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CHEMISTRY **0620/33**

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

MARK SCHEME

Maximum Mark: 80

Published

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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

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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**

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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**

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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

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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**

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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

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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

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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**

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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**

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