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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

0620 CHEMISTRY

0620/21 Paper 2 (Core Theory), maximum raw mark 80

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1 **(a)** E / nitrogen (di)oxide / NO_2 [1]

(b) B / potassium nitrate / KNO_3 [1]

(c) A / ammonia / NH_3 [1]

(d) E / nitrogen(di)oxide / NO_2 [1]

(e) C / NCl_3 / nitrogen (tri)chloride [1]

(f) B / potassium nitrate / KNO_3 [1]

2 **(a)** atoms of same element with different number of neutrons / same type of atom with different mass number / atoms with same proton number but different number of neutrons / atoms with same proton number but different nucleon number/ atoms with same atomic number but different nucleon number [1]

(b) 23 protons [1]
23 electrons [1]
27 neutrons [1]

(c) non [1]
medicine [1]
cancer [1]

(d) 2nd box ticked [1]
5th box ticked [1]

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3 **(a)** anhydrous copper sulfate / white copper sulfate [1]
ignore oxidation numbers
turns blue [1]

OR

anhydrous cobalt chloride / blue cobalt chloride (1 mark)
ignore oxidation numbers
turns pink (1 mark)
note second mark is dependent on the first being correct BUT cobalt chloride turns pink = 1 mark

(b) coolant / solvent / hydroelectric power [1]
allow for cooling / to cool
allow specific reactions e.g. making sulfuric acid / making ethanol
allow: for washing or cleaning if specific industrial process mentioned
allow for agriculture / for growing crops (on a large scale) / brewing
ignore for cooking / for drinking / for power (unqualified) / for watering plants / for cooling food

(c) substance OR liquid which dissolves another (substance) /
substance which does the dissolving [1]
ignore it dissolves / it is a liquid / names of solvents

(d) **(i)** burning coal / burning fossil fuels / burning petrol petrol / burning specified fuel (as long as it contains sulfur) / from volcanoes / from heating sulphide ores [1]
ignore burning pure substances e.g. hydrogen, methane / car exhausts
ignore from ores without qualification /

(ii) any two effects (1 mark each) e.g. [2]
- forest death / kills trees / deforestation / destroys trees / damages trees
  ignore kills plants / rots trees / kills crops
- acidification of lakes / acidification of rivers
  ignore acidifies soils
- kills fish / aquatic plants / plant in lakes or rivers
  ignore kills fish or plants in the sea / kills animal (unqualified) / kills plants (unqualified)
- erodes buildings made from limestone / erodes carbonate rocks / damages buildings made from limestone / damages carbonate rocks
  allow destroys building made from limestone / destroys carbonate rocks
  ignore just erosion of buildings or rocks unqualified / dissolves buildings / chemical weathering
- corrosion of metal structures / corrosion of named metal structures e.g. bridges or railings / damages metal structures
  allow erosion of metal structures / damaging metal structures / destroys metal structures / reacts with metals
  ignore dissolves metals
  ignore effects on humans

(iii) 64 (g) [1]

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(e) In each of these points, the explanation mark depends on the correct step

filtration or words to that effect [1]

removal of undissolved substances / solids / impurities get trapped / removes insoluble impurities [1]
allow removes dirt
ignore solids which would sediment rapidly or are large e.g. pieces of metal, batteries, twigs etc. / removes impurities

chlorination / adding chlorine [1]
allow chlorification

kills bacteria [1]
allow kills microbes / kills germs / disinfection / sterilisation
ignore kills bugs / removes bacteria

allow other stages with correct explanation e.g.
screening (1 mark) removing large objects / removing twigs etc. (1 mark)
sedimentation (1 mark) allowing particles to settle (1 mark)
adding carbon (1 mark) removes tastes / removes smells (1 mark)
flocculation (1 mark) coagulates clay / makes small particles clump together (1 mark)
lime (1 mark) idea of neutralisation or removal of acids (1 mark)

(f) **(i)** 20 (%) allow 19–21 (%) [1]

(ii) 28 (g) [1]

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4 (a) (i) D [1]

(ii) B [1]

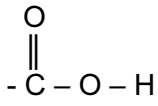
(iii) E [1]

(iv) C [1]

(b) (i) 4 (H_2O) [1]
5 (O_2) [1]
note 2nd mark dependent on 4 (H_2O) being correct

(ii) any 2 of:
carbon monoxide / carbon
allow soot
water
allow correct formulae [2]

(c)



[1]

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5 **(a)** breakdown (of substance / electrolyte) by electricity / splitting up of substance by electricity / decomposition by electricity [1]
allow current / voltage for electricity
ignore separation by electricity / division by electricity
note idea of breakdown AND idea of current / electricity for the mark

(b) anode [1]

(c) hydrogen [1]
allow H_2

(d) platinum [1]
inert [1]

(e) **(i)** 2,8,7 as numbers or as shown in electron shell diagram [1]

(ii) pair of electrons between two chlorine atoms [1]
rest of electrons correct [1]
ignore inner shells

(iii) (damp) litmus (paper) / universal indicator (paper) [1]
allow indicator paper / pH paper

bleaches / goes white [1]
allow goes red then bleaches
reject changes colour of bromides / iodides

(f) **(i)** calcium chloride + water (1 mark each) [2]
apply listing for extra elements / compounds
allow correct formulae

(ii) H_2 on right [1]
ignore numbers in front of H_2 unless equation balanced

2 on left [1]

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6 (a) (i) copper → zinc → magnesium → calcium [1]

(ii) cold water → no reaction [1]
steam → fairly rapid / moderately rapidly / moderately / slowly / very slowly
ignore less rapidly than zinc / more rapidly that copper / it reacts [1]
reject rapidly

(b) zinc + water → zinc oxide + hydrogen [1]
allow steam in place of water

(c) Any three of: [3]
- conducts electricity
- conducts heat
- malleable / can be bent
- ductile /
- shiny / lustrous
- sonorous / rings when hit
- solid

ignore reference to melting point / boiling point / density / strength
ignore colours e.g. grey

(d) (i) allow any figures in the range 120–200°C [1]
(actual = 181°C)

(ii) less hard (down the Group) / softer (down the Group) [1]
allow decreases (in hardness)
ignore from hard to soft / the softer is at the bottom and the harder at the top / gets softer as melting point decreases

(iii) allow any figures in the range 0.7–1.3 (g / cm^3) [1]
(actual = 0.86)

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7 **(a)** top left box → oxygen [1]
bottom right box → slag [1]
bottom left box → (molten) steel [1]

(b) **(i)** they are gases / gases escape easily / sulphur oxides are gases / named sulfur oxides are gases / carbon dioxide is a gas / named oxide of carbon is gas / the products are gases [1]

(ii) any three of:
- phosphorus(V) oxide is acidic oxide
  ignore it is acidic
- calcium oxide is basic oxide
- idea of calcium oxide neutralising OR reacting with phosphorus oxide
  allow they combine together / they react together / it reacts with the phosphorus oxide
  ignore they react (unqualified)
- slag formed (by the reaction) / slag is removed [3]

(c) **(i)** D [1]

(ii) any suitable use e.g. chemical plant / cutlery / surgical instruments / (ball) bearings / [1]
allow facings of buildings (not buildings without qualification)
parts of aircraft engines (not aircraft without qualification)
bridges
car decoration / trim / radiator grills / exhaust pipes (not cars without qualification)
washing machine drums
razor blades
chemical tankers / road tankers (not tankers unqualified)
cooking utensils ignore for cooking
watches

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8 **(a)** any three of [3]

- particles move faster / in liquid particles move slowly AND in gas they move rapidly
- particles more spread out / in liquid particles are touching (or very close) AND in gas they are far apart
- particles more randomly arranged / in liquid the particles have some order AND in gas the particles are random
- particles move more freely / in liquid particles do not move freely AND in gases particles are freely moving / in liquid particles have limited motion (or slide over each other) AND in gases particles are free

(b) **(i)** chlorine + (bromide ions) → chloride (ions) + bromine [1]
allow correct symbols

(ii) vaporises easily / forms a gas easily [1]
allow vaporises (very) fast / evaporates (very) fast / low boiling point
reject ideas of reaction

(c) **(i)** substance which speeds up reaction / makes reaction go faster / lowers the activation energy [1]
allow changes rate of reaction
ignore slows down reaction

(ii) it gains hydrogen / oxygen accepts hydrogen / hydrogen peroxide accepts hydrogen / oxidation number of oxygen decreases [1]
allow it loses oxygen / hydrogen peroxide loses oxygen / hydrogen peroxide gains electrons / oxygen gains electrons
ignore comments related to hydrogen bromide alone

(iii) sodium bromide [1]
carbon dioxide AND water [1]

[Total: 80]

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