

ST. GEORGE'S SCHOOL, ALAKNANDA  
MID TERM EXAMINATION (2015-16)  
SUB- CHEMISTRY  
CLASS-XI (SET I)

DATE: 14.9.15

MAX. TIME: 3HR

MM: 70

No. of Pages: 4

General Instructions

Question 1 to 5 carry one mark each

Question 6 to 10 carry 2 marks each

Question 11 to 22 carry three marks each

Question 23 carries 4 marks

Question 24 to 26 carry five marks each

Use log tables if necessary, calculators are not allowed

Q-1- Chlorophyll, the green colouring matter of plants responsible for photosynthesis, contains 2.68% of magnesium by weight. Calculate the number of magnesium atoms in 2g of chlorophyll (Mg = 24)

Q-2- Write the electronic configuration of  $Ce^{3+}$  (atomic no. Ce = 58)?

Q-3- Arrange the following bonds in the order of increasing ionic character, LiF,  $K_2O$ ,  $N_2$ ,  $SO_2$ ,  $ClF_3$ ?

Q-4- Why are the gases Helium and hydrogen not liquefied at room temperature by applying very high pressure?

Q-5- Out of sigma and pi bond, which one is weaker and why?

Q-6- Out of  $SnCl_2$  and  $SnCl_4$  which has greater covalent character? Explain using Fajan's rule?

Q-7- Calculate heat of formation of methane if heat of formation of  $CO_2$  is  $-393 \text{ kJ mol}^{-1}$ ,  $H_2O(l)$  is  $-286 \text{ kJ mol}^{-1}$  and heat of combustion of methane is  $-890 \text{ kJ mol}^{-1}$

Q-8-  $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

What is the relationship between  $K_p$  and  $K_c$ ?

Q-9- State the group to which elements having following electronic configuration belong:

(i)  $[Ar] 18 4s^2 3d^1$  (ii)  $[Kr] 36 5s^1$  (iii)  $[Ar] 18 4s^2 3d^{10} 4p^5$  (iv)  $[Ar] 18 3d^{10} 4s^2$

Q-10- If  $Q_c < K_c$ , in which direction reaction will proceed? Explain.

Q-11- The first ionization enthalpy values (in KJ/mol) of group 13 elements are

B	Al	Ga	In	Tl
801	577	579	558	589

How would you explain this deviation from the general trend

Q-12- On analysis, a substance was found to have the following percentage composition:

K = 31.84; Cl = 28.98 and O = 39.18. Calculate its molecular formula if its molecular mass is 122.5.

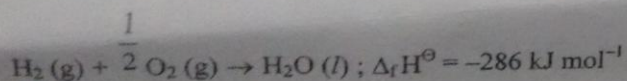
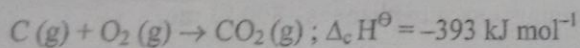
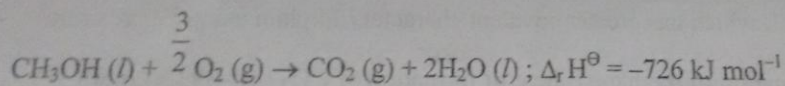
Q-13- Commercially available concentrated hydrochloric acid contains 38% HCl by mass. What is the molarity of this solution if its density is  $1.19 \text{ g cm}^{-3}$ . What volume of concentrated hydrochloric acid is required to make 1.00L of 0.10M HCl?

Q-14- The threshold frequency  $\nu_0$  for a metal is  $7.0 \times 10^{14} \text{ s}^{-1}$ . Calculate the kinetic energy of an electron emitted when radiation of frequency  $\nu = 1.0 \times 10^{15} \text{ s}^{-1}$  hits the metal.

Q-15 (i) Calculate the formal charge on all O-atoms in  $\text{O}_3$ .

- (ii) Explain important aspects of resonance with reference to  $\text{CO}_3^{2-}$  ion.
- (iii) Explain the formation of  $\text{NH}_3$  using Hybridisation?

Q-16- Calculate the standard enthalpy of formation of  $\text{CH}_3\text{OH} (l)$  from the following data:



Q-17- A student forgot to add the reaction mixture to the round bottomed flask at  $27^\circ\text{C}$  but instead he /she placed the flask on the flame. After a lapse of time, he realised his mistake, and using a pyrometer he found the temperature of the flask was  $477^\circ\text{C}$ . What fraction of air would have been expelled out?

Q-18- The work function for caesium atom is 1.9 eV. Calculate (a) the threshold wavelength and (b) the threshold frequency of the radiation. If the caesium element is irradiated with a

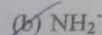
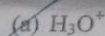
wavelength 500nm , calculate the kinetic energy and the velocity of the ejected photo electron?

- Q-19-
- (a) Why is ionization enthalpy of Be higher than boron?
  - (b) Why is second ionization energy of alkali metals very high?
  - (c) How does electronegativity vary down the group 17? Give reason.

Q20- (i) Although both  $\text{CO}_2$  and  $\text{H}_2\text{O}$  are triatomic molecules, the shape of  $\text{H}_2\text{O}$  molecule is bent while that of  $\text{CO}_2$  is linear. Explain this on the basis of dipole moment

(ii) Although geometries of  $\text{NH}_3$  and  $\text{H}_2\text{O}$  molecules are distorted tetrahedral, bond angle in water is less than that of ammonia. Discuss.

Q-21- On the basis of VSEPR theory predict the shape of the following:



Q-22- (a) How does Bohr model explain the simultaneous appearance of a large number of lines in the hydrogen spectrum.

(b) Derive de Broglie relationship

Q-23- Taj Mahal is regarded as eighth wonder in the world. Millions of people from India and abroad visit this great historic monument every year. They appreciate the architecture and the carvings. It is indeed, very prestigious for every Indian. But over the years, it has faced immense pollution problems. It has lost its lustre due to the presence of traces of

Hydrogen Sulphide and other pollutants present in air.

(i) What is the main reason for the damage done to Taj Mahal and other historical Monuments?

(ii) How is damage actually caused?

(iii) Suggest some ways to check pollution?

Q24- The first ( $\Delta_i H_1$ ) and the second ( $\Delta_i H_2$ ) ionization enthalpies (in  $\text{kJ mol}^{-1}$ ) and the ( $\Delta_{\text{eg}} H$ ) electron gain enthalpy (in  $\text{kJ mol}^{-1}$ ) of a few elements are given below:

Elements	$\Delta H_1$	$\Delta H_2$	$\Delta_{\text{eg}} H$
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I	520	7300	-60
II	419	3051	-48
III	1681	3374	-328
IV	1008	1846	-295
<del>V</del>	2372	5251	+48
VI	738	1451	-40

Which of the above elements is likely to be:

- (a) The least reactive element.
- (b) The most reactive metal.
- (c) The most reactive non-metal.
- (d) The least reactive non-metal.
- (e) The metal which can form a stable binary halide of the formula  $MX_2$  ( $X = \text{halogen}$ )

Give reasons for your answer.

Q-25- Why do gases deviate from ideal behaviour. Explain the two types of deviations? What corrections were made by Vander Waals explain? Also explain how the two postulates are incorrect in Kinetic Molecular theory?

Q-26- A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38 g carbon dioxide, 0.690 of water and no other products. A volume of 10.0 L (measured at STP) of this welding gas is found to weigh 11.6 g. Calculate (i) empirical formula, (ii) molar mass of the gas, and (iii) molecular formula of the gas  
(molar mass of Na=23, C=12, O=16, Ca=40)