

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0620 CHEMISTRY

0620/31

Paper 3 (Extended Theory), maximum raw mark 80

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

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1 (a) diffusion or fractional distillation;

(b) fractional distillation;

(c) simple distillation;

(d) crystallisation;

(e) filtration;

(f) chromatography;

[Total: 6]

2 (a) (i) become darker; [1]

(ii) increase; [1]

(iii) black / dark grey; [1]

not: brown
solid; [1]

(b) (i) same Z / same number of protons; [1]

accept: atoms of the same element
different number of neutrons / different nucleon number / different mass
number; [1]

(ii) 53 protons and 53 electrons; [1]

78 neutrons; [1]

(iii) xenon; [1]

(c) BrF_3 / F_3Br ; [1]

BrF_5 / F_5Br ; [1]

[Total: 11]

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- 3 (a) (i) any three from:
 particles have more energy;
 move faster;
 collide more frequently;
 more successful collisions; [3]
accept: atoms or molecules for particles
not: electrons
not: vibrate more
- (ii) reaction faster with temperature increase; [1]
 enzymes denatured / destroyed; [1]
not: killed
- (b) (i) bigger initial gradient; [1]
 same final volume of nitrogen; [1]
- (ii) decrease / slows down; [1]
- (iii) concentration of organic compound decreases; [2]
 compound used up = [1]
or: fewer particles;
 collision rate decreases;
- (c) (i) carbon monoxide-incomplete combustion; [1]
 carbon - containing fuel / fossil fuel / petrol; [1]
- oxides of nitrogen - oxygen and nitrogen react; [1]
 at high temperature / in engine; [1]
not: in exhaust
- (ii) carbon monoxide to carbon dioxide; [1]
 oxides of nitrogen to nitrogen; [1]
 correct balanced equation; [1]

[Total: 17]

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- 4 (a) giant covalent; [1]
or: polymer made from monomers;
- (b) (i) any three from:
 high mp / bp;
 hard;
 brittle;
 insoluble (in water);
 poor conductor of electricity / heat; [3]
- (ii) carbon / diamond / silicon / boron; [1]
not: graphite
- (c) (i) sodium hydroxide / any named alkali / reactive metal; [1]
- (ii) named acid; [1]
 zirconium oxide; [1]
- [Total: 8]**
- 5 (a) (i) rate of reaction; [1]
 influenced by light / only happens in light; [1]
or:
 turns light into chemical energy = [2]
accept: light is catalyst = [1]
- (ii) reduction of silver halides; [1]
 they are reduced to silver / $2\text{AgCl} \rightarrow 2\text{Ag} + \text{Cl}_2$; [1]
 appropriate importance given; [1]
or:
 photosynthesis;
 correct comment about chemistry carbon dioxide to carbohydrates / carbon dioxide to oxygen;
 anything sensible e.g. its role in the food chain or decrease greenhouse effect or oxygen for respiration;
or:
 chlorination;
 making chloroalkanes;
 appropriate importance given;
- (b) (i) pressure would move position of equilibrium to right / increase yield of COCl_2 ; [1]
 increase pressure favours side with less (gas) molecules / smaller volume; [1]
- (ii) increase temperature favours endothermic reaction; [1]
 so less products / reduce yield; [1]
- (iii) keeps rate high / increase rate at lower temperatures; [1]

Page 5	Mark Scheme	Syllabus	Paper
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- (c) each chlorine 1 bp and 3 nbps; [1]
 4 e between carbon atom and oxygen atom; [1]
 2 nbps on oxygen atom; [1]

[Total: 13]

- 6 (a) (i) amino acid / peptides; [1]
 salt / carboxylate or soap / fatty acid or glycerine / alcohol; [1]
 sugars or glucose; [1]
accept: named sugar

- (ii) polyester; [1]
allow: named polyester
 polyamide; [1]
allow: nylon

- (b) one correct amide linkage; [1]
 second amide linkage correctly orientated
 – NHCO – followed by – NHCO –; [1]
note: monomers are amino acids not diamines or dicarboxylic acid

- (c) bromine / bromine water / aqueous bromine; [1]
 unsaturated - brown / orange to colourless **not:** clear [1]
 saturated - stays brown / orange [1]
or: alkaline potassium manganate(VII);
 from purple / pink to green / brown;
 stays purple;
or: acidic potassium manganate(VII)
 from purple / pink to colourless; **not:** clear
 stays purple;

[Total: 10]

- 7 (a) (i) melting point is below 25°C; [1]
 boiling point above 25°C; [1]
accept: argument based on actual values
note: 25°C is between mp and bp = [2]

- (ii) strontium loses 2e; [1]
 sulfur gains 2e; [1]

- (iii) hydrogen chloride / hydrochloric acid; [1]
accept: sulfurous acid or sulfur dioxide

- (iv) molten strontium chloride has ions / ionic compound; [1]
 which can move; [1]
 sulfur chloride has no ions / only molecules / molecular / covalent; [1]

Page 6	Mark Scheme	Syllabus	Paper
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- (b) (i) strontium carbonate does not dissolve / no effervescence; [1]
note: not just reaction is complete
- (ii) to remove excess / unreacted / undissolved strontium carbonate; [1]
- (iii) water of crystallisation needed / $6\text{H}_2\text{O}$ in crystals / would get anhydrous salt / would not get hydrated salt / crystals dehydrate; [1]
not: just to obtain crystals
- (c) number of moles of HCl used = $0.05 \times 2 = 0.1$ [1]
number of moles of $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$ which could be formed. = 0.05 [1]
mass of one mole of $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$ is 267 g
theoretical yield of $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$ = $0.05 \times 267 = 13.35\text{ g}$ [1]
percentage yield = $6.4 / 13.35 \times 100 = 47.9\%$ [1]
accept: 48%
allow: ecf

[Total: 15]