M.Sc.-III/CHEM-305EID/18

M.Sc. 3rd Semester Examination, 2018

(Advanced General Chemistry)

Paper : 305EID

Course ID : 31454

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any five*: 2×5=10

(a) Why is valences of carbon four?

(b) Define the term "Resonance Energy".

(c) Write the basic difference in covalent and ionic bonds.

(d) State the Huckel's rule for Aromaticity.

(e) What is collision theory of gases?

(f) What do you mean by mean free path?

(g) How many σ-bonds are present in acetylene molecule?

2. Answer *any four*: 5×4=20

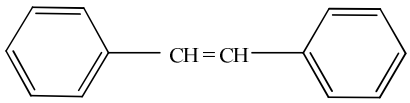
(a) Calculate the radius of the first stationary orbit of hydrogen atom in angstrom (Å). Write the statements of Bohr's Postulates. 3+2=5

(b) What is standing wave? From the concept of standing wave prove that $m\vartheta r = nh/2\pi$ (symbols are as usual). 2+3=5

(c) What is root mean square velocity? How can you derive it? 2+3=5

(d) Calculate heat capacity of linear & non-linear molecules with the help of principle of equi partition of energy. 5

(e) Draw the orbital picture of $CH_3 - CH_3$ & $CH \equiv CH$ molecules. Mention the hybridization state, bond angle and bond length. 2+(1·5×2)=5

(f) (i) Draw the resonating structures of O_3 and 

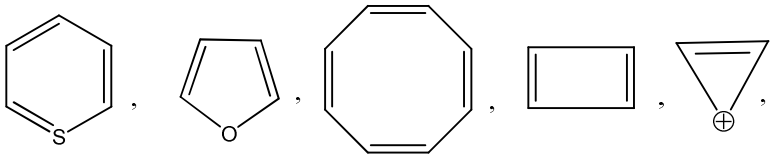
(ii) '2, 6- Dimethyl 4-nitro aniline is weak basic than 3, 5 dimethyl 4-nitro aniline' — Explain.

(iii) Why is hyperconjugation called "no bond resonance"? 2+2+1=5

3. Answer *any one*: 10×1=10

(a) (i) State the difference between resonance and tautomerism.

(ii) Mention the following compounds is aromatic, non-aromatic and anti-aromatic.



[18] Annulene

(iii) Write down the two demerits of Rutherford's atomic model. Why did Rutherford use gold foil in his α-particle scattering experiment?

(iv) A radioactive element 'X' emits one α-particle followed by two β-particles to produce Y. What is the relation between X & Y? 2+(½×6)+(2+1)+2=10

(b) (i) What do you mean by non-classical carbocation? Why is it more stable than classical carbocation?

(ii) Arrange the following chemical species according to their stability with explanation:

$CH_3 - CH = CH_2^+,\ Me_3C^+, (Cl_3)_2CH^+, CH_3 - CH_2^+$

(iii) Calculate the Kinetic energy of the electron in the first orbit of He^+. What will be the value in the second orbit? (1+1)+3+(3+2)=10

———————