Inspector of Legal Metrology.

CAI/17

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE ASKED TO DO SO.

2017

TEST BOOKLET

TEST BOOKLET SERIES

D

Time allowed : $1\frac{1}{2}$ hours

Full marks : 100

6396

Answer ***all*** the questions.

Questions are of equal value.

Serial No. .....

Signature of the Candidate:

INSTRUCTIONS

Candidates should read the following instructions carefully before answering the questions:

1. This booklet consists of 12 pages including this front page. Verify the Page Nos. and bring at once to the Invigilator's notice any discrepancy.

2. Answers will have to be given in the Special Answer-Sheet supplied for the purpose.

3. Before you proceed to mark in the Answer-Sheet in response to various items in the Test Booklet, you have to fill in some particulars in the Answer-Sheet as per instructions sent to you in the Admit Card. ***Do not fold the Answer-Sheet as this will result in error in your marks.***

4. All questions are of multiple-choice answer-type. You will find ***four*** probable answers **(A), (B), (C)** and **(D)** against each question. Find out which of the four answers appears to be correct or the best. Now darken the oval corresponding to the letter of the selected answer in the Answer-Sheet with **Black Ball Point Pen** as per instructions printed on the reverse of the Admit Card and in the Answer-Sheet.

5. If more than one oval is encoded for a particular answer, it will be treated as a wrong answer.

6. ***There will be negative marking of $\frac{1}{3}$ mark for each wrong answer.***

7. **There is a blank page at the end of this Test Booklet for Rough Work.**

8. ***The Special Answer-Sheet should be handed over to the Invigilator before leaving the Examination Hall. You are permitted to take away the used Test Booklet after completion of the examination.***

[Please Turn Over]

1. A hollow metal sphere is placed in a constant electric field. The force on a charge inside the hollow sphere is
   (A) zero
   (B) proportional to the external field
   (C) constant independent of the external field
   (D) None of the above

2. The resistance of a Si sample
   (A) increases with increase in temperature.
   (B) remains constant with Change in temperature.
   (C) decreases with increase in temperature.
   (D) may increase or decrease with increase in temperature.

3. In the following circuit (Fig. 1), $R_1 = 2\Omega$, $R_2 = 3\Omega$ and $R_3 = 6\Omega$. If the battery has an emf of 4 V and internal resistance 1Ω, the rate of internal energy loss (in Joule/sec) in the battery is

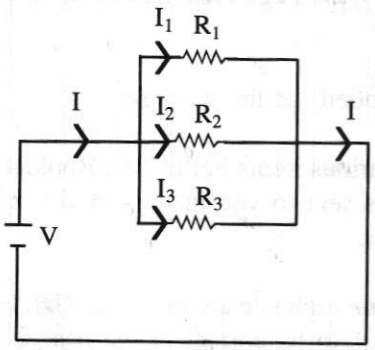


Figure 1

   (A) 1
   (B) 2
   (C) 3
   (D) 4

4. To use a galvanometer as a voltmeter, one has to
   (A) connect a high resistance in series with the galvanometer.
   (B) connect a low resistance in series with the galvanometer.
   (C) connect a low resistance in parallel with the galvanometer.
   (D) connect a high resistance in parallel with the galvanometer.

5. A steady current of 2 Amps. is passed through a silver voltameter for half an hour. If the mass of silver deposited is 4·18 g, the electrochemical equivalent of silver is approximately
   (A) 1·16 mg/C
   (B) 0·58 g/C
   (C) 2·32 mg/C
   (D) 1 g/C

6. The magnetic field necessary in a cyclotron of radius r for a particle of mass m and charge q to be accelerated to a velocity v is
   (A) $mv/(qr)$
   (B) $mv^2/(qr)$
   (C) $mv^2/(qr^2)$
   (D) $mv/(qr^2)$

7. A very long wire is carrying a current i. The magnetic field at a distance r from the wire is
   (A) $\mu_0 i^2/(2\pi r)$
   (B) $\mu_0 i/(2\pi r)$
   (C) $\mu_0 i^2/(2\pi r^2)$
   (D) $\mu_0 i/(2\pi r^2)$

8. Paramagnetic substances have
   (A) atoms with permanent magnetic dipole moments.
   (B) nuclei with permanent magnetic dipole moments.
   (C) atoms with zero magnetic dipole moments.
   (D) atoms with closed electron shells.

9. The sensitivity of a tangent galvanometer is maximum if the deflection is
   (A) 30°
   (B) 45°
   (C) 60°
   (D) sensitivity is constant

10. A circuit contains an inductance of value 20 mH and a certain capacitance. The circuit has the resonant angular frequency 1000 rad/s. The value of the capacitance is

(A) $5{\cdot}0\times10^{-5}$ F

(B) $1{\cdot}30\times10^{-6}$ F

(C) $5{\cdot}0\times10^{-6}$ F

(D) $1{\cdot}30\times10^{-5}$ F

11. Which of the following statements is *not* true?

(A) Ultraviolet rays have longer wavelength than gamma rays.

(B) Red light has longer wavelength than yellow light.

(C) X-rays have longer wavelength than ultraviolet rays.

(D) Radio waves have longer wavelength than infrared rays.

12. If the phase difference at a point between two waves having the same frequency is constant at all times, the two waves are called

(A) incoherent

(B) coherent

(C) uniform

(D) sinusoidal

13. Light from a source with wavelength 590 nm falls on a pair of slits. If the separation between the slits is 0·135 mm, the fringe width is approximately

(A) 0·17 cm

(B) 0·35 cm

(C) 0·50 cm

(D) 0·76 cm

14. The direction of polarization of two polaroids make an angle 30° between themselves. The fraction of intensity of unpolarized light that is transmitted by the combination is

(A) 1/2

(B) 1/4

(C) $\sqrt{3/2}$

(D) 3/8

15. A point source of light is at a distance 50 cm from a screen. The distance at which a thin converging lens of focal length 8 cm must be placed so as to obtain a sharp image of the source on the screen is

(A) 10 cm

(B) 15 cm

(C) 20 cm

(D) 25 cm

16. At sunset and sunrise, the sun appears red because

(A) light from the sun is predominantly red.

(B) the scattering of light by the atmosphere is maximum for blue light.

(C) the scattering of light by the atmosphere is minimum for blue light.

(D) None of the above

17. Light of frequency 5×10^{14} Hz is incident on a metal and electrons of energy 1·3 eV are emitted. Taking Planck's constant to be 4×10^{-15} eVs, the work function of the metal is

(A) 0·35 eV

(B) 0·7 eV

(C) 1·1 eV

(D) 1·3 eV

18. In Bohr model of the hydrogen atom, the energy of the photon for the transition from the second to the first electron orbit is (where the symbols have their usual meaning)

(A) 13·6 eV

(B) 10·2 eV

(C) 6·83eV

(D) 3·4 eV

19. A nucleus undergoes alpha decay. If ΔZ and ΔA denote the decreases in its atomic number and mass number respectively, then

(A) $\Delta Z = -2,\ \Delta A = 4$

(B) $\Delta Z = 2,\ \Delta A = 4$

(C) $\Delta Z = -1,\ \Delta A = 0$

(D) $\Delta Z = 2,\ \Delta A = 2$

20. To generate energy, nuclear reactors use the principle of

(A) fusion
(B) fission
(C) alpha decay
(D) beta decay

21. The nuclei ^{112}Sn, ^{114}Sn, ^{116}Sn are called

(A) isotopes
(B) isotones
(C) isobars
(D) isotherms

22. In beta decay, the origin of the electrons is

(A) the nucleus
(B) the inner electron shells
(C) the outer electron shells
(D) free electrons in metals

23. To make a *n* type semiconductor, a Si samples has to be doped with

(A) Al
(B) As
(C) B
(D) In

24. Reverse saturation current in a p-n junction diode is due to

(A) majority carriers
(B) minority carriers
(C) ions
(D) None of the above

25. The moon does not have atmosphere because

(A) the moon is older than earth
(B) the moon is younger than earth
(C) the moon was formed in a different process than the other planets
(D) the moon has a very weak gravity

26. If $a\left(2+\sqrt{3}\right)=b\left(2-\sqrt{3}\right)=1$, then the value of $\frac{1}{a}+\frac{1}{b}$ is

(A) 1
(B) 2
(C) $2\sqrt{3}$
(D) 4

27. A man rows a boat 18 km in 4 hr downstream and returns upstream in 12 hr. The speed of the stream (in km/hr) is

(A) 1
(B) 1·5
(C) 2
(D) 2·5

28. In a 800 m race, A defeated B by 15 second. If A's speed was 8 km/hr, then speed of B was

(A) $7\frac{17}{25}$ km/hr
(B) $8\frac{17}{25}$ km/hr
(C) $\frac{16}{27}$ km/hr
(D) $\frac{27}{16}$ km/hr

29. If 6 persons working 8 hr a day earn ₹ 8400 per week, then 9 persons working 6 hr a day will earn per week

(A) ₹ 8400
(B) ₹ 16800
(C) ₹ 9450
(D) ₹ 16200

30. A and B can do a piece of work in 30 days. While B and C can do the same work in 24 days and C and A in 20 days. They all work together for 10 days, when B and C leave. How many days more will A take to finish the work?

(A) 18 days
(B) 24 days
(C) 30 days
(D) 36 days

31. If $a : b = c : d = e : f = 1 : 2$, then $(pa + qc + re) : (pb + qd + rf)$ is equal to

(A) 1 : 4
(B) 1 : 5
(C) 1 : 3
(D) 1 : 2

32. Salary of a person is first increased by 20%, then it is decreased by 20%. Change in his salary is

(A) 4% decrease
(B) 4% increase
(C) 8% decrease
(D) 20% increase

33. The simplified value of $\frac{1{\cdot}49 \times 14{\cdot}9 - 0{\cdot}51 \times 5{\cdot}1}{14{\cdot}9 - 5{\cdot}1}$ is equal to

(A) 0·20
(B) 20·00
(C) 2·00
(D) 22·00

34. Successive discounts of 10%, 20% and 30% is equivalent to a single discount of

(A) 60%
(B) 49·6%
(C) 40·5%
(D) 50%

35. From a point in the interior of an equilateral triangle the perpendicular distances of the sides are $\sqrt{3}$ cm, $2\sqrt{3}$ cm and $5\sqrt{3}$ cm. The perimeter of the triangle is

(A) 64 cm
(B) 32 cm
(C) 48 cm
(D) 24 cm

36. Two trains are running 40 km/hr and 20 km/hr respectively in the same direction. The fast train completely passes a man sitting in the slow train in 5 second. The length of the fast train is

(A) $23\frac{2}{9}$ m
(B) 27 m
(C) $27\frac{7}{9}$ m
(D) 23 m

37. A man riding his bicycle covers 150 m in 25 second. Its speed in km/hr is

(A) 25
(B) 21·6
(C) 23
(D) 20

38. The compound interest on ₹ 6000 at 10% per annum for $1\frac{1}{2}$ yrs., when the interest being compounded annually is

(A) ₹ 910
(B) ₹ 870
(C) ₹ 930
(D) ₹ 900

39. A dishonest fruit seller sells his goods at cost price but he uses a weight of 900 gm for the kg weight. His gain percent is

(A) 10%
(B) 12%
(C) $11\frac{1}{9}$ %
(D) $10\frac{1}{9}$ %

40. If the cost price of an article is 80% of its selling price, then profit percent is

(A) 20%
(B) $22\frac{1}{2}$ %
(C) 24%
(D) 25%

41. The mean proportional between $\left(3+\sqrt{2}\right)$ and $\left(12-\sqrt{32}\right)$ is

(A) $\sqrt{7}$

(B) $2\sqrt{7}$

(C) 6

(D) $\frac{1}{2}\left(15-3\sqrt{2}\right)$

42. If $a : (b + c) = 1 : 3$ and $c : (a + b) = 5 : 7$, then $b : (c + a)$ is equal to

(A) 1 : 2

(B) 2 : 3

(C) 1 : 3

(D) 2 : 1

43. 0·15% of $33\frac{1}{3}$ % of ₹ 10,000 is

(A) ₹ 5

(B) ₹ 150

(C) ₹ 0·05

(D) ₹ 105

44. There are 50 students in a class one of them weighting 50 kg goes away and a new student joins. By this the average weight of the class increases by $\frac{1}{2}$ kg. The weight of the new student is

(A) 70 kg

(B) 75 kg

(C) 72 kg

(D) 76 kg

45. The product of two numbers is 9375 and the quotient, when the larger one is divided by the smaller one is 15, the sum of the numbers is

(A) 395

(B) 380

(C) 400

(D) 425

46. $\frac{137\times137+133\times133+18221}{137\times137\times137-133\times133\times133}$ is equal to

(A) 4

(B) 270

(C) $\frac{1}{4}$

(D) $\frac{1}{270}$

47. The value of $\frac{4-\sqrt{0{\cdot}04}}{4+\sqrt{0{\cdot}4}}$ is close to

(A) 0·4

(B) 0·8

(C) 1·0

(D) 1·4

48. $\dfrac{5\frac{9}{14}}{5+\dfrac{3}{3+\dfrac{1}{\frac{3}{5}}}}$ is equal to

(A) 1

(B) 1·5

(C) 2

(D) 2·5

49. The number nearest to 10000, which is exactly divisible by each of 3, 4, 5, 6, 7 and 8 is

(A) 9240

(B) 10080

(C) 9996

(D) 10000

50. A rational number between $\frac{3}{4}$ and $\frac{3}{8}$ is

(A) $\frac{12}{7}$

(B) $\frac{7}{3}$

(C) $\frac{16}{9}$

(D) $\frac{9}{16}$

51. The dimension of the gravitational constant G is

(A) $L^2T^{-2}M^{-1}$

(B) $L^3T^{-2}M^{-1}$

(C) $L^2T^{-2}M$

(D) $L^3T^{-3}M$

52. Three objects have masses 13·2 kg, 2·13 kg and 0·319 kg. The total mass of the three objects, expressed up to the correct number of significant figure is

(A) 15·649 kg

(B) 15·65 kg

(C) 15·64 kg

(D) 15·6 kg

53. The distance from A to B is 60 km. A person travels half the distance at a speed of 20 km/hour and the rest at a speed of 30 km/hour. His average speed is

(A) 24 km/hour

(B) 25 km/hour

(C) 26 km/hour

(D) 27 km/hour

54. The unite vectors along the three axes in a Cartesian co-ordinate system are given by $\hat{i}$, $\hat{j}$ and $\hat{k}$. The projection of the vector $\hat{i}+\hat{j}+\hat{k}$ along $\hat{i}-\hat{j}+\hat{k}$ direction is

(A) $(\hat{i}-\hat{j}+\hat{k})/\sqrt{3}$

(B) $(\hat{i}-\hat{j}+\hat{k})/3$

(C) $(\hat{i}+\hat{j}+\hat{k})/\sqrt{3}$

(D) $(\hat{i}+\hat{j}+\hat{k})/3$

55. A particle moving in a straight line with uniform acceleration traverses 25 cm in the 5th second and 33 cm in the seventh second. The initial velocity of the particle is

(A) 4 cm/s

(B) 5 cm/s

(C) 6 cm/s

(D) 7 cm/s

56. A plane moving with an uniform velocity drops a bomb. Assuming the friction of air on the bomb is negligible, at the time of impact of the bomb on the ground the position of the plane will be

(A) ahead of the impact point.

(B) behind the impact point.

(C) just above the impact point.

(D) insufficient data is given.

57. An electron moves with a speed 2×10^6m/s. The circular orbit around the nucleus has a radius 5×10^{-11}m. The acceleration of the electron is

(A) 10^{-4}m/s^2

(B) $1{\cdot}25\times10^{23}$m/s^2

(C) 8×10^{22}m/s^2

(D) 2×10^2m/s^2

58. A stone thrown at an angle to the vertical describes a parabolic path. Neglecting air resistance, the quantity which remains constant throughout its flight is

(A) linear momentum

(B) angular momentum

(C) vertical component of the velocity

(D) horizontal component of the velocity

59. A ball starts to move up a frictionless inclined plane with a initial velocity 50 m/sec. The plane is inclined at angle 30° with the horizontal. The ball suffers a fully elastic collision with a ball of same mass rest after 2 second. Assuming one dimensional collision, the velocity of the first ball 2 sec after collision has the magnitude

(A) 0

(B) 10 m/sec

(C) 40 m/sec

(D) 50 m/sec

60. A body of mass m is taken to the top of a tower. The potential energy gained by the body is V. If the body is now droped, it strikes the ground with a velocity

(A) $2V/m$

(B) $\sqrt{V/m}$

(C) $\sqrt{2V/m}$

(D) None of the above

61. The moment of inertia of a uniform solid sphere about an axis passing through the centre is $2MR^2/5$ where M and R are mass and radius of the sphere respectively. The moment of inertia of the sphere about any of its tangents is

(A) MR^2

(B) $4MR^2/5$

(C) $7MR^2/5$

(D) $2MR^2$

62. A planet lies at a distance 4 times the mean distance from the Earth to the Sun. Its time period of its motion around the Sun in standard Earth years is

(A) 4 years

(B) 8 years

(C) 16 years

(D) 64 years

63. Five molecules have velocities 20, 30, 40, 50 and 60 units respectively. Their rms velocity is

(A) 40·0 units

(B) 42·4 units

(C) 45·6 units

(D) 50·0 units

64. An ideal gas at 27°C is heated so that its pressure and volume is doubled. The temperature of the gas is now

(A) 108°C

(B) 1200°C

(C) 927°C

(D) 1080°C

65. The coefficient of thermal linear expansion of a metal is 5×10^{-6}/°C. If the temperature rises by 100°C, the increase in volume of a cube of the metal is

(A) 0·05 per cent

(B) 0·10 per cent

(C) 0·15 per cent

(D) 0·20 per cent

66. A carnot engine has a source temperature 127°C and a sink temperature 27°C. The maximum efficiency of the engine is

(A) 0·25

(B) 0·79

(C) 0·52

(D) 0·37

67. The wavelength of maximum emission from the Sun is $5{\cdot}0\times10^{-5}$ cm. The effective temperature of the Sun is 6000K. If a distant star has a emission which peaks at $4{\cdot}0\times10^{-5}$ cm, the temperature of the star is

(A) 4800 K

(B) 5700K

(C) 6600 K

(D) 7500 K

68. A metal block has a length 20 cm, breadth 5 cm and a thickness 3 cm. The thermal conductivity of the metal is 1 cal/cm/sec/°C. If the block is heated in such a way that the temperature difference between the two largest surfaces is maintained at 5°C, the heat that is being transmitted in one minute between these two surfaces is

(A) 5 kcal

(B) 10 kcal

(C) 12 kcal

(D) 20 kcal

69. A one dimensional simple harmonic oscillator has frequency ω. If its velocity at a distance x from the equilibrium position is given by v, the following quantity is a constant. The mass of the oscillator is m.

(A) $v^2 + x^2$
(B) $mv^2 + \omega^2 x^2$
(C) $v^2 + m\omega^2 x^2$
(D) $v^2 + \omega^2 x^2$

70. Two waves of equal frequency have intensity one unit. If they are superposed, the maximum intensity is

(A) four units
(B) two units
(C) one unit
(D) zero unit

71. The frequency of light from a far away galaxy is seen to be shifted by 5 per cent. The velocity of the galaxy with respect to earth is approximately

(A) 15000 km/s
(B) 1500 km/s
(C) 30000 km/s
(D) 3000 km/s

72. Two tuning forks of frequency 300 c.p.s and 310 c.p.s. produce beats. The frequency of the beats is

(A) 610 c.p.s.
(B) 305 c.p.s.
(C) 20 c.p.s.
(D) 10 c.p.s.

73. A standing wave is generated in a string of length 50 cm tied at both ends by plucking at the middle point. The velocity is 350 m/s. The frequency of the first overtone is

(A) 350 Hz
(B) 700 Hz
(C) 1050 Hz
(D) 1040 Hz

74. Two equal charges $+q$ are placed at a very small distance d apart. At a very large distance (r) away from the charges, the electric field intensity varies as

(A) $1/r$
(B) $1/r^2$
(C) $1/r^3$
(D) $1/r^4$

75. Two capacitors 0·1 μF and 0·2 μF are placed in series. The total capacity of the combination is

(A) 0·3 μF
(B) 0·015 μF
(C) 0·067 μF
(D) 0·034 μF

76. Which Governor General is associated with the 'Doctrine of Lapse'?

(A) Lord Ripon
(B) Lord Dalhousie
(C) Lord Bantinck
(D) Lord Curzon

77. Who was the President of the Board of Revenue established by Warren Hastings?

(A) Sir John Shore
(B) Sir A Clarke
(C) Sir George Barlow
(D) Sir Charles Metcalfe

78. Who said in 1834 that 'the bones of the cotton weavers are bleaching the plains of India'?

(A) W. C. Bonnerjee
(B) William Dalrymple
(C) Pherozeshah Mehta
(D) None of the above

79. 'Patta' was a written agreement between the
(A) Peasant and Zamindars providing a record of the amount of rent.
(B) Peasants and the state.
(C) Zamindars and the state.
(D) Peasants and Zamindars regarding cesses to be paid except rent.

80. Which one of the following territories was not affected by the Revolt of 1857?
(A) Jhansi
(B) Chittor
(C) Jagdishpur
(D) Lucknow

81. By virtue of whose efforts Hindu Widow Remarriage Act was passed in 1856?
(A) Ishwar Chandra Vidyasagar
(B) Raja Ram Mohan Roy
(C) H. V. Derozio
(D) None of the above

82. Who was the President of the first Conference of Communist Party at Kanpur in 1925?
(A) Satyabhakta
(B) M. N. Ray
(C) Subhash Chandra Bose
(D) Singaravelu Chettiar

83. After which incident Gandhi had called Non-co-operation Movement as the 'Himalayan Blunder'?
(A) Chauri-Chaura
(B) Kheda Satyagraha
(C) Nagpur Satyagraha
(D) Rajkot Satyagraha

84. Who among the following was *not* a member of the Cabinet Mission in 1946?
(A) Sir Stafford Cripps
(B) A.V. Alexander
(C) Sir Cyril Radcliffe
(D) Pethwick Lawrence

85. 'Raga Kameshwari' was composed by
(A) Ustad Amjad Ali Khan
(B) Uday Shankar
(C) Pandit Ravi Shankar
(D) Pandit Ajay Chakraborti

86. The classical dance of Andhra Pradesh is
(A) Kathakali
(B) Kuchipudi
(C) Odissi
(D) Bharatnatyam

87. Which of the following festival is celebrated by Lepcha tribe of Sikkim to pay homage to mountain Kanchanjungha?
(A) Saga Dawa
(B) Drupka Teshi
(C) Tendong
(D) Wangala

88. In which of the following states Kuruwa —— the primitive form of cultivation is practised?
(A) Jharkhand
(B) Odisha
(C) Madhya Pradesh
(D) Andhra Pradesh

89. Naihati in West Bengal is famous for ——— industry.
(A) cotton
(B) jute
(C) paper
(D) tabacco

90. In India the main limiting factor for cultivation is
(A) length of growing season
(B) infertile soil
(C) inadequacy of water supply
(D) small size of farms

91. Which among the following is an important fishing centre of India?

(A) Bhubaneswar
(B) Porbander
(C) Thiruvanthapuram
(D) Itanagar

92. Which is not a factor of industrial location?

(A) Market
(B) Capital
(C) Power
(D) Population density

93. The theme of 2016 Pravasi Bharatiya Divas is

(A) Apna Bharat Apna Gaurav
(B) Bharat Ko Jano and Bharat Ko Mano
(C) Engaging Diaspora Connecting Across Generation
(D) Engaging Diaspora : The Indian Growth Story

94. Political right does not include

(A) Right to Vote
(B) Right to take life
(C) Right to contest in Election
(D) Right to lodge complaint with executive bodies of the Government

95. On which of the following ground restrictions cannot be imposed on Right to Freedom of Religion?

(A) Public Order
(B) Morality
(C) Security of India
(D) Health

96. Fundamental Duties do not enjoy any

(A) social sanction
(B) military sanction
(C) political sanction
(D) spiritual sanction

97. Who among the following did not hold the office of the Vice-President of India?

(A) Dr. S. Radhakrishnan
(B) Mr. R. Venkataraman
(C) Dr. Shankar Dayal Sharma
(D) Indira Gandhi

98. Which one of the following is the apex co-operative organisation at the national level of India?

(A) TRIFED
(B) NAFED
(C) FCS
(D) RRBs

99. 'World Economic Outlook' report is published by

(A) IMF
(B) World Bank
(C) RBI
(D) UNCTAD

100. Who among the following Indian Women did not win a gold medal in the Asian Games?

(A) P. T. Usha
(B) Sunita Rani
(C) Shiny Abraham
(D) Bula Chaudhuri

Space for Rough Work