QB365 Question Paper Software
12th Standard - Physics
Electromagnetic Waves Assertion and reason

Exam Time: 00:20 Hrs | Date: 2025-09-30

Total Marks: 10

Questions:

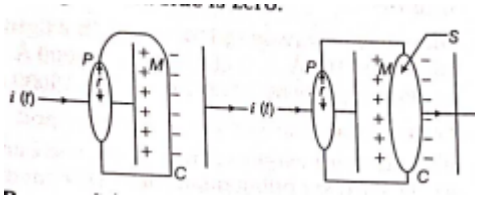
1. **Assertion (A)** : The electric field and magnetic field have equal average values in linearly polarised plane em wave.
   Reason (R) : The electric energy and magnetic energy have equal average values in linearly polarised plane em wave.
   Codes:
   (a) Both A and R are true and R is the correct explanation of A
   (b) Both A and R are true but R is NOT the correct explanation of A
   (c) A is true but R is false
   (d) A is false and R is also false

2. **Assertion (A)** : The microwaves are better carriers of signals than radio waves.
   Reason (R) : The electromagnetic waves do not required any material medium for propagation.
   Codes:
   (a) Both A and R are true and R is the correct explanation of A
   (b) Both A and R are true but R is NOT the correct explanation of A
   (c) A is true but R is false
   (d) A is false and R is also false

3. **Assertion (A)** : X-rays in vacuum travel faster than light waves in vacuum.
   Reason (R) : The energy of X-rays photon is less than that of light photon.
   Codes:
   (a) Both A and R are true and R is the correct explanation of A
   (b) Both A and R are true but R is NOT the correct explanation of A
   (c) A is true but R is false
   (d) A is false and R is also false

4. **Assertion (A)** : Radio waves cannot be diffracted by the buildings.
   Reason (R) : The wavelength of radio waves is very small
   Codes:
   (a) Both A and R are true and R is the correct explanation of A
   (b) Both A and R are true but R is NOT the correct explanation of A
   (c) A is true but R is false
   (d) A is false and R is also false

5. **Assertion (A) :** While applying Ampere's circuital law to given surfaces with same perimeter, the left hand side $\oint B \cdot dl = \mu_0 i(t)$ has not changed but the right hand side is zero.



Reason (R) : No current passes through the surface.
(a) Both Assertion and Reason are true and Reaton is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason in not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

6. **Assertion (A) :** Microwaves are better carriers of signals than optical waves.
Reason (R) : Microwaves move faster than optical waves.
(a) Both Assertion and Reason are true and Reaton is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason in not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

7. **Assertion :** Microwaves are better carrier of signals than optical waves.
Reason : Microwaves move faster than optical waves.
Codes:
(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
(c) If the Assertion is correct but Reason is incorrect.
(d) If both the Assertion and Reason are incorrect.

8. **Assertion :** Electromagnetic wave does not require any medium to travel.
Reason : Electromagnetic wave cannot travel through any medium.
Codes:
A) Both A and R are true and R is the correct explanation of A
B) Both A and R are true but R is NOT the correct explanation of A
C) A is true but R is false
D) A is false and R is true

9. **Assertion :** Microwaves are considered suitable for radar system.
Reason : Microwaves are of shorter wavelength.
Codes:
A) Both A and R are true and R is the correct explanation of A
B) Both A and R are true but R is NOT the correct explanation of A
C) A is true but R is false
D) A is false and R is true

10. **Assertion** : Gamma rays are electromagnetic waves having the smallest wavelength.
Reason : Gamma rays are having the lowest frequency.
Codes:
A) Both A and R are true and R is the correct explanation of A
B) Both A and R are true but R is NOT the correct explanation of A
C) A is true but R is false
D) A is false and R is true

Answers Key:

1. **(b)**: In case of a linearly polarised plane electromagnetic wave, the average values of electric field and magnetic field are equal and average values of electric energy and magnetic energy are also equal.
2. **(b)**: Microwaves are the electromagnetic waves of wavelength of the order of a few millimetres, which is less than those of T.V. signals. On account of smaller wavelength, the microwaves can be transmitted as beam signals in a particular direction and are much better than radiowaves because microwaves do not spread or bend around the corners of any obstacle coming in their way. Therefore microwaves are better carriers of signals than radiowaves.
3. **(d)**: All electromagnetic waves including X-rays travels with same velocity in vacuum. The energy of X-rays is greater than energy of the light because energy is inversely proportional to wavelength (E = hc/λ) and wavelength of X-rays are smaller than light waves.
4. **(d)**: For wave to suffer diffraction, the wavelength should be of the order of size of the obstacle. The wavelength of radio waves (short radio waves) is order of the size of the building and the other obstacles coming in their path and hence they easily get diffracted.
5. (a) Both Assertion and Reason are true and Reaton is the correct explanation of Assertion.
   On applying Ampere's circuital law to such sarfaces with the same perimeter, we find that the left hand side of equation $\oint B \cdot dl = \mu_0 i(t)$has not changed but the right hand side is zero and not μ_0i. Since, no carrent passes through the surface.
6. (c) Assertion is true but Reason is false.
7. (d) If both the Assertion and Reason are incorrect.
   Explanation:
   The optical waves used in optical fibre communication are better carrier of signals than microwaves. The speed of microwave and optical wave is the same in vacuum.
8. C) A is true but R is false
9. A) Both A and R are true and R is the correct explanation of A
10. C) A is true but R is false