MULTIPLE CHOICE QUESTIONS

1. As the Sun’s rays travel through the atmosphere, they are __________ by cloud droplets or ice crystals, or by raindrops.
   a. scattered
   b. reflected
   c. refracted
   d. All of these are correct.
   e. None of these is correct.

2. The spectrum of visible light bounds the region of __________ intensity of light emitted by the Sun.
   a. maximum
   b. minimum

3. Our perception of the color of most objects on Earth is that of the visible wavelength bands __________ by the object.
   a. emitted
   b. reflected

4. The blue of the daytime sky is due primarily to selective scattering of visible solar radiation by
   a. atmospheric aerosols
   b. clouds
   c. nitrogen and oxygen molecules
   d. water droplets

5. If air molecules only scattered the __________ wavelengths of visible light, the sky would be red.
   a. longest
   b. shortest

6. Violet light is scattered much more efficiently than red light in the optical effect known as
   a. Mie scattering.
   b. Rayleigh scattering.

7. Because of scattering, the setting Sun turns the horizon __________ on a clear evening.
   a. white
   b. yellow
   c. red
d. blue
e. violet

8. The cloud-free highly rarefied atmosphere of the Moon is
a. white.
b. green.
c. blue.
d. black.
e. red.

9. Scattering of light is wavelength dependent if the radius of the scattering particles is
   ___________ the wavelength of the scattered light.
a. much less than
b. much larger than

10. Most atmospheric aerosols scatter visible solar radiation
   a. primarily at the violet end of the spectrum.
b. primarily at the red end of the spectrum.
c. with equal efficiency at all wavelengths.

11. Mie scattering explains
   a. the blue of the daytime sky.
b. enhanced red and orange sunsets following a volcanic eruption.

12. A halo around the Sun is caused by refraction of sunlight by
   a. raindrops.
b. liquid cloud droplets.
c. ice crystals composing high, thin clouds.
d. All of these are correct.
e. None of these is correct.

13. A type of cloud that may produce a halo around the Sun or Moon is
   a. any warm cloud.
b. stratus.
c. nimbostratus.
d. cumulonimbus.
e. cirrostratus.

14. The speed of light is _____ in air than in water
   a. smaller
b. greater
c. equal

15. The probability of seeing a halo is greatest if clouds composed of
   a. liquid droplets are in the same areas of the sky as the Sun.
b. liquid droplets are in the sky opposite the Sun.
c. ice crystals are in the same area of the sky as the Sun.
d. ice crystals are in the sky opposite the Sun.

16. The most commonly seen halo has a radius of about ______ degrees about the Sun or Moon.
   a. 22
   b. 46
   c. 66
   d. 7

17. At sunrise in middle latitudes, look for a sundog toward the __________.
   a. north
   b. south
   c. east
   d. west

18. Rainbows are caused by ______ of sunlight by falling raindrops.
   a. reflection
   b. refraction
   c. both refraction and internal reflection
   d. diffraction
   e. None of these is correct.

19. The color that is refracted (bent) the most as sunlight enters a raindrop is
   a. violet.
   b. blue.
   c. green.
   d. yellow.
   e. red.

20. A rainbow _____ forms when the sky is completely cloud covered.
   a. sometimes
   b. usually
   c. never

21. A rainbow appears to an observer who __________ and __________.
   a. is facing the Sun . . . . has his or her back to a distant rain shower
   b. has his or her back to the Sun . . . . is facing a distant rain shower

22. In a secondary rainbow, double reflection causes the colors to be
   a. in reverse order as compared to the primary rainbow.
   b. in the same order as the primary rainbow.

23. A corona is caused by ______ of moonlight around water droplets that compose a thin layer
    of altocumulus or stratocumulus clouds.
   a. reflection
   b. refraction
c. scattering

d. diffraction

e. absorption

24. A rainbow is most likely to be seen
a. during mid-day shower activity in the summer.
b. a few hours before sunset when it is raining to the east of the observer.
c. a few hours before sunset when it is raining to the west of the observer.
d. whenever sunlight strikes falling raindrops.

25. In the primary rainbow, light rays interact with each raindrop by
a. reflecting once and refracting once.
b. reflecting twice and refracting once.
c. reflecting once and refracting twice.
d. reflecting twice and refracting twice.

26. A glory is caused by ______ of sunlight by cloud water droplets.
a. reflection
b. refraction
c. diffraction
d. All of these optical processes contribute.
e. None of the above is correct.

27. __________ is the slight bending of a light wave as it moves along the boundary of an object, such as a water droplet.
a. Refraction
b. Reflection
c. Diffraction

28. Sunlight is refracted as it travels through the atmosphere. Hence, the image of the setting or rising Sun that we see is slightly ____________ in the sky than it would be without an atmosphere.
a. lower
b. higher

29. Illumination during __________ twilight is just adequate for outdoor activities without the need for artificial lighting.
a. astronomical
b. nautical
c. civil
d. Mie
e. Rayleigh

30. The green flash
a. appears briefly at the lower edge of the Sun at sunset or sunrise.
b. is best seen on a cloudy evening.
c. is primarily the consequence of refraction and scattering of sunlight.
d. All of the above are correct.
e. None of the above is correct.

31. Sound waves _____ require a transmitting medium.
   a. do
   b. do not

32. Low frequency sound waves can propagate __________ distances than high frequency sound waves.
   a. longer
   b. shorter

33. As wind speed increases, the speed of sound waves propagating through the atmosphere
   a. does not change
   b. increases
   c. decreases

34. Sound waves travel faster in __________ then in __________ air.
   a. cold……warm
   b. warm……cold
   c. always travels the same speed

35. __________ of sound waves in the atmosphere explains the formation of acoustic shadows.
   a. Scattering
   b. Absorption
   c. Adsorption
   d. Diffraction
   e. Refraction

36. If 15 seconds elapse between lightning flash and the sound of thunder, the lightning is about _____ km away.
   a. 15
   b. 12
   c. 9
   d. 5

37. An aircraft traveling at a speed __________ that of sound may produce a sonic boom.
   a. less than
   b. greater than

38. A fog bow forms in a similar fashion to a rainbow, but is
   a. narrower and appears almost white.
   b. narrower and has more brilliant colors.
   c. broader and appears almost white.
   d. broader and has more brilliant colors.
39. In an inferior mirage, objects appear ________ than we usually see them.
   a. lower
   b. higher

40. In a superior mirage, objects appear ________ than normal.
   a. lower
   b. higher

41. Fata Morgana, an optical phenomenon in which images of distant objects are distorted vertically so that they resemble castles or walls with spires, involves
   a. inferior mirages only.
   b. superior mirages only.
   c. the simultaneous occurrence of superior and inferior mirages.

42. At Washington, DC, length of daylight on an equinox is
   a. slightly less than 12 hours.
   b. exactly 12 hours.
   c. slightly more than 12 hours.

43. Scintillation is especially noticeable on ________ nights when rapid, small-scale fluctuations in air density alter the path of starlight through the atmosphere.
   a. cold, cloudy
   b. cold, clear
   c. warm, cloudy
   d. warm, clear

44. Illumination is at the highest level during ________ twilight.
   a. astronomical
   b. nautical
   c. civil

45. Crepuscular rays can be seen when looking ________ the Sun.
   a. in the same direction as
   b. in the direction opposite that of

46. The green flash typically lasts the longest at ________ latitudes, where the Sun rises and sets the slowest.
   a. polar
   b. tropical

47. Lightning causes a(n) ________ that produces sound waves heard as thunder.
   a. sonic boom
   b. green flash
   c. shock wave
   d. acoustic shadow
48. Heat lightning can be observed when
   a. thunderstorm cells are more than 20 km away.
   b. a thunderstorm cell is in the immediate area and the air temperature exceeds 95 °F.

49. A pilot of a supersonic aircraft _________ hear the plane’s sonic boom.
   a. can
   b. cannot

50. The pitch of aeolian sound _________ with higher wind speeds.
   a. decreases
   b. increases