



DOON UNIVERSITY, DEHRADUN
End Semester Examination, December, 2017
School of Physical Sciences
Inorganic Chemistry II: s- and p-Block Elements
Course: CYC-201

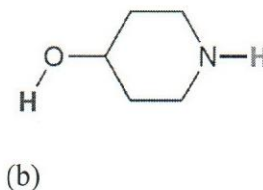
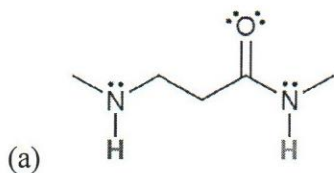
Time Allowed: 2 Hours.

Maximum Marks: 30

Section: A (*Attempt all questions*)

(Marks: 10 Q × 1 = 10)

- (a) Write the name of metal carbonyls usually present as impurities in the process of Ni purification by Mond's process.
 (b) You are provided with samples of some impure metals such as Ti, Ni and Ge. Which methods would you recommend for the purification of each of these metals?
- Show that strong acids have weak conjugate bases and strong bases have weak conjugate acids.
- (a) What are *Lewis acids*? Arrange the following in the order of increasing acid strength:
 BCl_3 , BF_3 , BBr_3 .
 (b) What are *Lewis bases*? Arrange the following in the order of decreasing base strength:
 NH_3 , NCl_3 , NF_3 .
- Compare the two protons shown in the following pictures. Which one is more acidic?



- Comment on the basicity order of the hydrides of group 15 elements (NH_3 , PH_3 , AsH_3 and SbH_3).

6. Give reason for the following:

i) Electron affinity of F atom is less than that of Cl atom.

ii) Ionization energies of C, N and O atoms follow the order: $C < N > O$.

7. In the gaseous and liquid states, phosphorus pentachloride consists of PCl_5 molecules, but in the solid state it consists of a 1:1 mixture of PCl_4^+ and PCl_6^- ions. Predict the geometric structures of PCl_4^+ and PCl_6^- .

8. How does the structure of BN differ from that of graphite? What is the hybridization on representative atoms present in the molecules?

9. Explain the following:

(i) Diamond is non-conductor while graphite is a good conductor of electricity.

(ii) Pb^{4+} compounds are oxidizing agents.

10. List three properties of diamond and account for them in terms of structure and bonding.

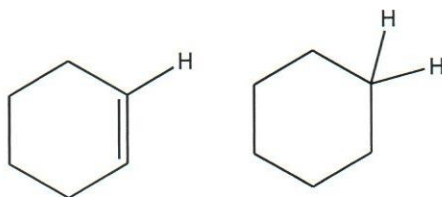
Section: B (Attempt any **four** questions)

(Marks: **4Q** \times 2 = 8)

11. Discuss the structure of the following molecules using VSEPR theory:

(i) ClF_3 (ii) XeOF_4 (iii) I_3^- (iv) SnCl_3^- .

12. (i) Which is the stronger acid and why?



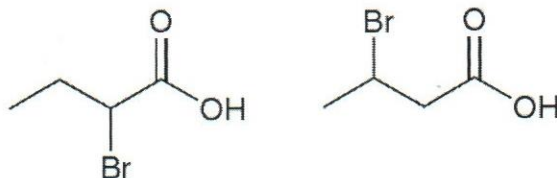
(ii) Identify the most acidic proton in each of the following:



(iii) Determine the most acidic proton in the following. Explain with reason.



(iv) Which of the following compounds is more acidic?



13. (a) Why is CO_2 a gas and SiO_2 a highly stable solid.

(b) Describe the structure of SO_2 and SO_3 molecule.

14. What are pseudohalogens? Why are they so called? Describe the important characteristics of pseudohalogens.

15. What are clathrate compounds of noble gases? Describe the clathrate compounds of Ar or Xe with quinol.

Section: C (Attempt any three questions)

(Marks: $3Q \times 4 = 12$)

16. What are phosphazines? How are they prepared? Discuss the structures of important chlorophosphazines.

17. Write a short note on:

(i) *Bent's rule*

(ii) ortho- and pyrosilicates

(iii) *Kroll* method to purify Ti.

18. Discuss the detailed structures of B_2H_6 , borazine and fullerenes.

19. Explain the following:

(i) NF_5 is not known while PF_5 is so well known.

(ii) The bond order in O_2^- is less than that in O_2 which, in turn is less than that in O_2^+ .

(iii) The bond energy of NO^+ is higher than that of NO .

(iv) NH_3 molecule has higher boiling point than PH_3 .

(v) AgF is most soluble in water among silver halides.