# DELHI PUBLIC SCHOOL

## KNOWLEDGE PARK V

## CHEMISTRY

## CLASS - XI

**TIME ALLOWED: 3 HOURS** **MAXIMUM MARKS: 70**

**General Instructions**

Read the following instructions carefully and follow them:

(i) This question paper contains **33** questions. **All** questions are compulsory.
(ii) This question paper divided into **five** sections – **A, B, C, D** and **E.**
(iii) In **Section A**, Question number **1** to **12** are multiple choice questions (MCQ) and question numbers **13 to 16** are Assertion- Reason based questions of 1 mark each.
(iv) In **Section B,** Question number **17** to **21** are very short answer (VSA) type questions, carrying 2 marks each.
(v) In **Section C**, Question number **22** to **28** are short answer (SA) type questions carrying 3 marks each.
(vi) In **Section D,** Question numbers **29** to **30** are questions carrying 4 marks each.
(vii) In **Section E,** Question number **31** to **33** are long answer (LA) type questions carrying 5 marks each.
(viii) There is no overall choice.
(ix) Use of calculator is **NOT allowed**.

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### SECTION A

**Q 1** The number of moles present in 6 gm of carbon is: **1**
(a) 2 (b) 0.5 (c) 1.0 (d) 5

**Q 2** Downward in a group, electropositive character of elements **1**
(a) increases (b) decreases (c) remains same (d) none of these

**Q 3** If 500 mL of a 5M solution is diluted to 1500 mL, what will be the molarity of the solution obtained? **1**
(a) 1.5 M (b) 1.66 M (c) 0.017 M (d) 1.59 M

**Q 4** Which of the following molecules has maximum bond angle **1**
(a) $NH_3$ (b) $CH_4$ (c) $H_2O$ (d) $CO_2$

**Q 5** The principal quantum number of an atom is related to the **1**
(a) size of the orbital (b) spin angular momentum
(c) orbital angular momentum (d) orientation of the orbital

**Q 6** The shape of $NH_3$ molecule is **1**
(a) Square planar (b) Square pyramid (c) Tetrahedral (d) Pyramidal

1

**Q 7** Total number of orbitals associated with n=3 shell will be _____. 1

(a) 2 (b) 4 (c) 9 (d) 3

**Q 8** The oxidation state of Fe in $Fe_3O_4$ is 1

(a) +2 (b) + 3 (c) 8/ 3 (d) + 2, + 3

**Q 9** Which of the following processes does not involve either oxidation or reduction? 1

(a) Formation of slaked lime from quick lime (b) Heating Mercuric Oxide

(c) Formation of Calcium Chloride from its oxide (d) Formation of Zinc from Zinc sulphide

**Q 10** The oxidation number of Cl in $Cl_2O_7$ is 1

(a) + 7 (b) + 5 (c) + 3 (d) – 7

**Q 11** Ionic radii vary as 1

(a) inverse proportion to the effective nuclear charge.

(b) inverse proportion to the square of effective nuclear charge.

(c) direct proportion to the screening effect.

(d) direct proportion to the square of screening effect.

**Q 12** Which among the following is responsible for ruling out the existence of definite paths or trajectories of the electrons? 1

(a) Pauli's exclusion principle. (b) Heisenberg's uncertainty principle.

(c) Hund's rule of maximum multiplicity. (d) Aufbau principle.

**Q 13** **Assertion (A):** 1M & 1N Sulphuric acid concentration is same. 1

**Reason (R):** Mass & equivalent mass of sulphuric acid is different.

*a) Assertion and reason both are correct statements and reason is correct explanation for assertion.*

*b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.*

*c) Assertion is correct statement but reason is wrong statement.*

*d) Assertion is wrong statement but reason is correct statement.*

**Q 14** **Assertion (A):** Though the central atom of both $NH_3$ and $H_2O$ molecules are sp3 hybridised, yet H–N–H bond angle is greater than that of H–O–H. 1

**Reason (R):** This is because nitrogen atom has one lone pair and oxygen atom has two lone pairs.

*a) Assertion and reason both are correct statements and reason is correct explanation for assertion.*

*b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.*

*c) Assertion is correct statement but reason is wrong statement.*

*d) Assertion is wrong statement but reason is correct statement.*

**Q 15** **Assertion (A):** Generally, ionisation enthalpy increases from left to right in a period. 1

**Reason (R):** When successive electrons are added to the orbitals in the same principal quantum level, the shielding effect of inner core of electrons does not increase very much to compensate for the increased attraction of the electron to the nucleus.

*a) Assertion and reason both are correct statements and reason is correct explanation for assertion.*

*b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.*

*c) Assertion is correct statement but reason is wrong statement.*

*d) Assertion is wrong statement but reason is correct statement.*

**Q 16** **Assertion (A):** In HF, the oxidation state of 'F' is –1
**Reason (R):** 'F' being most electronegative, will have -1 oxidation in its compound.

*a) Assertion and reason both are correct statements and reason is correct explanation for assertion.*

*b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.*

*c) Assertion is correct statement but reason is wrong statement.*

*d) Assertion is wrong statement but reason is correct statement.*

## SECTION B

**Q 17** The energy of photon is $3 \times 10^{-25}$ joules. What is the wavelength of the radiation incident? **2**

**Q 18** a) The radius of $Na^+$ cation is less than that of Na atom. Give reason. **2**
b) How does the electron negativity vary from left to right in a period? Explain with a suitable example.

**Q 19** Draw the resonating structure of the following: $CO_3^{2-}$ , $O_3$ **2**

**OR**

**Q 19** Draw Lewis structure of the following molecules: $H_2S$, $CH_4$.

**Q 20** If 4 g of NaOH dissolves in 36 g of $H_2O$, calculate the mole fraction of each component in the solution. **2**

**Q 21** What is the order of the first ionization enthalpies of Na, Mg, Al and Si and why? **2**

## SECTION C

**Q 22** a) 100 g of $CaCO_3$ is treated with HCl. What would be the weight of $CO_2$ liberated after the completion of the reaction? **2+1**
b) State the concept of limiting agent. Explain by citing an example.

**Q 23** What is disproportion reaction? Identify the substance oxidized, reduced, oxidizing agent and reducing agent for the following reactions: **1+2**

(a) $3N_2H_4(g) + 2H_2O_2(l) \rightarrow N_2(g) + 4H_2$

(b) $Pb(s) + PbO_2(s) + 2H_2SO_4(aq) \rightarrow 2PbSO_4(s) + 2H_2O(l)$

**Q 24** Explain in detail the hybridisation, geometry & shape of $PCl_3$, $XeF_6$ & $IF_5$ **3**

**Q 25** a) Yellow light emitted from a sodium lamp has a wavelength of 580 nm. Calculate the frequency and wave number of yellow light. **2+1**

b) Using s, p and d notations, describe the orbitals with following quantum numbers: **3**

(i) $n = 1, l = 0$ (ii) $n = 4, l = 3$

**Q 26** How would you explain the fact that first ionization enthalpy of sodium is lower than that of magnesium but its second ionization enthalpy is higher than that of magnesium? **3**

**Q 27** Calculate the oxidation number of the element in bold in the following: **1+2**

$\mathbf{BH_3}$, $\mathbf{S_2O_3^{2-}}$ , $\mathbf{SiH_4}$, $\mathbf{BF_3}$, $\mathbf{C_2O_4^{-2}}$ , $\mathbf{BrO_4^-}$

**Q 28** Describe the postulates of valence bond theory of covalent bond formation by taking an example of hydrogen. What is the hybridisation & shape of $SF_6$ and $NH_3$? **4**

## SECTION D

**Q 29 Read the passage and answer the following questions:**

In the modem periodic table, elements are arranged in order of increasing atomic numbers which is related to the electronic configuration. Depending upon the type of orbitals receiving the last electron, the elements in the periodic table have been divided into four blocks, viz, s,p,d and f The modem periodic table consists of 7 periods and 18 groups. Properties are periodic function of their atomic number.

a) Give the IUPAC name and the symbol of an element with Z=105
b) Predict the period, group & block of element with Z= 28.
c) The element with atomic number 17, 35, 53 are all belong to which family.
d) Write electronic configuration of Cr [Z= 24].

**Q 30 Read the passage and answer the following questions:** **4**

The attractive force which holds the two atoms together is called a chemical bond. A covalent bond is formed by an equal sharing of electrons. A coordinate bond is formed by unequal sharing of electrons. An ionic bond is formed by the transfer of electrons from one atom to another. Octet rule, although very useful but is not universally applicable. Bond order is the number of bonds between atoms in a molecule. The polarity of a covalent bond depends upon the difference in electronegativity.

a) Identify the bond order in: Oxygen molecule & Methane
b) What is the bond length & bond angle?
c) On which factors Covalent bond formation depends?
d) What is Octet rule?

## SECTION E

**Q 31** a) An organic compound on analysis gave the following percentage composition; C=40%, H=6.67% and the rest is oxygen. The molecular mass of the compound was found to be 90. Find out the molecular formula of the compound. **3+2**

b) Calculate molarity of a solution containing 13.8g of potassium carbonate (molar mass =138g/mol) dissolved in 500ml of solution.

**Q 32** The work function for cesium atom is 1.9 eV. Calculate (a) the threshold wavelength and (b) the threshold frequency of the radiation. If the cesium element is irradiated with a wavelength 500 nm, calculate the kinetic energy and the velocity of the ejected photoelectron. (1ev= 1.6 x $10^{-19}$J) 5

**Q 33** Balance **ANY TWO** equations by ANY METHOD: 5

a) $Cr(s) + ClO_4^-(aq) \rightarrow Cr(OH)_3 + ClO_3^-$ (Basic medium)

b) $H_2O_2 + MnO_4^- \rightarrow MnO_2 + O_2$ (Basic medium)

c) $Cl_2 \rightarrow ClO_3^- + Cl^-$ (Acidic medium)