Electromagnetic Waves

1. **Assertion (A):** When cooking in microwave ovens, metal containers are used.
Reason (R): Energy of microwaves can be easily transferred to the food through metal.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

2. **Assertion (A):** Infrared waves are often called heat waves.
Reason (R): Infrared waves vibrate not only electrons but entire atoms or molecules.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

3. **Assertion (A):** Conduction and displacement current may be present in the same region of space.
Reason (R): There is no perfectly conducting or perfectly insulating medium.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

4. **Assertion (A):** Electromagnetic waves cannot penetrate through a perfect conductor and hence are totally reflected.
Reason (R): The speed of electromagnetic waves in any dielectric medium is less as compared to vacuum.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

5. **Assertion (A):** Electromagnetic radiations like UV, visible and IR coming from Sun towards earth's surface can't be trapped by earth's magnetic field where as cosmic rays coming towards earth's surface are trapped by the magnetic field of earth.
Reason (R): Electromagnetic wave doesn't contain any live charge where the cosmic rays is a huge storage of charged particle.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

6. **Assertion (A):** An E.M. wave has constantly interchanging electric and magnetic fields, which are perpendicular to each other.
Reason (R): The direction of propagation is given by $(\vec{B} \times \vec{E})$.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

7. **Assertion (A):** Average value of electric field and magnetic field in one cycle is same in electromagnetic waves.
Reason (R): The ratio of electric field intensity and magnetic field intensity of EM waves is equal to speed of EM waves.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

8. **Assertion (A):** Comet tail points away from the sun.
Reason (R): Solar radiation vapourise the volatile materials within the comet.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

9. **Assertion (A):** When electromagnetic waves are incident on a surface, exert radiation pressure on the surface.
Reason (R): Electromagnetic waves carry energy as well as momentum.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

10. **Assertion (A):** In an electromagnetic wave, both the electric and magnetic field vibrates with same phase and frequency.
Reason (R): Amplitude of vibration of electric and magnetic field are equal in an electromagnetic wave.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

11. **Assertion (A):** The energy in a small volume through which an EM wave is passing oscillates with double the frequency of wave.
Reason (R): The electric field and magnetic field can not have equal average numerical value in each half cycle.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

12. **Assertion (A):** A magnetic needle when placed in between the plates of a parallel plate capacitor under charging, the needle shows deflection.
Reason (R): As the charge on the capacitor plates increases, the electric field and the electric flux between the plates changes which generates a magnetic field.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

13. **Assertion (A):** In an electromagnetic wave, magnitude of magnetic field vector is much smaller than the magnitude of electric field vector.
Reason (R): Energy of electromagnetic waves is shared equally by the electric and magnetic fields.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

14. **Assertion (A):** The gyrating electron can be a source of EMW.
Reason (R): The electron in circular motion is accelerated motion.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ans.	4	1	1	2	1	3	2	2	1	3	2	1	2	1