Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/33**

Paper 3 Theory (Core) **May/June 2016**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

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This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

Abbreviations used in the Mark Scheme

- ; separates marking points
- / separates alternatives within a marking point
- **OR** gives alternative marking point
- **R** reject
- **I** ignore mark as if this material was not present
- **A** accept (a less than ideal answer which should be marked correct)
- **COND** indicates mark is conditional on previous marking point
- owtte or words to that effect (accept other ways of expressing the same idea)
- max indicates the maximum number of marks that can be awarded
- ecf credit a correct statement that follows a previous wrong response
- ( ) the word / phrase in brackets is not required, but sets the context
- ora or reverse argument

Question	Answer	Marks
1(a)(i)	C **and** E;	**1**
1(a)(ii)	B;	**1**
1(a)(iii)	B;	**1**
1(a)(iv)	B;	**1**
1(a)(v)	$C_5H_5Cl_5$ / CHC*l*;	**1**
1(b)(i)	different number of neutrons / different mass numbers / different numbers of nucleons;	**1**
1(b)(ii)	8;	**1**

Question	Answer	Marks
2(a)	T; (very) good / best conductor of heat; has a high melting point;	**3** 1 1 1
2(b)	filtration / filter;	**1**
2(c)(i)	breakdown of an ionic compound by the passage of electricity (1 mark for breakdown of a compound by the passage of / using electricity)	**2**
2(c)(ii)	two electrodes dipping into a liquid and connected to power supply; anode **OR** cathode correctly labelled / positive **OR** negative electrode correctly labelled; electrolyte labelled;	**3** 1 1 1
2(d)	saves valuable resources / saves energy / reduces pollution / saves waste / saves named resource / reduces need for mining ore;	**1**

Question	Answer	Marks
3(a)(i)	black / grey-black / grey;	**1**
3(a)(ii)	(boiling point) increases down the Group / decreases up the Group;	**1**
3(a)(iii)	liquid; –50 °C is above the melting but below the boiling point / –50 °C is between the melting point and the boiling point;	**2** 1 1
3(b)(i)	potassium bromide; astatine;	**2** 1 1
3(b)(ii)	bromine is less reactive than chlorine / chlorine more reactive than bromine;	**1**
3(c)	220.5 (1 mark for 1 correct row, e.g. (3 × 16 =) 48 or (1 × 35.5 =) 35.5)	**2**
3(d)	methyl orange is red / pink in hydrochloric acid; methyl orange is yellow / orange in sodium hydroxide;	**2** 1 1
3(e)	chromatography paper in beaker; bottom of chromatography paper dipping in solvent / liquid; chromatography paper / filter paper correctly labelled **OR** solvent / liquid correctly labelled;	**3** 1 1 1

Question	Answer	Marks
4(a)	compound containing carbon and hydrogen <u>only</u>;	**1**
4(b)	any 5 of: • petroleum vaporised (in furnace); • column is hot at the bottom and cool at the top; • smaller / lighter molecules move higher up the column ora; • fractions with lower boiling points move further up column ora; • smaller / lighter molecules have lower boiling points ora; • fractions condense when the temperature in the column falls below the (average) boiling point of the fraction;	**5**
4(c)(i)	the higher the values of the boiling range, the greater the number of (carbon) atoms / boiling range is higher, the greater the number of (carbon) atoms / the more atoms, the more energy it takes to boil;	**1**
4(c)(ii)	52%;	**1**
4(c)(iii)	A;	**1**
4(c)(iv)	road surfaces / roofing / cattle sprays / synthetic crude oil / battery sealant / treating fences / waterproofing;	**1**
4(d)(i)	high temperature / heat;	**1**
4(d)(ii)	C_5H_{10};	**1**

Question	Answer	Marks
5(a)	maximum 4 from: • high melting point / high boiling point; • high density; • conducts heat / conducts electricity; • hard / strong; • malleable / ductile; • sonorous; • silvery / shiny; • magnetic; maximum 3 from: • reacts with oxygen / rusts; • reacts with steam; • reacts with chlorine; • catalytic activity;	**5**
5(b)(i)	low melting point / low boiling point; does not conduct electricity;	**2** 1 1
5(b)(ii)	carbon monoxide is given off; (carbon monoxide) is poisonous / toxic;	**2** 1 1

Question	Answer	Marks
6(a)	reversible reaction;	**1**
6(b)	high temperature / heat; catalyst / correctly named catalyst;	**2** 1 1
6(c)	exothermic; products have less energy than reactants;	**2** 1 1
6(d)(i)	(percentage yield) decreases as temperature increases;	**1**
6(d)(ii)	32%;	**1**
6(e)(i)	structure of ethanol completed to show all atoms and all bonds;	**1**
6(e)(ii)	any suitable use, e.g. fuel / solvent;	**1**
6(e)(iii)	2 (CO_2); 3 (H_2O);	**2** 1 1

Question	Answer	Marks
7(a)	open the stopcock / open the tap / allow sulfuric acid to drip onto the iron;	**1**
7(b)(i)	reaction complete / reaction finished / no more sulfuric acid left;	**1**
7(b)(ii)	3 minutes / 180 s (unit required);	**1**
7(b)(iii)	line of steeper gradient than the one shown on the grid and starting at (0, 0); line ends at the same volume as the one shown on the grid but reaches this volume sooner;	**2** 1 1
7(c)	faster reaction / rate increases / reaction speeds up; (zinc) powder has larger surface area ora;	**2** 1 1
7(d)(i)	(substance containing) 2 or more different atoms bonded / joined together;	**1**
7(d)(ii)	named sulfur ore, e.g. zinc sulfide / underground deposits of element;	**1**
7(d)(iii)	preservative / bleach / papermaking / wine-making;	**1**

Question	Answer	Marks
8(a)	volume decreases as pressure increases; reference to rate of change is more rapid at first / rate of change decreases / correct reference to curve;	**2** 1 1
8(b)	(distance) increases;	**1**
8(c)(i)	carbon dioxide loses oxygen;	**1**
8(c)(ii)	"reaction of an acid with a metal oxide" box ticked;	**1**
8(c)(iii)	any 2 from: • climate change / more extreme weather; • desertification; • melting ice caps; • rise in sea levels / increased flooding of low-lying areas; • temperature of atmosphere / oceans increases; • habitat loss;	**2**