CSE CENTRE FOR STRATEGIC EDUCATION
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IARTV

CSE TEST– MAY 2009

YEAR 11 CHEMISTRY

Written test 1

ANSWERS & SOLUTIONS BOOK

SECTION A – Multiple choice questions (20 marks)

1	**C**	5	**B**	9	**D**	13	**B**	17	**B**
2	**D**	6	**A**	10	**B**	14	**A**	18	**A**
3	**C**	7	**D**	11	**D**	15	**B**	19	**A**
4	**D**	8	**C**	12	**A**	16	**A**	20	**C**

SECTION B – Short answer questions (60 marks)

1 mark is indicated by *

Question 1 (10 marks)

a. **i.** B **ii.** C **iii** D
iv. A **v.** F **vi.** E 6 x ½ = 3 marks

b. **i.** $^{79}_{35}Br$ and $^{81}_{35}Br$*. 1 mark
(The mass number of the isotope will be whole number closest to the accurate value of the relative mass, ie 79 for 78.918.)

ii. Two of the five peaks are due to $^{79}_{35}Br$ and $^{81}_{35}Br$ atoms* 1 mark
The remaining peaks are due to three different Br_2 molecules.
$^{79}Br—^{79}Br$, $^{79}Br—^{81}Br$ and $^{81}Br—^{81}Br$. ** 2 marks

c. If the abundance of ^{79}Br is y then the abundance of ^{81}Br is 100 – y.

$$\frac{78.918y + 80.916(100 - y)}{100} = 79.9^*$$ 1 mark

$78.918y + 8091.6 - 80.916y = 7990$

$-1.998y = -101.6$

$y = 50.9^*$ 1 mark

The abundances of the isotopes are $^{79}Br = 50.9\%$ and $^{81}Br = 49.1\%$* 1 mark

Question 2 (11 marks)

a. A has 2* full electron shells and B has 3* full shells.
2 marks

b. A is in the 4th period*. B is in the 4th period*.
2 marks

c. A is in Group 4* (transition metal). B is in Group 16* (non-metal).
2 marks

d. B will have a higher electronegativity*.
Both elements are in the same period. The core charge increases going across a period and thus the electron attracting power of an atom will increase going across a period.
1 mark

Saturated / unsaturated	Saturated compounds have only single bonds (eg C–C), ie they contain the maximum possible number of hydrogen atoms. Unsaturated compounds have at least one carbon carbon double bond (C=C).*	1 mark

Question 7 (3 marks)

a. Each member of a homologous series differs from the next by $-CH_2-$.*
(Also accept the relative mass increases by 14 or that compounds have the same general formula.)

1 mark

b. propan-1-ol * (or propan-2-ol) and $CH_3CH_2CH_2OH$ (or $CH_3CH(OH)CH_3$)*
(Name must be related to structure)

2 marks

e. A will have a larger radius*.
Both elements are in the same period. The nuclear charge increases going across a period and there is a larger attraction of the nucleus for the electrons. The electrons are pulled closer to the nucleus.

1 mark

f. B will have a higher ionisation energy*
The core charge is larger for B and thus there is a greater attraction for the outer shell electrons.

1 mark

g. Element A is a transition metal. This element will have high melting and boiling temperatures, conduct heat and electricity, be malleable and ductile and form coloured compounds.

Any two of these for 1 mark

Element B is a non-metal It will have low melting and boiling temperatures or be a brittle solid. It will be a poor conductor of heat and electricity.

Any two of these for 1 mark

Question 3 (9 marks)

a.	*Calcium:*	Calcium is a metal. The atoms of calcium are held together by strong metallic bonding*. Each Ca atom loses one or more electrons to form a positive ion. The positive ions are arranged in a three dimensional lattice. The electrons form a 'sea' of electrons which is strongly attracted to the lattice of positive ions.* This attraction results in high melting and boiling temperatures.	1 mark 1 mark
	Bromine:	Bromine is a non-metal and exists as Br_2 molecules. Each Br atom shares one electron to form a single covalent bond with another Br atom*. These bonds are strong. However each Br_2 molecule is only weakly attracted to other Br_2 molecules by dispersion forces*. Thus bromine has low melting and boiling temperatures.	1 mark 1 mark
b.		Each calcium atom loses two electrons to form a Ca^{2+} ion*. Each Br atom gains an electron to form Br^- ion*.	1 mark 1 mark
c.	*Calcium:*	Ca will conduct electricity and also heat. It is malleable and ductile. (Only one of these is needed.)	1 mark
	Bromine:	Bromine is a poor conductor of heat and electricity. *	1 mark
	Calcium bromide:	Calcium bromide is a brittle solid. As a solid it is a poor conductor of heat and electricity. When molten it is a good electrical conductor. Calcium bromide is soluble in water and the solution conducts electricity (only one of these is needed).	1 mark

Question 4 (8 marks)

a. $n(I) = \frac{3.694}{126.9} = 0.02911$ mol* 1 mark

b. mass of Zn reacting = 2.573 – 1.628 = 0.945 g * 1 mark

c. $n(Zn) = \frac{0.945}{65.4} = 0.01445$ mol* 1 mark

ratio $\frac{n(I)}{n(Zn)} = \frac{0.02911}{0.01445} = 2.01$* 1 mark

and the empirical formula of zinc iodide is ZnI_2. * 1 mark

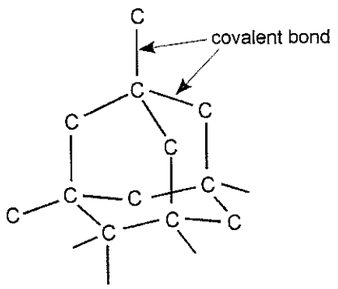
d. To remove the zinc iodide formed in the reaction. * 1 mark

e. Zinc iodide would have been left on the remaining zinc and would have been weighed with it. Hence the mass of zinc reacting would have appeared lower. * 1 mark

n(Zn) would have been smaller and thus the ratio n(I) : n(Zn) would have been higher. * 1 mark

Question 5 (8 marks)

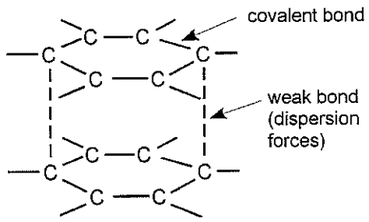
a. Diamond



Each C atom is strongly bonded to 4 other C atoms to make a continuous 3D lattice.

2 marks

Graphite



C atoms are arranged in layers. There is strong bonding (–)within each layer but weak bonding(---) between the layers.

2 marks

b. *Diamond*

Properties: Any two of hardness, high melting temperature, solid at SLC, non-conductor of electricity — 2 x ½ = 1 mark

Explanation: In diamond each carbon atom is covalently bonded to 4 other C atoms. These are strong bonds and they extend throughout the 3D structure. There are no weaknesses. — 1 mark

Graphite

Properties: Any two of high melting temperature, soft, slippery or greasy, leaves trail on paper, hard in one direction but soft at an angle to this direction, good conductor of electricity. — 2 x ½ = 1 mark

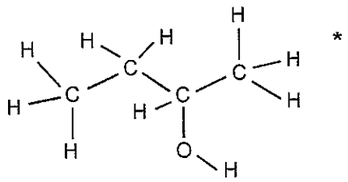
Explanation: Carbon atoms are arranged in layers. In the layers each C atom is strongly bonded to 3 other C atoms (covalent bonding). The layers are held together by weak dispersion forces so can slide over one another and separate when pressure is applied. — 1 mark

Question 6 (11 marks)

a. These reactions are all additions reactions. * 1 mark

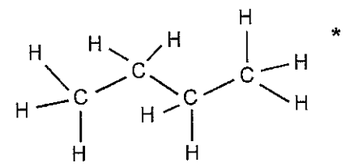
b. HBr* (The formula of but-2-ene is C_4H_8 and that of 2-bromobutane is C_4H_9Br. The difference between these formulae is HBr.) 1 mark

c.



* butan–2–ol* (or 2–butanol) 2 marks

d.



* butane* 2 marks

e. $C_4H_8(l) + 6O_2(g) \rightarrow 4CO_2(g) + 4H_2O(l)$ ** 2 marks

f. Y(butan-2-ol): saturated; but-2-ene: unsaturated; Z(butane): saturated; 2-bromobutane: saturated — 4 x ½ = 2 marks