CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0620 CHEMISTRY

0620/32 Paper 3 (Extended Theory), maximum raw mark 50

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1 (a) (i) Sb;

(ii) Xe / B;

(iii) Sr / Te / A / D;

(iv) Sn and I / E and F;

(v) Sr / A; [5]

(b) any two from:
physical
niobium is
harder; stronger; higher mp/bp; higher density [2]
note: there has to be a comparison

any two from:
chemical
niobium is less reactive; forms coloured compounds; forms complex ions; its compounds have catalytic properties; has more than one oxidation state; has more than one valency electron; [2]
note: the response has to refer to or compare properties of both elements

[Total: 9]

2 (a) liquid; [1]

(b) (l) and (s); [1]
reversible sign; [1]
accept: X in equation
ignore: any compounds just look for state symbols
must be the same compound on both sides of equation

(c) boiling / condensation; [1]
accept: evaporation or vaporisation

(d) (in region BC) solid melts / liquid boils (in region DE); [1]
at one / fixed / sharp / single / specific temperature; [1]

[Total: 6]

3 (a) (i) correct structure of an isomer e.g. 2-chloropropane; [1]

(ii) chlorine; [1]
light / heat / lead tetraethyl; [1]

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(iii) could produce 2-chloropropane; [1]
could produce HCl; [1]
or
could produce dichloropropanes = [2]

(b) (i) add silver nitrate / lead nitrate; [1]
yellow precipitate; [1]
note: do not insist on presence of dilute nitric acid

(ii) propanol / propan-1-ol; [1]

(c) (i) for A;
reaction slower;
decreased collision rate;
less bromobutane present / concentration of bromobutane less / less reacting particles; [2]
any two
accept: reverse arguments for B

(ii) halogens Cl > Br > I reactivity / reactivity decreases down group; [1]
organic halides I > Br > Cl / reactivity increases down group; [1]
opposite without explanation = [1]

(iii) any three from:
less energy;
particles move slower;
less collisions / fewer particles have energy to react / fewer successful collisions;
slower rate; [3]

[Total: 15]

4 (a) $C + O_2 \rightarrow CO_2$ [1]

(b) (i) CO_2 already formed (from C burning or from $CaCO_3$); [1]
then carbon reacts with carbon dioxide; [1]
or
$C + CO_2 \rightarrow 2CO$ = [2] If equation not balanced = [1]

(ii) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ [2]
not balanced = [1]
not: reduction by carbon

(c) to remove / neutralise silica / silicon dioxide / silicon(IV) oxide / sand; [1]
reacts with limestone to form slag / calcium silicate; [1]
$CaCO_3 + SiO_2 \rightarrow CaSiO_3 + CO_2$ [1]
or $CaO + SiO_2 \rightarrow CaSiO_3$
or $CaCO_3 \rightarrow CaO + CO_2$

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(d) (i) galvanising / galvanisation / sacrificial protection; [1]

(ii) sacrificial protection / zinc is sacrificed;
zinc corrodes rather than iron;
zinc is oxidised in preference to iron;
zinc reacts with oxygen and / water in preference to iron;
zinc more reactive / electropositive than iron;
zinc loses electrons more readily than iron;
electrons move on to iron
any **three** [3]

[Total: 12]

5 (a) any two from:
bleaching (wood pulp / silk / straw);
manufacture of sulfuric acid / SO_3 / in Contact process;
fumigating / sterilising; refrigerant; making dyes; making wine; insecticide;
fungicide; [2]

(b) burn / heat / react sulfur; [1]
in air / oxygen; [1]
or
burn / heat / roast zinc sulfide or lead sulfide;
in air / oxygen;

(c) from purple / pink; **not:** red [1]
to colourless; **not** clear [1]

(d) number of moles of Na_2SO_3 = 3.15/126 = 0.025 [1]
number of moles of SO_2 formed = 0.025 [1]
volume of SO_2 = 0.025 x 24 = 0.6 dm^3/litres **or** 600 cm^3 [1]
allow: ecf
for 1.6 g of SO_2 [1] only
If used 22.4 max [2]
note: need correct units for last mark

[Total: 9]

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6 (a) (i) correct arrow from negative terminal of battery or from anode; [1]

(ii) from battery / power supply / cell; [1]
from negative electrode of battery to external circuit; [1]
or from anode;
from iodide ion losing electron **or** oxidation of anion;

(iii) ions cannot move in solid / ions can move in liquid; [1]

(b) copper; [1]
(changes to) sulfuric acid; [1]

hydrogen; [1]
(changes to) potassium hydroxide; [1]

(c) (i) $2H^+ + 2e \rightarrow H_2$ [2]
not balanced = [1]

(ii) $4OH^- \rightarrow O_2 + 2H_2O + 4e$ [1]

(iii) water used up; [1]

(d) it is a cell; [1]
hydrogen reacts with oxygen; [1]
this reaction produces energy / is exothermic / produces flow of electrons /
changes chemical energy to electrical energy; [1]

[Total: 15]

7 (a) (i) $C_nH_{2n+1}OH$ [1]

(ii) 116-17 = 99, 2n+1 = 99, n = 7
for any evidence of working out [1]
$C_7H_{15}OH$ [1]

(iii) 4bps around C; [1]
1 bp on each hydrogen; [1]
2bps and 2nbps on oxygen; [1]

(b) (i) increases yield / moves equilibrium to RHS / favours forward reaction; [1]
high pressure favours side with smaller number of (gas) molecules; [1]

(ii) any two from:
higher temperature / catalyst causes faster reaction;
comment about compromise conditions to give best rate and yield;
at 250°C (lower temp) higher yield / forward reaction favoured;
at 350°C (higher temp) lower yield / back reaction favoured; [3]

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(c) (i) methanoic acid; [1]
correct SF showing all bonds; [1]
accept: -OH

(ii) methyl methanoate; [1]

[Total: 14]

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