

AE-F

2/2015

SUBJECT : CHEMISTRY (SET-I)

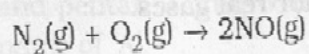
Time : 3 Hrs.

M.M.: 70

General Instructions :

- i) All questions are compulsory.
- ii) Question numbers 1 to 5 are very short answer type questions carrying 1 mark each.
- iii) Question numbers 6 to 10 are short answer type questions carrying 2 marks each.
- iv) Question numbers 11 to 22 are also short answer type questions carrying 3 marks each.
- v) Question numbers 23 is a value based question carrying 5 marks.
- vi) Question numbers 24 to 26 are long answer type questions carrying 5 marks each.
- vii) Use log tables, if necessary. Use of calculators is not allowed.

- Q1. How many significant figures are present in 0.00035?
- Q2. Why is energy of 1s electron lower than 2s electron?
- Q3. What is the nature of oxides formed by most of p-block elements?
- Q4. Name the isotope of hydrogen which contains equal number of protons and neutrons.
- Q5. How is classical smog different from photo-chemical smog? (any one point)
- Q6. Conc. HCl is 38% HCl by mass. What is the molarity of this solution if density = 1.19 g cm^{-3} ?
- Q7. Critical temperature for carbon dioxide and methane are 31.1°C and -81.9°C respectively. Which of these has stronger intermolecular forces and why?
- Q8. (a) Determine the sign of entropy change in the following reaction :



(1)

- (b) Under what condition ΔU for a chemical reaction can be equal?

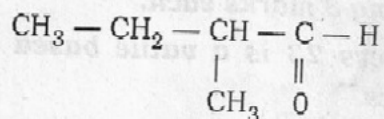
OR

Derive the relationship between C_p and C_v for an ideal gas.

- Q9. An organo metallic compound on analysis was found to contain, C = 64.4%, H = 5.5% and Fe = 29.9%. Determine its empirical formula.

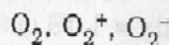
(At. mass of C = 12, H = 1, Fe = 56 u)

- Q10. (a) Write the IUPAC name of the following compound:



- (b) Write the structural formula of 3, 4, 4, 5 - tetra methyl heptane.
- Q11. Give the reasons for the following :
- (a) Electron gain enthalpy of fluorine is less negative than that of chlorine.
- (b) Anionic radius is always more than that of neutral atom.
- (c) Ionization enthalpy of nitrogen is more than that of oxygen.

- Q12. On the basis of molecular orbital theory compare the relative stabilities of the following species and indicate their magnetic behaviour :

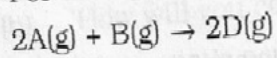


- Q13. Density of a gas is found to be 5.46 g/dm^3 at 27°C at 2 bar pressure. What will be its density at STP?

OR

Why do real gases deviate from ideal behaviour? Derive under Waal's equation for real gases.

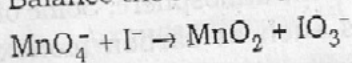
Q14. For the reaction :



$$\Delta U^\circ = -10.5 \text{ KJ and } \Delta S^\circ = -44.1 \text{ JK}^{-1} \text{ mol}^{-1}$$

Calculate ΔG° for the reaction and predict whether the reaction may occur spontaneously.

Q15. Balance the following redox reaction in basic medium :



Q16. What causes the temporary and permanent hardness of water? Explain the method of softening of hard water by permutit method.

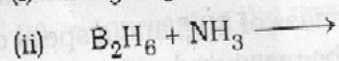
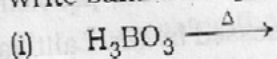
Q17. Give reasons :

(a) Beryllium and magnesium do not give colour to flame whereas other alkaline earth metals do so. Why?

(b) LiI is more soluble than KI in ethanol.

(c) Alkali metals do not occur in free state.

Q18. (a) Write balanced equation for :



(b) Why does boron trifluoride behave as a Lewis acid?

Q19. (a) Gallium has higher ionisation enthalpy than Al. Explain.

(b) Boron does not form $[\text{BF}_6]^{3-}$ whereas $[\text{AlF}_6]^{3-}$ exists. why?

(c) What do you understand by inert pair effect?

Q20. Explain the following reactions, giving suitable example of each:

(a) Wurtz reaction

(b) Friedal - Crafts alkylation

(c) Markovnikov addition

Q21. (a) An alkene 'A' on ozonolysis gives a mixture of ethanol and pentan-3-one. Write the structure and IUPAC name of 'A'.

(b) Trans-2-butene has higher melting point than cis-isomer.

Q22. Define hybridisation. Explain the structure of C_2H_2 with orbital diagram.

Q23. About 75% of solar energy reaching the earth, is absorbed by earth's surface which increases its temperature. The rest of heat radiates back to the atmosphere. Some of the heat is trapped by gases such as carbon monoxide, methane, ozone, chlorofluorocarbons (CFCs) and water vapours present in the atmosphere. Thus, they add to heating the atmosphere. This causes global warming. Mr. Vinay Jain's family has four cars and they use all of them everyday creating lot of pollution whereas Mr. Lalit Jain takes metro to reach his place of work.

(a) How can we decrease carbon monoxide gas in the atmosphere?

(b) How can we save ozone layer?

(c) Can use of solar energy solve our problems?

(d) What values are possessed by Mr. Lalit Jain?

Q24. (a) A golf ball has a mass of 40g, and a speed of 45m/s. If the speed can be measured within an uncertainty of 2%, calculate the uncertainty in the position.

(b) How many electrons in an atom may have the following quantum numbers :

(i) $n=4$ $m_s = -\frac{1}{2}$

(ii) $n=3$ $l=0$

(c) State Pauli's Exclusion Principle.

OR

(a) What are the frequency and wavelength of a photon emitted during a transition from $n=5$ state to $n=2$ state in the hydrogen atom?

(b) How many subshells are associated with $n=4$?

(c) Write the electronic configuration of Cr^+ .

[At. no. of Cr = 24]

Q25. (a) Draw the resonating structures of C_6H_5OH .

(b) How will you convert :

- (i) acetic acid into methane
- (ii) benzene into acetophenone
- (iii) benzene into p-nitrobromobenzene

OR

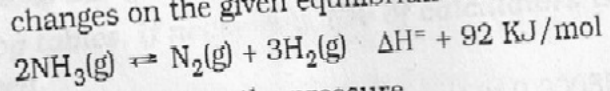
(a) Arrange primary (1°), secondary (2°) and tertiary (3°) carbocations in order of their increasing stability. Also give reason for your answer.

(b) Explain the following giving example :

- (i) Inductive effect
- (ii) Electrophile

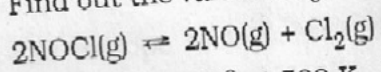
(c) What type of isomerism is shown by pentane and 2 methyl pentane?

Q26. (a) Explain and describe the effect of the following changes on the given equilibrium mixture :



- (i) increasing the pressure
- (ii) increasing the temperature
- (iii) decreasing the concentration of NH_3

(b) Find out the value of K_c for the following equilibria:



if $K_p = 1.8 \times 10^{-2}$ at 500 K

OR

(a) Calculate the p^H of the resulting mixture formed by mixing 10ml of 0.2 M $Ca(OH)_2$ and 25 ml of 0.1 M HCl solution.

(b) Write the conjugate acids of the following species :

- (i) F^-
- (ii) HSO_4^-

(c) The ionization constant of HF at 298K is 6.8×10^{-4} . Calculate the ionization constant of the corresponding conjugate base.