CHAPTER 4 – STRUCTURE OF THE ATOM

Question 1: What are canal rays?

Answer- The positively charged particles moving from anode to cathode in cathode ray tube are known as canal rays or anode rays.

Question 2: If an atom contains one electron and one proton, will it carry any charge or not?

Answer- Since a proton is a positively charged particle and an electron is a negatively charged particle, the net charge becomes neutral as both the particles neutralize each other.

**Question 3: On the basis of Thomson's model of an atom, explain how the atom is neutral as a whole.**

Answer- As per Thomson's model of an atom, electrons and protons are equal in number hence an atom on the whole is electrically neutral.

Question 4: On the basis of Rutherford's model of an atom, which subatomic particle is present in the nucleus of an atom?

Answer- Protons.

Question 5: Draw a sketch of Bohr's model of an atom with three shells.

Answer-
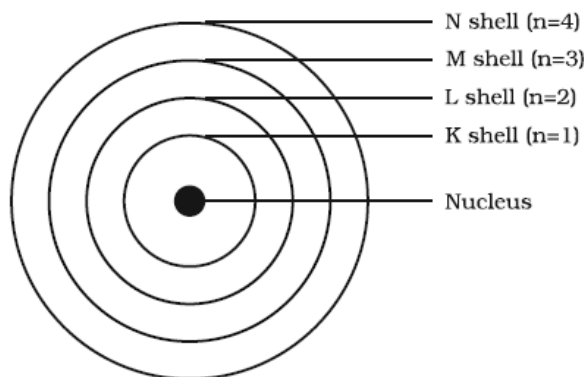
Question 6: What do you think would be the observation if the ∝– particle scattering experiment is carried out using a foil of a metal other than gold?

Answer- In the ∝ – particle scattering experiment, when any other metal foil is used instead of gold, the observation would almost remain the same. But as other metals are not as malleable as gold, so more number of alpha particles will bounce back.

Question 7: Name the three subatomic particles of an atom.

Answer- Protons, Electrons and Neutrons.

Question 8: Helium atom has an atomic mass of 4 u and two protons in its nucleus. How many neutrons does it have?

Answer- Number of neutrons = A-P = 4 – 2 = 2.

Question 9: Write the distribution of electrons in Carbon and Sodium atoms.

Answer- Carbon (Z=6) = 2, 4.

Sodium (Z=11) = 2, 8, 1.

Question 10: If K and L shells of an atom are full, then what would be the total number of electrons in the atom?

Answer- Total electrons = 2 + 8 = 10.

Question 11: How will you find the valency of chlorine, sulphur and magnesium?

Answer- (i) Chlorine (Z=17) = 2, 8, 7

Clearly Chlorine requires 1 electron to complete its outermost shell, So its valency is **-1.**

(ii) Sulphur (Z=16) = 2, 8, 6

Clearly Sulphur requires 2 electron to complete its outermost shell, So its valency is **-2.**

(iii) Magnesium (Z=12) = 2, 8, 2

Clearly Magnesium requires 2 electrons to eject from its outermost shell to be fully vacant, So its valency is **+2.**

Question 12: If the number of electrons in an atom is 8 and number of protons is also 8, then

(i) What is the atomic number of the atom? and

(ii) What is the charge on the atom?

Answer- (i) Atomic number (Z) of the atom = 8.

(ii) Total charge on the atom is zero as number of protons (positive charge) and electrons (negative charge) are same.

Question 13: With the help of Table 4.1, find out the mass number of oxygen and sulphur atom.

Answer- Mass number (A) of Oxygen = No. of protons + No. of neutrons = 8+8 = **16.**

Mass number (A) of Sulphur = No. of protons + No. of neutrons = 16+16 = **32.**

Table 4.1: Composition of Atoms of the First Eighteen Elements with Electron Distribution in Various Shells

Name of Element	Symbol	Atomic Number	Number of Protons	Number of Neutrons	Number of Electrons	Distribution of Electrons				Valency
						K	L	M	N	
Hydrogen	H	1	1	-	1	1	-	-	-	1
Helium	He	2	2	2	2	2	-	-	-	0
Lithium	Li	3	3	4	3	2	1	-	-	1
Beryllium	Be	4	4	5	4	2	2	-	-	2
Boron	B	5	5	6	5	2	3	-	-	3
Carbon	C	6	6	6	6	2	4	-	-	4
Nitrogen	N	7	7	7	7	2	5	-	-	3
Oxygen	O	8	8	8	8	2	6	-	-	2
Fluorine	F	9	9	10	9	2	7	-	-	1
Neon	Ne	10	10	10	10	2	8	-	-	0
Sodium	Na	11	11	12	11	2	8	1	-	1
Magnesium	Mg	12	12	12	12	2	8	2	-	2
Aluminium	Al	13	13	14	13	2	8	3	-	3
Silicon	Si	14	14	14	14	2	8	4	-	4
Phosphorus	P	15	15	16	15	2	8	5	-	3,5
Sulphur	S	16	16	16	16	2	8	6	-	2
Chlorine	Cl	17	17	18	17	2	8	7	-	1
Argon	Ar	18	18	22	18	2	8	8		0

Question 14: For the symbol H, D and T, tabulate three subatomic particles found in each of them.

Answer-

Isotope	Symbol	Mass no.	Atomic no.	No. of electrons	No. of protons	No. of neutrons
Hydrogen	H	1	1	1	1	0
Deuterium	D	2	1	1	1	1
Tritium	T	3	1	1	1	2

Question 15: Write the electronic configuration of any one pair of isotopes and isobar.

Answer- (a) **Isotopes**: Isotopes are atoms of same element, which have different mass number. Example: Carbon molecule exists as $_6C^{12}$ and $_6C^{14}$ but when their electronic configuration is noticed, both have 2, 4.

(b) **Isobars**: Isobars are atoms of different element ,which have the same mass number but differ in the atomic number. Example: Electronic configuration of $_6C^{14}$ =2,4. Electronic configuration of $_7N^{14}$ = 2,5.

EXERCISE

Question 1: Compare the properties of electrons, protons and neutrons.

Answer-

Property	Electrons	Protons	Neutrons
Charge	Negatively charged	Positively charged	No charge.
Location	Located outside the nucleus	Located within the nucleus	Located inside the nucleus of an atom

Question 2: What are the limitations of J.J.Thomson's model of the atom?

Answer- (i) It could not explain the result of scattering experiment performed by Rutherford.

(ii) It did not have any experiment support.

Question 3: What are the limitations of Rutherford's model of the atom?

Answer- (i) It failed to explain the stability of an atom.

(ii) It doesn't explain the spectrum of hydrogen and other atoms.

Question 4: Describe Bohr's model of the atom.

Answer- (i) All the positive charge and nearly all the mass (P+N) is concentrated in the center of the atom, known as nucleus.
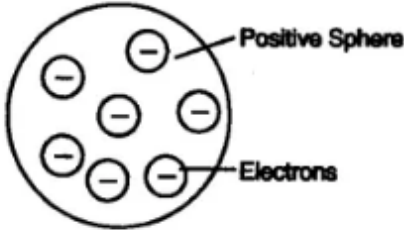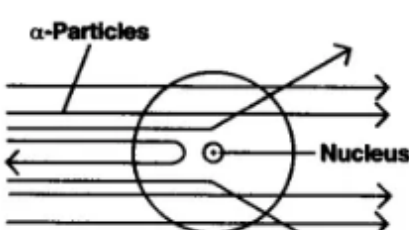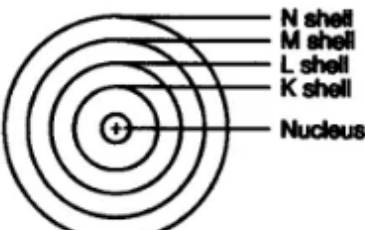
(ii) Negatively charged electrons revolve around the nucleus in some discrete orbits.

(iii) Electrons do not radiate energy when they are in their orbits.

(iv) The distinct orbits are named as K, L, M, N orbits. Numbers used to denote them are n=1, 2, 3, 4

Question 5: Compare all the proposed models of an atom given in this chapter.

Answer-

Thomson	Rutherford	Bohr
• Sphere of positive charge	• Sphere of positive charge in centre called nucleus. All mass of an atom resides in the nucleus	• Positive charge in centre called nucleus.
• Electrons are spread randomly all over in the sphere	• Electrons revolve around the nucleus in well defined orbits.	• Electrons revolve in discrete orbits and do not radiate energy.
• Thomson's Model	• Rutherford's Model	• Bohr's Model
• Positive charge = Negative charge. • Atom is electrically neutral.	• Size of nucleus is very small as compared to size of atom.	• The orbits were termed as energy shells labelled as K, L, M, N or $n = 1, 2, 3, 4$ (numbered)

Question 6: Summarize the rules for writing of distribution of electrons in various shells for the first eighteen elements.

Answer- Electrons in n^{th} shell are $2n^2$. So for first 18 elements electron distribution is: 2, 8, 8.

Question 7: Define valency by taking examples of silicon and oxygen.

Answer- The definite combining capacity of the atoms of each element, where electrons are lost, gained or shared to make the octet of electrons present in the outermost shell is defined as valency.

For Silicon (Z=14) = 2, 8, 4

Thus, the valency of silicon is 4 as these electrons can be shared with others to complete octet.

For Oxygen (Z=8) = 2, 6

Clearly Oxygen requires 2 electrons to complete its outermost shell, So its valency is **-2.**

Question 8: Explain with examples (i) Atomic number, (ii) Mass number, (iii) Isotopes and (iv) Isobars. Give any two uses of isotopes.

Answer- (i) **Atomic Number (Z)-** Total number of protons present in an atom. For example Carbon has 6 protons in its nucleus, So its atomic number is 6.

(ii) **Mass Number (A)-** Sum of protons and neutrons present in an atom. For example Carbon has 6 protons and 6 neutrons in its nucleus, So its mass number is 12.

(iii) **Isotopes**: Isotopes are atoms of same element, which have different mass number. Example: Isotopes of Carbon are $_6C^{12}$ and $_6C^{14}$.

(iv) **Isobars**: Isobars are atoms of different element, which have same mass number but differ in the atomic number. Example: $_6C^{14}$ and $_7N^{14}$.

Uses of isotopes: (i) The isotope of Iodine atom is used to treat Goitre and iodine deficient disease.

(ii) In the treatment of cancer, an isotope of cobalt is used.

(iii) Fuel for nuclear reactors is derived from the isotopes of the Uranium atom.

Question 9: Na^+ has completely filled K and L shells. Explain.

Answer- Electronic configuration of Sodium-Na (Z=11) is = 2, 8, 1

Electronic configuration of Sodium ion-Na^+ is = 2, 8

Clearly Na^+ has completely filled K (2) and L (8) shells.

Question 10: If bromine atom is available in the form of, say, two isotopes $_{35}Br^{79}$ (49.7%) and $_{35}Br^{81}$ (50.3%), calculate the average atomic mass of Bromine atom.

Answer- Average atomic mass of bromine atom is $= 79 \, X \frac{49.7}{100} + 81 \, X \frac{50.3}{100} = \frac{3926.3}{100} + \frac{4074.3}{100}$

$$= \frac{8000.6}{100} = 80.006 \, u$$

Question 11: The average atomic mass of a sample of an element X is 16.2 u. What are the percentages of isotopes $_8X^{16}$ and $_8X^{18}$ in the sample?

Answer- Average atomic mass = 16.2 u.

Let the percentage of isotope $_8X^{16}$ is = y %

Then, the percentage of isotope $_8X^{18}$ is = (100- y) %

So, $18 \, X \frac{y}{100} + 16 \, X \frac{100-y}{100} = 16.2$

$\frac{18y + 1600 - 16y}{100} = 16.2$

18y +1600 -16y = 1620

2y = 1620 – 1600 = 20

$y = \frac{20}{2} = 10.$

Therefore, the percentage of isotope $_8X^{16}$ is = **10 %**

Then, the percentage of isotope $_8X^{18}$ is = **90 %**

Question 12: . If Z=3, what would be the valency of the element? Also, name the element.

Answer- Atom with atomic number 3 is Lithium (Li).

For Lithium (Z=3) = 2, 1

So valency is +1.

Question 13: Composition of the nuclei of two atomic species X and Y are given as under

	X	Y
Protons =	6	6
Neutrons =	6	8

Give the mass numbers of X and Y. What is the relation between the two species?

Answer- Mass number of X: Protons + neutrons = 6+6 = 12

Mass number of Y: Protons + neutrons = 6+8 = 14

They are isotopes of the same element.

Question 14: For the following statements, write T for true and F for false.

(a) J.J. Thomson proposed that the nucleus of an atom contains only nucleons. **(F)**

(b) A neutron is formed by an electron and a proton combining together. Therefore it is neutral. **(F)**

(c) The mass of an electron is about $\frac{1}{1837}$ times that of proton. **(T)**

(d) An isotope of iodine is used for making tincture iodine, which is used as a medicine. **(F)**

Question 15: Put a tick (✓) against correct choice and cross (x) against wrong choice in questions 15, 16 and 17.

15. Rutherford's alpha – particle scattering experiment was responsible for the discovery of

(a) **Atomic nucleus (✓)**   (b) Electron **(x)**   (c) Proton **(x)**   (d) Neutron **(x)**

Question 16: Isotopes of an element have

(a) The same physical properties **(x)**   (b) Different chemical properties **(x)**

(c) **Different number of neutrons (✓)**   (d) Different atomic numbers. **(x)**

Question 17: Number of valence electrons in Cl⁻ ion are:

(a) 16 **(x)**   (b) **8 (✓)**   (c) 17 **(x)**   (d) 18 **(x)**

Question 18: Which one of the following is a correct electronic configuration of Sodium?

(a) 2, 8 **(x)**   (b) 8, 2, 1 **(x)**   (c) 2, 1, 8 **(x)**   (d) **2, 8, 1 (✓)**

Question 19: Complete the following table.

Atomic Number	Mass Number	Number of Neutrons	Number of Protons	Number of Electrons	Name of the Atomic Species
9	19	10	9	9	Flourine
16	32	16	16	16	Sulphur
12	24	12	12	12	Magnesium
1	2	1	1	1	Deuterium
1	1	0	1	0	Hydrogen ion

CHAPTER 12 –SOUND

Question 1: How does the sound produced by a vibrating object in a medium reach your ear?

Answer- When a disturbance is created on an object, it starts vibrating and sets the particles of the medium to vibrate. These vibrating particles take the sound from object to our ear through the medium.

Question 2: Explain how sound is produced by your school bell.

Answer- When the school bell is struck with a hammer, it starts vibrating and as a result of these vibrations, sound waves are produced.

Question 3: Why are sound waves called mechanical waves?

Answer- Because sound waves require a medium to propagate to interact with the particles present in it.

Question 4: Suppose you and your friend are on the moon. Will you be able to hear any sound produced by your friend?

Answer- No, we will not be able to hear the sound because sound requires a medium for its propagation. On the moon there is no atmosphere, i.e., there is vacuum.

Question 5: Which wave property determines (a) loudness, (b) pitch?

Answer- (a) Loudness is determined by the amplitude of the sound wave which in turn depends on the force with which the object is made to vibrate.

(b) Pitch of a sound is determined by its frequency.

Question 6: Guess which sound has a higher pitch: guitar or car horn?

Answer- Guitar.

Question 7: What are wavelength, frequency, time period and amplitude of a sound wave?

Answer-(a) Wavelength(λ) : The distance between two consecutive compressions (C) or two consecutive rarefactions (R) is called the wavelength, unit-metre.

(b) Frequency : The number of oscillations per unit time is called frequency, unit-Hz.

(c) Time period : The time taken by two consecutive compressions or rarefactions to cross a fixed point is called the time period.

(d) Amplitude : The magnitude of the maximum disturbance in the medium on either side of the mean value is called the amplitude of the wave.

Question 8: How are the wavelength and frequency of a sound wave related to its speed?

Answer- Speed = Wavelength x Frequency.

Question 9: Calculate the wavelength of a sound wave whose frequency is 220 Hz and speed is 440 m/s in a given medium.

Answer- Frequency = f = 220 Hz

Speed of sound = v = 440 m/s

Wavelength = $\lambda = \frac{v}{f} = \frac{440}{220} =$ **2 m.**

Question 10: A person is listening to a tone of 500 Hz sitting at a distance of 450 m from the source of the sound. What is the time interval between successive compressions from the source?

Answer- Frequency = f = 500 Hz

Time between successive compressions = Time period of sound wave = $T = \frac{1}{f} = \frac{1}{500} =$ **0.002 sec.**

Question 11: Distinguish between loudness and intensity of sound.

Answer-

Loudness of sound	Intensity of sound
1. Loudness refers to how loud or soft a sound seems to a listener.	1. Intensity is defined as the power carried by sound waves per unit area.
2. Loudness of sound is determined of amplitude.	2. Intensity of the sound wave is determined by frequency of sound waves.
3. The unit of loudness is the decibel (dB).	3. The unit of intensity of sound is watt per square meter (W/m^2).

Question 12: In which of the three media, air, water or iron, does sound travel the fastest at a particular temperature?

Answer- Iron (Solid).

Question 13: An echo is heard in 3 s. What is the distance of the reflecting surface from the source, given that the speed of sound is 342 ms^{-1} ?

Answer- Time = 3 sec

Speed of sound = v = 342 m/s

Let the distance of reflecting surface from the source is = S

Then, total distance travelled by sound is = 2S

Now, Speed = $\frac{Distance}{Time}$

$342 = \frac{2S}{3}$; 2S = 342 x 3 ; S = $\frac{1026}{2}$ = **513 m.**

Question 14: Why are the ceilings of concert halls curved?

Answer- Ceilings of concert halls are curved to uniformly spread sound in all directions after reflecting from the walls.

Question 15: What is the audible range of the average human ear?

Answer- 20 Hz to 20,000 Hz.

Question 16: What is the range of frequencies associated with (a) Infrasound? (b) Ultrasound?

Answer- (a) **Infrasound**: Less than 20 Hz ; (b) **Ultrasound**: More than 20000 Hz

Question 17: A submarine emits a sonar pulse, which returns from an underwater cliff in 1.02 s. If the speed of sound in salt water is 1531 m/s, how far away is the cliff?

Answer- Time = t = 1.02 sec

Speed of sound = v = 1531 m/s

Let the distance of cliff from the submarine is = S

Then, total distance travelled by sound is = 2S

Now, Speed = $\frac{Distance}{Time}$

$1531 = \frac{2S}{1.02}$; 2S = 342 x 1.02 ; S = $\frac{1561.62}{2}$ = **780.8 m.**

EXERCISE QUESTION-ANSWERS

**Question 1: What is sound and how is it produced?**

Answer- Sound is a form of energy and it is produced due to vibrations of different types of objects.

Question 2: Describe with the help of a diagram, how compressions and rarefactions are produced in the air near a source of sound.

Answer- (1) When a vibrating object moves forward, it pushes the air in front of it and compresses the air creating a region of high pressure called compression (C).

(2)   It starts moving away from the surface of the vibrating object.

(3)   As this occurs the surface moves backward creating a region of low pressure called rarefaction (R)
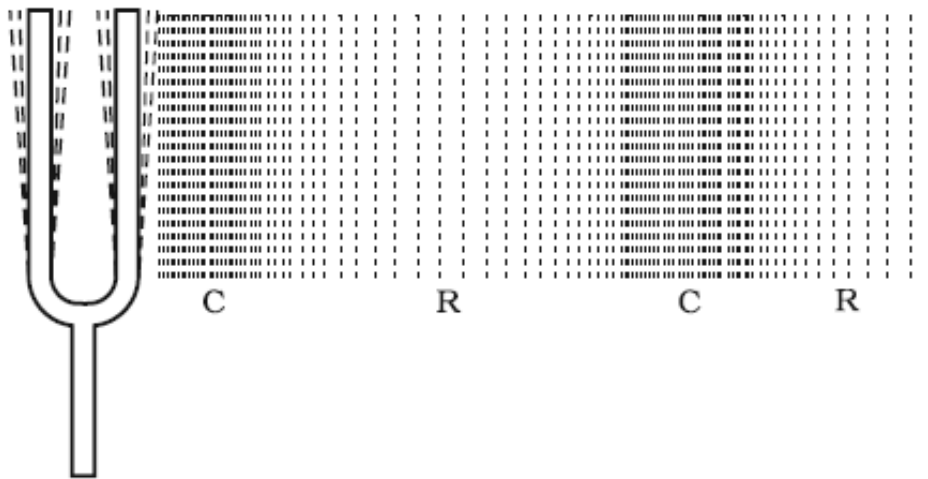
Question 3: Cite an experiment to show that sound needs a material medium for its propagation.

Answer- Take an electric bell and an air tight glass bell jar. The electric bell is suspended inside an air tight glass jar which is connected to a vacuum pump. **Working:**

1.   When we press the switch, we will be able to hear the bell.

2.   When the air in the jar is pumped out gradually, the sound becomes feeble although the same amount of current is flowing through the bell.

3.   When the air is removed completely, are will not be able to hear the sound of the bell. Conclusion: This experiment shows that sound requires a medium for its propagation.
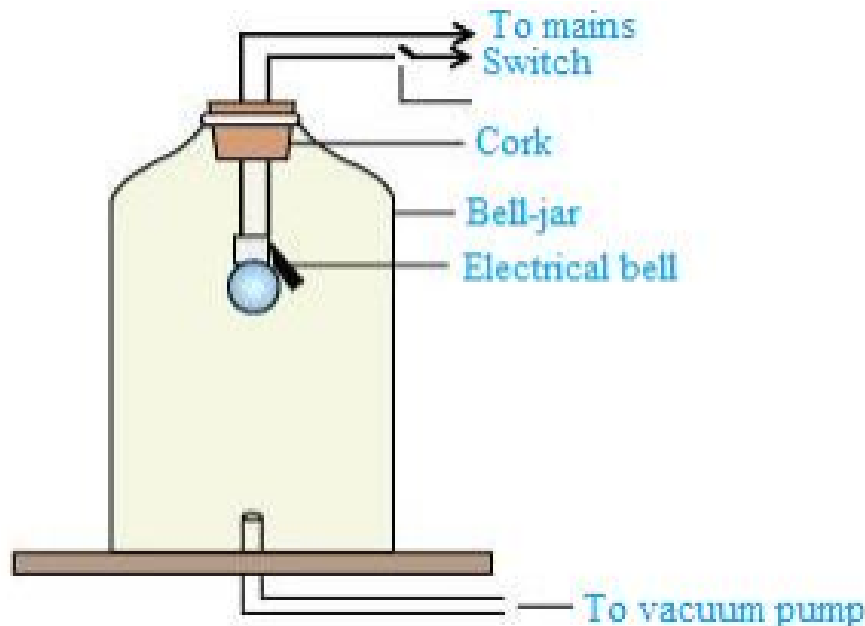
Question 4: Why sound wave is called a longitudinal wave?

Answer- A sound wave is called a longitudinal wave as it travels in a medium by the vibration of particles in a direction which is parallel to the direction of propagation of the sound wave.

Question 5: Which characteristics of the sound help you to identify your friend by his voice while sitting with others in a dark room?

Answer- The quality (or timbre), pitch and loudness of sound.

Question 6: Flash and thunder are produced simultaneously. But thunder is heard a few seconds after the flash is seen, why?

Answer- The speed of light is much higher than speed of sound. Due to this reason, the thunder takes more time to reach the Earth as compared to the light. Hence, lightning is seen before whenever we hear the thunder.

Question 7: A person has a hearing range from 20 Hz to 20 kHz. What are the typical wavelengths of sound waves in air corresponding to these two frequencies? Take the speed of sound in air as 344 m/s.

Answer- Speed of sound = v = 344 m/s.

For Minimum audible frequency

Frequency = f = 20 Hz

Wavelength = $\lambda = \dfrac{v}{f} = \dfrac{344}{20} = 17.2$ m

For Maximum audible frequency

Frequency = f = 20000 Hz

Wavelength = $\lambda = \dfrac{v}{f} = \dfrac{344}{20000} = 0.0172$ m

Question 8: Two children are at opposite ends of an aluminum rod. One strikes the end of the rod with a stone. Find the ratio of times taken by the sound wave in the air and in aluminum to reach the second child.

Answer- Speed of sound in air = V_{air} = 344 m/s

Speed of sound in aluminum = $V_{aluminum}$ = 6420 m/s

As time is inversely proportional to the speed hence:

$T_{air} / T_{aluminum} = V_{aluminum} / V_{air}$ = 6420 / 344 = 1605 **:** 86

Question 9: The frequency of a source of sound is 100 Hz. How many times does it vibrate in a minute?

Answer- Frequency = 100 Hz

Number of vibrations in 1 second = 100

Number of vibrations in 60 second = 100 x 60

Number of vibrations in 1 minute = **6000.**

Question 10: Does sound follow the same laws of reflection as light does? Explain.

Answer- Yes, sound follows the same laws of reflection as light does because,

(1)   Angle of incidence of sound is always equal to angle of reflection of sound waves.

(2)   The direction in which sound is incident, the direction in which it is reflected and normal all lie in the same plane.

Question 11: When a sound is reflected from a distant object, an echo is produced. Let the distance between the reflecting surface and the source of sound production remains the same. Do you hear echo sound on a hotter day?

Answer- An echo is heard when time interval between the reflected sound and the original sound is at least 0.1 second. As the temperature increases, the speed of sound in a medium also increases. On a hotter day, the time interval between the reflected and original sound will decrease and an echo is audible only if the time interval between the reflected sound and the original sound is greater than 0.1 s.

Question 12: Give two practical applications of reflection of sound waves.

Answer- (i) Reflection of sound is used to measure the speed and distance of underwater objects. This method is called SONAR.

(ii) Working of a stethoscope - the sound of patient's heartbeat reaches the doctor's ear through multiple reflections of sound.

Question 13: A stone is dropped from the top of a tower 500 m high into a pond of water at the base of the tower. When is the splash heard at the top? Given, g = 10 ms^{-2} and speed of sound = 340 ms^{-1} .

Answer- Height of tower = S = 500 m

Acceleration due to gravity = g = 10 m/s^2

Initial speed of stone = u = 0

By equation of motion, S = ut + $\frac{1}{2}$ at^2

$$500 = 0 \text{ x } t + \frac{1}{2} \text{ x } 10 \text{ x } t^2$$

$$t^2 = \frac{500}{5} = 100$$

Hence, t = 10 sec

Now time taken by sound to reach to the top of tower = T = $\frac{Distance}{Speed\ of\ sound} = \frac{500}{340} = 1.47$ sec

Total time takes to hear splash after dropping the stone = t + T = 10 + 1.47 = **11.47 sec.**

Question 14: A sound wave travels at a speed of 339 m/s. If its wavelength is 1.5 cm, what is the frequency of the wave? Will it be audible?

Answer- Speed of sound = v = 339 m/s

Wavelength = λ = 1.5 cm = $\frac{1.5}{100}$ = 0.015 m

Frequency = $\frac{v}{\lambda} = \frac{339}{0.015}$ = 22600 Hz

The sound is not audible as its frequency lies beyond the audible range (20 Hz to 20000 Hz).

Question 15: What is reverberation? How can it be reduced?

Answer- The continuous multiple reflections of sound in a big enclosed space is reverberation. It can be reduced by covering walls and ceiling of enclosed space with the help of sound absorbing materials such as loose woolens, fibre boards.

Question 16: What is loudness of sound? What factors does it depend on?

Answer- Loudness refers to how loud or soft a sound seems to a listener. Loudness of sound is determined of amplitude. The unit of intensity is the decibel (dB).

Question 17: Explain how bats use ultrasound to catch prey.

Answer- The ultrasonic waves emitted by the bat are reflected from the prey (e.g., an insect) and are detected by its ears. The nature of reflected waves tells the bat about the location and the nature of its prey.

Question 18: How is ultrasound used for cleaning?

Answer- Objects that need to be cleansed are put in a cleaning solution and ultrasonic sound waves are passed through the solution. The high frequency of ultrasound waves helps in detaching the dirt from the objects.

Question 19: Explain the working and application of a SONAR.

Answer- SONAR;(-Sound Navigation and Ranging).It consists of a transmitter and a detector and is installed in a boat or a ship as shown in figure:
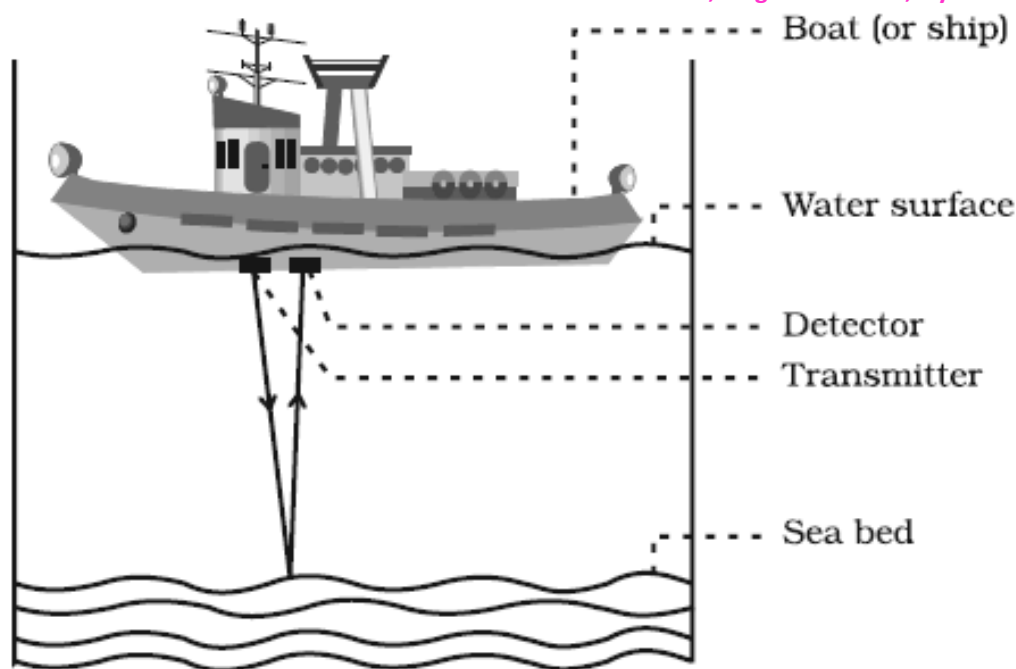
Fig.12.17: *Ultrasound sent by the transmitter and received by the detector.*

The transmitter produces and transmits ultrasonic waves. These waves travel through water and after striking the object on the sea bed, get reflected back and are sensed by the detector. SONAR calculates the distance (d) of the object by measuring time taken for transmission and reception of signal (t) by formula:

$$d = \frac{v \, X \, t}{2}$$: Where v is speed of sound in sea water.

The SONAR technique is used to determine the depth of the sea and to locate the underwater hills, valleys, submarines, icebergs and sunken ships etc.

Question 20: A sonar device on a submarine sends out a signal and receives an echo 5 s later. Calculate the speed of sound in water if the distance of the object from the submarine is 3625 m.

Answer- Time = t = 5 sec

Distance of object from submarine = d = 3625 m

Using, $d = \frac{v \, X \, t}{2}$

Speed of sound in water = $v = \frac{2 \, Xd}{t} = \frac{2 \, X \, 3625}{5} =$ **1450 m/s**

Question 21: Explain how defects in a metal block can be detected using ultrasound.

Answer- Ultrasounds can be used to detect cracks and flaws in metal blocks. Ultrasonic waves are allowed to pass through the metallic block and detectors are used to detect the transmitted waves. If there is even a small defect, the ultrasound gets reflected back indicating the presence of the flaw or defect.
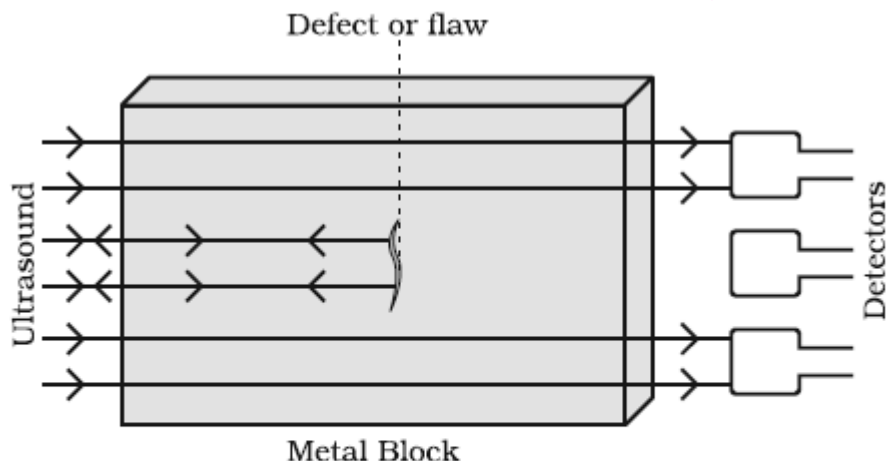
Fig 12.16: *Ultrasound is reflected back from the defective locations inside a metal block.*

Question 22: Explain how the human ear works.

Answer- Various sounds produced by particles in our surroundings are collected by pinna that transfers these sounds to the ear drum through the ear canal. The eardrum begins to vibrate back and forth briskly as soon as the sound waves fall on it. The vibrating Eardrum initiates the small bone hammer to vibrate. These vibrations are passed from the hammer to the third bone stirrup via the second bone anvil. The stirrup strikes the membrane of the oval window to pass its vibration to the cochlea. The liquid in the cochlea produces electrical impulses in the nerve cells. These electrical impulses are carried to the brain by the auditory nerve. They are interpreted by the brain as sound and hence we get a sensation of hearing.
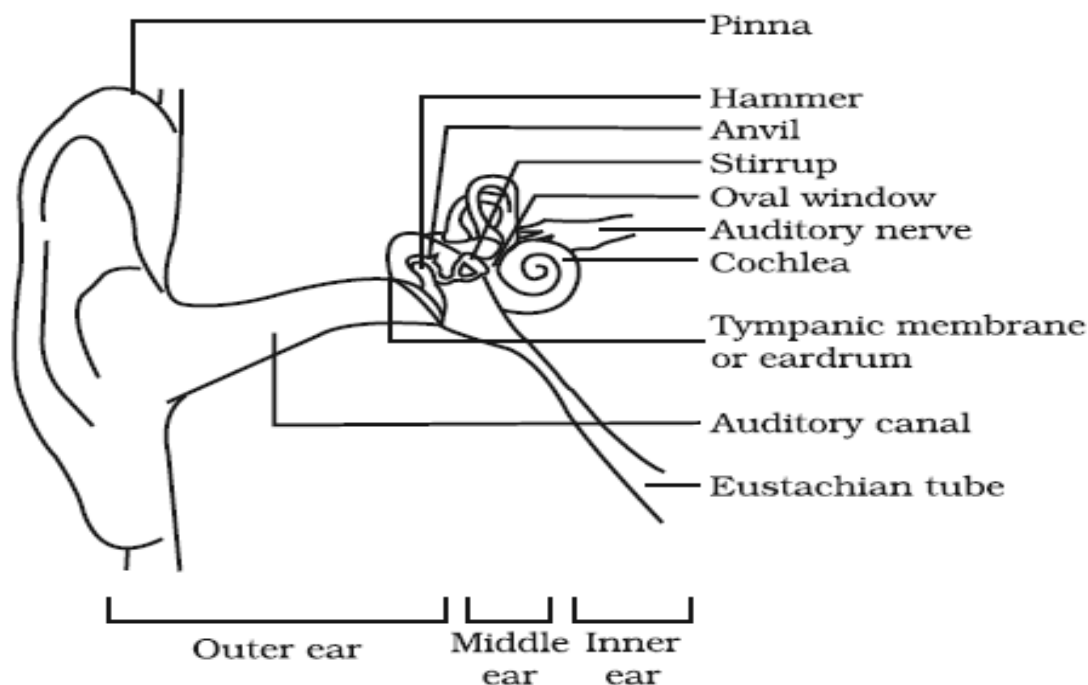

Fig. 12.19: *Auditory parts of human ear.*

CHAPTER 13 –WHY DO WE FALL ILL

Question 1: State any two conditions essential for good health.

Answer- (1) Better sanitation or clean surroundings

(2) Mental, social and physical well being.

Question 2: State any two conditions essential for being free of disease.

Answer- (1) To be free from any specific disease.

(2) Get vaccination against infectious disease whenever required.

Question 3: Are the answers to the above questions necessarily the same or different? Why?

Answer-The answers to the above questions are different because a person may be free of disease but not be good mentally, socially, and economically

Question 4: List any three reasons why you would think that you are sick and ought to see a doctor. If only one of these symptoms were present, would you still go to the doctor? Why or why not?

Answer (i) having high body temperature; (ii) having diarrhea (loose motions), and ; (iii) having cough/cold. If only one symptom persists, then also one should go to a doctor. The doctor will diagnose on the basis of the symptoms. Doctor will also get laboratory tests done to pin point the disease further.

Question 5: In which of the following case do you think the long-term effects on your health are likely to be most unpleasant?

- **if you get jaundice,**
- **if you get lice,**
- **if you get acne. Why?**

Answer-   Jaundice causes a long term effect on our health. This chronic disease lasts for a long period of time. Jaundice develops slowly and does not spread rapidly.

Question 6: Why are we normally advised to take bland and nourishing food when we are sick?

Answer- Bland food is soft and can be easily digested and assimilated in body. Nourishing food increases resistance for disease and is essential for repair and growth of body tissue.

Question 7: What are the different means by which infectious diseases are spread?

Answer- Infectious diseases are generally spread through air, water, sexual contact, vectors, physical contact with affected person and through articles of use of affected person.

Question 8: What precautions can you take in your school to reduce the incidence of infectious diseases?

Answer- (a). Trying to stay away from students who are infected.

(b). Covering mouth and nose while coughing and sneezing.

(c). Keeping the school environment clean.

(d). Consuming safe clean water.

Question 9: What is immunization?

Answer- The method to boost our immune system with the help of vaccines that help the body to fight against infectious diseases is called immunization

Question 10: What are the immunization programs available at the nearest health center in your locality? Which of these diseases are the major health problems in your area?

Answer- The immunization programs available at the nearest health centers are Measles, Mumps, and Rubella (MMR), polio vaccine, jaundice, Diphtheria, Pertussis, and Tetanus (DPT), typhoid and hepatitis B. From above typhoid and jaundice create major health problems.

EXERCISE QUESTION-ANSWERS

Question 1: How many times did you fall ill in the last one year? What were the illnesses?

(a). Think of one change you could make in your habits in order to avoid any of/most of the above illnesses.

(b). Think of one change you would wish for in your surroundings in order to avoid any of/most of the above illnesses.

Answer- I suffered last year from cough and cold (twice) and malaria (once).

(a) Change in habits : Wear suitable clothes in order to give protection to the body during changing season and against mosquito bite.

(b) Change in surroundings:

- Improve the sanitary conditions in the surroundings,
- Do not allow water to collect near the houses, because it provides the breeding ground for mosquitoes.

Question 2: A doctor/nurse/health-worker is exposed to more sick people than others in the community. Find out how she/he avoids getting sick herself/himself.

Answer- A doctor/nurse/health-worker take following precautions to avoid become sick themselves:

(i) Get immunization done against all the infectious diseases.

(ii) Take balanced diet (rich in proteins especially) to strengthen their immune system.

(iii) Dispose off blood samples, urine or stool, sputum, etc., carefully.

(iv) Wear masks while diagnosing mouth or chest infections.

(v) Clean their hands and wear gloves even while doing minor surgeries.

Question 3: Conduct a survey in your neighborhood to find out what the three most common diseases are. Suggest three steps that could be taken by your local authorities to bring down the incidence of these diseases.

Answer- The following three are the most common diseases in any neighborhood: Cold and cough, loose motions, and malaria. Some of the preventive measures that can be taken are:

(a). By providing fresh, uncontaminated, and clean drinking water.

(b). By maintaining hygienic sanitary conditions.

(c). By educating people about various preventive measures with the help of posters, and pamphlets.

Question 4: A baby is not able to tell her/his caretakers that she/he is sick. What would help us to find out

(a) that the baby is sick?

(b) what is the sickness?

Answer- (a). It can be found out by observing the behavioral changes of the child such as: Improper food intake Constant crying, Mood changes frequently.

(b). The sickness can be determined with the help of symptoms or indications shown by the child. The symptoms could be loose motion, vomiting, paleness in body, and fever.

Question 5: Under which of the following conditions is a person most likely to fall sick?

(a) when she is recovering from malaria.

(b) when she has recovered from malaria and is taking care of someone suffering from chicken-pox.

(c) when she is on a four-day fast after recovering from malaria and is taking care of someone suffering from chicken-pox. Why?

Answer- In condition **(c)** a person is most likely to fall sick. Because she is fasting, when her immune system is still weak. At this stage her body will not be able to fight against infection and if she is taking care of someone else suffering from chicken pox even she can get infected with chickenpox virus and will fall sick again.

Question 6: Under which of the following conditions are you most likely to fall sick?

(a) when you are taking examinations.

(b) when you have travelled by bus and train for two days.

(c) when your friend is suffering from measles. Why?

Answer- I will be most likely to fall sick when my friend is suffering from measles and I come in contact with him because measles is contagious disease and also spreads by droplet infection.

CHAPTER 14 – NATURAL RESOURCES

Question 1: How is our atmosphere different from the atmospheres on Venus and Mars?

Answer- Atmosphere on Venus and Mars have high percentage (approx. 95%) of CO_2 which does not support life, while atmosphere of our earth consists of various gases like nitrogen (78%), oxygen (21%), carbon dioxide (0.03%), argon (0.91%), water vapour etc. that help life to exist on earth.

Question 2: How does the atmosphere act as a blanket?

Answer- The presence of ozone in the upper layer of atmosphere protects life from harmful ultraviolet radiations. Atmosphere maintains the temperature on the surface of the earth during day and night time. In this way, atmosphere acts as a blanket.

Question 3: What causes winds ?

Answer- The uneven heating of the earth's surface is the main cause for the winds. On being heated more the air raises up and hence low pressure is created. Hence the air in high pressure occupies the low-pressure region causing the wind.

Question 4: How are clouds formed?

Answer- During day time water from different sources like river, sea etc. rises in the form of water vapours and goes into the air. At a particular height the air cools and the water vapours condense to form minute droplets and form clouds.

Question 5: List any three human activities that you think would lead to air pollution.

Answer- (i) Harmful gases released from various industries.

(ii) Burning of fossil fuels like coal and petroleum.

(iii) Burning of diesel and petrol in vehicles.

Question 6: Why do organisms need water?

Answer- (i) Plants require water for photosynthesis.

(ii) All cellular processes occur in a water medium.

(iii) Transportation of substances in our body takes place in dissolved form.

    (iv) It helps to maintain body temperature.

Question 7: What is the major source of fresh water in the city/town/village where you live?

Answer- Major Sources of fresh water in the city/town/village are ground water, rivers, streams, lakes, etc.

Question 8: Do you know of any activity which may be polluting this water source?

Answer- Discharge of sewage, industrial wastes, hospital wastes, chemical fertilizers etc. into the rivers and streams pollutes these fresh water sources.

Question 9: How is soil formed?

Answer- Soil is formed by breaking down of rocks at or near the surface of earth through various physical, chemical and biological processes by various factors such as sun, water, wind and living organisms.

Question 10: What is soil erosion?

Answer- The removal of top fertile layer of soil by the action of air, wind, water etc. is called soil erosion.

Question 11: What are the methods of preventing or reducing soil erosion ?

Answer- Methods of preventing or reducing soil erosion-

- Intensive cropping;
- planting grasses and other trees;
- Terrace farming;
- Proper drainage canals around the fields.

Question 12: What are the different states in which water is found during the water cycle ?

Answer- Solid (snow, ice), liquid (water) and gas (water vapours).

Question 13: Name two biologically important compounds that contain both oxygen and nitrogen ?

Answer- Proteins and nucleic acids (DNA and RNA).

Question 14: List any three human activities which would lead to an increase in the carbon dioxide content of air?

Answer- (i) Burning of fuels like coal, petrol, diesel etc.

(ii) Deforestation.

(iii) Human induced forest fires.

(iv) Respiration.

Question 15: What is the greenhouse effect ?

Answer- Gases like CO_2 and methane trap Sun's radiation reflected from earth's surface. This causes warming of atmosphere. This effect is called greenhouse effect.

Question 15: What are the two forms of oxygen found in the atmosphere ?

Answer- Oxygen gas (O_2) and Ozone gas (O_3).

EXERCISE

Question 1: Why is the atmosphere essential for life ?

Answer- Atmosphere is very important for sustaining life because:

- It contains various gases like O_2 CO_2, N_2 which are required for various life processes by plants and animals.

- CO_2 gas is used by plants to prepare food . by the process called photosynthesis.

- Oxygen is required for combustion and respiration.

- Ozone layer acts as a protective layer which prevents harmful U.V. rays to enter the earth's atmosphere.

- Atmosphere acts as a temperature buffer.

Question 2: Why is water essential for life?

Answer- (i) Plants require water for photosynthesis.

(ii) All cellular processes occur in a water medium.

(iii) Transportation of substances in our body takes place in dissolved form.

(iv) It helps to maintain body temperature.

Question 3: How are living organisms dependent on the soil? Are organisms that live in water totally independent of soil as a resource?

Answer- All living organisms are directly or indirectly dependent on soil. Plants obtain water, minerals from the soil and prepare food for themselves and for other animals.

Organisms that live in water are not totally independent of soil because the microbes growing on the soil in water are the primary producers which start the food chain and even other microbes that live in soil help in the decomposition of dead plants and animals in water to return the nutrients back to the water.

Question 4: You have seen weather reports on television and in newspapers. How do you think we are able to predict the weather?

Answer- Weather is studied as the collection of various elements like high and low temperatures, humidity, rainfall, wind speed and more using various figures and facts with relevant instruments.

Question 5: We know that many human activities lead to increasing levels of pollution of the air, water-bodies and soil. Do you think that isolating these activities to specific and limited areas would help in reducing pollution?

Answer- Limiting activities to certain place will definitely help the air pollution to be controlled to some extent.

Question 6: Write a note on how forests influence the quality of our air, soil and water resources?

Answer- Role of **forest** in influencing the quality of: **(1) Air:**

- It helps in purifying the air.
- It takes carbon dioxide gas during photosynthesis thus greenhouse effect is controlled.
- Transpiration helps in the formation of clouds and thus helps in raining.

(2) Soil:

- Plants in forest prevent soil erosion.
- It helps in increasing the underground water level.
- Forest increases the fertility of soil.

(3) Water:

- Forest helps in bringing rain and increasing the level of water in the underground and water bodies.

CHAPTER 15-IMPROVEMENT IN FOOD RESOURCES

Question 1: What do we get from cereals, pulses, fruits and vegetables?

Answer- Cereals give carbohydrates which provide energy. Pulses give proteins which build our body. Vegetables and fruits provide vitamins and minerals.

Question 2: How do biotic and abiotic factors affect crop production?

Answer- Two major factors that affect the crop are:

• Biotic factors like insects, rodents, pests, and many more spread the disease and reduce crop production.

• Abiotic factors like humidity, temperature, moisture, wind, rain, flood and many more destroy the crop raised.

Question 3: What are the desirable agronomic characteristics for crop improvements?

Answer- The essential agronomic features required for crop improvement are:

• Profuse branching along with tallness in any fodder crop

• Dwarfness in any cereals.

Question 4: What are macro-nutrients and why are they called macro-nutrients?

Answer- Macro-nutrients are the essential elements which are utilized by plants in large quantities. As they are required in large quantities they are called macro-nutrients e.g., carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, etc.

Question 5: How do plants get nutrients ?

Answer- Plants get nutrients from air, water and soil. There are, sixteen nutrients essential for the growth of plants. Carbon and Oxygen are supplied by water. The remaining thirteen nutrients are supplied by soil.

Question 6: Compare the use of manures and fertilisers in maintaining soil fertility.

Answer-

Manures	Fertilisers
1. Manure is organic matter.	2. Fertilizers are inorganic substances.
2. The manures enrich the soil with humus.	2. The fertilizers do not enrich the soil with humus.
3. They reduce soil erosion.	3. They do not reduce soil erosion.
4. They are prepared from animals and plants wastages.	4. They are produced in factories from chemicals.
5. Manures have less concentration of nutrients.	5. Fertilizers are rich in specific nutrients.
6. Manures increase soil fertility.	6. Long time use of fertilizers decrease soil fertility.

Question 7: Which of the following conditions will give the most benefits? Why?

(a) Farmers use high-quality seeds, do not adopt irrigation or use fertilizers.

(b) Farmers use ordinary seeds, adopt irrigation and use fertilizer.

(c) Farmers use quality seeds, adopt irrigation, use fertilizer and use crop protection measures. (✓)

Question 8: Why should preventive measures and biological control methods be preferred for protecting crops ?

Answer- Diseases in plants are caused by pathogens. To get rid of pathogens, some preventive measures and biological control methods are used as they are simple, economic and minimise pollution without affecting the soil quality.

Question 9: What factors are responsible for losses of grains during storage ?

Answer- (i) Abiotic factors like moisture (present in food grains), humidity (of air) and temperature.

(ii) Biotic factors like insects, rodents, birds, mites, bacteria and fungi

Question 10: Which method is commonly used for improving cattle breeds and why?

Answer- Cross breading is generally the best method adopted for improving the cattle breed quality. In this method, breeding is between two good cattle breed results in a new improved variety of cattle breed or offspring. While breeding, it is taken care to have a good resultant with high yield having resistance to climatic conditions.

Question 11: Discuss the implications of the following statement: "It is interesting to note that poultry is India's most efficient converter of low fiber food stuff into highly nutritious animal protein food."

Answer- The poultry birds are efficient converters of agricultural by products, particularly cheaper fibrous wastes into high quality meat and in providing egg, feathers and nutrient rich manure. So, the given statement is correctly said for the poultry birds.

Question 12: What management practices are common in dairy and poultry farming?

Answer- (1) Well designed and hygienic shelter.

(2) Proper food is required to get good yield of egg and meat.

(3) Complete protection from diseases causing agents like virus, bacteria or fungi.

Question 13: What are the differences between broilers and layers and in their management?

Answer- Broilers: The poultry bird raised for meat purpose is called broiler. Broilers feed on protein rich adequate fat food. The level of vitamins A and K is kept high in the poultry feeds.

Layers: The egg laying poultry bird is called layer. The housing, environmental and nutritional requirements of broilers vary from those of egg layers. Layers require proper lightning and enough space.

Question 14: How are fish obtained?

Answer- There are two ways of obtaining fish. One is from natural resources, which is called capture fishing. The other way is by fish farming, which is called culture fishery.

Question 15: What are the advantages of composite fish culture?

Answer- Advantages of composite fish culture are: (i) In a single fish pond, a combination of 5 or 6 types of fish species can be cultured since they do not compete for food among them.

(ii) Food resource can be completely utilized

(iii) Survival of the fish also increases, (iv) More yield.

Question 16: What are the desirable characters of bee varieties suitable for honey production?

Answer- (i) The variety of bee should yield large amount of honey.

(ii) The bees should stay for a longer period in bee hives

(iii) The bees should not sting much.

(iv) Bee should be disease resistant.

Question 17: What is pasturage and how is it related to honey production?

Answer- Pasturage refers to the availability of flowers to the bees for easy accessibility for pollen collection and nectar. Kinds of flowers available will determine the taste of the honey.

EXERCISE QUESTION-ANSWERS

Question 1: Explain any one method of crop production which ensures high yield.

Answer- Plant breeding is one of the methods adopted for high yield plant breeding and is implemented to improve the varieties of crops by breeding plants. Plants from various places/areas are picked up with preferred traits and then the process of hybridization or cross-breeding is done among these diversities to get a crop/plant of anticipated characteristic.

Question 2: Why are manure and fertilizers used in fields?

Answer- They are used to ensure good vegetative growth (leaves, branches and flowers), giving rise to healthy plants, that results in high crop production.

Question 3: What are the advantages of inter-cropping and crop rotation ?

Answer- Advantages of using inter-cropping:

1.   It helps to maintain soil fertility.
2.   It increases productivity per unit area.
3.   Save labour and time.
4.   Both crops can be easily harvested and processed separately.

Advantages of using crop rotation:

1.   It improves the soil fertility.
2.   It avoids depletion of a particular nutrient from soil.
3.   It minimise pest infestation and diseases.
4.   It helps in weed control.
5.   It prevents change in the chemical nature of the soil.

Question 4: What is genetic manipulation? How is it useful in agricultural practices?

Answer- Genetic manipulation is process in which the transfer of genes takes place from one organism to another. Here gene of a particular character is introduced inside the chromosome cell and hence results in a transgenic plant.

Genetic manipulation is useful in developing varieties which have increased yield, better quality, shorter and early maturity period, better adaptability to adverse environmental conditions, well as desirable characteristics.

Question 5: How do storage grain losses occur?

Answer- The factors responsible for loss of grains during storage are:

•   Abiotic factors like moisture (present in food grains), humidity (of air) and temperature.
•   Biotic factors like insects, rodents, birds, mites and bacteria.

Question 6: How do good animal husbandry practices benefit farmers ?

Answer- Good practice of animal husbandry benefits farmers by following ways:

• Yields in good quality cattle.
• Better quality of milk production.
• Use in agriculture for carting, irrigation and tilling.

Question 7: What are the benefits of cattle farming?

Answer- Benefits of cattle farming are:

• Cattles are used in agricultural purpose.
• Generation of good quality cattle.
• Milking and meat purpose.
• Skin of cattle is used for leather and wool industry.

Question 8: For increasing production, what is common in poultry, fisheries and bee-keeping ?

Answer- Through cross breeding, the production of poultry, fisheries and bee keeping can be increased.

Question 9: How do you differentiate between capture fishing, marine culture, and aquaculture ?

Answer- Capture fishing: It is a technique in which fishes are captured from various sources of natural resources like sea, rives, lake and pond.

Marine culture: culturing of fish in marine fishes like prawns, oyster, bhetki and mullets in marine water for commercial use.

Aquaculture: Involves in culturing of fish in both marine and fresh water.