Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY (US) **0439/43**

Paper 4 Theory (Extended) **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)	A;	**1**
1(a)(ii)	B;	**1**
1(a)(iii)	D;	**1**
1(a)(iv)	C;	**1**
1(a)(v)	C;	**1**
1(b)(i)	(hot) air;	**1**
1(b)(ii)	(molten) iron;	**1**
1(b)(iii)	any 2 from: carbon dioxide; carbon monoxide; nitrogen;	**2**
1(c)(i)	as the percentage of carbon increases, so the malleability decreases;	**1**
1(c)(ii)	 **M1** oxygen (gas) blown in; **M2** carbon dioxide formed / $C + O_2 \rightarrow CO_2$;	**2** 1 1

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Question	Answer	Marks
2(a)	butane;	**1**
2(b)	compounds: E **and** F; general formula: C_nH_{2n+2}; **OR** compounds: A **and** B; general formula: C_nH_{2n};	**2** 1 1 1 1
2(c)	compounds: E **and** F; explanation: same molecular formula / contain the same number of atoms each element; different structures / different structural formulae / different arrangement of atoms;	**3** 1 2
2(d)	contains a double bond / not all bonds are single bonds; C and H only;	**2** 1 1
2(e)	$C_2H_4 + H_2O \rightarrow C_2H_5OH$; any 2 from: high temperature / 220 °C–350 °C; high pressure / 60 atm–70 atm; phosphoric acid catalyst;	**3** 1 2

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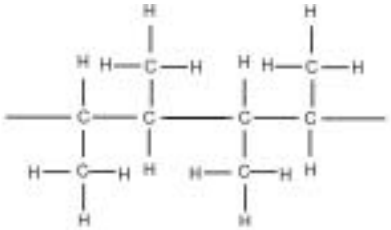
Question	Answer	Marks
2(f)	 **M1** correct carbon structure with only single bonds; **M2** continuation bonds;	**2**

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Question	Answer	Marks
3(a)	any 2 from: carbon dioxide; nitrogen; any named noble gas;	**2**
3(b)	any 6 from: carbon monoxide; from incomplete combustion (of carbon-containing fuel); sulfur dioxide; from burning fossil fuels / roasting ores which contain sulphur / volcanoes; oxides of nitrogen; nitrogen reacting with oxygen in car engines / lightning; methane; from anaerobic decomposition / anaerobic decay;	**6**

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Question	Answer	Marks
4(a)(i)	**M1** movement of electron(s) from potassium to iodine; **M2** one electron transferred;	**2** 1 1
4(a)(ii)	**M1** regular arrangement / (giant) lattice of alternating; **M2** positive potassium ions / K^+ **and** negative iodide ions / I^-;	**2** 1 1
4(a)(iii)	**M1** strong (forces of) attraction (between oppositely charged ions) / ionic bonds are strong; **M2** which require lots of energy to overcome / break;	**2** 1 1
4(b)(i)	**M1** dissolve solids (in water) and mix / combine / add; **M2** filter; **M3** wash the residue (with water); **M4** leave to dry / place in oven / dry between filter papers;	**4** 1 1 1 1
4(b)(ii)	$Pb^{2+} + 2I^- \rightarrow PbI_2$ formulae of ions correct; rest correct;	**2**
4(c)(i)	start colour: colourless; end colour: brown;	**2** 1 1
4(c)(ii)	**M1** iodide / I^-; **M2** it is oxidised **OR** it loses electrons / it increases oxidation number / it reduces the chlorine;	**2** 1 1

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Question	Answer	Marks
5(a)	carbon dioxide / a gas is made;	**1**
5(b)(i)	red;	**1**
5(b)(ii)	0.001;	**1**
5(b)(iii)	0.0005;	**1**
5(b)(iv)	0.031 (2 marks) **M1 (iii)** / 0.0162;	**2**
5(c)	0.48 (dm^3) **M1** moles carbon dioxide = 0.02; **M2** volume carbon dioxide = 0.02 × 24; **M3** = 0.48 (dm^3);	**3** 1 1 1

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Question	Answer	Marks
6(a)(i)	$NH_3 + HCl \rightarrow NH_4Cl$;	**1**
6(a)(ii)	diffusion;	**1**
6(a)(iii)	solid forms at: A; explanation: ammonia molecules / particles have a smaller mass; (and so) move / diffuse faster;	**3** 1 2
6(a)(iv)	**M1** solid forms in less time / faster / quicker; **M2** particles / molecules have more energy; **M3** (and so) move faster / diffuse faster;	**3** 1 1 1
6(b)(i)	test: add sodium hydroxide (solution and warm); result: test gas / ammonia with (red) litmus / Universal Indicator / pH paper; indicator turns blue / ammonia produced;	**3** 1 2
6(b)(ii)	test: add silver nitrate (solution); result: add (dilute) nitric acid; white precipitate;	**3** 1 2

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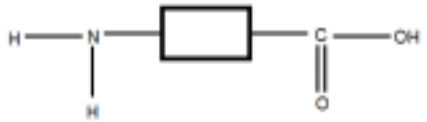
Question	Answer	Marks
6(c)(i)	covalent;	**1**
6(c)(ii)	**M1** one shared pair of electrons between each N and H; **M2** one shared pair of electrons between the N atoms; **M3** one lone pair on each N and no additional electrons anywhere;	**3** 1 1 1
6(d)(i)	amide;	**1**
6(d)(ii)	proteins are made from more than two monomers; **OR** nylon is made from 1 or 2 monomers (only);	**1**
6(d)(iii)	amino acids;	**1**
6(e)	 ;	**1**

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