GCSE Mock Test 2023

Satisfactory.

66/100

Subject: CHEMISTRY

Board: AQA

Level: Paper 2 (Higher)

Student Name: _____

School Name: _____

Date: 14/04/23

Score: _____

Total Marks: 100 marks

Time Allowed: 1 hour 45 minutes

Instructions:

- Use black ink or a black ballpoint pen. The pencil should only be used for drawing.
- Answer **all** questions in the spaces provided.
- Do all the rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.
- Where appropriate, your answer should be supported with working. Marks might be given for a correct method, even if the answer is wrong.
- Please try all the questions.

Student performance can be improved with practice
Topics to be focused: Organic chemistry and Tests for ions
Handwriting can be made better(Refer blue underlines in the sheet where the teacher can't understand what the student has written)
Common repeating questions should be picked from pastpapers and answered on regular basis to make organic chemistry and reactions crystal clear
With more mock tests and revising topics that are not clear, grades can be improved

0 1 This question is about chemical analysis.

0 1. 1. A student adds sodium hydroxide to a salt solution.

She gets a white precipitate that dissolves in excess of sodium hydroxide.

Identify the metal ion present. **[1 mark]**

0

~~Barium~~ magnesium Aluminium

0 1. 2. Give the ionic equation for the reaction happening in 01.1 **[1 mark]**

0

$H^+ + OH^- \rightarrow H_2O$

0 1. 3. What test must the student carry out if the above salt contains sulphate?

Mention observation of the above test **[2 marks]**

1

barium chloride

White precipitate is seen

0 1. 4. Give the formula of the salt the student tested. **[1 mark]**

0

NaOH

0 1. 5. To test for a cation in another salt, the student uses NaOH and gets a white precipitate that is insoluble in excess. The student decides it is either calcium or magnesium ion.

Name the test that can confirm the cation in the above test.

Give the result of the test with both ions. **[3 marks]**

1

flame emission spectroscopy Flame test

Calcium - Brick red colour

Magnesium - No colour

0 2. This question is about water.

0 2. 1. What is potable water? **[2 marks]**

1

It is water that is safe to drink and contains dissolved ~~impurities~~ substances.

0 2. 2. Potable water can contain **[1 mark]**

Tick (✓) the correct answer

1

- Stone and sand
- Twigs and plastic
- ✓ Soluble impurities
- Undissolved substances

0 2. 3. Write the steps involved in the treatment of sewage water. **[5 marks]**

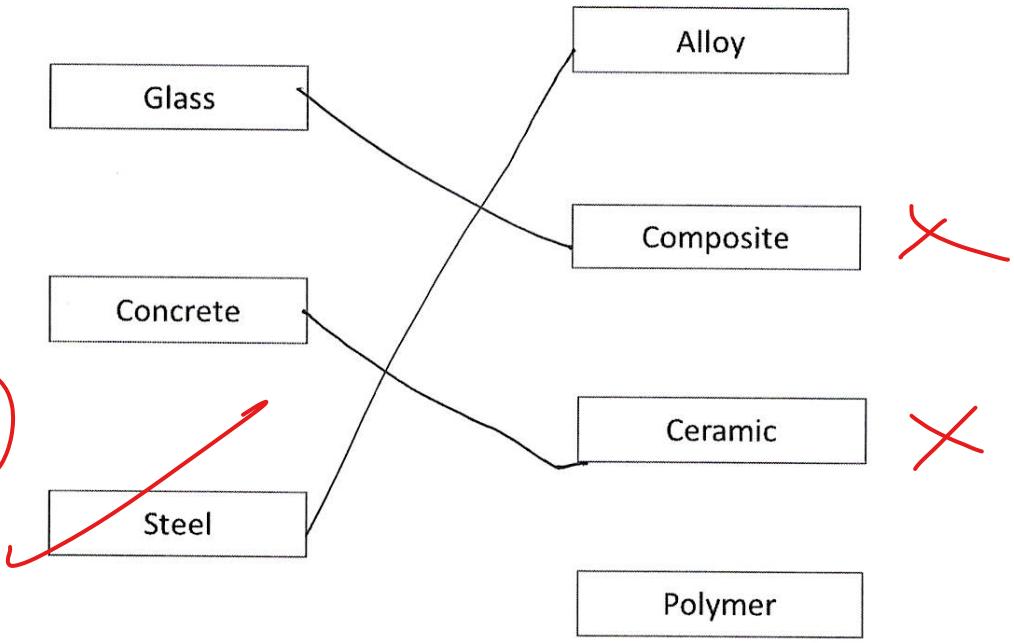
5

First, sewage water goes through a mesh which catches all debris, grit and all other large debris like grit. However, this does not purify the water so the water is placed into a tank where sludge is separated. After this the sludge is filtered out and it can be used as fertiliser for plants & animals. The remaining water then undergoes sterilisation using chlorine and UV light to destroy ~~germs~~ harmful bacteria. After this step it undergoes one more round of purification and it goes through water pipes and it is supplied everywhere.

Good

We have many materials on earth that are very useful.

0 2. 4. Connect these materials by drawing lines to join them **[3 marks]**



1

0 2. 5. Rusting destroys the metal surface.

Give the word equation for the rusting of iron. **[1 mark]**

1

iron + oxygen → iron oxide

0 2. 6. Magnesium coated on zinc can prevent rusting.

Justify this statement. **[2 marks]**

2

This is true because magnesium acts as a layer of protection of the zinc as it is more reactive than zinc.

0 2. 7. Fertilizers are important chemicals used for better yield.

Name two substances required to produce ammonium nitrate **[2 marks]**

0

nitrogen and hydrogen

0 3 This question is about hydrocarbons.

0 3. 1. Butane, hexane and octane are obtained by fractional distillation of crude oil.

Which of these will have: **[2 marks]**

2

a) Lower boiling point ..butane.....

b) High flammability ...butane.....

0 3. 2. Octane is broken into smaller hydrocarbons by catalytic cracking.

Name the catalyst used during cracking.

If one of the products is ethene, which is the other product? **[2 marks]**

Catalyst ..steam iron.....

0

Product ..heptene.....

0 3. 3. Which of these will not decolourise bromine water?

[1 mark]

Tick (✓) the correct answer

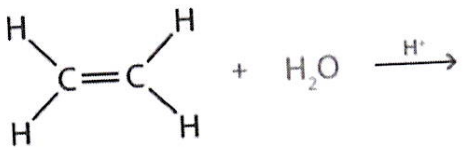
1

- ✓ Butane
- Ethene
- Butene
- Hexene

0 3. 4. Ethene is treated with steam and catalyst as follows:

Complete the reaction by writing the structure and name of the product in the given box. **[2 marks]**

0



ethane

0 3. 5. Fill in the blanks by using suitable choices. **[2 marks]**

(substitution, ionic, addition, double)

2

Alkenes undergo ..... addition ..... reaction when the ..... double ..... bond opens up to give a carbon-carbon single bond.

0 4. This question is about purity and separation.

A student analyses three samples namely A, B and C.

She records the melting points which are given in the table below:

Sample	Melting point
A	25°C
B	32-35 °C
C	5-7°C

0 4. 1. Which of these samples is pure? **[3 marks]**

Justify your answer.

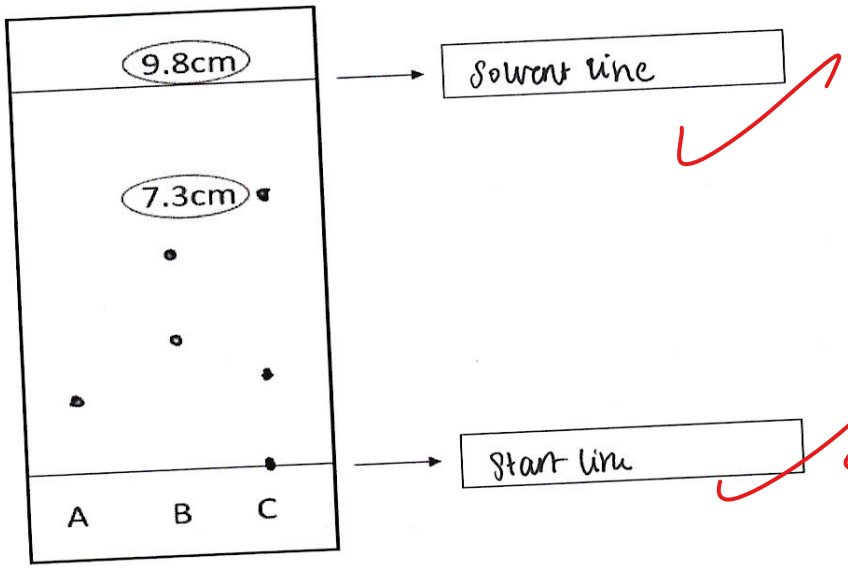
specific

3

Sample A is pure because it only has 1 boiling point whereas the others have a range e.g. 5-7°C meaning that there were multiple substances with different boiling points that evaporated first. A pure substance does not contain any dissolved substances e.g. dissolved ions.

0 4. 2. In order to confirm the results in 0 4.1, she chooses to do paper chromatography. The results are shown in the figure below.

Fill the name of two lines in the boxes in front of them **[2 marks]**



2

can use 'Base line'

0 4. 3. Why did one spot on C not move? **[1 mark]**

Insoluble in the solvent

0 The one spot probably did not move because ~~they~~ it has the same Rf value as ~~another~~ substance or ~~group~~ the solvent was not able to separate it.

0 4. 4. How does the result of chromatography confirm the result in 04. 1?

Justify your answer. **[2 marks]**

1 It proves that sample A is pure as it only had one substance in it whereas both B and C separated into different substances, proving them they are not pure. It has definite melting point

In chromatography, if produced one spot

0 4. 5. Calculate the Rf value for the highest travelled spot on C using the distances travelled by them in the chromatogram. **[1 mark]**

1 $\frac{7.3}{9.8} = 0.74487$ Ans to 2 decimal places = 0.74

0 5. This question is about materials used to make cups.

Drinking cups can be made from glass, steel, clay and polystyrene.

0 5. 1. Using the concept of LCA, suggest which cup is the better choice.

Justify your answer taking all the choices available **[5 marks]**

If the drinking cup is made from glass it is reusable but glass can break easily, however, it can be recycled. Steel is also reusable, sturdy and recyclable. Polystyrene is single use and is not the most eco-friendly as they do not decompose easily, they have to be recycled many times. Overall, I think that steel drinking cups are the best material to make cups because it is durable, lasts long and it is also recyclable. However, people may look for glass cups based on pretty designs etc. as steel is a monotonous colour and is not so appealing. Polystyrene is not a very good material for cups as they have low melting point, it is not sturdy. Steel is also quite a good insulator and it a good material for hot drinks. Clay is not very widely demanded and it will be costly to make large scale. Overall, steel is the best choice.

5
Impressive

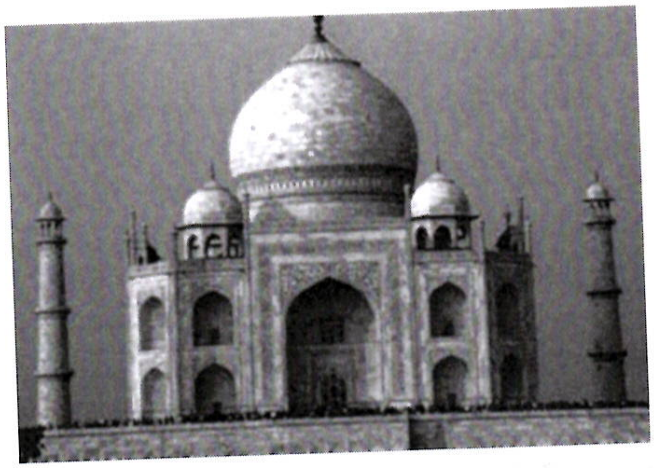
0 5. 2. What information can be obtained by doing a Life Cycle Assessment of any material? **[2 marks]**

Disposal, manufacturing costs, production, life-span of product
↳ is it recyclable? Etc.

2

0 6 This question is about atmospheric pollution.

The below image shows how the marble monument Taj Mahal is being affected by pollution.



0 6. 1. Soot is one of the pollutants that cause the monuments lose their shine.

What is soot? **[1 mark]**

1

carbon

'carbon particles/powder' can be better

0 6. 2. Incomplete combustion of fossil fuel also produces some harmful chemicals.

Identify A in the following incomplete combustion.

Butane + oxygen → A + water **[1 mark]**

1

carbon monoxide ✓

0 6. 3. The product A in 06.2 is harmful to health.

Justify this using its harmful effects **[2 marks]**

2

It will ~~get~~ filtrate into red blood cells and stops oxygen circulating from brain to around the body ✓

0 6. 4. Air pollution can cause acid rain. The gaseous air pollutants are given here.

A. Carbon dioxide
B. Sulphur oxide
C. Methane
D. Nitrogen oxide

Tick (✓) the correct answer **[1 mark]**

- A and B
- A and C
- B and D
- C and D

0

0 6. 5. Give two reasons why there is an increase in carbon dioxide in the atmosphere. **[2 marks]**

Increased population and due to the greenhouse effect. There is more carbon emission than there is ~~trees~~ e.g. trees

more fossil fuel burning, deforestation

1

0 6. 6. Give three ways to reduce carbon footprint. **[3 marks]**

One way is by buying local food rather than ordering imports food from across the world. Another way is by ~~use~~ using your car less and use walking, cycling instead. You can also plant more trees to try and achieve a carbon neutral state where we are producing the same amount of carbon that we are counteracting with e.g. oxygen.

3

0 7 This question is about carboxylic acids

0 7. 1. Ethanoic acid is the main constituent of vinegar.

Ethanoic acid is considered a weak acid. Explain. **[2 marks]**

1

It is a weak acid because its ions only partially dissociate and it is a reversible reaction

Produces low H^+ ions

0 7. 3. The reaction of methanol with ethanoic acid produces an ester.

a) The catalyst and side product in this reaction is

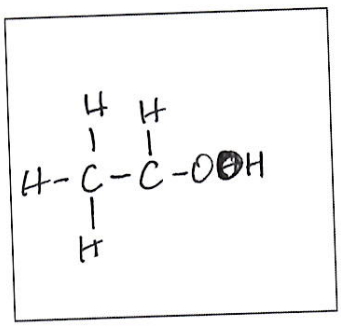
Tick (✓) the correct answer **[1 mark]**

0

- Alkali and water
- acid and water
- aluminium and acid
- ✓ Iron and water ✗

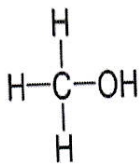
b) The reaction for the formation of the ester is given here. **[3 marks]**

Complete and write the name and structures in the spaces provided below.



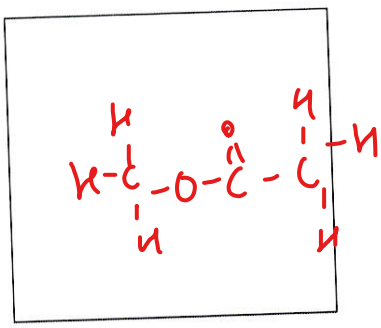
Ethanoic acid

+



Methanol

→



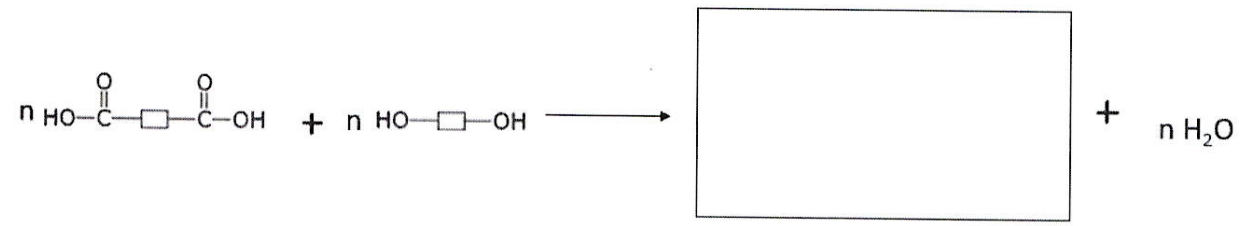
methyl methanoate ✗

0

methyl ethanoate

0 7. 4. A dicarboxylic acid reacts with a diol to produce polyester.

Write the structure of polyester formed in the reaction given below: **[1 mark]**



0

0 7. 5. The above reaction is called condensation because

Tick (✓) the correct answer **[1 mark]**

- the boxes are condensing ✗
- there is polymerisation ✗
- water molecules are lost ✓
- double bonds are broken ✗

0

0 7. 6. Write any two problems caused by using non-biodegradable polymers. **[2 marks]**

- It takes a long time to decompose. You cannot recycle it. ~~For instance~~ It will become unusable waste and when burning it is to manually attempt to recycle, toxic fumes will be released.

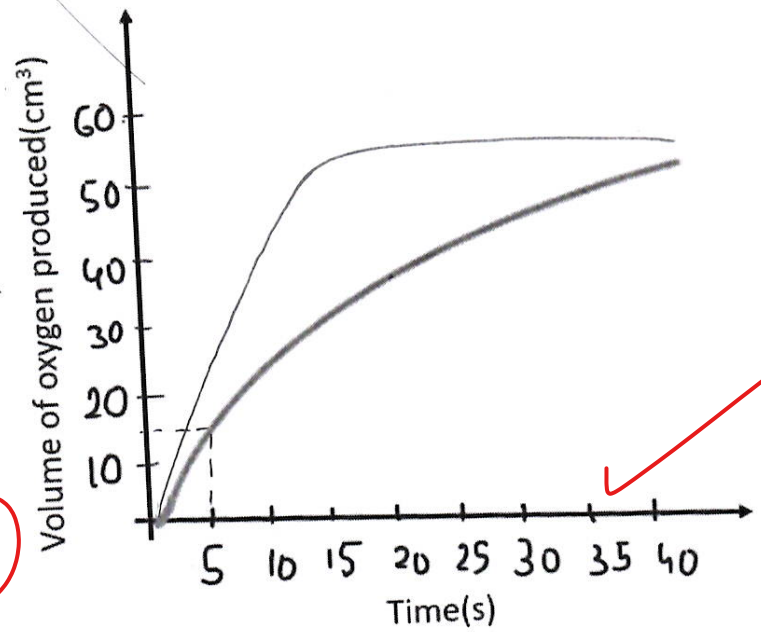
2

0 8. This question is about the rate of the reaction.

Hydrogen peroxide decomposes to form water and oxygen at rtp.

The equation for decomposition is as follows: $2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$

The graph for the same is shown in the figure.



1

0 8. 1. What is the rate in 5 seconds in cm^3/s? **[1 mark]**

1

15 = 3 cm^3/s

5

0 8. 2. How does the speed of this reaction vary with time? **[1 mark]**

speed decreases.

1

The speed of the reaction slows down as it changes from a steep gradient to a less steep gradient e.g. from 5 - 20s reaction was fast which is seen from steep gradient however from 20 - 40s reaction slow down.

0 8. 3. Give one dependent variable and one independent variable in this reaction. **[2 marks]**

1

Dependant variable: volume of oxygen produced

Independent variable: rate of reaction

0 8. 4. Manganese oxide is added as the catalyst in this reaction. **[3 marks]**

Draw the curve in the above graph after the addition of the catalyst.

[A rough curve is sufficient in the figure mentioned above]

Justify the answer to why this different curve appears.

decreases activation energy, more molecules can react with lesser energy rate increases.

The gradient from 5 - 20s is much steeper to show how quick the catalyst has speed up the reaction - it has lowered the activation energy. The reaction also finishes faster so rate of reaction becomes steady which is seen by the (almost) horizontal plateau - it forms product quicker.

2

0 8. 5. Explain the changes in the rate with respect to the following changes based on particles of reactants.

a) If the temperature is raised **[2 marks]**

Rate of reaction will increase due to the molecules frequency colliding due to increased kinetic energy. ~~This will increase~~ give low

2

b) If the pressure is increased **[2 marks]**

Rate of reaction will increase due to molecules frequency colliding due to increased kinetic energy. These frequent collision lowers the activating energy and gives high yield

decreased volume

1

0 8. 6. Mention any two ways of measuring the rate of the reaction. **[2 marks]**

By measuring the temperature - using a timer to see when reaction starts and ends. Can draw a graph and use $\frac{\text{change in y}}{\text{change in x}}$ to calculate rate of reaction.

by measuring the volume of gas formed, loss in mass, precipitation

1

0 9. Biomolecules are found inside our bodies.

0 9. 1. Complete the following using suitable answers **[4 marks]**

(proteins, alcohol, carboxylic acid, enzymes, polypeptide, amino, ester)

Amino acids contain two functional groups namely ...amino..... and

carboxylic acid ..... Amino acids can form polymers called

polypeptide ..... The long chain of this polymer is known as

protein .....

0 9. 2. DNA is made up of two polymeric chains called

[1 mark]

Tick (✓) the correct answer

- ✓ bases
- sugar
- ✓ nucleotide
- genes

0 9. 3. Glucose is a carbohydrate.

Name three elements that make sugar glucose. **[3 marks]**

starch, enzyme

0 9. 4. Name two naturally occurring polymers produced from glucose **[2 marks]**

starch, sugar

1 0. This question is about a reversible reaction

1 0. 1. What is a reversible reaction? **[1 mark]**

It is a reaction that can be converted both from reactants to products and from the products back to the reactants

1 0. 2. Tick (✓) the correct statement about equilibrium. **[1 mark]**

- Amount of reactants and products are the same at equilibrium
- Reaction has stopped
- In all equilibrium reactions, more product is formed
- ✓ Rate of both forward and reverse reactions are the same

1 0. 3. Formation of ammonia by Haber's process has the following reaction:

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$, the reaction is exothermic.

Mention the temperature, pressure and catalyst required for this reaction. **[3 marks]**

a) Temperature ....460°C.....

Pressure ..200 atm.....

Catalyst ....Iron.....

3

b) Write the direction of the reaction using the words forward or reverse depending on the following conditions. **[3 marks]**

Apply Le-Chatlier's principle to determine the direction of the reaction.

Increasing the temperature ....forward..... Backward.

Decreasing pressure ....~~backwards~~ reverse.....

Increasing concentration of nitrogen ..forward.....

2

Page for Rough Work

Page for Rough Work