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XI-D

St. Mary's School, Dwarka
First Term Examination
Class XI
Subject: Chemistry (043)

Reading Time: 15 mins.
Writing Time: 3 hrs. **M.M.: 70**
No. of questions:26

General Instructions :

(i) All questions are compulsory.
(ii) Question numbers 1 to 5 are very short answer question, each of 1 mark. Answer them in one word or one sentence each.
(iii) Question numbers 6 to 10 are short answer questions of 2 marks each. Answer them in about 30 words each.
(iv) Question numbers 11 to 22 are also short answer questions of 3 marks each. Answer them in about 40 words each.
(v) Question number 23 is a Value Based Questions and carries 4 marks. Answer in about 50 words.
(vi) Question numbers 24 and 26 are long answer questions of 5 marks each. Answer them in about 70 words each.
(vii) Use log table, if necessary.
(viii) Please check that this question paper contains 26 questions.

Given $^{39}K_{19}$, $^{35.5}Cl_{17}$, $^{16}O_8$, Cr_{24}, P_{15}, $h = 6.626 \times 10^{-34}$ Js, $^{27}Al_{13}$, Ne A=20;

Q1. What is the significance of an element having a fractional atomic mass ? 1
Q2. Arrange the elements B, C, N, F and Si in the increasing order of their non-metallic character. 1
Q3. He_2 molecule is not formed. Justify on the basis of Molecular Orbital Theory. 1
Q4. What is the major source of CO pollution ? 1
Q5. What is the sign of ΔH and ΔS for
(a) evaporation of water
(b) freezing of water to ice 1
Q6. Arrange the following in order of increasing masses.
(a) 0.5 gram of sulphur
(b) 0.1 mole of NO_2
(c) 0.05 gram molecules of O_3
(d) 6.022×10^{23} atoms of oxygen 2
Q7. Justify the following :
(a) H_2O molecules is triatomic but its geometry is not linear.
(b) The dipole moment of hydrogen halides decreases from HF to HI. 2
Q8. (a) Name the gases which constituent acid rain.
(b) What is eutrophication ? 2
Q9. State two postulates which are incorrect in Kinetic theory of gases. 2

Q10. How much energy is released when 6 mol of octane is burnt in air ?
Given $\Delta_f H^\circ$ for $CO_2(g)$, $H_2O(g)$ and $C_8H_{18}(l)$ respectively are -490, -240 and +160 kJ/mol. 2

Q11. Concentrated nitric acid used in laboratory work is 68% nitric by mass in aqueous solution. What should be the molarity of such a sample of the acid if the density of the solution is 1.504 g/mL ? 3

Q12. Give reasons :
(i) Atoms with half filled or completely filled orbitals are more stable.
(ii) The energy of an electron is negative.
(iii) Only group 1 and 2 elements show photoelectric effect. 3

Q13. A compound has the following composition :
Na = 14.31 % O = 69.5%
S = 9.97% H = 6.22%
If all the hydrogen in this compound is present as water of crystallization then determine the molecular formula of the compound if its vapour density is 161. 3

Q14. An atom has Z = 22
Answer the following questions based on the above informations.
(a) What is the highest value of n ?
(b) How many electrons have l = 1 ?
(c) How many electrons have n + l = 3 ?
(d) How many electrons have n = 4 value ?
(e) How many maximum number of e- are unpaired ?
(f) What is the electronic configuration of Cu^+ ? (Cu Z=29) 3

Q15. Amongst the elements of the third period (Na to Ar), Identify the elemnt
(i) with highest ionisation enthalpy
(ii) with largest atomic radii
(iii) most reactive non-metals
(iv) most reactive metals
(v) An element that shows characteristic properties of metals as well as non-metals.
(vi) An element whose oxide is amphoteric in nature. 3

Q16. (a) What do BOD and COD stands for ?
(b) Why does maximum ozone depletion occur over Antarctica ? 3

Q17. A, B and C are three elements with Atomic numbers Z-1, Z and Z+1. B is an inert gas.
(a) Predict the group of A, B and C.
(b) Which one has positive electron gain enthalpy ?
(c) Which one has least ionisation enthalpy ? 3

Q18. (a) Mg^{2+} ion is smaller than O^{2-} ion although both have same electronic configuration.
(b) Account for the following:
(i) electron gain enthalpy of fluorine is less negative than that of chlorine.
(ii) electron gain enthalpy of noble gases is positive. 3

Q19. (a) How is the structure of PCl_5 responsible for the fact that it is used as a chlorinating agent ?
(b) In spite of the higher electronegativity of fluorine, NH_3 has higher dipole moment than NF_3. Why ?
(c) Using the concept of hybridization, explain the shape of CO_2 molecule. 3

Q20. What are pesticides ? Name its types and their applications in everyday life. 3

Q21. A container holds 3.87 g of Ne at STP. What mass of Ne shall be present in it at 100°C and 10 atm pressure ? 3

Q22. Comment on the statements

(a) Energy of the universe remains constant but the entropy is always increasing.

(b) ΔH is not the sole criteria of feasibility of a process.

(c) Reactions of $\Delta G^\circ < 0$, always have equilibrium constant greater than 1. 3

Q23. Hydrogen bonding enhances the properties of substances particularly physical properties to a large extent. The melting point of p-nitrophenol ia 114°C while that of o-nitrophenol is 45°C, although both of them involved hydrogen bonding.

(i) What is the reason for the difference in the melting point of o-nitrophenol and p-nitrophenol.

(ii) Justify your answer by drawing the relevant structures showing hydrogen bonding.

(iii) What value did you learn.

(iv) H_2O is liquid whereas H_2S is a gas. Give reason. 4

Q24. (i) What is the difference between :

(a) Emission and absorption spectrum.

(b) Orbit and orbital.

(c) Information given by azimuthal and magnetic quantum number.

(d) 'ψ' and 'ψ^2'

(ii) How many nodal spheres are present in a 4s orbital ? 5

Q25. (a) What is the significance of 'R'. Derive its value in SI units.

(b) Define U_{rms} of a gas. If U_{av} of a gas is given to be 400 m/s. Calculate its U_{rms} at the same temperature. 5

Q26. (a) (i) What is the physical significance of internal energy ?

(ii) What is the origin of energy change in a chemical reaction ?

(b) Calculate the bond energy of H-Cl.

Given

B.E. (H – H) = 436 kJ/mol

B.E. (Cl – Cl) = 242 kJ/mol

$\Delta_f H$ (HCl) = - 91 kJ /mol 5