

# SHRI SHANTADURGA HIGHER SECONDARY SCHOOL

BICHOLIM - GOA

MID-TERM PRACTICE TEST (2020-21)

Subject: Chemistry

Date: 21 /11/2020

Class: XI Science

Maximum Marks: 20

**ANSWER KEY**

Duration: 1 hour

Q.1	The number of water molecules present in 18g of water is <u><math>6.022 \times 10^{23}</math></u> * $1.2044 \times 10^{24}$ * $6.022 \times 10^{22}$ * $3.011 \times 10^{23}$ * $6.022 \times 10^{23}$	01																
Q.2	The frequency of an electromagnetic wave with wavelength $\lambda=600\text{nm}$ is <u><math>0.5 \times 10^{15} \text{ s}^{-1}</math></u> . * $0.5 \times 10^{15} \text{ s}^{-1}$ * $5 \times 10^{15} \text{ s}^{-1}$ * $0.5 \times 10^{16} \text{ s}^{-1}$ * $5.5 \times 10^{12} \text{ s}^{-1}$	01																
Q.3	<b>Write the IUPAC nomenclature for the following.</b> a) The element which is named after scientist Dmitri Mendeleev. <b>Mendelevium</b> <i>Additional information ( Z=101 Name: Unnilunium= symbol= Unu )</i> b) The element with highest atomic number present in Modern periodic table. <b>Oganesson</b> <i>Additional information ( Z=118 Name = Ununoctium symbol= Uuo)</i>	01																
Q.4	Write a point of difference between Orbit and Orbital. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" style="background-color: #f4a460;">Difference Between Orbit and Orbital</th> </tr> <tr> <th style="background-color: #f4a460; color: green;">Orbit</th> <th style="background-color: #f4a460; color: red;">Orbital</th> </tr> </thead> <tbody> <tr> <td>Orbits represent the planner motion of the electron.</td> <td>Orbitals represent the three-dimensional motion of the electron around the nucleus.</td> </tr> <tr> <td>They are Circular in shape.</td> <td>They are Different in shapes from each other.</td> </tr> <tr> <td>It is a well-defined path that revolving electrons follow around a nucleus.</td> <td>It is simply a region of space around a nucleus where the electron is present.</td> </tr> <tr> <td>The orbits theory doesn't satisfy the Heisenberg uncertainty principle.</td> <td>Orbitals Concept completely complies with the Heisenberg uncertainty principle.</td> </tr> <tr> <td>Can accommodate <math>2n^2</math> electron in the shells where n is the number of orbits.</td> <td>Only two electrons can be present in an orbital.</td> </tr> <tr> <td>the planner motion of electron can be designated by L, M, N, etc.</td> <td>The 3D motion of electron by s, p, d, f orbitals.</td> </tr> </tbody> </table> <p style="text-align: center;"><b><u>OR</u></b></p>	Difference Between Orbit and Orbital		Orbit	Orbital	Orbits represent the planner motion of the electron.	Orbitals represent the three-dimensional motion of the electron around the nucleus.	They are Circular in shape.	They are Different in shapes from each other.	It is a well-defined path that revolving electrons follow around a nucleus.	It is simply a region of space around a nucleus where the electron is present.	The orbits theory doesn't satisfy the Heisenberg uncertainty principle.	Orbitals Concept completely complies with the Heisenberg uncertainty principle.	Can accommodate $2n^2$ electron in the shells where n is the number of orbits.	Only two electrons can be present in an orbital.	the planner motion of electron can be designated by L, M, N, etc.	The 3D motion of electron by s, p, d, f orbitals.	01
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**SECTION - B**

Q.5	How would you justify the presence of 18 elements in the 4 <sup>th</sup> period of the Periodic Table? <b>Answer:</b> When we consider — $n = 4$ , the orbitals 3d, 4s and 3p present in the (form of) outermost shells show the order of their increasing energies — i.e. $3p < 4s < 3d$ . Since the total number of orbitals available are 9 (1 from 4s, 3 from 3p & 5 from 3d orbital), the maximum number of electrons that can occupy the three orbitals is 18.	02
Q.6	Answer the following questions with respect to p block elements. a) Which group elements are coming under p block elements? <b>Elements from Group 3 to Group 12</b> b) Write the general electronic configuration of these elements. The <b>general electronic configuration of p-block elements</b> is $ns^2np^{1-6}$ except for Helium (He)	02
Q.7	Write the four postulates of Bohr's model of atom.	02

**Main postulates of Bohr's model of an atom are:**

- In an atom, the electrons revolve around the nucleus in certain definite circular paths called orbits, or shells.
- Each shell or orbit corresponds to a definite energy. Therefore, these circular orbits are also known as energy levels or energy shells.
- The orbits or energy levels are characterized by an integer  $n$ , where,  $n$  can have values 1, 2, 3, 4..... The integer  $n$  (= 1, 2, 3...) is called the quantum number of respective orbit. The orbits are numbered as 1, 2, 3, 4..... etc., starting from the nucleus side. Thus, the orbit for which  $n=1$  is the lowest energy level.  
The orbits corresponding to  $n = 1, 2, 3, 4, \dots$  etc., are also designated as K, L, M, N... etc., shells.  
When the electron is in the lowest energy level, it is said to be in the ground state.

Since, electrons can be present only in these orbits, hence, these electrons can only have energies corresponding to these energy levels, i.e., electrons in an atom can have only certain permissible energies .

4. The electrons present in an atom can move from a lower energy level (E<sub>lower</sub>) to a level of higher energy (E<sub>higher</sub>) by absorbing the appropriate energy. Similarly, an electron can jump from a higher energy level (E<sub>higher</sub>) to a lower energy level (E<sub>lower</sub>) by losing the appropriate energy.

The energy absorbed or lost is equal to the difference between the energies of the two energy levels, i.e.,

$$\Delta E = E(\text{higher}) - E(\text{lower})$$

### SECTION - C

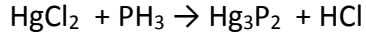
Q.8	<p>(i) An organic compound contains 38.8% of Carbon; 16.2% of hydrogen ; 45.1% of nitrogen. Calculate its empirical formula.</p> <p><b>ANSWER</b></p> <p>Let 100 gm of compound          mass of carbon = 38.8 g.          mass of hydrogen = 16.2 g          mass of nitrogen = 45.1 g</p> $\text{number of mole of carbon} = \frac{38.8}{12} = 3.176$ $\text{number of mole of hydrogen} = \frac{16.2}{1} = 16.2$ $\text{number of mole of nitrogen} = \frac{45.1}{14} = 3.22$ <p>3.176 : 16.2 : 3.22          1 : 5 : 1</p> <p>Empirical formula CH<sub>3</sub>N</p> <p>(ii) At STP, what volume of H<sub>2</sub> (g) is needed to react completely with 8.02 x 10<sup>23</sup> molecules of CO (g) ?</p> $\text{CO}_{(g)} + 2 \text{H}_{2(g)} \rightarrow \text{CH}_3\text{OH}_{(g)}$ <p><b>Answer</b></p> $\frac{8.02 \times 10^{23} \text{ molecules}}{6.02 \times 10^{23} \text{ particles}} \times 1 \text{ mole CO(g)} = 1.33 \text{ moles CO(g)}$ $\frac{1.33 \text{ moles CO(g)}}{1 \text{ mole CO(g)}} \times 2 \text{ moles H}_2\text{(g)} = 2.66 \text{ moles H}_2\text{(g)}$ $\frac{2.66 \text{ moles H}_2\text{(g)}}{1 \text{ mole H}_2\text{(g)}} \times 22.4 \text{ L} = 59.7 \text{ L}$	03
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Q.10

iii) For the reaction:  $A + B_2 \rightarrow AB_2$  Identify the limiting reagent for the following reaction mixture. 6 moles of A and 7 moles of B  
Ans: 6 mol A + 7 mol B: In this reaction, 1 molecule of A reacts with 1 molecule of B. hence, 6 molecules of A will react with 6 molecules of B. Here, 1 molecule of B will be left unreacted. **A is limiting reagent.**

iv) **Balance the following chemical reaction:**



**ANS:**  $3\text{HgCl}_2 + 2\text{PH}_3 \rightarrow \text{Hg}_3\text{P}_2 + 6\text{HCl}$   
**OR**

**Answer the following questions:**

i) **Define Limiting reagent.**

The **limiting reagent** is the reactant that is completely used up in a reaction, and thus determines when the reaction stops. ... The **limiting reagent** is the one that is totally consumed; it limits the reaction from continuing because there is none left to react with the in-**excess** reactant.

ii) The density of 4M solution of NaCl is  $1.25\text{g ml}^{-1}$ . Calculate molality of the solution.

**Answer:** Molality of the solution is = 3.94m

**Explanation:**

molar mass of NaCl = 58.5

No. of moles = weight / molecular weight

weight = no. of moles  $\times$  molecular weight

Mass of NaCl in 1 lit solution =  $4 \times 58.5 = 234$

Mass = density  $\times$  volume

Mass of 1 lit solution =  $1000 \times 1.25 = 1250\text{g}$

mass of water in solution = mass of solution - mass of solute

=  $1250 - 234 = 1016\text{g}$

mass of water in solution = 1.016kg

molality = no. of moles of solute / mass of solvent in kg =  $4 / 1.016 = 3.94\text{ m}$

Molality of the solution is = **3.94 m**

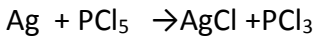
iii) Calculate mass percentage of oxygen in  $\text{C}_6\text{H}_{12}\text{O}_6$ .  
(H=1, C =12, O=16)

**ANSWER**

Total molar mass of O-atoms present in  $\text{C}_6\text{H}_{12}\text{O}_6 = 6 \times 16 = 96\text{g/mol}$

Percentage composition =  $96/180 \times 100 = 53.33\%$

iv) Balance the following chemical reaction:



Answer :  $2\text{Ag} + \text{PCl}_5 \rightarrow 2\text{AgCl} + \text{PCl}_3$

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