DDS ACADEMY

ELECTRO-MAGNETIC WAVES DPP

MAINS/NEET

1. Which of the following statement is wrong
   (a) Infrared photon has more energy than the photon of visible light
   (b) Photographic plates are sensitive to ultraviolet rays
   (c) Photographic plates can be made sensitive to infrared rays
   (d) Infrared rays are invisible but can cast shadows like visible light rays
2. Pick out the longest wavelength from the following types of radiations
   (a) Blue light (b) γ-rays
   (c) X-rays (d) Red light
3. Wave which cannot travel in vacuum is
   (a) X-rays (b) Infrasonic
   (c) Ultraviolet (d) Radio waves
4. Light is an electromagnetic wave. Its speed in vacuum is given by the expression
   (a) $\sqrt{\mu_o \varepsilon_o}$ (b) $\sqrt{\frac{\mu_o}{\varepsilon_o}}$
   (c) $\sqrt{\frac{\varepsilon_o}{\mu_o}}$ (d) $\frac{1}{\sqrt{\mu_o \varepsilon_o}}$
5. The range of wavelength of the visible light is
   (a) 10 Å to 100 Å (b) 4,000 Å to 8,000 Å
   (c) 8,000 Å to 10,000 Å (d) 10,000 Å to 15,000 Å
6. Which radiation in sunlight, causes heating effect
   (a) Ultraviolet (b) Infrared
   (c) Visible light (d) All of these
7. Which of the following represents an infrared wavelength
   (a) 10^{-4} cm (b) 10^{-5} cm
   (c) 10^{-6} cm (d) 10^{-7} cm
8. The wavelength of light visible to eye is of the order of
   (a) 10^{-2} m (b) 10^{-10} m
   (c) 1 m (d) 6×10^{-7} m
9. The speed of electromagnetic wave in vacuum depends upon the source of radiation
   (a) Increases as we move from γ-rays to radio waves
   (b) Decreases as we move from γ-rays to radio waves
   (c) Is same for all of them
   (d) None of these
10. Which of the following radiations has the least wavelength
    (a) γ-rays (b) β-rays
    (c) α-rays (d) X-rays
11. The maximum distance up to which TV transmission from a TV tower of height h can be received is proportional to
    (a) $h^{1/2}$ (b) h
    (c) h (d) h^2
12. Which of the following are not electromagnetic waves
13. Ozone is found in
    (a) Stratosphere (b) Ionosphere
    (c) Mesosphere (d) Troposphere
14. The electromagnetic waves travel with a velocity

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14. The electromagnetic waves travel with a velocity
(a) Equal to velocity of sound
(b) Equal to velocity of light
(c) Less than velocity of light
(d) None of these

15. The ozone layer absorbs
(a) Infrared radiations (b) Ultraviolet radiations
(c) X-rays (d) γ-rays

16. Electromagnetic radiation of highest frequency is
(a) Infrared radiations (b) Visible radiation
(c) Radio waves (d) γ-rays

17. Which of the following shows green house effect
(a) Ultraviolet rays (b) Infrared rays
(c) X-rays (d) None of these

18. Which of the following waves have the maximum wavelength
(a) X-rays (b) I.R. rays
(c) UV rays (d) Radio waves

19. Electromagnetic waves are transverse in nature is evident by
(a) Polarization (b) Interference
(c) Reflection (d) Diffraction

20. If $\vec{E}$ and $\vec{B}$ are the electric and magnetic field vectors of E.M. waves then the direction of propagation of E.M. wave is along the direction of
(a) $\vec{E}$ (b) $\vec{B}$
(c) $\vec{E}\times\vec{B}$ (d) None of these

21. Biological importance of Ozone layer is
(a) It stops ultraviolet rays
(b) Ozone rays reduce green house effect
(c) Ozone layer reflects radio waves
(d) Ozone layer controls O_2 / H_2 radio in atmosphere

22. What is ozone hole
(a) Hole in the ozone layer
(b) Formation of ozone layer
(c) Thinning of ozone layer in troposphere
(d) Reduction in ozone thickness in stratosphere

23. Which rays are not the portion of electromagnetic spectrum
(a) X-rays (b) Microwaves
(c) α-rays (d) Radio waves

24. Radio wave diffract around building although light waves do not. The reason is that radio waves
(a) Travel with speed larger than c
(b) Have much larger wavelength than light
(c) Carry news
(d) Are not electromagnetic waves

25. The frequencies of X-rays, γ-rays and ultraviolet rays are respectively a, b and c. Then

(a) $a<b, b>c$ (b) $a>b, b>c$

(c) $a>b, b<c$ (d) $a<b, b<c$

26. Radio waves and visible light in vacuum have

(a) Same velocity but different wavelength

(b) Continuous emission spectrum

(c) Band absorption spectrum

(d) Line emission spectrum

27. Energy stored in electromagnetic oscillations is in the form of

(a) Electrical energy (b) Magnetic energy

(c) Both (a) and (b) (d) None of these

28. Heat radiations propagate with the speed of

(a) α-rays (b) β-rays

(c) Light waves (d) Sound waves

29. If a source is transmitting electromagnetic wave of frequency $8.2\times10^{6}\ Hz$, then wavelength of the electromagnetic waves transmitted from the source will be

(a) $36.6\ m$ (b) $40.5\ m$

(c) $42.3\ m$ (d) $50.9\ m$

30. In an apparatus, the electric field was found to oscillate with an amplitude of $18\ V/m$. The magnitude of the oscillating magnetic field will be

(a) $4\times10^{-6}\ T$ (b) $6\times10^{-8}\ T$

(c) $9\times10^{-9}\ T$ (d) $11\times10^{-11}\ T$

31. According to Maxwell's hypothesis, a changing electric field gives rise to

(a) An e.m.f. (b) Electric current

(c) Magnetic field (d) Pressure radiant

32. In an electromagnetic wave, the electric and magnetizing fields are $100\ V\,m^{-1}$ and $0.265\ A\,m^{-1}$. The maximum energy flow is

(a) $26.5\ W/m^{2}$ (b) $36.5\ W/m^{2}$

(c) $46.7\ W/m^{2}$ (d) $765\ W/m^{2}$

33. The $21\ cm$ radio wave emitted by hydrogen in interstellar space is due to the interaction called the hyperfine interaction is atomic hydrogen. the energy of the emitted wave is nearly

(a) $10^{-17}\ Joule$ (b) $1\ Joule$

(c) $7\times10^{-8}\ Joule$ (d) $10^{-24}\ Joule$

34. TV waves have a wavelength range of 1-10 *meter*. Their frequency range in *MHz* is

(a) 30-300 (b) 3-30

(c) 300-3000 (d) 3-3000

35. Maxwell's equations describe the fundamental laws of

(a) Electricity only (b) Magnetism only

(c) Mechanics only (d) Both (a) and (b)

36. The oscillating electric and magnetic vectors of an electromagnetic wave are oriented along

(a) The same direction but differ in phase by 90°

(b) The same direction and are in phase

(c) Mutually perpendicular directions and are in phase

(d) Mutually perpendicular directions and differ in phase by 90°

37. In which one of the following regions of the electromagnetic spectrum will the vibrational motion of molecules give rise to absorption

(a) Ultraviolet (b) Microwaves

(c) Infrared (d) Radio waves

38. An electromagnetic wave travels along z-axis. Which of the following pairs of space and time varying fields would generate such a wave

(a) E_x, B_y (b) E_y, B_x

(c) E_z, B_x (d) E_y, B_z

39. Which of the following rays has the maximum frequency

(a) Gamma rays (b) Blue light

(c) Infrared rays (d) Ultraviolet rays

40. A signal emitted by an antenna from a certain point can be received at another point of the surface in the form of

(a) Sky wave (b) Ground wave

(c) Sea wave (d) Both (a) and (b)

41. Approximate height of ozone layer above the ground is

(a) 60 to 70 km (b) 59 km to 80 km

(c) 70 km to 100 km (d) 100 km to 200 km

42. The electromagnetic waves do not transport

(a) Energy (b) Charge

(c) Momentum (d) Information

43. A plane electromagnetic wave is incident on a material surface. If the wave delivers momentum p and energy E, then

(a) $p = 0, E = 0$ (b) $p \neq 0, E \neq 0$

(c) $p \neq 0, E = 0$ (d) $p = 0, E \neq 0$

44. An electromagnetic wave, going through vacuum is described by $E = E_0 \sin(kx - \omega t)$. Which of the following is independent of wavelength

(a) k (b) ω

(c) k/ω (d) $k\omega$

45. An electromagnetic wave going through vacuum is described by $E = E_0 \sin(kx - \omega t)$; $B = B_0 \sin(kx - \omega t)$. Which of the following equation is true

(a) $E_0 k = B_0 \omega$ (b) $E_0 \omega = B_0 k$

(c) $E_0 B_0 = \omega k$ (d) None of these

46. An LC resonant circuit contains a 400 pF capacitor and a 100 μH inductor. It is set into oscillation coupled to an antenna. The wavelength of the radiated electromagnetic waves is

(a) 377 mm (b) 377 $metre$

(c) 377 cm (d) 3.77 cm

47. A radio receiver antenna that is 2 m long is oriented along the direction of the electromagnetic wave and receives a signal of intensity $5 \times 10^{-16} W/m^2$. The maximum instantaneous potential difference across the two ends of the antenna is

(a) 1.23 μV (b) 1.23 mV

(c) 1.23 V (d) 12.3 mV

48. Television signals broadcast from the moon can be received on the earth while the TV broadcast from Delhi cannot be received at places about 100 km distant from Delhi. This is because

(a) There is no atmosphere around the moon

(b) Of strong gravity effect on TV signals

(c) TV signals travel straight and cannot follow the curvature of the earth

(d) There is atmosphere around the earth

49. A TV tower has a height of 100 m. The average population density around the tower is 1000 per km^2. The radius of the earth is 6.4×10^6 m. the population covered by the tower is

(a) 2×10^6 (b) 3×10^6

(c) 4×10^6 (d) 6×10^6

50. The wavelength 21 *cm* emitted by atomic hydrogen in interstellar space belongs to

(a) Radio waves (b) Infrared waves

(c) Microwaves (d) γ-rays

51. Which scientist experimentally proved the existence of electromagnetic waves

(a) Sir J.C. Bose (b) Maxwell

(c) Marconi (d) Hertz

52. An electromagnetic wave of frequency $\nu = 3.0\ MHz$ passes from vacuum into a dielectric medium with permittivity $\varepsilon = 4.0$. Then

(a) Wavelength is doubled and the frequency remains unchanged

(b) Wavelength is doubled and frequency becomes half

(c) Wavelength is halved and frequency remains unchanged

(d) Wavelength and frequency both remain unchanged

53. Frequency of a wave is $6 \times 10^{15}\ Hz$. The wave is

(a) Radio wave (b) Microwave

(c) X-ray (d) None of these

54. The region of the atmosphere above troposphere is known as

(a) Lithosphere (b) Upper sphere

(c) Ionosphere (d) Stratosphere

55. Which of the following electromagnetic waves have minimum frequency

(a) Microwaves (b) Audible waves

(c) Ultrasonic waves (d) Radio waves

56. Which one of the following have minimum wavelength

(a) Ultraviolet rays (b) Cosmic rays

(c) *X*-rays (d) γ – rays

57. Radiations of intensity $0.5\ W/m^2$ are striking a metal plate. The pressure on the plate is

(a) $0.166 \times 10^{-8}\ N/m^2$ (b) $0.332 \times 10^{-8}\ N/m^2$

(c) $0.111 \times 10^{-8}\ N/m^2$ (d) $0.083 \times 10^{-8}\ N/m^2$

58. Electromagnetic waves travel in a medium which has relative permeability 1.3 and relative permittivity 2.14. Then the speed of the electromagnetic wave in the medium will be

(a) $13.6 \times 10^6\ m/s$ (b) $1.8 \times 10^2\ m/s$

(c) $3.6 \times 10^8\ m/s$ (d) $1.8 \times 10^8\ m/s$

59. The intensity of gamma radiation from a given source is I. On passing through 36 *mm* of lead, it is reduced to $\frac{I}{8}$. The thickness of lead which will reduce the intensity to $\frac{I}{2}$ will be

(a) 18 *mm* (b) 12 *mm*

(c) 6 *mm* (d) 9 *mm*

60. If $\lambda_x, \lambda_\gamma$ and λ_m represent the wavelength of visible light *x*-rays and microwaves respectively, then

(a) $\lambda_m > \lambda_x > \lambda_\gamma$ (b) $\lambda_\gamma > \lambda_m > \lambda_x$

(c) $\lambda_m > \lambda_\gamma > \lambda_x$ (d) $\lambda_\gamma > \lambda_x > \lambda_m$

61. For sky wave propagation of a 10 *MHz* signal, what should be the minimum electron density in ionosphere

(a) $\sim 1.2 \times 10^{12}\ m^{-3}$ (b) $\sim 10^6\ m^{-3}$

(c) $\sim 10^{14}\ m^{-3}$ (d) $\sim 10^{22}\ m^{-3}$

62. The pressure exerted by an electromagnetic wave of intensity I ($watts/m^2$) on a nonreflecting surface is [c is the velocity of light]

(a) Ic (b) Ic^2

(c) I/c (d) I/c^2

63. Infrared radiation was discovered in 1800 by

(a) William Wollaston (b) William Herschel

(c) Wilhelm Roentgen (d) Thomas Young

64. Which of the following is electromagnetic wave

(a) X-rays and light waves

(b) Cosmic rays and sound waves

(c) Beta rays and sound waves

(d) Alpha rays and sound waves

65. Which one of the following is not electromagnetic in nature

(a) X-rays (b) Gamma rays

(c) Cathode rays (d) Infrared rays

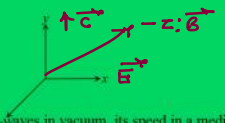
66. Light wave is travelling along y-direction. If the corresponding $\vec{E}$ vector at any time is along the x-axis, the direction of $\vec{B}$ vector at that time is along

(a) y-axis

(b) x-axis

(c) $+z$-axis

(d) $-z$ axis



67. If c is the speed of electromagnetic waves in vacuum, its speed in a medium of dielectric constant K and relative permeability μ_r is

(a) $v = \frac{1}{\sqrt{\mu_r K}}$ (b) $v = c\sqrt{\mu_r K}$

(c) $v = \frac{c}{\sqrt{\mu_r K}}$ (d) $v = \frac{K}{\sqrt{\mu_r C}}$

$\rightarrow v = \frac{c}{n}$; $n = \sqrt{\mu_r \cdot K}$

ANSWER KEY

1	a	2	d	3	b	4	d	5	b
6	b	7	a	8	d	9	c	10	a
11	a	12	c	13	a	14	b	15	b
16	d	17	b	18	d	19	a	20	c
21	a	22	d	23	c	24	b	25	a
26	a	27	c	28	c	29	a	30	b
31	c	32	a	33	d	34	a	35	d
36	c	37	b	38	a	39	a	40	d

41	a	42	b	43	b	44	c	45	a
46	b	47	a	48	c	49	c	50	a
51	c	52	c	53	d	54	d	55	b
56	b	57	a	58	d	59	b	60	c
61	a	62	c	63	b	64	a	65	c
66	d	67	c						