Grade 10 Science Andhra Pradesh 2024

SECTION- A

Q1. Convert 25° C into Kelvin scale.

Solution:

The temperature on Kelvin scale = Temperature on Celsius Scale + 273

= 25°C + 273

= 298 K

Q2. Give an example of the olfactory indicator.

Solution:

Examples of the olfactory indicators are vanilla Essence, onion, clove Oil

Q3. From the data given in the table:

Material Medium	Air	Ice	Water	Diamond
Refractive Index	1.003	1.31	1.33	2.43

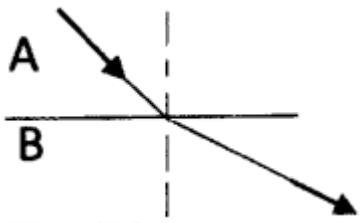
In which material medium light travels faster?

Solution:

The Light travels faster in the air medium because of its low refractive index.

[It is because the speed of light in a medium is inversely proportional to the refractive index of that medium]

Q4. Which material medium is denser in the given figure?



Solution:

Material Medium A is denser in the given figure as the refracted ray bending away from the normal.

Q5. Draw a neat diagram of the shape of the biconvex lens.

Solution:

Q6. Assertion 1: The Sky appears in blue due to light scattering.

Assertion 2: Blue color has the longest wavelength among all colors of white light.

(A) Both the Assertions are true

(B) Both the Assertions are false

(C) Only Assertion 1 is true

(D) Only Assertion 2 is true

Solution:

(C) Only Assertion 1 is true

[Assertion-2 is wrong because red color has the longest wavelength among all colors of white light.]

Q7. Imagine and write the element that exists in the I group and I period.

Solution:

Hydrogen

Q8. How do you appreciate the role of soap in daily life?

Solution:

- Soap helps in cleaning dirt, germs, and bacteria from the skin.

- It supports personal hygiene and helps prevent infections.
- It effectively removes oil and grease from surfaces.
- It is a necessary item for cleaning tasks.

Section-II

Q9. A prism with an angle of prism A = 60° produces an angle of minimum deviation of 30°. Find the refractive index of the material of the prism.

Solution:

Given

Angle of prism (A) = 60°

Angle of minimum deviation (D) = 30°

we know,

$$n = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\left(\frac{A}{2}\right)} = \frac{\sin\left(\frac{90°}{2}\right)}{\sin 30°} = \frac{\sin 45°}{\sin 30°} = \frac{1}{\sqrt{2}} \times \frac{2}{1} = \sqrt{2}$$

∴ The refractive index of the given prism = $\sqrt{2}$

Q10. Pose any two questions to understand the Bohr-Sommerfeld model of an atom.

Solution:

- What are the key postulates of the Bohr-Sommerfeld model?
- How do the allowed orbits in the Bohr-Sommerfeld model relate to the principal quantum number?
- What is the significance of the quantum numbers in the Bohr-Sommerfeld model?
- How does the Bohr-Sommerfeld model explain how atoms emit and absorb light?

Q11. Imagine the reason and write why the value of ionization potential II is more than the value of ionization potential I.

Solution:

- The amount of energy which is required to remove the first electron from the outermost orbit of a neutral gaseous atom of the element is known as the first ionization energy.
- The amount of energy which is required to remove an electron from a unipositive ion is called the second ionization energy.
- More energy is required to remove an electron from the outermost orbit of an unipositive ion than from a neutral atom because the nuclear attraction force on the outermost electron of the unipositive ion is more than the nuclear attraction force on the outermost electron of a neutral atom.
- Hence, the second ionization energy is higher than the first ionization energy.

Section-III

Q12. Draw any one of the following diagrams:

(A) Draw a neat ray diagram of the formation of the image when the object is kept before a convex lens in the following positions:

(i) at F

(ii) between F and P

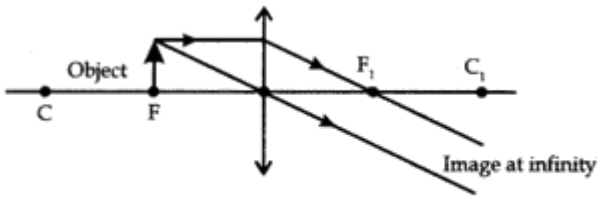
[OR]

(B) Draw a neat diagram of the formation of oxygen (O_2) molecules.

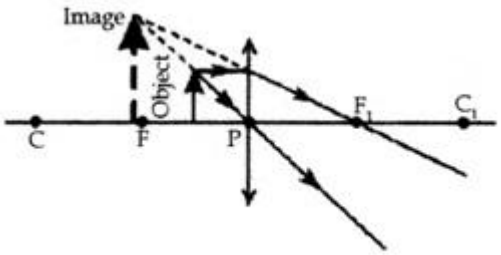
Solution:

(A)

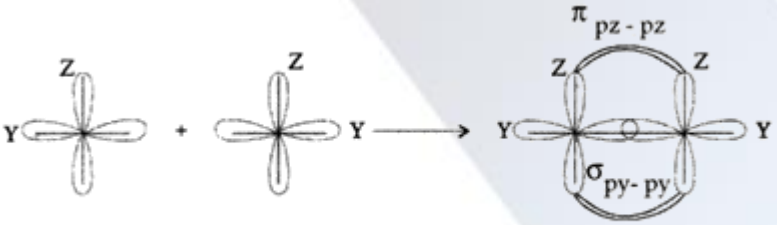
(i) Object is placed at F



(ii) Object placed between Focal point and P



(B)



Q13. Fill in the given table:

Sub Shell	**Orbital**	**Number of Orbitals**	**Maximum Number of Electrons**
l = 0		1	
l = 1	p	3	
l = 3		5	10
l = 4		7	

Solution:

Sub Shell	Orbital	Number of Orbitals	Maximum Number of Electrons
l = 0	s	1	2
l = 1	p	3	6
l = 3	d	5	10
l = 4	f	7	14

Q14. Write the advantages of parallel and series connections of electric circuits in our daily lives.

Solution:

Advantages of Parallel Connections:

- Keeps the voltage constant across all devices.
- Devices can work separately without depending on each other.
- If one device fails, it does not affect the others.

Advantages of Series Connections:

- Current flows equally through all components.
- Ideal for devices that require the same current.
- Simple design for certain uses.

Section-IV

Q15. (A) Define the following:

(1) Dew

(2) Fog

(3) Latent Heat of Vaporization

(4) Latent Heat of Fusion

(OR)

(B) Write about the working nature of the motor.

Solution:

(A)

(1) **Dew:** Dew is the moisture that appears on surfaces like window panes, grass, flowers, leaves, or car windows during nighttime or early morning hours. It forms when water vapor in the atmosphere condenses into tiny droplets of liquid water.

(2) **Fog:** Fog is the thick mist (or) layer formed by droplets of water keeps on floating in the air and making it hard to see the objects clearly.

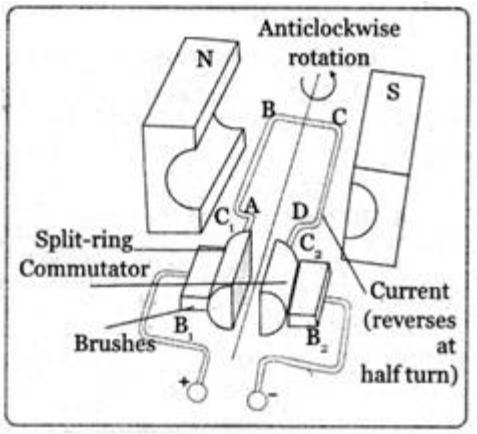
(3) **Latent Heat of Vaporization:** The amount of heat energy which is required to convert 1 gram of liquid to gas at a constant temperature is known as the latent heat of vaporization.

(4) **Latent Heat of Fusion:** The amount of heat energy which is required to convert 1 gm of solid completely into liquid at a constant temperature is known as the latent heat of fusion.

(OR)

(B) **Working nature of electric motor:**

Q16. An electric motor is a device that transforms electrical energy into mechanical energy. It operates based on the principle of the magnetic effects of electric current.



Working Procedure:

- It includes an armature, a strong horseshoe-shaped magnet, split rings, and carbon brushes.
- Begin with the coil's plane in a horizontal position, where split ring C_1 is in contact with brush B_1, and split ring C_2 is in contact with brush B_2, allowing current to flow in the direction ABCD as illustrated in the figure.
- According to the right-hand rule, no force acts on arms CB and DA because they are parallel to the magnetic field lines.
- The force on arm AB pushes it downward, while the force on arm CD pushes it upward, causing the armature to rotate in the anti-clockwise direction.
- After half a rotation, the split ring C_1 makes contact with brush B_2, and C_2 contacts brush B_1. As a result, the current in the coil is reversed and flows in the direction of DCBA.
- If the direction of the current in the coil remains unchanged, the coil undergoes a back-and-forth motion.
- In an electric motor, the split rings function as a commutator, reversing the direction of current flow through the circuit.
- The coil now rotates continuously in the counterclockwise direction.

Q17. (A) Write briefly about the following:

(1) Plaster of Paris

(2) Bleaching Powder

(3) Sodium Bicarbonate

(4) Sodium Carbonate

(OR)

(B) Explain the chain reaction when methane is reacted with chlorine to get carbon tetrachloride.

Solution:

(A)

(1) Plaster of Paris:

When Gypsum ($CaSO_4.2H_2O$) is heated carefully at 373 K, it loses some of its water molecules and transforms into Plaster of Paris.

$$\underset{\text{Gypsum}}{CaSO_4 \cdot 2H_2O} \xrightarrow{373\ K} \underset{\text{Plaster of Paris}}{CaSO_4 \cdot \frac{1}{2}H_2O} + \frac{3}{2}H_2O$$

Calcium sulphate hemihydrate ($CaSO_4.\frac{1}{2}H_2O$) is also called as Plaster of Paris.

- Doctors use Plaster of Paris to keep fractured bones in the correct position while they heal.
- It is used to make toys and decorative items.
- It is also used to enhance the smoothness of surfaces.

(2) Bleaching Powder:

Bleaching powder is produced by reacting chlorine gas (derived from the chlor-alkali process) with dry slaked lime [$Ca(OH)_2$]

$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$

The formula of the bleaching powder is [$CaOCl_2$]

- Chlorine is generated through the electrolysis of aqueous sodium chloride (brine).
- Chlorine gas is used in the production of bleaching powder.
- It is used as a bleaching agent for dirty clothes in laundry and for bleaching cotton and linen in the textile industry.
- It is used as a disinfectant to purify water, making it safe for drinking.

(3) **Sodium hydrogen carbonate (or) Sodium bicarbonate:**

- The chemical formula of sodium bicarbonate is $NaHCO_3$. It is also known as baking soda.
- Sodium hydrogen carbonate, an alkaline substance, is a key ingredient in antacids. It neutralizes excess stomach acid, offering relief from acidity.
- It is used in soda-acid fire extinguishers.
- It also acts as a mild antiseptic.

(4) **Sodium Carbonate:**

- Recrystallization of sodium bicarbonate gives sodium carbonate. It is also known as washing soda.
  $Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$
- The chemical formula of sodium carbonate is $Na_2CO_3.10H_2O$
- Sodium carbonate (washing soda) is utilized in the glass, soap, and paper industries
- It is utilized in the production of sodium compounds like borax.
- It can be used as a cleaning agent for domestic purposes.
- It can be used for removing the permanent hardness of water.

(OR)

(B) During direct halogenation of alkanes in the presence of sunlight (hυ), all the hydrogen atoms in the compound are replaced by halogens.

i) $CH_4 + Cl_2 \xrightarrow{h\upsilon} CH_3Cl + HCl$

Methyl chloride

ii) $CH_3Cl + Cl_2 \xrightarrow{h\upsilon} CH_2Cl_2 + HCl$

di Methylene chloride

iii) $CH_2Cl_2 + Cl_2 \xrightarrow{h\upsilon} CHCl_3 + HCl$

Trichloro methane

iv) $CHCl_3 + Cl_2 \xrightarrow{h\upsilon} CCl_4 + HCl$

Tetrachloro methane

Q18. (A) Write the lab activity to understand lateral shift using glass lab.

(OR)

(B) Write an activity to understand the corrosion of iron(rusting) in the presence of water and air.

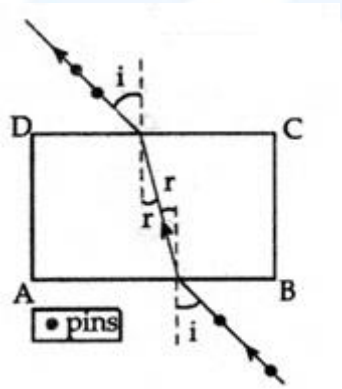
Solution:

(A)

Aim: To find the lateral shift using a glass slab.

Material Required:

Drawing board, chart paper, clamps, scale, pencil, thin glass slab, and pins.



Experimental procedure:

- Use pins to fix a chart paper onto a drawing board.
- Put a glass slab in the centre of the paper and use a pencil to draw lines around its edges.
- Take out the slab and label the edges of the rectangle as A, B, C, and D.
- Draw a perpendicular at a point on the longer side (AB) of the rectangle.
- Again place the slab on the paper, ensuring that it aligns with the sides of the rectangle ABCD
- Place two pins on the perpendicular line to AB.
- Place two additional pins on the opposite side of the slab, ensuring that all the pins align in a straight line and are visible.
- Remove the slab from its position, take out the pins, and draw a straight line connecting the dots formed by the pins, extending it to the first edge (AB) of the rectangle.
- It forms a straight line. We can conclude that, the light ray that strikes the surface of the slab perpendicularly emerges without any deviation, forming a straight line.
- Draw a line from the point where side AB of the rectangle intersects the perpendicular, ensuring it forms a 30° angle with the normal.
- This line represents the incident ray striking the slab, and the angle it forms with the normal is referred to as the angle of incidence.
- Position the slab on the paper so that it aligns perfectly within the drawn rectangle.
- Position two marked pins along the line forming a 30° angle to the normal, ensuring they stand vertically with equal height.
- From the opposite side of the slab, fix two additional pins so that all four pins appear to form a straight line.

- Remove the slab, take out the pins, and draw a straight line by connecting the dots created by the pins, extending it to the edge ‘CD’ of the rectangle.
- Draw a perpendicular to the line 'CD' and measure the angle formed between the emergent ray and the normal. This angle is referred to as the angle of emergence.
- The incident and emergent rays are observed to be parallel, and the separation between these parallel rays is referred to as the lateral shift.

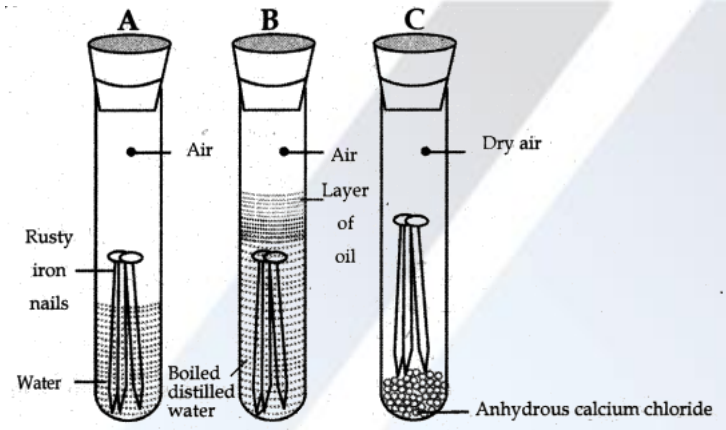
(OR)

(B)

Aim: To understand the corrosion of iron(rusting) in the presence of water and air.

Material Required:

Test tubes, oil, water, iron nails, anhydrous calcium chloride.



Experimental procedure:

(i) Take three test tubes and place clean iron nails in each of them.
(ii) Label the test tubes as A, B, and C.

(iii) Fill test tube A with water and seal it with a cork.
(iv) Pour some boiled distilled water into test tube B, add around 1 ml of oil, and seal it with a cork.

(v) The oil will float on the water and prevent air from mixing with it.

(vi) Place some anhydrous calcium chloride in test tube 'C' and seal it with a cork.

(vii) Anhydrous calcium chloride will absorb any moisture from the air.

(viii) Leave the test tubes for a few days and then check them.

(ix) You will notice that iron nails in test tube 'A' rust, but they do not rust in test tubes 'B' and 'C'.

(x) In test tube 'A', the nails are exposed to both air and water. In test tube 'B', the nails are only exposed to water, and in test tube 'C', the nails are exposed to dry air.

(xi) From this activity, we can conclude that both air and water are needed for the rusting of iron.