UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

0620 CHEMISTRY

0620/22 Paper 22 (Core Theory), maximum raw mark 80

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International Examinations

1 **(a)** **(i)** titanium / vanadium / zirconium / niobium **max [2]** [2]
(1 mark each)
allow: symbols

(ii) Na / Mg [1]

(iii) sodium / Na [1]

(iv) potassiu / K [1]

(v) vanadium / V [1]

(b) O_2 [1]
correct balance [1]

2 **(a)** **(i)** A: giant ionic [1]
B: simple atomic [1]
C: simple molecular [1]
D: metallic [1]

(ii) B and C (both needed for mark) [1]

(b) solid; molten; [2]

3 **(a)** coolant / making ethanol / any other names large scale relevant reaction
e.g. making sulfuric acid [1]

(b) blue / anhydrous cobalt chloride (paper); turns pink; [2]
OR white / anhydrous copper sulfate; turns blue;

(c) **(i)** lighted splint;
pops / explodes; [2]

(ii) pH 12 [1]

(d) **(i)** 3 (CO_2); 4(H_2O); [2]

(ii) combustion [1]

(iii) 36 (mg) [1]

4 **(a)** Any 2 of:
diffusion /
ink particles move /
water particles or molecules move /
movement of particles is random / [2]

(b) two or more substances (together) that can be separated by physical means [1]

(c) **(i)** ethanol [1]
allow: carboxylic acids

(ii) oxidation state / third box down ticked [1]

(iii) idea of small molecules / monomers joining / repeating units;
long chains / large molecules formed; [2]

(d) **(i)** ring around COOH group [1]

(ii) removal of oxygen / decrease in oxidation number / addition of electrons [1]

5 **(a)** filtration / centrifugation [1]
allow: decanting

(b) C [1]

(c) **(i)** solvent shown in bottom of beaker; [1]
spot on the base line <u>vertically below</u> the spots shown; [1]
chromatography paper labelled anywhere; [1]

(ii) 4 [1]

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

(ii) bromine water;
decolourises / goes colourless; [2]
allow: potassium manganate (VII); decolourises;

(iii) substance containing carbon and hydrogen <u>only</u> [1]

(iv) ethanoic acid [1]

(v) alcohols / alkanols [1]

6 **(a)** conduct heat / conduct electricity / shiny / malleable / ductile **max [2]** [2]

(b) 4 [1]

(c) 82 electrons [1]
82 protons [1]
126 neutrons [1]

(d) lead + oxygen → lead(II) oxide [1]

(e) **(i)** carbon [1]

(ii) gas at room temperature / third box down ticked [1]

7 **(a)** **(i)** one of:
BMF molecule and diamond a giant covalent structure / [1]
BMF has pentagonal (and hexagonal) structure diamond has bent hexagonal or tetrahedral structure /
BMF each carbon joined to 3 others, diamond each carbon joined to four others /

(ii) two of:
graphite has (flat) hexagonal rings, diamond has bent hexagonal rings or tetrahedral /
graphite has 3 bonds to each carbon, diamond has 4 /
graphite is layered diamond is not /
graphite has two types of bonding / forces or weak and strong bonds whereas diamond has only one type of bond / covalent bonds only [2]

(b) covalent [1]

(c) layers can slide over each other / forces weak between layers [1]

(d) cutting / drilling **allow:** jewellery [1]

(e) any 2 of:
carbon dioxide is a greenhouse gas /
absorbs infrared radiation /
increases global warming /
lead to climate change / [2]

(f) any two of:
sulfur reacts with oxygen (when coal burnt) /
forms sulfur dioxide /
sulfur dioxide reacts with oxygen (to form sulfur trioxide) /
sulfur dioxide or trioxide dissolve in rain (to form acid) / [2]

(g) **(i)** waste gases from digestion in animals / second box down ticked [1]

(ii) correct dot and cross diagram for methane [1]

(iii) ethane / propane / butane etc [1]

8 **(a)** calcium oxide [1]

(b) thermal decomposition [1]

(c) carbon dioxide has been removed from the limestone / it comes from the limestone [1]

(d) neutralising acid soils / treating acidic lakes / flue gas desulfurisation etc [1]

(e) temperature of Bunsen / distance of Bunsen from the tube / amount or mass of carbonate used [1]

(f) **(i)** calcium [1]

(ii) 25 cm^3 [1]

(iii) calcium faster than strontium which is faster than barium / idea of trend down the group;
correct trend i.e. less rapid reaction the further down the group; ORA [2]

(g) add acid to carbonate;
bubble gas or carbon dioxide (evolved) through limewater / test gas or carbon dioxide with limewater;
limewater goes milky or cloudy; [3]