

# UP-CPMT - 1999

## Paper-2

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### Physics

1. If intensity of light falling on a metal is increased, then :
  - 1) photoelectric current increases
  - 2) photoelectric current decreases
  - 3) kinetic energy of photoelectrons increases
  - 4) kinetic energy of photoelectrons decreases
2. An ammeter can be converted into a voltmeter by connecting :
  - 1) a low resistance in series
  - 2) a high resistance in series
  - 3) a low resistance in parallel
  - 4) a high resistance in parallel
3. The angular speed of a flywheel making 120 rev/min is :
  - 1)  $\pi/2$  rad/s
  - 2)  $2\pi/3$  rad/s
  - 3)  $4\pi$  rad/s
  - 4)  $4\pi^2$  rad/s
4. The instantaneous acceleration of a particle executing simple harmonic motion  $y = A \sin \omega t$  is given by :
  - 1)  $+\omega^2 y$
  - 2)  $-\omega^2 y$
  - 3)  $-\omega y$
  - 4)  $\omega y$
5. For driving a current of 2 A for 6 min in a circuit 1000 J of work is to be done. The emf of the source in the circuit is :
  - 1) 1.38 V
  - 2) 13.8 V
  - 3) 73.3 V
  - 4) 7.3 V
6. A tank is filled with a transparent liquid to a height of 1m. When seen from above its bottom appears to be shifted upward by a distance 0.1 m the refractive index of liquid is :
  - 1) 9/10

- 2)  $10/9$
- 3)  $11/10$
- 4)  $10/11$

7. A charged particle is moving in a uniform magnetic field in a circular path of radius  $R$ . When energy of the particle is doubled, then the new radius will be :

- 1)  $R^2$
- 2)  $R\sqrt{2}$
- 3)  $2/\sqrt{R}$
- 4)  $2R^2$

8. 1 MeV is :

- 1)  $1.6 \times 10^{-20} \text{ J}$
- 2)  $1.6 \times 10^{-18} \text{ J}$
- 3)  $1.6 \times 10^{-22} \text{ J}$
- 4)  $1.6 \times 10^{-24} \text{ J}$

9. Two lenses of focal lengths +25 cm and -20 cm are placed in contact, the combined power of lens will be :

- 1) -1 D
- 2) +1 D
- 3) +0.5 D
- 4) -0.5 D

10. A geostationary satellite has a orbital-period :

- 1) 3h
- 2) 12h
- 3) 16h
- 4) 24h

11. The minimum energy required to excite a hydrogen atom from its ground state is :

- 1) 9.2 eV
- 2) 10.2 eV
- 3) 11.2 eV
- 4) -11.2 eV

12. If 1 g of hydrogen is converted into 0.993 g of helium in a thermonuclear reaction the energy released in the reaction is :

- 1)  $6.3 \times 10^5 \text{ J}$
- 2)  $6.3 \times 10^{11} \text{ J}$
- 3)  $6.3 \times 10^{14} \text{ J}$
- 4)  $6.3 \times 10^{24} \text{ J}$

13. Two electric bulbs of filament resistances  $R_1$  and  $R_2$  are connected in parallel to a

constant voltage source. The power dissipated in them will have the ratio :

- 1)  $(R_1/R_2)$
- 2)  $(R_2/R_1)$
- 3)  $(R_1/R_2)^2$
- 4)  $(R_2/R_1)^2$

14. If  $\vec{x} + \vec{y} = \vec{x} - \vec{y}$ , then angle between  $\vec{x}$  and  $\vec{y}$  is :

- 1)  $30^\circ$
- 2)  $15^\circ$
- 3)  $90^\circ$
- 4)  $135^\circ$

15. Plutonium has a half-life of 24000 years. If plutonium is stored for 72000 years, then fraction of plutonium that remains is :

- 1)  $1/2$
- 2)  $1/6$
- 3)  $1/4$
- 4)  $1/8$

16. What is the value of linear velocity of a particle on a body. Its position vector is  $\vec{r} = 5\hat{i} - 6\hat{j} + 6\hat{k}$  and the body rotates with an angular velocity  $\vec{\omega} = 3\hat{i} - 4\hat{j} + \hat{k}$  ?

- 1)  $12\hat{i} + 2\hat{j} - 3\hat{k}$
- 2)  $18\hat{i} + 13\hat{j} - 2\hat{k}$
- 3)  $12\hat{i} - 13\hat{j} + 6\hat{k}$
- 4)  $-18\hat{i} - 13\hat{j} + 2\hat{k}$

17. For higher frequency, a capacitor offers :

- 1) higher reactance
- 2) smaller reactance
- 3) same reactance at all frequencies
- 4) zero reactance

18. If a body is released into a tunnel dug across the diameter of earth, it executes simple harmonic motion with time period :

- 1)  $T = 2\pi\sqrt{(R_e/g)}$
- 2)  $T = 2\pi\sqrt{(2R_e/g)}$
- 3)  $T = 2\pi\sqrt{(R_e/2g)}$
- 4)  $T = 2s$

19. In a cyclotron the angular frequency of the charged particle is independent of :

- 1) mass
- 2) radius
- 3) charge

4) magnetic field

20. Liquid drops are spherical due to :

- 1) viscosity
- 2) surface tension
- 3) pressure
- 4) Bernoulli's theorem

21. The average power dissipated in a purely inductive coil is :

- 1)  $(1/2)LI^2$
- 2)  $(1/8)LI^2$
- 3)  $(1/4)LI^2$
- 4) zero

22. The energy emitted per second by a black body at  $27^\circ\text{C}$  is  $E$ . If the temperature of black body is increased to  $327^\circ\text{C}$ , the energy emitted per second will become/remains :

- 1)  $E/16$
- 2)  $4E$
- 3)  $16E$
- 4)  $E/4$

23. The value  $(e/m)$  of electron is :

- 1)  $1.76 \times 10^{11} \text{ C/kg}$
- 2)  $1.76 \times 10^{10} \text{ C/kg}$
- 3)  $1.76 \times 10^{-11} \text{ C/kg}$
- 4)  $1.76 \times 10^{27} \text{ C/kg}$

24. A charge  $q$  is placed at the centre of line joining two equal charges  $Q$ . The system of three charges will be in equilibrium if  $q$  is equal to :

- 1)  $-(Q/8)$
- 2)  $-(Q/4)$
- 3)  $+(Q/4)$
- 4)  $+(Q/8)$

25. Magnification at least distance of distinct vision of a microscope having a convex lens of focal length 5 cm is :

- 1) 1
- 2) 3
- 3) 5
- 4) 6

26. Six identical cells each of emf  $E$  and internal resistance  $r$  are connected in parallel, then the net emf and internal resistance of the combination will be :

- 1)  $6E, r$
- 2)  $E, (r/6)$

- 3)  $E, 6r$
- 4)  $(E/6), (r/6)$

27. Antimony and bismuth are usually used in a thermo-couple, because of :

- 1) production of higher thermo-emf
- 2) production of lower thermo-emf
- 3) higher neutral point
- 4) straight line graph between emf and temperature of hot junction

28. A convex lens (refractive index  $\mu = 1.57$ ) has power  $P$ . If it is immersed in a liquid ( $\mu = 4/3$ ), then its power will become/remains :

- 1)  $P$
- 2)  $(P/2)$
- 3)  $(P/4)$
- 4)  $4P$

29. On doping germanium with indium, one gets :

- 1) rectifier
- 2) insulator
- 3) n-type semiconductor
- 4) p-type semiconductor

30. Casting of geometrical shadow is due to phenomenon of :

- 1) diffraction
- 2) polarisation
- 3) reflection
- 4) refraction

31. The speed of sound in a gas at  $27^\circ\text{C}$  is  $v$ . At what temperature the speed will be  $2v$  ?

- 1)  $127^\circ\text{C}$
- 2)  $227^\circ\text{C}$
- 3)  $927^\circ\text{C}$
- 4)  $1027^\circ\text{C}$

32. The surface tension of a liquid at critical temperature is :

- 1) zero
- 2) infinite
- 3) equal to that at any other temperature
- 4) uncertain

33. When a copper sphere is heated, then the percentage increase is maximum in :

- 1) diameter
- 2) length
- 3) volume
- 4) mass

34. The space charge limited current  $i$  and plate voltage  $V$  in a diode valve are related as :

- 1)  $i \propto V^{1/2}$
- 2)  $i \propto V$
- 3)  $i \propto V^{3/2}$
- 4)  $i \propto V^{2/3}$

35. The refractive indices of glass of a prism of angle  $10^\circ$  for violet and red colours are 1.54 and 1.52 respectively, the angular dispersion caused by the prism will be :

- 1)  $0.2^\circ$
- 2)  $0.025^\circ$
- 3)  $0.002^\circ$
- 4)  $0.25^\circ$

36. A magnet makes 40 oscillations per minute at a place where horizontal component of earth's magnetic field  $H$  is  $0.1 \times 10^{-5} \text{T}$ . At another place, it takes 2.5 s to complete one vibration, the value of earth's horizontal field at that place is :

- 1)  $2.5 \times 10^{-6} \text{T}$
- 2)  $0.36 \times 10^{-6} \text{T}$
- 3)  $25 \times 10^{-6} \text{T}$
- 4)  $3.6 \times 10^{-6} \text{T}$

37. A wire of resistance  $R$  is stretched to double its length, its new resistance will become/remains:

- 1)  $2R$
- 2)  $4R$
- 3)  $8R$
- 4)  $R$

38. A stone is projected at an angle  $\theta$  with horizontal speed  $u$ . If it executes nearly circular motion at its highest point for a short time, the radius of circular arc will be :

- 1)  $(u^2/g)$
- 2)  $(u^2 \cos^2 \theta/g)$
- 3)  $(u^2 \sin^2 \theta/g)$
- 4)  $(u^2 \cos^2 \theta/2g)$

39. When a light ray enters from one medium to another, which one of the following is not changed ?

- 1) Velocity
- 2) Wavelength
- 3) Frequency
- 4) Intensity

40. X-rays is phenomenon of :

- 1) conversion of radiant energy into kinetic energy
- 2) conversion of mass into energy
- 3) conversion of charge into energy
- 4) conversion of kinetic energy into radiant energy

41. Nuclear force is :

- 1) short range and charge dependent
- 2) short range and charge independent
- 3) long range and charge dependent
- 4) long range and charge independent

42. The escape velocity from earth is  $v_e$ . If the mass of a certain planet is 3 times and radius 3 times that of earth, then the escape velocity from the planet will be :

- 1)  $9v_e$
- 2)  $18v_e$
- 3)  $\sqrt{3}v_e$
- 4)  $v_e$

43. According to first law of thermodynamics :

- 1) energy is conserved
- 2) charge is conserved
- 3) heat neither enters nor leaves the system
- 4) heat of system remains constant in an isothermal process

44. In L-R circuit the phase difference between current  $i$  and voltage  $V$  is :

- 1)  $0^\circ$
- 2)  $\pi/3$
- 3)  $\pi/6$
- 4) between  $0^\circ$  and  $\pi/2$

45. Which one of the following may be deflected by electric field ?

- 1) X-rays
- 2)  $\gamma$ -rays
- 3) Neutrons
- 4)  $\alpha$ -particles

46. The ratio of intensities of two sound waves is 25 : 9. What is the ratio of their amplitudes ?

- 1) 16 : 9
- 2) 9 : 16
- 3) 3 : 5
- 4) 5 : 3

47. A wire elongates by length  $l$ , when a body of mass  $M$  is suspended from it. Then work done will be :
- 1)  $Ml$
  - 2)  $2Mg l$
  - 3)  $(1/2)Mg l$
  - 4) zero
48. If the current in a coil changes from 0 to 2 A in 0.05 s, the emf induced is 8 V. The self-inductance of the coil is :
- 1) 0.1 H
  - 2) 0.2 H
  - 3) 0.6 H
  - 4) 0.12 H
49. The average binding energy per nucleon of a nucleus is of the order of :
- 1) 16 eV
  - 2) 2 J
  - 3) 4 keV
  - 4) 8 MeV
50. The dimensions of Planck's constant and angular momentum are :
- 1)  $[ML^2T^{-1}]$ ,  $[ML^2T^{-2}]$
  - 2)  $[MLT^{-1}]$ ,  $[ML^2T^{-2}]$
  - 3)  $[ML^2T^{-1}]$ ,  $[ML^2T^{-1}]$
  - 4)  $[ML^2T^{-2}]$ ,  $[MLT^{-1}]$

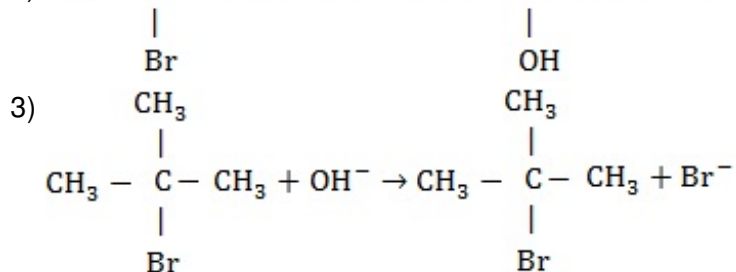
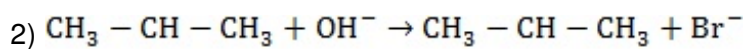
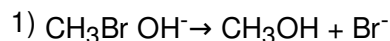
### Chemistry

51. The molecular formula of a compound having empirical formula  $CH_2O$  and vapour density 30 is :
- 1)  $CH_2O$
  - 2)  $C_6H_{12}O_6$
  - 3)  $C_2H_4O_2$
  - 4)  $C_3H_6O_3$
52.  $C_6H_5OH \xrightarrow[NaOH]{CCl_4} X \xrightarrow[heat]{Zn\ dust} Y \xrightarrow[(ii)\ soda.lime]{(i)\ Na} Z$   
 What is Z ?
- 1) Cresol
  - 2) Benzene
  - 3) Toluene



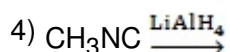
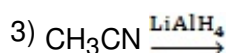
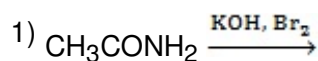
4) Benzyl alcohol

53. Which of the following is the example of  $S_N2$  reaction ?

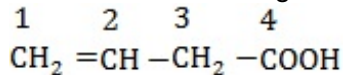


4) None of these

54. Which of the following reaction will not give primary amine ?



55. Which of the following carbon atom possesses tetrahedral nature ?



1) 1

2) 2

3) 3

4) 4

56. The simplest carbohydrate among the following is :

1) starch

2) cellulose

3) glucose

4) inulin

57. The freezing point of solution are given below, ionisation being 100%, assume molarity = molality

(I) 1 M NaCl

(II) 1 M  $\text{MgCl}_2$

(III) 1 M  $\text{Na}_2\text{SO}_4$

(IV) 1 M  $(\text{NH}_4)_3\text{PO}_4$

The correct order for decreasing freezing point is :

1) I > II > III > IV

2) II > III > IV > I

3) IV > II > I > III

4)  $\text{III} > \text{II} > \text{IV} > \text{I}$

58. The maximum number of electrons that can be accommodated in  $d$  sub-shell is :

- 1) 2                                  2) 6                                  3) 8                                  4) 10

59. Diazonium compounds are useful for preparing :

- 1) vitamins  
2) proteins  
3) pesticides  
4) dyes

60. The unit of equivalent conductivity is :

- 1)  $\text{ohm}^{-1} \text{ cm}^2 (\text{g - equivalent})^{-1}$   
2)  $\text{ohm cm}^2 (\text{g - equivalent})$   
3)  $\text{ohm cm}^3$   
4)  $\text{ohm}^4 \text{ cm}$

61. In an exothermic reaction the enthalpy of reaction is always :

- 1) 0  
2) positive  
3) negative  
4) none of these

62. A catalyst increases rate of reaction by :

- 1) decreasing enthalpy  
2) decreasing activation energy  
3) decreasing internal energy  
4) increasing activation energy

63. What is the hybridisation of  $\text{NH}_3$  ?

- 1)  $\text{sp}^3$  hybridisation  
2)  $\text{sp}^2$  hybridisation  
3)  $\text{dsp}^2$  hybridisation  
4)  $\text{sp}$  hybridisation

64. Which one of the following is not true with heated copper at  $300^\circ\text{C}$  ?

- 1) Secondary alcohol  $\rightarrow$  ketone  
2) Tertiary alcohol  $\rightarrow$  olefin  
3) Phenol  $\rightarrow$  benzyl alcohol  
4) Primary alcohol  $\rightarrow$  aldehyde

65. Which of the following species participate in sulphonation of benzene ring ?

- 1)  $\text{SO}_2^-$
- 2)  $\text{SO}_3$
- 3)  $\text{HSO}_3^-$
- 4)  $\text{H}_2\text{SO}_4$

66. (e/m) ratio was determined by :

- 1) Chadwick
- 2) Goldstein
- 3) Dalton
- 4) J. J. Thomson

67. The galvanisation process involves :

- 1) Cu
- 2) Ag
- 3) Zn
- 4) Fe

68. The number of isomers for  $\text{C}_7\text{H}_8\text{O}$  is :

- 1) 6
- 2) 8
- 3) 7
- 4) 5

69. van der Waals' equation for one mole of  $\text{CO}_2$  gas at low pressure will be :

- 1)  $P(V - B) = RT - (a/V^2)$
- 2)  $P = ((RT/(V - b)) - (a/V^2))$
- 3)  $P = (RT/(V - b))$
- 4)  $(P + (a/V^2))V = RT$

70. pH of solution can be expressed as :

- 1)  $\log_e [\text{H}^+]$
- 2)  $\log_{10} [\text{H}^+]$
- 3)  $-\log_e [\text{H}^+]$
- 4)  $-\log_{10} [\text{H}^+]$

71. Alcoholic  $\text{KMnO}_4$  oxidise acetylene to :

- 1) acetic acid
- 2) ethyl alcohol
- 3) ethylene glycol
- 4) oxalic acid

72. The rise in the boiling point of a solution containing 1.8 g of glucose in 100 g of a solvent is  $0.1^\circ\text{C}$ . The molal elevation constant is :

- 1) 0.18 K/m

- 2) 1.8 K/m
- 3) 1 K/m
- 4) 10 K/m

73. Number of moles of a solute per kilogram of a solvent is called :

- 1) normality
- 2) formality
- 3) molality
- 4) molarity

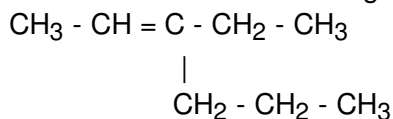
74. The best source of vitamin A is :

- 1) wheat
- 2) beans
- 3) carrots
- 4) oranges

75. An orbit in which  $n = 4$  and  $l = 2$  is represented by :

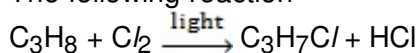
- 1) 4s
- 2) 4p
- 3) 4d
- 4) none of these

76. IUPAC name of the following compound will be :



- 1) 3-propyl-3-hexene
- 2) 3-ethyl-2-hexene
- 3) 3-prop-2-hexene
- 4) 4-ethyl-4-4-hexene

77. The following reaction

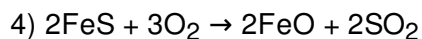
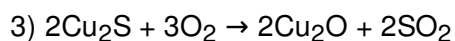


is an example of :

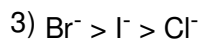
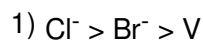
- 1) addition reaction
- 2) substitution
- 3) elimination
- 4) rearrangement

78. In the extraction of Cu, the reaction takes place in Bessemer converter is :

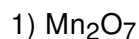
- 1)  $2\text{Cu}_2\text{OCu}_2\text{S} \rightarrow 6\text{Cu} + \text{SO}_2$
- 2)  $2\text{CuFeS}_2 + \text{O}_2 \rightarrow \text{Cu}_2\text{S} + \text{FeS} + \text{SO}_2$



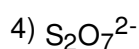
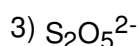
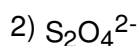
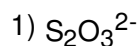
79. The correct order for being oxidised to dihalogen is :



80. The amphoteric oxide is :



81. Which does not have S—S linkage ?



82. The function of enzyme is to :

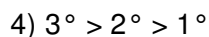
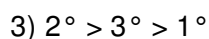
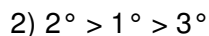
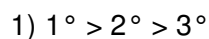
1) provide energy

2) provide immunity

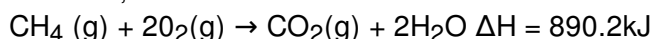
3) catalyse biochemical reaction

4) transport oxygen

83. The correct order of boiling point of primary ( $1^\circ$ ), secondary ( $2^\circ$ ), and tertiary ( $3^\circ$ ) alcohol is :



84. At 298 K, the heat of combustion of methane is :



At the same temperature the magnitude of  $\Delta E$  of reaction is :

1) equal to  $\Delta H$

2) lesser to  $\Delta H$

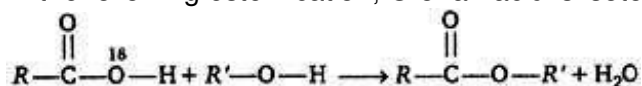
3) greater than  $\Delta H$

4) infinity

85. The process of passing precipitate into colloidal solution on adding an electrolyte is :

- 1) electro-osmosis
- 2) dialysis
- 3) peptisation
- 4) electrophoresis

86. In the following esterification, O of an acid is isotopic



Which is the correct statement ?

- 1)  $^{18}\text{O}$  is in ester
- 2)  $^{18}\text{O}$  is in water
- 3)  $^{18}\text{O}$  is in none
- 4)  $^{18}\text{O}$  is in both

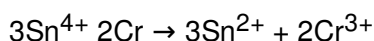
87. Which one of the following possesses highest melting point ?

- 1) o-dichloro benzene
- 2) p-dichloro benzene
- 3) Chloro-benzene
- 4) m-dichloro benzene

88.  $\text{O}_2$  molecule is :

- 1) paramagnetic
- 2) ferromagnetic
- 3) diamagnetic
- 4) none of these

89. The equilibrium constant ( $K_c$ ) for the following reaction is :



$$[E^\circ_{\text{cell}} = 0.885\text{V}, n = 6]$$

- 1)  $1 \times 10^{90}$
- 2)  $1 \times 10^{45}$
- 3)  $1 \times 10^{75}$
- 4)  $1 \times 10^{39}$

90. At  $27^\circ\text{C}$  and 0.821 atm pressure, the volume of 2.8 g of carbon monoxide is :

$$[R = 0.0821 \text{ L atm/mol K}]$$

- 1) 30 L
- 2) 3 L

- 3) 15 L
- 4) 0.15 L

91. Small liquid droplet dispersed in another liquid is called :

- 1) suspension
- 2) gel
- 3) emulsion
- 4) true solution

92. The test, which identifies acetaldehyde and acetone, is :

- 1) Molisch test
- 2) todoform test
- 3) Bromoform test
- 4) Schiff's test

93. Which one of the following does not give iodoform test ?

- 1) Iso-propyl alcohol
- 2) Ethanol
- 3) Benzyl alcohol
- 4) Ethanal

94. The metal which does not react with  $\text{CuSO}_4$  solution is :

- 1) Ag
- 2) Zn
- 3) Fe
- 4) Mg

95. Second law of thermodynamics states that :

- 1) entropy increases
- 2) total energy is conserved
- 3) heat is conserved
- 4) none of the above

96. The product formed when acetylene is passed through red hot tube is :

- 1) cyclohexane
- 2) ethane
- 3) neoprene
- 4) benzene

97. Amino acids are the building block of :

- 1) proteins
- 2) fats
- 3) vitamins
- 4) carbohydrates

98. Nitrolim is :

- 1)  $\text{CaCN}_2 + \text{O}_2$
- 2)  $\text{CaC}_2 + \text{graphite}$
- 3)  $\text{CaCN}_2 + \text{graphite}$
- 4)  $\text{CaCN}_2 + \text{N}_2$

99. Which one of the following is the major constituent of gun powder ?

- 1) Sulphur
- 2) Charcoal
- 3) Chile salt petre
- 4) Nitre

100. The vapour density of ozone is :

- 1) 24
- 2) 16
- 3) 64
- 4) 72



### Answer Key

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