Grade 10 Science Andhra Pradesh 2014

Part A

SECTION – I

5 × 2 = 10

GROUP - A

Q1. What are the factors that influence the value of ' g ' ?

Solution:

According to formula, $g = GM/R^2$, the value of G depends upon the mass (M), radius (R) of the planet and the value of acceleration due to gravity on the surface of the planet.

Q2. What are the characteristics of Simple Harmonic Motion?

Solution:

Motion along a straight line is a Simple Harmonic Motion (SHM). When a body moves back and forth with respect to the mean position

Since acceleration is directly proportional to displacement from the mean position and is always directed towards it ($\alpha \propto -\omega^2 x$).

The force on the body will always tries to bring the body back to the equilibrium position. The maximum displacements on either side of the equilibrium position are equal.

Q3. What are basic processes involved in the working of a LASER?

Solution:

LASER stands for Light Amplification by Stimulated Emission of Radiation.

It is a device that emits light via a process of optical amplification is known as LASER.

The process is based on the emission of electromagnetic radiation.

Q4. Define the terms Electrotyping and Electro-plating.

Solution:

Electroplating and Electrotyping are related to each other.

Electroplating uses current so that it can form a thin layer or coating on object.

Electrotyping is a chemical process to make metal parts.

GROUP B

Q5. Into how many classes the elements are divided based on the electronic configuration? What are they?

Solution:

The elements are divided into 4 groups (s, p, d and f). The division is based on the valence electrons.

Q6. Calculate the pH of 0.001 M HCl solution.

Solution:

To calculate the pH of HCL, we will dissociate it in aqueous solution.

$HCl_{(aq]} + H_2O_{(l]} \rightarrow H_3O^+{}_{(aq]} + Cl^-{}_{(aq]]}$

Since pH is a measure of hydronium ions -

$pH = -\log([H_3O^+])$

Since, we have one mole of hydronium ions for every one mole of hydrochloric acid, you can say that

$[H_3O^+] = [HCl] = 0.001M$

So pH would be $-pH = -\log(0.001)$

$pH = 3$

Q7. Define solubility and write the factors which influence the solubility.

Solution:

Solubility can be defined as the amount of substance known as solute which gets dissolved in a unit volume of liquid substance known as solvent to form a solution. The temperature and pressure conditions are specified.

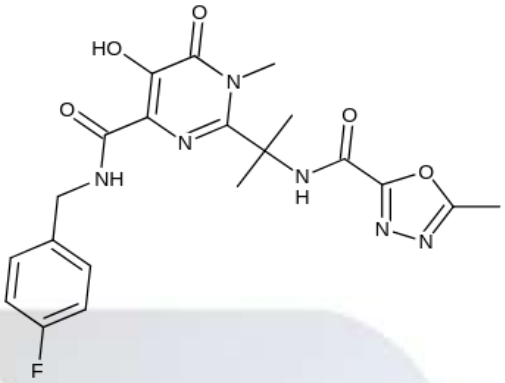
Factors affecting solubility

- Temperature
- Polarity
- Pressure
- Molecular size
- Stirring

Q8. Sketch the structure of any drug molecule.

Solution:

Raltegravir – FDA approved drug molecule.



SECTION – II

4 × 1 = 4

Q9. State Lenz's law.

Solution:

It was named after physicist Heinrich Lenz. It is basically based on Newton's 3rd law and conservation of energy.

It says that whenever a current is introduced in a circuit with change in magnetic field it opposes the change in flux and to exert a mechanical force opposing the motion.

Q10. Write the equations of motion for a freely falling body.

Solution:

A freely falling body always experience a downward acceleration g which we call as acceleration due to gravity. Thus acceleration of freely falling body $a = g = 9.8\ m/s^2$

(Taking downward direction to be positive)

Initial speed of that body $u = 0$

Equations of motion :

(i) : $v = gt$

(ii) : $S = \frac{1}{2}gt^2$

(iii) : $v^2 = 2gS$

Q11. In a Stationary wave, the distance between a node and the next antinode is 10 cm . What is the value of its wavelength?

Solution:

Distance between 2 adjacent nodes and antinodes $= 1/2$ of the wavelength.

So, the distance between adjacent nodes and antinodes $= 1/4$ of the wavelength

Similarly, the distance between a node and the next antinode in a stationary wave = 5 cm

So the wavelength would be 4×10 cm $= 40$ cm

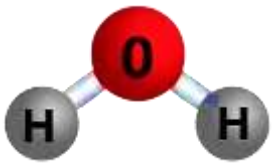
Q12. Write the names of Inert gases.

Solution:

The most common inert gases: helium (He), argon (Ar), neon (Ne), krypton (Kr), xenon (Xe), and radon (Rn). Another noble gas, element 118 (Uuo), does not occur naturally.

Q13. Draw the shape of Water molecule.

Solution:



Q14. What is the use of adding cullet to the raw material of glass?

Solution:

Cullet is added in the raw material of glass since it reduces the energy consumption in the manufacturing of the glass.

SECTION-III

4 × 4 = 16

GROUP - A

Q15. How do you determine the diameter of a wire using a Screw gauge? Explain.

Solution:

Step 1 - Find value of one Linear Scale Division. Record the pitch and least count of gauge. Find zero error and repeat it for atleast 3 times.

Step 2 - Move face B away from face A. using a ratchet head *R*, move the face A towards face *B* lengthwise and stop when *R* turns without moving the screw.

Step 3 - Linear scale reading is recorded by noting down the no. of visible and uncovered divisions of linear scale. To measure diameter in a perpendicular direction, repeat the step by rotating the wire to 90°.

Step 4 - Repeat the step for entire and record zero error.

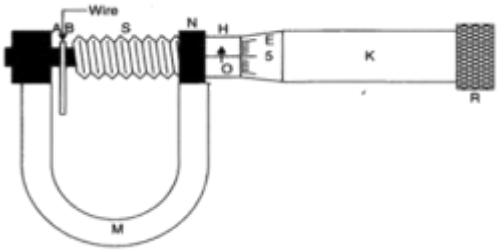


Fig. Screw gauge measuring diameter of the wire.

Q16. Compare the values of Relative Permeability and Magnetic Susceptibility of Dia, Para and Ferro magnetic substances.

Solution:

Diamagnetic -

- magnetic susceptibility should be greater than -1 and less than 0.
- relative magnetic permeability should be greater than 0 and less than 1
- permeability of vacuum should be greater than magnetic permeability of the substance

Paramagnetic -

- magnetic susceptibility should be greater than 0 and less than ε.
- magnetic permeability of the substance should be greater than 1 and less than $1 + \varepsilon$.
- permeability of vacuum should be less than magnetic permeability of the substance

Ferromagnetic -

- magnetic susceptibility should be greater than 1
- relative magnetic permeability should be greater than 1
- permeability of vacuum should be greater than magnetic permeability of the substance.

Q17. State the properties and uses of a Junction transistor.

Solution:

Uses of Junction Transistor -

1. It switches or amplifies eletronic power and electronic signals.
2. It can be used as a multivirator or as an oscilator.

Properties of Junction Transistor -

1. It can be connected in 3 configurations -
   a. CE or Common Emitter
   b. CB or Common Base
   c. CC or Common Collector
2. They can also be considered as n-p-n transistors and p-np transistors.

Q18. What is (a) mass defect, and (b) binding energy in Oxygen 16/8O, whose nuclear mass is 15.995 amu. (mp = 1.0078 amu; mn − 1.0087 amu)

Solution:

Atomic mass of ${}_8O^{16}$ is 16 .

Nuclear mass is 15.995 amu

${}_8O^{16}$ have 8p, 8n & 8e

Mass of nucleus = Mass of $8p$ + Mass of $8n$

$= 8 \times 1.00757 + 8 \times 1.00893$

$= 8.06056 + 8.07144$

$= 16.1320$ amu

(a) Mass defect = (Actual mass – Given mass)

= 16.1320 – 15.9956

= 0.1364 amu

(b) Binding energy = Mass defect × 931 MeV

$= 0.1364 \times 931$

$= 126.988$ MeV

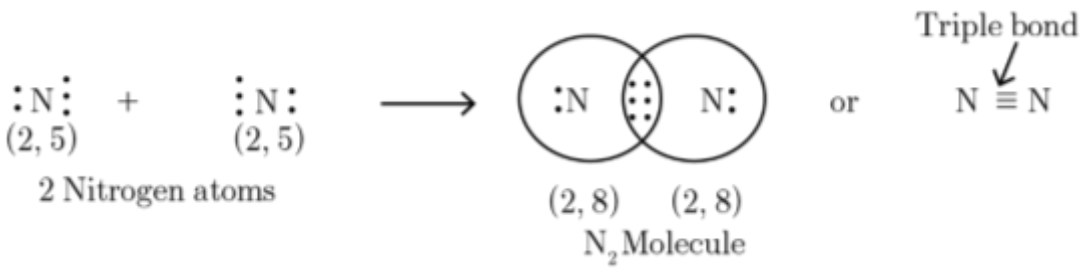
GROUP- B

Q19. Explain the formation of Triple bond with diagram.

Solution:

Triple Bond = 1 sigma bonds + 2 pi-bonds

Below image shows the triple formation in Nitrogen atoms.



Q20. Write reactions of group 1 A elements with

1. Water
2. Oxygen
3. Hydrogen
4. Chlorine

Solution:

1. Water: Cold water vigorously reacts with alkali metals and hydrogen gas is evolved along with metal hydroxide. The reaction down the group increases since the reactivity of alkali metals increases down the group.
2. Oxygen: Alkali Metals reacts readily with atmospheric oxygen.
3. Hydrogen: It reacts readily with Hydrogen and form metal hydroxides.
4. Chlorine - Alkali metals reacts with chlorine to form chloride salts and burn with an orange flame.

Q21. Compare the structures of diamond and graphite.

Solution:

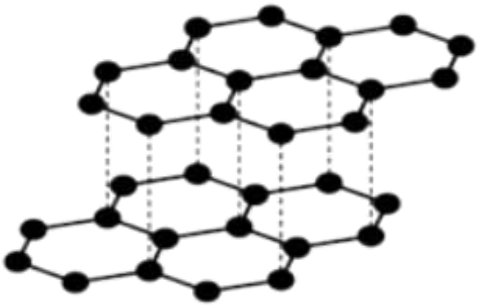
Structure of diamond:

It is known to have a tetrahedron structure throughout the crystal. Carbon atoms of diamonds possesses strong chemical bonds. The carbon atoms are sp^3 hybridized. The length of carbon-carbon bonds are equal.

Diamond structure

Structure of Graphite:

It has stable chemical bonds among all the carbon atoms. Carbon atoms are sp^2 hybridized and forms a hexagonal rings.



Graphite structure

Q22. Define a Drug. What are the characters of an ideal drug?

Solution:

Drug can be a defined as a chemical substance and produces a biological effect when administered by a living organism.

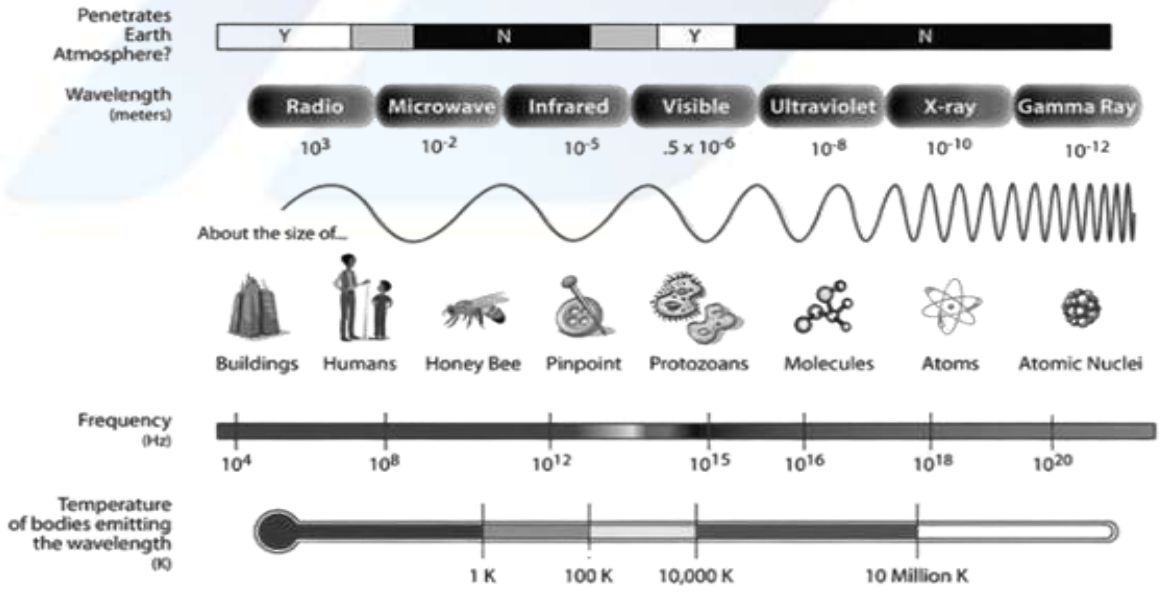
Characteristics of drugs -

1. Non-Toxic, bio-degradable and bio-compatible and should have no side effects.
2. Drugs shouldn't be accumulated in any organ or tissue or produce any harmful effect.
3. During transit the drug leakage should be minimum.
4. Proper therapeutic effect with proper release of drug at the target site.

SECTION - IV

Q23. Draw and label the diagram showing various regions of Electro-magnetic spectrum and their wavelength ranges.

Solution:



Q24. Draw the shapes of five d-orbitals

Solution: