Pearson
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Mark Scheme

Sample Assessment Material 2018

Pearson Edexcel International
GCSE Chemistry (4CH1) Paper 1C

Pearson Edexcel International GCSE
in Science Double Award (4SD0) Paper 1C

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Subject specific marking guidance

Symbols, terms used in the mark scheme

- Round brackets ( ): words inside round brackets are to aid understanding of the marking point but are not required to award the point
- Curly brackets { }: indicate the beginning and end of a list of alternatives (separated by obliques), where necessary, to avoid confusion
- Oblique /: words or phrases separated by an oblique are alternatives to each other and either answer should receive full credit.
- ecf: indicates error carried forward which means that a wrong answer given in an early part of a question is used correctly to a later part of a question.

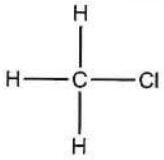
You will not see 'owtte' (or words to that effect). Alternative correct wording should be credited in every answer unless the mark scheme has specified specific.

The Additional Guidance column is used for extra guidance to clarify any points in the mark scheme. It may be used to indicate:

- what will not be accepted for that marking point in which case the phrase 'do not accept' will be alongside the relevant marking point
- it might have examples of possible acceptable answers which will be adjacent to that marking point

Question number	Answer	Additional Guidance	Marks
1 (a)	**A** (a nihonium atom has 113 protons)		1
(b) (i)	3		1
(ii)	N already used for nitrogen / Ni already used for nickel **OR** each element in the Periodic Table has its own unique symbol / cannot share a symbol with another element	ACCEPT, these are already elements for those / symbols	1
(c) (i)	**M1** <u>atoms</u> of the same element **M2** that have different masses	**ACCEPT** atoms with the same number of protons/atoms with the same atomic number.... **ACCEPT** different number of neutrons/different mass numbers	2
(ii)	**B** (173)		1
(d)	**M1** (60.1 x 69) + (39.9 x 71) **OR** 69/9.8 **M2** 6979.8÷100 **OR** 69.798 **M3** 69.8	(69 x 0.601) ÷ (71 x 0.399) **OR** 69.798 with no working scores **2** 69.8 with no working scores **3**	3

Total for Question 1 = 9 marks

Question number	Answer	Additional guidance	Marks
2 (a)	**A** (compound P)		1
(b)	CH_2		1
(c)	**C** (pentane)		1
(d)		**ACCEPT** multiple substitution	1
(e)	Student X is justified because **M1** **S** does not have a carbon-carbon double bond **M2** so cannot be an alkene / must be an alkane Student Y is justified because **M3** **S** fits the general formula C_nH_{2n} **M4** which is the general formula for alkenes	**ACCEPT** **S** only has carbon-carbon single bonds ACCEPT "saturated" for only single bonds so must be an alkane / cannot be an alkene **S** does not fit the general formula C_nH_{2n+2} which is the general formula for alkanes	4

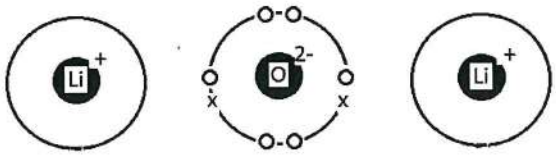
Require mention of general formula for both these marks

Total for Question 2 = 8 marks

Question number	Answer	Additional guidance	Marks
3 (a)	**2**$H_2O_2(aq) \rightarrow$ **2**$H_2O(l) + O_2(g)$	**ACCEPT** multiples	1
(b)	Any two from: temperature mass of catalyst surface area of catalyst	**IGNORE** same solution of hydrogen peroxide / water IGNORE volume of catalyst ALLOW amount of catalyst	2
(c) (i)	An explanation that links the following two points **M1** no gas would be produced **M2** because this solution would just be water / no hydrogen peroxide present to decompose	IGNORE volume of H_2O_2 **ACCEPT** the time would be infinite ACCEPT no reaction IGNORE nothing would happen IGNORE "take too long"	2
(ii)	**M1** 20 ÷ 26 **M2** = 0.77 (cm^3 per second)	0 if division the wrong way up **ACCEPT** any number of significant figures except 1	2
(iii)	**M1** correct linear scale added to y-axis **M2** axis labelled "Time taken to collect 20cm^3 of oxygen in s"	No need to label horizontal axis **ACCEPT** "Time in s" **ACCEPT** use of solidus i.e. "Time / s" **ACCEPT** use of seconds, sec in place of s If scale & label drawn for vol. of water, score 0	2
(iv)	Any point drawn at 4cm^3 on the x-axis that is above the best fit line.		1
(v)	**M1** 32 (s) **M2** vertical line from x-axis to curve at 5 cm^3 **OR** Horizontal line from the curve to the y-axis at 32 s	**ACCEPT** value read correctly to nearest gridline	2

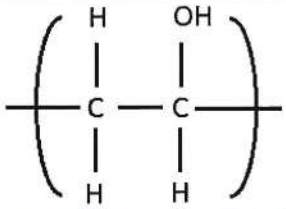
Question number	Answer	Additional guidance	Marks
(d)	**M1** $10cm^3$ of 10 volume hydrogen peroxide would produce $100cm^3$ of oxygen gas **M2** which is the maximum capacity of the gas syringe **OR** using more hydrogen peroxide would produce too much gas / push the plunger out of the gas syringe	• Needs ref. to specific volume • IGNORE references to rate and time	2 for M1

Total for Question 3 = 14 marks

Question number	Answer	Additional guidance	Marks
4 (a)	**M1** correct outer shell for oxide ion **M2** correct outer shell for **two** lithium ions **M3** charges of +1 and -2 shown on ions 	**ALLOW** any use of dots or crosses **ACCEPT** outer shell shown with two electrons ACCEPT the 2 ions shown as a multiplier either before ion or as subscript afterwards	3
(b) (i)	**M1** calculation of amount of sodium i.e. 1.38 / 23 = 0.06 mol **M2** calculation of amount of oxygen i.e. 0.96 / 16 = 0.06 mol **M3** ratio of Na : O is 1 : 1, so NaO	Answer must give formula, not just ratio	3
(ii)	78 ÷ (23 + 16) = 2, so Na_2O_2	Not mark CQ on 4(i)	1

Question number			Answer	Additional guidance	Marks
	(c)	(i)	KOH	**REJECT** symbols in wrong order	1
		(ii)	**M1** amount carbon dioxide = 5 500 000 / 44 = 125 000 mol **M2** ratio 2:1, so 250 000 moles potassium superoxide **M3** mass potassium superoxide = 250 000 x 71 = 17 750 000 = 18 million tonnes (2sf) NOTE: the calculation above can be done in megamoles i.e. with no conversion to grams **ACCEPT** 17.8 or 17.75 million tonnes **ACCEPT** answer in grams only if units have been altered on the answer line	**OR** Mr seen: CO_2 = 44 and KO_2 = 71 142 tonnes of KO_2 react with 44 tonnes of CO_2, or ratio of 2:1 seen in calculation (5.5 ÷ 44) x 142 = 17.75 = 18 million tonnes	3

Total for Question 4 = 11 marks

Question number	Answer	Notes	Marks
5 (a)	**B** (ethenol)		1
(b)	An explanation that links the following two points **M1** bromine is decolorised / turns colourless **M2** because vinyl alcohol has a double bond/is unsaturated	**IGNORE** any starting colour given ACCEPT "unsaturated" for double bond	2
(c)	**M1** single bond between the carbon atoms **M2** continuation bonds shown NOTE brackets are optional	 SCORE 1 if >1 repeat units drawn	2
(d)	**M1** M_r of the repeat unit = 2(12) + 4(1) + 16 = 44 **M2** 27 500 ÷ 44 = 625		2
(e)	impure PVA would melt over a range of temperatures / would not all melt at 200°C	**ACCEPT** impure PVA would melt below 200°C **ACCEPT** any specified range of temperatures below 200°C	1

Total for Question 5 = 8 marks

Question number	Answer	Notes	Marks
6 (a)	**B** (lilac)		1
(b)	$Al^{3+}(aq) + 3OH^-(aq) \rightarrow Al(OH)_3(s)$ **M1** balanced equation **M2** state symbols CQ on M1 very near miss	IGNORE $Na^+_{(aq)}$ ions if written separately from other ions & on both sides of equation M2 only scored if M1 near miss	2
(c)	**M1** add hydrochloric acid **M2** and barium chloride solution **M3** white precipitate	**ACCEPT** nitric acid **ACCEPT** barium nitrate	3
(d) (i)	x = 1, y = 1, z = 2 **OR** $KAl(SO_4)_2$ given as formula	**ACCEPT** other combinations that give a neutral product e.g. x = 3, y = 1, z = 3	1
(ii)	**M1** formula mass of $KAl(SO_4)_2$ = 39 + 27 + 2×(32 + (4x16)) **M2** mass water = 474 – **M1** = 216 **M3** moles water = 216 ÷ 18 = 12 **Mark CQ** on answer to (d)(i). Final answer must be a whole number.	258 scores M1	3

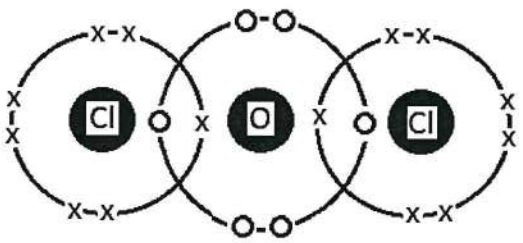
If d(i) correct and M1, M2 scored CQ then M3 can only be scored if rounding ≤ 0.1 away from whole number

Total for Question 6 = 10 marks

Question number	Answer	Additional guidance	Marks
7 (a)	Any value in the range 40 – 110 °C	Actual boiling point is 59 °C	1
(b)	**M1** colour = pale yellow **M2** state = gas	**ACCEPT** colourless ACCEPT "even pale green"	2
(c) (i)	**M1** bromine (molecules) gain electrons, so are reduced **M2** Fe^{2+} ions lose electrons, so are oxidised Score 1 for "Bromine is reduced and iron ions are oxidised"	Score 1 for "Br gains electrons & Fe ions lose electrons" if no mention of oxidation or reduction	2
(ii)	**M1** solution of suitable named iron(II) salt e.g. iron(II) nitrate **M2** chlorine water added / chlorine gas bubbled into the solution of the iron(II) salt **M3** sodium hydroxide solution added **M4** if Fe^{2+} did not react, green ppte forms **M5** if Fe^{2+} does react, red-brown ppte forms **M6** suitable safety precaution e.g. fume cupboard for using chlorine, safety glasses for using sodium hydroxide	**ACCEPT** solution containing Fe^{2+} ions IGNORE "Add Fe^{2+} ions" REJECT "placed" for bubbled ALLOW "if Fe^{2+} present then green ppte forms" ALLOW if Fe^{3+} has been made, red-brown ppte forms	6

Require formula for ion, or mention of ions

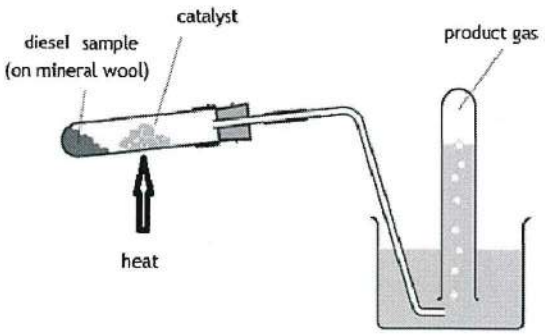
(note typo on doc)

Question number	Answer	Additional guidance	Marks
(d) (i)	**M1** shared pair of electrons between one of the Cl atoms and the O atom *These may be shown within the overlap area* **M2** 3 pairs of non-bonded electrons on a Cl atom **OR** 2 pairs of non-bonded electrons on an O atom **M3** rest of the diagram correct  	**M1** <u>both</u> shared pairs of electrons between each Cl atom and the O atom **M2** 3 pairs of non-bonded electrons on both Cl atoms **M3** **2** pairs of non-bonded electrons on O atom	3
(ii)	**M1** acidic / pH less than 7 **M2** because chlorine is a non-metal	**ACCEPT** Cl_2O is the oxide of a non-metal	2

Total for Question 7 = 16 marks

Question number	Answer	Additional guidance	Marks
8 (a)	**C** (one week)		1
(b)	iron goes rusty / turns brown		1
(c)	An explanation that links the following two points **M1** tube is held upright **M2** so that scale can be correctly read / volume recorded is accurate / to avoid parallax error	**ACCEPT** equalise the levels of water so that the gas in the test tube is at atmospheric pressure IGNORE "easily read"	2
(d) (i)	**M1** for (32 – 26) or 6 seen **M2** (6 ÷ 32) x 100% = 18.75 = 19%	 **ALLOW** 18.75 or 18.8	2
(ii)	An explanation that links the following two points **M1** volume change is small /data recorded to nearest $1cm^3$ **M2** so a small error in making the measurement will give a very different value	**ACCEPT** ALLOW not very precise graduations temperature may not be constant therefore volume of gas may alter	2
(e) (i)	**M1** percentage oxygen would be lower **M2** because some oxygen remains unreacted with the iron	Clear explanations required.	2
(ii)	**M1** no change in percentage oxygen **M2** because the iron wool is in excess		2

Total for Question 8 = 12 marks

Question number	Answer	Additional Guidance	Marks
9 (a)	**D** (octane)		1
(b) (i)	nitrogen		1
(ii)	produces acid rain		1
(iii)	An explanation that links the following three points **M1** the fuel react/combines with oxygen **M2** by complete combustion to produce carbon dioxide **M3** and incomplete combustion to produce carbon monoxide		3
(c)	**M1** Brent Crude has a higher proportion of lighter fractions **M2** lighter fractions are more economically useful / have higher demand **M3** therefore Brent Crude has a higher price than Maya crude oil **ACCEPT** reverse argument for Maya crude	**ACCEPT** named fraction e.g. gasoline	3
(d)	 **M1** diesel sample in test tube **M2** heat / Bunsen burner ← REJECT if in fractional distillation **M3** catalyst Set-up must clearly show catalyst in position for diesel vapour **M4** suitable method of collection e.g over water	**ACCEPT** named catalyst e.g. porcelain	4

Total for Question 9 = 13 marks

Question number	Answer	Additional guidance	Marks
10 (a)	**M1** in a compound, elements are chemically combined together **M2** in fixed proportions OR in a mixture, two or more elements/particles are not chemically bonded.	This applies to M1 **ACCEPT** can only be separated by chemical reactions	2
(b) (i)	**B** (chloride)		1
(ii)	**M1** magnesium is reactive, so would react with the acid (to form hydrogen) **M2** but no visible reaction / only a slow reaction when acid is added to the coin		2
(c) (i)	**M1** prevents spots spreading sideways (and merging together)	Accept "don't merge into each other" and "stop them overlapping"	1
(ii)	**M1** the iron salt is insoluble / has very low solubility in the solvent		1
(iii)	**M1** nickel and copper **M2** the Rf values of these reference samples are the same as spots in the coin solution	ACCEPT Ni^{2+} & Cu^{2+} **ACCEPT** the spots have travelled the same distance IGNORE "they both appear in the coin solution" IGNORE "line up with"	2

Total for Question 10 = 9 marks

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