Unit 20: Electromagnetic Waves

64 MCQs. Correct option in bold. 1 mark each.

1. Electromagnetic waves are
A. longitudinal waves B. sound waves
C. transverse waves D. surface waves only

2. Electromagnetic waves
A. travel only in solids **B. do not require a medium for propagation**
C. cannot pass through air D. need a material medium

3. The range of different frequencies and wavelengths of electromagnetic waves is called the
A. colour chart B. sound spectrum
C. visible spectrum **D. electromagnetic spectrum**

4. The correct order of EM waves from the longest wavelength to the shortest is
A. radio, microwave, infrared, visible, ultraviolet, X-rays, gamma rays
B. microwave, radio, infrared, visible, X-rays, ultraviolet, gamma
C. gamma rays, X-rays, ultraviolet, visible, infrared, microwave, radio
D. radio, infrared, microwave, visible, ultraviolet, gamma, X-rays

5. The speed of all electromagnetic waves in vacuum is
A. 340 m/s **B. 3×10^{8} m/s**
C. 3×10^{10} m/s D. 3×10^{6} m/s

6. Which EM waves have the longest wavelength?
A. Radio waves B. Ultraviolet
C. Gamma rays D. X-rays

7. The energy of a photon is given by
A. $E = h/f$ B. $E = hf^2$ **C. $E = hf$** D. $E = f/h$

8. The constant h in $E = hf$ is called
A. Avogadro's number B. Faraday's constant
C. Boltzmann's constant **D. Planck's constant**

9. The value of Planck's constant is
A. 3×10^{8} J s **B. 6.63×10^{-34} J s**
C. 6.63×10^{34} J s D. 1.6×10^{-19} J s

10. The energy of an electromagnetic wave depends directly on its
A. frequency B. speed C. amplitude D. medium

11. The relation between energy and wavelength is
A. $E = h\lambda/c$ B. $E = c\lambda/h$ **C. $E = hc/\lambda$** D. $E = \lambda/hc$

12. The wavelength of an EM wave of frequency 5.0×10^{14} Hz is
A. 60 nm B. 1.5 μm C. 6000 nm **D. 600 nm**

13. A wave of wavelength 10 cm belongs to
A. microwaves B. gamma rays
C. infrared D. ultraviolet

14. X-rays have higher energy than visible light because of their
A. lower frequency B. longer wavelength
C. higher speed **D. shorter wavelength**

15. When an EM wave enters another medium, the quantity that does not change is
A. wavelength **B. frequency**
C. speed D. direction always

16. Electromagnetic waves are produced by
A. neutral particles B. stationary charges
C. accelerating charged particles D. accelerating neutral particles

17. One electron-volt (eV) is equal to
A. 6.63×10^{-34} J B. 1.6×10^{19} J
C. 9.1×10^{-31} J **D. 1.6×10^{-19} J**

18. The energy of a radiation of wavelength 200 nm is about
A. 9.945×10^{-19} J B. 9.945×10^{-34} J
C. 1×10^{-10} J D. 9.945×10^{-5} J

19. The momentum of a photon of wavelength 200 nm is about
A. 3.315×10^{27} kg m/s **B. 3.315×10^{-27} kg m/s**
C. 3.315×10^{-34} kg m/s D. 6.63×10^{-34} kg m/s

20. A radiation of energy 4.7 eV has wavelength about 265 nm and belongs to
A. radio waves B. X-rays
C. ultraviolet D. infrared

21. Radio waves are used in
A. detecting cracks in metals
B. television, mobile phones and wireless networks
C. sterilising food
D. killing cancer cells

22. The study of radio waves from space is called
A. radiography B. spectroscopy
C. radio astronomy D. radiology

23. Radio telescopes need to be very large because radio waves have
A. much longer wavelengths than visible light
B. very high energy
C. very high frequencies
D. very short wavelengths

24. Satellite TV communication uses
A. visible light B. gamma rays
C. X-rays **D. microwaves**

25. Microwaves are used for satellite communication because they can
A. be blocked by clouds B. not travel far
C. pass easily through the atmosphere D. be absorbed by the atmosphere

26. A typical microwave oven uses a frequency of
A. 2.45 kHz **B. 2.45 GHz** C. 245 GHz D. 24.5 MHz

27. Microwaves cook food by making _____ molecules vibrate.
A. water B. carbon C. metal D. oxygen

28. Infrared means
A. beyond blue B. beyond violet
C. above red **D. below red**

29. Infrared radiation is used in
A. radiography **B. remote controllers**
C. sterilising water D. detecting counterfeit notes

30. The type of radiation which primarily carries heat energy is
A. ultraviolet B. X-rays
C. infrared D. radio waves

31. Waves used for treating muscle aches in physiotherapy are
A. microwaves B. X-rays
C. ultraviolet **D. infrared**

32. The Sun has a surface temperature of about
A. 6000 K B. 300 K C. 60,000 K D. 600 K

33. UV-A has wavelengths of about
A. 290 to 320 nm B. 220 to 290 nm
C. 320 to 400 nm D. 400 to 700 nm

34. Most UV-B and all UV-C radiation is absorbed by the
A. ozone layer B. carbon dioxide
C. clouds D. oxygen only

35. About _____ of solar UV reaching Earth's surface is UV-A.
A. 50 % **B. 99 %** C. 10 % D. 1 %

36. Counterfeit bank notes can be detected using
A. radio waves B. infrared light
C. microwaves **D. ultraviolet light**

37. UV light is used for sterilising
A. air bubbles B. glass beams only
C. water D. metals

38. X-rays are widely used for
A. heating food **B. medical imaging of bones**
C. mobile calls D. satellite TV

39. The use of X-rays in medical science is called
A. radiology B. radiography of the sky
C. spectroscopy D. radio astronomy

40. X-ray security scanners are used to detect
A. colour B. sound
C. temperature **D. weapons or explosives under clothing**

41. X-rays and gamma rays are used in radiographic testing to detect
A. weight of metals **B. cracks in metals**
C. temperature of metals D. colour of metals

42. At high doses, X-rays or gamma radiation therapy kills cancer cells by damaging their
A. proteins only B. cell walls only
C. DNA D. water content

43. Gamma rays are emitted from the
A. nucleus of a heavy atom B. air
C. electron shell D. outer atom only

44. The radioactive isotope commonly used for sterilising food and medical equipment is
A. Uranium-235 B. Carbon-14
C. Iodine-131 only **D. Cobalt-60**

45. Food sterilised with gamma rays
A. becomes hot **B. does not become radioactive**
C. becomes radioactive D. becomes light

46. Ionizing radiation includes
A. radio waves and microwaves B. radio waves only
C. infrared and visible light **D. UV, X-rays and gamma rays**

47. Non-ionizing radiation includes
A. visible light, infrared, microwaves and radio waves
B. X-rays and gamma rays
C. gamma rays only
D. UV and X-rays

48. Long-term exposure to UV waves can cause
A. better eyesight B. stronger bones only
C. skin cancer D. no effects

49. Protection from ionizing radiation includes shielding, limiting exposure time and
A. maintaining a safe distance B. increasing exposure time
C. using no protection D. getting close to the source

50. Shorter wavelengths of light scatter
A. equally B. not at all
C. less **D. more**

51. The sky appears blue because of
A. absorption of red light by air
B. scattering of shorter wavelengths by air molecules
C. reflection from the sea
D. dispersion by rain

52. The scattering of light by gas molecules is called
A. Raman effect B. polarisation
C. Rayleigh scattering D. diffraction

53. The sky appears red at sunset because
A. the Sun becomes cooler
B. the Sun is closer
C. red light is scattered away
D. most of the blue light is scattered away and red light reaches us

54. Light is made of tiny massless particles called
A. photons B. neutrons C. electrons D. protons

55. A photon has
A. charge only
B. energy and momentum but no mass and no charge
C. mass and charge
D. mass only

56. The idea that light is made of quanta was introduced by
A. Isaac Newton B. Ibn al-Haytham
C. Max Planck D. Faraday

57. The momentum of a photon is given by
A. $p = \lambda/h$ **B. $p = h/\lambda$** C. $p = h + \lambda$ D. $p = h\lambda$

58. The momentum of a photon of frequency 4.0×10^{14} Hz is about
A. 1.3×10^{-9} kg m/s B. 8.84×10^{-34} kg m/s
C. 8.84×10^{-19} kg m/s **D. 8.84×10^{-28} kg m/s**

59. Which of these EM waves has the least momentum?
A. Radio waves B. Infrared
C. Gamma rays D. Ultraviolet

60. The pressure exerted by light on objects due to transfer of momentum is called
A. thermal pressure B. atmospheric pressure
C. radiation pressure D. fluid pressure

61. Radiation pressure is directly proportional to the
A. colour of the object **B. intensity of light**
C. mass of the object D. temperature of the object

62. On halving the area of a totally reflecting surface, the radiation pressure
A. remains the same B. quadruples
C. doubles D. halves

63. A solar sail uses the
A. chemical fuel B. wind
C. electric energy **D. momentum of photons**

64. Solar sails are preferred for deep-space missions because they need
A. chemical energy B. much fuel
C. no fuel D. electric energy