



B.Sc DEGREE PROGRAMM 2006/2007
LEVEL 3- ASSIGNMENT TEST 1(NBT)
CHU 1221 – BASIC PRINCIPLES OF CHEMISTRY
DURATION: 1 HOUR AND 30 MINUTES

DATE: 29 th July 2006

TIME- 3.30 p.m TO 5.00 p.m

Instructions to candidates

Answer all questions.

Choose the most correct answer to each question and mark a cross over the appropriate cage on the answer sheet. Questions with more than one answer will not be counted for grading. Each correct answer will carry 1 mark. **1/6 th of a mark will be deducted for each incorrect answer.**

Use a pen (not a pencil) to mark your answers.

1. To what multiplier does the prefix “micro” corresponds?

- (1) 10^{-3} (2) 10^{-6} (3) 10^{-9} (4) 10^3 (5) 10^6

2. Which of the following is **not** basic physical quantity in the SI system?

- (1) Length (2) Energy (3) Electric charge (4) Electric current (5) Amount of substance

3. The SI unit for the derived quantity pressure would be,

- (1) $\text{kg m}^{-1} \text{s}^{-2}$ (2) kg m s^{-2} (3) $\text{kg m}^{-3} \text{s}^{-1}$ (4) kg s^{-2} (5) kg m^{-3}

4. Cathode rays,

- (1) may be positively or negatively charged particles
(2) have properties identical to β particles
(3) are a form of electromagnetic radiation
(4) have masses that depend on the matter from which they are derived
(5) always travel from anode to cathode

5. Rutherford’s model of atom failed because

- (1) The atom did not have a nucleus and electrons
(2) It did not account for the attraction between protons and neutrons.
(3) It did not account for the stability of the atom
(4) There is actually no space between the nucleus and the electrons.
(5) It did not explain the sharp lines in the spectrum.

6. The relative atomic mass of boron, which consists of isotopes $^{10}_5\text{B}$ and $^{11}_5\text{B}$ is 10.8. The percentage of $^{11}_5\text{B}$ atoms in the isotopic mixture is,

- (1). 0.8 % (2). 8.0 % (3). 20 % (4). 80 % (5). 92 %

7. Eight liters of 0.86 M HBr solution contains

- (1). 6800 m mol of HBr (2). 0.688 mol of HBr (3). 3.44 mol of HBr
(4) 28000 m mol of HBr (5) 6.88 mol of HBr

8. Which of the following determines the position of an element in the periodic table?

- (1) chemical reactivity (2) first ionization energy (3) number of electrons in the outer shell
(4) number of protons in the nucleus of its atom (5) relative atomic mass

9. Which of the following statements regarding the properties associated with ionic and covalent compounds is correct?

- (1) A covalent compound cannot be an electrolyte.
(2) Both ionic bonding and covalent bonds cannot occur in the same compound.
(3) Ionic compounds differ from metals in that ionic compounds do not conduct electricity in the solid state.
(4) Ionic compound only in molten state conduct electricity.
(5) The only covalent compounds with high melting points are those in which hydrogen bonds occur.

10. Approximate number of electrons in 2.8 g of Nitrogen gas is

- (1) 84.3×10^{23} (2) 8.43×10^{23} (3) 6.02×10^{22} (4) 42.14×10^{23} (5) 6.02×10^{23}

11. Which one of the following is involved in determining the enthalpy change in a chemical reaction?

- (1) The number of steps involved in the chemical reaction
(2) The activation energy of the reaction
(3) The initial and final stages of the reacting system
(4) The mechanism of the reaction
(5) The intermediates of the reaction

12. The statement "Energy of the electron in the Hydrogen atom is quantized" means

- (1) Electron of the Hydrogen atom can take any amount of energy.
(2) Electron of the Hydrogen atom is permitted to have only certain values of energy.
(3) Energy is emitted when electron of the Hydrogen atom moves around the nucleus.
(4) Energy levels of the Hydrogen atom become closer with the distance from the nucleus.
(5) Energy of the Hydrogen atom is described by the azimuthal quantum number.

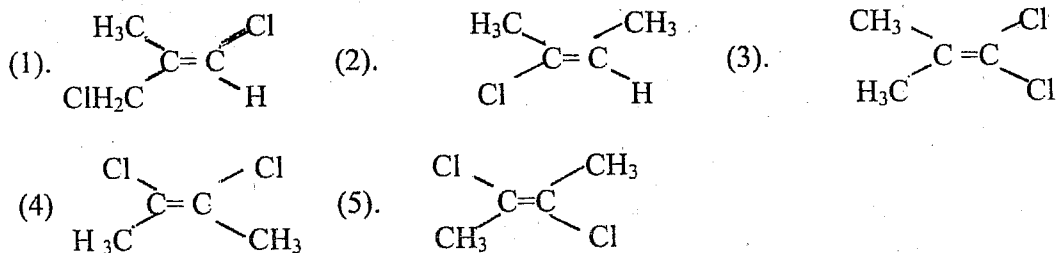
13. What is the atomic number of the element that has four **unpaired** electrons in its **ground state**?

- (1). 6 (2). 14 (3). 16 (4). 22 (5). 26

14. de Broglie equation is associated with

- (1) the wave nature of electron (2) the dual nature of electron (3) the particle nature of electron
(4) the wavelength and energy relationship (5) angular momentum of electron

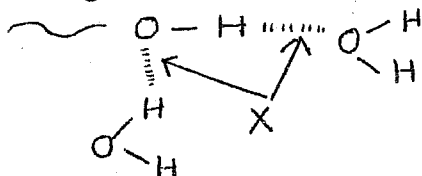
15. Which of the following molecular structures will have the **smallest** overall dipole moment?



16. In micro wave ovens, the wave energy produced is absorbed by certain polar molecules. Which of the following would absorb microwave energy?

- (1). C_2H_5OH (2). $NaCl$ (3). SiO_2 (4). NaF (5). MgO

17. X in the diagram below is most correctly described as



- (1). ionic bond (2). covalent bond (3). Hydrogen bond (4) Vander Waal bond (5) Coordin

18. The wavelength of a spectral line for an electronic transition is inversely related to

- (a). The number of electrons undergoing the transition
 (b) The nuclear charge of the atom
 (c) the difference in the energy of the energy levels involved in the transition
 (d) the velocity of electron undergoing the transition

The correct answer is/are

- (1). a only (2). c only (3). a and b only (4). C and d only (5). (a), (b), and (c)

19. Which of the following sets of quantum numbers are allowed for an electron in an atom?

- (1). $n = 2, l = 1, m = 0, s = +\frac{1}{2}$ (2) $n = 2, l = 2, m = 2, s = +\frac{1}{2}$ (3) $n = 2, l = 2, m = 2, s = +\frac{1}{2}$
 (4) $n = 1, l = 1, m = 0, s = +\frac{1}{2}$ (4) $n = 1, l = 1, m = -1, s = +\frac{1}{2}$

20. Zeeman effect is related to

- (1) effective nuclear charge of an atom
 (2) splitting of spectral lines in an electric field
 (3) Probability electron distribution of 2s electrons
 (4) dual nature of an electron.
 (5) splitting of spectral lines in a magnetic field.

21. Which of the following equation represent the 2nd ionization enthalpy of Mg?

- (1). $\text{Mg}_{(s)} \rightarrow \text{Mg}^+_{(g)} + e^-$ (2). $\text{Mg}_{(g)} \rightarrow \text{Mg}^+_{(g)} + e^-$ (3). $\text{Mg}_{(g)} \rightarrow \text{Mg}^{2+}_{(g)} + 2e^-$
 (4). $\text{Mg}^+_{(g)} \rightarrow \text{Mg}^{2+}_{(g)} + e^-$ (5). $\text{Mg}_{(g)} + e^- \rightarrow \text{Mg}^-_{(g)}$

22. Of the following pairs, the one containing examples of metalloid elements in the periodic table is,

- (1). Sodium and Potassium (2). Fluorine and Chlorine (3). Calcium and Magnesium
 (4). Boron and Silicon (5). Copper and Gold

23. Consider the following statements

- a. the number of orbitals in a shell is equal to n^2 , where n = shell number.
 b. the three quantum numbers l, m, s define the orbital in which the electron resides
 c. there are three degenerate p orbitals in the shell $n = 4$

The correct statements from (a), (b) and (c) are,

- (1). a and b only (2). a and c only (3). all a, b and c (4). b and c only (5). None of the above

24. Consider the following statements regarding Fe, Co, and Ni

- a. all three elements are known to form coloured complexes.
 b. except Fe, Co and Ni are transition elements
 c. the general outer shell electron configuration for all three can be given as $(n-1)d^{1-10}ns^2$.

The correct statement/s is/are

- (1). a only (2). a and b only (3). a and c only (4). b and c only (5). None of the above

25. Which of the following equations represent the Lattice energy of TlCl ?

- (1). $\text{Tl}^+_{(aq)} + \text{Cl}^-_{(aq)} \rightarrow \text{TlCl}_{(s)}$
 (2). $\text{Tl}_{(s)} + \frac{1}{2} \text{Cl}_{2(g)} \rightarrow \text{TlCl}_{(s)}$
 (3). $\text{Tl}^+_{(g)} + \text{Cl}^-_{(g)} \rightarrow \text{TlCl}_{(s)}$
 (4). $\text{Tl}^+_{(g)} + \text{Cl}^-_{(g)} \rightarrow \text{TlCl}_{(g)}$
 (5). $\text{TlCl}_{(s)} \rightarrow \text{Tl}^+_{(aq)} + \text{Cl}^-_{(aq)}$

26. The correct ground state electronic configuration of B_2 molecule is

- (1). $\sigma_{2s}^2, \sigma_{2s}^{*2}, \pi_{2py}^1, \pi_{2pz}^1$ (2). $\sigma_{2s}^1, \sigma_{2s}^{*1}, \pi_{2py}^1, \pi_{2pz}^1$ (3). $\sigma_{2s}^2, \sigma_{2s}^{*2}, \pi_{2py}^2, \pi_{2p}$
 (4). $\sigma_{2s}^2, \sigma_{2s}^{*2}, \pi_{2py}^2, \pi_{2pz}^2$ (5). $\sigma_{1s}^2, \sigma_{1s}^{*2}, \pi_{2py}^1, \pi_{2pz}^1$

27. Which of the following species has the same magnetic properties as O_2 ?

- (1) Cu^+ (2) Zn^{2+} (3) K^+ (4) Ni^{2+} (5) Mg^{2+}

28. The correct ground state electronic configuration of Cr^{3+} ion is
- (1). $[\text{Ar}] (3d)^5(4s)^1$ (2). $[\text{Ar}] (3d)^3(4s)^0$ (3). $[\text{Ar}] (3d)^4(4s)^0$
 (4) $[\text{Ar}] (4d)^5(4s)^1$ (5). $[\text{Ne}] (3d)^3(4s)^0$

For questions 29 and 30 select the most correct answer from the five choices given below

- (1). linear (2). Triangular planar (3). Tetrahedral (4). trigonal bipyramidal (5). Octahedral
29. According to the VSEPR theory, what is the geometrical structure of $\text{PCl}_5(\text{g})$?
 30. What is the geometry related to sp^3d^2 hybridization?

31. Ionization energy data of Li and Be are given below:

	1 st I.E (kJ mol ⁻¹)	2 nd I.E (kJ mol ⁻¹)
Li	520	7298
Be	900	1757

Which of the following statement best describes the above differences in the ionization energies of the two elements?

- (1) Be atom is smaller than the Li atom.
 (2) The effective nuclear charge on Li atom is more than that on Be atom.
 (3) The type of electron that is being removed in two atoms are different.
 (4) More energy is required to remove an electron from a filled orbital.
 (5) None of the above.
32. Which of the following is related to the Balmer series in the H atomic spectrum?

(1) $\Delta E = R \left[\frac{1}{2^2} - \frac{1}{3^2} \right]$ (2) $\Delta E = R \left[\frac{1}{1^2} - \frac{1}{3^2} \right]$ (3) $\Delta E = R \left[\frac{1}{3^2} - \frac{1}{4^2} \right]$
 (4) $\Delta E = R \left[\frac{1}{1^2} - \frac{1}{\alpha} \right]$ (5) $\Delta E = R \left[\frac{1}{1^2} - \frac{1}{2^2} \right]$

33. Which of the following compounds has the least solubility in water?

- (1) CsCl (2) NaI (3) LiI (4) LiF (5) LiCl

34. Which of the following molecules obey octet rule?

- (a) SF_4 (b) CO_2 (c) SiCl_4 (d) POCl_3

The correct answer is

- (1) a and b only (2) b and c only (3) c and d only (4) a and d only (5) a, b and c only

35. Which of the following sets of orbitals are **degenerate** in an atom with two or more electrons?

- (1) $3d_{xy}$ and $4d_{xy}$ (2) $4s$ and $4p_z$ (3) $4p_z$ and $4d_{xy}$ (4) $4p_x$ and $4p_y$ (5) $1s$ and $2s$

36. The bond order of O_2 is 2 and the bond length is 1.21 \AA . The values for N_2 for the same is 3 and 1.10 \AA respectively. Which of the following can be true regarding the bond order and bond length of O_2^+ ?

- (1) Bond order is 0 and the bond length between 1.10 \AA and 1.21 \AA .
- (2) Bond order 2 and the bond length between 1.10 \AA and 1.21 \AA .
- (3) Bond order 2.5 and the bond length between 1.10 \AA and 1.21 \AA .
- (4) Bond order 2.5 and the bond length 1.21 \AA .
- (5) Bond order 2 and the bond length 1.10 \AA .

37. Which of the following set of quantum numbers describes the electron, which is most difficult to remove from a boron atom in its ground state?

- (1) $n = 2, l = 1, m = 0, s = -1/2$
- (2) $n = 1, l = 0, m = 0, s = -1/2$
- (3) $n = 2, l = 0, m = 0, s = -1/2$
- (4) $n = 3, l = 1, m = 1, s = -1/2$
- (5) $n = 4, l = 1, m = 1, s = 1/2$

38. The orbital diagram which describes the Hund's rule is given by

- (1) $1s \uparrow \quad 2s \uparrow \quad 2p \uparrow \uparrow \uparrow$
- (2) $1s \uparrow \uparrow \quad 2s \uparrow \uparrow \quad 2p \uparrow \uparrow \uparrow$
- (3) $1s \uparrow \uparrow \quad 2s \uparrow \quad 2p \uparrow \uparrow \uparrow$
- (4) $1s \uparrow \uparrow \quad 2s \uparrow \uparrow \quad 2p \uparrow \uparrow \uparrow$
- (5) $1s \uparrow \quad 2s \uparrow \uparrow \quad 2p \uparrow \uparrow \uparrow$

39. Which of the following statement is wrong?

- (1) Bohr model can be used for He^+ and Li^{2+} ions.
- (2) At the nodal plane the probability of finding the electron is zero.
- (3) An orbital can accommodate any number of electrons.
- (4) The bond angle in sp^2 hybridization is 120° .
- (5) The structure of NO_3^- is a resonance hybrid of many structures.

40. Consider the following statements.

- (a) The gaps between the spectral lines in the hydrogen spectrum are all equal.
- (b) Hydrogen atom can show both absorption and emission spectrum.
- (c) Spectral lines in the Lyman series are not visible to human eye.

the correct statement/s is/are,

- (1). (a) only
- (2). (b) only
- (3). (c) only
- (4). (a) and (c) only
- (5). (b) and (c) only