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SSC PUBLIC EXAMINATIONS – 2024

PHYSICAL SCIENCE

PREPARED BY

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Section-IV

Q.No: 17 (Physics and Chemistry Part –AS₃)

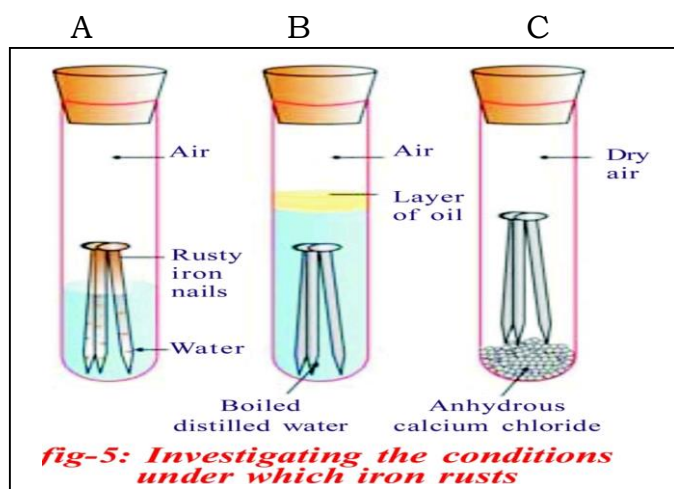
8 Marks

1. Suggest an experiment to prove that the presence of air and water is essential for corrosion. Explain the procedure.

Ans: Aim: To prove that the presence of air and water are essential occurrences of corrosion.

Apparatus: Three test tubes, three corks, Distilled water, anhydrous calcium chloride, clean iron nails and oil etc.

Procedure: 1. Take 3 test tubes and place clean iron nails in each of them. Label the test tubes A, B and C
2. Pour some water in test tube A and cork it.
3. Pour boiled distilled water in test tube B, and about 1ml of oil and cork it.
4. Put some anhydrous calcium chloride in test tube C and cork it.
5. Leave these test tubes for a few days and then observe.
6. After a few days, we will observe that iron nails rust in test tube A, but they do not rust in test tubes B and C.



Conclusion: From the above experiment, we can prove that air and water are essential for corrosion.

2. Compounds such as alcohols and glucose contain hydrogen but are not categorized as acids. Describe an activity to prove it.

Describe an activity to prove it.

Ans: i) Prepare solutions of glucose, alcohol, hydrochloric acid and sulphuric acid etc.,

ii) Connect two different coloured electrical wires to graphite rods separately in a 100 ml beaker as shown in figure.

iii) Connect free ends of the wire to 230 volts AC plug and complete the circuit as shown in the fig by connecting a bulb to one of the wires.

iv) Now pour some dilute HCl in the beaker and switch on the current.

v) We observe that the bulb glows.

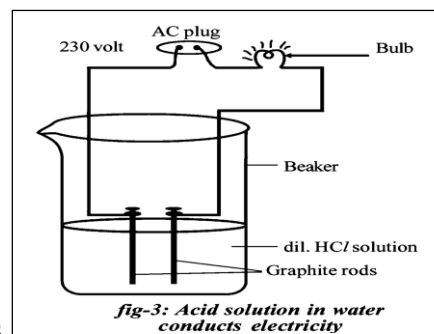
vi) Repeat activity with dilute sulphuric acid and glucose and alcohol solutions separately.

vii) You will notice that the bulb glows only in acid solutions but not in glucose and alcohol solutions.

viii) Glowing of bulb indicates that there is flow of electric current through the solution. Acid solutions have ions and the movement of these ions in solution helps for flow of electric current through the solution.

ix) The positive ion (cation) present in HCl solution is H^+ . This suggests that acids produce hydrogen ions H^+ in solution, which are responsible for their acidic properties.

x) In glucose and alcohol solution the bulb did not glow indicating the absence of H^+ ions in these solutions. The acidity of acids is attributed to the H^+ ions produced by them in solutions.

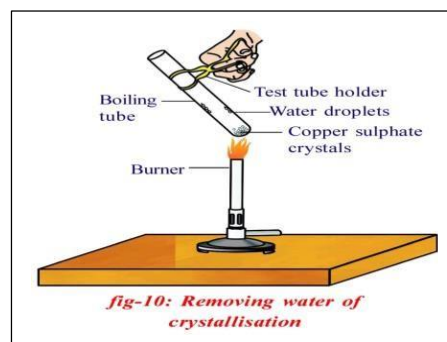


3. What is meant by “water of crystallization” of a substance? Describe an activity to show the water of crystallisation.

Ans: Water of crystallization is the fixed number of water molecules present in one formula unit of a salt.

Activity:

- Take a few crystals of blue colour copper sulphate in a dry test tube and heat the test tube.
- We observed that blue colour salt turns white and water droplets on the walls of the test tube.
- Add 2-3 drops of water on the sample of copper sulphate obtained after heating.
- We observed that blue colour of salt is restored.
- From this activity we conclude that some water molecules are fixed in the blue coloured copper sulphate crystals.



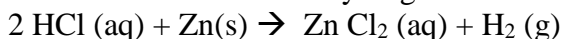
4. Show that acids produce hydrogen gas when react with metals.

Ans: Aim: To show that acid produce hydrogen gas reacted with metals.

Materials required: test tube, delivery tube, glass trough, candle, soap water, dil. HCl, and zinc granules.

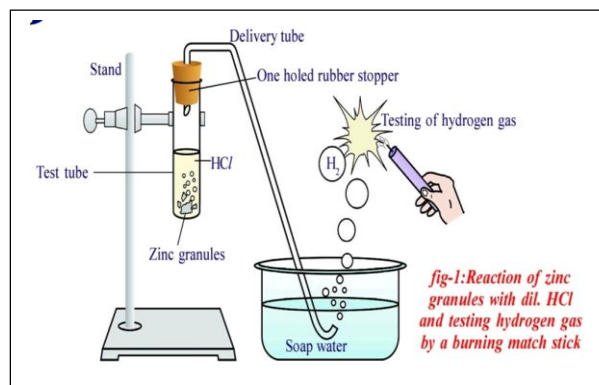
Procedure:

- Set the apparatus as shown in figure.
- Take about 10ml of dilute HCl in a test tube and add a few zinc granules to it.
- We observe a gas is evolved from the zinc granules
- Pass the gas being evolved through the soap water.
- We observe some bubbles formed in the soap solution.
- Bring a burning candle near the gas filled bubble.
- The candle turn off with a pop sound
- The pop sound indicates that the gas evolved in H₂



- Repeat this experiment with remaining acids

Conclusion: We conclude that hydrogen gas is produced when acid reacts with metals.



Section-IV

Q.No: 16 (Chemistry Part -AS₁)

8 Marks

1. Explain the significance of three Quantum numbers in predicting the positions of an electron in an atom.

Ans: 1. Principal Quantum Number (n)

- The principal quantum number gives the size and energy of the main shell and it is denoted by n.
- 'n' has positive integer values of 1, 2, 3,...
- As 'n' increases, size and energy of the shell increases.
- The shells are denoted by the letters K,L,M,N,...

| Shell | K | L | M | N |
|-------|---|---|---|---|
| n | 1 | 2 | 3 | 4 |

2. The angular - momentum quantum number (l)

- The angular momentum quantum gives the shape of sub-shells and it is denoted by l
- 'l' has integer values from 0 to n-1 for each value of 'n'.
- The sub-shell are designated by the letters s,p,d,f...

| | | | | |
|-----------------------|---|---|---|---|
| l | 0 | 1 | 2 | 3 |
| Name of the sub-shell | s | p | d | f |

3. The magnetic quantum number (m_l)

- It gives the information about the orientation of orbitals in the presence of magnetic field.
- The magnetic quantum number (m_l) has integer values between -l and l, including zero.
- For given l value, m_l has (2l+1) values
- s-orbital is spherical in shape, p-orbital is dumbbell-shaped and d-orbital are double dumbbell-shaped

| Sub shells | Number of orbitals (2l+1) | Maximum number of electrons |
|------------|---------------------------|-----------------------------|
| s (l=0) | 1 | 2 |
| p (l=1) | 3 | 6 |
| d (l=2) | 5 | 10 |
| f (l=3) | 7 | 14 |

2. Define the modern periodic Law. Discuss the construction of the long form of the periodic table.

Ans: "The physical and chemical properties of elements are the periodic functions of the electronic configurations of their atoms."

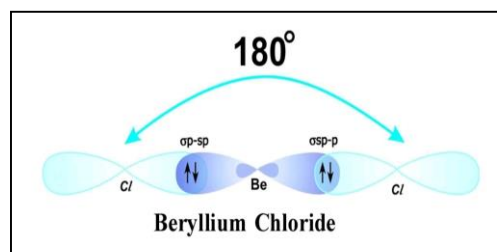
1. Based on the modern periodic law, this modern periodic table is proposed.
2. The modern periodic table has 18 vertical columns known as Groups and 7 horizontal rows known as Periods.
3. 18 groups represented by using Roman numeral I through VIII with letters A and B in traditional notation or 1 to 18 Arabic numerals.
4. 7 periods represented by 1 to 7 Arabic numerals.
5. 1st period contains 2 elements, 2nd and 3rd periods contains 8 elements each, 4th and 5th periods contains 18 elements each, 6th period contains 32 elements and 7th periods is incomplete.
6. The elements are classified as s,p,d and f block elements.
7. Inert or Noble or Rare gases elements are placed in 18th group.
8. Each period starting with metal and ending with inert gas.
9. Left side elements are metals and right side elements are non-metals.
10. s and p block elements are known as Representative elements.
11. d-block elements are called Transition elements.
12. f-block elements are called Inner transition elements. They are placed separately at the bottom of the table.

Advantage: 1. To study the properties of the elements easily

3. Explain the formation of BeCl₂ molecule using hybridization.

Ans: Formation of BeCl₂:-

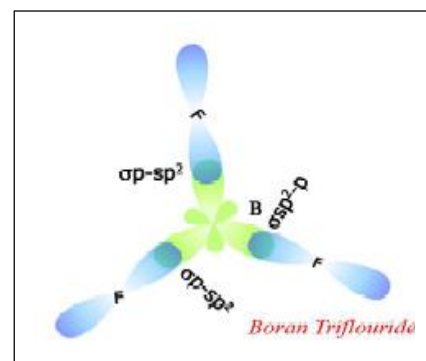
- a) Be(z=4) has electronic configuration 1s²2s²
- b) It has no unpaired electrons
- c) It is suggested that excited Be atom in which an electron from 2s shifts to 2p_x level.
- d) The excited electronic configuration of Be is 1s² 2s¹ 2p¹_x
- e) Electronic configuration of Cl(z=17) is 1s² 2s² 2p⁶ 3s² 3p²_x 3p²_y 3p¹_z
- f) If Be forms two covalent bonds with two Chlorine atoms, one bond should be σ2s-3p due to the overlap of 2s orbital of Be, the 3p_z orbital of one Chlorine atom.
- g) The other bond should be σ2s-3p due to the overlap of 2p_x orbital of Be atom the 3p orbital of the other Chlorine atom and bond angle is 180⁰



4. Explain the formation of BF₃ molecule using hybridization.

Ans: Formation of BF₃:-

- a) B(z=5) has electronic configuration 1s² 2s² 2p¹_x
- b) The excited electronic configuration of B is 1s² 2s¹ 2p¹_x2p¹_y
- c) As it forms three identical B-F bonds in BF₃
- d) It is suggested that excited B atom undergoes hybridization.
- e) There is an intermixing of 2s, 2p_x, 2p_y orbitals and their redistribution into three identical orbitals called sp² hybrid orbitals
- f) For three sp² orbitals to get separated to have minimum repulsion the angle between any two orbitals is 120⁰ at the central atom.
- g) Now three fluorine atoms overlap their 2p_z orbitals containing unpaired electrons. [F (z=9) 1s²2s²2p²_x2p²_y2p¹_z] the three sp² orbitals of B that contain unpaired electrons to form.



Section-IV

Q.No: 15 (Physics Part -AS₁)

8 Marks

1. Write the differences between evaporation and boiling?

Ans:

| Evaporation | Boiling |
|---|---|
| 1. The process of escaping of molecules from the surface of a liquid at any temperature is called evaporation | 1. Boiling is a process in which the liquid phase changes to gaseous phase at a constant temperature at a given pressure. |
| 2. It is surface phenomenon | 2. It is bulk phenomenon |
| 3. It takes place at any temperature | 3. It takes place at constant temperature |
| 4. It is a cooling process | 4. It is not a cooling process |
| 5. It's depends on surface area, temperature, wind speed and humidity | 5.It's depends on nature of the substance |

2. Explain the formation of mirages?

Ans: i) During a hot summer day, air just above the road surface is very hot and the air at higher altitudes is cool.

ii) It means that the temperature decreases with height.

iii) As a result density of air increases with height.

iv) We know that refractive index of air increases with density.

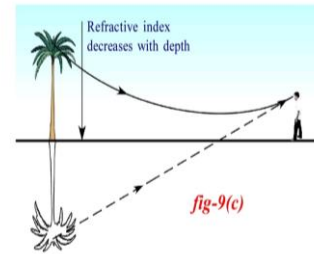
v) Thus the refractive index of air increases with height. So, the cooler air at the top has greater refractive index than hotter air just above the road.

Light travels faster through the thinner hot air than through the denser cool air

vi) When the light from a tall object such as tree or from the sky passes through a medium just above the road, whose refractive index decreases towards ground, it suffers, refraction and takes a curved path because of total internal reflection.

vii) This refracted light reaches the observer in a direction shown in Figure.

viii) Hence we feel the illusion of water being present on road which is the virtual image of the sky (mirage) and an inverted image of tree on the road



3. How do you correct the eye defect Myopia?

Ans: i) Some people cannot see objects at long distances but can see nearby objects clearly.

This type of defect in vision is called “Myopia”

ii) It is also called “Near sightedness”

iii) If person with myopia his maximum focal length is less than 2.5 cm

iv) If person with myopia, form an image before the retina

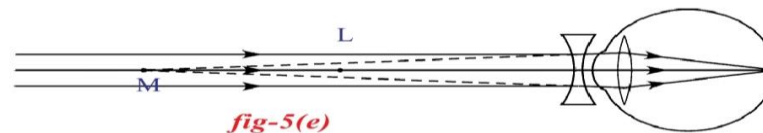


v) The point of maximum distance at which the eye lens can form an image on the retina is called “far point(M)”

vi) A person with myopia can see objects clearly up to far point. After far point cannot see the objects clearly

vii) To correct this myopia by using bi-concave lens

vii) Focal length of bi-concave lens is $f = -D$



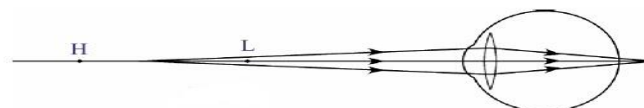
4. Explain the correction of the eye defect Hypermetropia.

Ans: i) Some people cannot see objects at near distances but can see distant objects clearly. This type of defect in vision is called “Hypermetropia”

ii) It is also called “Far sightedness”

iii) If person suffering from hypermetropia, his maximum focal length is more than 2.27cm

iv) If person suffering from hypermetropia, form an image beyond the retina

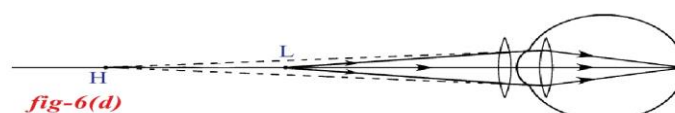


v) The point of minimum distance at which the eye lens can form an image on the retina is called “near point(H)”

vi) A person with hypermetropia can see objects clearly after near point. Cannot see the objects clearly between Least distance of distinct vision(L) and near point(H)

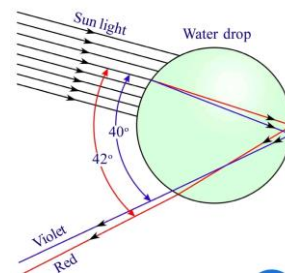
vii) To correct this hypermetropia by using bi-convex lens

viii) Focal length of bi-concave lens is $f = 25d/(d-25)$



5. Explain the formation of rainbow.

- Ans:** i) The rainbow are due to dispersion of the sunlight by millions of tiny water droplets.
 ii) Let us consider the case of an individual water drop.
 iii) The rays of sunlight enter the drop near its top surface. At this first refraction the white light is dispersed into its spectrum of colours, violet being deviated the most and red the least.
 iv) Reaching the opposite side of the drop, each colour is reflected back into the drop because of total internal reflection.
 v) At the second refraction the angle between red and violet rays further increases when compared to the angle between those at first refraction.
 vi) The angle between the incoming and outgoing rays can be anything between 0° and about 42° .
 vii) We observe bright rainbow when the angle between incoming and outgoing rays is near the maximum angle of 42° .



Section-III

Q.No: 12 (Physics and Chemistry – AS₅)

4 Marks

1. Draw a neat diagram showing acid solution in water conducts electricity.

Ans:

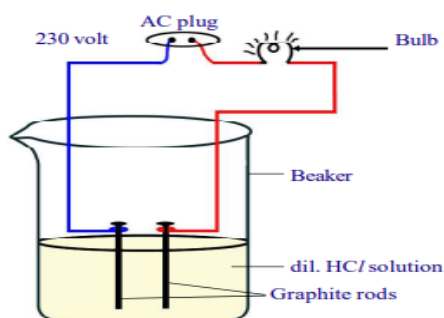
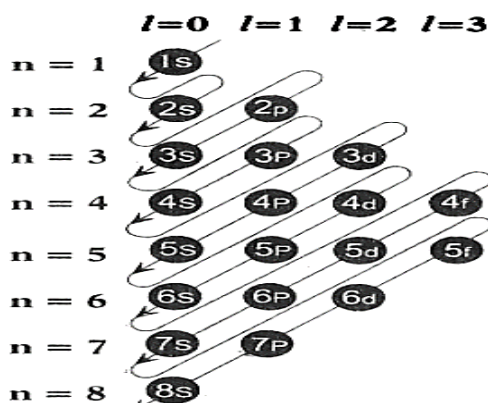


fig-3: Acid solution in water conducts electricity

2. Draw a diagram showing the increasing value of (n+l) of orbitals (OR)

Draw moeller chart of filling order of atomic orbitals

Ans:



3. Draw Reverberatory furnace and label its parts. (OR) Which furnace is generally used for roasting? Draw a neat diagram and label the parts of this furnace

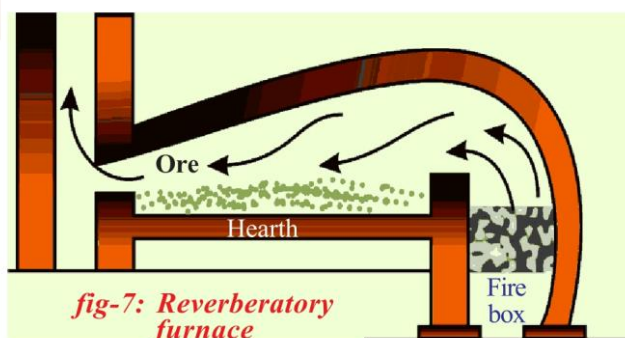


fig-7: Reverberatory furnace

4. Which method is suitable to enrich sulphide ores? Draw a neat diagram and label the parts (OR) Draw the diagram showing Froth floatation method and label its parts.

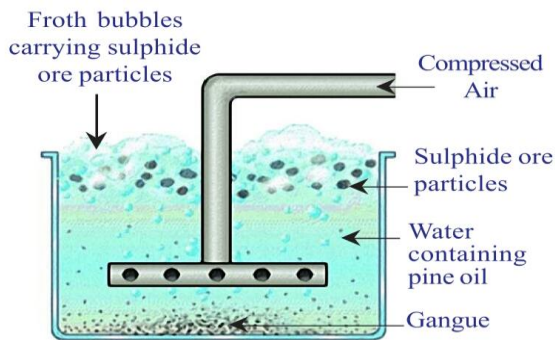
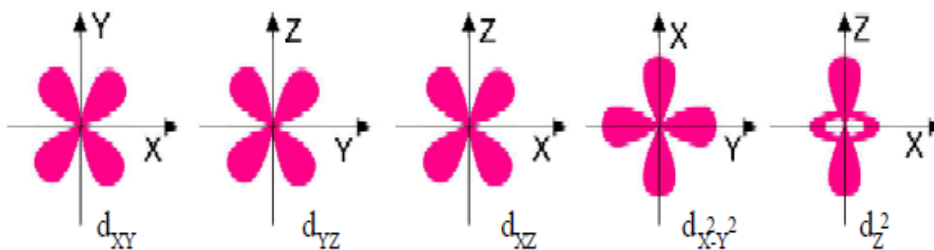


fig-1: Froth flotation process for the concentration of sulphide ores

5. Draw the d-orbitals (OR) Draw the shapes of orbitals with $l = 2$



6. Draw pH value as shown by different colour in universal indicator

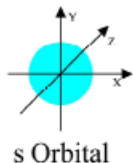


Section-I

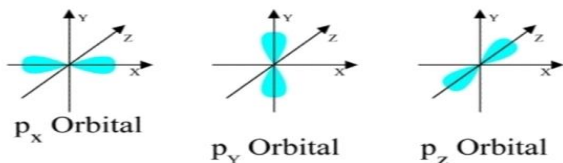
Physics and Chemistry – AS₅

1 Mark

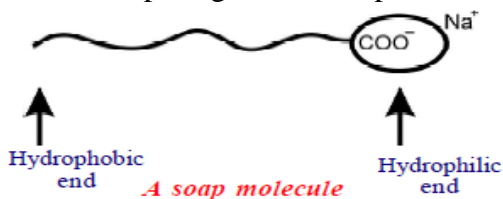
1. Draw the shape of s-orbital



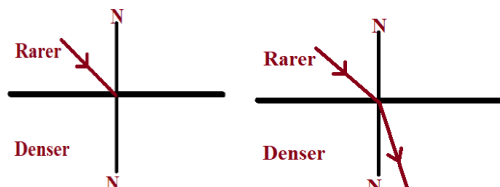
2. Draw the shape of any one of p-orbital



3. Draw the simple figure of a soap molecule.



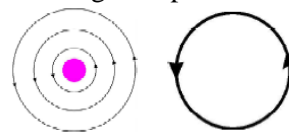
4. Complete the ray diagram



5. Represent Calcium atom using Lewis notation.

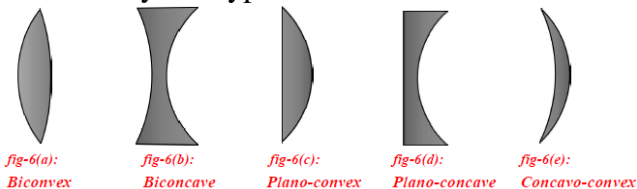


6. Observe figure. a) What is the direction of current b) What type of magnetic pole formed at the face



a) Into page b) North pole

7. Draw any one type of lens.



8. Draw the symbols of

a) Resistance b) Resistor c) Battery d) Rheostat

