Test 1: Example #5

Note: The first answer is correct.

1. The frequency of an organ note is 33 Hz (=33 cycles per second). What is its wavelength?
   (1) 10.2 m  (2) 10.2 cm  (3) 9.1 x 10^6 m  (4) 91 m  (5) 91 cm

2. In Fig. A, which of the plots is best described by the phrase “in phase”?
   (1) 1  (2) 2  (3) 3  (4) 4  (5) 5

3. In Fig. A, which of the plots is best described by the phrase “out of phase”?
   (1) 2  (2) 1  (3) 3  (4) 4  (5) 5

4. Infrared light is light in the wavelength range
   (1) above 700 nm  (2) 400 - 700 nm  (3) 600 - 700 nm  (4) below 400 nm  (5) 0

5. The wavelength of a green light is 500 nm. What is its frequency?
   (1) 6 x 10^{14} Hz  (2) 1.67 x 10^{14} Hz  (3) 6.7 x 10^8 Hz  (4) 6000 Hz  (5) 6.7 x 10^{14} Hz

6. A radio wave
   (1) is an electromagnetic wave.
   (2) moves at the speed of sound.
   (3) consists of air density fluctuations.
   (4) is visible light.
   (5) is in the x-ray range of light.

7. What is the wavelength of the wave depicted in Fig. B?
   (1) 10 nm  (2) 5 nm  (3) 12 nm  (4) 20 nm  (5) 30 nm

8. The amplitude of the wave of Fig. B is
   (1) 1  (2) 2  (3) 1.5  (4) 0  (5) 4

9. The index of refraction of a medium is 2. The speed of light in this medium is
   (1) 1.5 x 10^8 m/s  (2) 3 x 10^8 m/s  (3) 0  (4) 335 m/s  (5) 6 x 10^8 m/s
10. The amplitude of a wave is related to its frequency, $f$, and velocity, $v$, as
   (1) they are unrelated
   (2) $A = vf$
   (3) $A = f^2$
   (4) $A = v/f$
   (5) $A = f/v$

11. Passing white light through a prism produces
   (1) not enough information to answer question
   (2) all the colors of the rainbow
   (3) white light
   (4) most of the colors of the rainbow
   (5) infrared light

12. A given wave has wavelength 1 meter and frequency 300 Hz. Its velocity is
   (1) 300 m/s
   (2) 300 cm/s
   (3) 0.005 m/s
   (4) $3 \times 10^8$ m/s
   (5) it depends on the type of wave

13. Black-body radiation is expected from
   (1) an incandescent bulb
   (2) a neon bulb
   (3) a fluorescent bulb
   (4) any light source
   (5) a black-light source

14. If two light bulbs are rated at 100 watts, this means that
   (1) they cost the same to operate
   (2) they produce the same amount of visible light
   (3) they each produce 100 watts of visible light
   (4) their peak is in the visible range
   (5) they are made by GE

15. Given two black-body sources, one at 2000 K (K = degrees Kelvin), the other at 3000 K, which of the following is true?
   (1) that at 3000 K is brighter
   (2) that at 2000 K is brighter
   (3) the apparent brightness is the same
   (4) each source appears black
   (5) one of the sources is as hot as the sun

16. An electron in a hydrogen atom makes a transition from the tenth level to the first level. The wavelength of the light emitted is (approximately)
   (1) 95 nm  (2) 950 nm  (3) $9.5 \times 10^5$ nm  (4) 475 nm  (5) depends on the electron
17. In Fig. C, a spectrum of a particular color light is sketched. The color looks
   (1) green  (2) red  (3) violet  (4) white  (5) black

18. In Fig. D, a spectrum of a particular color light is sketched. The color appears
   (1) white  (2) green  (3) blue  (4) black  (5) violet

19. Light is incident on a surface. Which of the following is true (Notation: R = percent of
    reflected light intensity, A = percent of absorbed light intensity, T = percent of transmitted light
    intensity)
   (1) R + T + A = 100 %
   (2) R is greater than A
   (3) R + T + 50 %
   (4) R = 0 if the surface is opaque
   (5) A = 0 if the surface is translucent

20. Transitions of electrons between a pair of their energy levels accounts for
   (1) monochromatic (single wavelength) light  (2) white light  (3) a discrete spectrum
   (4) a continuous spectrum  (5) ultraviolet light

21. Turning two polarizers so that they are oriented 90 degrees with respect to one another
   (1) transmits no light  (2) transmits all light  (3) transmits 50 % of the incident light
   (4) transmits 25 % of the incident light  (5) transmits only visible light

22. A 15 watt bulb delivers how much power?
   (1) 15 joules/sec  (2) 15 Ev/sec  (3) 150 joules/sec  (4) 1.6 x 10^{-19} joules/sec
   (5) 1.5 joules/sec

For the next 3 questions refer to Fig. E where the absorption spectra of five materials are drawn.

23. Which heats up the most in sunlight?
   (1) 1  (2) 2  (3) 3  (4) 4  (5) 5

24. Which heats up the most in green light?
   (1) 4  (2) 2  (3) 1  (4) 3  (5) 5

25. Which stays coolest in violet light?
   (1) 3  (2) 1  (3) 2  (4) 4  (5) 5
For the next 4 questions refer to Fig. F, where the spectrum of a light source is shown.

26. If this is passed through the filter of Fig. G, the resulting spectrum looks like which of those in Fig. H?
(1) 1 (2) 2 (3) 3 (4) 4 (5) 5

27. Passed through a filter like that of Fig. I, the resultant color would appear
(1) purple (2) red (3) black (4) white (5) brown

28. If this is passed successively through the two filters depicted in Fig. J, the resultant color would look
(1) red (2) blue (3) violet (4) white (5) black

29. If this is passed through the filter of Fig. G and then reflected off a body with a reflectance curve as in Fig. K, the reflected light will look
(1) red (2) black (3) green (4) white (5) ultraviolet
30. Given a light source as indicated in Fig. L, in order to get red light in the frequency range 640 – 660 nm, we must pass it through which of the filters of Fig. M?

(1) there is no way to get red light out (2) filter 1 (3) filter 3 followed by filter 3 (4) filter 2 (5) filter 4 followed by filter 2

31. Polaroid sunglasses are useful because they
(1) reduce glare from the road surface preferentially (2) remove ultraviolet rays (3) correct the eye's color balance (4) remove infrared rays (5) reduce glare from all objects equally

32. Blue glass absorbs which color light?
(1) all but blue (2) only blue (3) only red (4) depends on thickness (5) there is no light absorbed

For the next 5 questions refer to Fig. N where there are five sets of reflection, transmission, and absorption curves for five different materials.

33. Illuminated by a perfect white light source, which removes most everything but green in the transmitted light?
(1) 4 (2) 1 (3) 2 (4) 3 (5) 5

34. Which, when illuminated by a perfect white light source, heats up the most?
(1) 5 (2) 1 (3) 2 (4) 3 (5) 4

35. Illuminated by a red light, which appears black?
(1) 2 (2) 1 (3) 3 (4) 4 (5) 5

36. White light passed through which of these remains white?
(1) 2 and 3 (2) 1 and 2 (3) 2 and 4 (4) 4 and 5 (5) 3 and 5

37. Which of the materials is best described as opaque
(1) 1 (2) 2 (3) 3 (4) 4 (5) 5
38. A “heat lamp” radiates heavily in the
   (1) infrared  (2) ultraviolet  (3) x rays  (4) green  (5) blue

39. The following are the additive primary colors:
   (1) red, green, blue
   (2) yellow, magenta, cyan
   (3) purple, violet, orange
   (4) yellow, green, red
   (5) red, magenta, cyan

40. Light which is absorbed by a material is largely
    (1) turned to heat
    (2) re-emitted as x rays
    (3) converted to static electricity
    (4) re-emitted immediately
    (5) converted to electrons