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Advanced Qualification Question Bank for Amateur Radio Operator Certificate Examinations

Canada

Foreword:
This question bank contains the questions that will be used effective the date printed on the title page, for making Advanced Qualification examinations for the Amateur Radio Operator Certificate.
The correct choice of the four suggested answers appears in brackets following each question identifier. i.e. A-001-001-001 (D)

While every reasonable effort has been made to ensure accuracy in this document, no warranty is expressed or implied.

Candidates for amateur radio operator certificate examinations are encouraged to contact the following amateur radio organizations for information on study material.

Radio Amateurs of Canada
720 Belfast Road, Suite 217
Ottawa, Ontario
K1G 0Z5
www.rac.ca

Radio Amateur du Québec inc.
4545 Pierre-de-Coubertin Avenue
C.P. 1000, Succursale M
Montréal, Quebec
H1V 3R2
www.raqi.qc.ca

Instructions for examiners are contained in Radiocommunication Information Circular RIC-1, Guide for Examiners Accredited to Conduct Examinations for the Amateur Radio Operator Certificate.

For additional information, please contact the Amateur Radio Service Centre:

Industry Canada
Amateur Radio Service Centre
2 Queen Street East
Sault Ste. Marie, ON
P6A 1Y3

E-mail address: spectrum.amateur@ic.gc.ca
Telephone: 1-888-780-3333 (Toll free)
Fax number: 1-705-941-4607

A-001-001-001 **(A)**

What is the meaning of the term "time constant" in an RL circuit?

A The time required for the current in the circuit to build up to 63.2% of the maximum value
B The time required for the current in the circuit to build up to 36.8% of the maximum value
C The time required for the voltage in the circuit to build up to 63.2% of the maximum value
D The time required for the voltage in the circuit to build up to 36.8% of the maximum value

A-001-001-002 **(A)**

What is the term for the time required for the capacitor in an RC circuit to be charged to 63.2% of the supply voltage?

A One time constant
B An exponential rate of one
C A time factor of one
D One exponential period

A-001-001-003 **(B)**

What is the term for the time required for the current in an RL circuit to build up to 63.2% of the maximum value?

A One exponential rate
B One time constant
C An exponential period of one
D A time factor of one

A-001-001-004 **(A)**

What is the term for the time it takes for a charged capacitor in an RC circuit to discharge to 36.8% of its initial value of stored charge?

A One time constant
B A discharge factor of one
C An exponential discharge of one
D One discharge period

A-001-001-005 **(A)**

What is meant by "back EMF"?

A A voltage that opposes the applied EMF
B A current that opposes the applied EMF
C An opposing EMF equal to R times C percent of the applied EMF
D A current equal to the applied EMF

A-001-001-006 **(B)**

After two time constants, the capacitor in an RC circuit is charged to what percentage of the supply voltage?

A 36.8%
B 86.5%
C 63.2%
D 95%

A-001-001-007 **(C)**

After two time constants, the capacitor in an RC circuit is discharged to what percentage of the starting voltage?

A 86.5%
B 63.2%
C 13.5%
D 36.8%

A-001-001-008 **(D)**

What is the time constant of a circuit having a 100 microfarad capacitor in series with a 470 kilohm resistor?

A 4700 seconds
B 470 seconds
C 0.47 seconds
D 47 seconds

A-001-001-009 **(A)**

What is the time constant of a circuit having a 470 microfarad capacitor in series with a 470 kilohm resistor?

A 221 seconds
B 221 000 seconds
C 47 000 seconds
D 470 seconds

A-001-001-010 **(C)**

What is the time constant of a circuit having a 220 microfarad capacitor in series with a 470 kilohm resistor?

A 470 seconds
B 220 seconds
C 103 seconds
D 470 000 seconds

A-001-002-001 **(C)**

What is the result of skin effect?

A Thermal effects on the surface of the conductor increase impedance
B Thermal effects on the surface of the conductor decrease impedance
C As frequency increases, RF current flows in a thinner layer of the conductor, closer to the surface
D As frequency decreases, RF current flows in a thinner layer of the conductor, closer to the surface

A-001-002-002 **(A)**

What effect causes most of an RF current to flow along the surface of a conductor?

A Skin effect
B Piezoelectric effect
C Resonance effect
D Layer effect

A-001-002-003 **(D)**

Where does almost all RF current flow in a conductor?

A In a magnetic field in the centre of the conductor
B In a magnetic field around the conductor
C In the centre of the conductor
D Along the surface of the conductor

A-001-002-004 **(B)**

Why does most of an RF current flow within a very thin layer under the conductor's surface?

A Because of heating of the conductor's interior
B Because of skin effect
C Because the RF resistance of a conductor is much less than the DC resistance
D Because a conductor has AC resistance due to self-inductance

A-001-002-005 **(D)**

Why is the resistance of a conductor different for RF currents than for direct currents?

A Because of the Hertzberg effect
B Because conductors are non-linear devices
C Because the insulation conducts current at high frequencies
D Because of skin effect

A-001-002-006 **(C)**

What unit measures the ability of a capacitor to store electrical charge?

A Watt
B Volt
C Farad
D Coulomb

A-001-002-007 **(C)**

A wire has a current passing through it. Surrounding this wire there is:

A a cloud of electrons
B a skin effect that diminishes with distance
C an electromagnetic field
D an electrostatic field

A-001-002-008 **(C)**

In what direction is the magnetic field oriented about a conductor in relation to the direction of electron flow?

A In the same direction as the current
B In the direct opposite to the current
C In the direction determined by the left-hand rule
D In all directions

A-001-002-009 **(D)**

What is the term for energy that is stored in an electromagnetic or electrostatic field?

A Kinetic energy
B Ampere-joules
C Joule-coulombs
D Potential energy

A-001-002-010 **(B)**

Between the charged plates of a capacitor there is:

A an electric current
B an electrostatic field
C a magnetic field
D a cloud of electrons

A-001-002-011 **(D)**

Energy is stored within an inductor that is carrying a current. The amount of energy depends on this current, but it also depends on a property of the inductor. This property has the following unit:

A coulomb
B farad
C watt
D henry

A-001-003-001 **(B)**

What is the resonant frequency of a series RLC circuit if R is 47 ohms, L is 50 microhenrys and C is 40 picofarads?

A 79.6 MHz
B 3.56 MHz
C 1.78 MHz
D 7.96 MHz

A-001-003-002 **(B)**

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 40 microhenrys and C is 200 picofarads?

A 1.78 kHz
B 1.78 MHz
C 1.99 kHz
D 1.99 MHz

A-001-003-003 **(D)**

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 50 microhenrys and C is 10 picofarads?

A 7.12 kHz
B 3.18 MHz
C 3.18 kHz
D 7.12 MHz

A-001-003-004 **(C)**

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 25 microhenrys and C is 10 picofarads?

A 10.1 kHz
B 63.7 kHz
C 10.1 MHz
D 63.7 MHz

A-001-003-005 **(A)**

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 3 microhenrys and C is 40 picofarads?

A 14.5 MHz
B 13.1 MHz
C 13.1 kHz
D 14.5 kHz

A-001-003-006 **(B)**

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 4 microhenrys and C is 20 picofarads?

A 17.8 kHz
B 17.8 MHz
C 19.9 MHz
D 19.9 kHz

A-001-003-007 **(D)**

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 8 microhenrys and C is 7 picofarads?

A 28.4 MHz
B 2.84 MHz
C 2.13 MHz
D 21.3 MHz

A-001-003-008 **(C)**

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 3 microhenrys and C is 15 picofarads?

A 35.4 kHz
B 23.7 kHz
C 23.7 MHz
D 35.4 MHz

A-001-003-009 **(C)**

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 4 microhenrys and C is 8 picofarads?

A 49.7 kHz
B 28.1 kHz
C 28.1 MHz
D 49.7 MHz

A-001-003-010 **(D)**

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 1 microhenry and C is 9 picofarads?

A 5.31 MHz
B 17.7 MHz
C 1.77 MHz
D 53.1 MHz

A-001-003-011 **(B)**

What is the value of capacitance (C) in a series R-L-C circuit, if the circuit resonant frequency is 14.25 MHz and L is 2.84 microhenrys?

A 2.2 picofarads
B 44 picofarads
C 2.2 microfarads
D 44 microfarads

A-001-004-001 **(B)**

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 1 microhenry and C is 10 picofarads?

A 15.9 MHz
B 50.3 MHz
C 15.9 kHz
D 50.3 kHz

A-001-004-002 **(C)**

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 2 microhenrys and C is 15 picofarads?

A 5.31 MHz
B 5.31 kHz
C 29.1 MHz
D 29.1 kHz

A-001-004-003 **(C)**

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 5 microhenrys and C is 9 picofarads?

A 3.54 MHz
B 3.54 kHz
C 23.7 MHz
D 23.7 kHz

A-001-004-004 **(A)**

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 2 microhenrys and C is 30 picofarads?

A 20.5 MHz
B 2.65 MHz
C 2.65 kHz
D 20.5 kHz

A-001-004-005 **(A)**

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 15 microhenrys and C is 5 picofarads?

A 18.4 MHz
B 2.12 kHz
C 2.12 MHz
D 18.4 kHz

A-001-004-006 **(A)**

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 3 microhenrys and C is 40 picofarads?

A 14.5 MHz
B 1.33 kHz
C 1.33 MHz
D 14.5 kHz

A-001-004-007 **(B)**

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 40 microhenrys and C is 6 picofarads?

A 10.3 kHz
B 10.3 MHz
C 6.63 MHz
D 6.63 kHz

A-001-004-008 **(A)**

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 10 microhenrys and C is 50 picofarads?

A 7.12 MHz
B 7.12 kHz
C 3.18 MHz
D 3.18 kHz

A-001-004-009 **(D)**

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 200 microhenrys and C is 10 picofarads?

A 3.56 kHz
B 7.96 MHz
C 7.96 kHz
D 3.56 MHz

A-001-004-010 **(B)**

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 90 microhenrys and C is 100 picofarads?

A 1.68 kHz
B 1.68 MHz
C 1.77 kHz
D 1.77 MHz

A-001-004-011 **(C)**

What is the value of inductance (L) in a parallel RLC circuit, if the resonant frequency is 14.25 MHz and C is 44 picofarads?

A 3.9 millihenrys
B 0.353 microhenry
C 2.8 microhenrys
D 253.8 millihenrys

A-001-005-001 **(A)**

What is the Q of a parallel RLC circuit, if it is resonant at 14.128 MHz, L is 2.7 microhenrys and R is 18 kilohms?

A 75.1
B 7.51
C 0.013
D 71.5

A-001-005-002 **(A)**

What is the Q of a parallel RLC circuit, if it is resonant at 14.128 MHz, L is 4.7 microhenrys and R is 18 kilohms?

A 43.1
B 13.3
C 0.023
D 4.31

A-001-005-003 **(D)**

What is the Q of a parallel RLC circuit, if it is resonant at 4.468 MHz, L is 47 microhenrys and R is 180 ohms?

A 7.35
B 0.00735
C 13.3
D 0.136

A-001-005-004 **(A)**

What is the Q of a parallel RLC circuit, if it is resonant at 14.225 MHz, L is 3.5 microhenrys and R is 10 kilohms?

A 31.9
B 7.35
C 0.0319
D 71.5

A-001-005-005 **(C)**

What is the Q of a parallel RLC circuit, if it is resonant at 7.125 MHz, L is 8.2 microhenrys and R is 1 kilohm?

A 0.368
B 0.273
C 2.73
D 36.8

A-001-005-006 **(C)**

What is the Q of a parallel RLC circuit, if it is resonant at 7.125 MHz, L is 10.1 microhenrys and R is 100 ohms?

A 0.00452
B 4.52
C 0.221
D 22.1

A-001-005-007 **(B)**

What is the Q of a parallel RLC circuit, if it is resonant at 7.125 MHz, L is 12.6 microhenrys and R is 22 kilohms?

A 25.6
B 39
C 22.1
D 0.0256

A-001-005-008 **(C)**

What is the Q of a parallel RLC circuit, if it is resonant at 3.625 MHz, L is 3 microhenrys and R is 2.2 kilohms?

A 31.1
B 0.031
C 32.2
D 25.6

A-001-005-009 **(C)**

What is the Q of a parallel RLC circuit, if it is resonant at 3.625 MHz, L is 42 microhenrys and R is 220 ohms?

A 4.35
B 0.00435
C 0.23
D 2.3

A-001-005-010 **(C)**

What is the Q of a parallel RLC circuit, if it is resonant at 3.625 MHz, L is 43 microhenrys and R is 1.8 kilohms?

A 54.3
B 23
C 1.84
D 0.543

A-001-005-011 **(D)**

Why is a resistor often included in a parallel resonant circuit?

A To increase the Q and decrease the skin effect
B To decrease the Q and increase the resonant frequency
C To increase the Q and decrease bandwidth
D To decrease the Q and increase the bandwidth

A-002-001-001 **(A)**

What two elements widely used in semiconductor devices exhibit both metallic and non-metallic characteristics?

A Silicon and germanium
B Galena and germanium
C Galena and bismuth
D Silicon and gold

A-002-001-002 **(B)**

In what application is gallium-arsenide used as a semiconductor material in preference to germanium or silicon?

A In bipolar transistors
B At microwave frequencies
C In high-power circuits
D At very low frequencies

A-002-001-003 **(A)**

What type of semiconductor material contains fewer free electrons than pure germanium or silicon crystals?

A P-type
B N-type
C Bipolar type
D Superconductor type

A-002-001-004 **(B)**

What type of semiconductor material contains more free electrons than pure germanium or silicon crystals?

A Superconductor
B N-type
C P-type
D Bipolar

A-002-001-005 **(C)**

What are the majority charge carriers in P-type semiconductor material?

A Free protons
B Free neutrons
C Holes
D Free electrons

A-002-001-006 **(A)**

What are the majority charge carriers in N-type semiconductor material?

A Free electrons
B Holes
C Free protons
D Free neutrons

A-002-001-007 **(C)**

Silicon, in its pure form, is:

A a semiconductor
B a conductor
C an insulator
D a superconductor

A-002-001-008 **(D)**

An element which is sometimes an insulator and sometimes a conductor is called a:

A intrinsic conductor
B N-type conductor
C P-type conductor
D semiconductor

A-002-001-009 **(A)**

Which of the following materials is used to make a semiconductor?

A Silicon
B Tantalum
C Copper
D Sulphur

A-002-001-010 **(A)**

Substances such as silicon in a pure state are usually good:

A insulators
B conductors
C tuned circuits
D inductors

A-002-001-011 **(D)**

A semiconductor is said to be doped when it has added to it small quantities of:

A protons
B ions
C electrons
D impurities

A-002-002-001 **(B)**

What is the principal characteristic of a Zener diode?

A An internal capacitance that varies with the applied voltage
B A constant voltage under conditions of varying current
C A constant current under conditions of varying voltage
D A negative resistance region

A-002-002-002 **(D)**

What type of semiconductor diode varies its internal capacitance as the voltage applied to its terminals varies?

A Zener
B Silicon-controlled rectifier
C Hot-carrier (Schottky)
D Varactor

A-002-002-003 **(C)**

What is a common use for the hot-carrier (Schottky) diode?

A As a variable capacitance in an automatic frequency control (AFC) circuit
B As a constant voltage reference in a power supply
C As VHF and UHF mixers and detectors
D As balanced mixers in FM generation

A-002-002-004 **(A)**

What limits the maximum forward current in a junction diode?

A Junction temperature
B Forward voltage
C Back EMF
D Peak inverse voltage

A-002-002-005 **(C)**

What are the major ratings for junction diodes?

A Maximum forward current and capacitance
B Maximum reverse current and peak inverse voltage (PIV)
C Maximum forward current and peak inverse voltage (PIV)
D Maximum reverse current and capacitance

A-002-002-006 **(C)**

Structurally, what are the two main categories of semiconductor diodes?

A Electrolytic and point contact
B Electrolytic and junction
C Junction and point contact
D Vacuum and point contact

A-002-002-007 **(B)**

What is a common use for point contact diodes?

A As a high voltage rectifier
B As an RF detector
C As a constant current source
D As a constant voltage source

A-002-002-008 **(D)**

What is one common use for PIN diodes?

A As a constant current source
B As a high voltage rectifier
C As a constant voltage source
D As an RF switch

A-002-002-009 **(B)**

A Zener diode is a device used to:

A increase current
B regulate voltage
C dissipate voltage
D decrease current

A-002-002-010 **(A)**

If a Zener diode rated at 10 V and 50 watts was operated at maximum dissipation rating, it would conduct ____ amperes:

A 5
B 50
C 0.05
D 0.5

A-002-002-011 **(A)**

The power-handling capability of most Zener diodes is rated at 25 degrees C or approximately room temperature. If the temperature is increased, the power handling capability is:

A less
B the same
C much greater
D slightly greater

A-002-003-001 **(D)**

What is the alpha of a bipolar transistor?

A The change of collector current with respect to base current
B The change of base current with respect to collector current
C The change of collector current with respect to gate current
D The change of collector current with respect to emitter current

A-002-003-002 **(C)**

What is the beta of a bipolar transistor?

A The change of collector current with respect to emitter current
B The change of base current with respect to gate current
C The change of collector current with respect to base current
D The change of base current with respect to emitter current

A-002-003-003 **(B)**

Which component conducts electricity from a negative emitter to a positive collector when its base voltage is made positive?

A A PNP transistor
B An NPN transistor
C A varactor
D A triode vacuum tube

A-002-003-004 **(D)**

What is the alpha of a bipolar transistor in common base configuration?

A Forward voltage gain
B Reverse current gain
C Reverse voltage gain
D Forward current gain

A-002-003-005 **(C)**

In a bipolar transistor, the change of collector current with respect to base current is called:

A delta
B alpha
C beta
D gamma

A-002-003-006 **(C)**

The alpha of a bipolar transistor is specified for what configuration?

A Common gate
B Common emitter
C Common base
D Common collector

A-002-003-007 **(D)**

The beta of a bipolar transistor is specified for what configurations?

A Common emitter or common gate
B Common base or common collector
C Common base or common emitter
D Common emitter or common collector

A-002-003-008 **(B)**

Which component conducts electricity from a positive emitter to a negative collector when its base is made negative?

A An NPN transistor
B A PNP transistor
C A triode vacuum tube
D A varactor

A-002-003-009 **(D)**

Alpha of a bipolar transistor is equal to:

A beta x (1 + beta)
B beta x (1 - beta)
C beta / (1 - beta)
D beta / (1 + beta)

A-002-003-010 **(B)**

The current gain of a bipolar transistor in common emitter or common collector compared to common base configuration is:

A usually about half
B high to very high
C very low
D usually about double

A-002-003-011 **(D)**

Beta of a bipolar transistor is equal to:

A alpha / (1 + alpha)
B alpha x (1 - alpha)
C alpha x (1 + alpha)
D alpha / (1 - alpha)

A-002-004-001 **(A)**

What is an enhancement-mode FET?

A An FET without a channel; no current occurs with zero gate voltage
B An FET with a channel that blocks voltage through the gate
C An FET with a channel that allows current when the gate voltage is zero
D An FET without a channel to hinder current through the gate

A-002-004-002 **(A)**

What is a depletion-mode FET?

A An FET that has a channel with no gate voltage applied; a current flows with zero gate voltage
B An FET without a channel; no current flows with zero gate voltage
C An FET without a channel to hinder current through the gate
D An FET that has a channel that blocks current when the gate voltage is zero

A-002-004-003 **(D)**

Why do many MOSFET devices have built-in gate protective Zener diodes?

A The gate-protective Zener diode keeps the gate voltage within specifications to prevent the device from overheating

B The gate-protective Zener diode protects the substrate from excessive voltages

C The gate-protective Zener diode provides a voltage reference to provide the correct amount of reverse-bias gate voltage

D The gate-protective Zener diode prevents the gate insulation from being punctured by small static charges or excessive voltages

A-002-004-004 **(D)**

Why are special precautions necessary in handling FET and CMOS devices?

A They are light-sensitive

B They have micro-welded semiconductor junctions that are susceptible to breakage

C They have fragile leads that may break off

D They are susceptible to damage from static charges

A-002-004-005 **(B)**

How does the input impedance of a field-effect transistor (FET) compare with that of a bipolar transistor?

A The input impedance of FETs and bipolar transistors is the same

B An FET has high input impedance; a bipolar transistor has low input impedance

C One cannot compare input impedance without knowing supply voltage

D An FET has low input impedance; a bipolar transistor has high input impedance

A-002-004-006 **(A)**

What are the three terminals of a junction field-effect transistor (JFET)?

A Gate, drain, source

B Emitter, base 1, base 2

C Emitter, base, collector

D Gate 1, gate 2, drain

A-002-004-007 **(D)**

What are the two basic types of junction field-effect transistors (JFET)?

A High power and low power

B MOSFET and GaAsFET

C Silicon and germanium

D N-channel and P-channel

A-002-004-008 **(C)**

Electron conduction in an n-channel depletion type MOSFET is associated with:

A p-channel enhancement

B q-channel enhancement

C n-channel depletion

D p-channel depletion

A-002-004-009 **(D)**

Electron conduction in an n-channel enhancement MOSFET is associated with:

A q-channel depletion

B p-channel enhancement

C p-channel depletion

D n-channel enhancement

A-002-004-010 **(C)**

Hole conduction in a p-channel depletion type MOSFET is associated with:

A q-channel depletion

B n-channel depletion

C p-channel depletion

D n-channel enhancement

A-002-004-011 **(C)**

Hole conduction in a p-channel enhancement type MOSFET is associated with:

A n-channel enhancement

B q-channel depletion

C p-channel enhancement

D n-channel depletion

A-002-005-001 **(C)**

What are the three terminals of a silicon controlled rectifier (SCR)?

A Base, collector and emitter

B Gate, source and sink

C Anode, cathode and gate

D Gate, base 1 and base 2

A-002-005-002 **(C)**

What are the two stable operating conditions of a silicon controlled rectifier (SCR)?

A NPN conduction and PNP conduction
B Oscillating and quiescent
C Conducting and non-conducting
D Forward conducting and reverse conducting

A-002-005-003 **(D)**

When a silicon controlled rectifier (SCR) is triggered, to what other semiconductor diode are its electrical characteristics similar (as measured between its cathode and anode)?

A The PIN diode
B The hot-carrier (Schottky) diode
C The varactor diode
D The junction diode

A-002-005-004 **(B)**

Under what operating condition does a silicon controlled rectifier (SCR) exhibit electrical characteristics similar to a forward-biased silicon rectifier?

A During a switching transition
B When it is gated "on"
C When it is gated "off"
D When it is used as a detector

A-002-005-005 **(B)**

The silicon controlled rectifier (SCR) is what type of device?

A PPNN
B PNPN
C NPPN
D PNNP

A-002-005-006 **(D)**

The control element in the silicon controlled rectifier (SCR) is called the:

A anode
B cathode
C emitter
D gate

A-002-005-007 **(A)**

The silicon controlled rectifier (SCR) is a member of which family?

A Thyristors
B Phase locked loops
C Varactors
D Varistors

A-002-005-008 **(C)**

In amateur radio equipment, which is the major application for the silicon controlled rectifier (SCR)?

A Microphone preamplifier circuit
B SWR detector circuit
C Power supply overvoltage "crowbar" circuit
D Class C amplifier circuit

A-002-005-009 **(C)**

Which of the following devices has anode, cathode, and gate?

A The field effect transistor
B The triode vacuum tube
C The silicon controlled rectifier (SCR)
D The bipolar transistor

A-002-005-010 **(B)**

When it is gated "on", the silicon controlled rectifier (SCR) exhibits electrical characteristics similar to a:

A reverse-biased hot-carrier (Schottky) diode
B forward-biased silicon rectifier
C reverse-biased silicon rectifier
D forward-biased PIN diode

A-002-005-011 **(A)**

Which of the following is a PNPN device?

A Silicon controlled rectifier (SCR)
B PIN diode
C Hot carrier (Schottky) diode
D Zener diode

A-002-006-001 **(B)**

For what portion of a signal cycle does a Class A amplifier operate?

A Less than 180 degrees
B The entire cycle
C Exactly 180 degrees
D More than 180 degrees but less than 360 degrees

A-002-006-002 **(C)**

Which class of amplifier has the highest linearity and least distortion?

A Class B
B Class C
C Class A
D Class AB

A-002-006-003 **(D)**

For what portion of a cycle does a Class AB amplifier operate?

A Exactly 180 degrees
B The entire cycle
C Less than 180 degrees
D More than 180 degrees but less than 360 degrees

A-002-006-004 **(D)**

For what portion of a cycle does a Class B amplifier operate?

A Less than 180 degrees
B More than 180 degrees but less than 360 degrees
C The entire cycle
D 180 degrees

A-002-006-005 **(A)**

For what portion of a signal cycle does a Class C amplifier operate?

A Less than 180 degrees
B More than 180 degrees but less than 360 degrees
C The entire cycle
D 180 degrees

A-002-006-006 **(B)**

Which of the following classes of amplifier provides the highest efficiency?

A Class B
B Class C
C Class A
D Class AB

A-002-006-007 **(A)**

Which of the following classes of amplifier would provide the highest efficiency in the output stage of a CW, RTTY or FM transmitter?

A Class C
B Class AB
C Class B
D Class A

A-002-006-008 **(A)**

Which class of amplifier provides the least efficiency?

A Class A
B Class C
C Class B
D Class AB

A-002-006-009 **(C)**

Which class of amplifier has the poorest linearity and the most distortion?

A Class A
B Class B
C Class C
D Class AB

A-002-006-010 **(C)**

Which class of amplifier operates over the full cycle?

A Class B
B Class C
C Class A
D Class AB

A-002-006-011 **(D)**

Which class of amplifier operates over less than 180 degrees of the cycle?

A Class AB
B Class A
C Class B
D Class C

A-002-007-001 **(D)**

What determines the input impedance of a FET common-source amplifier?

A The input impedance is essentially determined by the resistance between the source and substrate
B The input impedance is essentially determined by the resistance between the source and the drain
C The input impedance is essentially determined by the resistance between the drain and substrate
D The input impedance is essentially determined by the gate biasing network

A-002-007-002 **(B)**

What determines the output impedance of a FET common-source amplifier?

A The output impedance is essentially determined by the input impedance of the FET
B The output impedance is essentially determined by the drain resistor
C The output impedance is essentially determined by the drain supply voltage
D The output impedance is essentially determined by the gate supply voltage

A-002-007-003 **(D)**

What are the advantages of a Darlington pair audio amplifier?

A Mutual gain, high stability and low mutual inductance
B Mutual gain, low input impedance and low output impedance
C Low output impedance, high mutual impedance and low output current
D High gain, high input impedance and low output impedance

A-002-007-004 **(D)**

In the common base amplifier, when the input and output signals are compared:

A the output signal lags the input signal by 90 degrees
B the output signals leads the input signal by 90 degrees
C the signals are 180 degrees out of phase
D the signals are in phase

A-002-007-005 **(C)**

In the common base amplifier, the input impedance, when compared to the output impedance is:

A only slightly lower
B very high
C very low
D only slightly higher

A-002-007-006 **(A)**

In the common emitter amplifier, when the input and output signals are compared:

A the signals are 180 degrees out of phase
B the output signal leads the input signal by 90 degrees
C the output signal lags the input signal by 90 degrees
D the signals are in phase

A-002-007-007 **(D)**

In the common collector amplifier, when the input and output signals are compared:

A the output signal leads the input signal by 90 degrees
B the output signal lags the input signal by 90 degrees
C the signals are 180 degrees out of phase
D the signals are in phase

A-002-007-008 **(A)**

The FET amplifier source follower circuit is another name for:

A common drain circuit
B common source circuit
C common mode circuit
D common gate circuit

A-002-007-009 **(C)**

The FET amplifier common source circuit is similar to which of the following bipolar transistor amplifier circuits?

A Common base
B Common mode
C Common emitter
D Common collector

A-002-007-010 **(C)**

The FET amplifier common drain circuit is similar to which of the following bipolar transistor amplifier circuits?

A Common base
B Common mode
C Common collector
D Common emitter

A-002-007-011 **(A)**

The FET amplifier common gate circuit is similar to which of the following bipolar transistor amplifier circuits?

A Common base
B Common mode
C Common collector
D Common emitter

A-002-008-001 **(A)**

What is an operational amplifier (op-amp)?

A A high-gain, direct-coupled differential amplifier whose characteristics are determined by components mounted externally
B A high-gain, direct-coupled audio amplifier whose characteristics are determined by internal components of the device
C An amplifier used to increase the average output of frequency modulated amateur signals to the legal limit
D A program subroutine that calculates the gain of an RF amplifier

A-002-008-002 **(A)**

What would be the characteristics of the ideal op-amp?

A Infinite input impedance, zero output impedance, infinite gain, and flat frequency response
B Zero input impedance, zero output impedance, infinite gain, and flat frequency response
C Infinite input impedance, infinite output impedance, infinite gain and flat frequency response
D Zero input impedance, infinite output impedance, infinite gain, and flat frequency response

A-002-008-003 **(A)**

What determines the gain of a closed-loop op-amp circuit?

A The external feedback network
B The PNP collector load
C The voltage applied to the circuit
D The collector-to-base capacitance of the PNP stage

A-002-008-004 **(C)**

What is meant by the term op-amp offset voltage?

A The potential between the amplifier input terminals of the op-amp in an open-loop condition
B The output voltage of the op-amp minus its input voltage
C The potential between the amplifier input terminals of the op-amp in a closed-loop condition
D The difference between the output voltage of the op-amp and the input voltage required for the next stage

A-002-008-005 **(B)**

What is the input impedance of a theoretically ideal op-amp?

A Exactly 1000 ohms
B Very high
C Very low
D Exactly 100 ohms

A-002-008-006 **(A)**

What is the output impedance of a theoretically ideal op-amp?

A Very low
B Very high
C Exactly 100 ohms
D Exactly 1000 ohms

A-002-008-007 **(D)**

What are the advantages of using an op-amp instead of LC elements in an audio filter?

A Op-amps are more rugged and can withstand more abuse than can LC elements
B Op-amps are available in more styles and types than are LC elements
C Op-amps are fixed at one frequency
D Op-amps exhibit gain rather than insertion loss

A-002-008-008 **(D)**

What are the principal uses of an op-amp RC active filter in amateur circuitry?

A Op-amp circuits are used as low-pass filters at the output of transmitters
B Op-amp circuits are used as filters for smoothing power supply output
C Op-amp circuits are used as high-pass filters to block RFI at the input of receivers
D Op-amp circuits are used as audio filters for receivers

A-002-008-009 **(D)**

What is an inverting op-amp circuit?

A An operational amplifier circuit connected such that the input and output signals are in phase
B An operational amplifier circuit connected such that the input and output signals are 90 degrees out of phase
C An operational amplifier circuit connected such that the input impedance is held to zero, while the output impedance is high
D An operational amplifier circuit connected such that the input and output signals are 180 degrees out of phase

A-002-008-010 **(B)**

What is a non-inverting op-amp circuit?

A An operational amplifier circuit connected such that the input and output signals are 180 degrees out of phase
B An operational amplifier circuit connected such that the input and output signals are in phase
C An operational amplifier circuit connected such that the input and output signals are 90 degrees out of phase
D An operational amplifier circuit connected such that the input impedance is held low, and the output impedance is high

A-002-008-011 **(C)**

What term is most appropriate for a high gain, direct-coupled differential amplifier whose characteristics are determined by components mounted externally?

A High gain audio amplifier
B Summing amplifier
C Operational amplifier
D Difference amplifier

A-002-009-001 **(C)**

What is the mixing process?

A The recovery of intelligence from a modulated signal
B The elimination of noise in a wideband receiver by phase comparison
C The combination of two signals to produce sum and difference frequencies
D The elimination of noise in a wideband receiver by phase differentiation

A-002-009-002 **(A)**

What are the principal frequencies that appear at the output of a mixer circuit?

A The original frequencies and the sum and difference frequencies
B 1.414 and 0.707 times the input frequencies
C The sum, difference and square root of the input frequencies
D Two and four times the original frequency

A-002-009-003 **(C)**

What occurs when an excessive amount of signal energy reaches the mixer circuit?

A A beat frequency is generated
B Mixer blanking occurs
C Spurious signals are generated
D Automatic limiting occurs

A-002-009-004 **(B)**

In a frequency multiplier circuit, the input signal is coupled to the base of a transistor through a capacitor. A radio frequency choke is connected between the base of the transistor and ground. The capacitor is:

A part of the output tank circuit
B a DC blocking capacitor
C part of the input tuned circuit
D a by-pass for the circuit

A-002-009-005 **(C)**

A frequency multiplier circuit must be operated in:

A class B
B class A
C class C
D class AB

A-002-009-006 **(C)**

In a frequency multiplier circuit, an inductance (L1) and a variable capacitor (C2) are connected in series between VCC+ and ground. The collector of a transistor is connected to a tap on L1. The purpose of the variable capacitor is to:

A tune L1 to the frequency applied to the base
B provide positive feedback
C tune L1 to the desired harmonic
D by-pass RF

A-002-009-007 **(D)**

In a frequency multiplier circuit, an inductance (L1) and a variable capacitor (C2) are connected in series between VCC+ and ground. The collector of a transistor is connected to a tap on L1. A fixed capacitor (C3) is connected between the VCC+ side of L1 and ground. The purpose of C3 is to:

A form a pi filter with L1 and C2
B resonate with L1
C by-pass any audio components
D provide an RF ground at the VCC connection point of L1

A-002-009-008 **(A)**

In a frequency multiplier circuit, an inductance (L1) and a variable capacitor (C2) are connected in series between VCC+ and ground. The collector of a transistor is connected to a tap on L1. C2 in conjunction with L1 operate as a:

A frequency multiplier
B frequency divider
C voltage divider
D voltage doubler

A-002-009-009 **(B)**

In a circuit where the components are tuned to resonate at a higher frequency than applied, the circuit is most likely a:

A a frequency divider
B a frequency multiplier
C a VHF/UHF amplifier
D a linear amplifier

A-002-009-010 **(D)**

In a frequency multiplier circuit, an inductance (L1) and a variable capacitor (C2) are connected in series between VCC+ and ground. The collector of a transistor is connected to a tap on L1. A fixed capacitor (C3) is connected between the VCC+ side of L1 and ground. C3 is a:

A DC blocking capacitor
B tuning capacitor
C coupling capacitor
D RF by-pass capacitor

A-002-009-011 **(C)**

What stage in a transmitter would change a 5.3-MHz input signal to 14.3 MHz?

A A frequency multiplier
B A beat frequency oscillator
C A mixer
D A linear translator

A-002-010-001 **(A)**

What is a NAND gate?

A A circuit that produces a logic "0" at its output only when all inputs are logic "1"
B A circuit that produces a logic "1" at its output only when all inputs are logic "1"
C A circuit that produces a logic "0" at its output if some but not all of its inputs are logic "1"
D A circuit that produces a logic "0" at its output only when all inputs are logic "0"

A-002-010-002 **(B)**

What is an OR gate?

A A circuit that produces a logic "0" at its output if any input is logic "1"
B A circuit that produces a logic "1" at its output if any input is logic "1"
C A circuit that produces a logic "0" at its output if all inputs are logic "1"
D A circuit that produces logic "1" at its output if all inputs are logic "0"

A-002-010-003 **(A)**

What is a NOR gate?

A A circuit that produces a logic "0" at its output if any or all inputs are logic "1"
B A circuit that produces a logic "0" at its output only if all inputs are logic "0"
C A circuit that produces a logic "1" at its output only if all inputs are logic "1"
D A circuit that produces a logic "1" at its output if some but not all of its inputs are logic "1"

A-002-010-004 **(A)**

What is a NOT gate (also known as an INVERTER)?

A A circuit that produces a logic "0" at its output when the input is logic "1"
B A circuit that does not allow data transmission when its input is high
C A circuit that allows data transmission only when its input is high
D A circuit that produces a logic "1" at its output when the input is logic "1"

A-002-010-005 **(C)**

What is an EXCLUSIVE OR gate?

A A circuit that produces a logic "1" at its output when all of the inputs are logic "1"
B A circuit that produces a logic "1" at its output when all of the inputs are logic "0"
C A circuit that produces a logic "1" at its output when only one of the inputs is logic "1"
D A circuit that produces a logic "0" at its output when only one of the inputs is logic "1"

A-002-010-006 **(C)**

What is an EXCLUSIVE NOR gate?

A A circuit that produces a logic "1" at its output when only one of the inputs are logic "1"
B A circuit that produces a logic "0" at its output when all of the inputs are logic "1"
C A circuit that produces a logic "1" at its output when all of the inputs are logic "1"
D A circuit that produces a logic "1" at its output when only one of the inputs is logic "0"

A-002-010-007 **(A)**

What is an AND gate?

A A circuit that produces a logic "1" at its output only if all its inputs are logic "1"
B A circuit that produces a logic "1" at the output if at least one input is a logic "0"
C A circuit that produces a logic "1" at its output only if one of its inputs is logic "1"
D A circuit that produces a logic "1" at its output if all inputs are logic "0"

A-002-010-008 **(A)**

What is a flip-flop circuit?

A A binary sequential logic element with two stable states
B A binary sequential logic element with eight stable states
C A binary sequential logic element with four stable states
D A binary sequential logic element with one stable state

A-002-010-009 **(B)**

What is a bistable multivibrator?

A A clock
B A flip-flop
C An OR gate
D An AND gate

A-002-010-010 **(A)**

What type of digital logic is also known as a latch?

A A flip-flop
B A decade counter
C An OR gate
D An op-amp

A-002-010-011 **(D)**

In a multivibrator circuit, when one transistor conducts, the other is:

A saturated
B reverse-biased
C forward-biased
D cut off

A-002-011-001 **(B)**

What is a crystal lattice filter?

A A power supply filter made with interlaced quartz crystals
B A filter with narrow bandwidth and steep skirts made using quartz crystals
C A filter with wide bandwidth and shallow skirts made using quartz crystals
D An audio filter made with four quartz crystals that resonate at 1 kHz intervals

A-002-011-002 **(A)**

What factor determines the bandwidth and response shape of a crystal lattice filter?

A The relative frequencies of the individual crystals
B The centre frequency chosen for the filter
C The gain of the RF stage following the filter
D The amplitude of the signals passing through the filter

A-002-011-003 **(A)**

For single-sideband phone emissions, what would be the bandwidth of a good crystal lattice filter?

A 2.4 kHz
B 15 kHz
C 500 Hz
D 6 kHz

A-002-011-004 **(C)**

The main advantage of a crystal oscillator over a tuned LC oscillator is:

A freedom from harmonic emissions
B simplicity
C much greater frequency stability
D longer life under severe operating use

A-002-011-005 **(C)**

A quartz crystal filter is superior to an LC filter for narrow bandpass applications because of the:

A LC circuit's high Q
B crystal's simplicity
C crystal's high Q
D crystal's low Q

A-002-011-006 **(D)**

Piezoelectricity is generated by:

A touching crystals with magnets
B adding impurities to a crystal
C moving a magnet near a crystal
D deforming certain crystals

A-002-011-007 **(A)**

Electrically, what does a crystal look like?

A A very high Q tuned circuit
B A very low Q tuned circuit
C A variable capacitance
D A variable tuned circuit

A-002-011-008 **(A)**

Crystals are sometimes used in a circuit which has an output close to an integral multiple of the crystal frequency. This circuit is called:

A an overtone oscillator
B a crystal multiplier
C a crystal lattice
D a crystal ladder

A-002-011-009 **(A)**

Which of the following properties does not apply to a crystal when used in an oscillator circuit?

A High power output
B Good frequency stability
C Very low noise because of high Q
D Good frequency accuracy

A-002-011-010 **(B)**

Crystal oscillators, filters and microphones depend upon which principle?

A Overtone effect
B Piezoelectric effect
C Hertzberg effect
D Ferro-resonance

A-002-011-011 **(A)**

Crystals are not applicable to which of the following?

A Active filters
B Microphones
C Lattice filters
D Oscillators

A-002-012-001 **(A)**

What are the three general groupings of filters?

A High-pass, low-pass and band-pass
B Hartley, Colpitts and Pierce
C Audio, radio and capacitive
D Inductive, capacitive and resistive

A-002-012-002 **(A)**

What are the distinguishing features of a Butterworth filter?

A It has a maximally flat response over its pass-band
B The product of its series and shunt-element impedances is a constant for all frequencies
C It only requires conductors
D It only requires capacitors

A-002-012-003 **(B)**

Which filter type is described as having ripple in the passband and a sharp cutoff?

A A Butterworth filter
B A Chebyshev filter
C An active LC filter
D A passive op-amp filter

A-002-012-004 **(B)**

What are the distinguishing features of a Chebyshev filter?

A It has a maximally flat response in the passband
B It allows ripple in the passband in return for steeper skirts
C It requires only inductors
D It requires only capacitors

A-002-012-005 **(A)**

Resonant cavities are used by amateurs as a:

A narrow bandpass filter at VHF and higher frequencies
B power line filter
C low-pass filter below 30 MHz
D high-pass filter above 30 MHz

A-002-012-006 **(B)**

On VHF and above, 1/4 wavelength coaxial cavities are used to give protection from high-level signals. For a frequency of approximately 50 MHz, the diameter of such a device would be about 10 cm (4 in). What would be its approximate length?

A 3.7 metres (12 ft)
B 1.5 metres (5 ft)
C 0.6 metres (2 ft)
D 2.4 metres (8 ft)

A-002-012-007 **(B)**

A device which helps with receiver overload and spurious responses at VHF, UHF and above may be installed in the receiver front end. It is called a:

A duplexer
B helical resonator
C diplexer
D directional coupler

A-002-012-008 **(C)**

Where you require bandwidth at VHF and higher frequencies about equal to a television channel, a good choice of filter is the:

A Butterworth
B Chebyshev
C none of the other answers
D resonant cavity

A-002-012-009 **(B)**

What is the primary advantage of the Butterworth filter over the Chebyshev filter?

A It requires only capacitors
B It has maximally flat response over its passband
C It allows ripple in the passband in return for steeper skirts
D It requires only inductors

A-002-012-010 **(D)**

What is the primary advantage of the Chebyshev filter over the Butterworth filter?

A It requires only capacitors
B It requires only inductors
C It has maximally flat response over the passband
D It allows ripple in the passband in return for steeper skirts

A-002-012-011 **(B)**

Which of the following filter types is not suitable for use at audio and low radio frequencies?

A Butterworth
B Cavity
C Elliptical
D Chebyshev

A-003-001-001 **(B)**

What is the easiest amplitude dimension to measure by viewing a pure sine wave on an oscilloscope?

A Average voltage
B Peak-to-peak voltage
C Peak voltage
D RMS voltage

A-003-001-002 **(B)**

What is the RMS value of a 340 volt peak-to-peak pure sine wave?

A 300 volts
B 120 volts
C 170 volts
D 240 volts

A-003-001-003 **(D)**

What is the equivalent to the RMS value of an AC voltage?

A The AC voltage found by taking the square root of the peak AC voltage
B The DC voltage causing the same heating of a given resistor as the peak AC voltage
C The AC voltage found by taking the square root of the average AC value
D The AC voltage causing the same heating of a given resistor as a DC voltage of the same value

A-003-001-004 **(B)**

If the peak value of a 100 Hz sinusoidal waveform is 20 volts, the RMS value is:

A 16.38 volts
B 14.14 volts
C 28.28 volts
D 7.07 volts

A-003-001-005 **(D)**

In applying Ohm's law to AC circuits, current and voltage values are:

A average values
B average values times 1.414
C none of the proposed answers
D peak values times 0.707

A-003-001-006 **(C)**

The effective value of a sine wave of voltage or current is:

A 100% of the maximum value
B 63.6% of the maximum value
C 70.7% of the maximum value
D 50% of the maximum value

A-003-001-007 **(D)**

AC voltmeter scales are usually calibrated to read:

A peak voltage
B instantaneous voltage
C average voltage
D RMS voltage

A-003-001-008 **(B)**

An AC voltmeter is calibrated to read the:

A peak value
B effective value
C peak-to-peak value
D average value

A-003-001-009 **(B)**

Which AC voltage value will produce the same amount of heat as a DC voltage, when applied to the same resistance?

A The peak-to-peak value
B The RMS value
C The average value
D The peak value

A-003-001-010 **(B)**

What is the peak-to-peak voltage of a sine wave that has an RMS voltage of 120 volts?

A 204.8 volts
B 339.5 volts
C 84.8 volts
D 169.7 volts

A-003-001-011 **(D)**

A sine wave of 17 volts peak is equivalent to how many volts RMS?

A 24 volts
B 34 volts
C 8.5 volts
D 12 volts

A-003-002-001 **(A)**

The power supplied to the antenna transmission line by a transmitter during an RF cycle at the highest crest of the modulation envelope is known as:

A peak-envelope power
B mean power
C carrier power
D full power

A-003-002-002 **(D)**

To compute one of the following, multiply the peak-envelope voltage by 0.707 to obtain the RMS value, square the result and divide by the load resistance. Which is the correct answer?

A PIV
B ERP
C power factor
D PEP

A-003-002-003 **(B)**

Peak-Envelope Power (PEP) for SSB transmission is:

A a hypothetical measurement
B Peak-Envelope Voltage (PEV) multiplied by 0.707, squared and divided by the load resistance
C peak-voltage multiplied by peak current
D equal to the RMS power

A-003-002-004 **(A)**

The formula to be used to calculate the power output of a transmitter into a resistor load using a voltmeter is:

A P = (E exponent 2) /R
B P = EI/R
C P = EI cos 0
D P = IR

A-003-002-005 **(D)**

How is the output Peak-Envelope Power of a transmitter calculated if an oscilloscope is used to measure the Peak-Envelope Voltage across a dummy resistive load (where PEP = Peak-Envelope Power, PEV = Peak-Envelope Voltage, Vp = peak-voltage, RL = load resistance)?

A PEP = [(Vp)(Vp)] / (RL)
B PEP = (Vp)(Vp)(RL)
C PEP = [(1.414 PEV)(1.414 PEV)] / RL
D PEP = [(0.707 PEV)(0.707 PEV)] / RL

A-003-002-006 **(D)**

What is the output PEP from a transmitter if an oscilloscope measures 200 volts peak-to-peak across a 50-ohm dummy load connected to the transmitter output?

A 400 watts
B 1000 watts
C 200 watts
D 100 watts

A-003-002-007 **(A)**

What is the output PEP from a transmitter if an oscilloscope measures 500 volts peak-to-peak across a 50-ohm dummy load connected to the transmitter output?

A 625 watts
B 1250 watts
C 2500 watts
D 500 watts

A-003-002-008 **(D)**

What is the output PEP of an unmodulated carrier transmitter if a wattmeter connected to the transmitter output indicates an average reading of 1060 watts?

A 2120 watts
B 1500 watts
C 530 watts
D 1060 watts

A-003-002-009 **(B)**

What is the output PEP from a transmitter, if an oscilloscope measures 400 volts peak-to-peak across a 50 ohm dummy load connected to the transmitter output?

A 1000 watts
B 400 watts
C 200 watts
D 600 watts

A-003-002-010 **(A)**

What is the output PEP from a transmitter, if an oscilloscope measures 800 volts peak-to-peak across a 50 ohm dummy load connected to the transmitter output?

A 1600 watts
B 800 watts
C 6400 watts
D 3200 watts

A-003-002-011 **(A)**

An oscilloscope measures 500 volts peak-to-peak across a 50 ohm dummy load connected to the transmitter output during unmodulated carrier conditions. What would an average-reading power meter indicate under the same transmitter conditions?

A 625 watts
B 427.5 watts
C 884 watts
D 442 watts

A-003-003-001 **(D)**

What is a dip meter?

A An SWR meter
B A marker generator
C A field-strength meter
D A variable frequency oscillator with metered feedback current

A-003-003-002 **(C)**

What does a dip meter do?

A It measures field strength accurately
B It measures frequency accurately
C It gives an indication of the resonant frequency of a circuit
D It measures transmitter output power accurately

A-003-003-003 **(B)**

What two ways could a dip meter be used in an amateur station?

A To measure resonant frequency of antenna traps and percentage modulation
B To measure resonant frequencies of antenna traps and to measure a tuned circuit resonant frequency
C To measure antenna resonance and impedance
D To measure antenna resonance and percentage modulation

A-003-003-004 **(C)**

A dip meter supplies the radio frequency energy which enables you to check:

A the impedance mismatch in a circuit
B the adjustment of an inductor
C the resonant frequency of a circuit
D the calibration of an absorption-type wavemeter

A-003-003-005 **(C)**

A dip meter may not be used directly to:

A determine the frequency of oscillations
B align receiver-tuned circuits
C measure the value of capacitance or inductance
D align transmitter-tuned circuits

A-003-003-006 **(B)**

The dial calibration on the output attenuator of a signal generator:

A reads half the true output when the attenuator is properly terminated
B reads accurately only when the attenuator is properly terminated
C always reads the true output of the signal generator
D reads twice the true output when the attenuator is properly terminated

A-003-003-007 **(A)**

What is a signal generator?

A A high-stability oscillator which can produce a wide range of frequencies and amplitudes
B A low-stability oscillator which sweeps through a range of frequencies
C A low-stability oscillator used to inject a signal into a circuit under test
D A high-stability oscillator which generates reference signals at exact frequency intervals

A-003-003-008 **(A)**

A dip meter:

A should be loosely coupled to the circuit under test
B should be tightly coupled to the circuit under test
C may be used only with series tuned circuits
D accurately measures frequencies

A-003-003-009 **(A)**

Which two instruments are needed to measure FM receiver sensitivity for a 12 dB SINAD ratio (signal + noise + distortion over noise + distortion)?

A Calibrated RF signal generator with FM tone modulation and total harmonic distortion (THD) analyzer
B RF signal generator with FM tone modulation and a deviation meter
C Oscilloscope and spectrum analyzer
D Receiver noise bridge and total harmonic distortion analyser

A-003-003-010 **(A)**

The dip meter is most directly applicable to:

A parallel tuned circuits
B operational amplifier circuits
C digital logic circuits
D series tuned circuits

A-003-003-011 **(A)**

Which of the following is not a factor affecting the frequency accuracy of a dip meter?

A Transmitter power output
B Hand capacity
C Stray capacity
D Over coupling

A-003-004-001 **(B)**

What does a frequency counter do?

A It produces a reference frequency
B It makes frequency measurements
C It measures frequency deviation
D It generates broad-band white noise for calibration

A-003-004-002 **(A)**

What factors limit the accuracy, frequency response and stability of a frequency counter?

A Time base accuracy, speed of the logic, and time base stability
B Time base accuracy, temperature coefficient of the logic and time base stability
C Number of digits in the readout, speed of the logic, and time base stability
D Number of digits in the readout, external frequency reference and temperature coefficient of the logic

A-003-004-003 **(B)**

How can the accuracy of a frequency counter be improved?

A By improving the accuracy of the frequency response
B By increasing the accuracy of the time base
C By using slower digital logic
D By using faster digital logic

A-003-004-004 **(C)**

If a frequency counter with a time base accuracy of +/- 0.1 PPM (parts per million) reads 146 520 000 Hz, what is the most that the actual frequency being measured could differ from that reading?

A 1.4652 Hz
B 1.4652 kHz
C 14.652 Hz
D 0.1 MHz

A-003-004-005 **(B)**

If a frequency counter, with a time base accuracy of 10 PPM (parts per million) reads 146 520 000 Hz, what is the most the actual frequency being measured could differ from that reading?

A 1465.2 kHz
B 1465.2 Hz
C 146.52 Hz
D 146.52 kHz

A-003-004-006 **(A)**

The clock in a frequency counter normally uses a:

A crystal oscillator
B self-oscillating Hartley oscillator
C mechanical tuning fork
D free-running multivibrator

A-003-004-007 **(C)**

The frequency accuracy of a frequency counter is determined by:

A type of display used in the counter
B the number of digits displayed
C the characteristics of the internal time-base generator
D the size of the frequency counter

A-003-004-008 **(D)**

Which device relies on a stable low-frequency oscillator, with harmonic output, to facilitate the frequency calibration of receiver dial settings?

A Signal generator
B Harmonic calibrator
C Frequency counter
D Frequency-marker generator

A-003-004-009 **(A)**

What is the traditional way of verifying the accuracy of a crystal calibrator?

A Zero-beat the crystal oscillator against a standard frequency station such as WWV
B Compare the oscillator with your transmitter
C Use a dip-meter to determine the oscillator's fundamental frequency
D Compare the oscillator with your receiver

A-003-004-010 **(C)**

Out of the following oscillators, one is NOT, by itself, considered a high-stability reference:

A oven-controlled crystal oscillator (OCXO)
B GPS disciplined oscillator (GPSDO)
C voltage-controlled crystal oscillator (VCXO)
D temperature compensated crystal oscillator (TCXO)

A-003-004-011 **(C)**

You want to calibrate your station frequency reference to the WWV signal on your receiver. The resulting beat tone must be:

A the mathematical mean of both frequencies
B at the highest audio frequency possible
C of a frequency as low as possible and with a period as long as possible
D a combined frequency above both

A-003-005-001 **(D)**

If a 100 Hz signal is fed to the horizontal input of an oscilloscope and a 150 Hz signal is fed to the vertical input, what type of pattern should be displayed on the screen?

A A rectangular pattern 100 mm wide and 150 mm high
B An oval pattern 100 mm wide and 150 mm high
C A looping pattern with 100 horizontal loops and 150 vertical loops
D A looping pattern with 3 horizontal loops, and 2 vertical loops

A-003-005-002 **(A)**

What factors limit the accuracy, frequency response and stability of an oscilloscope?

A Accuracy of the time base and the linearity and bandwidth of the deflection amplifiers
B Deflection amplifier output impedance and tube face frequency increments
C Accuracy and linearity of the time base and tube face voltage increments
D Tube face voltage increments and deflection amplifier voltages

A-003-005-003 **(B)**

How can the frequency response of an oscilloscope be improved?

A By using triggered sweep and a crystal oscillator for the timebase
B By increasing the horizontal sweep rate and the vertical amplifier frequency response
C By using a crystal oscillator as the time base and increasing the vertical sweep rate
D By increasing the vertical sweep rate and the horizontal amplifier frequency response

A-003-005-004 **(C)**

You can use an oscilloscope to display the input and output of a circuit at the same time by:

A measuring the input on the X axis and the output on the Z axis
B measuring the input on the Y axis and the output on the X axis
C utilizing a dual trace oscilloscope
D measuring the input on the X axis and the output on the Y axis

A-003-005-005 **(D)**

An oscilloscope cannot be used to:

A measure frequency
B measure DC voltage
C determine the amplitude of complex voltage wave forms
D determine FM carrier deviation directly

A-003-005-006 **(D)**

The bandwidth of an oscilloscope is:

A directly related to gain compression
B indirectly related to screen persistence
C a function of the time-base accuracy
D the highest frequency signal the scope can display

A-003-005-007 **(C)**

When using Lissajous figures to determine phase differences, an indication of zero or 180 degrees is represented on the screen of an oscilloscope by:

A an ellipse
B a circle
C a diagonal straight line
D a horizontal straight line

A-003-005-008 **(B)**

A 100-kHz signal is applied to the horizontal channel of an oscilloscope. A signal of unknown frequency is applied to the vertical channel. The resultant wave form has 5 loops displayed vertically and 2 loops horizontally. The unknown frequency is:

A 30 kHz
B 40 kHz
C 20 kHz
D 50 kHz

A-003-005-009 **(C)**

An oscilloscope probe must be compensated:

A through the addition of a high-value series resistor
B when measuring a signal whose frequency varies
C every time the probe is usde with a different oscilloscope
D when measuring a sine wave

A-003-005-010 **(C)**

What is the best instrument to use to check the signal quality of a CW or single-sideband phone transmitter?

A A signal tracer and an audio amplifier
B A field-strength meter
C An oscilloscope
D A sidetone monitor

A-003-005-011 **(A)**

What is the best signal source to connect to the vertical input of an oscilloscope for checking the quality of a transmitted signal?

A The RF output of the transmitter through a sampling device
B The RF signals of a nearby receiving antenna
C The IF output of a monitoring receiver
D The audio input of the transmitter

A-003-006-001 **(B)**

A meter has a full-scale deflection of 40 microamperes and an internal resistance of 96 ohms. You want it to read 0 to 1 mA. The value of the shunt to be used is:

A 40 ohms
B 4 ohms
C 24 ohms
D 16 ohms

A-003-006-002 **(D)**

A moving-coil milliammeter having a full-scale deflection of 1 mA and an internal resistance of 0.5 ohms is to be converted to a voltmeter of 20 volts full-scale deflection. It would be necessary to insert a:

A series resistance of 1 999.5 ohms
B shunt resistance of 19 999.5 ohms
C shunt resistance of 19.5 ohms
D series resistance of 19 999.5 ohms

A-003-006-003 **(B)**

A voltmeter having a range of 150 volts and an internal resistance of 150 000 ohms is to be extended to read 750 volts. The required multiplier resistor would have a value of:

A 1 200 000 ohms
B 600 000 ohms
C 1 500 ohms
D 750 000 ohms

A-003-006-004 **(C)**

The sensitivity of an ammeter is an expression of:

A the loading effect the meter will have on a circuit
B the value of the shunt resistor
C the amount of current causing full-scale deflection
D the resistance of the meter

A-003-006-005 **(A)**

Voltmeter sensitivity is usually expressed in ohms per volt. This means that a voltmeter with a sensitivity of 20 kilohms per volt would be a:

A 50 microampere meter
B 1 milliampere meter
C 50 milliampere meter
D 100 milliampere meter

A-003-006-006 **(C)**

The sensitivity of a voltmeter, whose resistance is 150 000 ohms on the 150-volt range, is:

A 10 000 ohms per volt
B 150 ohms per volt
C 1000 ohms per volt
D 100 000 ohms per volt

A-003-006-007 **(C)**

The range of a DC ammeter can easily be extended by:

A changing the internal inductance of the meter
B changing the internal capacitance of the meter to resonance
C connecting an external resistance in parallel with the internal resistance
D connecting an external resistance in series with the internal resistance

A-003-006-008 **(D)**

What happens inside a multimeter when you switch it from a lower to a higher voltage range?

A Resistance is reduced in series with the meter
B Resistance is reduced in parallel with the meter
C Resistance is added in parallel with the meter
D Resistance is added in series with the meter

A-003-006-009 **(C)**

How can the range of an ammeter be increased?

A By adding resistance in parallel with the circuit under test
B By adding resistance in series with the meter
C By adding resistance in parallel with the meter
D By adding resistance in series with the circuit under test

A-003-006-010 **(A)**

Where should an RF wattmeter be connected for the most accurate readings of transmitter output power?

A At the transmitter output connector
B One-half wavelength from the transmitter output
C One-half wavelength from the antenna feed point
D At the antenna feed point

A-003-006-011 **(D)**

At what line impedance do most RF wattmeters usually operate?

A 25 ohms
B 100 ohms
C 300 ohms
D 50 ohms

A-004-001-001 **(B)**

For the same transformer secondary voltage, which rectifier has the highest average output voltage?

A Full-wave centre-tap
B Bridge
C Half-wave
D Quarter-wave

A-004-001-002 **(B)**

In a half-wave power supply with a capacitor input filter and a load drawing little or no current, the peak inverse voltage (PIV) across the diode can reach _____ times the RMS voltage.

A 1.4
B 2.8
C 0.45
D 5.6

A-004-001-003 **(A)**

In a full-wave centre-tap power supply, regardless of load conditions, the peak inverse voltage (PIV) will be _____ times the RMS voltage:

A 2.8
B 0.636
C 0.707
D 1.4

A-004-001-004 **(A)**

A full-wave bridge rectifier circuit makes use of both halves of the AC cycle, but unlike the full-wave centre-tap rectifier circuit it does not require:

A a centre-tapped secondary on the transformer
B any output filtering
C a centre-tapped primary on the transformer
D diodes across each leg of the transformer

A-004-001-005 **(D)**

For a given transformer the maximum output voltage available from a full-wave bridge rectifier circuit will be:

A half that of the full-wave centre-tap rectifier
B the same as the full-wave centre-tap rectifier
C the same as the half-wave rectifier
D double that of the full-wave centre-tap rectifier

A-004-001-006 **(A)**

The ripple frequency produced by a full-wave power supply connected to a normal household circuit is:

A 120 Hz
B 60 Hz
C 90 Hz
D 30 Hz

A-004-001-007 **(A)**

The ripple frequency produced by a half-wave power supply connected to a normal household circuit is:

A 60 Hz
B 90 Hz
C 120 Hz
D 30 Hz

A-004-001-008 **(A)**

Full-wave voltage doublers:

A use both halves of an AC wave
B create four times the output voltage of half-wave doublers
C use less power than half-wave doublers
D are used only in high-frequency power supplies

A-004-001-009 **(B)**

What are the two major ratings that must not be exceeded for silicon-diode rectifiers used in power-supply circuits?

A Peak load impedance; peak voltage
B Peak inverse voltage; average forward current
C Average power; average voltage
D Capacitive reactance; avalanche voltage

A-004-001-010 **(C)**

In a high voltage power supply, why should a resistor and capacitor be wired in parallel with the power-supply rectifier diodes?

A To decrease the output voltage
B To ensure that the current through each diode is about the same
C To equalize voltage drops and guard against transient voltage spikes
D To smooth the output waveform

A-004-001-011 **(A)**

What is the output waveform of an unfiltered full-wave rectifier connected to a resistive load?

A A series of pulses at twice the frequency of the AC input
B A steady DC voltage
C A sine wave at half the frequency of the AC input
D A series of pulses at the same frequency as the AC input

A-004-002-001 **(B)**

Filter chokes are rated according to:

A breakdown voltage
B inductance and current-handling capacity
C reactance at 1000 Hz
D power loss

A-004-002-002 **(C)**

Which of the following circuits gives the best regulation, under similar load conditions?

A A half-wave rectifier with a choke input filter
B A full-wave rectifier with a capacitor input filter
C A full-wave rectifier with a choke input filter
D A half-wave bridge rectifier with a capacitor input filter

A-004-002-003 **(B)**

The advantage of the capacitor input filter over the choke input filter is:

A lower peak rectifier currents
B a higher terminal voltage output
C better filtering action or smaller ripple voltage
D improved voltage regulation

A-004-002-004 **(C)**

With a normal load, the choke input filter will give the:

A greatest ripple frequency
B highest output voltage
C best regulated output
D greatest percentage of ripple

A-004-002-005 **(A)**

There are two types of filters in general use in a power supply. They are called:

A choke input and capacitor input
B choke output and capacitor output
C choke input and capacitor output
D choke output and capacitor input

A-004-002-006 **(B)**

The main function of the bleeder resistor in a power supply is to provide a discharge path for the capacitor in the power supply. But it may also be used for a secondary function, which is to:

A act as a secondary smoothing device in conjunction with the filter
B improve voltage regulation
C provide a ground return for the transformer
D inhibit the flow of current through the supply

A-004-002-007 **(D)**

In a power supply, series chokes will:

A readily pass the DC and the AC component
B impede the passage of DC but will pass the AC component
C impede both DC and AC
D readily pass the DC but will impede the flow of the AC component

A-004-002-008 **(D)**

When using a choke input filter, a minimum current should be drawn all the time when the device is switched on. This can be accomplished by:

A utilizing a full-wave bridge rectifier circuit
B placing an ammeter in the output circuit
C increasing the value of the output capacitor
D including a suitable bleeder resistance

A-004-002-009 **(A)**

In the design of a power supply, the designer must be careful of resonance effects because the ripple voltage could build up to a high value. The components that must be carefully selected are:

A first choke and first capacitor
B the bleeder resistor and the first choke
C first capacitor and second capacitor
D first choke and second capacitor

A-004-002-010 **(C)**

Excessive rectifier peak current and abnormally high peak inverse voltages can be caused in a power supply by the filter forming a:

A parallel resonant circuit with the first choke and second capacitor
B tuned inductance in the filter choke
C series resonant circuit with the first choke and first capacitor
D short circuit across the bleeder

A-004-002-011 **(A)**

In a properly designed choke input filter power supply, the no-load voltage across the filter capacitor will be about nine-tenths of the AC RMS voltage; yet it is advisable to use capacitors rated at the peak transformer voltage. Why is this large safety margin suggested?

A Under no-load conditions and a burned-out bleeder, voltages could reach the peak transformer voltage

B Resonance can be set up in the filter producing high voltages

C Under heavy load, high currents and voltages are produced

D Under no-load conditions, the current could reach a high level

A-004-003-001 **(A)**

What is one characteristic of a linear electronic voltage regulator?

A The conduction of a control element is varied in direct proportion to the line voltage or load current

B It has a ramp voltage at its output

C A pass transistor switches from its "on" state to its "off" state

D The control device is switched on or off, with the duty cycle proportional to the line or load conditions

A-004-003-002 **(C)**

What is one characteristic of a switching voltage regulator?

A It provides more than one output voltage

B It gives a ramp voltage at its output

C The control device is switched on and off, with the duty cycle proportional to the line or load conditions

D The conduction of a control element is varied in direct proportion to the line voltage or load current

A-004-003-003 **(B)**

What device is typically used as a stable reference voltage in a linear voltage regulator?

A A junction diode

B A Zener diode

C An SCR

D A varactor diode

A-004-003-004 **(D)**

What type of linear regulator is used in applications requiring efficient utilization of the primary power source?

A A shunt regulator

B A constant current source

C A shunt current source

D A series regulator

A-004-003-005 **(A)**

What type of linear voltage regulator is used in applications requiring a constant load on the unregulated voltage source?

A A shunt regulator

B A constant current source

C A shunt current source

D A series regulator

A-004-003-006 **(A)**

How is remote sensing accomplished in a linear voltage regulator?

A A feedback connection to an error amplifier is made directly to the load

B An error amplifier compares the input voltage to the reference voltage

C A load connection is made outside the feedback loop

D By wireless inductive loops

A-004-003-007 **(A)**

What is a three-terminal regulator?

A A regulator containing a voltage reference, error amplifier, sensing resistors and transistors, and a pass element

B A regulator that supplies three voltages at a constant current

C A regulator containing three error amplifiers and sensing transistors

D A regulator that supplies three voltages with variable current

A-004-003-008 **(D)**

In addition to an input voltage range what are the important characteristics of a three-terminal regulator?

A Maximum output voltage and minimum output current
B Minimum output voltage and maximum output current
C Output voltage and minimum output current
D Output voltage and maximum output current

A-004-003-009 **(A)**

What type of voltage regulator contains a voltage reference, error amplifier, sensing resistors and transistors, and a pass element in one package?

A A three-terminal regulator
B An op-amp regulator
C A switching regulator
D A Zener regulator

A-004-003-010 **(A)**

When extremely low ripple is required, or when the voltage supplied to the load must remain constant under conditions of large fluctuations of current and line voltage, a closed-loop amplifier is used to regulate the power supply. There are two main categories of electronic regulators. They are:

A linear and switching
B non-linear and switching
C linear and non-linear
D stiff and switching

A-004-003-011 **(B)**

A modern type of regulator, which features a reference, high-gain amplifier, temperature-compensated voltage sensing resistors and transistors as well as a pass element is commonly referred to as a:

A regulator six-terminal regulator
B three-terminal regulator
C nine-pin terminal regulator
D twenty-four pin terminal

A-004-004-001 **(B)**

In a series-regulated power supply, the power dissipation of the pass transistor is:

A indirectly proportional to the load voltage and the input/output voltage differential
B directly proportional to the load current and the input/output voltage differential
C the inverse of the load current and the input/output voltage differential
D dependent upon the peak inverse voltage appearing across the Zener diode

A-004-004-002 **(A)**

In any regulated power supply, the output is cleanest and the regulation is best:

A at the point where the sampling network or error amplifier is connected
B across the secondary of the pass transistor
C across the load
D at the output of the pass transistor

A-004-004-003 **(D)**

When discussing a power supply the_____ resistance is equal to the output voltage divided by the total current drawn, including the current drawn by the bleeder resistor:

A ideal
B rectifier
C differential
D load

A-004-004-004 **(B)**

The regulation of long-term changes in the load resistance of a power supply is called:

A dynamic regulation
B static regulation
C active regulation
D analog regulation

A-004-004-005 **(D)**

The regulation of short-term changes in the load resistance of a power supply is called:

A static regulation
B analog regulation
C active regulation
D dynamic regulation

A-004-004-006 **(D)**

The dynamic regulation of a power supply is improved by increasing the value of:

A the choke
B the input capacitor
C the bleeder resistor
D the output capacitor

A-004-004-007 **(D)**

The output capacitor, in a power supply filter used to provide power for an SSB or CW transmitter, will give better dynamic regulation if:

A the negative terminal of the electrolytic capacitor is connected to the positive and the positive terminal to ground
B a battery is placed in series with the output capacitor
C it is placed in series with other capacitors
D the output capacitance is increased

A-004-004-008 **(B)**

In a regulated power supply, four diodes connected together in a BRIDGE act as:

A a tuning network
B a rectifier
C equalization across the transformer
D matching between the secondary of the power transformer and the filter

A-004-004-009 **(D)**

In a regulated power supply, components that conduct alternating current at the input before the transformer and direct current before the output are:

A capacitors
B diodes
C chokes
D fuses

A-004-004-010 **(A)**

In a regulated power supply, the output of the electrolytic filter capacitor is connected to the:

A voltage regulator
B pi filter
C solid-state by-pass circuit
D matching circuit for the load

A-004-004-011 **(A)**

In a regulated power supply, a diode connected across the input and output terminals of a regulator is used to:

A protect the regulator from reverse voltages
B provide an RF by-pass for the voltage control
C provide additional capacity
D protect the regulator from voltage fluctuations in the primary of the transformer

A-005-001-001 **(B)**

How is the positive feedback coupled to the input in a Hartley oscillator?

A Through a neutralizing capacitor
B Through a tapped coil
C Through a capacitive divider
D Through link coupling

A-005-001-002 **(B)**

How is positive feedback coupled to the input in a Colpitts oscillator?

A Through a link coupling
B Through a capacitive divider
C Through a tapped coil
D Through a neutralizing capacitor

A-005-001-003 **(A)**

How is positive feedback coupled to the input in a Pierce oscillator?

A Through capacitive coupling
B Through a neutralizing capacitor
C Through link coupling
D Through a tapped coil

A-005-001-004 **(D)**

Why is the Colpitts oscillator circuit commonly used in a VFO?

A It can be used with or without crystal lock-in
B The frequency is a linear function with load impedance
C It has high output power
D It is stable

A-005-001-005 **(C)**

Why must a very stable reference oscillator be used as part of a phase-locked loop (PLL) frequency synthesizer?

A Any amplitude variations in the reference oscillator signal will prevent the loop from changing frequency

B Any amplitude variations in the reference oscillator signal will prevent the loop from locking to the desired signal

C Any phase variations in the reference oscillator signal will produce phase noise in the synthesizer output

D Any phase variations in the reference oscillator signal will produce harmonic distortion in the modulating signal

A-005-001-006 **(D)**

Positive feedback from a capacitive divider indicates the oscillator type is:

A Pierce

B Hartley

C Miller

D Colpitts

A-005-001-007 **(B)**

In an RF oscillator circuit designed for high stability, the positive feedback is drawn from two capacitors connected in series. These two capacitors would most likely be:

A Mylar

B silver mica

C ceramic

D electrolytics

A-005-001-008 **(D)**

In an oscillator circuit where positive feedback is obtained through a single capacitor in series with the crystal, the type of oscillator is:

A Colpitts

B Hartley

C Miller

D Pierce

A-005-001-009 **(C)**

A circuit depending on positive feedback for its operation would be a:

A detector

B audio amplifier

C variable-frequency oscillator

D mixer

A-005-001-010 **(D)**

An apparatus with an oscillator and a class C amplifier would be:

A a fixed-frequency single-sideband transmitter

B a two-stage frequency-modulated transmitter

C a two-stage regenerative receiver

D a two-stage CW transmitter

A-005-001-011 **(B)**

In an oscillator where positive feedback is provided through a capacitor in series with a crystal, that type of oscillator is a:

A Franklin

B Pierce

C Colpitts

D Hartley

A-005-002-001 **(B)**

The output tuning controls on a transmitter power amplifier with an adjustable PI network:

A are involved with frequency multiplication in the previous stage

B allow efficient transfer of power to the antenna

C allow switching to different antennas

D reduce the possibility of cross-modulation in adjunct receivers

A-005-002-002 **(A)**

The purpose of using a centre-tap return connection on the secondary of transmitting tube's filament transformer is to:

A prevent modulation of the emitted wave by the alternating current filament supply

B reduce the possibility of harmonic emissions

C keep the output voltage constant with a varying load

D obtain optimum power output

A-005-002-003 **(A)**

In a grounded grid amplifier using a triode vacuum tube, the input signal is applied to:

A the cathode
B the plate
C the control grid
D the filament leads

A-005-002-004 **(A)**

In a grounded grid amplifier using a triode vacuum tube, the plate is connected to the pi-network through a:

A blocking capacitor
B by-pass capacitor
C tuning capacitor
D electrolytic capacitor

A-005-002-005 **(A)**

In a grounded grid amplifier using a triode vacuum tube, the plate is connected to a radio frequency choke. The other end of the radio frequency choke connects to the:

A B+ (high voltage)
B filament voltage
C ground
D B- (bias)

A-005-002-006 **(B)**

In a grounded grid amplifier using a triode vacuum tube, the cathode is connected to a radio frequency choke. The other end of the radio frequency choke connects to the:

A B+ (high voltage)
B B- (bias)
C ground
D filament voltage

A-005-002-007 **(D)**

In a grounded grid amplifier using a triode vacuum tube, the secondary winding of a transformer is connected directly to the vacuum tube. This transformer provides:

A B- (bias)
B B+ (high voltage)
C Screen voltage
D filament voltage

A-005-002-008 **(A)**

In a grounded grid amplifier using a triode vacuum tube, what would be the approximate B+ voltage required for an output of 400 watts at 400 mA with approximately 50 percent efficiency?

A 2000 volts
B 500 volts
C 3000 volts
D 1000 volts

A-005-002-009 **(A)**

In a grounded grid amplifier using a triode vacuum tube, each side of the filament is connected to a capacitor whose other end is connected to ground. These are:

A by-pass capacitors
B tuning capacitors
C electrolytic capacitors
D blocking capacitors

A-005-002-010 **(D)**

After you have opened a VHF power amplifier to make internal tuning adjustments, what should you do before you turn the amplifier on?

A Make sure that the power interlock switch is bypassed so you can test the amplifier
B Be certain no antenna is attached so that you will not cause any interference
C Remove all amplifier shielding to ensure maximum cooling
D Be certain all amplifier shielding is fastened in place

A-005-002-011 **(C)**

Harmonics produced in an early stage of a transmitter may be reduced in a later stage by:

A greater input to the final stage
B transistors instead of tubes
C tuned circuit coupling between stages
D larger value coupling capacitors

A-005-003-001 **(A)**

In a simple 2 stage CW transmitter circuit, the oscillator stage and the class C amplifier stage are inductively coupled by a RF transformer. Another role of the RF transformer is to:

A be part of a tuned circuit
B act as part of a pi filter
C provide the necessary feedback for oscillation
D act as part of a balanced mixer

A-005-003-002 **(B)**

In a simple 2 stage CW transmitter, current to the collector of the transistor in the class C amplifier stage flows through a radio frequency choke (RFC) and a tapped inductor. The RFC, on the tapped inductor side, is also connected to grounded capacitors. The purpose of the RFC and capacitors is to:

A form a RF-tuned circuit
B form a low-pass filter
C provide negative feedback
D form a key-click filter

A-005-003-003 **(C)**

In a simple 2 stage CW transmitter, the transistor in the second stage would act as:

A the master oscillator
B an audio oscillator
C a power amplifier
D a frequency multiplier

A-005-003-004 **(A)**

An advantage of keying the buffer stage in a transmitter is that:

A changes in oscillator frequency are less likely
B key clicks are eliminated
C the radiated bandwidth is restricted
D high RF voltages are not present

A-005-003-005 **(A)**

As a power amplifier is tuned, what reading on its grid current meter indicates the best neutralization?

A A minimum change in grid current as the output circuit is changed
B Minimum grid current
C Maximum grid current
D A maximum change in grid current as the output circuit is changed

A-005-003-006 **(D)**

What does a neutralizing circuit do in an RF amplifier?

A It eliminates AC hum from the power supply
B It reduces incidental grid modulation
C It controls differential gain
D It cancels the effects of positive feedback

A-005-003-007 **(D)**

What is the reason for neutralizing the final amplifier stage of a transmitter?

A To limit the modulation index
B To cut off the final amplifier during standby periods
C To keep the carrier on frequency
D To eliminate parasitic oscillations

A-005-003-008 **(A)**

Parasitic oscillations are usually generated due to:

A accidental resonant frequencies in the power amplifier
B harmonics from some earlier multiplier stage
C excessive drive or excitation to the power amplifier
D a mismatch between power amplifier and transmission line

A-005-003-009 **(A)**

Parasitic oscillations would tend to occur mostly in:

A RF power output stages
B high gain audio output stages
C high voltage rectifiers
D mixer stages

A-005-003-010 **(C)**

Why is neutralization necessary for some vacuum-tube amplifiers?

A To cancel AC hum from the filament transformer
B To reduce the limits of loaded Q
C To cancel oscillation caused by the effects of interelectrode capacitance
D To reduce grid-to-cathode leakage

A-005-003-011 **(A)**

Parasitic oscillations in an RF power amplifier may be caused by:

A lack of neutralization
B overdriven stages
C poor voltage regulation
D excessive harmonic production

A-005-004-001 **(B)**

What type of signal does a balanced modulator produce?

A Single sideband, suppressed carrier
B Double sideband, suppressed carrier
C FM with balanced deviation
D Full carrier

A-005-004-002 **(A)**

How can a single-sideband phone signal be produced?

A By using a balanced modulator followed by a filter
B By driving a product detector with a DSB signal
C By using a loop modulator followed by a mixer
D By using a reactance modulator followed by a mixer

A-005-004-003 **(C)**

Carrier suppression in a single-sideband transmitter takes place in:

A the mechanical filter
B the frequency multiplier stage
C the balanced modulator stage
D the carrier decouple stage

A-005-004-004 **(B)**

Transmission with SSB, as compared to conventional AM transmission, results in:

A 3 dB gain in the transmitter
B 6 dB gain in the transmitter and 3 dB gain in the receiver
C 6 dB gain in the receiver
D a greater bandpass requirement in the receiver

A-005-004-005 **(A)**

The peak power output of a single-sideband transmitter, when being tested by a two-tone generator is:

A twice the RF power output of any of the tones
B equal to the RF peak output power of any of the tones
C one-half of the RF peak output power of any of the tones
D one-quarter of the RF peak output power of any of the tones

A-005-004-006 **(B)**

What kind of input signal is used to test the amplitude linearity of a single-sideband phone transmitter while viewing the output on an oscilloscope?

A Normal speech
B Two audio-frequency sine waves
C An audio-frequency sine wave
D An audio-frequency square wave

A-005-004-007 **(D)**

When testing the amplitude linearity of a single-sideband transmitter what audio tones are fed into the microphone input and on what kind of kind of instrument is the output observed?

A Two harmonically related tones are fed in, and the output is observed on an oscilloscope
B Two harmonically related tones are fed in, and the output is observed on a distortion analyzer
C Two non-harmonically related tones are fed in, and the output is observed on a distortion analyzer
D Two non-harmonically related tones are fed in, and the output is observed on an oscilloscope

A-005-004-008 **(D)**

What audio frequencies are used in a two-tone test of the linearity of a single-sideband phone transmitter?

A 20 Hz and 20 kHz tones must be used

B 1200 Hz and 2400 Hz tones must be used

C Any two audio tones may be used, but they must be within the transmitter audio passband, and must be harmonically related

D Any two audio tones may be used, but they must be within the transmitter audio passband, and should not be harmonically related

A-005-004-009 **(A)**

What measurement can be made of a single-sideband phone transmitter's amplifier by performing a two-tone test using an oscilloscope?

A Its linearity

B Its frequency deviation

C Its percent of carrier phase shift

D Its percent of frequency modulation

A-005-004-010 **(A)**

How much is the carrier suppressed below peak output power in a single-sideband phone transmission?

A At least 40 dB

B No more than 20 dB

C No more than 30 dB

D At least 60 dB

A-005-004-011 **(B)**

What is meant by "flat topping" in a single-sideband phone transmission?

A The transmitter's carrier is properly suppressed

B Signal distortion caused by excessive drive

C Signal distortion caused by insufficient collector current

D The transmitter's automatic level control is properly adjusted

A-005-005-001 **(B)**

In an FM phone signal having a maximum frequency deviation of 3000 Hz either side of the carrier frequency, what is the modulation index, when the modulating frequency is 1000 Hz?

A 1000

B 3

C 0.3

D 3000

A-005-005-002 **(C)**

What is the modulation index of an FM phone transmitter producing an instantaneous carrier deviation of 6 kHz when modulated with a 2 kHz modulating frequency?

A 2000

B 6000

C 3

D 0.333

A-005-005-003 **(B)**

What is the deviation ratio of an FM phone transmitter having a maximum frequency swing of plus or minus 5 kHz and accepting a maximum modulation rate of 3 kHz?

A 0.6

B 1.66

C 60

D 0.16

A-005-005-004 **(C)**

What is the deviation ratio of an FM phone transmitter having a maximum frequency swing of plus or minus 7.5 kHz and accepting a maximum modulation rate of 3.5 kHz?

A 47

B 0.214

C 2.14

D 0.47

A-005-005-005 **(A)**

When the transmitter is not modulated, or the amplitude of the modulating signal is zero, the frequency of the carrier is called its:

A centre frequency
B frequency deviation
C frequency shift
D modulating frequency

A-005-005-006 **(C)**

In an FM transmitter system, the amount of deviation from the centre frequency is determined solely by the:

A amplitude and the frequency of the modulating frequency
B modulating frequency and the amplitude of the centre frequency
C amplitude of the modulating frequency
D frequency of the modulating frequency

A-005-005-007 **(C)**

Any FM wave with single-tone modulation has:

A four sideband frequencies
B one sideband frequency
C an infinite number of sideband frequencies
D two sideband frequencies

A-005-005-008 **(B)**

Some types of deviation meters work on the principle of:

A a carrier peak and dividing by the modulation index
B a carrier null and multiplying the modulation frequency by the modulation index
C detecting the frequencies in the sidebands
D the amplitude of power in the sidebands

A-005-005-009 **(B)**

When using some deviation meters, it is important to know:

A pass-band of the IF filter
B modulating frequency and the modulation index
C modulation index
D modulating frequency

A-005-005-010 **(D)**

What is the significant bandwidth of an FM-phone transmission having a +/- 5-kHz deviation and a 3-kHz modulating frequency?

A 8 kHz
B 5 kHz
C 3 kHz
D 16 kHz

A-005-005-011 **(A)**

What is the frequency deviation for a 12.21-MHz reactance-modulated oscillator in a +/- 5-kHz deviation, 146.52-MHz FM-phone transmitter?

A +/- 416.7 Hz
B +/- 12 kHz
C +/- 5 kHz
D +/- 41.67 Hz

A-005-006-001 **(B)**

If the signals of two repeater transmitters mix together in one or both of their final amplifiers and unwanted signals at the sum and difference frequencies of the original signals are generated and radiated, what is this called?

A Amplifier desensitization
B Intermodulation interference
C Neutralization
D Adjacent channel interference

A-005-006-002 **(B)**

How does intermodulation interference between two repeater transmitters usually occur?

A When the signals are reflected out of phase by aircraft passing overhead
B When they are in close proximity and the signals mix in one or both of their final amplifiers
C When the signals are reflected in phase by aircraft passing overhead
D When they are in close proximity and the signals cause feedback in one or both of their final amplifiers

A-005-006-003 **(B)**

How can intermodulation interference between two repeater transmitters in close proximity often be reduced or eliminated?

A By using a Class C final amplifier with high driving power
B By installing a terminated circulator or ferrite isolator in the transmission line to the transmitter and duplexer
C By installing a low-pass filter in the antenna transmission line
D By installing a high-pass filter in the antenna transmission line

A-005-006-004 **(B)**

If a receiver tuned to 146.70 MHz receives an intermodulation product signal whenever a nearby transmitter transmits on 146.52, what are the two most likely frequencies for the other interfering signal?

A 73.35 MHz and 239.40 MHz
B 146.34 MHz and 146.61 MHz
C 146.88 MHz and 146.34 MHz
D 146.01 MHz and 147.30 MHz

A-005-006-005 **(A)**

What type of circuit varies the tuning of an amplifier tank circuit to produce FM signals?

A A phase modulator
B A balanced modulator
C A double balanced mixer
D An audio modulator

A-005-006-006 **(C)**

What audio shaping network is added at an FM transmitter to attenuate the lower audio frequencies?

A A heterodyne suppressor
B A de-emphasis network
C A pre-emphasis network
D An audio prescaler

A-005-006-007 **(C)**

Which type of filter would be best to use in a 2-metre repeater duplexer?

A An L-C filter
B A crystal filter
C A cavity filter
D A DSP filter

A-005-006-008 **(A)**

The characteristic difference between a phase modulator and a frequency modulator is:

A pre-emphasis
B the centre frequency
C de-emphasis
D frequency inversion

A-005-006-009 **(C)**

In most modern FM transmitters, to produce a better sound, a compressor and a clipper are placed:

A between the modulator and the oscillator
B in the microphone circuit, before the audio amplifier
C between the audio amplifier and the modulator
D between the multiplier and the PA

A-005-006-010 **(C)**

Three important parameters to be verified in an FM transmitter are:

A modulation, pre-emphasis and carrier suppression
B frequency stability, de-emphasis and linearity
C power, frequency deviation and frequency stability
D distortion, bandwidth and sideband power

A-005-006-011 **(B)**

Intermodulation interference products are not typically associated with which of the following:

A passive intermodulation
B intermediate frequency stage
C final amplifier stage
D receiver frontend

A-005-007-001 **(D)**

Maintaining the peak RF output of a SSB transmitter at a relatively constant level requires a circuit called the:

A automatic gain control (AGC)
B automatic output control (AOC)
C automatic volume control (AVC)
D automatic level control (ALC)

A-005-007-002 **(C)**

Speech compression associated with SSB transmission implies:

A a lower signal-to-noise ratio
B circuit level instability
C full amplification of low level signals and reducing or eliminating amplification of high level signals
D full amplification of high level signals and reducing or eliminating signals amplification of low level

A-005-007-003 **(A)**

Which of the following functions is not included in a typical digital signal processor?

A Aliasing amplifier
B Analog to digital converter
C Digital to analog converter
D Mathematical transform

A-005-007-004 **(C)**

How many bits are required to provide 256 discrete levels, or a ratio of 256:1?

A 16 bits
B 4 bits
C 8 bits
D 6 bits

A-005-007-005 **(A)**

Adding one bit to the word length, is equivalent to adding ____ dB to the dynamic range of the digitizer:

A 6 dB
B 1 dB
C 4 dB
D 3 dB

A-005-007-006 **(D)**

What do you call the circuit which employs an analog to digital converter, a mathematical transform, a digital to analog converter and a low pass filter?

A Digital formatter
B Mathematical transformer
C Digital transformer
D Digital signal processor

A-005-007-007 **(A)**

Which principle is not associated with analog signal processing?

A Frequency division
B Compression
C Bandwidth limiting
D Clipping

A-005-007-008 **(B)**

Which of the following is not a method used for peak limiting, in a signal processor?

A AF clipping
B Frequency clipping
C RF clipping
D Compression

A-005-007-009 **(A)**

What is the undesirable result of AF clipping in a speech processor?

A Increased harmonic distortion
B Reduced average power
C Increased average power
D Reduction in peak amplitude

A-005-007-010 **(D)**

Which description is not correct? You are planning to build a speech processor for your transceiver. Compared to AF clipping, RF clipping:

A has less distortion
B is more expensive to implement
C is more difficult to implement
D is easier to implement

A-005-007-011 **(A)**

Automatic Level Control (ALC) is another name for:

A RF compression
B AF compression
C RF clipping
D AF clipping

A-005-008-001 **(C)**

What digital code consists of elements having unequal length?

A Baudot
B ASCII
C Varicode
D AX.25

A-005-008-002 **(B)**

Open Systems Interconnection (OSI) model standardizes communications functions as layers within a data communications system. Amateur digital radio systems often follow the OSI model in structure. What is the base layer of the OSI model involving the interconnection of a packet radio TNC to a computer terminal?

A The transport layer
B The physical layer
C The link layer
D The network layer

A-005-008-003 **(B)**

What is the purpose of a Cyclic Redundancy Check (CRC)?

A Lossless compression
B Error detection
C Lossy compression
D Error correction

A-005-008-004 **(C)**

What is one advantage of using ASCII rather than Baudot code?

A ASCII characters contain fewer information bits
B The larger character set allows store-and-forward
C It includes both upper and lower case text characters in the code
D ASCII includes built-in error correction

A-005-008-005 **(B)**

What type of error control system is used in AMTOR ARQ (Mode A)?

A Mode A AMTOR does not include an error control system
B The receiving station automatically requests repeats when needed
C The receiving station checks the frame check sequence (FCS) against the transmitted FCS
D Each character is sent twice

A-005-008-006 **(A)**

What error-correction system is used in AMTOR FEC (Mode B)?

A Each character is sent twice
B Mode B AMTOR does not include an error-correction system
C The receiving station automatically requests repeats when needed
D The receiving station checks the frame check sequence (FCS) against the transmitted FCS

A-005-008-007 **(A)**

APRS (Automatic Packet Reporting System) does NOT support which one of these functions?

A Automatic link establishment
B Two-way messaging
C Telemetry
D Amateur-specific local information broadcast

A-005-008-008 **(C)**

Which algorithm may be used to create a Cyclic Redundancy Check (CRC)?

A Convolution code
B Lempel-Ziv routine
C Hash function
D Dynamic Huffman code

A-005-008-009 **(D)**

The designator AX.25 is associated with which amateur radio mode?

A RTTY
B ASCII
C spread spectrum speech
D packet

A-005-008-010 **(A)**

How many information bits are included in the Baudot code?

A 5
B 7
C 8
D 6

A-005-008-011 **(C)**

How many information bits are included in the ISO-8859 extension to the ASCII code?

A 6
B 5
C 8
D 7

A-005-009-001 **(C)**

What term describes a wide-band communications system in which the RF carrier varies according to some predetermined sequence?

A AMTOR
B Time domain frequency modulation
C Spread spectrum communication
D Amplitude-companded single sideband

A-005-009-002 **(B)**

What is the term used to describe a spread spectrum communications system where the centre frequency of a conventional carrier is changed many times per second in accordance with a pseudorandom list of channels?

A Frequency companded spread spectrum
B Frequency hopping
C Direct sequence
D Time-domain frequency modulation

A-005-009-003 **(A)**

What term is used to describe a spread spectrum communications system in which a very fast binary bit stream is used to shift the phase of an RF carrier?

A Direct sequence
B Frequency hopping
C Phase companded spread spectrum
D Binary phase-shift keying

A-005-009-004 **(B)**

Frequency hopping is used with which type of transmission?

A RTTY
B Spread spectrum
C AMTOR
D Packet

A-005-009-005 **(B)**

Direct sequence is used with which type of transmission?

A RTTY
B Spread spectrum
C AMTOR
D Packet

A-005-009-006 **(C)**

Which type of signal is used to produce a predetermined alteration in the carrier for spread spectrum communication?

A Quantizing noise
B Random noise sequence
C Pseudo-random sequence
D Frequency-companded sequence

A-005-009-007 **(C)**

Why is it difficult to monitor a spread spectrum transmission?

A It varies too quickly in amplitude
B The signal is too distorted for comfortable listening
C Your receiver must be frequency-synchronized to the transmitter
D It requires narrower bandwidth than most receivers have

A-005-009-008 **(C)**

What is frequency hopping spread spectrum?

A The carrier is frequency-companded
B The carrier is phase-shifted by a fast binary bit stream
C The carrier frequency is changed in accordance with a pseudo-random list of channels
D The carrier is amplitude-modulated over a wide range called the spread

A-005-009-009 **(A)**

What is direct-sequence spread spectrum?

A The carrier is phase-shifted by a fast binary bit stream
B The carrier is amplitude modulated over a range called the spread
C The carrier is frequency-companded
D The carrier is altered in accordance with a pseudo-random list of channels

A-005-009-010 **(C)**

Why are received spread-spectrum signals so resistant to interference?

A If interference is detected by the receiver, it will signal the transmitter to change frequencies
B The high power used by a spread-spectrum transmitter keeps its signal from being easily overpowered
C Signals not using the spectrum-spreading algorithm are suppressed in the receiver
D The receiver is always equipped with a special digital signal processor (DSP) interference filter

A-005-009-011 **(A)**

How does the spread-spectrum technique of frequency hopping work?

A The frequency of an RF carrier is changed very rapidly according to a particular pseudo-random sequence
B If interference is detected by the receiver, it will signal the transmitter to change frequency
C If interference is detected by the receiver, it will signal the transmitter to wait until the frequency is clear
D A pseudo-random bit stream is used to shift the phase of an RF carrier very rapidly in a particular sequence

A-006-001-001 **(B)**

What are the advantages of the frequency conversion process in a superheterodyne receiver?

A Automatic squelching and increased sensitivity
B Increased selectivity and optimal tuned circuit design
C Automatic detection in the RF amplifier and increased sensitivity
D Automatic soft-limiting and automatic squelching

A-006-001-002 **(C)**

What factors should be considered when selecting an intermediate frequency?

A Interference to other services
B Cross-modulation distortion and interference
C Image rejection and responses to unwanted signals
D Noise figure and distortion

A-006-001-003 **(C)**

One of the greatest advantages of the double-conversion over the single-conversion receiver is that it:

A is much more sensitive
B produces a louder signal at the output
C greater reduction of image interference for a given front end selectivity
D is much more stable

A-006-001-004 **(B)**

In a communications receiver, a crystal filter would be located in the:

A detector
B IF circuits
C local oscillator
D audio output stage

A-006-001-005 **(D)**

A multiple conversion superheterodyne receiver is more susceptible to spurious responses than a single-conversion receiver because of the:

A poorer selectivity in the IF caused by the multitude of frequency changes
B greater sensitivity introducing higher levels of RF to the receiver
C AGC being forced to work harder causing the stages concerned to overload
D additional oscillators and mixing frequencies involved in the design

A-006-001-006 **(C)**

In a dual-conversion superheterodyne receiver what are the respective aims of the first and second conversion:

A selectivity and dynamic range
B image rejection and noise figure
C image rejection and selectivity
D selectivity and image rejection

A-006-001-007 **(D)**

Which stage of a receiver has its input and output circuits tuned to the received frequency?

A The local oscillator
B The audio frequency amplifier
C The detector
D The RF amplifier

A-006-001-008 **(A)**

Which stage of a superheterodyne receiver lies between a tuneable stage and a fixed tuned stage?

A Mixer
B Radio frequency amplifier
C Intermediate frequency amplifier
D Local oscillator

A-006-001-009 **(D)**

A single conversion receiver with a 9 MHz IF has a local oscillator operating at 16 MHz. The frequency it is tuned to is:

A 16 MHz
B 21 MHz
C 9 MHz
D 7 MHz

A-006-001-010 **(B)**

A double conversion receiver designed for SSB reception has a beat frequency oscillator and:

A two IF stages and one local oscillator
B two IF stages and two local oscillators
C one IF stage and one local oscillator
D two IF stages and three local oscillators

A-006-001-011 **(D)**

The advantage of a double conversion receiver over a single conversion receiver is that it:

A does not drift off frequency
B is a more sensitive receiver
C produces a louder audio signal
D suffers less from image interference for a given front end sensitivity

A-006-002-001 **(D)**

The mixer stage of a superheterodyne receiver is used to:

A allow a number of IF frequencies to be used
B remove image signals from the receiver
C produce an audio frequency for the speaker
D change the frequency of the incoming signal to that of the IF

A-006-002-002 **(C)**

A superheterodyne receiver designed for SSB reception must have a beat-frequency oscillator (BFO) because:

A it reduces the pass-band of the IF stages
B it beats with the receiver carrier to produce the missing sideband
C the suppressed carrier must be replaced for detection
D it phases out the unwanted sideband signal

A-006-002-003 **(C)**

The first mixer in the receiver mixes the incoming signal with the local oscillator to produce:

A a radio frequency
B a high frequency oscillator (HFO) frequency
C an intermediate frequency
D an audio frequency

A-006-002-004 **(A)**

If the incoming signal to the mixer is 3 600 kHz and the first IF is 9 MHz, at which one of the following frequencies would the local oscillator (LO) operate?

A 5 400 kHz
B 3 400 kHz
C 10 600 kHz
D 21 600 kHz

A-006-002-005 **(B)**

The BFO is off-set slightly (500 - 1 500 Hz) from the incoming signal to the detector. This is required:

A to protect the incoming signal from interference
B to beat with the incoming signal
C to pass the signal without interruption
D to provide additional amplification

A-006-002-006 **(C)**

It is very important that the oscillators contained in a superheterodyne receiver are:

A stable and sensitive
B selective and spectrally pure
C stable and spectrally pure
D sensitive and selective

A-006-002-007 **(A)**

In a superheterodyne receiver, a stage before the IF amplifier has a variable capacitor in parallel with a trimmer capacitor and an inductance. The variable capacitor is for:

A tuning of the local oscillator (LO)
B tuning both the antenna and the BFO
C tuning of the beat-frequency oscillator (BFO)
D tuning both the antenna and the LO

A-006-002-008 **(C)**

In a superheterodyne receiver without an RF amplifier, the input to the mixer stage has a variable capacitor in parallel with an inductance. The variable capacitor is for:

A tuning the beat-frequency oscillator
B tuning both the antenna and the local oscillator
C tuning the receiver preselector to the reception frequency
D tuning both the antenna and the beat-frequency oscillator

A-006-002-009 **(D)**

What receiver stage combines a 14.25-MHz input signal with a 13.795-MHz oscillator signal to produce a 455-kHz intermediate frequency (IF) signal?

A BFO
B VFO
C Multiplier
D Mixer

A-006-002-010 **(D)**

Which two stages in a superheterodyne receiver have input tuned circuits tuned to the same frequency?

A IF and local oscillator
B RF and IF
C RF and local oscillator
D RF and first mixer

A-006-002-011 **(A)**

The mixer stage of a superheterodyne receiver:

A produces an intermediate frequency
B produces spurious signals
C acts as a buffer stage
D demodulates SSB signals

A-006-003-001 **(A)**

What is meant by the noise floor of a receiver?

A The weakest signal that can be detected above the receiver internal noise
B The weakest signal that can be detected under noisy atmospheric conditions
C The minimum level of noise that will overload the receiver RF amplifier stage
D The amount of noise generated by the receiver local oscillator

A-006-003-002 **(C)**

Which of the following is a purpose of the first IF amplifier stage in a receiver?

A To increase dynamic response
B To improve noise figure performance
C To improve selectivity and gain
D To tune out cross-modulation distortion

A-006-003-003 **(B)**

How much gain should be used in the RF amplifier stage of a receiver?

A Sufficient gain to keep weak signals below the noise of the first mixer stage
B Sufficient gain to allow weak signals to overcome noise generated in the first mixer stage
C As much gain as possible, short of self-oscillation
D It depends on the amplification factor of the first IF stage

A-006-003-004 **(B)**

What is the primary purpose of an RF amplifier in a receiver?

A To provide most of the receiver gain
B To improve the receiver noise figure
C To vary the receiver image rejection by using the AGC
D To develop the AGC voltage

A-006-003-005 **(C)**

How is receiver sensitivity often expressed for UHF FM receivers?

A Noise Figure in decibels
B Overall gain in decibels
C RF level for 12 dB SINAD
D RF level for a given Bit Error Rate (BER)

A-006-003-006 **(C)**

What is the term used for the decibel difference (or ratio) between the largest tolerable receiver input signal (without causing audible distortion products) and the minimum discernible signal (sensitivity)?

A Stability
B Noise figure
C Dynamic range
D Design parameter

A-006-003-007 **(D)**

The lower the receiver noise figure becomes, the greater will be the receiver's _____:

A rejection of unwanted signals
B selectivity
C stability
D sensitivity

A-006-003-008 **(D)**

The noise generated in a receiver of good design originates in the:

A detector and AF amplifier
B BFO and detector
C IF amplifier and detector
D RF amplifier and mixer

A-006-003-009 **(D)**

Why are very low noise figures relatively unimportant for a high frequency receiver?

A Ionospheric distortion of the received signal creates high noise levels
B The use of SSB and CW on the HF bands overcomes the noise
C Regardless of the front end, the succeeding stages when used on HF are very noisy
D External HF noise, man-made and natural, are higher than the internal noise generated by the receiver

A-006-003-010 **(A)**

The term which relates specifically to the amplitude levels of multiple signals that can be accommodated during reception is called:

A dynamic range
B AGC
C cross-modulation index
D noise figure

A-006-003-011 **(A)**

Normally, front-end selectivity is provided by the resonant networks both before and after the RF stage in a superheterodyne receiver. This whole section of the receiver is often referred to as the:

A preselector
B preamble
C preamplifier
D pass-selector

A-006-004-001 **(D)**

What audio shaping network is added at an FM receiver to restore proportionally attenuated lower audio frequencies?

A A pre-emphasis network
B An audio prescaler
C A heterodyne suppressor
D A de-emphasis network

A-006-004-002 **(B)**

What does a product detector do?

A It detects cross-modulation products
B It mixes an incoming signal with a locally generated carrier
C It provides local oscillations for input to a mixer
D It amplifies and narrows band-pass frequencies

A-006-004-003 **(C)**

Distortion in a receiver that only affects strong signals usually indicates a defect in or mis-adjustment of the:

A AF amplifier
B RF amplifier
C automatic gain control (AGC)
D IF amplifier

A-006-004-004 **(C)**

In a superheterodyne receiver with automatic gain control (AGC), as the strength of the signal increases, the AGC:

A distorts the signal
B introduces limiting
C reduces the receiver gain
D increases the receiver gain

A-006-004-005 **(B)**

The amplified IF signal is applied to the _____ stage in a superheterodyne receiver:

A LO
B detector
C RF amplifier
D audio output

A-006-004-006 **(C)**

The low-level output of a detector is:

A fed directly to the speaker
B applied to the RF amplifier
C applied to the AF amplifier
D grounded via the chassis

A-006-004-007 **(C)**

The overall output of an AM/CW/SSB receiver can be adjusted by means of manual controls on the receiver or by use of a circuit known as:

A inverse gain control
B automatic load control
C automatic gain control
D automatic frequency control

A-006-004-008 **(A)**

AGC voltage is applied to the:

A RF and IF amplifiers
B AF and IF amplifiers
C RF and AF amplifiers
D detector and AF amplifiers

A-006-004-009 **(C)**

AGC is derived in a receiver from one of two circuits. Depending on the method used, it is called:

A IF derived or RF derived
B detector derived or audio derived
C IF derived or audio derived
D RF derived or audio derived

A-006-004-010 **(C)**

Which two variables primarily determine the behaviour of an automatic gain control (AGC) loop?

A Slope and bandwidth
B Clipping level and hang time
C Threshold and decay time
D Blanking level and slope

A-006-004-011 **(A)**

What circuit combines signals from an IF amplifier stage and a beat-frequency oscillator (BFO), to produce an audio signal?

A A product detector circuit
B An AGC circuit
C A power supply circuit
D A VFO circuit

A-006-005-001 **(C)**

What part of a superheterodyne receiver determines the image rejection ratio of the receiver?

A AGC loop
B IF filter
C RF amplifier pre-selector
D Product detector

A-006-005-002 **(A)**

What is the term for the reduction in receiver sensitivity caused by a strong signal near the received frequency?

A Desensitization
B Cross-modulation interference
C Squelch gain rollback
D Quieting

A-006-005-003 **(B)**

What causes receiver desensitization?

A Audio gain adjusted too low
B Strong near frequency signals
C Squelch gain adjusted too high
D Squelch gain adjusted too low

A-006-005-004 **(C)**

What is one way receiver desensitization can be reduced?

A Increase the receiver bandwidth
B Increase the transmitter audio gain
C Use a cavity filter
D Decrease the receiver squelch gain

A-006-005-005 **(C)**

What causes intermodulation in an electronic circuit?

A Positive feedback
B Lack of neutralization
C Nonlinear circuits or devices
D Too little gain

A-006-005-006 **(A)**

Which of the following is an important reason for using a VHF intermediate frequency in an HF receiver?

A To move the image response far away from the filter passband
B To provide a greater tuning range
C To tune out cross-modulation distortion
D To prevent the generation of spurious mixer products

A-006-005-007 **(D)**

Intermodulation interference is produced by:

A the interaction of products from high-powered transmitters in the area
B the high-voltage stages in the final amplifier of an amplitude or frequency-modulated transmitter
C the mixing of more than one signal in the first or second intermediate frequency amplifiers of a receiver
D the mixing of two or more signals in the front-end of a superheterodyne receiver

A-006-005-008 **(B)**

Which of the following is NOT a direct cause of instability in a receiver?

A Temperature variations
B Dial display accuracy
C Mechanical rigidity
D Feedback components

A-006-005-009 **(C)**

Poor frequency stability in a receiver usually originates in the:

A RF amplifier
B mixer
C local oscillator and power supply
D detector

A-006-005-010 **(C)**

Poor dynamic range of a receiver can cause many problems when a strong signal appears within or near the front-end bandpass. Which of the following is NOT caused as a direct result?

A Intermodulation
B Cross-modulation
C Feedback
D Desensitization

A-006-005-011 **(A)**

Which of these measurements is a good indicator of VHF receiver performance in an environment of strong out-of-band signals?

A Two-tone Third-Order IMD Dynamic Range, 10 MHz spacing
B Third-Order Intercept Point
C Blocking Dynamic Range
D Intermediate frequency rejection ratio

A-007-001-001 **(B)**

For an antenna tuner of the "Transformer" type, which of the following statements is FALSE?

A The circuit is known as a transformer-type antenna tuner
B The circuit is known as a Pi-type antenna tuner
C The input is suitable for 50 ohm impedance
D The output is suitable for impedances from low to high

A-007-001-002 **(B)**

For an antenna tuner of the "Series" type, which of the following statements is false?

A The input is suitable for impedance of 50 ohms
B The circuit is known as a Pi-type antenna tuner
C The circuit is known as a Series-type antenna tuner
D The output is suitable for impedances from low to high

A-007-001-003 **(C)**

For an antenna tuner of the "L" type, which of the following statements is false?

A The antenna output is high impedance
B The circuit is known as an L-type antenna tuner
C The circuit is suitable for matching to a vertical ground plane antenna
D The transmitter input is suitable for 50 ohms impedance

A-007-001-004 **(B)**

For an antenna tuner of the "Pi" type, which of the following statements is false?

A The circuit is a Pi-type antenna tuner
B The circuit is a series-type antenna tuner
C The transmitter input is suitable for impedance of 50 ohms
D The antenna output is suitable for impedances from low to high

A-007-001-005 **(A)**

What is a pi-network?

A A network consisting of one inductor and two capacitors or two inductors and one capacitor
B An antenna matching network that is isolated from ground
C A network consisting of four inductors or four capacitors
D A power incidence network

A-007-001-006 **(C)**

Which type of network offers the greatest transformation ratio?

A Butterworth
B L-network
C Pi-network
D Chebyshev

A-007-001-007 **(B)**

Why is an L-network of limited utility in impedance matching?

A It has limited power handling capability
B It matches only a small impedance range
C It is thermally unstable
D It is prone to self-resonance

A-007-001-008 **(D)**

How does a network transform one impedance to another?

A It produces transconductance to cancel the reactive part of an impedance
B It introduces negative resistance to cancel the resistive part of an impedance
C Network resistances substitute for load resistances
D It cancels the reactive part of an impedance and changes the resistive part

A-007-001-009 **(B)**

What advantage does a pi-L network have over a pi-network for impedance matching between a vacuum tube linear amplifier and a multiband antenna?

A Greater transformation range
B Greater harmonic suppression
C Higher efficiency
D Lower losses

A-007-001-010 **(B)**

Which type of network provides the greatest harmonic suppression?

A L-network
B Pi-L network
C Inverse pi-network
D Pi-network

A-007-001-011 **(A)**

A Smith Chart is useful:

A because it simplifies mathematical operations
B only to solve matching and transmission line problems
C to solve problems in direct current circuits
D because it only works with complex numbers

A-007-002-001 **(C)**

What kind of impedance does a quarter wavelength transmission line present to the source when the line is shorted at the far end?

A The same as the output impedance of the source
B A very low impedance
C A very high impedance
D The same as the characteristic impedance of the transmission line

A-007-002-002 **(D)**

What kind of impedance does a quarter wavelength transmission line present to the source if the line is open at the far end?

A A very high impedance
B The same as the output impedance of the source
C The same as the characteristic impedance of the transmission line
D A very low impedance

A-007-002-003 **(B)**

What kind of impedance does a half wavelength transmission line present to the source when the line is open at the far end?

A A very low impedance
B A very high impedance
C The same as the characteristic impedance of the transmission line
D The same as the output impedance of the source

A-007-002-004 **(D)**

What kind of impedance does a half wavelength transmission line present to the source when the line is shorted at the far end?

A A very high impedance
B The same as the characteristic impedance of the transmission line
C The same as the output impedance of the source
D A very low impedance

A-007-002-005 **(D)**

What is the velocity factor of a transmission line?

A The velocity of the wave on the transmission line multiplied by the velocity of light in a vacuum
B The index of shielding for coaxial cable
C The ratio of the characteristic impedance of the line to the terminating impedance
D The velocity of the wave on the transmission line divided by the velocity of light

A-007-002-006 **(C)**

What is the term for the ratio of the actual velocity at which a signal travels through a transmission line to the speed of light in a vacuum?

A Surge impedance
B Standing wave ratio
C Velocity factor
D Characteristic impedance

A-007-002-007 **(B)**

What is a typical velocity factor for coaxial cable with polyethylene dielectric?

A 2.7
B 0.66
C 0.33
D 0.1

A-007-002-008 **(D)**

What determines the velocity factor in a transmission line?

A The line length
B The centre conductor resistivity
C The terminal impedance
D Dielectrics in the line

A-007-002-009 **(C)**

Why is the physical length of a coaxial cable shorter than its electrical length?

A Skin effect is less pronounced in the coaxial cable
B The characteristic impedance is higher in a parallel transmission line
C RF energy moves slower along the coaxial cable than in air
D The surge impedance is higher in the parallel transmission line

A-007-002-010 **(C)**

The reciprocal of the square root of the dielectric constant of the material used to separate the conductors in a transmission line gives the _____ of the line:

A impedance
B hermetic losses
C velocity factor
D VSWR

A-007-002-011 **(A)**

The velocity factor of a transmission line is the:

A ratio of the velocity of propagation in the transmission line to the velocity of propagation in free space
B impedance of the line, e.g. 50 ohm, 75 ohm, etc.
C speed at which the signal travels in free space
D speed to which the standing waves are reflected back to the transmitter

A-007-003-001 **(C)**

What term describes a method used to match a high-impedance transmission line to a lower impedance antenna by connecting the line to the driven element in two places, spaced a fraction of a wavelength on each side of the driven element centre?

A The omega match
B The stub match
C The T match
D The gamma match

A-007-003-002 **(B)**

What term describes an unbalanced feed system in which the driven element of an antenna is fed both at the centre and a fraction of a wavelength to one side of centre?

A The T match
B The gamma match
C The omega match
D The stub match

A-007-003-003 **(A)**

What term describes a method of antenna impedance matching that uses a short section of transmission line connected to the antenna transmission line near the antenna and perpendicular to the transmission line?

A The stub match
B The omega match
C The delta match
D The gamma match

A-007-003-004 **(A)**

Assuming a velocity factor of 0.66 what would be the physical length of a typical coaxial stub that is electrically one quarter wavelength long at 14.1 MHz?

A 3.51 metres (11.5 feet)
B 20 metres (65.6 feet)
C 2.33 metres (7.64 feet)
D 0.25 metre (0.82 foot)

A-007-003-005 **(A)**

The driven element of a Yagi antenna is connected to a coaxial transmission line. The coax braid is connected to the centre of the driven element and the centre conductor is connected to a variable capacitor in series with an adjustable mechanical arrangement on one side of the driven element. The type of matching is:

A gamma match
B lambda match
C T match
D zeta match

A-007-003-006 **(B)**

A quarter-wave stub, for use at 15 MHz, is made from a coaxial cable having a velocity factor of 0.8. Its physical length will be:

A 7.5 m (24.6 ft)
B 4 m (13.1 ft)
C 12 m (39.4 ft)
D 8 m (26.2 ft)

A-007-003-007 **(C)**

The matching of a driven element with a single adjustable mechanical and capacitive arrangement is descriptive of:

A an "omega" match
B a "Y" match
C a "gamma" match
D a "T" match

A-007-003-008 **(C)**

A Yagi antenna uses a gamma match. The coaxial braid connects to:

A the adjustable gamma rod
B the centre of the reflector
C the centre of the driven element
D the variable capacitor

A-007-003-009 **(A)**

A Yagi antenna uses a gamma match. The centre of the driven element connects to:

A the coaxial line braid
B the coaxial line centre conductor
C the adjustable gamma rod
D a variable capacitor

A-007-003-010 **(A)**

A Yagi antenna uses a gamma match. The adjustable gamma rod connects to:

A the variable capacitor
B the coaxial line centre conductor
C an adjustable point on the reflector
D the centre of the driven element

A-007-003-011 **(D)**

A Yagi antenna uses a gamma match. The variable capacitor connects to the:

A an adjustable point on the director
B center of the driven element
C coaxial line braid
D adjustable gamma rod

A-007-004-001 **(D)**

In a half-wave dipole, the distribution of _____ is highest at each end.

A current
B inductance
C capacitance
D voltage

A-007-004-002 **(A)**

In a half-wave dipole, the distribution of _____ is lowest at each end.

A current
B voltage
C inductance
D capacitance

A-007-004-003 **(C)**

The feed point in a centre-fed half-wave antenna is at the point of:

A minimum voltage and current
B maximum voltage
C maximum current
D minimum current

A-007-004-004 **(B)**

In a half-wave dipole, the lowest distribution of _____ occurs at the middle.

A current
B voltage
C capacity
D inductance

A-007-004-005 **(D)**

In a half-wave dipole, the highest distribution of _____ occurs at the middle.

A inductance
B voltage
C capacity
D current

A-007-004-006 **(C)**

A half-wave dipole antenna is normally fed at the point where:

A the resistance is maximum
B the antenna is resonant
C the current is maximum
D the voltage is maximum

A-007-004-007 **(B)**

At the ends of a half-wave dipole:

A voltage is low and current is high
B voltage is high and current is low
C voltage and current are both high
D voltage and current are both low

A-007-004-008 **(D)**

The impedance of a half-wave antenna at its centre is low, because at this point:

A voltage and current are both high
B voltage and current are both low
C voltage is high and current is low
D voltage is low and current is high

A-007-004-009 **(C)**

In a half-wave dipole, where does minimum voltage occur?

A It is equal at all points
B Both ends
C The centre
D At the right end

A-007-004-010 **(C)**

In a half-wave dipole, where does the minimum current occur?

A It is equal at all points
B At the right end
C At both ends
D At the centre

A-007-004-011 **(D)**

In a half-wave dipole, where does the minimum impedance occur?

A It is the same at all points
B At the right end
C At both ends
D At the centre

A-007-005-001 **(A)**

What is meant by circularly polarized electromagnetic waves?

A Waves with a rotating electric field
B Waves with an electric field bent into circular shape
C Waves that circle the earth
D Waves produced by a circular loop antenna

A-007-005-002 **(C)**

What type of polarization is produced by crossed dipoles fed 90 degrees out of phase?

A Perpendicular polarization
B None of the other answers, the two fields cancel out
C Circular polarization
D Cross-polarization

A-007-005-003 **(B)**

Which of these antennas does not produce circular polarization?

A Axial-mode helical antenna
B Loaded helical-wound antenna
C Crossed dipoles fed 90 degrees out of phase
D Lindenblad antenna

A-007-005-004 **(D)**

On VHF/UHF frequencies, Doppler shift becomes of consequence on which type of communication?

A Contact through a hilltop repeater
B Simplex line-of-sight contact between hand-held transceivers
C Contact with terrestrial mobile stations
D Contact via satellite

A-007-005-005 **(A)**

For VHF and UHF signals over a fixed path, what extra loss can be expected when linearly-polarized antennas are crossed-polarized (90 degrees)?

A 20 dB or more
B 3 dB
C 6 dB
D 10 dB

A-007-005-006 **(B)**

Which of the following is NOT a valid parabolic dish illumination arrangement?

A Cassegrain
B Newtonian
C Front feed
D Offset feed

A-007-005-007 **(B)**

A parabolic antenna is very efficient because:

A a horn-type radiator can be used to trap the received energy
B all the received energy is focused to a point where the pick-up antenna is located
C a dipole antenna can be used to pick up the received energy
D no impedance matching is required

A-007-005-008 **(D)**

A helical-beam antenna with right-hand polarization will best receive signals with:

A left-hand polarization
B vertical polarization only
C horizontal polarization
D right-hand polarization

A-007-005-009 **(A)**

One antenna which will respond simultaneously to vertically- and horizontally-polarized signals is the:

A helical-beam antenna
B folded dipole antenna
C ground-plane antenna
D quad antenna

A-007-005-010 **(C)**

In amateur work, what is the surface error upper limit you should try not to exceed on a parabolic reflector?

A 5 mm (0.2 in) regardless of frequency
B 1% of the diameter
C 0.1 lambda
D 0.25 lambda

A-007-005-011 **(C)**

You want to convert a surplus parabolic dish for amateur radio use, the gain of this antenna depends on:

A the focal length of the antenna
B the material composition of the dish
C the diameter of the antenna in wavelengths
D the polarization of the feed device illuminating it

A-007-006-001 **(D)**

A transmitter has an output of 100 watts. The cable and connectors have a composite loss of 3 dB, and the antenna has a gain of 6 dBd. What is the Effective Radiated Power?

A 350 watts
B 400 watts
C 300 watts
D 200 watts

A-007-006-002 **(D)**

As standing wave ratio rises, so does the loss in the transmission line. This is caused by:

A high antenna currents
B high antenna voltage
C leakage to ground through the dielectric
D dielectric and conductor heat losses

A-007-006-003 **(D)**

What is the Effective Radiated Power of an amateur transmitter, if the transmitter output power is 200 watts, the transmission line loss is 5 watts, and the antenna power gain is 3 dBd?

A 197 watts
B 228 watts
C 178 watts
D 390 watts

A-007-006-004 **(C)**

Effective Radiated Power means the:

A power supplied to the transmission line plus antenna gain
B ratio of signal output power to signal input power
C transmitter output power, minus line losses, plus antenna gain relative to a dipole
D power supplied to the antenna before the modulation of the carrier

A-007-006-005 **(C)**

A transmitter has an output power of 200 watts. The coaxial and connector losses are 3 dB in total, and the antenna gain is 9 dBd. What is the approximate Effective Radiated Power of this system?

A 1600 watts
B 400 watts
C 800 watts
D 3200 watts

A-007-006-006 **(B)**

A transmitter has a power output of 100 watts. There is a loss of 1.30 dB in the transmission line, a loss of 0.2 dB through the antenna tuner, and a gain of 4.50 dBd in the antenna. The Effective Radiated Power (ERP) is:

A 100 watts
B 200 watts
C 800 watts
D 400 watts

A-007-006-007 **(C)**

If the overall gain of an amateur station is increased by 3 dB the ERP (Effective Radiated Power) will:

A remain the same
B be cut in half
C double
D decrease by 3 watts

A-007-006-008 **(C)**

A transmitter has a power output of 125 watts. There is a loss of 0.8 dB in the transmission line, 0.2 dB in the antenna tuner, and a gain of 10 dBd in the antenna. The Effective Radiated Power (ERP) is:

A 1125
B 134
C 1000
D 1250

A-007-006-009 **(B)**

If a 3 dBd gain antenna is replaced with a 9 dBd gain antenna, with no other changes, the Effective Radiated Power (ERP) will increase by:

A 2
B 4
C 6
D 1.5

A-007-006-010 **(D)**

A transmitter has an output of 2000 watts PEP. The transmission line, connectors and antenna tuner have a composite loss of 1 dB, and the gain from the stacked Yagi antenna is 10 dBd. What is the Effective Radiated Power (ERP) in watts PEP?

A 18 000
B 20 000
C 2009
D 16 000

A-007-006-011 **(B)**

A transmitter has an output of 1000 watts PEP. The coaxial cable, connectors and antenna tuner have a composite loss of 1 dB, and the antenna gain is 10 dBd. What is the Effective Radiated Power (ERP) in watts PEP?

A 9000
B 8000
C 1009
D 10 000

A-007-007-001 **(D)**

For a 3-element Yagi antenna with horizontally mounted elements, how does the main lobe takeoff angle vary with height above flat ground?

A It increases with increasing height
B It does not vary with height
C It depends on E-region height, not antenna height
D It decreases with increasing height

A-007-007-002 **(B)**

Most simple horizontally polarized antennas do not exhibit significant directivity unless they are:

A three-eighths of a wavelength above the ground
B a half wavelength or more above the ground
C an eighth of a wavelength above the ground
D a quarter wavelength above the ground

A-007-007-003 **(C)**

The plane from which ground reflections can be considered to take place, or the effective ground plane for an antenna is:

A as much as a meter above ground
B at ground level exactly
C several centimeters to as much as 2 meters below ground, depending upon soil conditions
D as much as 6 cm below ground depending upon soil conditions

A-007-007-004 **(C)**

Why is a ground-mounted vertical quarter-wave antenna in reasonably open surroundings better for long distance contacts than a half-wave dipole at a quarter wavelength above ground?

A It has an omnidirectional characteristic
B It uses vertical polarization
C The vertical radiation angle is lower
D The radiation resistance is lower

A-007-007-005 **(D)**

When a half-wave dipole antenna is installed one-half wavelength above ground, the:

A radiation pattern changes to produce side lobes at 15 and 50 degrees
B side lobe radiation is cancelled
C radiation pattern is unaffected
D vertical or upward radiation is effectively cancelled

A-007-007-006 **(A)**

How does antenna height affect the horizontal (azimuthal) radiation pattern of a horizontal dipole HF antenna?

A If the antenna is less than one-half wavelength high, reflected radio waves from the ground significantly distort the pattern
B Antenna height has no effect on the pattern
C If the antenna is less than one-half wavelength high, radiation off the ends of the wire is eliminated
D If the antenna is too high, the pattern becomes unpredictable

A-007-007-007 **(A)**

For long distance propagation, the vertical radiation angle of the energy from the antenna should be:

A less than 30 degrees
B more than 45 degrees but less than 90 degrees
C 90 degrees
D more than 30 degrees but less than 45 degrees

A-007-007-008 **(B)**

Greater distance can be covered with multiple-hop transmissions by decreasing the:

A length of the antenna
B vertical radiation angle of the antenna
C power applied to the antenna
D main height of the antenna

A-007-007-009 **(B)**

The impedance at the centre of a dipole antenna more than 3 wavelengths above ground would be nearest to:

A 600 ohms
B 75 ohms
C 25 ohms
D 300 ohms

A-007-007-010 **(C)**

Why can a horizontal antenna closer to ground be advantageous for close range communications on lower HF bands?

A Low radiation angle for closer distances
B The radiation resistance is higher
C The ground tends to act as a reflector
D Lower antenna noise temperature

A-007-007-011 **(C)**

Which antenna system and operating frequency are most suitable for Near Vertical Incidence (NVIS) communications?

A A vertical antenna and a frequency below the maximum usable frequency
B A vertical antenna and a frequency above the lowest usable frequency
C A horizontal antenna less than 1/4 wavelength above ground and a frequency below the current critical frequency
D A horizontal antenna at a height of half a wavelength and an operating frequency at the optimum working frequency

A-007-008-001 **(D)**

What is meant by the radiation resistance of an antenna?

A The resistance in the atmosphere that an antenna must overcome to be able to radiate a signal
B The specific impedance of an antenna
C The combined losses of the antenna elements and transmission line
D The equivalent resistance that would dissipate the same amount of power as that radiated from an antenna

A-007-008-002 **(D)**

Why would one need to know the radiation resistance of an antenna?

A To measure the near-field radiation density from a transmitting antenna
B To calculate the front-to-side ratio of the antenna
C To calculate the front-to-back ratio of the antenna
D To match impedances for maximum power transfer

A-007-008-003 **(D)**

What factors determine the radiation resistance of an antenna?

A Transmission line length and antenna height
B Sunspot activity and time of day
C It is a physical constant and is the same for all antennas
D Antenna location with respect to nearby objects and the conductors length/diameter ratio

A-007-008-004 **(C)**

What is the term for the ratio of the radiation resistance of an antenna to the total resistance of the system?

A Effective Radiated Power
B Radiation conversion loss
C Antenna efficiency
D Beamwidth

A-007-008-005 **(D)**

What is included in the total resistance of an antenna system?

A Radiation resistance plus transmission resistance
B Transmission line resistance plus radiation resistance
C Radiation resistance plus space impedance
D Radiation resistance plus ohmic resistance

A-007-008-006 **(B)**

How can the approximate beamwidth of a beam antenna be determined?

A Measure the ratio of the signal strengths of the radiated power lobes from the front and rear of the antenna
B Note the two points where the signal strength is down 3 dB from the maximum signal point and compute the angular difference
C Draw two imaginary lines through the ends of the elements and measure the angle between the lines
D Measure the ratio of the signal strengths of the radiated power lobes from the front and side of the antenna

A-007-008-007 **(B)**

How is antenna percent efficiency calculated?

A (effective radiated power / transmitter output) x 100
B (radiation resistance / total resistance) x 100
C (radiation resistance / transmission resistance) x 100
D (total resistance / radiation resistance) x 100

A-007-008-008 **(C)**

What is the term used for an equivalent resistance which would dissipate the same amount of energy as that radiated from an antenna?

A Antenna resistance
B K factor
C Radiation resistance
D j factor

A-007-008-009 **(B)**

Antenna beamwidth is the angular distance between:

A the 3 dB power points on the first minor lobe
B the points on the major lobe at the half-power points
C the maximum lobe spread points on the major lobe
D the 6 dB power points on the major lobe

A-007-008-010 **(B)**

If the ohmic resistance of a half-wave dipole is 2 ohms, and the radiation resistance is 72 ohms, what is the antenna efficiency?

A 100%
B 97.3%
C 74%
D 72%

A-007-008-011 **(C)**

If the ohmic resistance of a miniloop antenna is 2 milliohms and the radiation resistance is 50 milliohms, what is the antenna efficiency?

A 25%
B 50%
C 96.15%
D 52%

A-007-009-001 **(A)**

Waveguide is typically used:

A at frequencies above 3000 MHz
B at frequencies above 2 MHz
C at frequencies below 150 MHz
D at frequencies below 1500 MHz

A-007-009-002 **(C)**

Which of the following is not correct? Waveguide is an efficient transmission medium because it features:

A low dielectric loss
B low copper loss
C low hysteresis loss
D low radiation loss

A-007-009-003 **(D)**

Which of the following is an advantage of waveguide as a transmission line?

A Frequency sensitive based on dimensions
B Expensive
C Heavy and difficult to install
D Low loss

A-007-009-004 **(C)**

For rectangular waveguide to transfer energy, the cross-section should be at least:

A one-eighth wavelength
B one-quarter wavelength
C one-half wavelength
D three-eighths wavelength

A-007-009-005 **(C)**

Which of the following statements about waveguide IS NOT correct?

A In the transverse magnetic mode, a component of the electric field is in the direction of propagation
B Waveguide has low loss at high frequencies, but high loss below cutoff frequency
C Waveguide has high loss at high frequencies, but low loss below cutoff frequency
D In the transverse electric mode, a component of the magnetic field is in the direction of propagation

A-007-009-006 **(C)**

Which of the following is a major advantage of waveguide over coaxial cable for use at microwave frequencies?

A Easy to install
B Inexpensive to install
C Very low losses
D Frequency response from 1.8 MHz to 24GHz

A-007-009-007 **(D)**

What is printed circuit transmission line called?

A Dielectric substrate
B Dielectric imprinting
C Ground plane
D Microstripline

A-007-009-008 **(C)**

Compared with coaxial cable, microstripline:

A must have much lower characteristic impedance
B must have much higher characteristic impedance
C has poorer shielding
D has superior shielding

A-007-009-009 **(B)**

A section of waveguide:

A is lightweight and easy to install
B operates like a high-pass filter
C operates like a low-pass filter
D operates like a band-stop filter

A-007-009-010 **(A)**

Stripline is a:

A printed circuit transmission line
B small semiconductor family
C high power microwave antenna
D family of fluids for removing coatings from small parts

A-007-009-011 **(B)**

What precautions should you take before beginning repairs on a microwave feed horn or waveguide?

A Be sure to wear tight-fitting clothes and gloves to protect your body and hands from sharp edges
B Be sure the transmitter is turned off and the power source is disconnected
C Be sure the weather is dry and sunny
D Be sure propagation conditions are unfavourable for tropospheric ducting