PHYSICS MCQ BOOKLET

Grade 10 · Chapter 11 · Electromagnetic Waves

FBISE / National Book Foundation Model Textbook companion

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Independent MCQs on the electromagnetic spectrum, applications and hazards, atmospheric scattering, and the photon model of light. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.

A. Important / Main Topics

1. Electromagnetic waves are generated by the oscillations of:

(A) electric and magnetic fields
(B) only air pressure
(C) only Earth's molten core
(D) only sound in steel

Correct Answer: A

Explanation: Changing E and B fields sustain each other and travel as an EM wave.

2. In an electromagnetic wave the electric field, magnetic field, and direction of travel are:

(A) all parallel
(B) mutually perpendicular
(C) randomly oriented
(D) confined to one plane of E only

Correct Answer: B

Explanation: In an electromagnetic wave the electric field, magnetic field, and direction of travel are mutually perpendicular.

3. Electromagnetic waves are classified as:

(A) longitudinal mechanical waves
(B) matter waves that need air
(C) transverse waves
(D) circular water ripples only

Correct Answer: C

Explanation: The field oscillations are perpendicular to the direction of travel.

4. Unlike sound, electromagnetic waves:

(A) cannot travel in vacuum
(B) travel only in iron cores
(C) are always audible
(D) can travel through vacuum, needing no material medium

Correct Answer: D

Explanation: Unlike sound, electromagnetic waves can travel through vacuum, needing no material medium.

5. The electromagnetic spectrum is the range of EM waves ordered by:

(A) frequency, wavelength, or photon energy
(B) only political frequency bands
(C) only loudness
(D) only nuclear half-life

Correct Answer: A

Explanation: The electromagnetic spectrum is the range of EM waves ordered by frequency, wavelength, or photon energy.

6. The speed of all electromagnetic waves in vacuum is:

(A) 3.0×10^5 m/s

(B) 3.0×10^8 m/s
(C) 3.0×10^8 km/s
(D) 330 m/s

Correct Answer: B

Explanation: $c = 3.0 \times 10^8$ m/s is the universal vacuum speed of EM radiation.

7. In air the speed of electromagnetic waves is:

(A) almost zero
(B) equal to the speed of sound
(C) approximately the same as in vacuum
(D) infinite

Correct Answer: C

Explanation: Air is so thin optically that c is almost unchanged from vacuum.

8. In order of increasing frequency, a correct sequence is:

(A) gamma, X-ray, ultraviolet, visible
(B) visible, radio, gamma
(C) X-ray, microwave, radio
(D) radio, microwave, infrared, visible, ultraviolet, X-ray, gamma

Correct Answer: D

Explanation: Radio is lowest frequency; gamma is highest.

9. In order of increasing wavelength, a correct sequence is:

(A) gamma, X-ray, ultraviolet, visible, infrared, microwave, radio
(B) radio, microwave, infrared
(C) microwave, gamma, radio
(D) visible, radio, X-ray

Correct Answer: A

Explanation: Wavelength runs opposite to frequency because $c = f\lambda$ is constant in vacuum.

10. The wave equation for light in vacuum is:

(A) $E = mc^2$ only
(B) $c = f\lambda$
(C) $V = IR$
(D) $N = N0 / 2^n$ only

Correct Answer: B

Explanation: The wave equation for light in vacuum is $c = f\lambda$.

11. If wavelength is halved in vacuum, frequency:

(A) halves
(B) stays the same
(C) doubles
(D) becomes zero

Correct Answer: C

Explanation: c is fixed, so f and λ are inversely proportional.

12. Photon energy is given by Planck's relation:

(A) $E = h / f$
(B) $E = h + f$
(C) $E = f / h$
(D) $E = hf$

Correct Answer: D

Explanation: Energy of a quantum is Planck's constant times frequency.

13. Planck's constant h used in the unit is about:

(A) 6.63×10^{-34} J s

(B) 6.63 × 10^{34} J s
(C) 3.0 × 10^{8} J s
(D) 1.6 × 10□^{19} J s

Correct Answer: A

Explanation: h = 6.63 × 10□^{34} J s links frequency to photon energy.

14. Combining E = hf with c = fλ gives:

(A) E = hcλ
(B) E = hc / λ
(C) E = λ / hc
(D) E = h + c + λ

Correct Answer: B

Explanation: Higher photon energy means shorter wavelength.

15. Visible light in the unit's table spans roughly:

(A) 750 m to 400 m
(B) 1 mm to 25 μm
(C) 750 nm to 400 nm
(D) 1 pm only

Correct Answer: C

Explanation: Red is near 750 nm and violet near 400 nm.

16. Red light compared with violet light has:

(A) higher frequency and shorter wavelength
(B) higher photon energy
(C) zero wavelength
(D) lower frequency and longer wavelength

Correct Answer: D

Explanation: Red is at the long-wavelength, low-frequency end of the visible band.

17. A glass prism splits white light because different colours:

(A) refract by different amounts due to different wavelengths
(B) all travel at identical speed in glass
(C) are absorbed completely
(D) become radio waves

Correct Answer: A

Explanation: Dispersion: each wavelength bends differently as speed changes from air to glass.

18. White light is best described as:

(A) a single unique wavelength
(B) a mixture of many visible wavelengths
(C) only ultraviolet
(D) a stream of alpha particles

Correct Answer: B

Explanation: A prism or raindrop can separate the mixture into a spectrum.

19. Radio waves are used for:

(A) cooking food by vibrating water only
(B) sterilising food with cobalt-60 only
(C) broadcasting, mobile phones, wireless networks, and GPS
(D) forming the ozone layer

Correct Answer: C

Explanation: Radio waves are used for broadcasting, mobile phones, wireless networks, and GPS.

20. A radio tuner selects a station by:

(A) measuring half-life

(B) dispersing light in a prism
(C) attracting a compass needle
(D) detecting a specific frequency

Correct Answer: D

Explanation: Each station is assigned a frequency that the receiver can pick out.

21. In the broadcasting chain, audio is mixed with an oscillator so that the antenna radiates:

(A) a radio-frequency wave
(B) a d.c. voltage only
(C) only infrared heat
(D) alpha particles

Correct Answer: A

Explanation: The mixer/oscillator shifts the signal up to a radio frequency for transmission.

22. Radio astronomy studies:

(A) only optical images of the Moon
(B) radio waves from astronomical objects
(C) only laboratory solenoids
(D) only household wiring

Correct Answer: B

Explanation: Changing magnetic fields in space emit radio waves that reveal composition and motion.

23. Radio telescopes must be very large mainly because radio wavelengths are:

(A) much shorter than visible light
(B) identical to X-rays
(C) much longer than visible light, so a large dish is needed for good resolution
(D) zero

Correct Answer: C

Explanation: Angular resolution improves when the aperture is large compared with wavelength.

24. Unlike optical telescopes, radio telescopes can often observe through:

(A) solid lead walls
(B) the Earth’s core
(C) a transformer iron core
(D) daylight, cloud, and rain

Correct Answer: D

Explanation: Unlike optical telescopes, radio telescopes can often observe through daylight, cloud, and rain.

25. Microwaves have, compared with radio waves:

(A) higher frequency and shorter wavelength
(B) lower frequency and longer wavelength
(C) zero energy
(D) only nuclear origin

Correct Answer: A

Explanation: Microwaves have, compared with radio waves higher frequency and shorter wavelength.

26. Satellite television often uses microwaves because they:

(A) cannot leave the atmosphere
(B) can travel through the atmosphere to and from satellites
(C) are identical to sound
(D) are stopped by a sheet of paper like alpha particles

Correct Answer: B

Explanation: The atmosphere is relatively transparent at microwave frequencies used for satellite links.

27. In the unit’s account, a mobile phone talks to a local tower with radio waves, while towers may link via satellites using:

(A) ultraviolet only
(B) alpha radiation
(C) microwaves
(D) 50 Hz mechanical rotation

Correct Answer: C

Explanation: Microwaves are suited to the long atmospheric path to orbit.

28. Bluetooth typically works over distances less than about:

(A) 90 km
(B) 9 mm only
(C) the Earth–Sun distance
(D) 9 m (about 30 feet)

Correct Answer: D

Explanation: It is a short-range, low-power radio/microwave link between nearby devices.

29. A typical microwave oven frequency and wavelength given in the unit are about:

(A) 2.45 GHz and 12.2 cm
(B) 50 Hz and 6000 km
(C) 2.45 Hz and 12.2 km
(D) 400 nm and 750 nm

Correct Answer: A

Explanation: Household ovens are designed around that microwave band.

30. A microwave oven cooks food mainly by:

(A) inducing fission in uranium
(B) making food molecules vibrate so their energy appears as heat
(C) emitting gamma rays from cobalt-60
(D) scattering blue sky light

Correct Answer: B

Explanation: Molecular agitation thermalises as heat throughout the food.

31. Weather services can monitor rain with microwaves because water:

(A) reflects all radio forever
(B) emits only X-rays
(C) absorbs microwaves, so a weaker received signal means more rain along the path
(D) stops Earth's rotation

Correct Answer: C

Explanation: Weather services can monitor rain with microwaves because water absorbs microwaves, so a weaker received signal means more rain along the path.

32. The name infrared means:

(A) above violet
(B) inside the nucleus
(C) the same as gamma
(D) below red, just beyond the long-wavelength end of visible light

Correct Answer: D

Explanation: The name infrared means below red, just beyond the long-wavelength end of visible light.

33. Infrared is emitted or absorbed in connection with:

(A) molecular vibrations and rotations, and by objects because of their temperature
(B) only nuclear proton decay
(C) only compass needles
(D) only slip rings

Correct Answer: A

Explanation: Infrared is emitted or absorbed in connection with molecular vibrations and rotations, and by objects because of their temperature.

34. A TV remote typically sends commands as:

(A) alpha particles
(B) infrared beams of different frequencies for different buttons
(C) 50 Hz a.c. on the mains
(D) ultraviolet-C from ozone

Correct Answer: B

Explanation: Each key launches a coded IR pulse that the receiver recognises.

35. A passive intruder alarm can trigger because a person:

(A) emits gamma rays
(B) stops all visible light in the universe
(C) emits extra infrared from body heat
(D) reverses Earth's magnetic field

Correct Answer: C

Explanation: A sudden rise in IR is treated as an intrusion (or, similarly, a flame).

36. An active IR alarm may use an LED and a photodiode so that the alarm sounds when:

(A) the beam is continuous forever
(B) the Sun sets only
(C) a transformer steps down voltage
(D) the infrared beam is interrupted

Correct Answer: D

Explanation: An active IR alarm may use an LED and a photodiode so that the alarm sounds when the infrared beam is interrupted.

37. Infrared is useful in glass optical fibres because that wavelength band has:

(A) relatively low absorption, so data can travel far with small loss
(B) very high absorption in glass
(C) zero speed
(D) only ionizing energy

Correct Answer: A

Explanation: Low-loss windows in glass make IR a practical carrier for long-distance fibre links.

38. Light (or IR) stays in an optical fibre mainly by:

(A) magnetic induction in an iron core
(B) total internal reflection at the core–cladding boundary
(C) alpha shielding in lead
(D) Rayleigh scattering in nitrogen only

Correct Answer: B

Explanation: The core has a higher refractive index than the cladding, so rays bounce along the fibre.

39. Thermal imaging cameras form pictures from:

(A) ultraviolet fluorescence of banknotes only
(B) 50 Hz generator e.m.f.
(C) infrared emitted by objects according to their temperature
(D) alpha tracks in gold foil

Correct Answer: C

Explanation: Thermal imaging cameras form pictures from infrared emitted by objects according to their temperature.

40. About half of the solar radiation reaching Earth is in the:

(A) gamma-ray band
(B) radio band below 1 Hz

(C) X-ray diagnostic band only
(D) infrared region

Correct Answer: D

Explanation: The Sun's 6000 K surface puts a large fraction of its output into IR as well as visible light.

41. Visible light is the narrow band to which:

(A) the normal human eye responds
(B) Geiger counters respond
(C) only transformers respond
(D) only smoke alarms respond

Correct Answer: A

Explanation: Vision is our detector for that small slice of the spectrum.

42. In the eye, focused light is converted to neural signals at the:

(A) cornea only, with no further processing
(B) retina, then processed by the brain
(C) lens alone without a retina
(D) outer ear

Correct Answer: B

Explanation: In the eye, focused light is converted to neural signals at the retina, then processed by the brain.

43. The word ultraviolet means:

(A) below red
(B) inside a nucleus
(C) above violet, just beyond the short-wavelength end of visible light
(D) the same as microwave

Correct Answer: C

Explanation: UV frequencies continue upward from violet.

44. UV-A, UV-B, and UV-C in the unit are distinguished mainly by:

(A) their speed in vacuum
(B) whether they are transverse
(C) whether they need a medium
(D) wavelength bands (UV-A longest, UV-C shortest among the three)

Correct Answer: D

Explanation: UV-A is about 320–400 nm, UV-B 290–320 nm, and UV-C 220–290 nm.

45. The ozone layer absorbs:

(A) most UV-B and all UV-C, so nearly all UV at the ground is UV-A
(B) all radio waves
(C) all visible light
(D) Earth's entire magnetic field

Correct Answer: A

Explanation: About 99% of solar UV reaching the surface is UV-A.

46. Fluorescence is the process in which a material absorbs higher-energy radiation such as UV and:

(A) emits alpha particles
(B) re-emits lower-energy (often visible) light
(C) becomes a transformer
(D) stops all scattering

Correct Answer: B

Explanation: Security marks and banknote fibres glow under a UV lamp for that reason.

47. UV sterilisation of water works by:

(A) making the water radioactive
(B) converting water to ozone gas only

(C) killing microorganisms without adding chemicals
(D) inducing nuclear fission

Correct Answer: C

Explanation: UV damages microbes; the water itself is not turned into a radioactive source.

48. Medical imaging with X-rays is called:

(A) radio astronomy
(B) Rayleigh scattering
(C) electromagnetic induction
(D) radiology

Correct Answer: D

Explanation: Medical imaging with X-rays is called radiology.

49. Airport-style body scanners mentioned in the unit use:

(A) very low-energy X-rays that scatter back to reveal objects
(B) very high-energy gamma sterilisation of food
(C) 50 Hz mechanical generators
(D) alpha particles from americium only

Correct Answer: A

Explanation: Backscatter of soft X-rays can show metallic threats under clothing.

50. High-dose X-rays in therapy are used to:

(A) cook food in a 2.45 GHz oven
(B) damage DNA of cancer cells so they stop dividing
(C) broadcast FM radio
(D) magnetise a solenoid

Correct Answer: B

Explanation: Imaging uses low dose; treatment uses a high dose aimed at a tumour.

51. Radiographic testing of metals looks for internal cracks because a crack lets:

(A) fewer X-rays through, appearing bright always
(B) only sound through
(C) more X-rays through the thinner path, so the flaw shows on the detector
(D) only UV-A through

Correct Answer: C

Explanation: It is a non-destructive test of welds and components.

52. Gamma rays are electromagnetic waves with:

(A) the longest wavelength in the spectrum
(B) zero frequency
(C) only audio frequencies
(D) the shortest wavelength and highest photon energy

Correct Answer: D

Explanation: They are nuclear in origin and highly penetrating.

53. In nuclear-medicine imaging, a gamma camera or PET scanner detects:

(A) gamma rays from a tracer that has concentrated in tissue
(B) sound from a loudspeaker
(C) Earth's 11° magnetic tilt
(D) IR from a TV remote

Correct Answer: A

Explanation: In nuclear-medicine imaging, a gamma camera or PET scanner detects gamma rays from a tracer that has concentrated in tissue.

54. Food and medical goods may be sterilised with gamma rays from:

(A) a 50 Hz generator coil

(B) cobalt-60
(C) a glass prism
(D) a Bluetooth speaker

Correct Answer: B

Explanation: Cobalt-60 is a practical sealed gamma source for irradiation plants.

55. After gamma sterilisation of food, the food:

(A) becomes a strong radioisotope
(B) emits only microwaves
(C) does not itself become radioactive
(D) turns into lead

Correct Answer: C

Explanation: After gamma sterilisation of food, the food does not itself become radioactive.

56. Compared with X-rays, gamma rays used in industrial NDT typically have:

(A) less penetrating power
(B) identical household oven frequencies
(C) only heating effects like IR lamps
(D) greater penetrating power in dense materials

Correct Answer: D

Explanation: Compared with X-rays, gamma rays used in industrial NDT typically have greater penetrating power in dense materials.

57. A gamma knife is a medical technique that uses:

(A) focused gamma beams to treat brain lesions without opening the skull
(B) a steel blade heated by microwaves
(C) only UV banknote lamps
(D) a split-ring motor

Correct Answer: A

Explanation: Many beams meet at the target so surrounding tissue receives a lower dose.

58. Ionizing electromagnetic radiation is able to:

(A) only warm tissue slightly like a weak IR lamp
(B) remove tightly bound electrons from atoms, forming ions
(C) travel only in copper wires
(D) exist only below radio frequencies

Correct Answer: B

Explanation: UV (especially shorter UV), X-rays, and gamma rays can ionize; radio, micro, IR, and ordinary visible generally cannot.

59. Which set is classed as non-ionizing in the unit's discussion?

(A) X-rays and gamma rays
(B) UV-C, X-rays, and gamma rays
(C) radio waves, microwaves, infrared, and ordinary visible light
(D) only gamma rays

Correct Answer: C

Explanation: Radio waves, microwaves, infrared, and ordinary visible light — this correctly answers the question.

60. A listed hazard of intense microwaves is damage to:

(A) only transformer cores
(B) Earth's geographic poles
(C) carbon-14 dating
(D) sensitive organs such as the eyes (for example cataracts) and tissue heating

Correct Answer: D

Explanation: High-power microwaves deposit heat; the eye is vulnerable.

61. A listed hazard of ultraviolet radiation is:

(A) sunburn, raised skin-cancer risk, and cataracts
(B) interference with pacemakers only
(C) only I^2R loss in cables
(D) only Bluetooth dropout

Correct Answer: A

Explanation: A listed hazard of ultraviolet radiation is sunburn, raised skin-cancer risk, and cataracts.

62. X-rays and gamma rays are hazardous mainly because they:

(A) are slower than sound
(B) ionize tissue, can mutate cells, and can cause radiation sickness at high dose
(C) cannot penetrate skin
(D) are identical to radio

Correct Answer: B

Explanation: X-rays and gamma rays are hazardous mainly because they ionize tissue, can mutate cells, and can cause radiation sickness at high dose.

63. Scattering of light is stronger for:

(A) longer wavelengths
(B) all wavelengths equally always
(C) shorter wavelengths
(D) only radio waves

Correct Answer: C

Explanation: Scattering of light is stronger for shorter wavelengths.

64. The daytime sky looks blue mainly because:

(A) the Sun emits only blue light
(B) oceans reflect onto the sky exclusively
(C) ozone emits blue lasers
(D) air molecules scatter shorter visible wavelengths in all directions (Rayleigh scattering)

Correct Answer: D

Explanation: Blue is scattered toward the observer from the whole sky vault.

65. The gases mainly responsible for that molecular scattering are:

(A) nitrogen and oxygen
(B) only radon and uranium
(C) only cobalt-60
(D) only water in microwave ovens

Correct Answer: A

Explanation: N2 and O2 particles are comparable in scale to blue wavelengths.

66. At sunset the Sun looks redder because sunlight then travels:

(A) a shorter path through air, keeping all blue
(B) a longer atmospheric path, so most blue has been scattered away
(C) only through vacuum with no air
(D) through a transformer core

Correct Answer: B

Explanation: The remaining beam is enriched in longer red and orange wavelengths.

67. Light can be modelled as massless particles called photons that carry:

(A) rest mass and negative charge
(B) only magnetic monopoles
(C) energy and momentum but no rest mass or charge
(D) only nucleon number A

Correct Answer: C

Explanation: Planck's quanta are uncharged and massless yet transport E = hf and momentum.

68. Until the early twentieth century, interference, diffraction, and polarisation supported a:

(A) purely particle model only
(B) nuclear fission model of light
(C) sound-wave identity of light
(D) wave model of light

Correct Answer: D

Explanation: Those effects are wave signatures; Planck then added the quantum picture.

69. Max Planck introduced the idea that light energy comes in:

(A) discrete packets (quanta or photons)
(B) continuous arbitrary amounts only
(C) alpha particles
(D) 50 Hz mechanical cycles only

Correct Answer: A

Explanation: The particle aspect of light begins with quantised energy hf.

70. If $c = 3.0 \times 10^8$ m/s and $\lambda = 500$ nm, the frequency is:

(A) 1.5×10^{14} Hz
(B) 6.0×10^{14} Hz
(C) 6.0×10^{8} Hz
(D) 500 Hz

Correct Answer: B

Explanation: If $c = 3.0 \times 10^8$ m/s and $\lambda = 500$ nm, the frequency is 6.0×10^{14} Hz.

71. Because E is proportional to f, ultraviolet photons compared with infrared photons have:

(A) less energy
(B) identical energy always
(C) more energy
(D) zero energy

Correct Answer: C

Explanation: UV has higher frequency, so each photon is more energetic.

72. Primary spectral colours each have a characteristic wavelength, whereas white is:

(A) one extra primary wavelength
(B) identical to gamma
(C) a radio standing wave
(D) a mixture without a single wavelength

Correct Answer: D

Explanation: White has no unique λ; a prism can recover the constituents.

73. Spectroscopy studies matter by seeing which EM wavelengths a sample:

(A) absorbs or emits, revealing atomic and molecular structure
(B) ignores completely always
(C) converts into 50 Hz a.c.
(D) uses as a compass

Correct Answer: A

Explanation: Only photons matching energy-level differences are strongly absorbed.

74. A diffraction grating, like a prism, can be used to:

(A) step down household voltage
(B) spread visible light into its spectrum
(C) induce Lenz's law in a coil
(D) date fossils with carbon-14

Correct Answer: B

Explanation: A diffraction grating, like a prism, can be used to spread visible light into its spectrum.

75. The human cornea and lens absorb the lowest ultraviolet frequencies, so those UV photons:

(A) always reach the retina
(B) become radio waves
(C) usually do not reach the retina
(D) magnetise the eye

Correct Answer: C

Explanation: The human cornea and lens absorb the lowest ultraviolet frequencies, so those UV photons usually do not reach the retina.

76. Thermal cameras remain useful in smoke because they image:

(A) only reflected blue sky light
(B) alpha radiation
(C) sound standing waves
(D) infrared heat that can penetrate smoke better than visible light

Correct Answer: D

Explanation: IR imaging is a heat picture, not a visible-light photograph.

77. Quartz heaters (infrared lamps) warm people efficiently because humans:

(A) absorb infrared well
(B) reflect all IR
(C) emit only gamma rays
(D) are transparent to IR like glass fibre

Correct Answer: A

Explanation: Skin absorbs IR, so the radiation becomes thermal energy in the body.

78. Safety with ionizing EM radiation emphasises:

(A) increasing exposure time without limit
(B) shielding, limiting time, and keeping distance
(C) removing all transformers
(D) using only higher frequency always

Correct Answer: B

Explanation: Dose falls when you spend less time near a source, stand farther away, and put absorber in between.

79. The unit's social applications of EM waves include communication, medicine, and:

(A) only generating Earth's 11° tilt
(B) only splitting nuclei in stars
(C) security scanning, industrial inspection, and astronomy
(D) only Fleming's left-hand rule

Correct Answer: C

Explanation: The same spectrum serves many technologies once wavelength is chosen to match the job.

80. Energy of photons at atomic scale is often quoted in electron-volts because the joule is:

(A) too small
(B) equal to 1 eV
(C) undefined for light
(D) inconveniently large, so 1 J = 6.25 × 10^{18} eV

Correct Answer: D

Explanation: Energy of photons at atomic scale is often quoted in electron-volts because the joule is inconveniently large, so 1 J = 6.25 × 10^{18} eV.

B. Less Important / Secondary Topics

81. Faraday and Maxwell are highlighted because they:

(A) linked electricity and magnetism into a wave theory

(B) discovered radioactivity
(C) invented the CRO phosphor
(D) measured carbon-14's half-life

Correct Answer: A

Explanation: Their work is the theoretical origin of electromagnetic waves.

82. Wavelength on an EM-wave diagram is the distance between:

(A) E and B field directions
(B) consecutive peaks of the same field oscillation
(C) the Sun and Earth
(D) two slip rings

Correct Answer: B

Explanation: One spatial period of the wave is λ.

83. FM and AM appear on spectrum charts as parts of the:

(A) gamma-ray band
(B) X-ray diagnostic band
(C) radio-wave region
(D) UV-C sterilising band

Correct Answer: C

Explanation: They are radio-frequency broadcasting modes.

84. A raindrop can form a rainbow for the same reason as a prism:

(A) it magnetises rain
(B) it emits cobalt-60 gammas
(C) it induces 50 Hz
(D) it disperses sunlight into colours

Correct Answer: D

Explanation: A raindrop can form a rainbow for the same reason as a prism it disperses sunlight into colours.

85. Secondary colours such as white do not have:

(A) a single characteristic wavelength
(B) any photons
(C) any frequency component
(D) any speed in vacuum

Correct Answer: A

Explanation: They are combinations, not spectral lines.

86. GPS receivers are listed among applications of:

(A) alpha decay
(B) radio waves
(C) nuclear fission energy only
(D) loudspeaker cones

Correct Answer: B

Explanation: Navigation signals are radio-frequency EM waves from satellites.

87. A mixer in a radio transmitter combines audio with a high-frequency oscillator to produce:

(A) a nuclear isotope
(B) a step-down of 220 V
(C) a modulated radio-frequency output
(D) a magnetic south pole

Correct Answer: C

Explanation: A mixer in a radio transmitter combines audio with a high-frequency oscillator to produce a modulated radio-frequency output.

88. Multiple satellites are used for TV so that:

(A) ozone is destroyed faster
(B) microwaves become ionizing
(C) the sky becomes red at noon
(D) coverage can be global and more continuous

Correct Answer: D

Explanation: Multiple satellites are used for TV so that coverage can be global and more continuous.

89. Bluetooth needs no router because devices:

(A) communicate directly over a short range
(B) use alpha particles
(C) require a 220 V transformer between them
(D) must see the Sun

Correct Answer: A

Explanation: It is a peer-to-peer low-power link.

90. Fire alarms can use IR sensors because flames emit:

(A) only radio at 50 Hz
(B) large amounts of infrared
(C) only UV-C that ozone blocks
(D) Earth's magnetic field

Correct Answer: B

Explanation: Hot combustion products are strong IR sources.

91. The Sun's photosphere temperature given in the unit is about:

(A) 6000 °C exactly as 0 K
(B) 3×10^8 K
(C) 6000 K
(D) 25 μT

Correct Answer: C

Explanation: The Sun's photosphere temperature given in the unit is about 6000 K.

92. Night-vision devices often detect:

(A) ultraviolet banknote glow only
(B) fission neutrons
(C) slip-ring current
(D) infrared from warm bodies and convert it to a visible image

Correct Answer: D

Explanation: Night-vision devices often detect infrared from warm bodies and convert it to a visible image.

93. Photography sensors capture light that is:

(A) reflected or emitted by the subject in the visible band
(B) only emitted by gamma knives
(C) only 2.45 GHz
(D) only Earth's B field

Correct Answer: A

Explanation: Cameras are built to mimic how the eye samples visible wavelengths.

94. Pakistani banknotes in the unit fluoresce under UV as a:

(A) transformer test
(B) security feature against counterfeits
(C) method of carbon dating
(D) source of 50 Hz a.c.

Correct Answer: B

Explanation: Pakistani banknotes in the unit fluoresce under UV as a security feature against counterfeits.

95. UV water treatment is described as having no danger of:

(A) killing microbes
(B) using any energy
(C) chemical ‘overdosing’ of disinfectant
(D) being fast

Correct Answer: C

Explanation: You are not adding a residual chemical dose the way chlorine can be overdosed.

96. Brachytherapy places a radioactive source:

(A) in Earth orbit as a TV satellite
(B) inside a microwave oven magnetron
(C) on a CRO phosphor
(D) in or near a tumour

Correct Answer: D

Explanation: Internal placement concentrates dose where it is needed.

97. A listed radio-wave hazard is interference with:

(A) pacemakers and hearing aids, plus tissue heating at high intensity
(B) only optical fibres’ IR window
(C) only carbon-14
(D) only solenoid polarity

Correct Answer: A

Explanation: Strong RF can both heat tissue and disturb electronics.

98. Intense visible light can cause:

(A) nuclear fusion in the retina always
(B) eye strain and, at extremes, retinal damage
(C) a step-up of household voltage
(D) Lenz’s law in a coil

Correct Answer: B

Explanation: The eye is a visible-light detector and can be overloaded.

99. Gamma-ray environmental risk is increased by:

(A) using Bluetooth headphones
(B) wearing sunglasses
(C) accidents or poor disposal of intense sources
(D) watching FM television

Correct Answer: C

Explanation: High-energy photons from unsecured sources irradiate people and the surroundings.

100. Rayleigh scattering is named in the unit as the process that:

(A) induces e.m.f. in generators
(B) splits heavy nuclei
(C) dates rocks with uranium
(D) makes the sky blue and contributes to red sunsets

Correct Answer: D

Explanation: Wavelength-dependent scattering by molecules is the optical mechanism.

101. In the evening, blue light is said to be:

(A) scattered out of the long slant path, leaving redder light
(B) generated in the soil
(C) converted into X-rays
(D) absorbed only by transformers

Correct Answer: A

Explanation: The long path through air removes short wavelengths from the direct beam.

102. Photons are compared in the text to tiny bullets except that they:

(A) have large rest mass
(B) have no rest mass
(C) carry charge +2e
(D) are alpha particles

Correct Answer: B

Explanation: They are massless energy–momentum packets.

103. Polarisation of light is evidence for a:

(A) longitudinal wave in a required medium
(B) nuclear decay mode
(C) transverse electromagnetic wave
(D) 50 Hz mechanical vibration of Earth

Correct Answer: C

Explanation: Only transverse waves show polarisation as described in optics.

104. If frequency triples, photon energy:

(A) falls to one third
(B) stays hf / 3
(C) becomes mc^2 only
(D) triples

Correct Answer: D

Explanation: If frequency triples, photon energy triples.

105. Low-range X-rays overlap spectrally with:

(A) ultraviolet, while high-energy X-rays overlap low-energy gamma
(B) long radio waves
(C) sound in air
(D) Earth's 25–65 μT field

Correct Answer: A

Explanation: The named bands meet at the edges; the names also reflect how the radiation is produced.

106. A thermal image of a person is brighter in warmer patches because those regions:

(A) emit less infrared
(B) emit more infrared
(C) emit only UV-C
(D) cannot be seen through smoke

Correct Answer: B

Explanation: Radiated IR increases with temperature.

107. Door openers and some wireless clocks are listed with:

(A) gamma sterilisation
(B) alpha smoke alarms only
(C) radio-wave applications
(D) solenoid motors only

Correct Answer: C

Explanation: Short-range radio links trigger or synchronise devices.

108. The unit's closing theme is that every EM band has uses and:

(A) zero risk at any intensity
(B) identical photon energy
(C) no speed in vacuum
(D) particular hazards that grow with intensity and photon energy

Correct Answer: D

Explanation: Choose wavelength for the job, and control dose where photons can ionize or heat.