CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 series

0620 CHEMISTRY

0620/21 Paper 2 (Core Theory), maximum raw mark 80

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.

Cambridge is publishing the mark schemes for the May/June 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

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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

Question	Answer	Marks
1(a)(i)	D / graphite / carbon;	1
1(a)(ii)	C / ethane;	1
1(a)(iii)	B / $CaCO_3$ / calcium carbonate;	1
1(a)(iv)	D / graphite / carbon;	1
1(a)(v)	A / CO_2 / carbon dioxide;	1
1(a)(vi)	B / calcium / calcium carbonate / Ca^{2+};	1
1(b)	calcium carbonate; carbon dioxide;	2
1(c)	limewater / calcium hydroxide / $Ca(OH)_2$; **COND** turns milky / turns cloudy / gives a white precipitate;	2

Question	Answer	Marks
2(a)	temperature rises;	1
2(b)	structure of ethanol completed correctly;	1
2(c)(i)	ethene + water → ethanol;	1
2(c)(ii)	2nd and 4th boxes ticked (one mark each);	2
2(c)(iii)	(aqueous bromine) decolourised / goes colourless;	1
2(d)	filter (off the solids); distillation; *one of:* • (distil) filtrate; • fractional (distillation) / fractionating (column);	3

Question	Answer	Marks
3(a)(i)	breakdown / decomposition of compound using electricity;	1
3(a)(ii)	U;	1
3(b)	sodium / Na; bromine / Br_2;	2
3(c)	pH 7;	1
3(d)(i)	ions / cations **and** anions;	1
3(d)(ii)	solid (particles / ions) close together; (particles / ions) regularly arranged / in rows / lattice;	2
3(e)	Br_2; 2(Na);	2
3(f)	atoms with same number of protons but different number of neutrons / atoms with same atomic number but different number of neutrons / atoms with same number of protons but different mass number;	1

Question	Answer	Marks
4(a)	(gas) syringe or measuring cylinder correctly labelled; (gas) tube leading from closed apparatus to flask or from inverted measuring cylinder with mouth underwater to flask; **COND** workable apparatus and apparatus airtight / no gaps in apparatus;	**3**
4(b)(i)	44–48 (seconds);	**1**
4(b)(ii)	41 (cm^3);	**1**
4(b)(iii)	initial gradient less than the original line AND starting at 0–0; ends up at same final volume;	**2**
4(b)(iv)	increased (rate) / faster (rate) / quicker;	**1**
4(c)(i)	pair of electrons between two (hydrogen) atoms;	**1**
4(c)(ii)	covalent;	**1**
4(d)	sulfuric acid; magnesium oxide / magnesium hydroxide / magnesium carbonate;	**2**

Question	Answer	Marks
5(a)	COOH group circled;	1
5(b)(i)	30;	1
5(b)(ii)	speeds up reaction / increases rate (of reaction);	1
5(b)(iii)	poisonous / toxic / death;	1
5(c)(i)	gain of electrons / loss of oxygen / decrease in oxidation number;	1
5(c)(ii)	carbon;	1
5(d)	grind grape skins / blend skins / crush skins; (grape skins) in water / in solvent / in named solvent; filter (off the solid / grape skins);	3
5(e)	ethene;	1
5(f)(i)	high temperature; catalyst / aluminium oxide / zeolites;	2
5(f)(ii)	4 (C_2H_4);	1

Question	Answer	Marks
6(a)(i)	B and D; they have low(er) density / they are soft;	2
6(a)(ii)	*Any two of:* • high densities; • high melting points / high boiling points; • catalysts; • (compounds have) variable valency / variable oxidation numbers / form ions with different charges; • form coloured compounds; • form complex ions;	2
6(a)(iii)	3 (Co); 4 (H_2);	2
6(a)(iv)	*Any 3 of:* • oxygen blown through molten iron / oxygen added to molten iron; • (oxygen) reacts with impurities / carbon / silicon / phosphorus; • oxides formed; • calcium oxide added / lime added / limestone / calcium carbonate added; • (calcium oxide) reacts with acidic oxides / silicon dioxide / oxides of phosphorus; • idea of slag being formed; • statement about removal of impurities e.g. CO_2 formed escapes as gas / slag removed from surface of molten iron; • other metals added;	3

Question	Answer	Marks
6(b)	(lithium) hydroxide / (potassium) hydroxide; hydrogen / H_2; *3 marks from any 3 differences in observations* e.g. • more bubbles with K ORA; • it / K moves faster (on water surface) ORA; • Li does not catch fire / K catches fire / K bursts into flame; • it / K fizzes more than Li ORA; • it / K disappears rapidly; • K explodes / lithium does not explode; • K melts / ball with K / lithium does not melt / does not go into ball;	**5**

Question	Answer	Marks
7(a)	• liquids / water have particles close together / touching; • gases / helium have particles far apart / room between gas particles / more space between gas particles; • volume of liquid does not decrease / liquid not compressed / liquid not squeezed / plunger does not move; • volume of gas decreases / gas compressed / plunger moves;	**4**
7(b)(i)	increases / gets larger;	**1**
7(b)(ii)	2,8;	**1**
7(b)(iii)	liquid;	**1**
7(b)(iv)	krypton;	**1**
7(c)	He: number of neutrons = 1; Ar: number of electrons = 18; symbol for neon is $^{21}_{10}Ne$;	**3**