General Class Study Group Chapter 3
Radio – Wave Propagation

Three questions from this chapter will be on the test.

Manual pages 1 to 4

G3B09
1. What is the maximum distance along the Earth's surface that is normally covered in one hop using the F2 region?
A. 180 miles
B. 1200 miles
C. 2500 miles
D. None; the F2 region does not support radio-wave propagation

G3B10
2. What is the maximum distance along the Earth's surface that is normally covered in one hop using the E region?
A. 180 miles
B. 1200 miles
C. 2500 miles
D. None of these choices is correct

G3C01
3. What is the average height of maximum ionization of the E region?
A. 45 miles
B. 70 miles
C. 200 miles
D. 1200 miles

G3C02
4. When can the F2 region be expected to reach its maximum height at your location?
A. At noon during the summer
B. At midnight during the summer
C. At dusk in the spring and fall
D. At noon during the winter

G3C03
5. Why is the F2 region mainly responsible for the longest-distance radio-wave propagation?
A. Because it exists only at night
B. Because it is the lowest ionospheric region
C. Because it is the highest ionospheric region
D. Because it does not absorb radio waves as much as other ionospheric regions

G3C05
6. What is the main reason the 160-, 80- and 40-meter amateur bands tend to be useful only for short-distance communications during daylight hours?
A. Because of a lack of activity

B. Because of auroral propagation
C. Because of D-region absorption
D. Because of magnetic flux

G3C12
7. Daylight fading on the 40-meter band is associated most with which ionospheric layer?
A. The F2 layer
B. The F1 layer
C. The E layer
D. The D layer

Manual pages 5 to 8

G3B01
8. If the maximum usable frequency (MUF) on the path from Minnesota to France is 24 MHz, which band should offer the best chance for a successful contact?
A. 10 meters
B. 15 meters
C. 20 meters
D. 40 meters

G3B02
9. If the maximum usable frequency (MUF) on the path from Ohio to Germany is 17 MHz, which band should offer the best chance for a successful contact?
A. 80 meters
B. 40 meters
C. 20 meters
D. 2 meters

G3B05
10. What usually happens to radio waves with frequencies below the maximum usable frequency (MUF) when they are sent into the ionosphere?
A. They are bent back to the earth
B. They pass through the ionosphere
C. They are completely absorbed by the ionosphere
D. They are bent and trapped in the ionosphere to circle the Earth

G3B11
11. What happens to HF propagation when the lowest usable frequency (LUF) exceeds the maximum usable frequency (MUF)?
A. No HF radio frequency will support communications along an ionospheric signal path
B. The lowest usable frequency can never exceed the maximum usable frequency
C. The ionospheric absorption of HF radio signals increases by 3 dB along every signal path
D. All ionospheric propagation paths are still usable, but the signal-to-noise ratio decreases

G3B12
12. What factors affect the maximum usable frequency (MUF)?

A. Path distance and locations
B. Time of day and season
C. Solar radiation and ionospheric disturbances
D. All of these choices are correct

G3B13
13. How might a skywave signal sound if it arrives at your receiver by both short path and long path propagation?
A. Periodic fading every 10 seconds
B. Signal strength increased by 3 dB
C. Signal strength decreased by 3 dB
D. A well-defined echo can be heard

G3B14
14. A short distance hop on 10 meters might indicate what conditions on 6 meters?
A. The MUF exceeds 50 MHz
B. Absolutely no chance of a skywave 6-meter band opening
C. 6-meter ground waves will diminish
D. 10-meter propagation has no bearing on possible 6-meter propagation

G3C04
15. What is the "critical angle" as used in radio-wave propagation?
A. The lowest takeoff angle that will return a radio wave to the earth under specific ionospheric conditions
B. The compass direction of a distant station
C. The compass direction opposite that of a distant station
D. The highest takeoff angle that will return a radio wave to the earth under specific ionospheric conditions

G3C11
16. Which is true about ionospheric absorption near the maximum usable frequency (MUF)?
A. Absorption will be minimum
B. Absorption is independent of frequency
C. Absorption approaches maximum
D. There is no correlation between MUF and absorption

Manual pages 8 to 10

G3A04
17. What is solar flux?
A. The density of the sun's magnetic field
B. The radio energy emitted by the sun
C. The number of sunspots on the side of the sun facing the earth
D. A measure of the tilt of the earth's ionosphere on the side toward the sun

G3A05
18. What is the solar-flux index?
A. A measure of solar activity that is taken annually
B. A measure of solar activity that compares daily readings with results

from the last six months
C. Another name for the American sunspot number
D. A measure of solar activity that is taken at a specific frequency

G3A09
19. When sunspot numbers are high, what is the effect on radio communications?
A. High-frequency radio signals are absorbed
B. Frequencies above 300 MHz become usable for long-distance communication
C. Long-distance communication in the upper HF and lower VHF range is enhanced
D. High-frequency radio signals become weak and distorted

G3A10
20. What is the sunspot number?
A. A daily index of sunspot activity
B. The number of sunspots observed during one solar rotation
C. The number of sunspots observed during a sunspot cycle
D. The number of sunspots observed averaged over a seven day period

G3A11
21. What is the sunspot cycle?
A. The 9- to 11-year periods when sunspots move from the sun's pole to its equatorial region
B. The 9- to 11-year periods when sunspots cause coronal holes to appear
C. The approximately 11-year variation in the sunspot number
D. The approximately 11-year periods when sunspots combine to form flares

G3B03
22. If the HF radio-wave propagation (skip) is generally good on the 24-MHz and 28-MHz bands for several days, when might you expect a similar condition to occur?
A. 7 days later
B. 14 days later
C. 28 days later
D. 90 days later

G3B04
23. What is one way to determine if the maximum usable frequency (MUF) is high enough to support 28-MHz propagation between your station and western Europe?
A. Listen for signals on a 10-meter beacon frequency
B. Listen for signals on a 20-meter beacon frequency
C. Listen for signals on a 39-meter broadcast frequency
D. Listen for WWVH time signals on 20 MHz

G3B06
24. Where would you tune to hear beacons that would help you determine propagation conditions on the 20-meter band?
A. 28.2 MHz
B. 21.1 MHz
C. 14.1 MHz
D. 18.1 MHz

25. G3B07
During periods of low solar activity, which frequencies are the least reliable for long-distance communication?
A. Frequencies below 3.5 MHz
B. Frequencies near 3.5 MHz
C. Frequencies on or above 10 MHz
D. Frequencies above 20 MHz

G3B08
26. At what point in the solar cycle does the 20-meter band usually support worldwide propagation during daylight hours?
A. At the summer solstice
B. Only at the maximum point of the solar cycle
C. Only at the minimum point of the solar cycle
D. At any point in the solar cycle

Manual pages 10 to 12

G3A01
27. What can be done at an amateur station to continue communications during a sudden ionospheric disturbance?
A. Try a higher frequency
B. Try the other sideband
C. Try a different antenna polarization
D. Try a different frequency shift

G3A02
28. What effect does a sudden ionospheric disturbance have on the day-time ionospheric propagation of HF radio waves?
A. It disrupts higher-latitude paths more than lower-latitude paths
B. It disrupts signals on lower frequencies more than those on higher frequencies
C. It disrupts communications via satellite more than direct communications
D. None, only areas on the night side of the earth are affected

G3A03
29. How long does it take the increased ultraviolet and X-ray radiation from solar flares to affect radio-wave propagation on the earth?
A. The effect is almost instantaneous
B. 1.5 minutes
C. 8 minutes
D. 20 to 40 hours

G3A06
30. What is a geomagnetic disturbance?
A. A sudden drop in the solar-flux index
B. A shifting of the earth's magnetic pole
C. Ripples in the ionosphere
D. A dramatic change in the earth's magnetic field over a short period of time

G3A07
31. At which latitudes are propagation paths more sensitive to geomagnetic disturbances?
A. Those greater than 45 degrees latitude
B. Those between 5 and 45 degrees latitude
C. Those near the equator
D. All paths are affected equally

G3A08
32. What can be the effect of a major geomagnetic storm on radio-wave propagation?
A. Improved high-latitude HF propagation
B. Degraded high-latitude HF propagation
C. Improved ground-wave propagation
D. Improved chances of UHF ducting

G3A12
33. What is the K-index?
A. A linear index of solar activity
B. A measure of geomagnetic stability
C. An index of solar flux measured at Boulder, Colorado
D. A daily value measured on a scale from 0 to 400 to express the range of disturbance of the geomagnetic field

G3A13
34. What is the A-index?
A. A monthly linear index of solar activity
B. An weekly index of solar flux measured at Boulder, Colorado
C. A daily value measured on a scale from 0 to 400 to express the range of disturbance of the geomagnetic field
D. An index used by NOAA to correlate the visual color wavelengths seen with Aurora Borealis (Northern Lights)

G3A14
35. How does solar coronal hole activity affect radio communications?
A. The activity emits charged particles that improve HF communications
B. The activity emits charged particles that improve VHF/UHF ducting
C. The activity emits charged particles that usually disrupt HF communications
D. The activity emits charged particles, but they never reach Earth's magnetosphere

G3A15
36. How long does it take charged particles from coronal mass ejections (CMEs) to affect radio-wave propagation on the earth?
A. Almost instantaneously
B. About 5 minutes
C. About 8 minutes
D. 20 to 40 hours

G3A16
37. What might result during periods of high geomagnetic activity?
A. A visible aurora
B. Excellent high-frequency radio conditions
C. Poor 6-meter conditions
D. F-layer absorption

Manual pages 13 to 15

G3C06
38. What is a characteristic of HF scatter signals?
A. High intelligibility
B. A wavering sound
C. Reversed modulation
D. Reversed sidebands

G3C07
39. What makes HF scatter signals often sound distorted?
A. Auroral activity and changes in the earth's magnetic field
B. Propagation through ground waves that absorb much of the signal
C. The state of the E-region at the point of refraction
D. Energy scattered into the skip zone through several radio-wave paths

G3C08
40. Why are HF scatter signals usually weak?
A. A part of the signal energy is propagated into the skip zone
B. Auroral activity absorbs most of the signal energy
C. Propagation through ground waves absorbs most of the signal energy
D. The F region of the ionosphere absorbs most of the signal energy

G3C09
41. What type of radio-wave propagation allows a signal to be detected at a distance too far for ground-wave propagation but too near for normal sky-wave propagation?
A. Ground wave
B. Scatter
C. Sporadic-E skip
D. Short-path skip

G3C10
42. When does scatter propagation on the HF bands most often occur?
A. When the sunspot cycle is at a minimum and D-region absorption is high
B. At night
C. When the F1 and F2 regions are combined
D. When communicating on frequencies above the maximum usable frequency (MUF)