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THE OPEN UNIVERSITY OF SRI LANKA B.Sc DEGREE PROGRAMME 2007/2008 CHU2123/CHE 4123 – INORGANIC CHEMISTRY- LEVEL 4 ASSIGNMENT TEST I - MCQ TEST

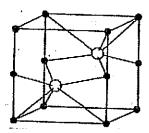
MCQ ANSWER SHEET: Mark a cross (X) over the most suitable answer.

Name:		
Reg.No/Index No.		•
Marks	FOR EXAM	INERS USE
Part A	Unanswered	
Part B	Correct Ansv	vers
Total %	Wrong Answ	vers
	Total	
	<u> </u>	
1. 1 2 3 4	2 . 1 2 3 4	3 . 1 2 3 4
4. 1 2 3 4	5 . 1 2 3 4	6 . 1 2 3 4
7. 1 2 3 4	8. 1 2 3 4	9. 1 2 3 4
10 . 1 2 3 4	11 . 1 2 3 4	12. 1 2 3 4
13 . 1 2 3 4	14 . 1 2 3 4	15. 1 2 3 4

Part B- Structured Essay (55 marks)

Answer all the questions in the space provided.

1. (a) The diagram given below depicts the unit cell for a compound containing atoms A (filled circles •) and B (open circles O).

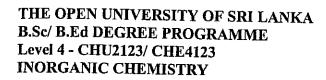


Show (by working out) that empirical formula of the given compound is AB.

(b) Would you get a diffraction effect by passing 500 nm visible radiation through a crystalline solid? Explain your answer.

(c) The density of silver is 10.5 g/cm ³ a Draw the unit cell of gold crystal	nd the metal crysta	allizes in the	FCC structure.
and the second of the second o			
		÷	
(d) Three physical properties of diamon feature/s of diamond related to each	nd are listed below n property.	. Write dowi	the structural
Poor conductor of electricity of the			
			•••••
High melting point			
			•
2. A molecule with formula XY ₅ was proceed with a nucleus three Y nuclei without changing the in XY ₃ is p. Then two more nuclei plane so that the two Y nuclei and X the said XY ₃ plane. The new XY b	of X. Then the the geometry of BF ₃ . of Y were bonded X are on a straight	ree F nuclei v The length of to X on either line which is	were replaced with of X-Y bond formed er side of the XY ₃ s perpendicular to
(a) Indicating the order locate the	principal axis of X	Y ₅	
(b) Indicating the order, locate any	y other axes of rota	ition in this n	nolecule.

(c) What is the symmetry point group of this molecule.	***************************************
(d) How many groups of equivalent X nuclei does this renuclei belonging to each group. Briefly describe you	nolecule have? Identify the X ir answer.
(e) If one Y is substituted by Z, how many different mo XY ₄ Z have? Briefly describe your answer.	no-substituted molecules can
••••••	(25 marks)





ASSIGNMENT TEST -	1		the first of the	
21 st November 2007 (We	dnesday)	Duration: 1.5 h	3.	30 p.m – 5.00 p.m.
P	art A - Mult	iple Choice Quest	ions (45 marks)
Answer all the question Select the most correct answer on the given an counted. 3 marks will b deducted for each incor	answer to ea swer sheet. e awarded fo	ich question giver Any answer with or each correct an	n below and m	ark a cross X over the
1. Covalent bonds are the (1) KF(s) (2) CO	ne only type ₂ (s) (3) H ₂	of bond or intern O(s) (4) NH ₄ NO	nolecular force 2(s) (5) C (6	es in: liamond)
	nond (3) w	ater (4) sodium	chloride (5)	none of the above
3. Which of the following substance?(1) rubber and plastic(4) caesium chloride a	(2) rubbe	r and sodium chlo	oride (3) sil	ica and rubber
 A substance melts with of electricity but it dissubstance is best descent a covalent networn (4) a metallic solid 	solves in wa ribed as k solid (2)	an ionic solid (ducting solution	on. The white
5. Based on intermoleculosiling point? (1) CH ₂ Cl ₂	lar interactio	•	ollowing shou) CH₃OH	
6. The number of unit c diagram below is	ells that shar	re an atom represo	ented by the fi	lled circle in the
				in in Alba Dinasi Dinasi Albasi naja
(1) 1 (2) 2	(3) 4	(4) 8	(5) 16	

 7. Covalent crystals have: (1) higher melting points than molecular crystals (2) lower melting points than molecular crystals (3) discrete molecules linked by van der Waals forces (4) hydrogen bonding (5) always excellent electrical conductivity
 8. The equation 2dsin 6 = n λ is known as the Bragg equation. Here, n is referred to as the number of unit cells in the crystal. the number of atoms in the crystal the order of reflection the order of inference the order of inference or reflection
 9. Which of the following will not give rise to a crystal defect? (1) an ion dislocated to an interstitial site (2) formation of a hole in the lattice. (3) a plane shift (4) substitution of a cation M²⁺ by M³⁺. (5) passing X-rays through a crystal.
10. Consider the following statements regarding a chemical defect. (i) composition of the lattice is changed due to new chemicals incorporated. (ii) ruby is an example of a crystal lattice with chemical impurity (iii) crystal colour is due to the incorporation of transition metals. The correct statement/s is/are (1) (i) only (2) (i) and (ii) only (3) (i) and (iii) only (4) All (i), (ii) and (iii) (5) None of (i), (ii) and (iii).
 Consider the following statements. (i) Any improper rotation about an improper axis is a symmetry operation. (ii) The outcome of any improper rotation does not depend on the order in which the rotation and reflection were performed. (iii) The outcome of a given improper rotation does not depend on the order in which the rotation and reflection were performed only if it is a symmetry operation.
The correct statements out of (i), (ii) and (iii) above are (1) (i) and (ii) only. (2) (i) and (iii) only. (3) (ii) and (iii) only. (4) All (i), (ii) and (iii) (5) None of the answers (1), (2), (3) or (4) is correct.
12. An improper rotation about an axis by 90° is a symmetry operation. Improper rotation by 360° about the same axis is equivalent to the identity operation. What is the smallest possible order of this axis?
(1) 2 (2) 3 (3) 4 (4) 5 (5) 6

- 13. The dipole moment of a SCI₆ molecule is zero.
 - (i) The resultant dipole moment of any five S-Cl bonds is cancelled by that of the remaining S-Cl bond.
 - (ii) The above statement is true because the molecule has at least three symmetry planes which meet on a straight line.
 - (iii) The above statement is true because the molecule has more than one non-coincident rotation axes of symmetry.

The correct statements out of (i), (ii) and (iii) above are

- (1) (i) and (ii) only. (2) (i) and (iii) only.
 - (3) (ii) and (iii) only.
- (4) All (i), (ii) and (iii) (5) None of the <u>answers</u> (1), (2), (3) or (4) is correct.
- 14. Consider the following statements.
 - (i) A centre of inversion (of a molecule) may not be located at a nucleus.
 - (ii) Some molecules may have two centres of inversion.
 - (iii) In principle, a macromolecule may have a centre of inversion.

The correct statements out of (i), (ii) and (iii) above are

- (1) (i) and (ii) only.
- (2) (i) and (iii) only.
- (3) (ii) and (iii) only.
- (4) All (i), (ii) and (iii). (5) None of the answers (1), (2), (3) or (4) is correct.
- 15. Consider the following statements.
 - (i) A molecule containing a vertical plane cannot have C₂ axes.
 - (ii) A molecule containing a dihedral plane definitely contains C2 axes.
 - (iii) A molecule having a dihedral plane and a horizontal plane definitely contains C₂ axes lying on the horizontal plane.

The correct statements out of (i), (ii) and (iii) above are

- (1) (i) and (ii) only.
- (2) (i) and (iii) only.
- (3) (ii) and (iii) only.
- (4) All (i), (ii) and (iii). (5) None of the <u>answers</u> (1), (2), (3) or (4) is correct.

CHU 2123/CHE 4123 Inorganic Chemistry - Level 4 Assignment Test I - Answer Guide

Part Λ- MCQ

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Part B – Structured Essay **innitario parti els contraerit, ini**nitario en 1980 en 1

₹. bar,eje 300 nijest tin Adriesa sie 1. (a) Contribution from atom A in the corner 1/8 x 8 Contribution from atom A at half length $\frac{1}{4} \times 4 = 1$ Contribution from atom B (onen circles) $= 2^{-2}$ Contribution from atom B (open circles)

Therefore the formula $= A_2B_2$

 $= \hat{\mathbf{A}}\hat{\mathbf{B}}^{-1}$. The results in the second section $\hat{\mathbf{B}}$ Empirical formula (the simplest ratio)

(b) NO.

In order to get a diffraction pattern, the wave length of the passing rays should be in the same order of magnitude as the distance between the atoms in a crystal. The wavelength of the visible radiation does not satisfy this requirement. Therefore no diffraction pattern will be observed,

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decimal designates in energy constitution and (b)

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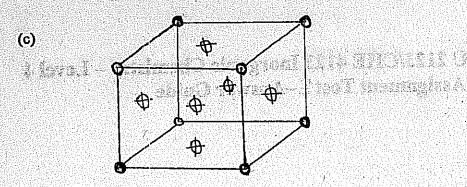
By considering the Bragg Equation, $2d \sin \theta = n\lambda$

When the angle is maximum, sin 90%=1 When the order of scattering is one

 $2d = \lambda$ As $\lambda = 500 \text{ nm}$ 2d = 500 nmd = 250 nm

As this distance is not the same order of magnitude as the distance between the atoms in a crystal, the diffraction cannot occur.

App. 1 Herrical very each



Silver atoms are at the corners of the cube and the center of the faces of the cube.

Valle Section of the (d) Poor conductor of electricity- Carbon atoms are sp³ hybridized, therefore no free electrons are available for conducting electricity. e call inconsing to microficolistics.) (1)

High melting point - Covalent network solid. Many bonds have to be broken in order to me t the solid.

Extreme Hardness - Covalent network solid, with sp³ hybridized carbon atoms, forming 4 payaringipus siir abaari saaligus bonds in each to form a giant structure.

- (a)C₃ The axis passing through X and the two Y nuclei added last.
- (b) There are three C₂, passing through X and each of the Y nuclei which replaced the F places appearable likely by each pointing of late out to nuclei.
- (c) D_{3h}
- (d) The molecule has 2 groups of equivalent Y nuclei.

The three Y nuclei which replaced F from one group. The other two Y nuclei form the other group.

By definition, equivalent nuclei can be exchanged with a rotational symmetry operation of the molecule, the three Y in one group can be exchanged using C_3^μ (or C_2). The two Y in the other group can be exchanged by C2 glar physician in the term the All Alexander

(e) Can have only two mono-substituted molecules There are two different groups of equivalent Y. is all others of a repulse courtain of as abeliances to when book but have a special out the

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