

Write your name here

Surname

Other names

Pearson Edexcel Certificate

Centre Number

Candidate Number

Pearson Edexcel
International GCSE**Chemistry****Unit: KCH0/4CH0****Paper: 2C**

Wednesday 15 June 2016 – Afternoon

Time: 1 hour

Paper Reference

**KCH0/2C
4CH0/2C****You must have:**

Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.
- Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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P 4 5 7 2 9 A 0 1 2 0

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THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0

Group

4	He	Helium	2
---	----	--------	---

1	H	Hydrogen	1
---	---	----------	---

7	Li	Lithium	3	9	Be	Beryllium	4	11	B	Boron	5	12	C	Carbon	6	13	Al	Aluminium	13	14	N	Nitrogen	7	15	O	Oxygen	8	16	F	Fluorine	9	17	Cl	Chlorine	17	18	Ar	Argon	18	19	Ne	Neon	10	20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
23	Na	Sodium	11	24	Mg	Magnesium	12	27	Al	Aluminium	13	28	Si	Silicon	14	31	P	Phosphorus	15	32	S	Sulfur	16	33	Cl	Chlorine	17	35.5	Br	Bromine	35	39	K	Potassium	19	40	Ca	Calcium	20	41	Sc	Scandium	21	42	Ti	Titanium	22	43	V	Vanadium	23	44	Cr	Chromium	24	45	Mn	Manganese	25	46	Fe	Iron	26	47	Co	Cobalt	27	48	Ni	Nickel	28	49	Cu	Copper	29	50	Zn	Zinc	30	51	Ga	Gallium	31	52	Ge	Germanium	32	53	As	Arsenic	33	54	Se	Selenium	34	55	Br	Bromine	35	56	Kr	Krypton	36	57	Rb	Rubidium	37	58	Sr	Strontium	38	59	Y	Yttrium	39	60	Zr	Zirconium	40	61	Nb	Niobium	41	62	Mo	Molybdenum	42	63	Tc	Technetium	43	64	Ru	Ruthenium	44	65	Rh	Rhodium	45	66	Pd	Palladium	46	67	Ag	Silver	47	68	Cd	Cadmium	48	69	In	Indium	49	70	Sn	Tin	50	71	Sb	Antimony	51	72	Te	Tellurium	52	73	I	Iodine	53	74	Xe	Xenon	54	75	Ba	Barium	56	76	La	Lanthanum	57	77	Hf	Hafnium	72	78	Ta	Tantalum	73	79	W	Tungsten	74	80	Hg	Mercury	80	81	Tl	Thallium	81	82	Pb	Lead	82	83	Bi	Bismuth	83	84	Po	Polonium	84	85	At	Astatine	85	86	Rn	Radon	86																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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223	Fr	Francium	87	226	Ra	Radium	88	227	Ac	Actinium	89	228	Fr	Francium	87	229	Ra	Radium	88	230	Ac	Actinium	89	231	Th	Thorium	90	232	Pa	Protactinium	91	233	U	Uranium	92	234	Np	Neptunium	93	235	Pu	Plutonium	94	238	Am	Americium	95	241	Cm	Curium	96	244	Bk	Berkelium	97	247	Cf	Californium	98	251	Es	Einsteinium	99	252	Fm	Fermium	100	257	Mn	Mendelevium	101	262	Nr	Nobelium	102	265	Lr	Lutetium	103	267	Uub	Ununbium	104	271	Uuq	Ununquadium	105	274	Uup	Ununpentium	106	277	Uuq	Ununquadium	107	281	Uuh	Ununhexium	108	284	Uuq	Ununquadium	109	287	Uuh	Ununhexium	110	291	Uuq	Ununquadium	111	294	Uuh	Ununhexium	112	297	Uuq	Ununquadium	113	301	Uuh	Ununhexium	114	304	Uuq	Ununquadium	115	307	Uuh	Ununhexium	116	311	Uuq	Ununquadium	117	315	Uuh	Ununhexium	118	318	Uuq	Ununquadium	119	321	Uuh	Ununhexium	120	325	Uuq	Ununquadium	121	329	Uuh	Ununhexium	122	332	Uuq	Ununquadium	123	335	Uuh	Ununhexium	124	339	Uuq	Ununquadium	125	343	Uuh	Ununhexium	126	346	Uuq	Ununquadium	127	350	Uuh	Ununhexium	128	353	Uuq	Ununquadium	129	357	Uuh	Ununhexium	130	361	Uuq	Ununquadium	131	365	Uuh	Ununhexium	132	368	Uuq	Ununquadium	133	372	Uuh	Ununhexium	134	376	Uuq	Ununquadium	135	380	Uuh	Ununhexium	136	384	Uuq	Ununquadium	137	388	Uuh	Ununhexium	138	392	Uuq	Ununquadium	139	396	Uuh	Ununhexium	140	400	Uuq	Ununquadium	141	404	Uuh	Ununhexium	142	408	Uuq	Ununquadium	143	412	Uuh	Ununhexium	144	416	Uuq	Ununquadium	145	420	Uuh	Ununhexium	146	424	Uuq	Ununquadium	147	428	Uuh	Ununhexium	148	432	Uuq	Ununquadium	149	436	Uuh	Ununhexium	150	440	Uuq	Ununquadium	151	444	Uuh	Ununhexium	152	448	Uuq	Ununquadium	153	452	Uuh	Ununhexium	154	456	Uuq	Ununquadium	155	460	Uuh	Ununhexium	156	464	Uuq	Ununquadium	157	468	Uuh	Ununhexium	158	472	Uuq	Ununquadium	159	476	Uuh	Ununhexium	160	480	Uuq	Ununquadium	161	484	Uuh	Ununhexium	162	488	Uuq	Ununquadium	163	492	Uuh	Ununhexium	164	496	Uuq	Ununquadium	165	500	Uuh	Ununhexium	166	504	Uuq	Ununquadium	167	508	Uuh	Ununhexium	168	512	Uuq	Ununquadium	169	516	Uuh	Ununhexium	170	520	Uuq	Ununquadium	171	524	Uuh	Ununhexium	172	528	Uuq	Ununquadium	173	532	Uuh	Ununhexium	174	536	Uuq	Ununquadium	175	540	Uuh	Ununhexium	176	544	Uuq	Ununquadium	177	548	Uuh	Ununhexium	178	552	Uuq	Ununquadium	179	556	Uuh	Ununhexium	180	560	Uuq	Ununquadium	181	564	Uuh	Ununhexium	182	568	Uuq	Ununquadium	183	572	Uuh	Ununhexium	184	576	Uuq	Ununquadium	185	580	Uuh	Ununhexium	186	584	Uuq	Ununquadium	187	588	Uuh	Ununhexium	188	592	Uuq	Ununquadium	189	596	Uuh	Ununhexium	190	600	Uuq	Ununquadium	191	604	Uuh	Ununhexium	192	608	Uuq	Ununquadium	193	612	Uuh	Ununhexium	194	616	Uuq	Ununquadium	195	620	Uuh	Ununhexium	196	624	Uuq	Ununquadium	197	628	Uuh	Ununhexium	198	632	Uuq	Ununquadium	199	636	Uuh	Ununhexium	200	640	Uuq	Ununquadium	201	644	Uuh	Ununhexium	202	648	Uuq	Ununquadium	203	652	Uuh	Ununhexium	204	656	Uuq	Ununquadium	205	660	Uuh	Ununhexium	206	664	Uuq	Ununquadium	207	668	Uuh	Ununhexium	208	672	Uuq	Ununquadium	209	676	Uuh	Ununhexium	210	680	Uuq	Ununquadium	211	684	Uuh	Ununhexium	212	688	Uuq	Ununquadium	213	692	Uuh	Ununhexium	214	696	Uuq	Ununquadium	215	700	Uuh	Ununhexium	216	704	Uuq	Ununquadium	217	708	Uuh	Ununhexium	218	712	Uuq	Ununquadium	219	716	Uuh	Ununhexium	220	720	Uuq	Ununquadium	221	724	Uuh	Ununhexium	222	728	Uuq	Ununquadium	223	732	Uuh	Ununhexium	224	736	Uuq	Ununquadium	225	740	Uuh	Ununhexium	226	744	Uuq	Ununquadium	227	748	Uuh	Ununhexium	228	752	Uuq	Ununquadium	229	756	Uuh	Ununhexium	230	760	Uuq	Ununquadium	231	764	Uuh	Ununhexium	232	768	Uuq	Ununquadium	233	772	Uuh	Ununhexium	234	776	Uuq	Ununquadium	235	780	Uuh	Ununhexium	236	784	Uuq	Ununquadium	237	788	Uuh	Ununhexium	238	792	Uuq	Ununquadium	239	796	Uuh	Ununhexium	240	800	Uuq	Ununquadium	241	804	Uuh	Ununhexium	242	808	Uuq	Ununquadium	243	812	Uuh	Ununhexium	244	816	Uuq	Ununquadium	245	820	Uuh	Ununhexium	246	824	Uuq	Ununquadium	247	828	Uuh	Ununhexium	248	832	Uuq	Ununquadium	249	836	Uuh	Ununhexium	250	840	Uuq	Ununquadium	251	844	Uuh	Ununhexium	252	848	Uuq	Ununquadium	253	852	Uuh	Ununhexium	254	856	Uuq	Ununquadium	255	860	Uuh	Ununhexium	256	864	Uuq	Ununquadium	257	868	Uuh	Ununhexium	258	872	Uuq	Ununquadium	259	876	Uuh	Ununhexium	260	880	Uuq	Ununquadium	261	884	Uuh	Ununhexium	262	888	Uuq	Ununquadium	263	892	Uuh	Ununhexium	264	896	Uuq	Ununquadium	265	900	Uuh	Ununhexium	266	904	Uuq	Ununquadium	267	908	Uuh	Ununhexium	268	912	Uuq	Ununquadium	269	916	Uuh	Ununhexium	270	920	Uuq	Ununquadium	271	924	Uuh	Ununhexium	272	928	Uuq	Ununquadium	273	932	Uuh	Ununhexium	274	936	Uuq	Ununquadium	275	940	Uuh	Ununhexium	276	944	Uuq	Ununquadium	277	948	Uuh	Ununhexium	278	952	Uuq	Ununquadium	279	956	Uuh	Ununhexium	280	960	Uuq	Ununquadium	281	964	Uuh	Ununhexium	282	968	Uuq	Ununquadium	283	972	Uuh	Ununhexium	284	976	Uuq	Ununquadium	285	980	Uuh	Ununhexium	286	984	Uuq	Ununquadium	287	988	Uuh	Ununhexium	288	992	Uuq	Ununquadium	289	996	Uuh	Ununhexium	290	1000	Uuq	Ununquadium

Key

Relative atomic mass
Symbol
Name
Atomic number

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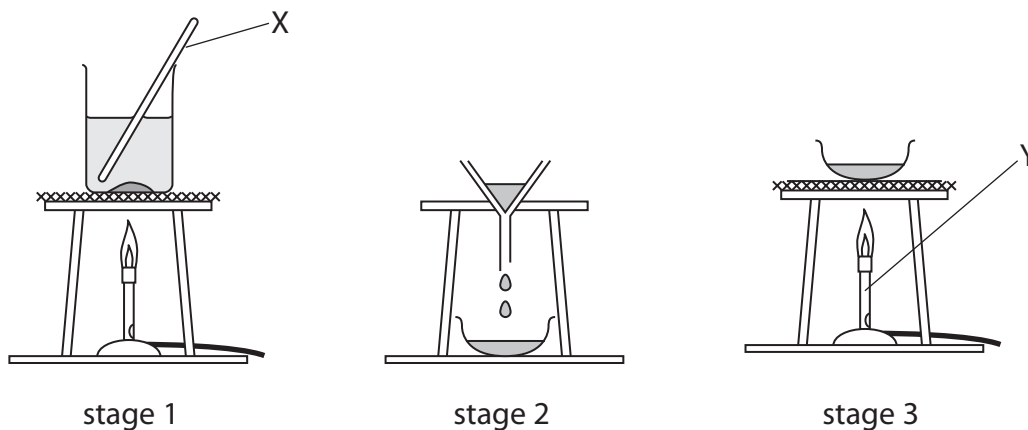


P 4 5 7 2 9 A 0 3 2 0

Answer ALL questions.

- 1 The diagram shows the apparatus a student uses to separate a mixture of salt and sand.

She adds the mixture to water in a beaker and then carries out the three stages shown.



- (a) Give the names of the pieces of apparatus labelled X and Y.

(2)

X

Y

- (b) (i) A liquid that dissolves substances is a

(1)

- A solute
- B solution
- C solvent
- D suspension

- (ii) The clear liquid that forms in stage 1 is a

(1)

- A solute
- B solution
- C solvent
- D suspension

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(c) (i) At which stage, 1, 2 or 3, is the sand collected?

(1)

(ii) At which stage, 1, 2 or 3, is the salt collected?

(1)

(d) What happens to the water in stage 3?

(1)

(Total for Question 1 = 7 marks)

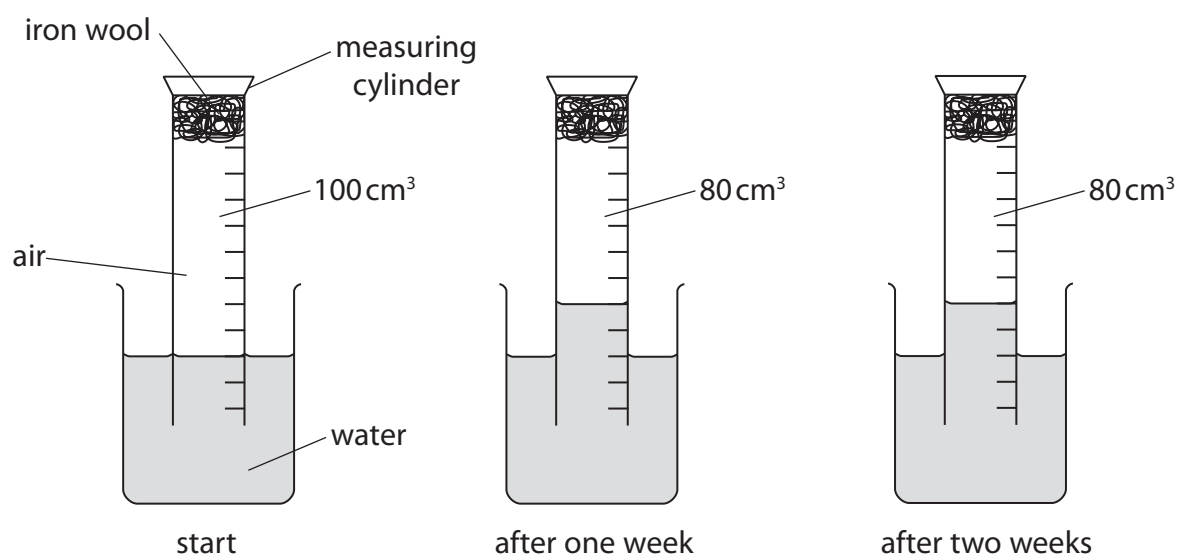
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2 The apparatus in the diagram was set up to demonstrate the rusting of iron.



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- (a) One week after the start of the experiment the volume of gas in the measuring cylinder has decreased.

After two weeks there is no further decrease in volume of gas in the measuring cylinder.

Explain these observations.

(2)

.....

.....

.....

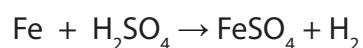
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- (b) Iron reacts with dilute sulfuric acid. The chemical equation for this reaction is



Complete the word equation for the reaction.

(2)

Iron + sulfuric acid → +





(c) Aqueous sodium hydroxide can be used to distinguish between solutions containing iron(II) ions (Fe^{2+}) and iron(III) ions (Fe^{3+}).

State the observation made when aqueous sodium hydroxide is added separately to each solution.

(2)

$\text{Fe}^{2+}(\text{aq})$

$\text{Fe}^{3+}(\text{aq})$

(Total for Question 2 = 6 marks)

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3 The diagram shows the elements in Period 3 of the Periodic Table.

Na	Mg	Al	Si	P	S	Cl	Ar
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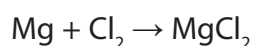
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(a) (i) Identify an element in Period 3 that forms a basic oxide. (1)

(ii) Identify an element in Period 3 that forms an acidic oxide. (1)

(b) Magnesium and chlorine react together to form magnesium chloride, a compound with ionic bonding.

The equation for the reaction is



(i) Complete the dot and cross diagram to show the arrangement of the outer electrons in the magnesium and chloride ions formed.

Show the charge on each ion.

(3)



(ii) State what is meant by the term **ionic bonding**. (2)



4 Crystals of copper(II) nitrate, $\text{Cu}(\text{NO}_3)_2$, can be prepared by reacting solid copper(II) oxide, CuO , with dilute nitric acid.

(a) Write a chemical equation for this reaction.

(1)

(b) A student is given a sample of copper(II) oxide containing small amounts of insoluble impurities.

The passage is from her notebook and describes the method she uses to prepare some pure, dry crystals of copper(II) nitrate from her sample of copper(II) oxide.

Stage 1: Place 50cm^3 of dilute nitric acid into a beaker and warm.

Stage 2: Add the impure copper(II) oxide a little at a time and stir, until it is in excess.

Stage 3: Filter the mixture.

Stage 4: Heat the filtrate until the crystallisation point is reached.

Stage 5: Allow the filtrate to cool.

Stage 6: Filter off the crystals and dry with filter paper.

(i) Why is the acid warmed in stage 1?

(1)

(ii) How will the student know when the copper(II) oxide is in excess in stage 2?

(1)

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(iii) How will the student know when the crystallisation point is reached in stage 4?

(1)

(iv) In which stage are the insoluble impurities removed?

(1)

(Total for Question 4 = 5 marks)

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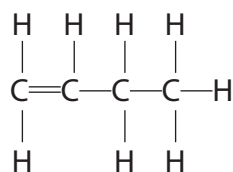
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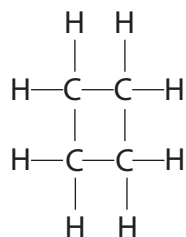
5 But-1-ene is a member of the homologous series of alkenes.

The displayed formula of but-1-ene is



The saturated compound cyclobutane is an isomer of but-1-ene.

The displayed formula of cyclobutane is



(a) (i) State what is meant by the term **isomers**.

(2)

.....

.....

.....

.....

(ii) Draw the displayed formula of another isomer of but-1-ene.

(1)

(iii) Describe a test that would distinguish between but-1-ene and cyclobutane.

(3)

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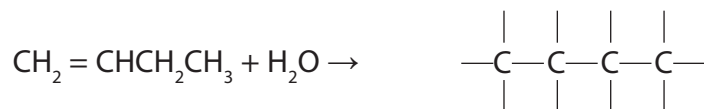
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(b) Using your knowledge of the reactions of ethene, complete the two chemical equations to show the formula of the organic product.

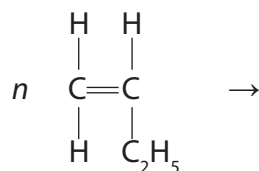
(i) The reaction between but-1-ene and steam.

(1)



(ii) The polymerisation of but-1-ene.

(2)



(Total for Question 5 = 9 marks)

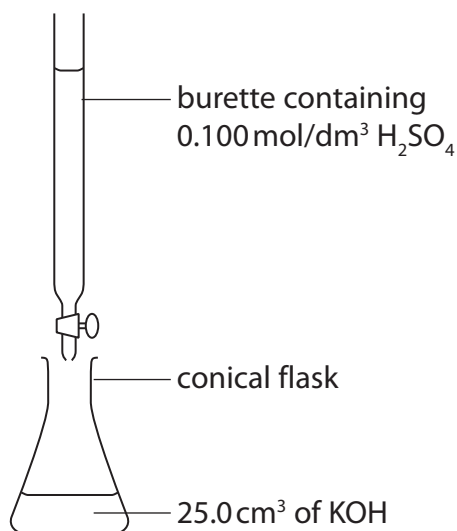
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- 6 This apparatus can be used in a method to find the volume of sulfuric acid required to neutralise a solution of potassium hydroxide (KOH).



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- (a) What name is given to this method?

(1)

- (b) Which piece of apparatus should be used to measure the 25.0 cm³ of KOH?

(1)

- A beaker
- B measuring cylinder
- C pipette
- D syringe

- (c) State the colours that are seen if methyl orange is used as the indicator.

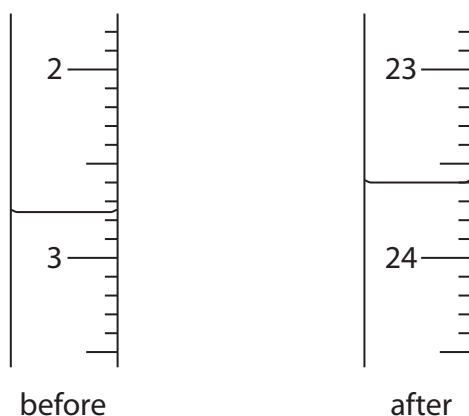
(2)

colour before adding the acid.....

colour after KOH is neutralised.....



- (d) A student carries out the experiment. His burette readings are shown in the diagram.



Use the diagram to complete the table. Give the readings to the nearest 0.05 cm³.

(3)

Burette reading after adding the acid	
Burette reading before adding the acid	
Volume in cm ³ of acid added	

- (e) A second student did the experiment four times, using a different solution of potassium hydroxide. The table shows her results.

Volume in cm ³ of acid added	22.90	22.60	22.45	22.55
Concordant results (✓)				

Concordant results are those within 0.20 cm³ of one another.

- (i) Place ticks in the table to indicate which results are concordant with one another. (1)
- (ii) Use your ticked results to calculate the average (mean) volume of acid added. (2)

average (mean) volume of acid = cm³

(Total for Question 6 = 10 marks)

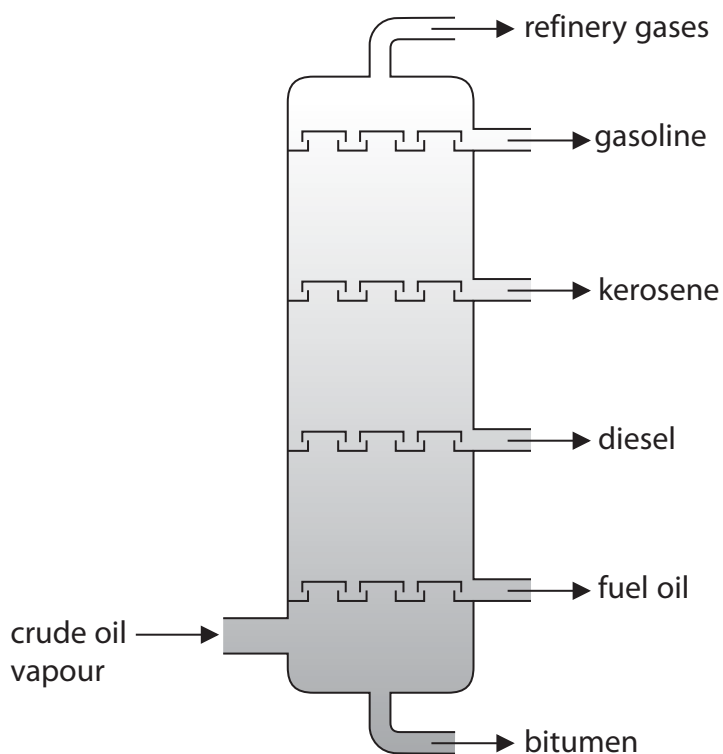
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- 7 Crude oil is a complex mixture of organic compounds called hydrocarbons. It is separated into fractions using a fractionating tower.



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(a) Which fraction has the lowest boiling point?

(1)

(b) Which fraction is the most viscous?

(1)



- (c) (i) Some fractions containing long-chain hydrocarbons are cracked. The cracking of octadecane, (C₁₈H₃₈), produces octane, (C₈H₁₈), and one other product.

Write a chemical equation for this cracking reaction.

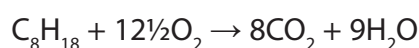
(1)

- (ii) Explain why it is important to crack long-chain hydrocarbon fractions.

(2)

- (d) Octane is one of the hydrocarbons in the petrol used in cars.

The equation for the complete combustion of octane is



The incomplete combustion of octane produces a poisonous gas that reduces the capacity of blood to carry oxygen.

Write a chemical equation for this incomplete combustion of octane.

(2)

(Total for Question 7 = 7 marks)

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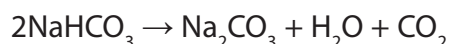
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8 This is a recipe for making Irish soda bread.

- add 170 g of wholemeal flour, 170 g of plain flour, 10 g of salt and 10.5 g of bicarbonate of soda (sodium hydrogencarbonate, NaHCO_3) to a bowl and stir
- pour in 290 cm^3 of buttermilk and stir quickly to form a soft dough
- form the dough into a round ball and slightly flatten it
- cut a cross in the top and bake for 30 minutes in an oven at 200°C

When sodium hydrogencarbonate is heated, it forms carbon dioxide gas.



- (a) Calculate the mass, in grams, of carbon dioxide that would be produced by completely decomposing 10.5 g of sodium hydrogencarbonate.
[M_r of $\text{NaHCO}_3 = 84$]

(2)

mass of carbon dioxide = g

- (b) Use your answer from part (a) to calculate the volume, in cm^3 , at room temperature and pressure, of carbon dioxide that would be produced by completely decomposing 10.5 g of sodium hydrogencarbonate.

Assume one mole of carbon dioxide has a volume of $24\,000\text{ cm}^3$ at room temperature and pressure.

(2)

volume of carbon dioxide = cm^3

(Total for Question 8 = 4 marks)

TOTAL FOR PAPER = 60 MARKS

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