

**CBSE**  
**Class IX Science**  
**Term 2**  
**Sample Paper - 1 Solution**

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**SECTION A**

1. In a game of billiards, the player provides kinetic energy to the cue ball by striking it with a cue stick. If the cue ball collides with another ball, it will slow down and the ball it collided with will gain speed as kinetic energy is transferred to it.
2. A group of atoms carrying a positive or negative charge on them are called polyatomic ions; Example - ammonium ion  $\text{NH}_4^+$ , hydroxide ion  $\text{OH}^-$ , sulphate ion  $\text{SO}_4^{2-}$ .
3. The different states in which water is found during the water cycle are liquid (water), gas (water vapour) and solid (snow).
4. In the process of lightning, flash and thunder are produced simultaneously. Flash is seen almost immediately because the speed of light is extraordinarily fast but thunder is heard a few seconds later because the speed of sound is less than the speed of light. The speed of light increases with an increase in the density of the medium.
5. **Variable valency:** Sometimes, same element may exhibit one valency in one compound and another valency in another compound. This property is called variable valency.

**Examples of elements exhibiting variable valencies are as follows:**

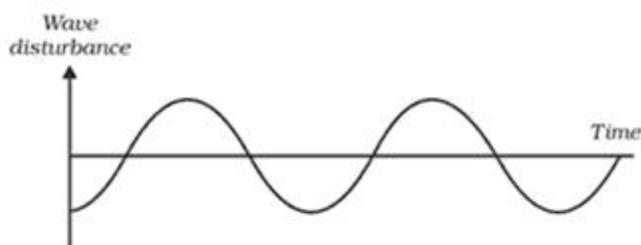
Element	Symbol	Valencies exhibited (variable valencies)	
Copper	Cu	1, 2	$\text{Cu}^{+1}, \text{Cu}^{+2}$
Silver	Ag	1, 2	$\text{Ag}^{+1}, \text{Ag}^{+2}$
Gold	Au	1, 3	$\text{Au}^{+1}, \text{Au}^{+2}$
Iron	Fe	2, 3	$\text{Fe}^{+2}, \text{Fe}^{+3}$

6. Differences between Gymnosperms and Angiosperms:

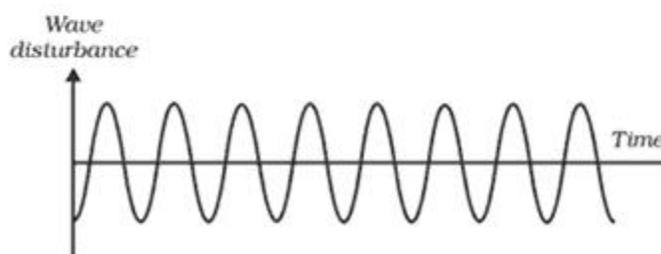
<b>Gymnosperms</b>	<b>Angiosperms</b>
i. The seeds are naked.	i. The seeds are enclosed by a fruit wall.
ii. The microspores and megaspores are produced by male and female cones.	ii. The microspores are produced in anthers while the megaspores are produced in the ovules of the ovary in flowers.

7.

(a)



*Wave shape for a low pitched sound*



*Wave shape for a high pitched sound*

(b) The sound of the spraying deodorant travels through the vibrations of air layers and so, it reaches first. However, the fragrance of the deodorant reaches the other person through the actual movement of air particles and therefore takes more time.

8.

(a) Work done = Force  $\times$  displacement  
 $= ma \times s$

Here the displacement 's' is height 'h'  
 $= m \times g \times h$   
 $= mgh$  (Potential Energy)

In both the situations,  $W = mgh$ , since it is independent of the path followed and depends only on the initial and final positions.

(b) Muscular force is doing positive work as it is in the direction of motion.

Gravitational force is doing negative work as it is opposite to the direction of motion.

**9. SONAR stands for SOund Navigation And Ranging.**

It is a device used to measure the distance, the direction and the speed of the objects lying under water using ultrasonic waves.

It comprises of a transmitter and a receiver. Powerful pulses of ultrasound waves are sent out at regular intervals from a transmitter mounted on a ship. When these pulses are intercepted by submerged objects, they are reflected. The reflected sound or echo is detected by an underwater receiver, which is also mounted on the ship.

If  $t$  = time interval between transmission and reception of reflected ultrasound wave,

$v$  = speed of sound through water,

$d$  = distance of the object that reflected the ultrasound, then

Distance = speed  $\times$  time

In time interval ' $t$ ', the sound waves travel twice i.e.  $2d$

$$2d = vt$$

$$\Rightarrow d = vt / 2$$

This gives the distance of the object lying under water.

**10. Work done by a force on an object is equal to the product of the magnitude of force exerted on the object and the distance travelled by the object in the direction of the force. The conditions for doing work are:**

- i. A force should act on an object.
- ii. The object must be displaced.

If any of the above two conditions are not satisfied, work is not done.

**11. The three conditions necessary for hearing sound are:**

- i. There must be a vibrating object capable of transferring its energy to its surroundings.
- ii. There must be a material medium to pick up energy and then propagate it in the forward direction.
- iii. There must be a receiver, so as to receive the sound vibrations and transmit them to the brain for final interpretation, such as the human ear.

**12.**

Molecular mass of  $S_8 = 8 \times$  Atomic mass of sulphur =  $8 \times 32 = 256$  g.

256 g of sulphur ( $S_8$ ) = 1 mole

$$\therefore 16 \text{ g of solid sulphur} = \frac{1 \times 16}{256} = \frac{1}{16} \text{ moles}$$

According to Avogadro's law,

1 mole of sulphur ( $S_8$ ) contains  $6.022 \times 10^{23}$

$$\therefore \frac{1}{16} \text{ moles of sulphur } (S_8) \text{ contain} = 6.022 \times 10^{23} \times \frac{1}{16} \text{ molecules}$$

Hence, 16 g of solid sulphur has  $0.376 \times 10^{23} = 3.76 \times 10^{22}$  molecules.

13.

(a) Given:

Atomic number of element 'M' = 13

Mass number of element 'M' = 27

Since, Number of protons = Atomic number

∴ Number of protons in the atom of an element 'M' will be 13.

Number of neutrons = Mass number – Number of protons

$$= 27 - 13$$

$$= 14$$

Atomic number = 13

Therefore, electronic configuration will be = 2, 8, 3

K	L	M
2	8	3

Since there are 3 electrons in the valence shell of the atom of an element 'M', valency will be 3.

(b) Given:

Atomic number = 6

∴ Electronic configuration = 2, 4

K	L
2	4

14. The greenhouse effect is a natural phenomenon which traps radiation within the earth's atmosphere. Natural greenhouse gases include water vapor, carbon dioxide, nitrous oxide and methane which are essential to support life.

The greenhouse effect is the cause of global warming. It is an irreversible, environmental condition in which harmful gases produced by human beings build up and trap heat within the earth's protective atmospheric shield, called the ozone layer. An increase in the amount of such gases in the atmosphere would cause an increase in the average temperature of the earth.

15.

(a) Diseases which spread through air: Common cold and tuberculosis.

(b) Diseases which spread through water: Jaundice and typhoid.

(c) Diseases which spread through insects: Malaria and dengue fever.

16. Precautions that can be taken in your school to prevent the incidence of infectious diseases are:

(a) Prevention of water logging to avoid mosquito breeding.

(b) Provision of safe drinking water.

(c) Periodic cleaning of toilets.

17.

(a)

- i. It makes study of organisms easy.
- ii. It gives inter-relationship amongst different groups of animal.
- iii. It gives us an idea about existing life forms.
- iv. Classification is the base for development of other branches of biological science.

**(Any two)**

(b) Bryophytes and pteridophytes grow in moist and shady places because they require water for fertilisation.

18. The effects of air pollution are:

- i. Air pollution can have serious consequences on the health of human beings. Human beings may suffer from respiratory problems, high blood pressure, renal problems, eye irritation, problems in nervous system etc.
- ii. Air pollution causes falling of leaves, reduced growth of plants, degeneration of chlorophyll etc.
- iii. Air pollution leads to acid rain which further damages soil, plants, buildings etc.

19.

(a) Kinetic energy of an object is the energy possessed by the body by virtue of its state of motion. A speeding vehicle, a rolling stone, a flying aircraft, flowing water, blowing wind, a running athlete etc. possess kinetic energy.

(b) Consider an object of mass 'm' in a state of motion with an initial velocity 'u'. Let a constant force 'F' act on the object and displace it through a distance 's' in the direction of the force applied.

$$\therefore \text{Work done on the object by the force, } W = F.s \text{ ----- (1)}$$

Due to the work done on the object, a change in velocity takes place. Let the velocity of the object change from 'u' to 'v'. Let 'a' be the acceleration produced.

Then, according to the equation of motion,

$$v^2 - u^2 = 2as$$

$$s = \frac{v^2 - u^2}{2a} \text{ -----(2)}$$

We know that according to the second law of motion,  $F = ma$  ----- (3)

Substituting (2) and (3) in (1) we get:

$$\text{Work done on the object } W = F.s = (m.a) \left( \frac{v^2 - u^2}{2a} \right)$$

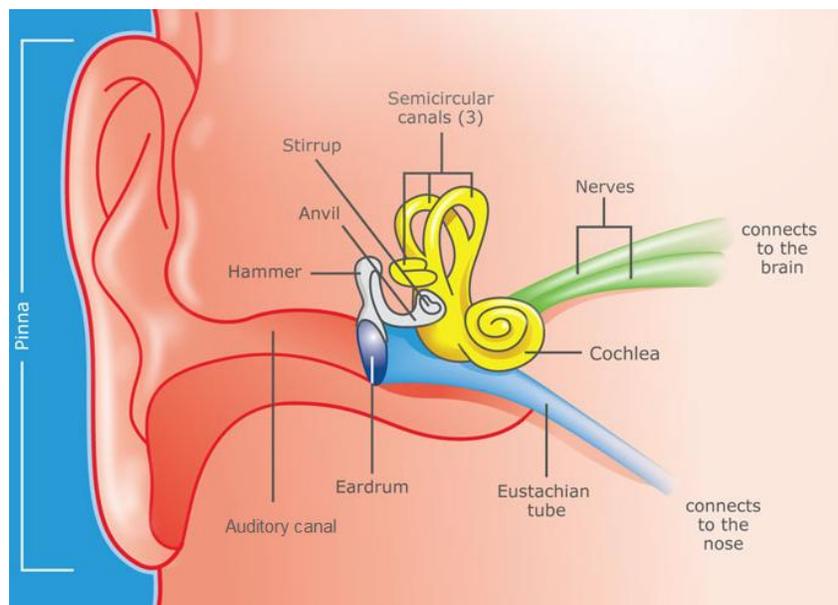
$$= \frac{1}{2} m(v^2 - u^2)$$

As the object starts from rest,  $u = 0$  hence,  $W = \frac{1}{2} mv^2$

Obviously, the work done on the object is equal to the kinetic energy imparted to the object. Thus, the kinetic energy possessed by an object of mass 'm' moving with a uniform velocity 'v' is given by:

$$E_k = \frac{1}{2}mv^2$$

- 20.** The ear allows us to convert pressure variations in the air with audible frequencies into electric signals which travel through the brain via auditory nerves. Human ear consists of three compartments: outer ear, middle ear and inner ear. The structure of the human ear is as shown below:



The outer ear is called pinna. It collects the sound from the surroundings. The collected sound passes through the auditory canal. At the end of the auditory canal, there is a thin membrane called the ear drum or the tympanic membrane. When a compression of the medium reaches the eardrum, the pressure on the outside of the membrane increases and forces the eardrum inward. Similarly, the eardrum moves outward when a rarefaction reaches it. In this way, the eardrum vibrates. The vibrations are amplified several times by three bones (the hammer, the anvil and the stirrup) in the middle ear. The middle ear transmits the amplified pressure variations received from the sound wave to the inner ear. In the inner ear, the pressure variations are turned into electrical signals by the cochlea. These electrical signals are sent to the brain via the auditory nerves, and the brain interprets them as sound.

## 21. Electrovalency

- When one atom transfers one or more electrons to another atom, the bond formed between them is known as an **electrovalent bond or electrovalency**.

### Covalency

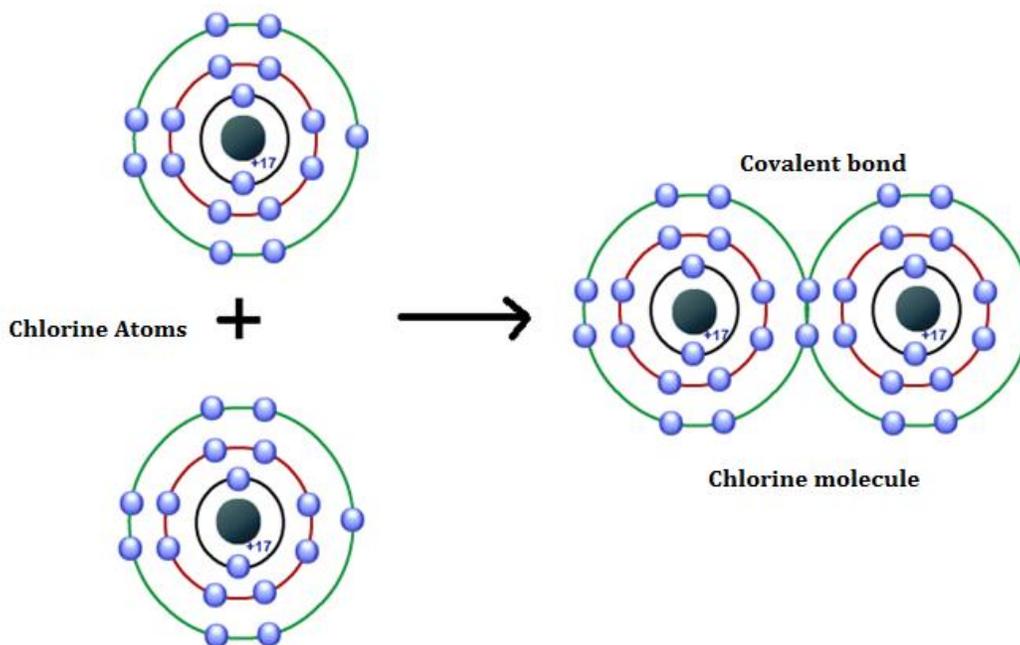
- The number of electrons shared by one atom of an element to achieve the nearest inert gas electron configuration is known as its covalency.

### Formation of Covalent Bond

- When both atoms in a reaction need to gain electrons to complete their octet, sharing of electrons takes place.
- Let us study how a Chlorine molecule is formed in order to understand the formation of a covalent bond.

### Formation of a chlorine molecule

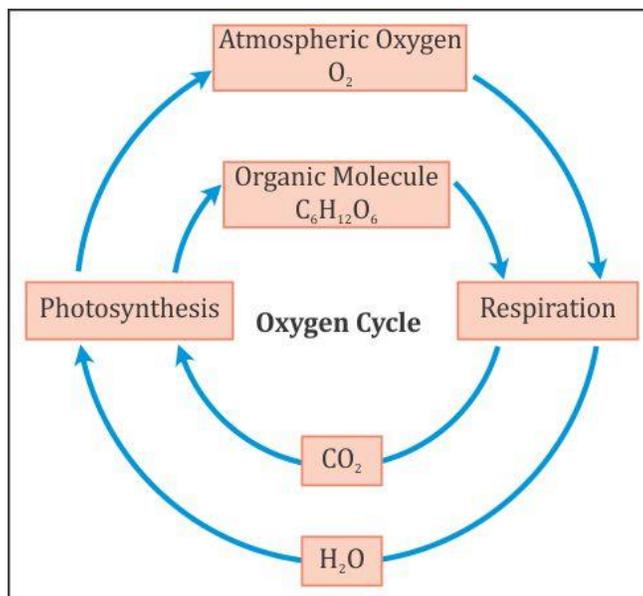
- A Chlorine atom has seven electrons in the outermost shell.
- When two Chlorine atoms combine, they share one electron each to form a shared pair of electrons, thus completing both their octets. Hence, a Chlorine molecule exists as  $\text{Cl}_2$ .



**Formation of Covalent bond between two Chlorine atoms**

22.

- (a) Oxygen-cycle: Oxygen from the atmosphere is used in combustion, respiration and in the formation of oxides of nitrogen. It is returned to the atmosphere through photosynthesis.



- (b) Chlorofluorocarbons used as solvents, refrigerants, propellants and blowing agents for plastic foams are stable and persist in the atmosphere for years. These enter the upper layers of the atmosphere where UV radiation causes CFCs to dissociate the ozone into oxygen.

23.

(a)

- i. **Lichens:** Some fungal species live in permanent mutually dependent relationships with blue-green algae. Such relationships are called symbiotic relations and the symbiotic life forms are called lichens.
  - ii. **Cryptogamae:** The reproductive organs of the thallophytes, the bryophytes and the pteridophytes are very inconspicuous and are therefore, called 'cryptogamae'. It means plants with 'hidden reproductive organs'.
  - iii. **Phanerogams:** The plants with well differentiated reproductive tissues which ultimately make seeds are called phanerogams'.
- (b) Whales can swim in water like fishes but are not fish as they respire with lungs and have four chambered heart and mammary glands; so, they are mammals.
- (c) When the body of an organism can be cut into two equal halves which are the mirror image of each other by one plane then the organism is said to have bilateral symmetry.

**24.**

- (a) Water borne diseases occur if the excreta of someone suffering from an infectious gut disease, such as cholera, gets mixed with drinking water used by people living nearby. The cholera causing microbes will enter into the body of the new host through the water they drink and cause them the disease. Such diseases are much likely to spread in the absence of safe supplies of drinking water.
- (b) Antibiotic is a chemical substance secreted by microorganisms which at low concentration levels, have the ability to destroy or inhibit the growth of pathogens.  
Example - Penicillin

### SECTION B

**25. (c)**

Reflection of sound by walls and ceiling causes reverberation in an auditorium.

**26. (b)**

The correct reading will correspond to the lower end of the meniscus.

**27. (d)**

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Volume of the solid} = (63 - 54)\text{ml} = 9\text{ ml} = 9\text{ cm}^3$$

$$\therefore \text{Density of the solid} = \frac{81\text{ g}}{9\text{ cm}^3} = 9\text{ g cm}^{-3} = 9000\text{ kg m}^{-3}$$

**28. (b)**

When the solid is completely immersed in the liquid, there is maximum apparent loss in its weight due to maximum volume of the liquid displaced.

**29. (a)**

The Pressure 'P' acting on the surface is the force 'F' acting per unit area. Thus,  $P = F/A$

**30. (a)**

The incident sound is directed along the axis of the tube to avoid loss.

**31. (d)**

The horizontal lines on the body of the earthworm show septa separating the segments of the body.

**32. (b)**

Nerve cells have a central cell body with branched cytoplasmic extensions at one end and a long projection at the other end.

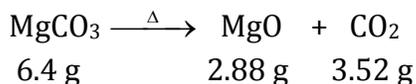
**33.(a)**

According to the law of conservation of mass, in a chemical reaction, mass can neither be created nor destroyed. The total mass of the reactants is equal to the total mass of the products.

**34. (d)**

Post anal tail places both of them in the same phylum.

**35.** From the given data, we get,



Mass of the reactant ( $\text{MgCO}_3$ ) = **6.4 g**

Mass of the products ( $\text{MgO} + \text{CO}_2$ ) =  $(2.88 + 3.52) \text{ g} = \mathbf{6.4 \text{ g}}$

Since, mass of the reactant is equal to the mass of the products; therefore, these results are in agreement with the law of conservation of mass.

The law of conservation of mass states that in a chemical reaction, mass can neither be created nor destroyed.

The total mass of the reactants is equal to the total mass of the products.

**36.** Given that:

$$\angle i + \angle r = 110^\circ$$

According to the law of reflection of sound:

$$\angle i = \angle r$$

$$\angle r + \angle r = 110^\circ$$

$$2\angle r = 110^\circ$$

$$\angle r = 55^\circ$$

According to the law of reflection of sound, angle of incidence is equal to the angle of reflection.  $\angle i = \angle r$ . With help of this, we get that the angle of reflection =  $55^\circ$ .