

Write your name here

Surname

Other names

Pearson Edexcel Certificate

Centre Number

Candidate Number

**Pearson Edexcel
International GCSE**

Chemistry

Unit: KCH0/4CH0**Paper: 2C**

Friday 16 January 2015 – Morning

Time: 1 hour

Paper Reference

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

Calculator

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.
- Keep an eye on the time.
- 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 ►

P44255A

©2015 Pearson Education Ltd.

1/1/1/1/

**PEARSON**

THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0

1	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; padding: 2px; text-align: center;"> 1 H Hydrogen 1 </div> <div style="border: 1px solid black; padding: 2px; text-align: center;"> 4 He Helium 2 </div> </div>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
2	7	9															20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	Li Lithium 3	Be Beryllium 4															Ne Neon 10																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
3	23	24															35.5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	Na Sodium 11	Mg Magnesium 12															Cl Chlorine 17																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
4	39	40															79																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	K Potassium 19	Ca Calcium 20															Se Selenium 34																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
5	86	88															127																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	Rb Rubidium 37	Sr Strontium 38															I Iodine 53																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
6	133	137															210																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	Cs Caesium 55	Ba Barium 56															Po Polonium 84																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
7	223	226															210																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	Fr Francium 87	Ra Radium 88															At Astatine 85																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
																	Rn Radon 86																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
			11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200	202	204	206	208	210	212	214	216	218	220	222	224	226	228	230	232	234	236	238	240	242	244	246	248	250	252	254	256	258	260	262	264	266	268	270	272	274	276	278	280	282	284	286	288	290	292	294	296	298	300	302	304	306	308	310	312	314	316	318	320	322	324	326	328	330	332	334	336	338	340	342	344	346	348	350	352	354	356	358	360	362	364	366	368	370	372	374	376	378	380	382	384	386	388	390	392	394	396	398	400	402	404	406	408	410	412	414	416	418	420	422	424	426	428	430	432	434	436	438	440	442	444	446	448	450	452	454	456	458	460	462	464	466	468	470	472	474	476	478	480	482	484	486	488	490	492	494	496	498	500	502	504	506	508	510	512	514	516	518	520	522	524	526	528	530	532	534	536	538	540	542	544	546	548	550	552	554	556	558	560	562	564	566	568	570	572	574	576	578	580	582	584	586	588	590	592	594	596	598	600	602	604	606	608	610	612	614	616	618	620	622	624	626	628	630	632	634	636	638	640	642	644	646	648	650	652	654	656	658	660	662	664	666	668	670	672	674	676	678	680	682	684	686	688	690	692	694	696	698	700	702	704	706	708	710	712	714	716	718	720	722	724	726	728	730	732	734	736	738	740	742	744	746	748	750	752	754	756	758	760	762	764	766	768	770	772	774	776	778	780	782	784	786	788	790	792	794	796	798	800	802	804	806	808	810	812	814	816	818	820	822	824	826	828	830	832	834	836	838	840	842	844	846	848	850	852	854	856	858	860	862	864	866	868	870	872	874	876	878	880	882	884	886	888	890	892	894	896	898	900	902	904	906	908	910	912	914	916	918	920	922	924	926	928	930	932	934	936	938	940	942	944	946	948	950	952	954	956	958	960	962	964	966	968	970	972	974	976	978	980	982	984	986	988	990	992	994	996	998	1000

Key

Relative atomic mass

Symbol

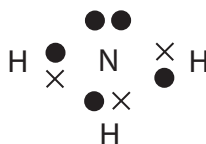
Name

Atomic number



Answer ALL questions.

1 The diagram represents a particle of ammonia.



(a) This particle of ammonia is

(1)

- A an atom
- B an ion
- C a lattice
- D a molecule

(b) Which type of bonding is present in this particle of ammonia?

(1)

- A covalent
- B hydrogen
- C ionic
- D metallic

(c) What is the formula of ammonia?

(1)

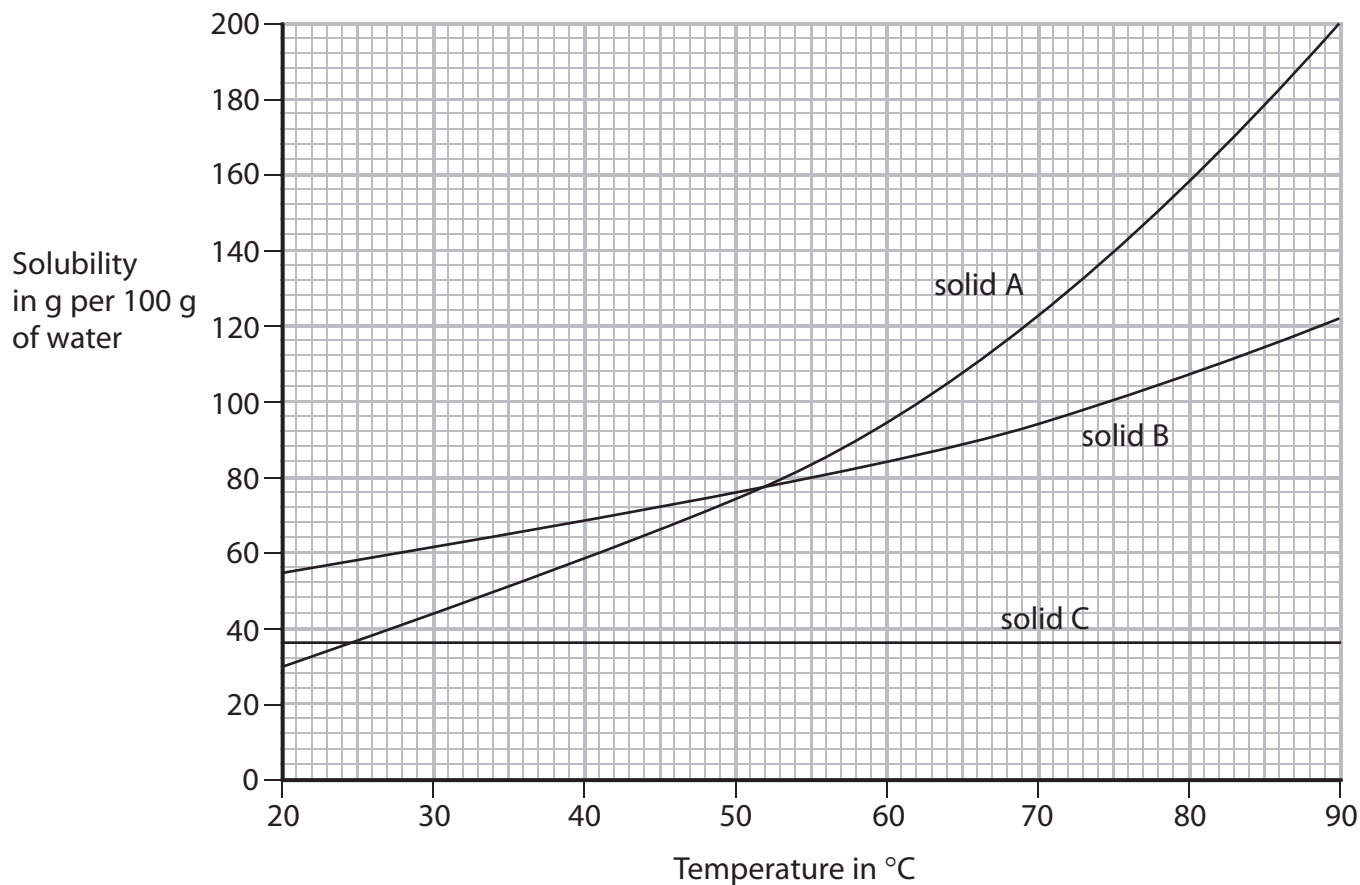
(Total for Question 1 = 3 marks)



- 2 The solubility of a solid in water is the maximum mass of the solid that can dissolve in 100 g of water at a given temperature.

An aqueous solution containing this maximum mass can be described as a saturated solution.

The graph shows the solubilities of three solids at different temperatures.



- (a) (i) What is the relationship between solubility and temperature for solid A?

(1)

- (ii) Which solid is the most soluble at 30 °C?

(1)



(b) Explain what you would observe if a saturated solution of solid A were cooled from 90°C to 20°C.

(2)

.....

.....

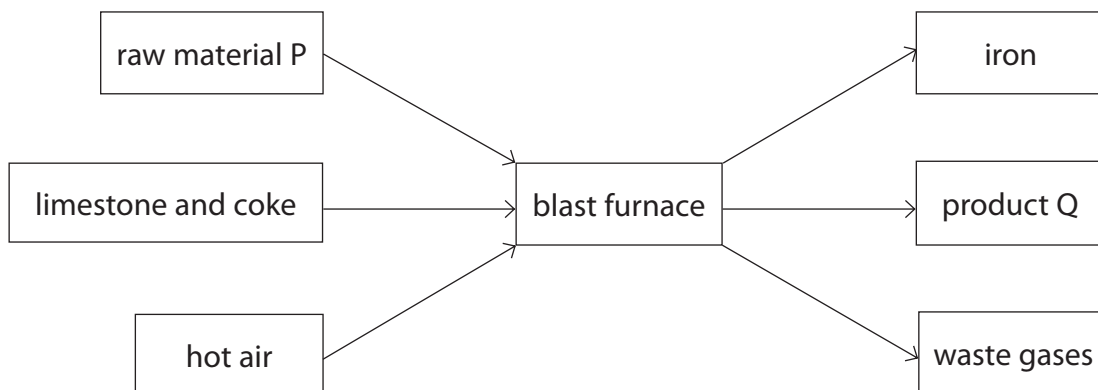
.....

.....

(Total for Question 2 = 4 marks)



3 The diagram shows how iron is produced in a blast furnace.



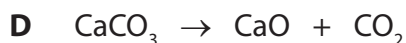
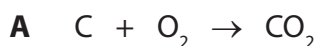
(a) Give the name of raw material P and of product Q.

(2)

raw material P

product Q

(b) The equations for some reactions in a blast furnace are



The table shows some types of reaction that occur in a blast furnace.

Complete the table by writing a letter, A, B, C, D, or E, to link each type of reaction to an appropriate reaction equation.

Each letter may be used once, more than once or not at all.

The first one has been done for you.

(3)

Type of reaction	Letter
one that gives out heat	A
one that is a thermal decomposition	
one that is a neutralisation	
one that forms a poisonous gas	



(c) The rusting of iron objects is a major problem.

Name the two substances needed for iron to rust.

(2)

1

2

(d) The order of reactivity of three metals is

most reactive

zinc

iron

tin

least reactive

Iron objects can be prevented from rusting by coating them with zinc or tin.

Some of these objects may be scratched when used, so the coating may come off.

Use the order of reactivity of the metals to suggest why coating these objects with zinc is more effective than coating them with tin.

(3)

.....

.....

.....

.....

.....

.....

.....

(Total for Question 3 = 10 marks)



4 (a) Wine can be made from grapes.

The grapes are crushed to produce an aqueous solution containing glucose.
Yeast is then added to this solution.

The solution is kept at a constant temperature for a period of time. The glucose is converted into ethanol.

(i) Name the process in which glucose is converted into ethanol. (1)

.....

(ii) What is the purpose of the yeast? (1)

.....

.....

(b) Grape vines can be attacked by a fungus that ruins the grapes. The fungus can be killed using Bordeaux mixture, a solid containing copper(II) sulfate and calcium hydroxide.

(i) State a test to show that Bordeaux mixture contains calcium ions. (2)

test for calcium ions

observation

(ii) A sample of Bordeaux mixture is dissolved in water.

Describe separate tests to show that this solution contains copper(II) ions and sulfate ions.

(5)

test for copper(II) ions

.....

observation

test for sulfate ions

.....

observation



- (c) Ethanol can be manufactured by passing a hot mixture of ethene and steam, at a high pressure, over a catalyst.

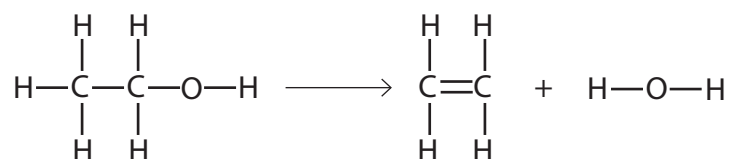
State the pressure used and name the catalyst.

(2)

pressure atm

catalyst

- (d) The equation for the conversion of ethanol into ethene can be written using displayed formulae.



The table gives some average bond energies.

Bond	Average bond energy in kJ/mol
C—C	348
C=C	612
C—H	412
C—O	360
O—H	463

Use information from the table to calculate the enthalpy change, in kJ/mol, for the conversion of ethanol into ethene.

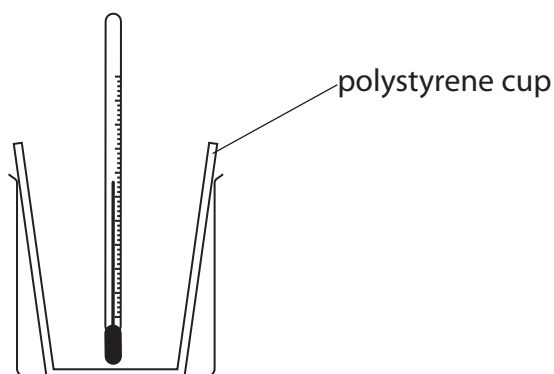
(4)

enthalpy change = kJ/mol

(Total for Question 4 = 15 marks)



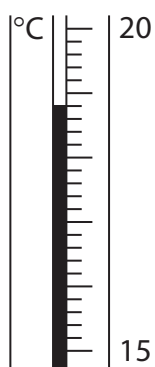
- 5 A student uses this apparatus to investigate the temperature change that occurs when potassium hydroxide is dissolved in water.



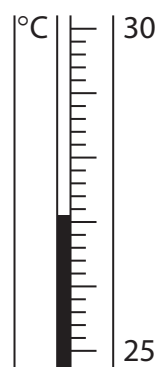
She uses this method.

- pour 50 cm^3 of water into the polystyrene cup and measure the temperature of the water
- add 3 g of potassium hydroxide and stir
- record the highest temperature of the solution

- (a) These diagrams show the thermometer readings before and after the student added the potassium hydroxide.



before



after

Use the readings to complete the table.

(3)

temperature in $^{\circ}\text{C}$ after adding potassium hydroxide	
temperature in $^{\circ}\text{C}$ before adding potassium hydroxide	
temperature change in $^{\circ}\text{C}$	



(b) The student uses her results to calculate the enthalpy change for dissolving potassium hydroxide in water.

She compares her value with a data book value.

Student's value = -32 kJ/mol .

Data book value = -55 kJ/mol .

There are no errors in the student's method or in the calculation.

Suggest two reasons why the student's value differs from the data book value.

(2)

1

.....

.....

2

.....

.....

(Total for Question 5 = 5 marks)



6 Potassium sulfide is an ionic compound.

(a) Complete the table to show the arrangement of electrons in the ions formed when potassium and sulfur react to form potassium sulfide.

Give the charge on each of the ions.

(3)

Element	Arrangement of electrons in atom	Arrangement of electrons in ion	Charge on ion
K	2.8.8.1		
S	2.8.6		

(b) (i) Explain why potassium sulfide conducts electricity when molten.

(1)

(ii) Explain why potassium sulfide has a high melting point.

(3)

(Total for Question 6 = 7 marks)

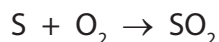


BLANK PAGE

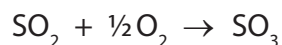


7 Sulfuric acid can be manufactured from sulfur in a four-stage process.

stage 1 sulfur is burned in air to form sulfur dioxide



stage 2 the sulfur dioxide is reacted with more oxygen to form sulfur trioxide



stage 3 the sulfur trioxide is absorbed in concentrated sulfuric acid to make oleum



stage 4 the oleum is carefully diluted with water to form sulfuric acid

(a) Write a chemical equation for the formation of sulfuric acid from oleum.

(1)

(b) A mass of 80 tonnes of sulfur is reacted with oxygen in stage 1.

Calculate the maximum mass, in tonnes, of sulfur trioxide that can be produced in stage 2.

[1 tonne = 1.0×10^6 g]

(3)

maximum mass =tonnes



(c) Calculate the minimum volume at rtp, in cubic decimetres (dm^3), of oxygen required to completely react with 64 tonnes of sulfur dioxide.

[1 mol of oxygen at rtp has a volume of 24 dm^3]

(2)

volume of oxygen = dm^3

(Total for Question 7 = 6 marks)



8 A student is supplied with aqueous solutions of these substances.

- bromine
- chlorine
- iodine
- potassium bromide
- potassium chloride
- potassium iodide

Describe two experiments the student could perform, using some of the solutions, to show the order of reactivity of bromine, chlorine and iodine.

Your answer should include the observations that the student would expect to make, and a chemical equation for one of the reactions.

(5)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 8 = 5 marks)



BLANK PAGE



9 Nitrogen dioxide (NO_2) is a brown gas.

Dinitrogen tetraoxide (N_2O_4) is a colourless gas.

The two gases can exist together in dynamic equilibrium according to the equation



A mixture of nitrogen dioxide gas and dinitrogen tetraoxide gas is allowed to reach equilibrium in a sealed container at 20°C . This equilibrium mixture is brown in colour.

(a) The sealed container is immersed in hot water at 60°C .

As the temperature of the gas mixture increases, the pressure of the gas mixture also increases.

(i) Predict the effect of the increase in temperature on the position of equilibrium.

(1)

(ii) Predict the effect of the increase in pressure on the position of equilibrium.

(1)

(iii) Suggest why it is difficult to predict which way the equilibrium will shift.

(1)



(b) Suggest why the equilibrium mixture is a darker shade of brown at 60°C than the equilibrium mixture at 20°C.

(2)

.....

.....

.....

.....

(Total for Question 9 = 5 marks)

TOTAL FOR PAPER = 60 MARKS



BLANK PAGE

