PHYSICS MCQ BOOKLET

Grade 10 · Chapter 9 · Electronics

FBISE / National Book Foundation Model Textbook companion

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Independent MCQs on semiconductors, diodes, LEDs, transistors, relays, logic gates, analogue versus digital, and quantum computers at textbook level. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.

A. Important / Main Topics

1. Electronics is the branch of physics that studies the emission and behaviour of electrons in:

(A) devices such as diodes, transistors, and integrated circuits
(B) only gravitational orbits
(C) only steam engines
(D) only bar magnets

Correct Answer: A

Explanation: Electronics is the branch of physics that studies the emission and behaviour of electrons in devices such as diodes, transistors, and integrated circuits.

2. A semiconductor's electrical conductivity lies between that of:

(A) two superconductors only
(B) conductors and insulators
(C) two electrolytes only
(D) two vacuum tubes

Correct Answer: B

Explanation: Silicon and germanium conduct poorly when pure, well enough when doped.

3. Semiconductor atoms used in this chapter are from periodic Group:

(A) I-A
(B) VIII-A noble gases
(C) IV-A (four valence electrons)
(D) II-A

Correct Answer: C

Explanation: Silicon and germanium each have four outer electrons for a tetrahedral lattice.

4. In a pure silicon crystal each Si atom forms:

(A) ionic bonds to sodium
(B) metallic bonds like copper
(C) no bonds at all
(D) covalent bonds with four neighbouring silicon atoms

Correct Answer: D

Explanation: In a pure silicon crystal each Si atom forms covalent bonds with four neighbouring silicon atoms.

5. An intrinsic semiconductor is:

(A) a pure semiconductor with no added impurity atoms
(B) heavily doped on purpose
(C) always a metal
(D) an insulator like rubber

Correct Answer: A

Explanation: Intrinsic means a pure, undoped crystal of silicon or germanium.

6. An extrinsic semiconductor is one that has been:

(A) kept perfectly pure
(B) doped with a controlled impurity to change its electrical properties

(C) turned into fused quartz
(D) used only as an earth wire

Correct Answer: B

Explanation: An extrinsic semiconductor is one that has been doped with a controlled impurity to change its electrical properties.

7. n-type silicon is made by adding a:

(A) trivalent Group III impurity such as boron
(B) noble-gas atom only
(C) pentavalent Group V impurity such as phosphorus
(D) proton beam only

Correct Answer: C

Explanation: The fifth valence electron of phosphorus is not needed for bonding and is free.

8. In n-type material the majority carriers are:

(A) holes
(B) neutrons
(C) positive ions only, with no electrons
(D) free electrons

Correct Answer: D

Explanation: Donor atoms release extra electrons that carry current.

9. p-type silicon is made by adding a:

(A) trivalent acceptor such as boron (Group III-A)
(B) pentavalent donor such as phosphorus
(C) Group IV atom identical to silicon
(D) neon atom

Correct Answer: A

Explanation: Boron has three valence electrons, so a bonding vacancy (hole) appears.

10. A hole in p-type semiconductor behaves as a:

(A) negative electron with extra mass
(B) positive charge carrier (a missing valence electron)
(C) neutron
(D) photon of light only

Correct Answer: B

Explanation: A hole in p-type semiconductor behaves as a positive charge carrier (a missing valence electron).

11. A PN junction (diode) is formed when:

(A) two n-type bars are glued with rubber
(B) two insulators touch
(C) one crystal is grown p-type on one side and n-type on the other
(D) a fuse melts

Correct Answer: C

Explanation: The interface of p and n regions is the junction.

12. At a freshly formed PN junction, electrons diffuse from n to p and leave behind a:

(A) layer of free copper
(B) superconducting film
(C) vacuum tube grid
(D) depletion region of uncovered ions, with a potential barrier

Correct Answer: D

Explanation: At a freshly formed PN junction, electrons diffuse from n to p and leave behind a depletion region of uncovered ions, with a potential barrier.

13. The built-in barrier is typically about 0.7 V for:

(A) silicon
(B) germanium
(C) an ideal metallic wire
(D) an LED's plastic lens only

Correct Answer: A

Explanation: Silicon's barrier is ~0.7 V; germanium's is ~0.3 V.

14. Germanium's potential barrier is about:

(A) 0.7 V
(B) 0.3 V
(C) 12 V
(D) 220 V

Correct Answer: B

Explanation: Germanium's potential barrier is about 0.3 V.

15. A diode allows conventional current mainly:

(A) equally both ways
(B) only as a.c. through earth
(C) in one direction (from p/anode toward n/cathode when forward biased)
(D) never at all

Correct Answer: C

Explanation: That one-way action is why a diode can rectify.

16. In the diode symbol the triangle (arrow) represents the:

(A) n-region / cathode
(B) earth pin
(C) fuse link
(D) p-region / anode, pointing in the conventional-current direction

Correct Answer: D

Explanation: Conventional current is drawn in the arrow's direction when the diode conducts.

17. Forward bias means connecting the battery so that:

(A) p (anode) goes to the positive terminal and n (cathode) to the negative
(B) p is to negative and n to positive
(C) both ends are earthed
(D) the LED is reverse-biased only

Correct Answer: A

Explanation: Majority carriers are pushed toward the junction and the barrier shrinks.

18. In forward bias the depletion layer:

(A) becomes much wider
(B) becomes narrower and a forward current of milliamperes can flow
(C) turns into an insulator forever
(D) emits alpha particles

Correct Answer: B

Explanation: Once the barrier is overcome, electrons and holes recombine and current flows.

19. Reverse bias means:

(A) p to + and n to −
(B) shorting the diode
(C) p to negative and n to positive, which widens the depletion region
(D) always destroying the crystal

Correct Answer: C

Explanation: Majority carriers are pulled away from the junction.

20. Reverse (leakage) current is small, typically of order:

(A) amperes
(B) kiloamperes
(C) exactly equal to forward current
(D) microamperes, due to minority carriers

Correct Answer: D

Explanation: A reverse-biased junction almost blocks; a μA meter is used, not a lamp.

21. On a diode I–V graph, significant forward current begins near the:

(A) knee (threshold) voltage, about 0.7 V for Si or 0.3 V for Ge
(B) reverse breakdown only
(C) 220 V mains peak
(D) zero for reverse bias only

Correct Answer: A

Explanation: On a diode I–V graph, significant forward current begins near the knee (threshold) voltage, about 0.7 V for Si or 0.3 V for Ge.

22. If reverse voltage is increased far enough, the diode may enter:

(A) forward milliamperes only
(B) reverse breakdown, with a sudden large reverse current
(C) superconductivity
(D) an ohmic copper state

Correct Answer: B

Explanation: Breakdown is a steep reverse rise and can destroy an ordinary diode.

23. In a semiconductor diode, electrons and holes under an applied field move:

(A) in the same direction
(B) only as neutrons
(C) in opposite directions, both contributing to current
(D) not at all

Correct Answer: C

Explanation: In a semiconductor diode, electrons and holes under an applied field move in opposite directions, both contributing to current.

24. An LED emits light when it is:

(A) reverse biased at breakdown only
(B) used as a fuse
(C) cold and unbiased
(D) forward biased, so electrons recombine with holes and radiate

Correct Answer: D

Explanation: An LED emits light when it is forward biased, so electrons recombine with holes and radiate.

25. LED materials in the chapter include compound semiconductors such as:

(A) GaAsP and GaP
(B) pure NaCl only
(C) only copper oxide rust
(D) only fused quartz

Correct Answer: A

Explanation: LED materials in the chapter include compound semiconductors such as GaAsP and GaP.

26. The LED circuit symbol is a diode with:

(A) inward light arrows like an LDR
(B) two arrows pointing away (light out)
(C) three earth bars
(D) a letter M

Correct Answer: B

Explanation: The LED circuit symbol is a diode with two arrows pointing away (light out).

27. A series resistor is used with an LED mainly to:

(A) increase reverse leakage
(B) convert it into an LDR
(C) limit the forward current so the LED is not destroyed
(D) earth the cathode

Correct Answer: C

Explanation: A series resistor is used with an LED mainly to limit the forward current so the LED is not destroyed.

28. A transistor is a three-terminal device that can:

(A) only store kWh
(B) only generate 50 Hz
(C) only measure mass
(D) amplify current and act as a switch

Correct Answer: D

Explanation: A transistor is a three-terminal device that can amplify current and act as a switch.

29. The three regions of a bipolar transistor are:

(A) emitter, base, and collector
(B) anode, cathode, and earth
(C) live, neutral, and fuse
(D) AND, OR, and NOT

Correct Answer: A

Explanation: E, B, and C are the three doped layers and terminals.

30. The base is made:

(A) thick and heavily doped
(B) very thin and lightly doped
(C) identical to the collector in every way
(D) from an insulator only

Correct Answer: B

Explanation: The base is made very thin and lightly doped.

31. The emitter is:

(A) lightly doped and huge
(B) always intrinsic silicon
(C) heavily doped (and moderately sized) so it can inject many carriers
(D) the output terminal only

Correct Answer: C

Explanation: Heavy doping supplies the carriers that become I_E.

32. The collector is:

(A) the thinnest layer
(B) always p-type in an npn device
(C) a vacuum tube
(D) larger than the emitter and moderately doped, to collect most carriers

Correct Answer: D

Explanation: It must handle most of the current and the heat.

33. An npn transistor sandwiches:

(A) a thin p-type base between two n-type regions
(B) n-type between two p-type layers
(C) three n-type layers only
(D) metal and glass only

Correct Answer: A

Explanation: n–p–n is the usual school switching transistor.

34. A pnp transistor sandwiches:

(A) p-type between two n-layers
(B) a thin n-type base between two p-type regions
(C) only intrinsic silicon
(D) two LEDs

Correct Answer: B

Explanation: The middle letter of pnp is the base type.

35. On the npn symbol the emitter arrow:

(A) points inward toward the base
(B) is omitted
(C) points outward, away from the base
(D) points to earth

Correct Answer: C

Explanation: The arrow shows conventional current out of the npn emitter.

36. On the pnp symbol the emitter arrow:

(A) points outward
(B) is a sine wave
(C) points to the collector only
(D) points inward toward the base

Correct Answer: D

Explanation: Inward arrow means conventional current into the pnp emitter.

37. A bipolar transistor uses:

(A) both electrons and holes in conduction
(B) only electrons, never holes
(C) only photons
(D) only neutrons

Correct Answer: A

Explanation: That is why it is called bipolar; a unipolar device uses one carrier type.

38. In normal npn operation the emitter–base junction is:

(A) reverse biased
(B) forward biased
(C) open-circuit
(D) a fuse

Correct Answer: B

Explanation: In normal npn operation the emitter–base junction is forward biased.

39. In normal npn operation the collector–base junction is:

(A) forward biased like an LED
(B) shorted
(C) reverse biased, so it collects carriers that cross the base
(D) at 0.3 V always

Correct Answer: C

Explanation: Reverse CB provides the field that sweeps carriers into the collector.

40. Transistor currents obey:

(A) $I_C = I_B + I_E$
(B) $I_B = I_E + I_C$
(C) $I_E = I_C - I_B$ always negative
(D) $I_E = I_B + I_C$

Correct Answer: D

Explanation: Charge is conserved at the three terminals: emitter current splits into base and collector.

41. About 95% to 98% of the emitter current becomes:

(A) collector current
(B) base current
(C) earth leakage
(D) photon current only

Correct Answer: A

Explanation: Only a few percent recombine in the thin base as I_B.

42. Current gain β (beta) is:

(A) I_E / I_C
(B) I_C / I_B
(C) I_B / I_C
(D) $I_E / I_B \times I_C$

Correct Answer: B

Explanation: β is the ratio of collector current to the controlling base current.

43. Current gain α (alpha) is:

(A) I_B / I_E
(B) I_E / I_B
(C) I_C / I_E
(D) V / I

Correct Answer: C

Explanation: α is slightly less than 1 because most of I_E becomes I_C.

44. If I_C = 4.95 mA and I_B = 0.05 mA, then I_E is:

(A) 4.90 mA
(B) 0.05 mA
(C) 99 mA
(D) 5.00 mA

Correct Answer: D

Explanation: If I_C = 4.95 mA and I_B = 0.05 mA, then I_E is 5.00 mA.

45. If β = 100 and I_C = 20 mA, the required I_B is:

(A) 0.20 mA
(B) 20 mA
(C) 2000 mA
(D) 100 mA

Correct Answer: A

Explanation: Because $\beta = I_C/I_B$, the base current is 20 mA / 100 = 0.20 mA.

46. Transistors replaced vacuum tubes in computers mainly because they are:

(A) larger and hotter
(B) economical and act as rapid-response switches with less heat and power
(C) unable to switch
(D) always analogue only

Correct Answer: B

Explanation: Transistors replaced vacuum tubes in computers mainly because they are economical and act as rapid-response switches with less heat and power.

47. A relay is:

(A) a colour-code band
(B) a type of kWh
(C) an electrically operated switch that lets a small signal control a larger load
(D) an intrinsic wafer

Correct Answer: C

Explanation: A remote's weak command can switch the TV's mains via a relay.

48. A mechanical relay switches by:

(A) doping silicon
(B) only an LED with no output
(C) quantum superposition
(D) moving contacts under a magnetic force

Correct Answer: D

Explanation: A mechanical relay switches by moving contacts under a magnetic force.

49. A solid-state relay (SSR) has:

(A) no moving contacts; semiconductors do the switching
(B) large moving contacts only
(C) only a bimetallic strip
(D) a lemon cell

Correct Answer: A

Explanation: A solid-state relay (SSR) has no moving contacts; semiconductors do the switching.

50. An optocoupler in an SSR uses light from an LED to:

(A) heat a fuse
(B) drive a phototransistor or photo-TRIAC while electrically isolating control from load
(C) measure kWh
(D) dope silicon

Correct Answer: B

Explanation: An optocoupler in an SSR uses light from an LED to drive a phototransistor or photo-TRIAC while electrically isolating control from load.

51. An npn transistor used as a switch is ON (closed) when biased in:

(A) cut-off
(B) reverse breakdown of an LED
(C) saturation, so C–E resistance is very small and I_C is large
(D) the earth wire only

Correct Answer: C

Explanation: Saturation is the fully-on switch state.

52. The same transistor is OFF (open) in:

(A) saturation
(B) the fully conducting LED state
(C) a shorted collector
(D) cut-off, when $I_B \approx 0$ so almost no I_C flows

Correct Answer: D

Explanation: The same transistor is OFF (open) in cut-off, when $I_B \approx 0$ so almost no I_C flows.

53. Collector and emitter act as the switch's main terminals; the control pair is:

(A) base and emitter
(B) live and neutral of the mains only
(C) anode and earth
(D) two NAND inputs only

Correct Answer: A

Explanation: Collector and emitter act as the switch's main terminals; the control pair is base and emitter.

54. $I_C = \beta I_B$ shows that a tiny base current can:

(A) reduce collector current to zero always
(B) control a much larger collector current that lights a lamp
(C) change the colour code

(D) create holes in copper

Correct Answer: B

Explanation: That current gain is what makes a transistor switch useful.

55. Digital electronics deals with signals that have:

(A) every voltage between 0 and 220 V continuously
(B) only sine-wave audio
(C) two states: ON/OFF, HIGH/LOW, 1/0
(D) only thermistor curves

Correct Answer: C

Explanation: Binary states, not a smooth analogue range, are the digital idea.

56. A bit is:

(A) eight bytes
(B) always a qubit
(C) a unit of resistance
(D) a binary digit, a single 0 or 1

Correct Answer: D

Explanation: Bit is the short form of binary digit: a single 0 or 1.

57. Analogue signals, such as sound or temperature, vary:

(A) continuously over a range
(B) in exactly two steps only
(C) only as 1 and 0
(D) never at all

Correct Answer: A

Explanation: Analogue signals, such as sound or temperature, vary continuously over a range.

58. An ADC (analogue-to-digital converter) lets a microcontroller measure:

(A) only 1 and 0 with no sensor
(B) continuous real-world signals via a transducer, as digital numbers
(C) only e.m.f. of a cell without conversion
(D) nuclear spin of iron

Correct Answer: B

Explanation: An ADC (analogue-to-digital converter) lets a microcontroller measure continuous real-world signals via a transducer, as digital numbers.

59. A DAC performs the reverse job: it turns digital codes into:

(A) only Boolean AND
(B) a fuse rating
(C) a smoothly varying analogue output
(D) an earth spike

Correct Answer: C

Explanation: A DAC performs the reverse job: it turns digital codes into a smoothly varying analogue output.

60. Boolean logic's three basic operators at this level are:

(A) sine, cosine, tangent
(B) α, β, and γ of transistors only
(C) live, neutral, earth
(D) AND, OR, and NOT

Correct Answer: D

Explanation: Boolean logic's three basic operators at this level are AND, OR, and NOT.

61. Logic gates are the building blocks of digital circuits; each gate has:

(A) one or more inputs but only one output
(B) no output

(C) exactly 220 outputs
(D) only analogue thermistors

Correct Answer: A

Explanation: Logic gates are the building blocks of digital circuits; each gate has one or more inputs but only one output.

62. A truth table lists:

(A) resistor colour bands
(B) every input combination and the corresponding output bit
(C) kWh tariffs
(D) only transistor β

Correct Answer: B

Explanation: It is the complete 0/1 behaviour of the gate.

63. An AND gate output is 1 only when:

(A) any one input is 1
(B) all inputs are 0
(C) all inputs are 1
(D) the LED is reverse-biased

Correct Answer: C

Explanation: AND is like two switches in series: both must be closed.

64. The Boolean expression for AND is:

(A) $X = A + B$
(B) $X = \bar{A}$
(C) $X = A + B$ with a bar over the sum only
(D) $X = A \cdot B$

Correct Answer: D

Explanation: The centred dot is the Boolean AND operator, so X equals A AND B.

65. An OR gate output is 0 only when:

(A) all inputs are 0
(B) any input is 1
(C) all inputs are 1
(D) $\beta = 100$

Correct Answer: A

Explanation: OR is like two switches in parallel: either path lights the lamp.

66. The Boolean expression for OR is:

(A) $X = A \cdot B$
(B) $X = A + B$
(C) $X = \bar{A}$
(D) $X = A \cdot B$ with a bar

Correct Answer: B

Explanation: The plus means OR, not ordinary addition of voltages.

67. A NOT gate (inverter) has:

(A) two inputs and no output
(B) three emitters
(C) one input and one inverted output
(D) only a fuse

Correct Answer: C

Explanation: A NOT gate (inverter) has one input and one inverted output.

68. NAND and NOR are called universal gates because they can be used to:

(A) store only analogue music

(B) replace a 60 A mains fuse
(C) dope silicon
(D) build any other logic function (AND, OR, NOT, …)

Correct Answer: D

Explanation: Any Boolean circuit can be made from only NAND, or only NOR.

69. A NAND gate is AND followed by NOT, so its output is 0 only when:

(A) all inputs are 1
(B) any input is 0
(C) all inputs are 0
(D) the transistor is in cut-off only

Correct Answer: A

Explanation: NAND is the inverse of AND; only 1 AND 1 gives 0.

70. The NAND expression is:

(A) X = A + B
(B) X = (A · B) with a bar over the product
(C) X = A · B with no bar
(D) X = A

Correct Answer: B

Explanation: A bar over the AND product inverts that result, which is NAND.

71. A NOR gate output is 1 only when:

(A) any input is 1
(B) all inputs are 1
(C) all inputs are 0
(D) β is large

Correct Answer: C

Explanation: NOR is the inverse of OR; only 0 OR 0 inverts to 1.

72. The NOR expression is:

(A) X = A · B
(B) X = A + B with no bar
(C) X = I_C / I_B
(D) X = (A + B) with a bar over the sum

Correct Answer: D

Explanation: A bar over the OR sum inverts that result, which is NOR.

73. A simple burglar alarm in the chapter uses an AND gate so the siren sounds only if:

(A) both the person sensor and the alarm switch are on
(B) either sensor or switch is on
(C) both are off
(D) the LED is reverse-biased

Correct Answer: A

Explanation: AND requires every enable input; that avoids false alarms when the system is off.

74. Circuits that keep their output state after the input is removed are said to have:

(A) no use in alarms
(B) memory (they latch)
(C) only analogue noise
(D) infinite β

Correct Answer: B

Explanation: A latch remembers until it is reset — the fire-alarm example stays sounding.

75. Analogue electronics uses continuous-time signals and both:

(A) only logic gates in ICs

(B) only bits and qubits
(C) active devices (diodes, transistors) and passive R, C, L
(D) only NAND latches

Correct Answer: C

Explanation: Analogue electronics uses continuous-time signals and both active devices (diodes, transistors) and passive R, C, L.

76. Digital electronics is built mainly from:

(A) only variable resistors
(B) only heating elements
(C) only thermocouples
(D) logic gates, often packed in integrated circuits

Correct Answer: D

Explanation: Computers, watches, and automation are digital systems.

77. Compared with analogue, digital circuits are described as having:

(A) greater accuracy, lower power, smaller size, and better noise immunity
(B) worse accuracy and more noise sensitivity
(C) no programmability
(D) only continuous voltages

Correct Answer: A

Explanation: Noise is a small voltage wiggle; a digital 1 or 0 still reads correctly.

78. Air temperature versus time of day is analogue because it takes:

(A) only two values, 0 and 1
(B) a continuous range of values
(C) only integer kelvin steps with nothing between
(D) only LED colours

Correct Answer: B

Explanation: The graph is a smooth curve, not a staircase of bits.

79. Quantum computers use qubits, which unlike ordinary bits can be in:

(A) only 0 or only 1, never both
(B) only analogue 220 V
(C) a superposition of states, not just a single 0 or 1
(D) only cut-off of a transistor

Correct Answer: C

Explanation: Superposition is the extra resource of a qubit.

80. At Grade 10 level, a major practical problem for quantum computers is that core parts must run:

(A) red-hot like a filament
(B) at 220 V a.c. without cooling
(C) only in cut-off
(D) at temperatures near absolute zero so thermal noise does not destroy qubit information

Correct Answer: D

Explanation: The chapter stresses that the technology is still early and extremely cold.

B. Less Important / Secondary Topics

81. Everyday electronics examples in the unit include computers, phones, ATMs, and:

(A) pen drives, televisions, and digital cameras
(B) only steam locomotives
(C) only lemon cells
(D) only fused quartz

Correct Answer: A

Explanation: Everyday electronics examples in the unit include computers, phones, ATMs, and pen drives, televisions, and digital cameras.

82. Aluminium can be used as a p-type dopant for silicon because it is:

(A) pentavalent
(B) trivalent (three valence electrons), like boron
(C) a noble gas
(D) Group IV identical to Si

Correct Answer: B

Explanation: Trivalent Group III atoms such as boron or aluminium act as acceptors.

83. The electric field in the depletion region points:

(A) from p toward n
(B) in random circles only
(C) from n-type toward p-type
(D) only along the LED arrows outward

Correct Answer: C

Explanation: Uncovered positive ions on the n-side and negative on the p-side set that field.

84. LED covers are transparent so that:

(A) reverse leakage can increase
(B) the diode becomes ohmic copper
(C) β becomes zero
(D) the generated light can escape

Correct Answer: D

Explanation: LED covers are transparent so that the generated light can escape.

85. LED colours such as red, green, and blue depend mainly on:

(A) the semiconductor compound (the photon energy of recombination)
(B) the fuse rating
(C) the earth-wire colour
(D) kWh tariff

Correct Answer: A

Explanation: LED colours such as red, green, and blue depend mainly on the semiconductor compound (the photon energy of recombination).

86. The name transistor blends ideas of:

(A) transformer and resistor only in name, from transferring a signal from a low-R input to a high-R output
(B) thermistor and transistor identically
(C) only AND and OR
(D) only live and neutral

Correct Answer: B

Explanation: The historical story is transfer + resistor.

87. Bardeen, Brattain, and Shockley developed the transistor at Bell Labs (1948) and later received:

(A) a kWh rebate
(B) a colour-code patent only
(C) the 1956 Nobel Prize in Physics
(D) a GFCI rating

Correct Answer: C

Explanation: The Nobel recognised the device that built modern electronics.

88. Computer generations in the chapter: first vacuum tubes, second transistors, third ICs, fourth:

(A) steam engines
(B) only relays
(C) only LEDs

(D) microprocessors

Correct Answer: D

Explanation: Computer generations in the chapter: first vacuum tubes, second transistors, third ICs, fourth microprocessors.

89. A TV remote sending a weak command to switch mains power is a textbook use of a:

(A) relay (low-power control, high-power output)
(B) colour band
(C) only an LDR in the dark
(D) quantum computer

Correct Answer: A

Explanation: A TV remote sending a weak command to switch mains power is a textbook use of a relay (low-power control, high-power output).

90. An Arduino-style microcontroller can drive a relay to:

(A) dope silicon wafers
(B) turn lamps or garage motors on from a logic signal or phone command
(C) replace the need for any transistor
(D) measure α of manganin

Correct Answer: B

Explanation: An Arduino-style microcontroller can drive a relay to turn lamps or garage motors on from a logic signal or phone command.

91. In the SSR chain, the LED lights, a photodiode array makes a voltage, then that voltage:

(A) opens a 60 A rewirable fuse only
(B) dopes the base p-type
(C) gates a transistor (or similar switch) on the output side
(D) reverses a burglar AND gate

Correct Answer: C

Explanation: In the SSR chain, the LED lights, a photodiode array makes a voltage, then that voltage gates a transistor (or similar switch) on the output side.

92. Table of a simple lamp switch: open → lamp OFF (0); closed → lamp ON (1). That mapping is:

(A) analogue FM radio
(B) Ohm's law for copper
(C) a potential barrier of 0.7 V
(D) the binary idea used in laptops, GPS, and phones

Correct Answer: D

Explanation: Table of a simple lamp switch: open → lamp OFF (0); closed → lamp ON (1). That mapping is the binary idea used in laptops, GPS, and phones.

93. A fire-extinguisher / fire-alarm latch in the chapter uses NAND gates plus a:

(A) thermistor in a potential divider, and a reset switch
(B) 60 A ring main
(C) only an LDR in sunlight
(D) lemon battery

Correct Answer: A

Explanation: A fire-extinguisher / fire-alarm latch in the chapter uses NAND gates plus a thermistor in a potential divider, and a reset switch.

94. When that thermistor is cold its resistance is high, so the voltage at the gate input is:

(A) forced to analogue 220 V
(B) logic high until heat lowers R and the voltage falls
(C) always 0
(D) a qubit superposition

Correct Answer: B

Explanation: When that thermistor is cold its resistance is high, so the voltage at the gate input is logic high until heat lowers R and the voltage falls.

95. Smoke sensors and fire alarms are mentioned as security devices that are:

(A) optional toys only
(B) replacements for transistors
(C) required in many commercial buildings (offices, hospitals, schools)
(D) quantum error-correction chips

Correct Answer: C

Explanation: The chapter links logic to life-safety.

96. Digital circuits use 'active high' and 'active low' to mean:

(A) a.c. and d.c.
(B) forward and reverse LED colours
(C) live and earth
(D) the two binary voltage bands for 1 and 0

Correct Answer: D

Explanation: Designers must know which voltage means true.

97. Noise in this comparison means:

(A) unwanted fluctuations in voltage
(B) sound from a buzzer only
(C) the colour of an LED
(D) a truth-table row

Correct Answer: A

Explanation: Digital levels sit far apart, so small wiggles rarely flip a bit.

98. FM radios, analogue TVs, and analogue telephones are listed as:

(A) purely NAND-only computers
(B) analogue-electronics applications
(C) quantum computers at 0 K
(D) only burglar AND gates

Correct Answer: B

Explanation: FM radios, analogue TVs, and analogue telephones are listed as analogue-electronics applications.

99. Data processing, storage, automation, and digital watches are listed as:

(A) only analogue filters
(B) only heating elements
(C) digital-electronics applications
(D) only lemon cells

Correct Answer: C

Explanation: Data processing, storage, automation, and digital watches are listed as digital-electronics applications.

100. Both analogue and digital electronics are used together in:

(A) only stone tools
(B) only a single fuse
(C) only Group IV doping tables
(D) robotics, telecommunications, and similar mixed systems

Correct Answer: D

Explanation: Sensors are often analogue; control is often digital.

101. A qubit is described as the quantum analogue of a:

(A) classical bit, but able to be a coherent superposition of 0 and 1
(B) coulomb
(C) thermistor
(D) kWh

Correct Answer: A

Explanation: The Bloch-sphere picture shows more states than two poles.

102. Thermal vibrations at ordinary temperatures would:

(A) improve qubit coherence
(B) destroy fragile qubit information, which is why extreme cooling is used
(C) dope silicon n-type
(D) raise β of an npn switch

Correct Answer: B

Explanation: The chapter's manufacturing challenge is keeping qubits cold and quiet.

103. Quantum computers at this syllabus level are:

(A) already in every phone charger
(B) identical to fourth-generation microprocessors
(C) still in early development
(D) forbidden in digital watches

Correct Answer: C

Explanation: The SLO is awareness, not a working home quantum PC.

104. A photodiode (symbol with inward arrows) is the light-detecting cousin of:

(A) a heating element
(B) a 60 A fuse
(C) a cell
(D) an LED (outgoing arrows mean emit; inward mean detect)

Correct Answer: D

Explanation: A photodiode (symbol with inward arrows) is the light-detecting cousin of an LED (outgoing arrows mean emit; inward mean detect).

105. Integrated circuits pack large numbers of:

(A) logic gates (and other devices) onto one chip
(B) only discrete 1 W resistors
(C) only lemon electrolytes
(D) only earth spikes

Correct Answer: A

Explanation: ICs are why digital electronics shrank.

106. Boolean variables A, B, C in the chapter stand for:

(A) resistivities
(B) binary states 0 or 1 of inputs
(C) ampere-hour ratings
(D) barrier voltages of Ge and Si

Correct Answer: B

Explanation: Algebra of 0 and 1 is the language of gates.

107. Using logic gates for security (alarms) shows that Boolean combinations can:

(A) only add voltages in series cells
(B) replace Ohm's law
(C) require several conditions before an output acts
(D) measure α of copper

Correct Answer: C

Explanation: Using logic gates for security (alarms) shows that Boolean combinations can require several conditions before an output acts.

108. The unit's big idea is that doped semiconductors make diodes and transistors, which switch bits in gates — while quantum computers remain:

(A) ordinary 5 V logic at room temperature

(B) a type of carbon resistor
(C) the same as an LED night-light
(D) an early, ultra-cold extra chapter of computing

Correct Answer: D

Explanation: From PN junctions to qubits, the theme is controlling electrons (and quantum states) in devices.