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

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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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UNIVERSITY of CAMBRIDGE
International Examinations

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 [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) [1]

(ii) comes from water / water won't run out / water renewable resource [1]
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 [1]
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) fast<u>er</u> / rate increases [1]
(comparative needed)
NOT: takes less time / reacts more

(ii) (speed would be) slow<u>er</u> / 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 [1]

(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; [1]
bromine [1]

(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 [1]

(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]