INDIAN SCHOOL MUSCAT

FIRST MID TERM EXAMINATION

SEPTEMBER 2018

CLASS XI

Marking Scheme – CHEMISTRY [THEORY] SET C

Q. NO.	Answers	Marks
1.	Because atomic mass of an element is the average of relative masses of its various isotopes.	1
2.	6	1
3.	• Used to distinguish polar and non- polar molecules. (½) • Useful in predicting the shapes of molecules. (½)	1
4.	• To maintain its structure (½) • To preserve the principle of classification by keeping elements with similar properties in a single column (½)	1
5.	It is defined as the amount of oxygen required by bacteria to break down organic materials present in water.	1
6.	Formula mass: It is defined as the sum of atomic masses of all the elements present in one formula unit of an ionic compound. (1) Molecular mass: It is the sum of the atomic masses of all the atoms present in a molecule of a substance. (1)	2
7.	i) Not possible because n cannot have zero value. ii) Not possible as *l* cannot be 1	2
8.	It is a phenomenon as a result of which the atmosphere around the earth traps the heat from the sun and at the same time it prevents the heat from earth escaping into the outer space. (1) Glaciers will melt at a higher rate and this will lead to rise in the sea level resulting in flood and loss of soil. It also increases the case of malaria, dengue, yellow fever etc. (1)	2
9.	i) $Al^{3+} < Mg^{2+} < Na^{+} < F^{-} < O^{2-} < N^{3-}$ ii) F > N > C > Si	2
10.	i) Polar - bent structure, the bond dipoles of the O –H bonds do not cancel each other. ii) Non- polar - linear molecule, the bond dipoles of the two C = O bonds cancel each other.	2
11.	i) Anion is formed by the gain of electrons. Number of electrons increases while the nuclear charge remains the same i.e; same nuclear charge attracts greater number of electrons and hence size of an anion is greater. ii) The orbital's to be filled in the third period are 9.(ie; 3s , 3p, 3d). But energy of 3d > 4s. Hence the orbital's to be filled in the 3rd period are 4 (3s and 3p). Hence only 8 elements. OR i) B ii) A iii) C iv) D	2
12.	The presence of phosphate as a pollutant in water encourages the formation of algae which reduces	2

the dissolved oxygen- eutrophication (1)

When concentration of dissolved oxygen decreases, the respiration for the fish becomes difficult and thus they die due to lack of oxygen. (1)

13. i) Equal volumes of all gases under similar conditions of temperature and pressure contain equal number of molecules. 3

ii) It is the reagent that is completely consumed in a reaction.

iii) It is defined as the ratio of the number of moles of a particular component to the total number of moles of solution.

14. K.E = ½ mv^2 = 0 3

K.E = $h\nu - h\nu_0$

$h\nu = h\nu_0$

$\nu = \nu_0$

$\nu = c / \lambda$

$= 3 \times 10^8 / 6800 \times 10^{-10}$

$\nu_0 = 4.411 \times 10^{14}\ s^{-1}$ (1 ½)

$w_0 = h\nu_0$

$= 6.63 \times 10^{-34} \times 4.411 \times 10^{14}$

$= \underline{29.24 \times 10^{-20}\ J}$ (1 ½)

15. Any three limitations (each point ½ + each example ½) 3

OR

- low ionization energy
- high negative value of electron gain enthalpy
- High lattice energy (1 + 1 + 1)

16. i) Group - 10 3

ii) Block - d

iii) IUPAC - Ununnilium

17. i) Number of moles of KCl formed = $\frac{1.58 \times 2}{2 \times 158}$ = 0.01 moles. (1) 3

ii) Volume of Cl_2 produced at STP = $\frac{1.58 \times 5 \times 22.4}{2 \times 158}$ = 0.56 L of Cl_2 (1)

iii) Number of molecules of Chlorine formed = $\frac{1.58 \times 5}{2 \times 158} \times 6.02 \times 10^{23}$

= 1.505×10^{22} molecules of Cl_2 (1)

18. i) Because half filled configuration gives greater stability due to 3

- Symmetrical distribution of e^-s around the nucleus.
- Maximum exchange energy. (1 ½)

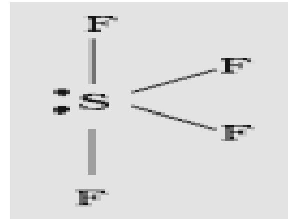
ii) Any three differences (1 ½)

19. i) Amount of energy required to break one mole of bonds of a particular type between two atoms in the gaseous state. (1) 3

ii)

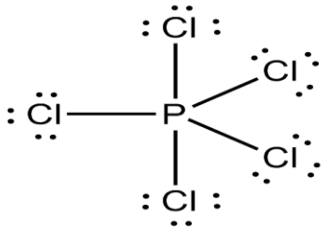
a) K- Shape B.P = 4

L.P = 1



(½+ ½)

b) Trigonal bipyramidal B.P = 5 (½+ ½)



20. i) Atoms and ions containing same no: of electrons but different atomic no: (1) 3

ii) $(n-1)d^{1-10}\ ns^{1-2}$ (1)

Any two properties. (½+ ½)

21. It is a mixture of smoke and fog. (1) 3

It is of two types:

Classical smog	**Photochemical smog**
• It occurs in cool, humid climate and is the result of buildup of SO_2 and particulate matters from fuel combustion.	• It occurs in warm, dry and sunny climate and results from the action of sunlight on the nitrogen oxides and hydrocarbons produced by automobiles and factories.
• It is reducing in nature.	• It is oxidizing in nature.

(1 + 1)

22. i) Angular momentum is same because it depends upon the quantum number *l* and not on n. (1) 3

ii) 7s < 5f < 6d < 7p (1)

iii)

- It rules out the existence of definite path of electrons around the nucleus and replaced it by the concept of orbitals.
- This principle is significant only for motion of microscopic objects and is negligible for macroscopic objects. (Any one point) (1)

23. i) Cl ii) Cs iii) C 3

24. i) Statement of Hund's rule of maximum multiplicity (1) 3

ii)

a) 4s has lesser energy than 3d orbital. (1)

b) Because energies of the orbits in which the electron revolves are fixed. (1)

25. i) 5

Element	%	At.mass	Moles	Mole ratio
C	24.27	12	2.02	1
H	4.07	1	4.07	2

Cl	71.65	35.5	2.02	1

Empirical formula = CH_2Cl (½)

n = M.M/ EFM = 98.96 / 49.5 = 2 (½)

M.F = $(CH_2Cl)_2$ = $C_2H_4Cl_2$ (1)

ii) a) Molality: Number of moles of solute that is present in 1Kg of solvent. (1)

b) ppm : Mass of solute dissolved in million grams of solution. (1)

OR

i)

a) Molarity $= \frac{\% \text{ x d x } 10}{M_B} = \frac{10 \text{ x } 10 \text{ x } 1.2}{180}$ (½ + ½)

$= 0.667M$ (½)

b) Mole fraction $= \frac{n_{glu}}{n_{glu} + n_{H2O}} = \frac{10/180}{10/180 + 90/18}$ (½+ ½)

$= 0.011$ (½)

ii) Molality involves mass which does not change with time but molarity involves volume which changes with temp. (1)

iii) It is the volume occupied by one mole of any gas at S.T.P (1)

26. i) Definition (1) 5

ii) $H_2O < NH_3 < BF_3 < BeF_2$ (1)

iii) Multiplicity of bonds α bond strength (½)

Multiplicity of bonds is inversely proportional to bond length (½)

iv) The bond dipoles of the 3 B-F bonds give a net sum of zero because the resultant of any two is equal and opposite of the third. Thus BF_3 is a non-polar molecule.

But in case of NH_3, the bond- moments of the three N-H bonds reinforce the L.p moment and thus have a net dipole moment. (1 + 1)

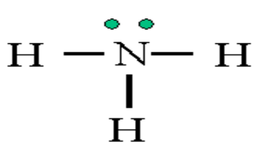
OR

i) It is the angle between the orbitals containing bonding electron pairs around the central atom in a molecule. (1)

b) 

(1)

ii)



N = 5 – 2 – 3 = 0 (½ + ½)

H = 1 – 0 – 1 = 0

iii) Nitrogen being smaller in size and highly electro negative, the shared pair of electron in N-H bond is closer to nitrogen and therefore has greater repulsion between the bond pairs , hence the bond angle is 107^o. Phosphorous being bigger in size and less electro negative , the shared pair of electron of the P-H bond is not close to P and hence less repulsion. (1 + 1)

27 i) 5

$$\Delta E = -2.18 \times 10^{-18} \left(\frac{1^2}{n_2^2} - \frac{1^2}{n_1^2} \right)$$

$$\Delta E = -2.18 \times 10^{-18} \left(\frac{1^2}{5^2} - \frac{1^2}{1^2} \right) = 2.09 \times 10^{-18}\ J \qquad (½+ ½ + ½)$$

$$\lambda = \frac{hc}{\Delta E} = \frac{6.626 \times 10^{-34} \times 3.0 \times 10^8}{2.09 \times 10^{-18}}$$

$$= 9.51 \times 10^{-8}\ m \qquad (½+ ½ + ½)$$

ii) Mn^{2+} has stable half –filled (d^5) configuration, but Fe^{2+} has a d^6 configuration.

iii) Statement of Pauli's exclusion principle.

OR

i)

$$\Delta V = \frac{0.005}{100} \times 800 = 0.04\ m/s$$

$$\Delta x \times m\Delta V = \frac{h}{4\pi} \qquad (½)$$

$$\Delta x = \frac{6.63 \times 10^{-34}}{4 \times 3.14 \times 9.1 \times 10^{-31} \times 0.04} \qquad (½)$$

$$= 1.450 \times 10^{-3} m \qquad (½)$$

ii)

$$m = \frac{h}{\lambda v} \qquad (½)$$

$$= \frac{6.63 \times 10^{-34}}{5000 \times 10^{-10} \times 3 \times 10^8} \qquad (½)$$

$$= 4.42 \times 10^{-36}\ kg \qquad (½)$$

iii) Any two important observations (1)

iv) It gives the shape of the orbital. (1)