

Question 1(b)(ii)**Candidate 1**

Because they all have different nuclide notation.

Candidate 2

because thats an average so its more exact

Candidate 3

The electron mass isn't exactly 0 but it is close, hence why the relative atomic ^{mass} isn't a whole number because neither is the mass of electron.

Candidate 4

~~Because ~~neutrons~~ electrons have a small mass~~
have a small relative atomic mass.
Because it is not rounded

Candidate 5

Because another isotope was added

Candidate 6

Because the relative atomic mass is
~~all of the hydrogen atoms mass~~
~~masses of~~ mass of all the hydrogen
atoms added together and then divided
by the number of hydrogen atoms. It
also shows what atom is most
abundant.

Candidate 7

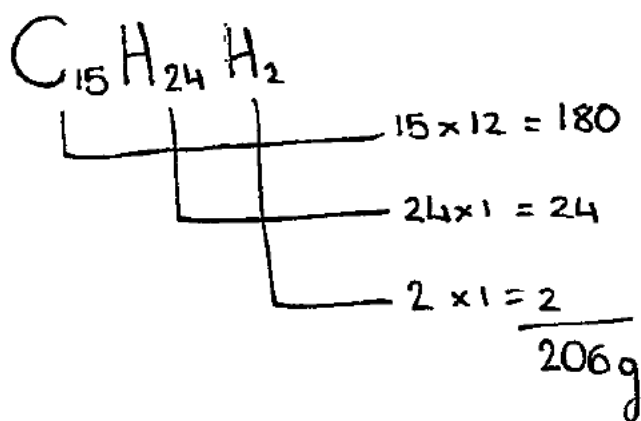
Because its an
average of the 3
isotopes

Candidate 8

because its an average
of all three
isotopes.

Question 2(c)(ii)**Candidate 1**

234g

Candidate 2**Candidate 3**

$$\begin{aligned}
 & \cancel{m = n \times \cancel{gfm} \text{ GFM}} \\
 & \text{mole} = 3 \text{ mole} \\
 & 1 \text{ mole } (204) = 3(204) \\
 & = 612 \text{ g}
 \end{aligned}$$

Candidate 4

$$H = 6 \times 1 = 6 \qquad 204 + 6 = \underline{\underline{210g}}$$

Candidate 5

$$\begin{array}{l} \text{206g} \\ H_2 = 1 \times 2 \\ [H_2]^3 = 1 \times 6 \quad 204 + 6 \\ \qquad \qquad \qquad = 210g \end{array}$$

Candidate 6

$$\begin{array}{l} 204 \times 3 \\ = \underline{\underline{612g}} \end{array}$$

Candidate 7

$$\text{mass} = 612g$$

Candidate 8

$$\begin{array}{l} Z \qquad 1 : 3 \\ \text{mole} = 1 \qquad 3 \\ \text{mass} = 204 \qquad 612 \text{ grams} \\ \text{GFM} = 204 \end{array}$$

Question 3(c)(iii)**Candidate 1**

Instead of using lumps use powdered limestone.

Candidate 2

number of gas bubbles produced

Candidate 3

You can check the progress of this chemical reaction over time by measuring ~~the~~ the decrease in the mass of limestones over time.

using balance.

Candidate 4

measurement of liquid left over after the reaction ~~can be~~ to tell how much of the acid reacted

Candidate 5

how much mass is lost

Candidate 6

The temperature

Candidate 7

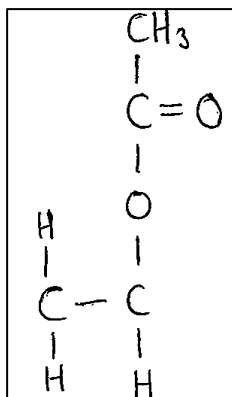
concentration

Candidate 8

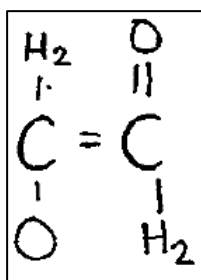
how cloudy
it becomes

Question 4(b)

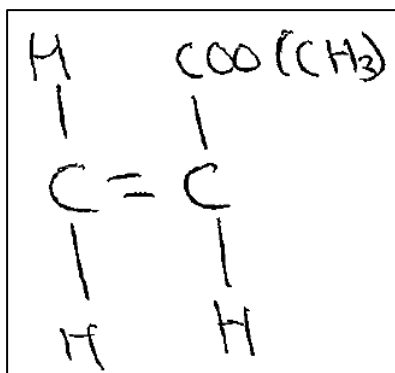
Candidate 1

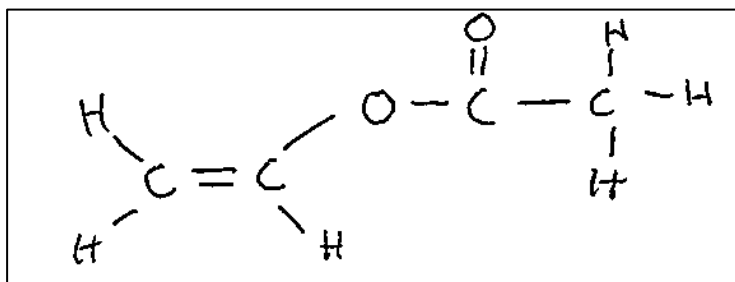
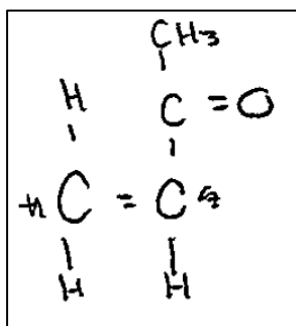
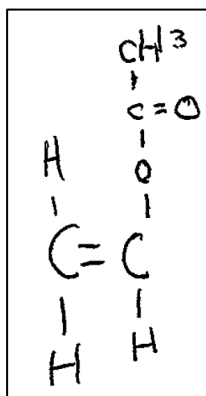


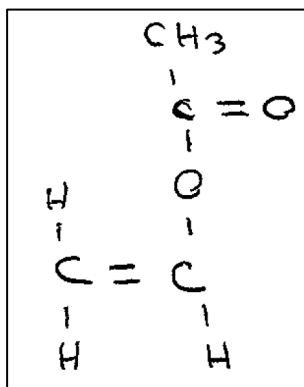
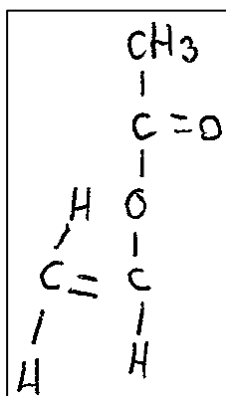
Candidate 2



Candidate 3



Candidate 4**Candidate 5****Candidate 6**

Candidate 7**Candidate 8**

Question 5(a)

Candidate 1

$$\begin{aligned}
 E_h &= cm\Delta T \\
 &= 4.18 \times 0.15 \times 43 \\
 &= 26.961
 \end{aligned}$$

Candidate 2

$$\begin{aligned}
 E_h &= cm\Delta T & 43^\circ\text{C} - 20^\circ\text{C} \\
 & & = 23^\circ\text{C} \\
 E_h &= 4.18 \times 0.1 \times 23 \\
 E_h &= 9.614 \text{ kJ}
 \end{aligned}$$

Candidate 3

$$\begin{aligned}
 E_h &= cm \Delta T & 43 - 20 \\
 & & = 23 \\
 E_h &= \cancel{4.18} \times \cancel{0.1} \times \cancel{23} & 4.18 \times 0.015 \times 23 \\
 E_h &= \cancel{4.18} \times 0.1 \times (\cancel{43} - 20) & \\
 E_h &= \cancel{9.614} & = 1.4421 \text{ kJ} \\
 E_h &= \cancel{10.14} &
 \end{aligned}$$

Candidate 4

$$E_h = cm\Delta T$$

$$E_h = 4.18 \times \cancel{0.015} \times$$

$$E_h = 4.18 \times 0.1 \times 23$$

$$= 9.614$$

$$= 9.6 \text{ kJ}$$

Candidate 5

$$E_h = cm\Delta T$$

$$E_h = 4.18 \times 15 \times 23$$

$$E_h = 1442.1 \text{ kJ}$$

Candidate 6

$$E_h = cm\Delta T$$

$$E_h = 4.18 \times 0.015 \times 23$$

$$E_h = 1.4421$$

$$E_h = 1.44 \text{ kJ}$$

Candidate 7

$$E_h = cm\Delta T$$
$$E_h = 4.18 \times 0.1 \times 23$$
$$E_h = 10 \text{ kJ}$$

Candidate 8

$$E_h = mc\Delta T$$
$$E_h = 15 \times 0.015 \times 4.18 \times 23$$
$$15 \div 1000 =$$
$$E_h = 1.4421 \dots$$
$$E_h = 1.44 \text{ kJ}$$

Question 5(b)

Candidate 1

Because the glass beaker will change temperature compared to the polystyrene cup.

Candidate 2

because polystyrene prevents heat from being lost making the results more accurate

Candidate 3

energy is able to be lost to the surroundings.

Candidate 4

The polystyrene cup will cause less heat energy to be lost to the surroundings, as it insulates better than glass.

Candidate 5

it holds heat better

Candidate 6

Polystyrene lets less heat escape than a glass beaker ~~does so it means the temperature~~ does.

Candidate 7

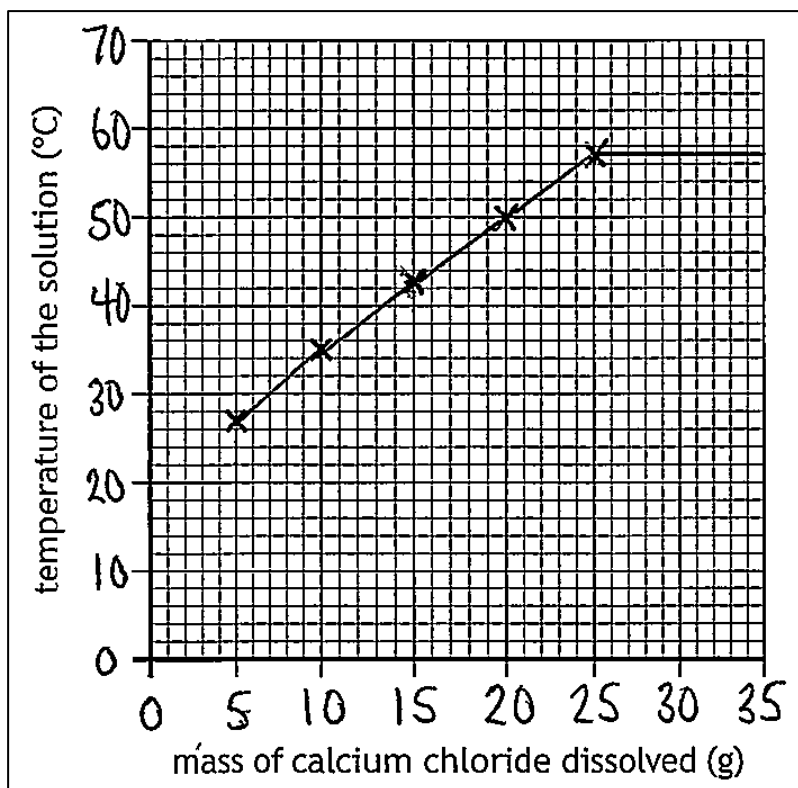
to it prevents heat lost to surroundings

Candidate 8

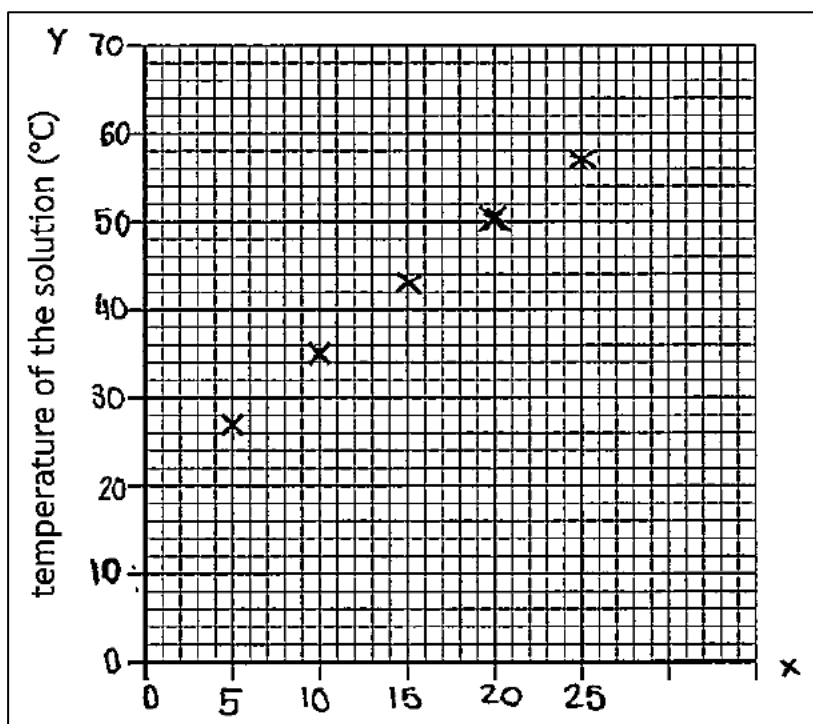
because glass beaker
will get too hot as it takes
~~polystyrene is~~
~~better~~ In too much
heat and thermometer
will touch it.

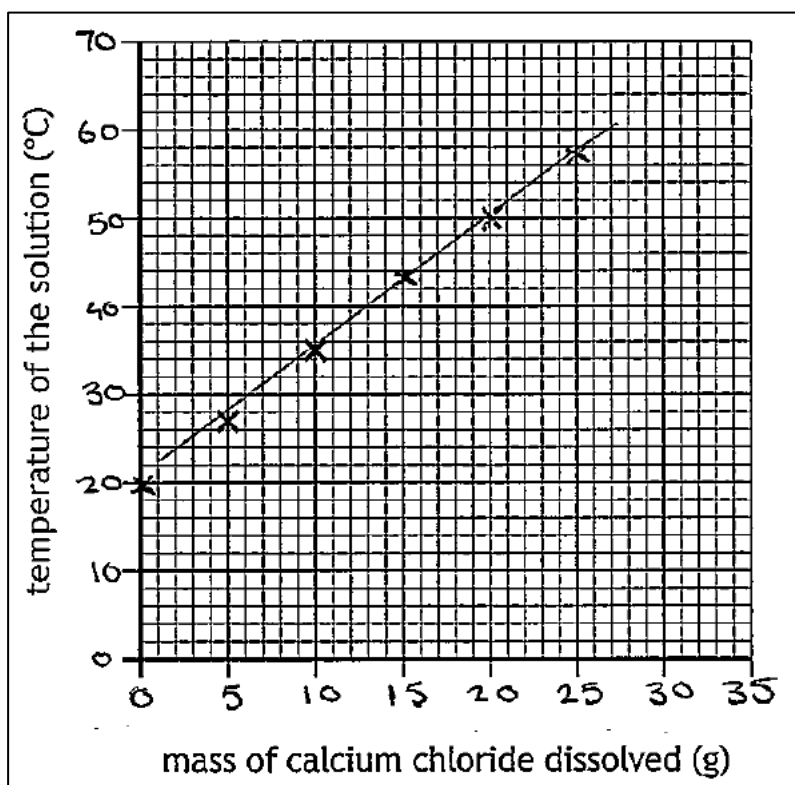
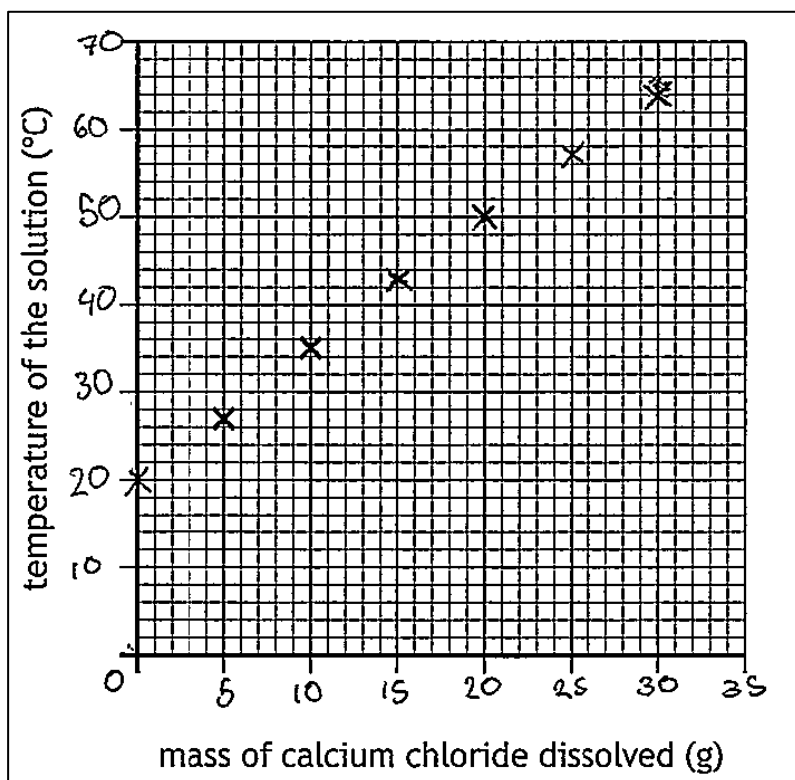
Question 5(c)

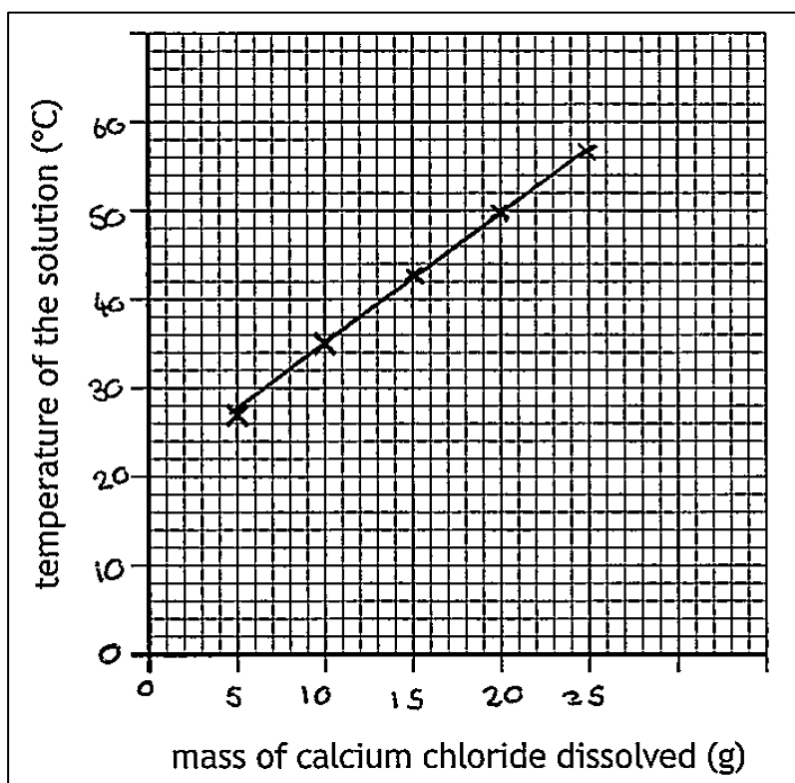
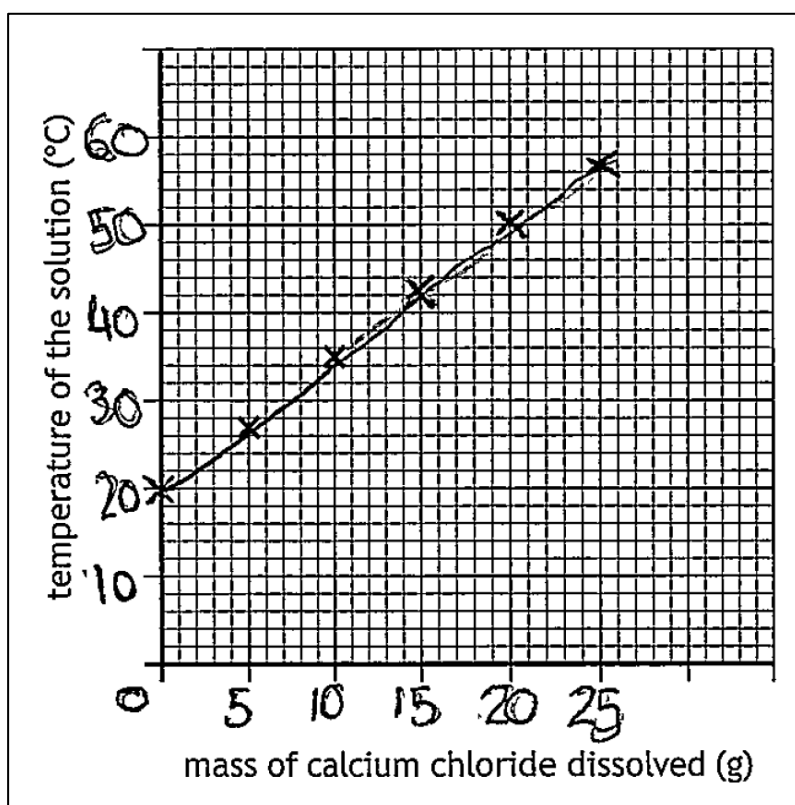
Candidate 1

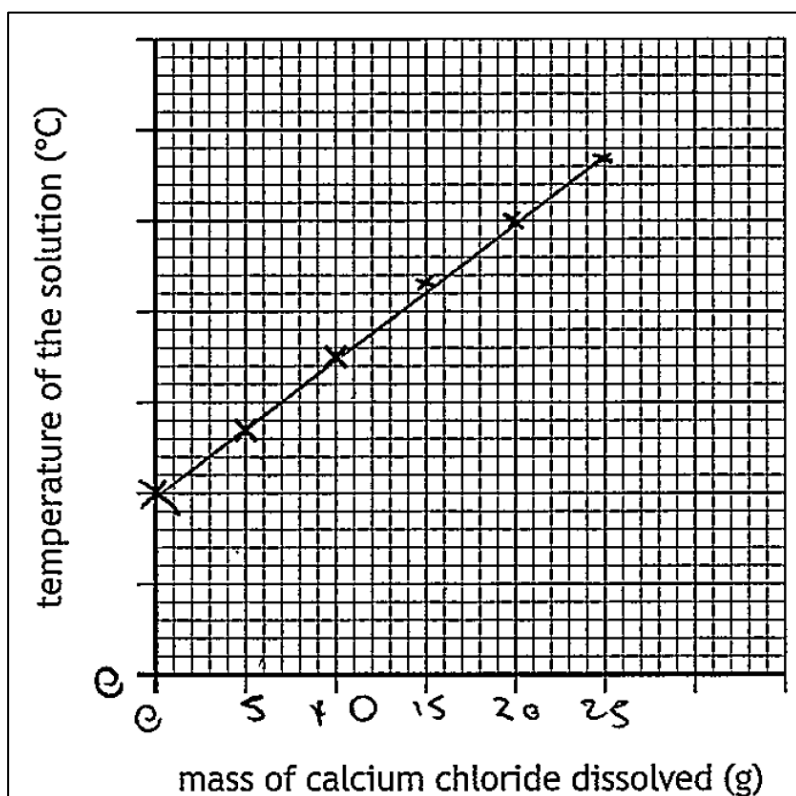
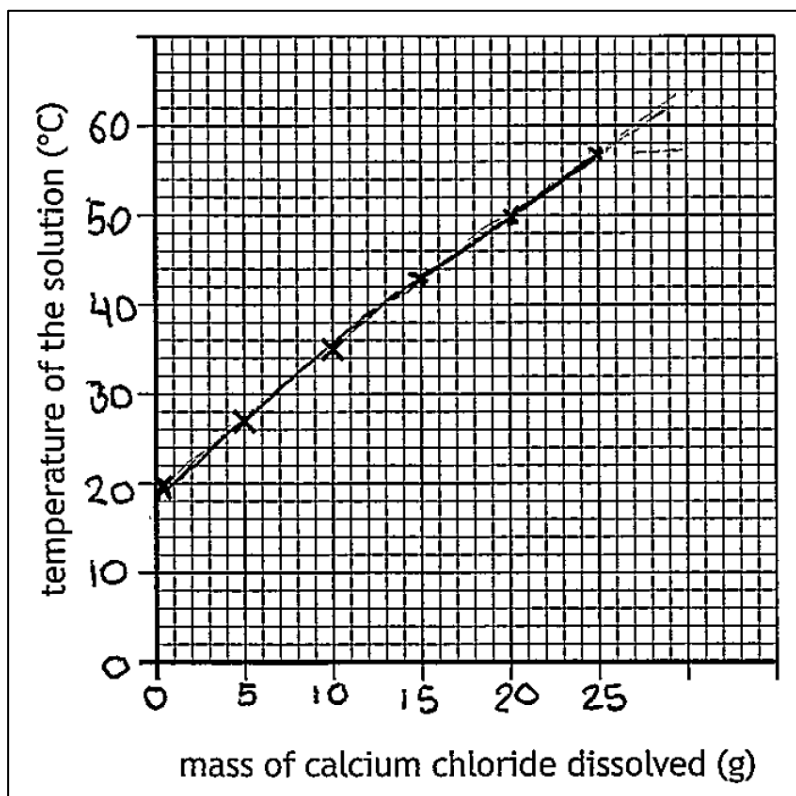


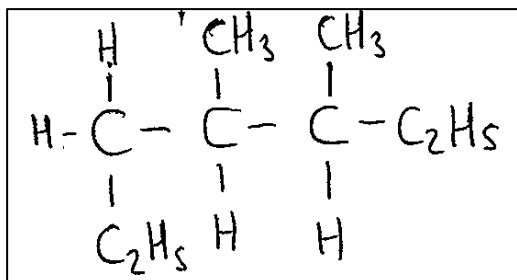
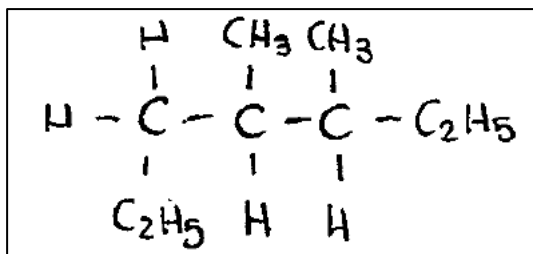
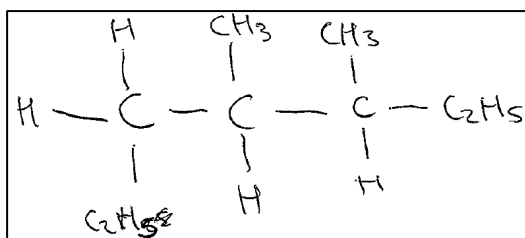
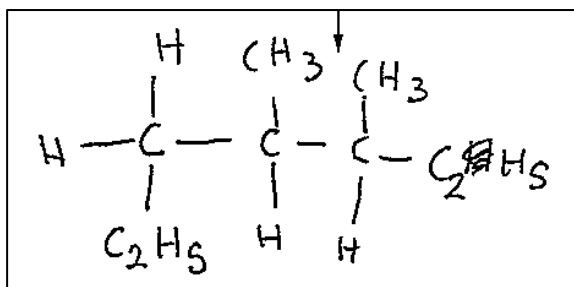
Candidate 2

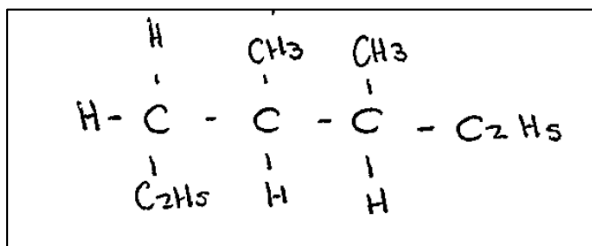
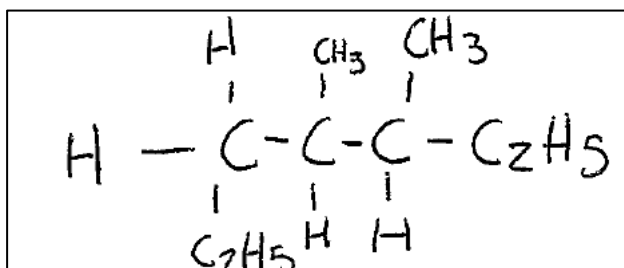
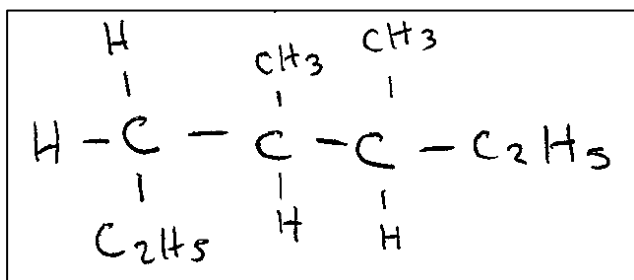
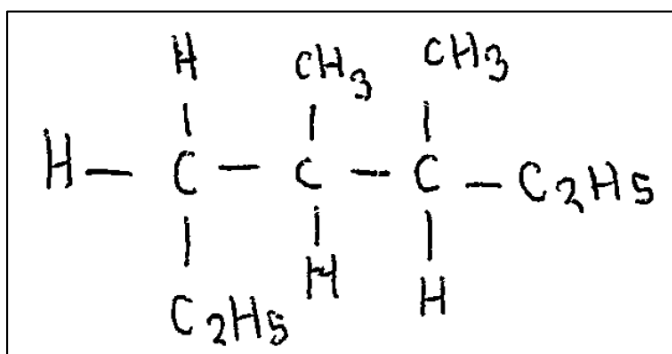


Candidate 3**Candidate 4**

Candidate 5**Candidate 6**

Candidate 7**Candidate 8**

Question 7(c)(ii)**Candidate 1****Candidate 2****Candidate 3****Candidate 4**

Candidate 5**Candidate 6****Candidate 7****Candidate 8**

Question 8(d)

Candidate 1

Because uranium has to pass through paper that's why you can't use beta

Candidate 2

because an alpha decay means that uranium loses two protons and two neutrons

Candidate 3

Number of electrons in Radium are 8 where as polonium is 6 so their different. Need to go under ~~an~~ alpha decay so that they are stable, & to become less reactive.

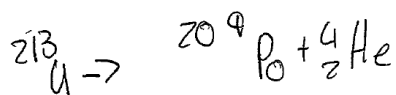
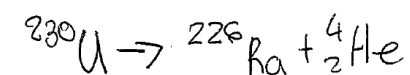
Candidate 4

Because alpha particles are the only radiation particle with protons & neutrons, ~~and if Uranium~~ meaning that the only way for Uranium to change into another element is to change how many protons & neutrons it has, which can be done by spitting out ~~two~~ parts of its nucleus which are called helium nuclei (alpha radiation particles) (${}^4_2\text{He}$), which then make the atomic mass number decrease, changing the ~~etc~~ atom into a polonium or radium atom.

Candidate 5

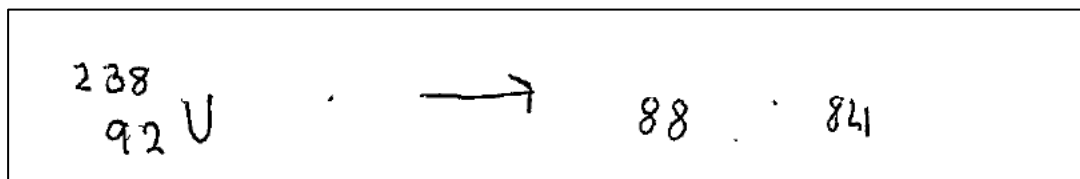
So that electrons aren't being gained

Candidate 6



Candidate 7

Because alpha decay reduces the number of protons ~~allowing the atomic number~~ to ~~decrease~~ which then forms other elements with a lower atomic number

Candidate 8

Question 9(a)(ii)**Candidate 1**

Because in ~~an~~ ionic solution the ions are free ^{an} to move.

Candidate 2

because an ionic solution contains ions

Candidate 3

The charged particles in an ionic solution are free to move.

Candidate 4

An ionic solution can conduct electricity because the electrons in it are free to move.

Candidate 5

because electrons are free to move

Candidate 6

The ions are free to move around

Candidate 7

because the electrons
are free to move so
conduct electricity

Candidate 8

because they have both
~~contain~~ a negatively
~~salt~~ charged nuclei
and a positively
charged nuclei and
contain a salt.

Question 10(c)(ii)**Candidate 1**

Place reaction mixture in a beaker
+ place ^{the beaker} in a container filled with
warm water to heat the mixture

Candidate 2

a heat lamp

Candidate 3

A hot plate / electrical
hot plate. Place mixture
in a flask which isn't flammable
& wait for mixture to heat.

Candidate 4

Heat on an electric stove

Candidate 5

heat a spatula and mix with that

Candidate 6

A water bath

Candidate 7

by using ~~an~~ a catalyst

Candidate 8

heating
with carbon

Question 11(b)

Candidate 1

The $4\text{H}_2\text{O}$ is a liquid + everything else is a gas + this shows there is an acid

Candidate 2

because when a neutralisation reaction takes place water is produced

Candidate 3

So that the acid can react with the tablet ^{create} in order to ~~neutralise~~ ~~the~~ break down, manganese ions.

Candidate 4

The equation shows that an acid is present due to the water (H_2O) as one of the products in the reaction, and it can ~~only~~ be obtained by reacting a metal oxide with an acid.

Candidate 5

there is a Hydrogen ion but no hydroxide ion.

Candidate 6

The H^+ ion

Candidate 7

because there is OH^+
ions present

Candidate 8

It has more H^+ ions
than OH^- ions
So
more hydrogen ions than
hydroxide

Question 11(c)(ii)(A)

Candidate 1

$$\frac{C_1 V_1}{n_1} \neq \frac{C_2 V_2}{n_2}$$

$$\frac{0.005 \times 20}{5} \times \frac{21.4}{5}$$

$$0.02 \times 4.28 = 0.085 \text{ mol l}^{-1}$$

Candidate 2



$$n = 0.005$$

$$C = ?$$

$$V = 21.4 \text{ cm}^3 / 1000 = 0.0214$$

$$C = \frac{n}{V}$$

$$C = \frac{0.005}{0.0214}$$

$$C = 0.234 \text{ mol l}^{-1}$$

Candidate 3

$$\begin{array}{l}
 n = CV \\
 n = 0.005 \times 0.0214 \\
 n = 0.000107 \\
 \\
 C = \frac{n}{V} \\
 C = \frac{0.0000214}{0.021} \\
 C = 0.00107
 \end{array}
 \quad
 \begin{array}{l}
 5:1 \\
 0.000107: 0.0000214 \\
 \\
 \text{Concentration} = \\
 0.00107 \text{ mol l}^{-1} \\
 \text{0.00170}
 \end{array}$$

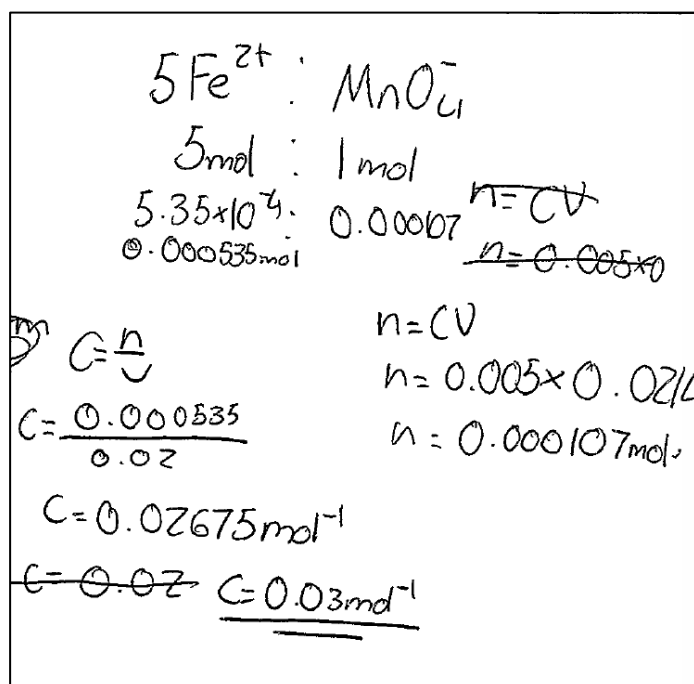
Candidate 4

$$\begin{array}{l}
 n = CV \\
 c = \frac{n}{V} \\
 c = \frac{5}{21.6} = 0.231 \\
 \text{0.0216} = 0.23 \text{ mol l}^{-1}
 \end{array}$$

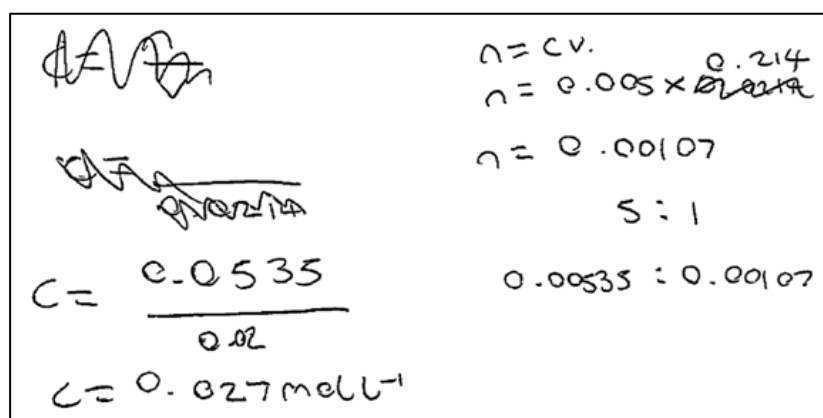
Candidate 5

$$\begin{array}{ll}
 n - 0.000107 & n - \frac{0.000535}{0.000107} \\
 C - 0.005 & c - 0.02675 \\
 V - 0.0214 & V - 0.02 \\
 \text{Potassium} & \text{Iron} \\
 \\
 & 0.02675
 \end{array}$$

Candidate 6



Candidate 7



Candidate 8

$\frac{0.535}{0.02}$		5:1	
Fe	MnO		21.4×0.005
$V = 0.02$	$V = 21.4$		
$n = 0.535$	$C = 0.005$		
$C = 26.75$	$n = 0.107$		
$C = 26.75 \text{ mol l}^{-1}$			
0.107×5			

Question 11(c)(ii)(B)**Candidate 1**

No use of an indicator because the colour of the ions is shown.

Candidate 2

because they had previously done the experiment and knew exactly how much to use to neutralise it

Candidate 3

The first titre already tells the student the ~~extent~~ exact ~~amount~~ volume required for the titration to reach the end point.

Candidate 4

Because the solution already changed colour by itself without the indicator, showing the reaction was finished.

Candidate 5

because the potassium permangrate
already changes colour

Candidate 6

The Colourless Solution would
turn purple

Candidate 7

because the fizzing
will stop when the
reaction is finished
so an indicator isn't
needed

Candidate 8

because the products
are colourless
and reactants are
coloured
so you can tell
when it loses
its colour