NELLORE DISTRICT COMMON EXAMINATION BOARD
HALF YEARLY EXAMINATIONS-DECEMBER-2015
GENERAL SCIENCE , Paper – I
(Physical Sciences)
(English Version)

Time: $2\frac{1}{2}$ Hours | **Parts A and B** | **Maximum Marks : 50**

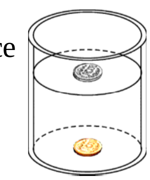
Class-10 - KEY SHEET - PART-A

Section - I

Group -A

1. **Evaporation :** The process of escaping of molecules from the surface of a liquid at any temperature is called evaporation. Evaporation is a cooling process. It is a surface phenomenon.
Boiling : The process in which the liquid phase changes to gaseous phase at a constant temperature and pressure is called boiling. Boiling does not cause cooling. Boiling is a bulk phenomenon.

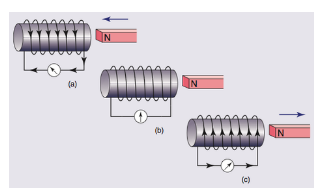
2. Take a cylindrical transparent vessel of 1 lit. Place a coin at the bottom of the vessel. Now pour water until you get the image of the coin on the water surface (look at the surface of water from a side). This is the phenomenon of total internal reflection. One of that is a mirage which we witness while driving or while walking on a road during a hot summer day.



If light ray passes from denser medium to rarer medium then the refractive angle is more than the incident angle. The incident angle for which the angle of refraction is 90^o, is called critical angle. If the angle of incidence is more than critical angle, then total internal reflection occurs.

3. The total current of the supply must passes through the fuse. In general, fuse is a thin wire of low melting point. When overload occurs, the fuse will melt due to heat. Then the circuit opens. The flow of current stopped. So there will be no damage in the house. So fuse plays a necessary and important role in household wiring process.

4. Connect the terminals of a coil to sensitive Galvanometer. Push a bar magnet towards the coil whose north pole is facing towards the coil. Then the needle in the galvanometer deflects. If the magnet is moved away from the coil, the needle in the galvanometer again deflects but in the opposite direction. If the south pole is facing towards the coil, then also the needle deflects. Whenever there is a continuous change of magnetic flux linked with closed coil, the current is generated. Thus Faraday stated the law of induction as - The induced e.m.f. generated in the closed loop is equal to the rate of change of magnetic flux passing through it..



Group –B

5. Fresh milk has a p^H of 6. By releasing lactic acid by Lacto bascillus bacteria, the milk turns into curd. As the p^H values of acids are less, The value of p^H of milk decreases, when it turns into curd.

6. The path of electron which revolves around the nucleus is called Orbit. The space around the nucleus where the probability of finding electron is maximum is called Orbital.

	ORBIT	ORBITAL
1.	These are represented by K,L,M,N,O	These are Represented by s,p,d,f,g.
2.	Orbit is two dimentional.	Orbital is three dimentional.
3.	The Max.number of electrons in an orbit is $2n^2$	The Max.number of electrons in an orbital is 2.
4.	Shape is circular.	Shape is spherical or dumbbell shaped or double dumbbell shaped or any other.

7. According to the occupation of differentiating electron the elements are classified into four blocks. They are s, p, d and f-blocks.

Groups	Name of the block
Group IA to IIA	s-block
Group IIIA to VIIIA	p-block
Elements lies between s and p-block elements.	d-block
The elements arranged at the bottom of the table.	f-block

(i) The valence electronic configuration of elements in s-block is ns^1 or ns^2. (group 1 to group 2)

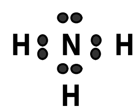
(ii) The valence electronic configuration of elements in p-block is $ns^2\ np^1$ to $ns^2\ np^6$. (group 13 to group 18)

(iii) The valence electronic configuration of elements in d-block is $ns^2\ np^6\ (n-1)d^1$ to $ns^2\ np^6(n-1)d^{1-10}$. (group 3 to group 12)

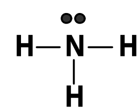
(iv) The valence electronic configuration of elements in f-block is $ns^2\ np^6\ (n-1)d^{10}(n-2)f^1$ to $ns^2\ np^6\ d^{10}(n-2)f^{14}$.

This classification is very useful for Expecting the properties of elements as per number of valence electrons.

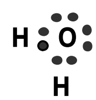
8. (a) Arrangement of electrons in Ammonia (NH_3) :



(or)



(b) Arrangement of electrons in Water molecule (H_2O):



Section - II

9. Mass (m_1) = 50 gm Temperature (T_1) = 20^oC

Mass (m_2) = 50 gm Temperature(T_2) = 40^oC

Final temperature as per Method of mixtures

$$(T) = \frac{m_1T_1+m_2T_2}{m_1+m_2} = \frac{50X20+50X40}{50+50} = \frac{1000+2000}{100} = \frac{3000}{100} = 30^oC$$

(OR)

Mass (m_1) = 50 gm Temperature (T_1) = 20^oC

Mass (m_2) = 50 gm Temperature(T_2) = 40^oC

$$\text{Temperature of mixture} = \frac{T_1+T_2}{2} = \frac{20+40}{2} = \frac{60}{2} = 30^oC$$

10. Electro motive force: The amount of work done by chemical force to move unit positive charge from anode to cathode.

11. Lenz's law: If an induced current flows, its direction is always to oppose the change.

12. (i) Electronic configuration of Argon : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$

(ii) Electronic configuration of Chromium : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^5$

13. Atom with atomic number 9 belongs to 'p' block

Atom with atomic number 27 belongs to 'd' block.

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14. The electrons in the inner shells of an atom are strongly bounded with the force of attraction of nucleus. They are all ready stable electrons. The electrons in the outer most shell are responsible for the formation of bond between two atoms. To get stability, most of the atoms form bonds with other atoms. The valence electrons only involve in bond formation.

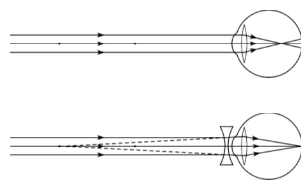
<u>Section - III</u>

<u>Group -A</u>

15. Diamonds have high refractive index (2.42). The critical angle of diamond is very less (24.4^o). By cutting the faces of diamond in such a way that most of the incident rays at every face get total internal reflection. This is the reason for shining of diamonds.

16. The eye lens can form clear image on the retina, when an object is placed between far point and point of least distance of distinct vision.

If we are able to bring the image of the object kept beyond far point , between the far point and the point of least distance of distinct vision using a lens, this image acts as an object for the eye lens.



This can be made possible only when a concave lens is used.

<u>The focal length of this bi-concave lens</u>.

Here object distance (u) is infinity and image distance (v) is equal to distance of far point.

u = - ∞ ; v = distance of far point = -D

let 'f' be the focal length of bi-concave lens.

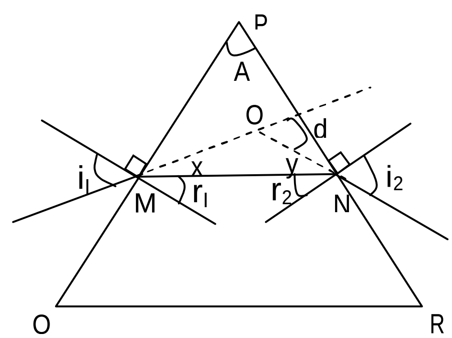
Using lens formula, 1/f = 1/v – 1/u

1/f = 1/ -D

f = -D

Here 'f' is negative showing that it is a concave lens.

17. Refractive index of material of a prism.



Place a white paper on a drawing board and arrange clips at is four ends. Place a prism on the paper so that the triangular shape touches the paper. Draw the boundary line with pencil. Name the vertices as P, Q and R. Measure the angle of the prism at 'P' and note down it as 'A' .

Now fix two pin on the line which was drawn with an angle to the surface 'PQ'. Observe the images at 'PR' side and fix another two pins such that four pins lie along a straight line.

Remove the prism. Extend the incident ray and emergent ray such that they can intersect with each other. The angle between incident ray and emergent ray is called angle of deviation (d).

Find angle of deviations for different angles of incidence. The minimum value of 'd' is to be taken as angle of minimum deviation (D).

The refractive index of prism is calculated by using the formula n = = $\frac{Sin(\frac{A+D}{2})}{Sin(\frac{A}{2})}$

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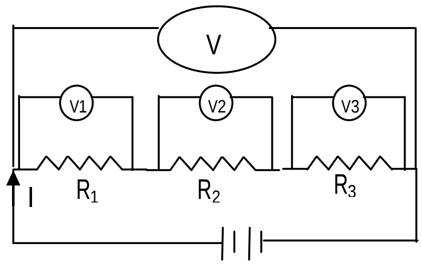
18. Series combination of resistors : Consider three resistors R_1, R_2 and R_3 are connected in series. V_1, V_2 and V_3 are the potential differences between the ends of the resistors R_1, R_2 and R_3 respectively. Let 'I' is the flow of current through them in the circuit.



Ohm's law : $V = IR$

Apply this ohm's law for R_1, R_2 and R_3.

Then $V_1 = IR_1$ $\quad V_2 = IR_2$ $\quad V_3 = IR_3$

Let the resultant potential difference and R is the resultant resistance.

Then $V = IR$

In series arrangement $V = V_1 + V_2 + V_3$

$$IR = IR_1 + IR_2 + IR_3$$

$$IR = I(R_1 + R_2 + R_3)$$

$$R = R_1 + R_2 + R_3$$

If resistors connected in series combination then the resultant resistance is equal to the sum of the individual resistances of resistors.

Group -B

19. Baking powder is a mixture of baking soda and a mild edible acid such as tartaric acid.

Its formula is $NaHCO_3$.

When baking powder is heated or mixed in water, the following reaction takes place.

$$NaHCO_3 + H^+ \rightarrow CO_2 + H_2O + \text{sodium salt of acid.}$$

Carbon dioxide produced during the reaction causes bread or cake to rise making them soft and spongy.

20. Quantum numbers : There are four quantum numbers.

(i) Principal quantum number (ii) Azimuthal quantum number

(iii) Magnetic quantum number (iv) Spin quantum number.

(i) Principal quantum number :

i) It was proposed by Neils bohr. ii) It is denoted by 'n'.

iii) It gives the size and energy of an orbit.

iv) The values are given as per the number of the orbit.

v) The values are from 1 to n and the values 1,2,3,4,5,… again designated by K,L,M,N,O,…

(ii) Azimuthal quantum number:

i) It was proposed by Sommer feld. ii) It is denoted by 'l''.

iii) It gives the shape of the sub shell(orbitals).

iv) The values of l depends on the value of 'n'.

v) The values are from 0 to (n-1) and the values 0,1,2,3,4,… again designated by s,p,d,f,g,… orbitals.

(iii)(a) Magnetic quantum number :

i) It was proposed by Lande. ii) It is denoted by 'm_l'.

iii) It indicates the orientations of the orbitals in the presence of magnetic field.

iv)The value of 'm' depends on the value of 'l'.

v) 'm_l' can have $(2l + 1)$ values and the values are from $-l$ to $+l$.

(iii)(b) Spin quantum number:

i) It proposed by Uhlenbeck and Goud smit. ii) It is denoted by 'm_s'.

iii) It indicates the direction of the spin of electrons.

iv)'m_s' has only two values..

v) The values of 'm_s' are $+{}^1/_2$ and $-{}^1/_2$. Also $+{}^1/_2$ represents the clock wise direction and $-{}^1/_2$represents the anti clock wise direction.

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21. Modern periodic table was constructed on the basis of atomic number or electronic configuration. The position of element tells us the atomic number, number of valence electrons and valency of the element. This helps in predicting the reactivity, comparative atomic size, metallic character, comparative ionisaion energy, in which type of bonds it can participate.
Ex: Group 17, the elements have 7 valence electrons. The valency of the elements in that group is 1. All these elements are highly reactive. They are non metals. Atomic size increases, and ionization energy decreases from top to bottom in that group. All the elements can gain one electron for their stability. All can participate in forming covalent bonds.

22. Hybridisation: The intermixing of atomic orbitals of almost equal energies of an atom and their redistribution into an equal number of identical orbitals is called hybridization.

Formation of BF_3 molecule:

(i) Electronic configuration of Boron(Z=5) is $1s^2 2s^2 2p^1$.

(ii) The configuration in excited state is $1s^2 2s^1 2p^2$.

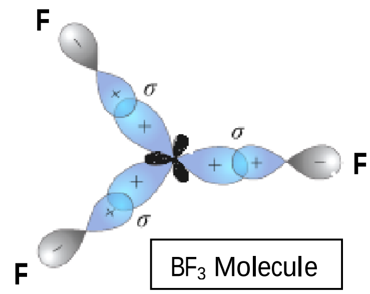
(iii) Due to hybridization of 2s and 2p orbitals, three identical sp^2-hybrid orbitals are formed and Separated in a planar triangular shape.

(iv) Electronic configuration of Flulorine (Z=9) is $1s^2 2s^2 2p^5$.

(v) It has unpaired electrons in $2p_z$ orbital.

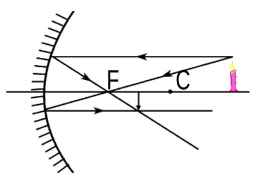
(vi) The three sp^2-hybrid orbitals in boron forms sigma bonds with each of p-orbitals in three Fluorine atoms.

(vii) Thus BF_3 is formed with planar triangular shape.



Section - IV

23.



24. Heating of Calcium carbonate and testing the gas evolved. (Diagram)

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KEY SHEET - PART-B

S. No	Ans.	S. No	Ans.	S. No	Ans.
1	B	**11**	B	**21**	Fog
2	A	**12**	D	**22**	Convex
3	B	**13**	C	**23**	Power of lens
4	A	**14**	C	**24**	6 Ω
5	B	**15**	D	**25**	Tesla
6	B	**16**	A	**26**	B
7	A	**17**	B	**27**	D
8	B	**18**	B	**28**	A
9	B	**19**	A	**29**	F
10	A	**20**	D	**30**	C

Note : * means allot full marks.

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