Grade 10 Science Andhra Pradesh 2018

Part A

Part-A comprises THREE sections I, II and III.

All the questions are compulsory.

There is no over all choice. However, there is an internal choice to the questions under Section-III.

SECTION – I

NOTE :

(i) Answer all the questions.

(ii) Answer each question in 1 or 2 sentences.

(iii) Each question carries ONE mark.

Q1. Iron gets rust, but Gold does not? Why?

Solution:

Rust is a form of iron oxide, formed as a result of oxidation. Metal molecules react with the existing oxygen in the air to form an oxide. In case of metals like Iron and Steel, this oxidation gradually corrodes the metal, forming rust. Whereas, in case of gold, this oxidation process does not happen that readily and does not generally erode the metal.

Q2. State Fermat's Principle.

Solution:

Fermat's Principle states that that light follows a path of the quickest time, rather than the shortest distance.

Q3. Can a virtual image be photographed by a camera?

Solution:

Yes, a camera can capture an actual as well as a virtual image. This is possible, because the light rays that are emitted from a virtual image and then reaching the

lens of the camera are real. A virtual image is captured from the reflecting surface, following the reflection of incident rays and thus, these rays enter the camera to give off the effect of a photographic film. Just as how we are able to see virtual images in a mirror, it can also be photographed by a camera. For example, the camera makes a secondary image of the virtual image reflected in the mirror. This secondary image is the object for the lens of the camera.

Q4. Give the names of the functional groups.

(a) -COOR

(b) -OH

Solution:

(a) Name of the functional group -COOR is esters

(b) Name of the functional group - OH is alcohol

SECTION – II

NOTE :

(i) Answer all the questions.

(ii) Answer each question in 4 or 5 sentences.

(iii) Each question carries TWO mark.

Q5. Your friend has a doubt that whether a concave mirror or a convex mirror is used as a rear view mirror in vehicles. What questions will you ask to clarify his doubts?

Solution:

Here are some questions that can help you confirm if a concave mirror or a convex mirror is used as a rear - view mirror in vehicles:

(1) What is a concave mirror?

(2) What are the different types of images formed when the object is placed:

1. At the infinity
2. Beyond the centre of curvature
3. At the centre of curvature

4. Between the centre of curvature and principal focus
5. At the principal focus
6. Between the principal focus and pole

(3) What is a convex mirror?

(4) What are the different types of images formed by convex mirror:

- When object is at infinity
- When object is between infinity and pole

(5) What are the uses of Concave and Convex mirrors?

Q6. The focal length of a converging lens is 20 cm . Where will the image be formed, if an object is placed at 60 cm from the lens ? Write characteristics of the image.

Solution:

Focal length is the distance between the focus and the centre of curvature. Here, the focal length, F is given as 20 cm . Hence, 2F, here will be 40 cm . Now, an object is kept at 60 cm from the centre of curvature. Since, the object is beyond $2F$. The nature of the image will be real and inverted, while the size will be smaller. Also, in a converging lens, the position of the image formed will be between F and 2 F on the other side of the lens.

Q7. What is the reason for the blue colour of the sky? How do you appreciate the role of molecules in the atmosphere in this regard?

Solution:

The blue color of the sky is due to Rayleigh scattering.

Explanation:

Shorter wavelengths of light (blue) scatter more than longer wavelengths (red). Atmospheric molecules like nitrogen and oxygen scatter blue light in all directions.

Appreciation:

Atmospheric molecules contribute to the sky's blue color and protect life by scattering harmful UV radiation.

Meanwhile, as these molecules in Earth's atmosphere like N_2 and O_2 act as scattering centres, their sizes are comparable to the wavelength of blue light. Also, if these molecules were absent, then there would be no scattering of the sunlight and the sky would appear dark. Due to this reason, we appreciate the role of molecules in the atmosphere for the blue colour of the sky.

Q8. Name the principle, which says an Orbital can hold only 2 electrons and explain.

Solution:

The principle, which says an Orbital can hold only 2 electrons is the Pauli exclusion principle, one of the important principles in chemistry. It basically helps us to understand the electron arrangements.

Q9. How do you appreciate the special nature of Inert gases?

Solution:

Group 18 of the modern periodic table consists of noble gases, such as Helium, neon, argon, krypton, xenon and radon These gases are monatomic and chemically inert under normal conditions and so are also named as inert gases.

SECTION – III

NOTE:

(i) Answer all the questions.

(ii) Answer each question in 8 or 10 sentences.

(iii)Only one choice from each question is to be attempted.

(iv) Each question carries FOUR mark.

Q10. Answer the following questions by using the data given in the table:

Substance	Specific Heat (Cal / g °C)
Lead	0.031

Aluminium	0.21
Copper	0.095
Water	1.00
Iron	0.115

(a)Write SI units for Specific Heat.

(b) Based on Specific Heat values; arrange the substances given in the table in ascending order.

(c) If we supply the same quantity of heat, which substance will heat up faster?

(d) Calculate the amount of heat required to raise the temperature of 1 kg of Iron through 10°C.

Solution:

(a) SI unit for specific heat here is Calorie/Gram °C. The specific heat capacity of a substance is the quantity of heat energy required to raise the temperature of 1 kg of the substance by 1°C. The symbol used for specific heat capacity is c and the units are J/(kg °C) or J/(kgK). (Note that these units may also be written as $Jkg-1°C-1$ or $Jkg-1\ K-1$). It is Joules /Kg.

(b) Based on specific heat values, the substances arranged in ascending order will be Lead, Copper, Iron, Aluminium, Water.

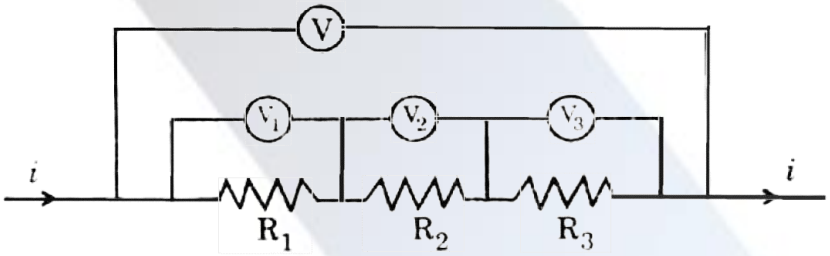
(c) If we supply the same quantity of heat, lead is more likely to heat up faster and the rise in temperature is dependent on the specific heat value of the metal.

(d) The amount of heat required to raise the temperature of a substance is calculated by applying the formula, heat (J) = mass of substance (g) × heat capacity of substance (J/g. K)x the change in temperature (K). Replacing the formula with values, you will get,

$J = 1000 \times 0.48 \times 10$

$= 4800$ J or 4.8 kJ

OR



Observe the above diagram and answer the following.

(a) Are all the resistors connected in parallel or series?

(b) What is the equivalent resistance of the combination of three resistors?

(c) In this system, which physical quantity is constant?

(d) If $\mathbf{R_1 = 2\Omega}$, R2 = $\mathbf{3}\Omega$ and $\mathbf{R}3 = 4\Omega$, find equivalent resistance.

Solution:

(a) The resistors are connected in series

(b) Equivalent resistance of the combination of three resistors,

That is $R_{\text{tad}} = R_1 + R_2 + R_3 = 2\Omega + 3\Omega + 4\Omega = 9\Omega$

(c) Current flowing through each resistor is constant

(d) The equivalent resistance = 9 ohms

Q11. Write the chemical formula for washing soda and baking soda and give their uses.

Solution:

Chemical formula for baking soda is $NaHCO_3$ and for washing soda, it is $Na_2CO_3.10H_2O$.

Or

Who proposed the Valence Bond Theory? Explain the formation of $\mathbf{N}_2$ molecules by using this theory.

Solution:

Valence Bond Theory was proposed by **Walter Heitler** and **Fritz London**.

Formation of N_2 Molecule:

Electronic Configuration: Nitrogen: $1s^2 2s^2 2p^3$

Orbital Overlap: Two nitrogen atoms overlap their 2p orbitals.

Bond Formation: Three covalent bonds (one sigma and two pi bonds) form, resulting in a stable triple bond.

In summary, the nitrogen molecule N_2 forms a triple bond through the overlap of 2p orbitals from each nitrogen atom.

As per the valence bond theory, the number of bonds that are formed by and the number of atoms is equal to the number of unpaired electrons that are present in it. In N_2, both the nitrogen atoms have 3 unpaired electrons, thus they form a triple bond in this molecule.

Q12. Explain the relation between angle of incidence and angle of refraction with an experiment.

Solution:

In optics, angle of incidence can be defined as the angle between a ray incident on a surface and the line perpendicular to the surface at the point of incidence (called normal).

The relationship between the angles of incidence and refraction is given by Snell's law.

According to this law, the ratio of the sines of the angles of incidence and refraction is constant for a given pair of media.

$$\frac{(\text{ Sineof angle of incidence (i)})}{(\text{ Sine of angle of refraction (r)})} = \text{ constant (n)}$$

This constant is known as refractive index.

Or

Write an activity to each of the following chemical reactions:

(A) Photo-chemical reaction

(B) Chemical displacement reaction

Solution:

(A) Reaction that occurs with absorption of light is called a photochemical reaction. A photochemical reaction is a chemical reaction triggered when light energy is absorbed by a substance's molecules.

Ex: Photosynthesis: $6CO_2 + 12H_2O \xrightarrow[\text{Sunlight}]{\text{chlorophyll}} C6H12O6 + 6H2O + 6O2$

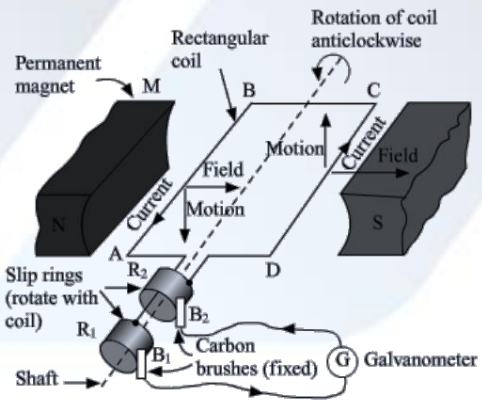
(B) A chemical displacement reaction is the one wherein the atom or a set of atoms is displaced by another atom in a molecule. For instance, dissolve 0.5 gm of Silver nitrate in 10 ml of water in a test tube. A copper wire is then dipped in it and kept undisturbed for some time. The shining silver crystals are visible on the Copper wire. The solution becomes bluish as some amount of copper is developed. In the below reaction, the copper metal displaces silver from Silver Nitrate solution.

$Cu(s) + 2AgNo3(aq) \rightarrow \mathbf{2Ag}(s) + Cu(NO_3)2(aq)$

Q13. Name the device that converts electrical energy into mechanical energy. Draw its diagram and label the parts.

Solution:

The device that converts electrical energy into mechanical energy is the motor.



MNST → Rectangular coil

A and B → Brushes

C and D → Two slip rings

X → Axle, G → Galvanometer

The principle of working of an electric generator is that when a loop is moved in a magnetic field, an electric current is induced in the coil. It generates electricity by rotating a coil in a magnetic field. The above figure shows a simple AC generator.

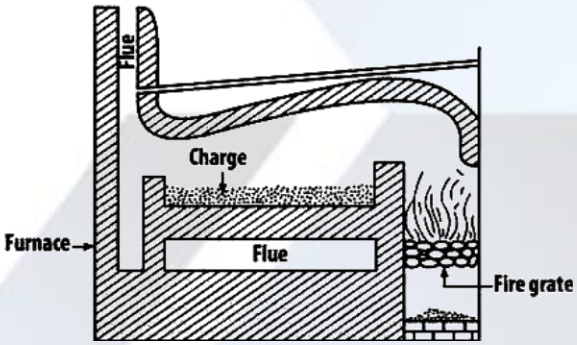
Or

What is a Furnace? Draw Reverberatory furnace and label its parts.

Solution:

Reverberatory furnace is a fumace that is mainly used for the extraction of tin, copper, aluminium and nickel metals as well as in the production of certain concrete and cements. The furnace is mostly used for smelting and refining these materials.

A Reverberatory Furnace



Part B

SECTION IV

Note:

(i) Answer all the questions.

(ii) Each question carries 1/2 mark

(iii) Marks will not be awarded in any case of over-writing, rewritten or erased answers.

(iv) Write the CAPITAL LETTER (A, B, C, D) showing the correct answer for the following questions in the brackets provided against them.

Q14. The S.I unit of Heat is

(A) Calorie

(B) Joule

(C) Calorie/ g°C

(D) Joule / Kg-kelvin

Solution:

(B) Joule

Q15. $x\mathrm{KC10_3} \rightarrow \mathrm{yKCl} + \mathrm{zO_2}$. The respective values of x, y, z are .....

(A) 1, 2, 3

(B) 3, 3, 2

(C) 2, 2, 3

(D) 2,2,2

Solution:

(C) 2, 2, 3

Q16. The iron nail dipped in Copper sulphate solution becomes brown and the blue colour of the Copper sulphate solution fades. Which type of reaction is this?

(A) Chemical combination

(B) Chemical decomposition

(C) Double decomposition

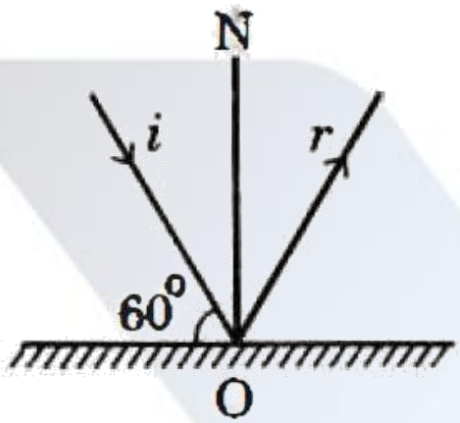
(D) Displacement

Solution:

(D)

Since Iron is more reactive than copper, it will displace the copper from the salt to form a subsequent salt, $\mathrm{FeSO_4}$ (Ferrous sulphate). During the reaction, you can see that the blue colour of copper sulphate will change to greenish blue of ferrous sulphate. Hence, this is an example for a displacement reaction.

Q17. Find the values of ∠i, ∠r in the diagram.



A. $\angle i = 60°, \angle r = 60°$

B. $\angle i = 60°, \angle r = 30°$

C. $\angle \mathrm{i} = 30°, \angle \mathrm{r} = 60°$

D. $\angle \mathrm{i} = 30°, \angle \mathrm{r} = 30°$

Solution:

(D) $\angle \mathrm{i} = 30°, \angle \mathrm{r} = 30°$

Q18. The colour of Methyl orange in alkali solutions is

A. Yellow

B. Orange

C. Red

D. Blue

Solution:

(A)Yellow

Q19. Which of the following is Snell's law?

A. $n_1 \sin\ i = n_d / \sin\ r$

B. $\mathrm{n}/\mathrm{n}_2 = \sin\ il \sin\ r$

C. $n_2 n_1 = \sin\ il \sin\ r$

D. $n_1/\sin\ i = n_2 \sin\ r$

Solution:

(C) $n_2 n_1 = \sin\ i/\sin\ r$

Q20. Where should the object be placed on the principle axis of a Convex lens in order to get a virtual image?

(A) Between Optic centre and F.

(B) At F .

(C) Between F and C.

(D) At C.

Solution:

(C) Between Optic centre and F.

Q21. Statement P: Myopia can be corrected by using a bi-concave lens. Statement Q: For a biconcave lens, f value is positive.

(A) P is false, Q is true

(B) P is true, Q is false

(C) Both P, Q are true

(D) Both P, Q are false

Solution:

(B) P is true, Q is false

Q22. The splitting of white light into 7 colours is called

(A) Scattering

(B) Reflection

(C) Refraction

(D) Dispersion

Solution:

(D) Dispersion

Q23. Which rule is violated in the electronic configuration $1\ S^2 2\ S^0 2P^2$?

(A) Aufbau Principle

(B) Hund's rule

(C) Pauli exclusion principle

(D) Octet rule

Solution:

(B) Hund's rule

Q24. If **n** = 2, then angular momentum quantum number / values =

(A) 0,1

(B) 0,1,2

(C) 0

(D) 1,2

Solution:

(A) 0, 1

Q25. On moving from top to bottom in a group, the values of lonizational energy

(A) Increases

(B) Decreases

(C) No change

(D) Can't say

Solution:

(B) Decreases

Q26. The bond present in HCl molecule is

(A) lonic bond

(B) Polar covalent bond

(C) Non-polar covalent bond

(D) None

Solution:

(B) Polar covalent bond

Q27. Shape of Ammonia molecule is

(A) Linear

(B) Trigonal - Planar

(C) Tetrahedron

(D) Trigonal Pyramid

Solution:

(D) Trigonal Pyramid

Q28. An unknown circuit draws a current of 2A from a 12 V battery. Its equivalent resistance is

(A) 24Ω

(B) 6Ω

(C) 12Ω

(D) 2Ω

Solution:

(B) 6Ω

V = IR

$R = V/I = 12/2 = 6$

Q29. The main difference between AC generator and DC generator is

A. Carbon brushes

B. Magnets

C. Coil

D. Commutator

Solution:

(D) Commutator

DC has all 4, while AC has all the three except for Commutator. DC has commutators that make the current flow in one direction only, while AC generators have slip-rings.

Q30. Observe the following table:

Metal	Ore
P	Bauxite

Mercury	*Q*
R	Haematite

Identify the substances that are to be present in the P, Q, R positions.

(A) Aluminium, Cinnabar, Iron

(B) Sodium, Galena, Magnesium

(C) Sodium, Cinnabar, Iron

(D) Magnesium, Galena, Iron

Solution:

(A) Aluminium, Cinnabar, Iron

Q31. When acetic acid reacts with Ethyl Alcohol, we add some conc. H_2SO_4 This process is called

(A) Saponification

(B) Esterification

(C) Catenation

(D) Isomerism

Solution:

(B) Esterification

Q32. Graphites and Diamonds are two

A. Isomers

B. Allotropes

C. Homologs

D. Metals

Solution:

(B) Allotropes

Q33. The name of $CH_3 - CH_2 - CH_2 - COOH$ is

A. Propanoic acid

B. Propaldehyde

C. Butanoic acid

D. Butanaldehyde

Solution:

(C) Butanoic Acid