

QUESTION BANK

Electronic Devices & Circuit and Digital Electronics

1. Consider the following four statement
 - i) In the 2's complement representation, negative numbers are stored in sign magnitude form
 - ii) Taking 2's complement is equivalent to sign change
 - iii) In a 4 bit binary representation of a binary number A
 $A + 1$'s complement of A = 2^4
 - iv) In the 2's complement representation the most significant bit (MSB) is zero for a positive numberOf this, the only true statement are
 - (a) (i) & (ii)
 - (b) (i) & (iv)
 - (c) (ii) & (iii)
 - (d) (ii) & (iv)

2. The sum S of A and B in Half Adder can be implemented by using K NAND gates. The value of K is
 - a) 3
 - b) 4
 - c) 5
 - d) None of these

3. In the expression $A(A+B)$ by writing the first term A as $A + 0$, the expression is best simplified as
 - a) $A + AB$
 - b) AB
 - c) A
 - d) $A + B$

4. The represent number 35 in binary number of bits required is
 - a) 6
 - b) 5
 - c) 4
 - d) 33

5. In grand – scale integration (GIS), a chip contains more than
 - a) 1500 gates
 - b) 1000 gates
 - c) 5000 gates
 - d) 10,000 gates

6. In 2's complement representation, a certain negative number -N is 1011. The representation for +N is

- a) 0100
 - b) 0101
 - c) 0110
 - d) 0011
7. What is output 'Z' of an EX-OR gate, whose all inputs are set at A?
- a) $Z = A$
 - b) $Z = 1$
 - c) $Z = \overline{0}$
 - d) $Z = \overline{A}$
8. A 4K, bit work computer has number of bits equal to
- a) 4×1024
 - b) 4×1000
 - c) $4 \times 1024 \times 16$
 - d) $4 \times 1000 \times 16$
9. The Boolean expression $\overline{A}B + A\overline{B}C + \overline{(A+B+C)}$ simplifies to
- a) $\overline{A}B + \overline{B}C$
 - b) $\overline{A}B + \overline{B}C$
 - c) $\overline{A}B + \overline{B}C$
 - d) $\overline{A}B + \overline{B}C$
10. The ASCII is an input output code
- a) It is a two bit code
 - b) It is a four bit code
 - c) It is a seven bit code
 - d) It is an eight bit code
11. Which of the following logic has the fan out of more than 50?
- a) TTL
 - b) 4-ns ECL
 - c) 8-ns ECL
 - d) CMOS
12. The expression for sum of A,B in the half adder is given by
- a) AB
 - b) $A+B$
 - c) $A \oplus B$
 - d) None of these
13. The 2's complement representation in 8 bit format is 11010000. The equivalent hexadecimal representation is
- a) -50
 - b) D0
 - c) 30

- d) -30
14. The Boolean expression $(\overline{A+B})(A+\overline{C})(\overline{B+C})$ simplifies to
- $(A+B)\overline{C}$
 - $(\overline{A+B})\overline{C}$
 - $(\overline{A+B})\overline{C}$
 - None of these
15. In a 5 x 7 dot matrix format to store 64 alphanumeric characters we require
- 1120 bits
 - 2240 bits
 - 33 bits
 - 64 bits
16. How many illegitimate states have a synchronous Mod -6 counter?
- 3
 - 2
 - 1
 - 0
17. By taking 2's complement again of the 2's complement of a binary one gets
- The 1's complement
 - The true complement
 - The original number
 - The sign magnitude form of the number
18. The 1's complement of the number 1101 is
- 1101
 - 0010
 - 0000
 - 0011
19. Which of the following flip – flops is used as latch?
- TTL
 - ECL
 - CMO
 - LSI
20. Recommended Fan out for ECL is
- 5
 - 10
 - 15
 - 25
21. Which of the following flip – flops is used as latch?
- JK flip - flop

- b) D flip - flop
 - c) RS flip - flop
 - d) T flip - flop
22. The number of bits in the binary representation of the decimal number 16 is
- a) 6
 - b) 5
 - c) 4
 - d) 3
23. Average latency time of magnetic tape memory is of the order of
- a) 1 μ sec.
 - b) 1 m sec.
 - c) 1 sec
 - d) 1 minutes
24. The voltage levels for a four input resistive divider are Logic 0 = 0V, Logic1 = +10V. The analog output voltage for a digital input of 1001 will be
- a) 3 V
 - b) 6 V
 - c) $7\frac{1}{8}$ V
 - d) 8 V
25. Some of MOS families are PMOS, NMOS and CMOS. The family dominating the LSI field where low power consumption is necessary in
- a) NMOS
 - b) CMOS
 - c) PMOS
 - d) Both NMOS and CMOS
26. NOR operation is
- a) $\overline{X + Y}$
 - b) $\overline{X.Y}$
 - c) $\overline{\overline{X}Y}$
 - d) $(X+Y) (X+Y)$
27. The fraction 0.68_{10} is equal to
- a) 0.010101_2
 - b) 0.101_2
 - c) 0.10101_2
 - d) 0.10111_2
28. How many 7490 ICs are to be cascaded to count up to 999?
- a) 1
 - b) 2
 - c) 3

- d) 4
29. A gate in which all inputs must be low to get a high output is called
- An inverter
 - A NOR gate
 - An AND gate
 - A NAND gate
30. What degree of resolution can be obtained using an eight bit optical encoder
- 1.4^0
 - 2.8^0
 - 4.2^0
 - 6.4^0
31. In sign magnitude numbers
- The leading bit stands for the sign
 - The leading bit is part of the magnitude
 - The leading bit is always 0
 - The leading bit is always 1
32. The code used to reduce the error due to ambiguity in reading of a binary optical encoder is
- Octal code
 - Excess -3 code
 - Gray code
 - BCD code
33. The hexadecimal number 'A0' has the decimal value
- 80
 - 256
 - 100
 - 160
34. Given two numbers A and B in sign magnitude representation in an eight bit format $A = 00011110$ & $B = 10011100$ $A \oplus B$ gives
- 10000010
 - 00011111
 - 10011101
 - 11100001
35. In large scale integration (LSI) a chip contains
- More than 100 but less than 1000 gates
 - More than 500 but less than 1000 gates
 - More than 1000 gates
 - More than 5000 gates
36. The resolution of a 12-bit D/A converter using a binary ladder with + 10 V as the full scale

output will be

- a) 2.44 mV
 - b) 3.50 mV
 - c) 4.32 mV
 - d) 5.12 mV
37. A four bit number is given as 1001. Its one's complement is
- a) 1001
 - b) 1110
 - c) 0110
 - d) 0111
38. Which of the following parameters is not specified for digital ICs?
- a) Gate dissipation
 - b) Propagation delay
 - c) Noise margin
 - d) Band width
39. The number of comparator circuits required to build a three bit simultaneous A/D converter is
- a) 7
 - b) 8
 - c) 15
 - d) 16
40. A four bit number is given as 0110. Its 2's complement is
- a) 1001
 - b) 1000
 - c) 1010
 - d) None of these
41. The value of the binary 1111 is
- a) $2^3 - 1$
 - b) $2^4 - 1$
 - c) 2^4
 - d) None of these
42. The Gray code for number 6 is
- a) 1100
 - b) 1001
 - c) 0101
 - d) 0110
43. In medium scale integration (MSI) a chip contains
- a) Less than 12 gates
 - b) Less than 100 gates

- c) Less than 1000 gates
d) Less than 5000 gates
44. Given BCD number 1001 0011, its decimal equivalent is
a) 147
b) 143
c) 93
d) 39
45. In the binary number 110.101 the fractional part has the value
a) 0.125
b) 0.625
c) 0.875
d) 0.5
46. A magnetic drum of 8 inch diameter has 100 tracks and storage density of 200 bits / inch. Its storage capacity will be
a) 502400 bits
b) 8402 bits
c) 1004800 bits
d) 202400 bits
47. The Boolean expression $Y = (A + \overline{B} + \overline{AB})\overline{C}$. Y is given by
a) \overline{AC}
b) \overline{BC}
c) C
d) None of these
48. A binary with n digits all of which are unity has the value
a) $n^2 - 1$
b) 2^n
c) $2^{(n-1)}$
d) $2^n - 1$
49. With reference to NAND gate the following statements are made
i) If all inputs are high the output is low
ii) If all inputs to it are low the output is low
iii) It is equivalent to an AND gate followed by an inverter
iv) NAND operation two elements is equivalent to OR operation on them.
Correct statement are
(a) (i), (ii)
(b) (i), (iii)
(c) (i), (iv)
(d) (ii), (iv)
50. In the 8421 BCD code, the decimal number 125 is written as

- a) 1111101
- b) 000100100101
- c) 7D
- d) FF2

51. A binary with n digits all of which are zero has the value
- a) 0
 - b) 2^n
 - c) $2^{(n-1)}$
 - d) $2^n - 1$
52. In a digital system, the maximum clock frequency that can be used with Master / Slave Clocked flip – flops having total propagation delay of 200 μ sec is
- a) 20 MHz
 - b) 50 MHz
 - c) 100 MHz
 - d) 200 MHz
53. In magnetic film memory, the memory element consists of
- a) Plated wires
 - b) Superconductive material
 - c) Nickel iron alloy
 - d) Doped aluminium
54. The number 149 in octal code will be
- a) 154
 - b) 178
 - c) 254
 - d) 225
55. With reference to the inverter as a gate, the following statements are made
- i) It has one or many inputs
 - ii) The outputs is in a state opposite to that of the inputs
 - iii) It has only one input
 - iv) The output is low if one of the inputs is high
- Of these statement, the true statement are
- a) Only i, ii
 - b) Only ii, iii
 - c) Only iii, iv
 - d) Only i, iv
56. Which of the following memories normally has highest storage capacity?
- a) Magnetic disc
 - b) Magnetic tape
 - c) Semiconductor memory
 - d) Core memory

57. The disadvantage of an open shift register is that
- Both shift left and shift right operations cannot be performed
 - The quantity stored is lost at every shift pulses
 - The register is reset when readout is over
 - All of these
58. To implement all functions of the basic logic functions, it suffices to have
- OR
 - NOT
 - AND & NOT
 - None of these
59. For emitter couple logic, the switching speed is very high because
- Negative logic is used
 - The transistors are not saturated when conducting
 - Emitter coupled transistors are used
 - Multi emitter transistors are used
60. The normal speed of a card reader is of the order of
- 1000 cards / min
 - 10000 cards / min
 - 100000 cards / min
 - All of these
61. A NAND circuit with positive logic will operate as
- NOR with negative logic
 - AND with negative logic
 - OR with negative logic input
 - AND with negative logic output
62. In the NMOS inverter
- The driver and active load are enhancement type
 - The driver is enhancement type and load depletion type
 - The driver is depletion type and load enhancement type
 - Both driver and load are depletion type
63. Which of the following components is used for storing binary information?
- A register
 - A latch
 - F flip – flop
 - All the above
64. Which of the following characteristics is not true for TTL logic?
- Good speed
 - Low power dissipation per gate

- c) High cost
 - d) None of these
65. Gray code for number 7 is
- a) 1100
 - b) 1001
 - c) 0100
 - d) 0110
66. BCD expresses each decimal digit as
- a) A string of 2 bits
 - b) A byte
 - c) A string of 8 bits
 - d) A string of 4 bits
67. The voltage levels for a six bit binary ladder are Logic 0= 0v, Logic 1=+10v. Its output for the input 101001 will be
- a) 0423 v
 - b) 0.552 v
 - c) 0.641 v
 - d) 0.923 v
68. In the sign magnitude representation, the leading bit
- a) Is a part of the number itself
 - b) Is unity for positive
 - c) Is always unity
 - d) Stands for the sign
69. The ECL can be used to switch frequencies as high as
- a) 1 MHz
 - b) 100MHz
 - c) 500 MHz
 - d) 1 GHz
70. The purpose of introducing feedback loop in a digital counter circuit is
- a) To improve stability
 - b) To improve distortion
 - c) Synchronies input and output pulses
 - d) To reduce the number of input pulses to reset the counter

71. An amplifier has $R_1 = 2K$ and $R_0 = 40 K$, $A_v = 90$, the amplifier is modified to provide 10% negative voltage feedback in series with input. The values of R_{1f} respectively are (in ohms)
- 2K and 40 K
 - 20 K and K
 - 16 K and 5K
 - 0.2 K and 400 K
72. In Avalanche multiplication
- Disruption of covalent bond occur by collision
 - Direct rupture of bonds
 - (a) and (b) both
 - None of these
73. n - Channel FET s are superior to p – channel FETs because
- They have a higher input impedance
 - They have high switching time
 - They consume less power
 - Mobility of electrons is greater than that of holes
74. When positive feedback amplifiers are used as oscillators, the condition $A.\beta = 1$ is known as
- Barkhausen criterion of oscillation
 - Parkinson criterion of oscillation
 - Positive criterion of oscillation
 - None of the above
75. Which oscillator incorporates two interdependent circuits in such a way that the output of each controls the input of the other?
- Relaxation oscillator
 - Feedback oscillator
 - Low impedance oscillator
 - Sine wave oscillator
76. In MOSFET devices the n channel type is better than the p channel type in the following respects
- It has better noise immunity
 - It is faster
 - It is TTL compatible
 - It has better drive capability
77. In a zener diode
- Forward voltage rating is high
 - Negative resistance characteristic exists
 - Sharp break down occurs at low reverse voltage
 - None of the above

78. Indicate the false statement
- Type values of β for transistors are 0.93 to 0.99
 - SCR is a silicon rectifier with a gate electrode to control when current flows from cathode to anode.
 - Typical forward bias on a silicon NPN transistor is 0.6 V
 - None of these
79. Bridge rectifiers are preferred because
- They require small transformer
 - Less peak inverse voltage
 - (a) and (b) both
 - None of these
80. The requirement of an oscillator using positive feedback amplifier as an oscillator is that
- There must be positive feedback
 - Initiality the value of loop gain $A\beta$ must be greater than unity
 - After the desired level is reached the loop gain $A\beta$ must decrease to unity
 - All of the above
81. Which of the following steps will help in frequency stabilization of an oscillator?
- Use of automatic biasing
 - Use of a tuned circuit
 - Controlling the gain
 - None of the above
82. An amplifier has a power gain of 50. This gain in dB will be
- 17dB
 - 31 dB
 - 34dB
 - 68dB
83. In case of indirectly heated tubes the heater filament is usually made of
- Maganin
 - Tungsten
 - Invar
 - Any of the above
84. Which of the following statements is not true for a hole?
- Holes may constitute an electric current
 - Holes can be considered as a net positive charge
 - Holes can exist in any material including conductors
 - Holes can exist in certain semiconductor material only
85. An emitter follower has high input impedance because
- Large load resistance may be used
 - Large biasing resistance is used

- c) Large emitter resistance is used
 - d) There is negative feedback in the base emitter circuit
86. The following statements are made regarding Zener diode
- a) Above 6 V Zener breakdown voltage decreases with increasing temperature
 - b) Below 6 V, Zener breakdown voltage decreases with increasing temperature
 - c) Above 6 V, Zener breakdown voltage decreases with increasing temperature
 - d) Below 6 V, Zener breakdown voltage increases with increasing temperature.
87. A narrow band amplifier has a pass band nearly
- a) 10% of the central frequency
 - b) 25% of the central frequency
 - c) 33% of the central frequency
 - d) 40% of the central frequency
88. The tolerance of ceramic capacitor is
- a) $\pm 5\%$
 - b) $\pm 10\%$
 - c) $\pm 20\%$
 - d) None of these
89. In case of indirectly heated cathode, the cathode is usually in the shape of
- a) Wire filament
 - b) Cylinder
 - c) Metal strip
 - d) None of these
90. What effect does a diode's cut in voltage have on the wave form of output voltage compared with the input?
- a) No effect
 - b) Output wave form is less than π radians
 - c) Output wave form is distorted
 - d) Output voltage is higher by the cut in voltage
91. In which of the following applications usually tuned voltage amplifier are not used?
- a) Television receiver
 - b) Radio receivers
 - c) Public address system
 - d) All of the above
92. For which of the following types of capacitors, colour coding is not used to specify the value?
- a) Paper capacitor
 - b) Ceramic capacitor
 - c) Mica capacitor
 - d) Electrolyte capacitor

93. A directly heated cathode may be made of
- Tungsten
 - Thoriated tungsten
 - Tungsten coated with strontium oxide
 - Any of the above
94. A signal containing frequency component from 445 KHz to 465 KHz is to be amplified. Which of the following amplifiers will be suitable for this purpose?
- Direct coupled amplifier
 - RC coupled amplifier using triodes
 - RC coupled amplifier using transistors
 - Transformer coupled tuned amplifier using transistors
95. When an alternating voltage is applied to a diode, at constant load the load line
- Shifts above and below the load line parallel to it
 - Is unaffected
 - Shifts in slope
 - Passes through origin
96. Single stage transformer coupled class A power amplifier uses a transistor with maximum dissipation capability of 2.5 watts. The maximum a.c. power in the load is
- 1.25 W
 - 2.5 W
 - 5.0 W
 - 0.65 W
97. In case of ceramic capacitors, the tolerance is given in *pf* for capacitors values less than
- 5pF
 - 10pF
 - 20pF
 - 100pF
98. A 0.2 μF capacitor will have reactance of 1000Ω at the frequency of
- 800 Hz
 - 1 kHz
 - 1 MHz
 - 8 MHz
99. In a Zener diode
- Only the P region is heavily doped
 - Only the N region is heavily doped
 - Both P and N regions are heavily doped
 - Both P and N regions are lightly doped
100. The barrier capacitance C_T

- a) Increases with the width of the space charge layer
 - b) Increases with increasing reverse voltage
 - c) In due to the immobile charges at the junction varying with the applied voltage
 - d) Can be defined as Q/V
101. 10^{-9} ohm m is the resistivity of
- a) Aluminium
 - b) Sodium
 - c) Bismuth
 - d) Nickel
102. Which of the following are typical resistance and power dissipation values of a carbon composition resistor?
- a) 100 K, 1 W
 - b) 5 Ω , 5 W
 - c) 10k, 10 W
 - d) 1k, 100 W
103. Under high electric fields, in a semi conductor with increasing electric field
- a) The mobility of charge carriers saturates
 - b) The mobility of the carriers increases
 - c) The voltage of the charge carriers saturates
 - d) The voltage of the charge carriers increases
104. The resistivity of silver is of the order of
- a) 10^{-12} ohm m
 - b) 10^{-9} ohm m
 - c) 10^{-6} ohm m
 - d) 10^{-3} ohm m
105. Heaters for vacuum tubes normally take a voltage of
- a) 1V
 - b) 2.3 V
 - c) 6.3 V
 - d) 220 V
106. Which of the following are typical resistance value and the power dissipation value for a wire wound resistor?
- a) 1 M Ω , 1/3 W
 - b) 500 Ω , 1 W
 - c) 50000 Ω
 - d) 10 Ω , 50 W
107. An oxide coated anode cannot be used if the voltage at the anode is
- a) 1V
 - b) 6 V

- c) 100V
 - d) 500V
108. Resistivity of iron and nickel is of the order of
- a) 10^{-9} ohm m
 - b) 10^{-7} ohm m
 - c) 10^{-6} ohm m
 - d) 10^{-3} ohm m
109. The typical turn off time of a transistor is
- a) 10 n sec
 - b) 60 n sec
 - c) 70 n sec
 - d) 40 n sec
110. Fermi level for potassium is 2.1 eV, the velocity of electron at Fermi level equals to
- a) 3.2×10^5 m/s
 - b) 4.9×10^4 m/s
 - c) 8.6×10^5 m/s
 - d) 9.7×10^4 m/s
111. For an ideal difference amplifier, the Common Mode Rejection Ratio (CMRR) should be
- a) As high as possible
 - b) As low as possible
 - c) Constant
 - d) None of these
112. In a class A series fed amplifier using a transistor, under ideal conditions the maximum ac power delivered is 1 watt. The maximum transistor dissipation capability is
- a) 1 watt
 - b) 2 watt
 - c) 3 watt
 - d) 4 watt
113. Which out of the following, has a lowest temperature coefficient of resistivity
Silver, Copper, Gold, Aluminium?
- a) Copper
 - b) Silver
 - c) Gold
 - d) Aluminium
114. In a practical oscillator, $A\beta$ is
- a) Slightly less than 1
 - b) 1
 - c) -1
 - d) Slightly greater than 1

115. It is proposed to use a Zener diode for regulation of high voltage of 100 V. For this
- The diode is equally doped on p and n side
 - The diode is heavily doped on p and n side
 - The diode is lightly doped on p and n side
 - It is not possible to use a Zener diode
116. If an ideal balanced differential amplifier, the common mode gain is
- Double of that of single ended amplifier
 - Half of that of single ended differential amplifier
 - Very low
 - Zero
117. In a metal
- The electrical conduction is by electrons and holes
 - With rise in temperature, the conductivity decreases
 - The conduction band is empty
 - There is a small energy gap between the two bands
118. When the voltage applied across a-p-n junction is increased from 1 to 4 volt, the junction capacitance
- Increases by a factor of 2
 - Decreases by a factor of 2
 - Decreases by a factor of 4
 - Decreases by a factor of 16
119. Blocking oscillators are used as
- Abrupt pulse generators
 - Low impedance switches
 - High impedance switches and frequency dividers
 - None of the above
120. The potential barrier formed at a p-n junction is due to the presence of the charges as
- Electrons and holes
 - Immobile donor and acceptor ions
 - Majority and minority carriers
 - None of the above
121. Temperature coefficient of resistivity of Nichrome wire is of the order of
- 0.00045
 - 0.00027
 - 0.00019
 - 0.00010
122. Which of the following has a lowest resistivity Tungsten, Molybdenum, Platinum, tantalum?

- a) Molybdenum
 - b) Platinum
 - c) Tantalum
 - d) Tungsten
123. With which of the following can the intrinsic semiconductor silicon be doped in order to obtain p-type silicon?
- a) Boron
 - b) Phosphorus
 - c) Gallium
 - d) Arsenic
124. On the pole-zero diagram of an amplifier, the low cut off frequency f_L will be determined by
- a) The pole farthest from the origin
 - b) The pole closest to the origin
 - c) The zero farthest from the origin
 - d) The zero closest to the origin
125. In switching a junction diode from forward to reverse voltage bias, the recovery of the current to the saturation value is delayed.
- a) During this time the current is in the same direction as the forward current
 - b) During this time the excess minority carriers have to drop to zero
 - c) During this time the excess minority carriers have disappeared and the minority carrier density reaches zero value at the junction
 - d) During this time the voltage across the diode is in the direction of forward bias
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 - d) During this time the voltage across the diode is in the direction of forward bias
127. Class B amplifier has less efficiency compared to
- a) Class A
 - b) Class B
 - c) Class C
 - d) A, AB and C
128. Which of the following plot can be directly used to determine β ?
- a) V_{CE} versus I_C for constant I_B
 - b) V_{BE} versus I_B for constant I_{CE}
 - c) V_{CB} versus I_C for constant I_E
 - d) All of the above

129. The temperature, at which the readings of Fahrenheit and centigrade thermometer are the same, is
- Zero
 - 25⁰
 - 40⁰C
 - 32⁰C
130. An oscillator that uses a tapped coil in the LC tuned circuit is the
- Pierce oscillator
 - Armstrong oscillator
 - Hartley oscillator
 - Colpitts oscillator

Answer Key (Electronic Devices & Circuit and Digital Electronics)

1.	d	21.	b	41.	b	61.	a	81.	b
2.	b	22.	b	42.	c	62.	b	82.	a
3.	c	23.	d	43.	b	63.	d	83.	b
4.	a	24.	b	44.	c	64.	c	84.	c
5.	b	25.	b	45.	b	65.	c	85.	d
6.	b	26.	c	46.	a	66.	d	86.	a
7.	c	27.	c	47.	a	67.	c	87.	a
8.	a	28.	c	48.	d	68.	d	88.	c
9.	d	29.	b	49.	b	69.	c	89.	b
10.	c	30.	a	50.	b	70.	d	90.	b
11.	d	31.	a	51.	a	71.	b	91.	c
12.	c	32.	c	52.	b	72.	a	92.	d
13.	b	33.	d	53.	c	73.	d	93.	d
14.	c	34.	a	54.	d	74.	a	94.	d
15.	b	35.	a	55.	b	75.	a	95.	a
16.	b	36.	a	56.	a	76.	b	96.	a
17.	c	37.	c	57.	c	77.	c	97.	b
18.	b	38.	d	58.	c	78.	b	98.	a
19.	b	39.	a	59.	b	79.	c	99.	c
20.	d	40.	c	60.	a	80.	d	100.	c

101.	a	121.	d
102.	a	122.	d
103.	d	123.	a
104.	b	124.	a
105.	c	125.	c
106.	d	126.	c
107.	d	127.	a
108.	b	128.	a
109.	c	129.	c
110.	c	130.	c
111.	a	131.	
112.	b	132.	
113.	c	133.	
114.	d	134.	
115.	c	135.	
116.	d	136.	
117.	b	137.	
118.	c	138.	
119.	c	139.	
120.	b	140.	