PHYSICS – 6

1. The length of a simple pendulum is increased by 44%. What is the percentage increase in its time period?

A. 20% B. 10% C. 35% D. none

2. When a wave is refracted into another medium, which of the following will change?
A. Velocity B. Amplitude
C. Both 1) and 2) D. None of the above

3. Which mirror should be used to obtain a parallel beam of light from a small lamp?
A. Concave mirror B. Plane mirror
C. Convex mirror D. None of the above

4. Which of the following parameters does not change when light travels from air into a glass slab?

A. Wavelength B. Frequency C. Velocity D. Amplitude

5. The refractive index of a glass prism depends upon

A. the colour of the incident light B. the angle of the prism

C. the intensity of the incident light D. None of the above

6. The frequency of vibrations of mass m suspended from a spring of spring constant k is given by a relation of the type $f = Cm^x k^y$, where C is the dimensionless constant. The values of x and y are

A. x = -1/2, y = 1/2 B. x = 1/2, y = -1/2
C. x = -1/2, y = -1/2 D. x = 1/2, y = 1/2

7. Magnetic permeability of a medium has the dimensions of (elecric charge as a fundamental quantity)
A. $[M^1 L^1 T^0 Q^{-2}]$ B. $[M^1 L^2 T^2 Q^{-2}]$
C. $[M^0 L^1 T^2 Q^{-2}]$ D. $[M^1 L^0 T^{-2} Q^{-2}]$

8. A point moves in a straight line so that its displacement 'X' m at time 't' seconds is given by $X^2 = 1 + t^2$. Its acceleration (in m/s^2) at a time 't' seconds is
A. $1/X^3$ B. $-1/X^2$ C. $(1/X) - (t^2/X^3)$ D. $(1/X) - (1/X^2)$

9. A man swims from a point A on one bank of river of width 100 m. When he swims perpendicular to the water current (V_r), he reaches the other bank 50 m down the stream. The angle to the bank, at which he should swim, to reach the directly opposite point B on the other bank is

A. 60° up the stream   B. 30° up the stream

C. 45° up the stream   D. $\tan^{-1}(1/2)$ up the stream
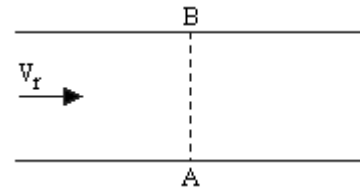
10. In the terrestrial telescope, the eye piece produces the final image at
A. infinity
B. the least distance of distinct vision from the objective
C. the least distance of distinct vision from the eye piece
D. a distance from the eye piece equal to the length of the telescope

11. A simple two lens telescope has an objective of focal length 50 cm and an eye piece of 2.5 cm. The telescope is pointed at an object at a very large distance which subtends at angle of 1 milli radian on the naked eye. The eye-piece is adjusted so that the final virtual image is formed at infinity. The size of the image formed by the objective is
A. 5 mm   B. 1 mm   C. 0.5 mm   D. 0.1 mm

12. A particle moving in a circle of radius r with constant speed v has an acceleration whose direction is
A. away from the centre   B. towards the centre
C. tangential to the circle   D. inwards at an angle of 45° with the tangent

13. The given figure shows rod of the same size of two different materials A and B placed end to end in thermal contact and heavily lagged at their sides. The outer ends of A and B are kept at 0^oC and 100^oC respectively. The conductivity of A is four times of B. The steady state temperature of the interface is
A. 20^oC   B. 25^oC
C. 50^oC   D. 75^oC
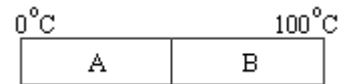
14. A DC voltage supply has an internal resistance of r Ω. A resistive load R is connected across the terminals of the supply. The power developed in R is maximum, when the value of R is
A. 1 Ω   B. $\sqrt{r}$ Ω   C. r Ω   D. r^2 Ω

15. Which of the following statements is correct?
A. The average KE of translation of a molecule of any gas is the same at the same temperature
B. The average KE of a molecule of any gas is independent of its temperature
C. The average KE of one g of any gas is the same at the same temperature

D. The average KE of one g of any gas is independent of its temperature

16. A heavy truck and a car moving with the same kinetic energy are brought to rest by application of the brake which provide the same retarding force in both the cases. Then
A. the truck will come to rest in shorter time
B. the car will come to rest in shorter distance
C. both will travel the same distance before coming to rest
D. the distance travelled depends on the mass

17. The energy of a self inductance L carrying a current 'i' resides in the
A. magnetic field produced by L   B. electric field due to the current carriers
C. thermal energy due to the current   D. battery that supplies the current

18. A galvanometer, having an armature coil with resistance of 10 Ω requires 0.01 amp for full scale deflection. To convert this galvanometer to a voltmeter which will give a full scale deflection when voltage is 120 volts : a coil in series must be added that will have a resistance in ohms of
A. 40   B. 120   C. 1200   D. 11990

19. A vessel contains a mixture of different types of gases. Which of the following statements is correct?
A. On the average the heavier molecules have higher speed
B. The average speed of different molecules is the same
C. The average translational energy of different types of molecules is the same
D. On the average the heavier molecules have higher translational energy

20. The snow on the mountains does not melt all at once when it is heated by the sun because is
A. becomes very hard   B. reflects most of the heat from the sun
C. has low specific heat capacity   D. has a high latent heat of fusion

21. According to the law of equipartition of energy, the average KE per degree of freedom per molecule of an ideal gas at absolute temperature T is
A. KT/2   B. 3KT/4   C. KTd   D. 3KT/2

22. Gravitational intensity at the surface of the earth is
A. GM/R towards the centre of the earth   B. GM/R^2 away from the centre of the earth
C. GM/R^2 towards the centre of the earth   D. $\sqrt{(GM/R^2)}$ towards the centre of the earth

23. If the distance between the earth and the sun is doubled, then the duration of the year will be

A. 2 times   B. 2√2 times   C. 1/2 times   D. same

24. During an elastic interaction between the two bodies,
A. the total kinetic energy of the system is conserved
B. velocity always remains constant
C. workdone changes the total kinetic energy
D. momentum of each particle remains constant

25. Which one of the following quantities referring to linear motion corresponds to moment of inertia in rotational motion?
A. Mass   B. Momentum   C. Force   D. Acceleration

26. The purpose of sound box in sonometer is to increase
A. frequency of sound   B. wavelength of sound
C. intensity of sound   D. velocity of sound

27. The tip of each prong of a tuning fork emitting a note of frequency 250 Hz has an amplitude of 0.5 mm. What is the speed (in mm s^{-1}) of each tip when its displacement is a maximum
A. 0   B. 250 π C. 2500 π D. 12500 π^2

28. In a Young's double slit experiment, the ratio of the intensities of maximum and minimum bright fringes is 9. This means that the
A. ratio of the amplitudes of the waves from the two slits is 3 : 1
B. intensity of light falling on the screen from the two slits is in the ratio 5 : 4
C. ratio of the amplitudes of the waves from the two slits is 2 : 1
D. intensity of light falling on the screen from the two slits is in the ratio 9 : 1

29. The largest and the shortest distance of the earth from the sun are r_1 and r_2. Its distance from the sun when it is at the perpendicular to the major axis of the orbit, drawn from the sun is
A. $(r_1 r_2)/(r_1 + r_2)$ B. $(2r_1 r_2)/(r_1 + r_2)$
C. $(r_1 + r_2)/3$ D. $(r_1 + r_2)/4$

30. The gravitational attraction between the two bodies increases when their masses
A. increased and the distance between them is increased   B. reduced and distance is increased
C. increasedand distance is reduced   D. reduced and distance is reduced

31. If the wavelength of incident light changes from 4000 Å to 3000 Å; both causing photoelectric emission, the stopping potential

A. remains same   B. increases

C. decreases   D. depends on surrounding temperature

32. Which of the following is not correct about nuclear forces?
A. They are short range attractive forces
B. They are independent of charge
C. They change to repulsion at very close distances
D. They obey inverse square law

33. Fusion reaction takes place at high temperature because
A. atoms are ionised at high temperature
B. molecules break up at high temperature
C. nuclei break up
D. kinetic energy is high enough to overcome repulsion of nuclei

34. Half life of an element is 140 days. Out of 16 g, 15 g of element will decay in
A. 560 days   B. 1120 days   C. 70 days   D. 140 days

35. Photons of energy 3.0 eV fall on a metal surface whose work function is 1.0=5 eV. It will be observed that
A. there will be no electrons with zero kinetic energy
B. all photoelectrons will have the same kinetic energy equal to 1.5 eV
C. the most energetic electrons will have kinetic energy equal to 3.0 eV
D. the kinetic energy of most energetic electrons will be 1.5 eV

36. A particle of charge 'q' and mass 'm' is describing a circular orbit of radius 'r' in a plane perpendicular to uniform magnetic induction B. The momentum of the particle is given by
A. Bq/r   B. Bqr   C. mBr   D. Bqmr

37. A vacuum diode is connected across an alternating voltage source. The current in the circuit is
A. zero at all the times   B. alternating at all the times
C. unidirectional and non zero at all the   D. unidirectional but at regular time
times   intervals

38. A deutron of kinetic energy 50 keV is describing a circular orbit of radius 0.5 m, in a plane perpendicular to magnetic field B. The kinetic energy of a proton that describe a circular orbit of radius 0.5 m in the same plane with same B is
A. 200 eV   B. 25 eV   C. 100 eV   D. 50 eV

39. In a semiconductor, the mobility of holes is

A. not related to the movement of electrons   B. equal to that of electrons

C. less than that of electrons   D. greater than that of electrons

40. In a shell of the principal quantum number n, the maximum number of electrons present will be

A. n^2 B. 2n   C. n   D. $2n^2$

41. Two coils each of inductance L are connected in parallel but are well separated from each other. The total inductance of the combination is

A. 2 L   B. 1.5 L   C. 0.5 L   D. 0.25 L

42. The workdone in increasing the extension of spring from 40 cm to 50 cm is 18 J. The spring constant is

A. 200 N M^{-1} B. 400 N M^{-1} C. 360 N M^{-1} D. 180 N M^{-1}

43. The object appears weightless in an elevator if it is

A. moving with an acceleration a = g upward

B. a free fall

C. moving down with zero acceleration

D. moving down with an acceleration a = g/2

44. The temperature of metal wire rises when an electric current passes through it because

A. collision of conduction electrons with each other releases heat energy

B. collision of conduction electrons with the atoms of the metal gives them energy which appears as heat

C. collision of metal atoms with each other releases heat energy

D. heat energy is released when the conduction electrons are separated from their parent atoms

45. A bullet is fired at an angle of 30° to the horizontal with a velocity of 36 km/hr. The time of flight is

A. 0.5 s   B. 1 s   C. 2 s   D. 4 s

46. Dimensional formula for the moment of a couple acting on a body is

A. ML^{-2}T^{-2} B. MLT^{-2} C. ML^{2}T^{-2} D. MLT^2

47. A flat body on a smooth inclined plane, slides down with a constant acceleration of 4.9m/s^2. What is the inclination of the plane to the horizontal?

A. 60°　　　　B. 30°　　　　C. 15°　　　　D. 45°

48. If two forces F and F' acting at a point give a resultant force of magnitude F, then the angle between the two forces must be

A. 0°　　　　B. 120°　　　　C. 60°　　　　D. 90°

49. A wooden ball of mass 500 g moving with a velocity of 10 m/s directly hits another ball of mass 4.5 kg at rest. After the impact, it sticks to the heavier mass. Then the lighter mass has a velocity

A. zero

B. 1 m/s in the same direction as before

C. 1 m/s in the opposite direction

D. same as the initial velocity

50. A flat body of mass 2 kg lies at rest on an inclined plane of inclination 30°. What is the coefficient of friction between the plane and the surface of the body?

A. 0.7427　　　　B. 0.5774　　　　C. 0.3726　　　　D. 0.4321

51. A smooth sphere of mass m moving with a velocity u makes a direct collision with another sphere of mass 2m at rest. If the collision is perfectly elastic, the impulse on the first sphere is

A. mu　　　　B. 2 mu/3　　　　C. -(4 mu/3)　　　　D. mu/2

52. Two masses A and B are connected as shown in the figure. If a force of 30 N pulls the system, the tension in the cord connecting A and B is

A. 13.33 N　　　　B. 15 N

C. 6.66 N　　　　D. 10 N
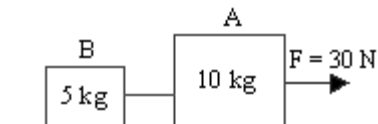
53. A uniform pipe weighing 100 N has two weights of 300 N and 600 N placed at its two ends. If the length of the pipe is 1 m, to balance the pipe fulcrum must be placed

A. 0.4 m from 600 N

B. 0.32 m from the centre

C. 0.15 m from 600 N

D. 0.65 m from 300 N

54. A rocket is launched vertically from the earth's surface (acceleration due to gravity is $10 m/s^2$). The mass of the rocket is 100 kg. The initial propelling force is 25000 N. The initial acceleration of the rocket is

A. $2500 \ m/s^2$　　　　B. $2400 \ m/s^2$　　　　C. $250 \ m/s^2$　　　　D. $240 \ m/s^2$

55. A man standing in a lift falling freely under gravity releases a ball from his hand. As seen by him the ball

A. falls down

B. goes up

C. remains stationary

D. executes simple harmonic motion

56. A particle projected up a rough inclined plane of length 5 m, with a velocity of 14 m/s, is able to just reach the top of the plane. If it is projected with a speed of 7m/s from the bottom, it will travel up the plane to a maximum length of

A. 1.25 m   B. 2.50 m   C. 3.75 m   D. 5.0 m

57. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m. Force P is applied at one end of the rope. The force which the rope exerts on the block is

A. P/(M - m)   B. P/[M(M + m)]
C. PM/(M + m)   D. Pm/(M + m)

58. A steel ball moving with a speed 'u' collides with an identical ball originally at rest. The first one is observed to stop dead. Then the second ball will

A. go forward with speed 2u   B. go forward with speed u
C. remain at rest   D. go forward with speed u/4

59. The linear velocities of the extremities of the hour, minute and second hands of a watch, their lengths being 12 mm, 20 mm, 6 mm respectively, are in the ratio

A. 6 : 10 : 3   B. 1 : 20 : 360
C. 2 : 5 : 200   D. 3 : 6 : 10

60. A straight groove is made on a smooth horizontal table and four identical balls touching one another are placed in the groove. An identical ball is rolled on in the groove with a velocity v, to strike the left extreme balls out of the four, touching one another. Then

A. all the five balls will roll on to the right with velocity v/5

B. the incident ball will rebound to the left with velocity v

C. the two balls at the extreme end will roll out, each with velocity v/2

D. the incident ball will stop dead and only the last ball at the extreme right end will roll out, to the right with velocity v

61. The workdone by the external forces in a system equals the change in

A. kinetic energy   B. potential energy   C. total energy   D. none

62. The diagram shows the displacement (S) - time (t) graph for a particle moving on a straight line. The average velocity for the interval t = 0 to t = 5 is

A. 6 m/s   B. -2 m/s
C. 2 m/s   D. -4 m/s

63. A particle moves along a straight line such that at time t its displacement from a fixed point O on the line is $3t^2 - 2$. The velocity of the particle when t = 2 is

A. 8 m/s   B. 4 m/s   C. 12 m/s   D. 6 m/s

64. A particle is thrown with an initial speed of 20 m/s at an angle of 60°. Its horizontal range is

A. 36.45 m   B. 28.45 m   C. 38.25 m   D. 35.35 m

65. As we proceed below the earth's surface nearer to the centre of Earth, acceleration due to gravity 'g', compared to its vale at the surface of the Earth

A. increases   B. decreases
C. does not change   D. none of the above

66. The velocity with which an Artificial Satellite circles around close to surface of the Earth is v. Then the velocity with which the same satellite should be projected from the surface of Earth to remove it completely beyond the influence of Earth is

A. $\sqrt{2}$ v   B. 2 v   C. v/2   D. none of the above

67. We have two spheres, one of which is hollow and the other solid. They have identical masses and moments of inertia, about their respective diameters. The ratio of their radii is given by

A. 5 : 3   B. 3 : 5
C. $\sqrt{5}$: $\sqrt{3}$ D. $\sqrt{3}$: $\sqrt{5}$

68. A stationary wave set up between the ends of a 4 m long wire vibrates in 8 segments. The distance between the first and fourth antinode is

A. 2.5 m   B. 2 m
C. 1.5 m   D. 1 m

69. A coin placed on a rotating turntable just slips if it is placed at a distance of 4 cm from the centre. If the angular velocity of the turntable is doubled, it will just slip at a distance of

A. 2 cm   B. 1 cm
C. 4 cm   D. 8 cm

70. A sound wave generated in a particular medium, passes to another medium. Which of the following properties pertaining to the wave does not alter?

A. Velocity   B. Amplitude
C. Frequency   D. Wavelength

71. The threshold frequency for potassium is 3 X 10^{14} second. The work function for potassium is

A. 3 X 10^{-17} J   B. 6.2 X 10^{-18} J
C. 1.99 X 10^{-19} J   D. 4.5 X 10^{-18} J

72. When stationary waves are set up in a medium, which of the following statements is

correct?

A. The amplitude of vibration changes simple harmonically with the distance of the particle from the origin

B. All particles between two nodes are in the same phase

C. Different particles of the medium have different periods of oscillation

D. Amplitude of vibration of each particle changes simple harmonically with time

73. A solid cylinder of diameter 30 cm is released from the top of an incline 2 m high. It rolls down the incline without loss of energy due to friction. Its linear and angular speeds at the bottom are respectively

A. 2 m/s and 20 rad/s   B. 5.1 m/s and 34 rad/s

C. 10.2 m/s and 30 rad/s   D. none of the above

74. The wavelength of an electron moving with a velocity of 500 km/s is (Take $m_e = 9 \times 10^{-31}$ kg and h = 6.62×10^{-34} Js)

A. 1.65 nm   B. 2.25 nm

C. 1.45 nm   D. 2.75 nm

75. A source of light is placed at a distance of 1 m from a photocell and cut off potential is found to be V. If the distance is doubled, the cut off potential will be

A. V   B. V/3   C. 2V   D. V/2

76. Two powerful 100 watt bulbs are used to study the interference of light. How will interference pattern be affected?

A. Fringes will become broader

B. Fringes will become narrow

C. The spacing between consecutive fringes increase

D. There will be no interference to produce fringes

77. If one of the two slits of a standard Young's double slit interference experiment is painted so that it transmits half the light intensity as the second slit,

A. the fringe system will altogether disappear

B. the bright fringes will become brighter and the dark fringes will become darker

C. both dark and bright fringes will become darker

D. dark fringes will become brighter and bright fringes darker

78. The R.M.S. velocity of a gas of mass M per mole is

A. 3kT/M   B. $\sqrt{(3RT/M)}$

C. $\sqrt{(kT/3M)}$ D. kT/2M)

79. The temperature at which the R.M.S. velocity of gas molecules will be half of its

value, at 127°C is

A. 64°C

B. 64 K

C. 173 K

D. 100 K

80. A tyre at -3°C contains air at a pressure four times the atmospheric pressure outside. When the temperature rises to 25°C, the tyre expands in volume by 2 percent. The new pressure in the tyre in atmospheres is

A. 3.1

B. 4.33

C. 2.3

D. 1.63

81. A closed vessel contains some gas at a given temperature and pressure. The vessel is given a high velocity by placing it on a fast moving train. Then the temperature of the gas

A. will increase

B. will decrease

C. will remain unchanged

D. may increase or decrease depending upon the nature of the gas

82. Which of the following methods will increase the volume of an ideal gas to four times its original value (Absolute temperature is used)?

A. Double the temperature and double the pressure

B. Halve the temperature and double the pressure

C. Quarter the temperature at constant pressure

D. Quarter the pressure at constant temperature

83. First law of thermodynamics is defined as

A. law of conservation of mass

B. law of conservation of energy

C. law of conservation of momentum

D. none of the above

84. When a certain metallic surface is illuminated with monochromatic light of wavelength λ, the stopping potential for photoelectric current is 3 V. When the same surface is illuminated with light of wavelength 2λ, the stopping potential is V. Then the threshold wavelength for this surface for photoelectric effect is

A. 2λ

B. 5λ

C. 4λ

D. 3λ

85. In an experiment carried out at 0°C, A was 1.20 m of nichrome wire of resistivity 100 X 10^{-8} ohm-m and diameter 1.20 mm and B was of german silver of 0.80 mm diameter and resistivity 28 X 10^{-8} ohm-m . The ratio of resistances A/B was 1.20. The length of the wire B was

A. 1.20 m

B. 1.59 m

C. 0.8 m

D. 1.95 m

86. A photocell is illuminated by a small bright source placed one metre away. When the same source is placed 2 m away, the electrons emitted by the photo-cathode

A. carry one quarter of their previous energy B. carry one half of their previous energy
C. are one quarter as numerous   D. are half as numerous

87. Light of two different frequencies, whose photons have energies 1 eV and 2.5 eV respectively, successively illuminate a metal whose work function is 0.5 eV. The ratio of maximum speeds of the emitted electrons will be
A. 1/7   B. 1/4   C. 1/3   D. 1/2

88. The speed of longitudinal waves in a thin brass rod is 3480 m/s. If the rod is clamped at one end and produces a note of fundamental frequency of 435 Hz, the length of the rod is
A. 1.8 m   B. 2.0 m   C. 2.5 m   D. 2.2 m

89. The tones that are separated by three octaves have a frequency ratio of
A. 2   B. 8   C. 6   D. 4

90. A stretched wire of length 60 cm vibrates with a fundamental frequency of 256 Hz. If the length of wire is reduced to 15 cm, while keeping the tension constant, the fundamental frequency of the wire will be
A. 1024 Hz   B. 512 Hz
C. 778 Hz   D. 1280 Hz

91. The fundamental frequency of a string stretched with a weight of 4 kgf is 256 Hz. The weight required to produce its octave is
A. 12 kgf   B. 16 kgf
C. 11 kgf   D. 18 kgf

92. A spring has a certain mass suspended from it and its period for vertical oscillations is T_1. The spring is now cut into two halves and the same mass is suspended from one of the halves. The period for vertical oscillations now is
A. $T_1/\sqrt{3}$ B. $T_1\sqrt{3}$
C. $T_1\sqrt{2}$ D. $T_1/\sqrt{2}$

93. The acceleration of a particle performing simple harmonic motion is 12 cm/s^2 at a distance of 3 cm from the mean position. Its period of oscillation is
A. 2.9 s   B. 3.8 s   C. 3.14 s   D. 3.62 s

94. The unit for surface tension is
A. newton   B. newton per square metre
C. newton per metre   D. newton per unit velocity gradient

95. A particle is vibrating in a simple harmonic motion with an amplitude of 4 cm. At

what displacement from the equilibrium position is its energy half potential and half kinetic?

A. 3√2 cm　　　　B. 2√2 cm　　　　C. 2√5 cm　　　　D. 3√3 cm

96. A simple pendulum suspended from the ceiling of a lift has a period of oscillation T, when the lift is stationary. If the lift ascends vertically with an acceleration of a = 3g, then the period of the pendulum will become

A. T/3　　　　B. T/4　　　　C. T/2　　　　D. T/8

97. In an isothermal process on an ideal gas, the pressure increases by 0.5%. The volume decreases by about

A. 0.6%　　　　B. 0.25%　　　　C. 1%　　　　D. 0.5%

98. A 5.0 kg object is to be given an upward acceleration of 0.30 m/s^2 by a rope pulling straight upward on it. What must be the tension on it? (Take g = $10m/s^2$)

A. 30.5 N　　　　　　　　B. 51.5 N
C. 55.5 N　　　　　　　　D. 75.5 N

99. When a 400 g mass is hung at the end of a vertical spring, the spring stretches by 35 cm. What is the spring constant of the spring?

A. 5.2 N/m　　　　B. 11.2 N/m　　　　C. 6.8 N/m　　　　D. 6.6 N/m

100. A rocket works on the principle of conservation of

A. mass　　　　　　　　B. energy
C. linear momentum　　　　D. angular momentum

Solutions:

1	2	3	4	5	6	7	8	9	10
A	C	A	B	C	A	A	C	A	C
11	12	13	14	15	16	17	18	19	20
B	B	A	C	A	C	A	D	C	D
21	22	23	24	25	26	27	28	29	30
A	B	B	C	A	C	A	C	B	C
31	32	33	34	35	36	37	38	39	40
B	D	D	A	D	B	D	C	B	D
41	42	43	44	45	46	47	48	49	50

C	B	B	B	B	C	B	B	B	B
51	52	53	54	55	56	57	58	59	60
C	D	D	D	C	A	C	B	B	D
61	62	63	64	65	66	67	68	69	70
C	B	C	D	B	A	D	C	B	C
71	72	73	74	75	76	77	78	79	80
C	B	B	C	A	D	D	B	D	B
81	82	83	84	85	86	87	88	89	90
C	D	B	C	B	C	D	B	B	A
91	92	93	94	95	96	97	98	99	100
B	D	C	C	B	C	D	B	B	C