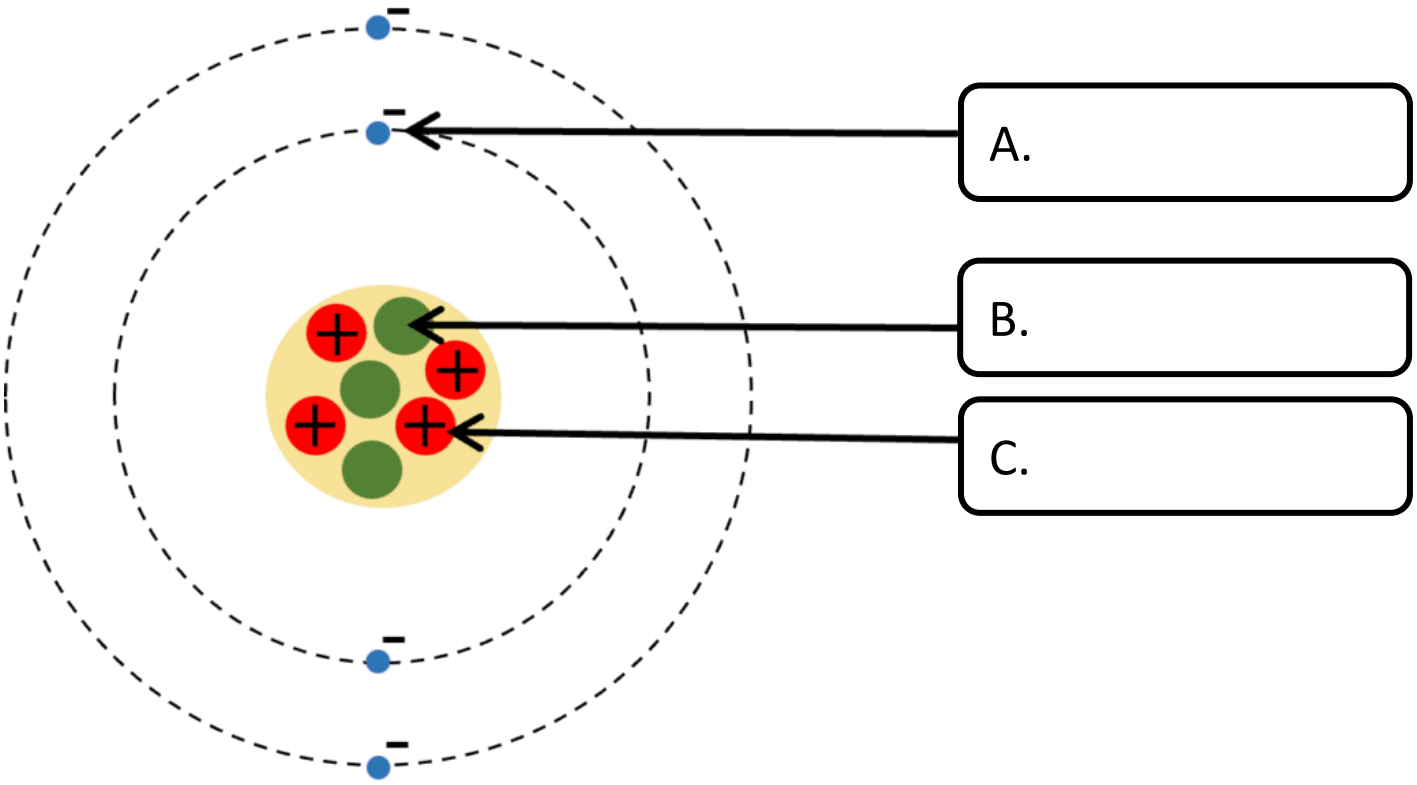
(1)	(2)											(3)	(4)	(5)	(6)	(7)	(0)
1																	**18**
1 **H** hydrogen 1.0	**2**											**13**	**14**	**15**	**16**	**17**	2 **He** helium 4.0
3 **Li** lithium 6.9	4 **Be** beryllium 9.0											5 **B** boron 10.8	6 **C** carbon 12.0	7 **N** nitrogen 14.0	8 **O** oxygen 16.0	9 **F** fluorine 19.0	10 **Ne** neon 20.2
11 **Na** sodium 23.0	12 **Mg** magnesium 24.3	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	13 **Al** aluminium 27.0	14 **Si** silicon 28.1	15 **P** phosphorus 31.0	16 **S** sulfur 32.1	17 **Cl** chlorine 35.5	18 **Ar** argon 39.9
19 **K** potassium 39.1	20 **Ca** calcium 40.1	21 **Sc** scandium 45.0	22 **Ti** titanium 47.9	23 **V** vanadium 50.9	24 **Cr** chromium 52.0	25 **Mn** manganese 54.9	26 **Fe** iron 55.8	27 **Co** cobalt 58.9	28 **Ni** nickel 58.7	29 **Cu** copper 63.5	30 **Zn** zinc 65.4	31 **Ga** gallium 69.7	32 **Ge** germanium 72.6	33 **As** arsenic 74.9	34 **Se** selenium 79.0	35 **Br** bromine 79.9	36 **Kr** krypton 83.8
37 **Rb** rubidium 85.5	38 **Sr** strontium 87.6	39 **Y** yttrium 88.9	40 **Zr** zirconium 91.2	41 **Nb** niobium 92.9	42 **Mo** molybdenum 95.9	43 **Tc** technetium	44 **Ru** ruthenium 101.1	45 **Rh** rhodium 102.9	46 **Pd** palladium 106.4	47 **Ag** silver 107.9	48 **Cd** cadmium 112.4	49 **In** indium 114.8	50 **Sn** tin 118.7	51 **Sb** antimony 121.8	52 **Te** tellurium 127.6	53 **I** iodine 126.9	54 **Xe** xenon 131.3
55 **Cs** caesium 132.9	56 **Ba** barium 137.3	57–71 lanthanoids	72 **Hf** hafnium 178.5	73 **Ta** tantalum 180.9	74 **W** tungsten 183.8	75 **Re** rhenium 186.2	76 **Os** osmium 190.2	77 **Ir** iridium 192.2	78 **Pt** platinum 195.1	79 **Au** gold 197.0	80 **Hg** mercury 200.6	81 **Tl** thallium 204.4	82 **Pb** lead 207.2	83 **Bi** bismuth 209.0	84 **Po** polonium	85 **At** astatine	86 **Rn** radon
87 **Fr** francium	88 **Ra** radium	89–103 actinoids	104 **Rf** rutherfordium	105 **Db** dubnium	106 **Sg** seaborgium	107 **Bh** bohrium	108 **Hs** hassium	109 **Mt** meitnerium	110 **Ds** darmstadtium	111 **Rg** roentgenium	112 **Cn** copernicium		114 **Fl** flerovium		116 **Lv** livermorium		

Key
atomic number
Symbol
name
relative atomic mass

57 **La** lanthanum 138.9	58 **Ce** cerium 140.1	59 **Pr** praseodymium 140.9	60 **Nd** neodymium 144.2	61 **Pm** promethium 144.9	62 **Sm** samarium 150.4	63 **Eu** europium 152.0	64 **Gd** gadolinium 157.2	65 **Tb** terbium 158.9	66 **Dy** dysprosium 162.5	67 **Ho** holmium 164.9	68 **Er** erbium 167.3	69 **Tm** thulium 168.9	70 **Yb** ytterbium 173.0	71 **Lu** lutetium 175.0
89 **Ac** actinium	90 **Th** thorium 232.0	91 **Pa** protactinium	92 **U** uranium 238.1	93 **Np** neptunium	94 **Pu** plutonium	95 **Am** americium	96 **Cm** curium	97 **Bk** berkelium	98 **Cf** californium	99 **Es** einsteinium	100 **Fm** fermium	101 **Md** mendelevium	102 **No** nobelium	103 **Lr** lawrencium

1. Atomic Structure

1. Label the diagram of the structure of the atom



(3 marks)

2. Complete the table below:

Subatomic particle	Relative mass	Relative size	Location

(3 marks)

3. Define the term atomic number.

_____

(1 marks)

4. Define the term mass number.

_____

(1 marks)

5. Define the term relative atomic mass.

_____

_____

(2 marks)

6. Define the term isotope.

_____

_____

(2 marks)

7. Copper has two stable isotopes, ^{63}Cu and ^{65}Cu, with their relative abundances are 69% and 31%, respectively. Calculate the relative atomic mass of copper.

_____

_____

_____

_____

(3 marks)

8. Sulfur has two stable isotopes, ^{32}S and ^{34}S, with their relative abundances are 95% and 5%, respectively. Calculate the relative atomic mass of sulfur.

_____

_____

_____

_____

(3 marks)

9. Magnesium has three stable isotopes, ^{24}Mg, ^{25}Mg and ^{26}Mg, with their relative abundances are 79%, 10% and 11%, respectively. Calculate the relative atomic mass of magnesium

_____

_____

_____

_____

(3 marks)

10. Ions are charged particles, the charge on an ion occurs because it has different numbers of protons and electrons. State the number of protons, neutrons and electrons in the atoms and ions in the table below (the first one has been completed for you)

	Number of protons	**Number of neutrons**	**Number of electrons**
3+ ion of ^{33}S	**16**	**17**	**13**
atom of ^{26}Mg			
2+ ion of ^{63}Cu			
3- ion of ^{16}N			
1- ion of ^{128}I			
4+ ion of ^{13}C			

(5 marks)

11. Complete the table to show the electron configuration of the first 20 elements (8 marks)

H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca						

2. Periodic table

1. In terms of electron configuration, what do elements in the same group have in common?

_____

_____

(2 marks)

2. In terms of electron configuration, what do elements in the same period have in common?

_____

(1 mark)

3. What is the name for group 1 elements?

_____

(1 mark)

4. What is the name for group 7 elements?

_____

(1 mark)

5. What is the name for group 0 elements?

_____

(1 mark)

6. Describe the reaction of group 1 elements with water. Include 2 observations, the trend in reactivity going down the group and the two products.

_____

_____

_____

_____

_____

(5 marks)

7. Describe the reaction of group 1 elements with group 7 elements. Include 2 observations, the trend in reactivity going down the group and the one product.

_____

_____

_____

_____

_____

(4 marks)

8. Explain why the reactivity of group 1 increases going down the group but the reactivity of group 1 decreases going down the group.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6 marks)

3. Stoichiometry

Chemical equations show the amount of each substance in a chemical reaction. The ratios of the substances are known as stoichiometric relationships. You have se stoichiometry without knowing it at GCSE when you calculated reacting masses etc. If we know the amount of each substance that is reacting, we can calculate:

- Reacting masses
- Empirical formula
- Percentage yield
- Atom economy
- Titration calculations
- Volumes and concentration of solutions

1. Balance the following equations: (7 marks)

a. $Mg(s) + O_2(g) \rightarrow MgO(s)$

b. $H_2(g) + O_2(g) \rightarrow H_2O(l)$

c. $Fe(s) + HCl(aq) \rightarrow FeCl_2(aq) + H_2(g)$

d. $CuO(s) + HNO_3(aq) \rightarrow Cu(NO_3)_2\,(aq) + H_2O(l)$

e. $Ca(OH)_2(aq) + HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l)$

f. $KHCO_3(s) + H_2SO_4(aq) \rightarrow K_2SO_4(aq) + CO_2(g) + H_2O(l)$

g. $Al(s) + Cl_2(g) \rightarrow AlCl_3(s)$

4. Amount of substance

Atoms and molecules are very small – far too small to count individually! They also have different masses. So, we can't easily do calculations involving chemical reaction by counting particles or by weighing them. But it is important to know how much of each substance we have, so we use a unit for amount of substance called a **mole**.

You are already familiar with some units for amount of substance:

- A dozen eggs = 12 eggs
- A baker's dozen = 13
- A team = 5, 11, 15 etc depending on the sport
- A ream of paper = 500 sheets

In chemistry:

$$1 \text{ mole} = 6.02 \times 10^{23} \text{ particles}$$

6.02×10^{23} is known as Avogadro's, N_A constant and it is given on your Data Sheet (see p.5).

Every substance has a molar mass, which is the mass of 1 mole of the substance. There are 3 types of molar mass:

- Relative atomic mass, A_r = mass of one mole of an element
- Relative formula mass, M_r = mass of one mole of a formula unit
- Relative formula molecular, M_r = mass of one mole of molecules

1. Complete the glossary below:

Key term	Meaning
Mass	
Volume	
Mole	
Molar mass	
Avogadro's constant	
Concentration	
Relative atomic mass, A_r	
Relative formula mass, M_r	
Relative formula molecular, M_r	

(9 marks)

2. Convert the following into grams:

a) 0.25 kg

_____

b) 15 kg

_____

c) 100 tonnes

_____

d) 2 tonnes

_____

(4 marks)

3. Convert the following into dm^3:

a) 100 cm^3

_____

b) 25 cm^3

_____

c) 50 m^3

_____

d) 50000 cm^3

_____

(4 marks)

Amount of substance in moles can be calculated using the equation:

$$amount\ of\ substance\ (mol) = \frac{mass\ (g)}{molar\ mass\ (g/mol)}$$

4. If you have 2.5 x 10^{21} atoms of magnesium, what is the amount in moles?

_____

_____

(2 marks)

5. If you have 0.25 moles of carbon dioxide, what is the amount in moles?

_____

_____

(2marks)

6. For the following questions, calculate the amount of substance in moles, mol:

a) 2.3 g of Na

_____

_____

(2marks)

b) 2.5 g of O_2

_____

_____

(2marks)

c) 240000 g of CO_2

_____

_____

(2marks)

d) 12.5 g of $Al(OH)_3$

_____

_____

(2marks)

e) 5.2 g of PbO_2

_____

_____

(2marks)

7. For the following questions, calculate the mass in grams, g:

a) 0.05 moles of Cl_2

_____

_____

(2marks)

b) 0.125 moles of KBr

_____

_____

(2marks)

c) 0.075 moles of $Ca(OH)_2$

_____

_____

(2marks)

d) 250 moles of Fe_2O_3

_____

_____

(2marks)

e) 0.02 moles of $Al_2(SO_4)_3$

_____

_____(2marks)

8. For the following questions, calculate the mola mass in grams per mole, g/mol:

a) 0.015 moles, 0.42 g

_____

_____

(2marks)

b) 0.0125 moles, 0.50 g

_____

_____

(2marks)

c) 0.55 moles, 88 g

_____

_____

(2marks)

d) 2.25 moles, 63 g

_____

_____

(2marks)

e) 0.00125 moles, 0.312 g

_____

_____

(2marks)

Concentration can be calculated using the equation:

$$comcentration\ (mol/dm^3) = \frac{amount\ of\ substance\ (mol)}{volume\ (dm^3)}$$

or the equation:

$$comcentration\ (g/dm^3) = \frac{mass\ (g)}{volume\ (dm^3)}$$

9. For the following questions, calculate the amount in moles:

a) 25 cm^3 of 0.1 $moldm^{-3}$ HCl

_____

_____

(2marks)

b) 40 cm^3 of 0.2 $moldm^{-3}$ HNO_3

_____

_____

(2marks)

c) 10 cm^3 of 1.5 $moldm^{-3}$ NaCl

_____

_____

(2marks)

d) 5 cm^3 of 0.5 $moldm^{-3}$ $AgNO_3$

_____

_____

(2marks)

e) 50 cm^3 of 0.1 $moldm^{-3}$ H_2SO_4

_____

_____

(2marks)

10. For the following questions, calculate the molar concentration (in mol/dm^3) and the mass concentration (in g/dm^3):

a) 0.05 moles of HCl in 20 cm^3

_____

_____

(2marks)

b) 0.01 moles of NaOH in 25 cm^3

_____

_____

(2marks)

c) 0.002 moles of H_2SO_4 in 16.5 cm^3

_____

_____

(2marks)

d) 0.02 moles of $CuSO_4$ in 200 cm^3

_____

_____

(2marks)

e) 0.1 moles of NH_3 in 50 cm^3

_____

_____

(2marks)

All gases take up the same amount of space if they are in the same conditions. At room temperature and pressure (RTP) 1 mole of any gas has a volume of 24 dm^3 (see Data Sheet, p.5). So you can find the amount of gas in moles if you are given the **volume** of the gas:

$$amount\ of\ substance\ (mol) = \frac{volume\ (dm^3)}{24}$$

Volume MUST be measured in dm^3!

11. For the following questions, calculate the amount in moles:
    a) 48 dm^3 of O_2

_____

_____

(2marks)

b) 1.2 dm^3 of CO_2

_____

_____

(2marks)

c) 200 cm^3 of N_2

_____

_____

(2marks)

d) 100 dm^3 of Cl_2

_____

_____

(2marks)

e) 60 cm^3 of NO_2

_____

_____

(2marks)

12. For the following questions, calculate the volume:

a) 0.05 moles of Cl_2

_____

_____

(2marks)

b) 0.25 moles of CO_2

_____

_____

(2marks)

c) 28 g of N_2

_____

_____

(2marks)

d) 3.2 g of O_2

_____

_____

(2marks)

e) 20 g of NO_2

_____

_____

(2marks)

13. For the following questions, calculate the mass:

a) 48 dm^3 of O_2

_____

_____

(2marks)

b) 1.2 dm^3 of CO_2

_____

_____

(2marks)

c) 200 cm^3 of N_2

_____

_____

(2marks)

d) 100 dm^3 of Cl_2

_____

_____

(2marks)

e) 60 cm^3 of NO_2

_____

_____

(2marks)

Density is a measure of how much matter exists in a given volume, it is calculated using the equation:

$$density\ (g/cm^3) = \frac{mass\ (g)}{volume\ (cm^3)}$$

14. For the following questions, calculate the density:

a) 50g in a volume of 30cm^3

_____

_____

(2marks)

b) 0.2g in a volume of 300cm^3

_____

_____

(2marks)

c) 700g in a volume of 2cm^3

_____

_____

(2marks)

d) 25g in a volume of 45cm^3

_____

_____

(2marks)

e) 800g in a volume of 90cm^3

_____

_____

(2marks)

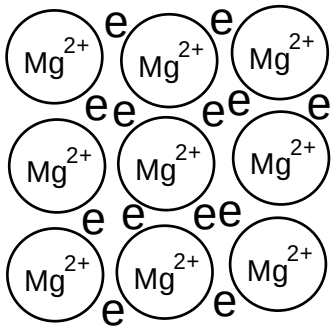
5. Structure and bonding

Metallic bonding

Occurs between metals.

Metallic bonds are formed when atoms lose electrons and the resulting electrons have an ***electrostatic force of attraction*** to all the resulting positive ions. The 'lost' electrons become delocalised ad are able to move throughout the giant metallic lattice.

E.g. Magnesium atoms lose two electrons each, and the resulting electrons are attracted to all the positive ions.

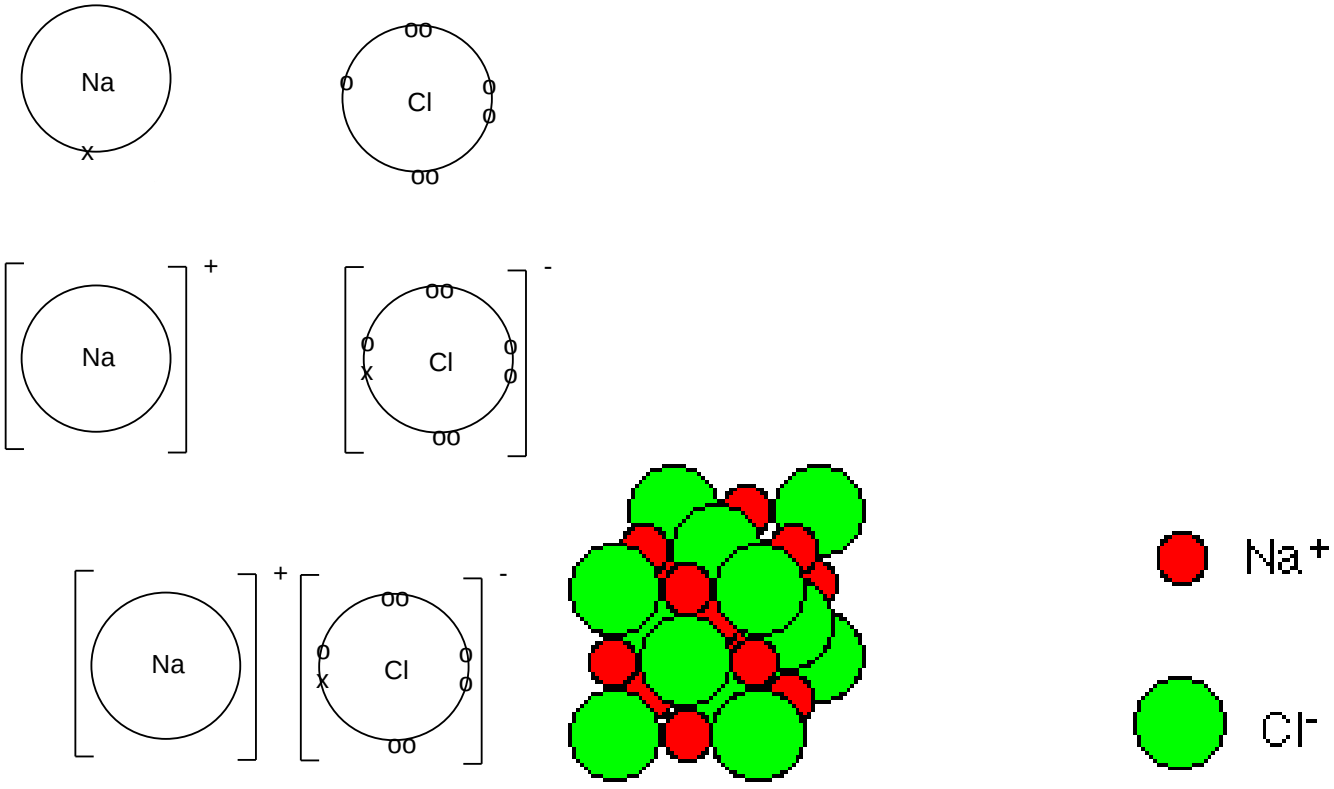


Ionic bonding

Occurs between a metal and a non-metal.

Ionic bonding is an ***electrostatic force of attraction*** between oppositely charged ions, which are formed by the transfer of electrons from one atom to another. Ionic compounds form giant ionic lattice.

E.g. In sodium chloride, each sodium atom transfers an electron to a chlorine atom. The result is a sodium ion and a chloride ion. These two ions have an ***electrostatic force of attraction*** to each other and form a stable compound.

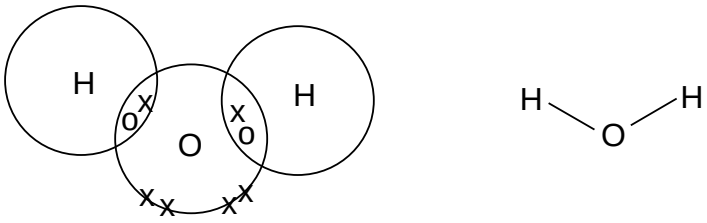


Covalent bonds

Occurs between non-metals.

A covalent bond is a pair of electrons shared between two atoms. In a single covalent bond, each atom provides one of the electrons in the bond. A covalent bond is represented by two overlapped electron shells with a shared pair of electron or a short straight line between the two atoms.

E.g. water



Covalent bonds happen between two specific atoms rather than between all the atoms in a molecule. For that reason, covalent bonding can give rise to simple covalent molecules where a small number of atoms are covalently bonded together e.g. water, carbon dioxide, polyethene and giant covalent structures where enormous numbers of atoms are covalently bonded e.g. diamond, graphite, silicon dioxide.

1. Complete the paragraph below using the following words:-

loses ions ionic protons negative electrons positive gains

Atoms are neutral because they have the same number of _____ and

_____. If atoms lose or gain electrons they become electrically charged and are called

_____ (they are not atoms any more). If atoms gain electrons they become

_____ ions, and if they lose electrons they become _____ ions.

When a metal reacts with a non-metal, the metal atoms _____ electrons and the non-

metal atoms _____ electrons, forming an _____ compound.

(8 marks)

2. Draw dot and cross diagrams for the following compounds (only show the outer shell electrons):
   a) NaCl

(4 marks)

b) $MgCl_2$

(4 marks)

c) Cl_2

(4 marks)

d) H_2O

(4 marks)

e) NH_3

(4 marks)

3. Describe the structure and bonding in magnesium chloride.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5 marks)

4. These questions are about ionic substances:

a) Explain why ionic substances have high melting and boiling points.

_____

_____

(2marks)

b) Explain why ionic substances can conduct electricity when molten or dissolved.

_____

_____

(2marks)

c) Explain why ionic substances cannot conduct electricity when solid.

_____

_____

(2marks)

5. Deduce the chemical formulae of the following ionic compounds:

a) Calcium chloride

_____

(1mark)

b) Sodium oxide

_____

(1mark)

c) Magnesium sulphide

_____

(1mark)

d) Aluminium hydroxide

_____

(1mark)

e) Potassium carbonate

_____

(1mark)

f) Calcium nitrate

_____

(1mark)

6. Predict which of the following pairs of substances is likely to have the higher melting point, giving reasons for your choice:

a) Na and Mg

_____

_____

(2marks)

b) NaCl and NaBr

_____

_____

(2marks)

c) Graphite and oxygen

_____

_____

(2marks)

d) Ne and Ar

_____

_____

(2marks)

e) SiO_2 and CO_2

_____

_____

(2marks)

6. Acids and alkalis

1. Complete the following general equations for the reactions of acids:

   a) acid + metal → _____ + _____

   b) acid + metal oxide → _____ + _____

   c) acid + metal hydroxide → _____ + _____

   d) acid + metal carbonate → _____ + _____ + _____

   (4marks)

2. What is the ionic equation for the reaction of an acid with a metal hydroxide?

   _____

   (1mark)

3. Describe the difference between a concentrated and a dilute solution.

   _____

   (1mark)

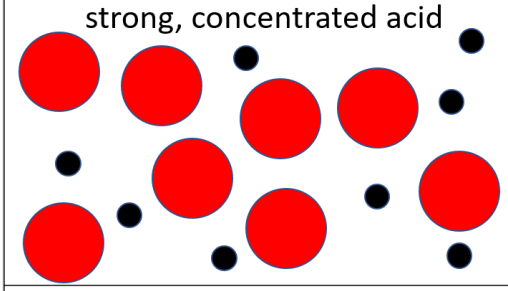
4. Describe the difference between a strong and a weak acid.

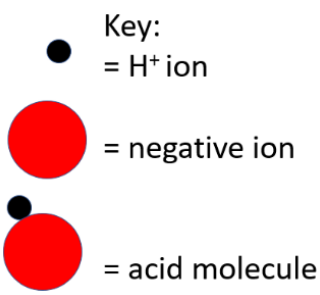
   _____

   (1mark)

5. Complete the diagram to show the particles of a strong, dilute acid, a weak, concentrated acid and a weak, dilute acid.(6 marks)

strong, concentrated acid	strong, dilute acid
weak, concentrated acid	weak, dilute acid





7. Redox

1. Define oxidation and reduction in terms of oxygen.

_____

(1mark)

2. Define oxidation and reduction in terms of electrons.

_____

_____

(2marks)

3. In the following reaction identify which element is oxidised and which element is reduced:
   a) $2Na + Cl_2 \rightarrow 2NaCl$

   oxidised = _____ reduced = _____

   (2 marks)

   b) $Ag_2O + Cu \rightarrow CuO + 2Ag$

   oxidised = _____ reduced = _____

   (2 marks)

   c) $ZnO + C \rightarrow Zn + CO$

   oxidised = _____ reduced = _____

   (2 marks)

   d) $4Al + 3O_2 \rightarrow 2Al_2O_3$

   oxidised = _____ reduced = _____

   (2 marks)

   e) $2CuSO_4 + 4KI \rightarrow 2CuI + I_2 + 2K_2SO_4$

   oxidised = _____ reduced = _____

   (2 marks)

8. Rate of reaction

The rate of a reaction can be determined by measuring the amount of reactant used up or the amount of product made in a given time. The equation and units used will depend on the reaction and the state of the reactant or product being measured.

$$rate\ of\ reaction\ (dm^3/s) = \frac{volume\ of\ reactant\ used\ (dm^3)}{time\ taken\ (s)}$$

$$rate\ of\ reaction\ (g/s) = \frac{mass\ of\ reactant\ used\ (g)}{time\ taken\ (s)}$$

$$rate\ of\ reaction\ (dm^3/s) = \frac{volume\ of\ product\ formed\ (dm^3)}{time\ taken}$$

$$rate\ of\ reaction\ (g/s) = \frac{mass\ of\ product\ formed\ (g)}{time\ taken\ (s)}$$

Rate of reaction can be determined using information from graphs.

1. The following questions are about a reaction where the volume of gas produced was measured. The reaction was carried out at two different temperatures to observe the effect of temperature on rate of reaction.

   a) Plot the data below as a graph on graph paper.

Time (s)	Volume of gas produced	
	20°C	40°C
0	0	0
50	22	36
100	33	40
150	39	40
200	40	40
250	40	40
300	40	40

(5 marks)

For the following questions, you must show (by marking with a pencil and ruler) on your graph, how you obtained your data.

   b) For the reaction conducted at 40°C, what is the rate of reaction across the first 150s?

_____

_____

_____

(3 marks)

c) For the reaction conducted at 40^{o}C, what is the rate of reaction across the first 50s?

_____

_____

_____

(3 marks)

d) For the reaction conducted at 40^{o}C, what is the rate of reaction across the first 10s?

_____

_____

_____

(3 marks)

e) For the reaction conducted at 20^{o}C, what is the rate of reaction at 30s?

_____

_____

_____

(4 marks)

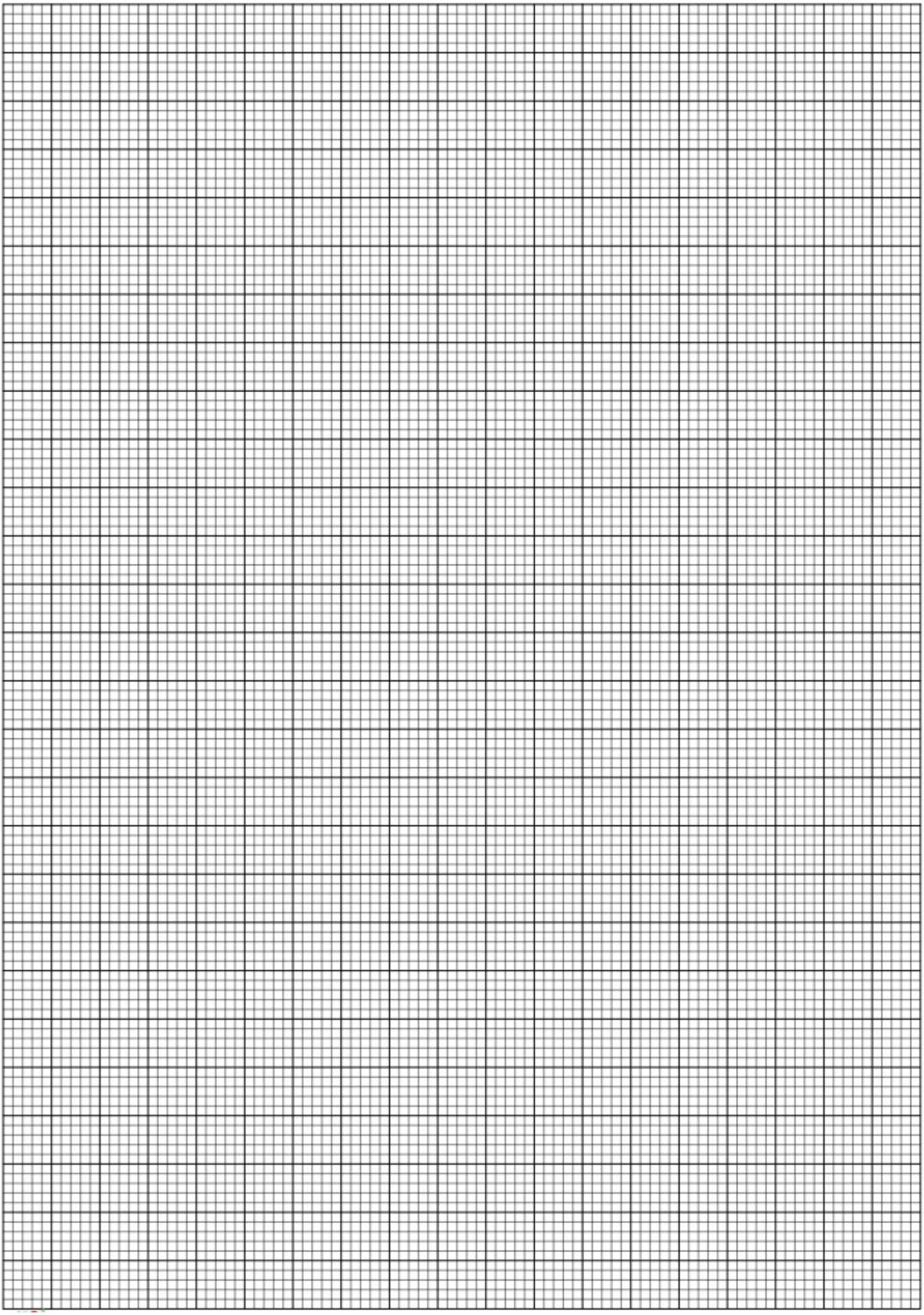
f) For the reaction conducted at 20^{o}C, what is the rate of reaction at 100s?

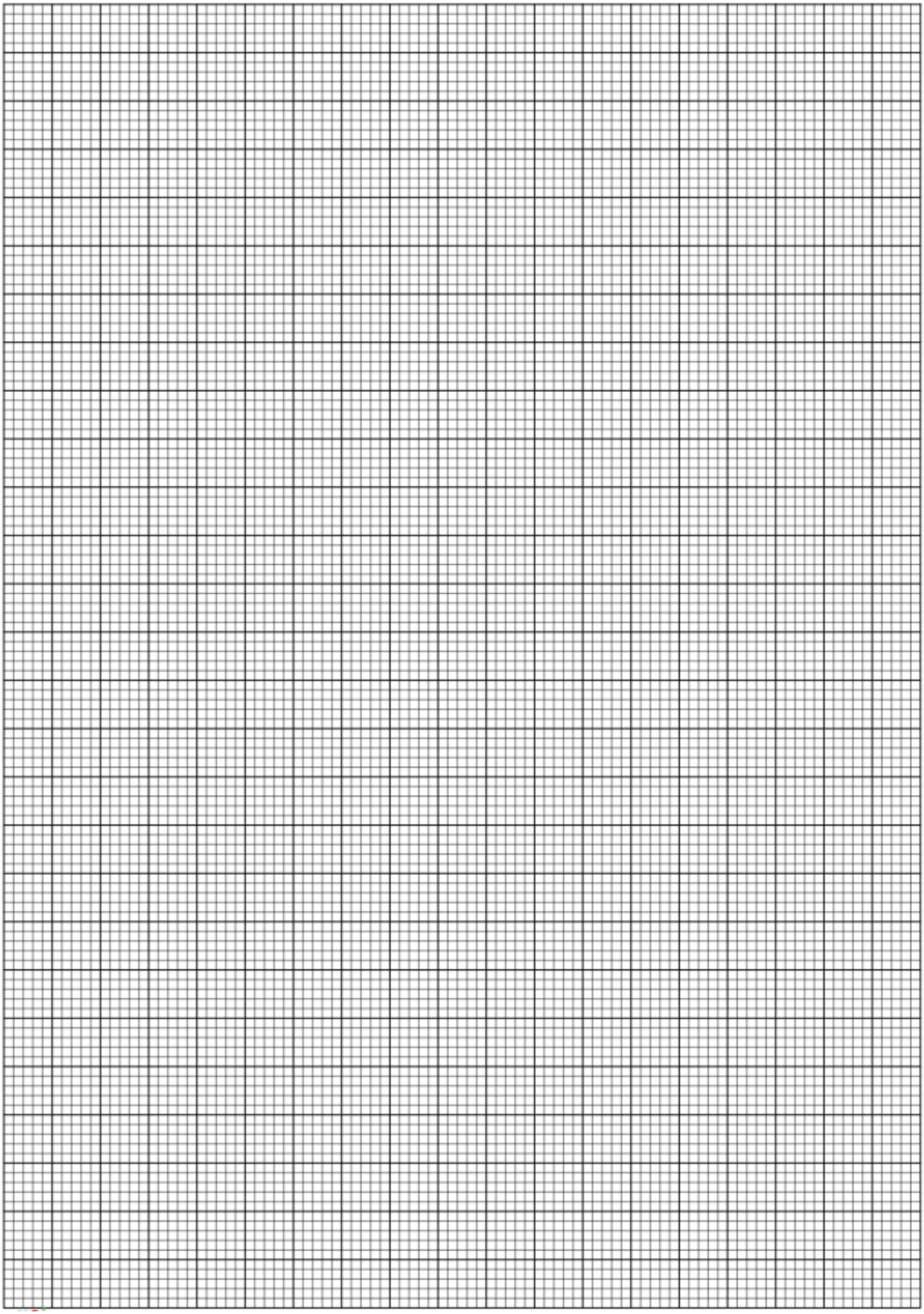
_____

_____

_____

(3 marks)





2. The following questions are about a reaction where the loss of mass was measured.

a) Plot the data below as a graph on graph paper.

Time (min)	Mass of flask (g)
1	102.80
2	101.30
3	100.30
4	99.75
5	99.60
6	99.10
7	99.00
8	99.00
9	99.00
10	99.00

(5 marks)

b) On your graph, identify the anomalous result.

(1 mark)

For the following questions, you must show (by marking with a pencil and ruler) on your graph, how you obtained your data. You can quote rate of reaction per minute.

c) What is the rate of reaction across the first 4min?

_____

_____

_____

(3 marks)

d) What is the rate of reaction across the first 6min?

_____

_____

_____

(3 marks)

e) What is the rate of reaction between 2min and 5min?

_____

_____

_____

(3 marks)

f) What is the rate of reaction at 30s?

_____

_____

_____

(4 marks)

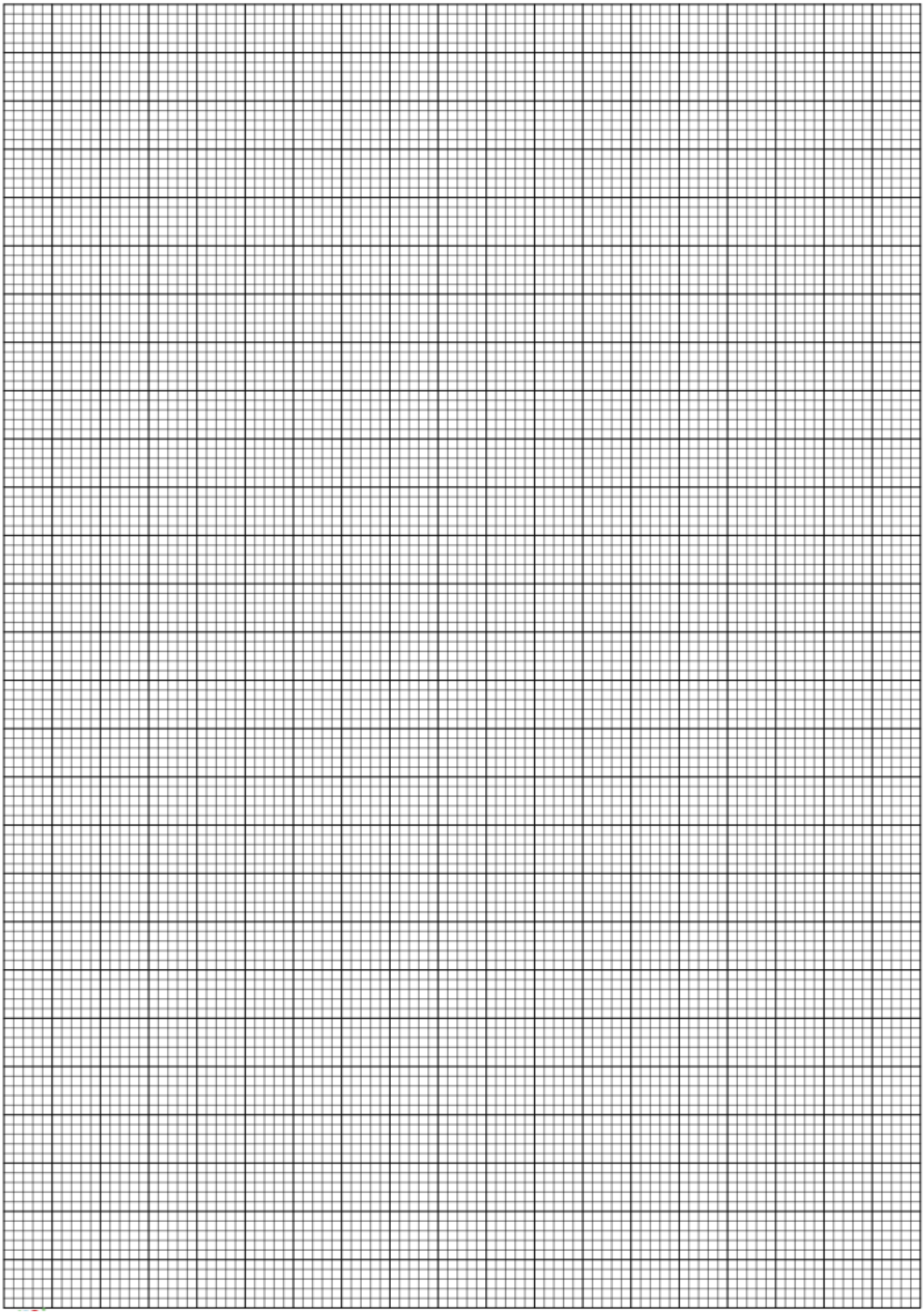
g) What is the rate of reaction at 1min?

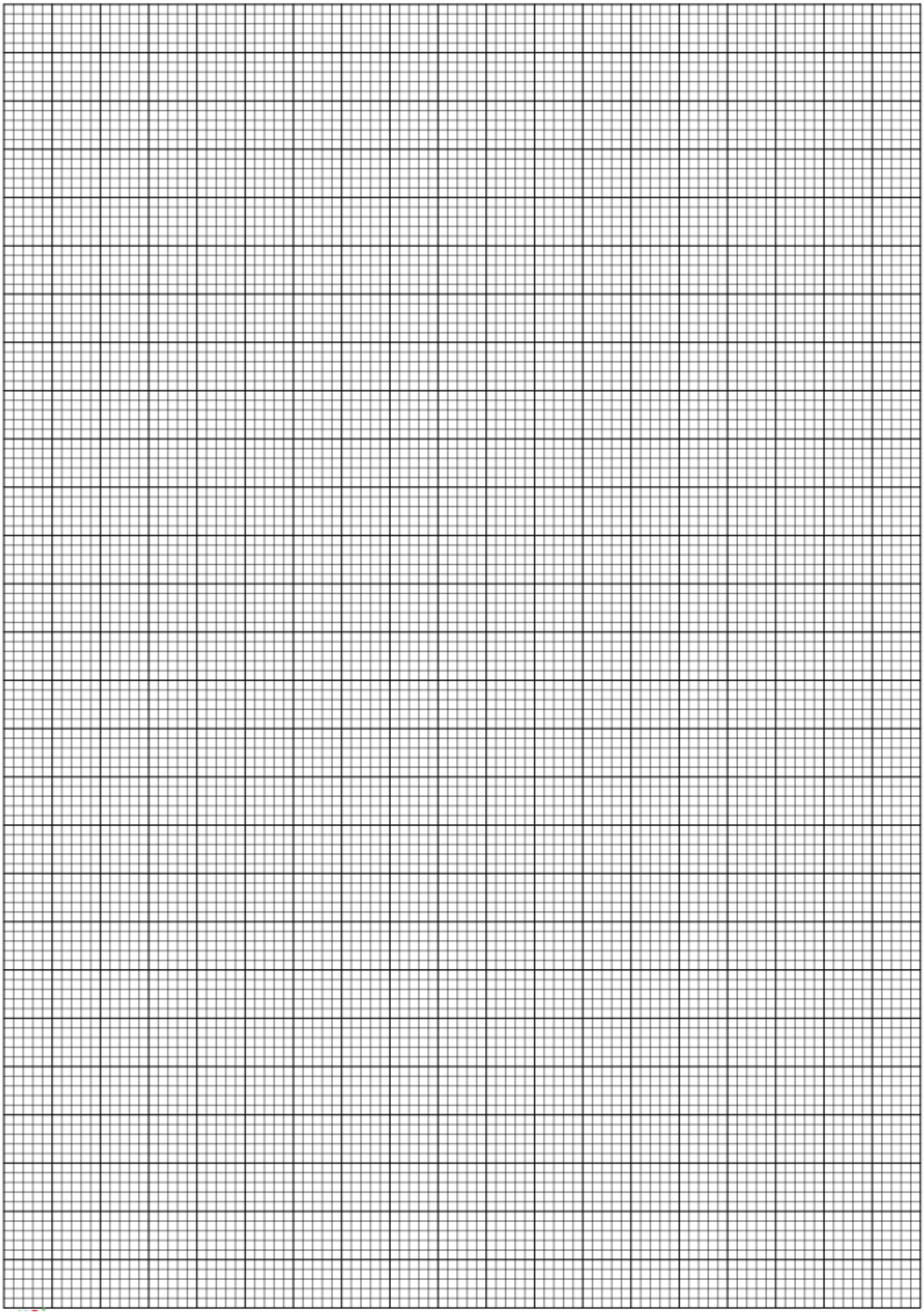
_____

_____

_____

(4 marks)





9. Organic chemistry

1. Complete the table below about the homologous series of organic compounds studied at GCSE. (Note: if you took combined science, you may not have studied some so you will need to research them.) The some sections have been completed for you.

Name of homologous series	**Suffix**	**Functional group**	**General formula**	**Notes**
Alkane	-ane	n/a	C_nH_{2n+2}	Saturated hydrocarbon. Good fuels. The more carbon atoms, the higher the boiling point and viscosity.
Alkene		n/a		
Alcohol		-OH		
Carboxylic acid				
Ester	(you only need to name ethyl ethanoate)		n/a	

Optional research task

This task is optional. If you complete it, please hand in your work to your chemistry teacher in the first lesson.

Chose from the following options:

A. Answer the question ‘What is the impact of catalytic converters on air pollution and climate change?’

B. Answer the question ‘How and why has the model of the atom changed over time?’

C. Answer the question ‘How and why has the periodic table changed over time?’

In each case, you should include diagrams and graphs where relevant and reference your work by including a bibliography.