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.

® IGCSE is the registered trademark of Cambridge International Examinations.

CAMBRIDGE
International Examinations

https://xtremepape.rs/

https://xtremepape.rs/

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

© Cambridge International Examinations 2015

https://xtremepapers/

Question	Answer	Marks	Guidance
1(a)(i)	D / graphite / carbon;	1	
1(a)(ii)	C / ethane;	1	
1(a)(iii)	B / $CaCO_3$ / calcium carbonate;	1	**A** D / carbon
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	**I** $CaCO_3$ **I** CO_2
1(c)	limewater / calcium hydroxide / $Ca(OH)_2$; **COND** turns milky / turns cloudy / gives a white precipitate;	2	

Question	Answer	Marks	Guidance
2(a)	temperature rises;	1	**A** gives off heat **I** bubbles given off
2(b)	structure of ethanol completed correctly;	1	**A** OH in place of O–H
2(c)(i)	ethene + water → ethanol;	1	**A** ethene + steam → ethanol **A** correct symbol equation **I** steam over the arrow
2(c)(ii)	2nd and 4th boxes ticked (one mark each);	2	
2(c)(iii)	(aqueous bromine) decolourised / goes colourless;	1	**I** aqueous bromine goes clear / discoloured **I** incorrect colour of bromine **A** colourless solution

© Cambridge International Examinations 2015

https://xtremepape.rs/

Question	Answer	Marks	Guidance
2(d)	filter (off the solids); distillation; *one of:* • (distil) filtrate; • fractional (distillation) / fractionating (column);	3	**A** boil and condense **I** heat / boil unqualified

Question	Answer	Marks	Guidance
3(a)(i)	breakdown / decomposition of compound using electricity;	1	**A** separation of compounds to elements using electricity **A** substances in place of compounds **A** breakdown of ionic bonds using electricity **I** separation of elements by electricity / plating using electricity / separation of compounds to elements unqualified / separating metals by electricity
3(a)(ii)	U;	1	
3(b)	sodium / Na; bromine / Br_2;	2	**R** sodium ions **R** bromide / bromine water / Br
3(c)	pH 7;	1	
3(d)(i)	ions / cations **and** anions;	1	**A** ionic / ionic bond **I** cations on own / anions on own
3(d)(ii)	solid (particles / ions) close together; (particles / ions) regularly arranged / in rows / lattice;	2	**A** atoms or molecules for ions **A** packed together / no spaces / attached to each other / held together **I** comments about movement **A** fixed shape / fixed positions **I** neat structure / reference to electrostatic forces

© Cambridge International Examinations 2015

https://xtremepapers/

Question	Answer	Marks	Guidance
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	**A** nucleon number for mass number **A** elements with same number of protons but different number of neutrons / atoms of same elements with different numbers of neutrons **I** atoms / elements with different (relative) atomic masses **I** same elements with different numbers of neutrons **I** reference to molecules **I** different neutrons (no number)

© Cambridge International Examinations 2015

https://xtremepapers/

Question	Answer	Marks	Guidance
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**	**A** burette / graduated test-tube drawn and labelled test-tube **R** if tube goes to surface of water or under water in reaction flask
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**	**A** straight line instead of curved line **A** line not reached final volume but still going up and likely to reach final volume **A** final horizontal line two small squares below the 25 °C line **R** if a single straight line is drawn from 0–0 to point 49–140
4(b)(iv)	increased (rate) / faster (rate) / quicker;	**1**	**I** reference to time unless it contradicts increased rate
4(c)(i)	pair of electrons between two (hydrogen) atoms;	**1**	hydrogen atoms do not have to be labelled H
4(c)(ii)	covalent;	**1**	**I** single bond
4(d)	sulfuric acid; magnesium oxide / magnesium hydroxide / magnesium carbonate;	**2**	**A** correct formulae **R** magnesium

© Cambridge International Examinations 2015

https://xtremepapers

Question	Answer	Marks	Guidance
5(a)	COOH group circled;	1	
5(b)(i)	30;	1	
5(b)(ii)	speeds up reaction / increases rate (of reaction);	1	**A** lowers the activation energy / allows the reaction to occur by more favourable mechanism
5(b)(iii)	poisonous / toxic / death;	1	**A** harmful / makes breathing difficult / respiratory problems **A** combines with haemoglobin / reduces the amount of oxygen in the blood / stops you breathing / asphyxiation / suffocates you **I** lung cancer / lung damage
5(c)(i)	gain of electrons / loss of oxygen / decrease in oxidation number;	1	**A** gain of hydrogen
5(c)(ii)	carbon;	1	**A** C
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	**A** crush grapes **I** grapes squeezed NOTE: mark for the idea that the grape skins are in solvent but NOT solvent in context of chromatography. **I** grapes in acids / alkalis
5(e)	ethene;	1	**A** alkene
5(f)(i)	high temperature; catalyst / aluminium oxide / zeolites;	2	**A** heat / stated temperatures between 200–1000 °C **A** absence of oxygen (for 2nd mark) **I** high pressure / enzymes (unqualified) / oxygen
5(f)(ii)	4 (C_2H_4);	1	

© Cambridge International Examinations 2015

https://xtremepape.rs/

Question	Answer	Marks	Guidance
6(a)(i)	B and D; they have low(er) density / they are soft;	2	**A** they have densities of 0.97 and 0.86 / light(weight) **I** comments about conductivity and boiling point
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	**A** heavy for high density **A** they are coloured for coloured compounds **A** hard BUT not hardness / medium hard
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	**I** (oxygen) oxidises iron / bonds to iron **A** suitable named oxides including CO / CO_2 **R** iron bonds with other metals

© Cambridge International Examinations 2015

https://xtremepape.rs/

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**	**A** correct formulae **I** smoke **A** K spits / K pops
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**	**A** no spaces between particles **A** syringe is not reduced **A** syringe is reduced **I** there is room / not room (reference to space between particles)
7(b)(i)	increases / gets larger;	**1**	**A** becomes heavier
7(b)(ii)	2,8;	**1**	**A** 2 in the first shell and 8 in the second
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**	

© Cambridge International Examinations 2015