UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2007 question paper

0620 CHEMISTRY

0620/02 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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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1 **(a)** ALLOW: correct names / correct formulae

(i) B [1]

(ii) E [1]

(iii) D [1]

(iv) E [1]

(v) C [1]

(vi) B + C [1]

(vii) A + F [1]

(b) **(i)** car exhausts / from vehicles [1]
ALLOW: from metal smelting
NOT: from factories / from natural causes e.g. volcanoes
NOT: from fuels if unqualified

(ii) damage to brain / nervous system (in children) [1]
ALLOW: mental damage / poisonous / toxic / lung irritant
NOT: harmful / lung cancers / poisonous to lungs / makes you ill / respiratory diseases / lung problems etc.

(c) forms sulphur dioxide / acid rain [1]
ALLOW: sulphur burns to form acid rain
REJECT: carbon monoxide / dioxide causes acid rain = 0
REJECT: sulphur causes acid rain = 0

effect of acid rain [1]
e.g. chemical erosion / chemical weathering / corrodes metals /
damages trees [or plants] / kills trees [or plants] / damages limestone buildings /
damages or kills plants [or animals] in lakes
NOT: harmful / makes soils acidic / corrodes limestone [or buildings] / pollutant
REJECT: global warming / affects ozone layer

[Total: 11]

2 **(a)** nitrogen / N_2;
oxygen / O_2

(b) **(i)** carbon dioxide / CO_2 [1]

(ii) water / H_2O [1]

(iii) O_2 on left;
correct balance [2]

(c) **(i)** (Period) 3 [1]

(ii) noble gases / inert gases [1]
ALLOW: group 0 / 8

(iii) correct electronic structure of argon 2.8.8 [1]

(iv) inert / doesn't react / prevents (tungsten) filament from burning [1]
ALLOW: implication that argon produces light after excitation by electric current (discharge tubes)
NOT: argon produces light when it reacts
NOT: argon lights up

(v) 22 [1]

(d) 169 [1]
IGNORE: units

(e) **(i)** XeF_4O (atoms in any order) [1]

(ii) covalent [1]
NOT: double and single bonding

[Total: 14]

3 (a) (i) 2 on both sides (NOTE: only one mark)

(ii) comes from water / water won't run out / water renewable resource
NOT: arguments about pollution
NOT: easily made / renewed
REJECT: found in air and water

(iii) exothermic [1]

(b) carbon dioxide / CO_2;
water / H_2O [2]

(c) 1 mark for each correct fraction; [2]
correct use linked to each specific fraction [2]
(if fraction incorrect mark cannot be given for use)
Examples:

Fraction	***Use***
Refinery gas NOT: methane / natural gas	fuel (alone or qualified) ALLOW: for heating / cooking
Naphtha	feedstock for chemicals / making specific chemicals e.g. ethane
Paraffin / kerosene	oil stoves / heating / aircraft fuel / feedstock for chemical industry ALLOW: for cooking NOT: fuel alone
Diesel	fuel in cars / fuel for diesel engines / central heating fuel NOT: fuel alone
Fuel oil	fuel for ships and power stations NOT: fuel alone
Lubricating fraction	lubricants / waxes / polishes
Bitumen / residue	roads / sealing roofs

(d) (i) breaking down of (larger) hydrocarbon molecules into smaller ones /
making alkenes from larger alkanes [1]
(idea of large hydrocarbons to smaller ones)
ALLOW: breaking down petroleum fractions / hydrocarbons / alkanes
NOT: decomposing unless qualified

(ii) high temperature
ALLOW: heat
REJECT: heat and burn

catalyst **OR** high pressure [1]
ALLOW: aluminium oxide / silicates;
IGNORE: incorrect name of catalyst
NOT: high pressure
(Catalyst + high pressure = 1 mark maximum)

(iii) correct structure of ethene [1]
All atoms and bonds must be shown

[Total: 13]

4 (a) (i) substance which speeds up (rate of) reaction [1]
NOT: slows rate of reaction

(ii) transition elements / transition metals [1]
NOT: specific metals / named metals

(b) (i) axes correctly labelled with time on horizontal axis and use of full grid [1]
ALLOW: V for volume and t for time
correct plotting of points (-1 per error / omission) [2]
Penalise 110 cm^3 points only once
smooth line going through all points [1]

(ii) line steeper at start; [1]
ending up at same level [1]
NOT: ending up after 50 mins
NOT: joining previous line before 50 minutes

(iii) all zinc used up / hydrochloric acid is in excess [1]
ALLOW: zinc and hydrochloric acid have completely reacted
NOT: reaction finished / completed / HC*l* completely reacted

(c) (i) (speed would be) faster / rate increases [1]
(comparative needed)
NOT: takes less time / reacts more

(ii) (speed would be) slower / rate decreases [1]
(comparative needed)
NOT: takes more time / reacts less

(d) (i) zinc chloride [1]

(ii) lighted splint / light the gas; [1]
pops / explodes etc. [1]

[Total: 14]

5 **(a)** electron

(b) any two of:
conducts electricity / conducts heat / shiny / malleable / ductile / sonorous [2]
NOT: high density / high melting point / high boiling point / hard
ALLOW: solid if qualified by mercury as exception

(c) 4th box down ticked [1]

(d) aqueous sodium hydroxide; [1]
(light) blue ppt; [1]
insoluble in excess [1]

OR
aqueous ammonia;
(light) blue ppt;
soluble in excess / forming (dark) blue solution

(e) electrical wiring / water pipes / cooking utensils / coinage / any other sensible specific use [1]
NOT: for wires / for pipes

[Total: 8]

6 **(a)** potassium chloride;
bromine

(b) iodine lower in group / less reactive than chlorine / iodine less good oxidising agent [1]
ALLOW: bond between potassium and chlorine is too strong for iodine to react

(c) **(i)** gas; [1]
grey / black; [1]
ALLOW: purple black
NOT: brown / brown-black / purple

(ii) ALLOW range of -200 to -90 (actual = -188); [1]
ALLOW range of 1.6 to 4.0 (actual = 3.12) [1]

(d) **(i)** 9 [1]

(ii) 7 [1]

(e) any suitable use e.g. in swimming pools/ water purification / disinfectant / kills germs / kills bacteria / bleaching agent (for paper) / extraction of titanium / de-tinning scrap tinplate etc. [1]
ALLOW: making named chemicals e.g. making hydrochloric acid / making halogenoalkanes / making CFCs / making carbon tetrachloride
NOT: sewage treatment / cleaning

[Total: 10]

7 **(a)** it is below the electrolyte

(b) graphite [1]

(c) A [1]

(d) aluminium is too reactive / a very reactive metal / above carbon in the reactivity series [1]
NOT: because carbon won't remove the oxygen from the oxide /
won't reduce the oxide / won't react

(e) **(i)** the aluminium oxide / the electrolyte [1]

(ii) CO_2 [1]

(iii) carbon is released as carbon dioxide / carbon dioxide is a gas [1]
NOT: it's getting oxidised / reaction between carbon and oxygen

(f) 530 (kg) [1]

(g) molten;
ions [2]

[Total: 10]