

*Vridhu*

AMITY, SAKET

## First Terminal Examination 2016 - 2017

Class - XI

Subject - Chemistry

Time : 3 Hours

Max. Marks : 70

### General Instructions :

- All questions are compulsory.
- Marks of each question are indicated against it.
- Question number 1 to 5 are very short answer type questions, carrying 1 mark each. Answer these in one word or about one sentence each.
- Question number 6 to 10 are short answer type questions, carrying 2 marks each. Answer these in about 30 words each.
- Question number 11 to 22 are also short answer type questions, carrying 3 marks each. Answer these in about 40 words each.
- Question number 23 is value based question of 4 marks.
- Question number 24 to 26 are long answer type questions, carrying 5 marks each. Answer these in about 70 words each.
- There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all three questions of 5 marks weightage. Attempt only one of the choices in such questions.
- Use log tables, if necessary. Use of calculators is not permitted.

- ✓ Identify the orbital having the value of quantum number as  $n = 4$  and  $l = 2$ .
- ✓ Which among I,  $I^+$  and  $I^-$  has smallest size and why?
- ✓  $BeF_2$  molecule is linear while  $SF_2$  is angular though both are triatomic. Justify.
- ④ What is the effect of temperature on :
  - Viscosity
  - Surface Tension
- ⑤ Which of the two is more hard, MgO or CaO?

6. Sulphuric acid is generally available in market as 18.0 M solution. How can you experimentally prepare 250 ml of 0.50 M aqueous  $H_2SO_4$ ?

7. Among the elements B, Al, C and Si:

(a) Which element has the highest first ionisation enthalpy?

(b) Which element has the most metallic character?

Justify your answer in each case.

8. Which of the two:  $N_2$  or  $N_2^+$  has higher bond order and why? Explain on the basis of molecular orbital theory.

9. If 1 gram of each of the following gases are taken at STP, which of the gases will occupy:

CO,  $H_2O$ ,  $CH_4$ , NO

(a) Highest Volume

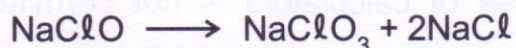
(b) Lowest Volume

(Atomic masses : C = 12u, H = 1u, O = 16u and N = 14u)

OR

→ At  $0^\circ C$ , the density of a certain oxide of a gas at 2 bar is same as that of nitrogen at 5 bar. What is the molecular mass of the oxide? (N = 14u)

10. (a) In the following reaction, which element loses as well as gains electrons?



(b) In which compound does Cr display its highest oxidation state?

11. (a) An atom having atomic mass number 13 has 7 neutrons. What is the atomic number of the atom? (1+2)

(b) In the reaction:



when 5 moles of A react with 6 moles of B, then

(i) Which is the limiting reagent?

(ii) Calculate the amount of C formed.

12. According to de Broglie, matter should exhibit dual behaviour, that is, it should exhibit both particle and wave like properties.

However, a cricket ball of mass 100 g does not move like a wave when it is thrown by a bowler at a speed of 100 km/h. Calculate the wavelength of the ball and explain why it does not show wave nature.

$$(h = 6.626 \times 10^{-34} \text{ Js})$$

13. Elements A and B have atomic numbers 12 and 29 respectively. On the basis of electronic configuration, write the period, group and block of each element.

14. (a) Identify the hybridization of each carbon atom in  $\text{CH}_3\text{CHO}$  molecule. (1+2)

(b) Give reasons for the following :

(i) Gases do not settle at the bottom of the container.

(ii) Window panes of old buildings become thicker at the bottom.

15. (a) Calculate formal charge on Carbon of  $\text{CO}_3^{2-}$  ion. (1+2)

(b) What are the two faulty assumptions in kinetic molecular theory of gases which are responsible for the deviation of ideal behaviour of gases ?

16. (a) Draw the shape of the orbital  $dx^2 - y^2$ .

(b) Write the formula given by Bohr to calculate radius of the stationary state.

(c) Why are fully filled and half-filled orbitals more stable ?

17. Among the following, which has higher value of property indicated and why ?

(a)  $\text{Mg}(\text{OH})_2$  or  $\text{Al}(\text{OH})_3$  (Basic nature)

(b)  $\text{P}_2\text{O}_5$  or  $\text{SiO}_2$  (Acidic nature)

(c)  $\text{Pb}^{2+}$  or  $\text{Pb}^{4+}$  (Stability)

OR

P&P

The first ( $IE_1$ ) and the second ( $IE_2$ ) ionization enthalpies ( $\text{kJ mol}^{-1}$ ) of a few elements designated by Roman numerals are shown below :

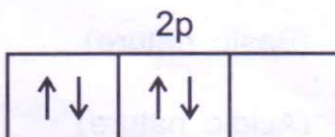
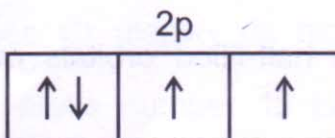
Element	$IE_1$	$IE_2$
I	2372	5251
II	520	7300
III	900	1760
IV	1680	3380

Which of the above elements is likely to be :

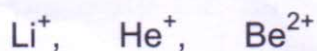
- (a) a reactive metal
- (b) a reactive non-metal
- (c) a noble gas

Justify your answer.

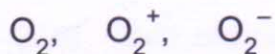
18. (a) What is the hybridization of phosphorous in  $\text{PCl}_5$ ? Draw the structure and mention the shape of molecule.
- (b) Are all the bond lengths equal? Explain giving reason. (2+1)
19. (a) What is average oxidation number of carbon in  $(\text{CH}_3\text{COCH}_3)$ ?
- (b) Why do  $\text{SO}_2$  and  $\text{H}_2\text{O}_2$  act as both oxidizing as well as reducing agents? (1+2)
20. (a) Which of the following representation is correct? Also identify the rule governing it.



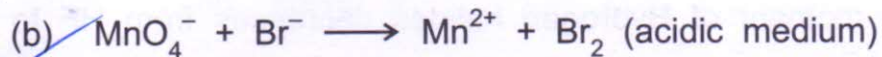
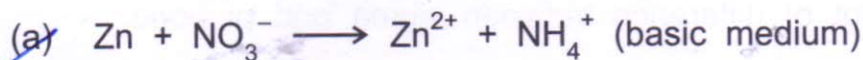
- (b) Differentiate between orbit and orbital.
- (c) Bohr's model is applicable to which of the following and why?



21. Write molecular orbital electronic configuration of the following species and indicate their magnetic properties on the basis of molecular orbital theory:



22. Balance the following chemical equations :



23. Gay Lussac's Law states that if the volume of a gas is kept constant, the pressure of the gas is directly proportional to temperature. This implies that in an ideal situation where the volume does not change, if either the pressure or the temperature is increased the other one will increase in the same proportion. This aspect has a number of applications in our daily life.

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \quad P \propto T$$

Now, answer the following questions:

(a) When we use a pressure deodorant can for a few seconds, the can tends to become cooler. Why?

(b) Beer or soda cans and bottles have a label on them stating 'store in cool, dry place'. Why?

(c) Why hot air is filled in balloons for meteorological observations?

(d) Which value do you associate with the child who understands the concept of Gay Lussac's Law and applies it to real life situation? (4)

24. (a) Write down the electronic configuration of  $Ni^{2+}$ . (Atomic no. of Ni = 28)

(b) What do you mean by saying that energy of an electron is quantized?

(c) Table Tennis ball has a mass of 10 gram and a speed of 90 m/s. If speed can be measured within an accuracy of 4 %, what will be the uncertainty in speed and position of the ball? ( $h = 6.626 \times 10^{-34}$  Js) (1+1+3)

OR

(a) Calculate total number of angular nodes and radial nodes present in 3p orbital.

l

$n-l-1$

- (b) Electrons are emitted with zero velocity from a metal surface when it is exposed to radiation of wavelength 6800 Å. Calculate threshold frequency ( $\nu_0$ ) and work function ( $W_0$ ) of the metal.

( $h = 6.626 \times 10^{-34}$  Js,  $c = 3 \times 10^8$  m/s)

$f_{eV} = 1.9 \times 10^{-16}$

(2+3)

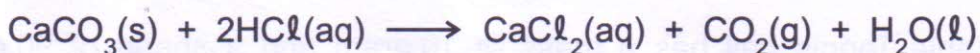
25. (a) Write one major point of difference between sigma and pi bond.  
(b) Explain why dipole moment of Hydrogen halides decreases from HF to HI.  
(c) Why  $AlF_3$  is a high melting solid whereas  $SiF_4$  is a gas?  
(d) Out of o-nitrophenol and p-nitrophenol, which of the two has higher boiling point. Explain with the help of their structures. (1+1+1+2)

vapour pressure.

OR

- (a) Draw the structure of a molecule containing a coordinate bond.  
(b) Which is more covalent: AgCl or AgI?  
(c) Draw Lewis dot structure of  $NH_3$  molecule.  
(d) Give a diagrammatic representation of  $p\pi-p\pi$  overlap.  
(e) Draw the resonating structures of nitrite ion. (1+1+1+1+1)

26. (a) What do you understand by 75% (w/v) of  $HNO_3$  solution?  
(b) Is the molar volume of  $SO_2$  same or different from  $SO_3$  at STP? Justify your answer.  
(c) Calcium carbonate reacts with aqueous HCl to give  $CaCl_2$  and  $CO_2$  according to the reaction given below:



- (i) What mass of  $CaCl_2$  will be formed when 250 ml of 0.76 M HCl reacts with 1000 g of  $CaCO_3$ ? (1+1+3)

(Atomic masses : Ca = 40u, C = 12u, Cl = 35.5u)

OR

- X (a) What is the ratio of molecules between one mole of  $\text{H}_2\text{O}$  and one mole of sucrose ( $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ )?
- (b) Two elements X and Y can combine to form two or more compounds. The mass of X that combines with a fixed mass of Y is in whole number ratio.
- (i) Is this statement true?
- (ii) Name the law on which this statement is based.
- (c) What is the molality of a solution of methanol in water, in which the mole fraction of methanol is 0.25? (1+1+3)