

DATE : 23/05/2010



Aakash Institute

Premier Institute in India for Medical Entrance Exams.

(Division of Aakash Educational Services Ltd.)

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Code - JBH
Test Booklet Series 19

Time : 3 hrs.

Max. Marks: 800

Answers

for

DUMET-2010

1. In ideal spring with spring constant $K = 200 \text{ N/m}$ is fixed on one end on a wall. If the spring is pulled with a force 10 N at the other end along its length, how much it will be extended?

- (1) 5 cm (2) 2 m
(3) 2 cm (4) 5 m

Ans. (1)

2. An iron block of mass 5 kg is kept on a trolley. If the trolley is being pushed with an acceleration of 5 m/s^2 , what will be the force of friction between the block and the trolley surface? (Take the coefficient of static friction between the block and the trolley surface to be 0.8).

- (1) Zero (2) 5 N
(3) 4 N (4) 25 N

Ans. (4)

3. A ball with charge $-50e$ is placed at the centre of a hollow spherical shell which has a net charge of $-50e$. What is the charge on the shell's outer surface?

- (1) $-50e$ (2) Zero
(3) $-100e$ (4) $+100e$

Ans. (3)

4. If the charge on a capacitor is doubled, the value of its capacitance C will be

- (1) Doubled (2) Halved
(3) Remain the same (4) None of these

Ans. (3)

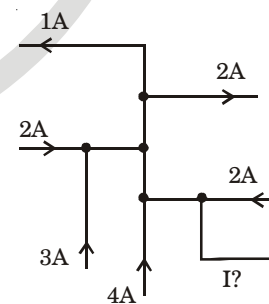
5. A point mass is placed inside a thin spherical shell of radius R and mass M at a distance $R/2$ from the centre of the shell. The gravitational force exerted by the shell on the point mass is

(1) $\frac{GM}{2R^2}$ (2) $-\frac{GM}{2R^2}$

(3) Zero (4) $\frac{GM}{4R^2}$

Ans. (3)

6. The magnitude and direction of current I (in A) indicated in the following circuit is



- (1) $14 \rightarrow$ (2) $8 \rightarrow$
(3) $\leftarrow 4$ (4) $\leftarrow 8$

Ans. (2)

7. An electric motor operating on 15 V supply draws a current of 5 A and yields mechanical power of 60 W . The energy lost as heat in one hour (in kJ) is

- (1) 0.54 (2) 5.4
(3) 54 (4) 540

Ans. (3)

8. The frequency of cyclotron motion of a charged particle in a magnetic field is independent of its

- (1) Charge e (2) Mass m
 (3) Velocity (4) e/m ratio

Ans. (3)

9. Iron would become paramagnetic at about

- (1) 200°C (2) 400°C
 (3) 600°C (4) 800°C

Ans. (4)

10. The electric dipole moment of an electron and a proton 4.3 nm apart is

- (1) 6.88×10^{-28} cm (2) 2.56×10^{-29} C^2/m
 (3) 3.72×10^{-14} C/m (4) 1.1×10^{-46} C^2m

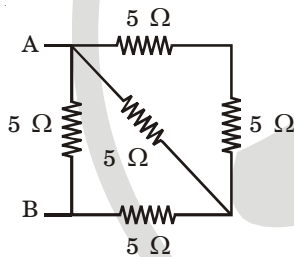
Ans. (1)

11. A parallel plate capacitor of a capacitance of 1 farad would have the plate area of about

- (1) 100 m^2 (2) 1 km^2
 (3) 100 km^2 (4) 1000 km^2

Ans. (4)

12. The equivalent resistance between the points A and B in the following circuit is



- (1) 3.12 Ω (2) 1.56 Ω
 (3) 6.24 Ω (4) 12.48 Ω

Ans. (1)

13. A galvanometer coil has a resistance of 10 Ω and the meter shows full scale deflection for a current of 1 mA. The shunt resistance required to convert the galvanometer into an ammeter of range 0-100 mA is about

- (1) 10 Ω (2) 1 Ω
 (3) 0.1 Ω (4) 0.01 Ω

Ans. (3)

14. A thermo-emf V appears across a conductor maintained at a temperature difference T . The Thomson coefficient is then given by

- (1) $-T^2 \frac{d^2 V}{dT^2}$ (2) $T^2 \frac{dV}{dT}$
 (3) $-\frac{1}{T} \frac{d^2 V}{dT^2}$ (4) $-\frac{1}{T^2} \frac{dV}{dT}$

Ans. (3)

15. How much current should be passed through a silver voltameter to deposit 200 gm of silver per hour on the cathode? (Faraday constant = 96500 C/mol and relative atomic mass of silver is 108)

- (1) 50 mA (2) 50 A
 (3) 15 mA (4) 15 A

Ans. (2)

16. The relative magnetic permeability of ferromagnetic materials is of the order of

- (1) 10 (2) 100
 (3) 1000 (4) 10000

Ans. (4)

17. A solenoid is placed inside another solenoid, the length of both being equal carrying same magnitude of current. The other parameters like radius and number of turns are in the ratio 1 : 2 for the two solenoids. The mutual inductance on each other would be

- (1) $M_{12} = M_{21}$ (2) $M_{12} = 2M_{21}$
 (3) $2M_{12} = M_{21}$ (4) $M_{12} = 4M_{21}$

Ans. (1)

18. The average magnetic energy density of an electromagnetic wave of wavelength λ travelling in free space is given by

- (1) $\frac{B^2}{2\lambda}$ (2) $\frac{B^2}{2\mu_0}$
 (3) $\frac{2B^2}{\mu_0\lambda}$ (4) $\frac{B}{\mu_0\lambda}$

Ans. (2)

19. The numerical aperture for a human eye is of the order of

- (1) 1 (2) 0.1
 (3) 0.01 (4) 0.001

Ans. (4)

20. The radius of a copper nucleus is of the order of

- (1) 10^{-16} m (2) 10^{-14} m
 (3) 10^{-12} m (4) 10^{-9} m

Ans. (2)

21. A material has N atom in its crystal structure which is a hexagonal close packed. Then the number of electronic states in a band is

- (1) N (2) $2N$
 (3) $4N$ (4) $6N$

Ans. (2)

22. If 10^{10} electrons are acquired by a body every second, the time required for the body to get a total charge of 1 C will be

- (1) Two hours (2) Two days
 (3) Two years (4) 20 years

Ans. (4)

23. The magnetic field in a plane electromagnetic wave is given by

$$B_y = 2 \times 10^{-7} \sin (0.5 \times 10^3 x + 1.5 \times 10^{11} t).$$

This electromagnetic wave is

- (1) A visible light (2) An infrared wave
 (3) A microwave (4) A radio wave

Ans. (3)

24. Which of these particles (having the same kinetic energy) has the shortest de Broglie wavelength?

- (1) Electron (2) Alpha particle
 (3) Proton (4) Neutron

Ans. (2)

25. A radioactive isotope has a half-life of T years. How long will it take the activity to reduce to 1% of its original value?

- (1) $3.2T$ year (2) $4.6T$ year
 (3) $6.6T$ year (4) $9.2T$ year

Ans. (3)

26. Although carbon, silicon and germanium have same lattice structure and four valence electrons each, their band structure leads to the energy gaps as

- (1) $E_g(\text{Si}) < E_g(\text{Ge}) < E_g(\text{C})$
 (2) $E_g(\text{Si}) > E_g(\text{Ge}) < E_g(\text{C})$
 (3) $E_g(\text{Si}) < E_g(\text{Ge}) > E_g(\text{C})$
 (4) $E_g(\text{Si}) > E_g(\text{Ge}) > E_g(\text{C})$

Ans. (2)

27. When a lens of refractive index n_1 is placed in a liquid of refractive index n_2 , the lens looks to be disappeared only, if

- (1) $n_1 = n_2/2$ (2) $n_1 = 3n_2/4$
 (3) $n_1 = n_2$ (4) $n_1 = 5n_2/4$

Ans. (3)

28. The density of a nucleus of mass number A is proportional to

- (1) A^3 (2) $A^{1/3}$
 (3) A^1 (4) A^0

Ans. (4)

29. A $p-n-p$ transistor having ac current gain of 50 is used to make an amplifier of a voltage gain of 5. What will be the power gain of the amplifier?

- (1) 125 (2) 178
 (3) 250 (4) 354

Ans. (3)

30. Which of the following frequencies will be suitable for beyond the horizon communication?

- (1) 10 kHz (2) 10 MHz
 (3) 1 GHz (4) 1000 GHz

Ans. (2)

31. In an air collision between an aeroplane and a bird, the force experienced by the bird as compared to that of the aeroplane is

- (1) Very high (2) Equal
 (3) Less (4) Zero

Ans. (2)

32. An iron ball of mass M is hanged from the ceiling by spring with a spring constant K . Executes a SHM with a period P . If the mass of the ball is increased by four times, the new period will be

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

Ans. (3)

33. Two stones of equal masses are dropped from a rooftop of height h one after another. Their separation distance against time will

- (1) Remain the same (2) Increase
 (3) Decrease (4) Be zero

Ans. (2)

34. The angle subtended by a circular disk of diameter 2 cm at a distance 1000 cm from your eye is

- (1) 0.2° (2) 0.002°
 (3) 0.11° (4) 0.22°

Ans. (3)

35. The mass and radius of the Sun are 1.99×10^{30} kg and $R = 6.96 \times 10^8$ m. The escape velocity of a rocket from the Sun is

- (1) 11.2 km/s (2) 2.38 km/s
 (3) 59.5 km/s (4) 618 km/s

Ans. (4)

36. A satellite of mass m is orbiting close to the surface of the earth (Radius $R = 6400$ km) has a kinetic energy K . The corresponding kinetic energy of the satellite to escape from the earth's gravitational field is

- (1) K (2) $2K$
 (3) mgR (4) mK

Ans. (2)

37. The height from the earth surface at which the value of acceleration due to gravity reduces to 1/4th of its value at earth's surface (assume earth to be sphere of radius 6400 km)

- (1) 6400 km (2) 2649 km
 (3) 2946 km (4) 1600 km

Ans. (1)

38. 10 moles of an ideal monatomic gas at 10°C is mixed with 20 moles of another monatomic gas at 20°C. Then the temperature of the mixture is

- (1) 15.5°C (2) 15°C
 (3) 16°C (4) 16.6°C

Ans. (4)

39. An ideal gas is made to go through a cyclic thermodynamical process in four steps. The amount of heat involved are $Q_1 = 100$ J, $Q_2 = 300$ J, $Q_3 = -400$ J and $Q_4 = -100$ J respectively. The corresponding work involved are $W_1 = 300$ J, $W_2 = -100$ J, $W_3 = 400$ J and W_4 . What is the value of W_4 ?

- (1) 100 J (2) -100 J
 (3) 500 J (4) -700 J

Ans. (4)

40. Two cylinders of equal size are filled with equal amount of ideal diatomic gas at room temperature. Both the cylinders are fitted with pistons. In cylinder A the piston is free to move, while in cylinder B the piston is fixed. When same amount of heat is supplied to both the cylinders, the temperature of the gas in cylinder A raises by 30°K. What will be the rise in temperature of the gas in cylinder B?

- (1) 42°K (2) 30°K
 (3) 20°K (4) 56°K

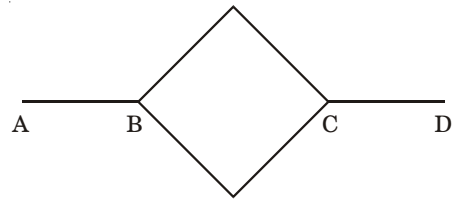
Ans. (1)

41. If the internal energy of n_1 moles of He at temperature 10 T is equal to the internal energy of n_2 mole of hydrogen at temperature at 6 T. The ratio of $\frac{n_1}{n_2}$ is

- (1) $\frac{3}{5}$ (2) 2
 (3) 1 (4) $\frac{5}{3}$

Ans. (3)

42. Six identical metallic rods are joined together in a pattern as shown in the figure. Points A and D are maintained at temperature 60°C and 240°C. The temperature of the junction B will be



- (1) 120°C (2) 150°C
 (3) 60°C (4) 80°C

Ans. (1)

43. The motion of a particle executing SHM in one dimension is described by $x = -0.3 \sin\left(t + \frac{\pi}{4}\right)$, where x is in meters and t in seconds. The frequency of oscillation in Hz is

- (1) 3 (2) $\frac{1}{2\pi}$
 (3) $\frac{\pi}{2}$ (4) $\frac{1}{\pi}$

Ans. (2)

44. At $t = 0$, a stone of mass 10 gm is thrown straight up from the ground level with a speed 10 m/s. After 1 s, a second stone of the same mass is thrown from the same position with a speed 20 m/s. What is the position of the first stone from the ground level at that moment? (Take $g = 10$ m/s²)

- (1) 10 m (2) 1 m
 (3) 2 m (4) 5 m

Ans. (4)

45. Two stars of mass m_1 and m_2 are part of a binary star system. The radii of their orbits are r_1 and r_2 respectively, measured from the C.M. of the system. The magnitude of acceleration of m_1 is

- (1) $\frac{m_1 m_2 G}{(r_1 + r_2)^2}$ (2) $\frac{m_1 G}{(r_1 + r_2)^2}$
 (3) $\frac{m_2 G}{(r_1 + r_2)^2}$ (4) $\frac{(m_1 + m_2)}{(r_1 + r_2)^2}$

Ans. (3)

46. A pendulum is made to hang from the ceiling of an elevator. It has period of T s (for small angles). The elevator is made to accelerate upwards with 10 m/s^2 . The period of the pendulum now will be (assume $g = 10 \text{ m/s}^2$)

- (1) $T\sqrt{2}$ (2) Infinite
 (3) $T/\sqrt{2}$ (4) Zero

Ans. (3)

47. A person is measuring his weight by standing on a weighing machine inside a lift. When the lift is at rest, the machine shows his weight to be 55 kg. In between the floor when the lift is moving up with a constant speed of 10 km/hr, he again measures his weight, which is

- (1) 55 kg (2) 65 kg
 (3) 50 kg (4) 45 kg

Ans. (1)

48. A child travelling in a train throws a ball outside with a speed V . According to a child who is standing on the ground, the speed of the ball is

- (1) Same as V (2) Greater than V
 (3) Less than V (4) None of these

Ans. (4)

49. A body of mass M at rest explodes into three pieces, two of them of mass $\frac{M}{4}$ each, are thrown off in perpendicular directions with velocities of 3 m/s and 4 m/s respectively. The third piece will be thrown off with a velocity of

- (1) 1.5 m/s (2) 2 m/s
 (3) 2.5 m/s (4) 3 m/s

Ans. (3)

50. A tunnel has been dug through the centre of the earth and a ball is released in it. It executes SHM with time period

- (1) 42 mins (2) 1 day
 (3) 1 hr (4) 84.6 mins

Ans. (4)

51. The secondary structure of proteins is derived from

- (1) Peptide linkages (2) Hydrogen bonding
 (3) Disulfide linkages (4) Folding of chains

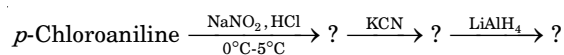
Ans. (2)

52. The source of energy in a cellular reaction is

- (1) Chemical energy (2) Light energy
 (3) Heat energy (4) Solar radiation

Ans. (1)

53. The final product in the following reaction sequence is



- (1) p -Chlorobenzamide
 (2) p -Chlorophenol
 (3) p -Chlorobenzylamine
 (4) p -Chlorobenzyl alcohol

Ans. (3)

54. Which of the following is *not* a biliquid propellant?

- (1) N_2O_4 + unsymmetrical dimethyl hydrazine
 (2) Nitroglycerine + nitrocellulose
 (3) Hydrazine + N_2O_4
 (4) Kerosene oil + liquid oxygen

Ans. (2)

55. The dyes which are used in reduced state and are then oxidised in the fabric by air are called

- (1) Azo dyes (2) Dispersed dyes
 (3) Basic dyes (4) Vat dyes

Ans. (4)

56. Which of the following compounds will not give Lassaigne's test for nitrogen?

- (1) NH_2NH_2 (2) $\text{C}_6\text{H}_5\text{NHNH}_2$
 (3) $\text{PhN}=\text{NPh}$ (4) NH_2CONH_2

Ans. (1)

57. The compound with molecular formula C_8H_{10} which will give two isomers on electrophilic substitution with $\text{Cl}_2/\text{FeCl}_3$ or with $\text{HNO}_3/\text{H}_2\text{SO}_4$ is

- (1) p -Dimethyl benzene (2) m -Dimethyl benzene
 (3) o -Dimethyl benzene (4) Ethyl benzene

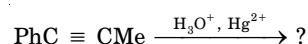
Ans. (3)

58. Decreasing order of reactivity in Williamson ether synthesis of the following

- I. $\text{Me}_3\text{CCH}_2\text{Br}$ II. $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
 III. $\text{CH}_2=\text{CHCH}_2\text{Cl}$ IV. $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$
 (1) III > II > IV > I (2) I > II > IV > III
 (3) II > III > IV > I (4) I > III > II > IV

Ans. (3)

59. Identify the product in the reaction



- (1) $\text{PhCH}_2\text{CH}_2\text{CHO}$ (2) $\text{PhCOCH}_2\text{CH}_3$
 (3) $\text{PhCH}_2\text{COCH}_3$ (4) PhCOCOMe

Ans. (2)

60. The order of rate of hydrolysis of alkyl halides 1° , 2° , 3° and CH_3X by the $\text{S}_{\text{N}}2$ pathway is

- (1) $1^\circ > 2^\circ > 3^\circ > \text{CH}_3\text{X}$
- (2) $\text{CH}_3\text{X} > 3^\circ > 2^\circ > 1^\circ$
- (3) $\text{CH}_3\text{X} > 1^\circ > 2^\circ > 3^\circ$
- (4) $3^\circ > 2^\circ > 1^\circ > \text{CH}_3\text{X}$

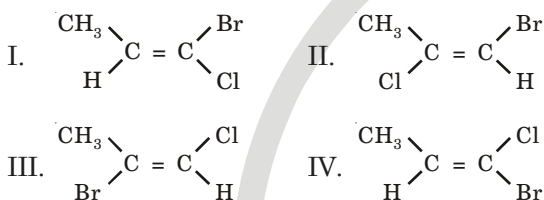
Ans. (3)

61. Compound 'A' undergoes formation of cyanohydrin which on hydrolysis gives lactic acid ($\text{CH}_3\text{CHOHCOOH}$). Therefore, compound 'A' is

- (1) Formaldehyde
- (2) Acetaldehyde
- (3) Acetone
- (4) Benzaldehyde

Ans. (2)

62. Which of the following is a pair of geometric isomers?



- (1) I & II
- (2) I & III
- (3) I & IV
- (4) II & III

Ans. (3)

63. How many chiral stereoisomers can be drawn for 2-bromo-3-chlorobutane?

- (1) 2
- (2) 3
- (3) 4
- (4) 5

Ans. (3)

64. Which of the following statements is *not* correct?

- (1) Aldehydes and ketones undergo nucleophilic additions
- (2) Aldehydes and ketones undergo electrophilic substitutions
- (3) Aldehydes and ketones contain polar carbonyl groups
- (4) Lower members of aldehydes and ketones are soluble in water due to hydrogen bonding

Ans. (2)

65. How many grams of ice at 0°C can be melted by the addition of 500 J of heat? (The molar heat of fusion for ice is 6.02 kJ mol^{-1})

- (1) 0.0831 g
- (2) 1.50 g
- (3) 3.01 g
- (4) 12.0 g

Ans. (2)

66. A 1.0 g sample of substance A at 100°C is added to 100 mL of H_2O at 25°C . Using separate 100 mL portions of H_2O , the procedure is repeated with substance B and then with substance C. How will the final temperatures of the water compare?

Substance	Specific Heat
A	$0.60 \text{ Jg}^{-1} \text{ }^\circ\text{C}^{-1}$
B	$0.40 \text{ Jg}^{-1} \text{ }^\circ\text{C}^{-1}$
C	$0.20 \text{ Jg}^{-1} \text{ }^\circ\text{C}^{-1}$

- (1) $T_{\text{C}} > T_{\text{B}} > T_{\text{A}}$
- (2) $T_{\text{B}} > T_{\text{A}} > T_{\text{C}}$
- (3) $T_{\text{A}} > T_{\text{B}} > T_{\text{C}}$
- (4) $T_{\text{A}} = T_{\text{B}} = T_{\text{C}}$

Ans. (3)

67. By what factor does the average velocity of a gaseous molecule increase when the absolute temperature is doubled?

- (1) 1.4
- (2) 2.0
- (3) 2.8
- (4) 4.0

Ans. (1)

68. When solid lead iodide is added to water, the equilibrium concentration of I^- becomes $2.6 \times 10^{-3} \text{ M}$. What is the K_{sp} for PbI_2 ?

- (1) 2.2×10^{-9}
- (2) 8.8×10^{-9}
- (3) 1.8×10^{-8}
- (4) 3.5×10^{-8}

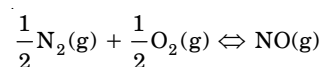
Ans. (2)

69. Which values can be obtained from the information represented by the vapour pressure curve of a liquid?

- A. Normal boiling point
 - B. Normal freezing point
 - C. Enthalpy of vaporisation
- (1) A only
 - (2) A & B only
 - (3) A & C only
 - (4) A, B & C

Ans. (3)

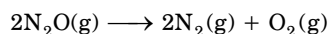
70. The free energy of formation of NO is 78 kJ mol^{-1} at the temperature of an automobile engine (1000 K). What is the equilibrium constant for this reaction at 1000 K?



- (1) 8.4×10^{-5}
- (2) 7.1×10^{-9}
- (3) 4.2×10^{-10}
- (4) 1.7×10^{-19}

Ans. (1)

71. The first-order reaction :



has a rate constant of $1.3 \times 10^{-11} \text{ s}^{-1}$ at 270°C and $4.5 \times 10^{-10} \text{ s}^{-1}$ at 350°C . What is the activation energy for this reaction?

- (1) 15 kJ (2) 30 kJ
 (3) 68 kJ (4) 120 kJ

Ans. (4)

72. A 0.010 M solution of maleic acid, a monoprotic organic acid, is 14% ionised. What is K_a for maleic acid?

- (1) 2.3×10^{-3} (2) 2.3×10^{-4}
 (3) 2.0×10^{-4} (4) 2.0×10^{-6}

Ans. (2)

73. What will happen to the volume of a bubble of air found underwater in a lake, where the temperature is 15°C and the pressure is 1.5 atm, if the bubble then rises to the surface where the temperature is 25°C and the pressure is 1.0 atm?

- (1) Its volume will become greater by a factor of 2.5
 (2) Its volume will become greater by a factor of 1.6
 (3) Its volume will become greater by a factor of 1.1
 (4) Its volume will become smaller by a factor of 0.70

Ans. (2)

74. Which of these changes with time for a first-order reaction?

- A. Rate of reaction
 B. Rate constant
 C. Half-life

- (1) A only (2) C only
 (3) A & B only (4) B & C only

Ans. (1)

75. What is the $[\text{H}^+]$ in a 0.40 M solution of HOCl, $K_a = 3.5 \times 10^{-8}$?

- (1) $1.4 \times 10^{-8} \text{ M}$ (2) $1.2 \times 10^{-4} \text{ M}$
 (3) $1.9 \times 10^{-4} \text{ M}$ (4) $3.7 \times 10^{-4} \text{ M}$

Ans. (2)

76. Sodium chloride, NaCl, usually crystallizes in a face-centered cubic lattice. How many ions are in contact with any single Na^+ ion?

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

Ans. (2)

77. Which of these species has a standard enthalpy of formation equal to zero?

- (1) $\text{F}_2(\text{g})$ (2) $\text{F}(\text{g})$
 (3) $\text{HF}(\text{aq})$ (4) $\text{F}^-(\text{aq})$

Ans. (1)

78. What is the osmotic pressure of a $0.0020 \text{ mol dm}^{-3}$ sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) solution at 20°C ?

(Molar gas constant, $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$;
 $1 \text{ dm}^3 = 0.001 \text{ m}^3$)

- (1) 4870 Pa (2) 4.87 Pa
 (3) 0.00487 Pa (4) 0.33 Pa

Ans. (1)

79. Calculate the wavelength of light required to break the bond between two chlorine atoms in a chlorine molecule. The Cl – Cl bond energy is 243 kJ mol^{-1} ($h = 6.6 \times 10^{-34} \text{ J}\cdot\text{s}$; $c = 3 \times 10^8 \text{ m/s}$; Avogadro's number = $6.02 \times 10^{23} \text{ mol}^{-1}$)

- (1) $8.18 \times 10^{-31} \text{ m}$ (2) $6.26 \times 10^{-21} \text{ m}$
 (3) $4.93 \times 10^{-7} \text{ m}$ (4) $4.11 \times 10^{-6} \text{ m}$

Ans. (3)

80. As $\text{O}_2(\text{l})$ is cooled at 1 atm pressure, it freezes to form solid I at 54.5 K. At a lower temperature, solid I rearranges to solid II, which has a different crystal structure. Thermal measurements show that for the phase transition solid I to solid II, $\Delta H = -743.1 \text{ J mol}^{-1}$ and $\Delta S = -17.0 \text{ JK}^{-1} \text{ mol}^{-1}$. At what temperature are solids I and II in equilibrium?

- (1) 2.06 K (2) 31.5 K
 (3) 43.7 K (4) 53.4 K

Ans. (3)

81. The hybridization in $[\text{Co}(\text{NH}_3)_6]^{3+}$ is :

- (1) dsp^3 (2) sp^3d^2
 (3) sp^3 (4) d^2sp^3

Ans. (4)

82. Which of the following configuration of ions has zero CFSE in both strong and weak ligand fields?

- (1) d^{10} (2) d^8
 (3) d^6 (4) d^4

Ans. (1)

83. pi (π) bond is formed by the overlap of :

- (1) p - p orbitals (2) s - s orbitals
 (3) s - p orbitals (4) s - d orbitals

Ans. (1)

84. Which of the following is diamagnetic in nature?
- (1) Co^{3+} , octahedral complex with weak field ligands
 - (2) Co^{3+} , octahedral complex with strong field ligands
 - (3) Co^{2+} in tetrahedral complex
 - (4) Co^{2+} in square planar complex

Ans. (2)

85. Which of the following complexes has minimum magnitude of Δ_0 ?
- (1) $[\text{Cr}(\text{CN})_6]^{3-}$
 - (2) $[\text{Co}(\text{NH}_3)_6]^{3+}$
 - (3) $[\text{CoCl}_6]^{3-}$
 - (4) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$

Ans. (3)

86. The polarity of the covalent bond among the following is maximum in :
- (1) F—F
 - (2) O—F
 - (3) N—F
 - (4) C—F

Ans. (4)

87. Which one of the following ions will give a coloured solution ?
- (1) Cu^+
 - (2) Fe^{2+}
 - (3) Zn^{2+}
 - (4) Ag^+

Ans. (2)

88. On adding excess of NH_4OH to copper sulphate solution :
- (1) A deep blue solution is obtained
 - (2) A blue precipitate of $\text{Cu}(\text{OH})_2$ is obtained
 - (3) A black precipitate of CuO is obtained
 - (4) No change takes place

Ans. (1)

89. In $\text{Fe}(\text{CO})_5$, the $\text{Fe} \leftarrow \text{CO}$ σ bond results by the overlap between filled sp hybrid orbital of C-atom of CO molecule and vacant :
- (1) d^2sp^3
 - (2) sp^3
 - (3) dsp^3
 - (4) dsp^2
- hybrid orbital of Fe atom

Ans. (3)

90. The bond angle formed by different hybrid orbitals are in the order :
- (1) $sp^2 > sp^3 > sp$
 - (2) $sp^3 < sp^2 > sp$
 - (3) $sp^3 > sp^2 > sp$
 - (4) $sp > sp^2 > sp^3$

Ans. (4)

91. Which one of the following is the *correct* increasing order of the magnitude of ionic radii of Ce^{3+} , La^{3+} , Pm^{3+} and Yb^{3+} ?
- (1) $\text{Yb}^{3+} < \text{Pm}^{3+} < \text{La}^{3+} < \text{Ce}^{3+}$
 - (2) $\text{Yb}^{3+} < \text{Pm}^{3+} < \text{Ce}^{3+} < \text{La}^{3+}$
 - (3) $\text{Pm}^{3+} < \text{La}^{3+} < \text{Ce}^{3+} < \text{Yb}^{3+}$
 - (4) $\text{Ce}^{3+} < \text{Yb}^{3+} < \text{Pm}^{3+} < \text{La}^{3+}$

Ans. (2)

92. The number of unpaired electrons in tetrahedral $[\text{Ni}(\text{CO})_4]$ is :
- (1) 0
 - (2) 2
 - (3) 3
 - (4) 4

Ans. (1)

93. Choose the correct order regarding the bond order :
- (1) $\text{O}_2^{2-} > \text{O}_2^+ > \text{O}_2^- > \text{O}_2$
 - (2) $\text{O}_2^+ > \text{O}_2^{2-} > \text{O}_2^- > \text{O}_2$
 - (3) $\text{O}_2^+ > \text{O}_2 > \text{O}_2^- > \text{O}_2^{2-}$
 - (4) $\text{O}_2 > \text{O}_2^- > \text{O}_2^{2-} > \text{O}_2^+$

Ans. (3)

94. Which one of the following metal ions is essential inside the cell for the metabolism of glucose/synthesis of proteins?
- (1) Ca^{2+}
 - (2) Mg^{2+}
 - (3) Na^+
 - (4) K^+

Ans. (2)

95. Which noble gas is most abundant in atmosphere ?
- (1) He
 - (2) Ne
 - (3) Ar
 - (4) Kr

Ans. (3)

96. On α -decay ${}_{92}^{238}\text{U}$ produces :

- (1) ${}_{93}^{238}\text{Np}$
- (2) ${}_{90}^{234}\text{Th}$
- (3) ${}_{91}^{234}\text{Pa}$
- (4) ${}_{92}^{234}\text{U}$

Ans. (2)

97. Which of the following methods is used for obtaining aluminium metal?
- (1) Electrolysing fused Al_2O_3 and cryolite
 - (2) By heating Al_2O_3 with carbon
 - (3) By heating Al_2O_3 in Muffle furnace
 - (4) By a process called pyrometallurgy

Ans. (1)

98. A hydroxy acid on heating gives a 5-membered lactone. The acid is :

- (1) $\text{CH}_2\text{OHCH}_2\text{CH}_2\text{COOH}$
- (2) $\text{CH}_3\text{CHOHCH}_2\text{COOH}$
- (3) $\text{CH}_3\text{CH}_2\text{CHOHCOOH}$
- (4) $\text{CH}_3\text{CHOHCHOHCOOH}$

Ans. (1)

99. Which of the following statements is *not* correct?

- (1) Caprolactam is the monomer of nylon-6
- (2) Terylene is a polyester polymer
- (3) Phenol formaldehyde resin is known as bakelite
- (4) The monomer of natural rubber is butadiene

Ans. (4)

100. The anticodon of transfer RNA for the messenger RNA codon G-C-A is

- (1) T-G-A
- (2) G-U-T
- (3) A-G-T
- (4) C-G-U

Ans. (4)

101. The exchange of segments of non-sister chromatids between chromosomes of a homologous pair is termed :

- (1) Transformation
- (2) Translocation
- (3) Crossing over
- (4) Chromosomal aberration

Ans. (3)

102. Okazaki is known for his contribution to the understanding of :

- (1) Transcription
- (2) Translation
- (3) DNA replication
- (4) Mutation

Ans. (3)

103. The beginning of understanding genetic transformation in bacteria was made by :

- (1) Frederick Griffith
- (2) Harshey and Chase
- (3) Watson and Crick
- (4) T.H. Morgan

Ans. (1)

104. The source of Taq polymerase used in PCR is a :

- (1) Thermophilic fungus
- (2) Mesophilic fungus
- (3) Thermophilic bacterium
- (4) Halophilic bacterium

Ans. (3)

105. Which of the following is *not* used as bioweapon?

- (1) *Bacillus anthracis*
- (2) *Botulinum* toxin
- (3) *Bacillus thuringiensis* toxin
- (4) Smallpox

Ans. (3)

106. Comparable to angiosperms, which of the following algae exhibits diplontic life cycle?

- (1) *Spirogyra*
- (2) *Ectocarpus*
- (3) *Polysiphonia*
- (4) *Fucus*

Ans. (4)

107. The cytoplasm of adjacent plant cells is connected to each other by :

- (1) Plasmalemma
- (2) Desmosome
- (3) Plasmodesmata
- (4) Plasmotubule

Ans. (3)

108. With the increase in diameter of the rotor, the effective RCF (relative centrifugal force) at a fixed RPM (revolutions per minute) will :

- (1) Remain unaffected
- (2) Increase
- (3) Decrease
- (4) Be lower at the bottom of centrifuge tube

Ans. (2)

109. Which of the following amino acids has hydroxyl methyl group as its R group?

- (1) Serine
- (2) Proline
- (3) Alanine
- (4) Arginine

Ans. (1)

110. Formation of both peptide and glycosidic bonds involves :

- (1) Hydration
- (2) Dehydration
- (3) Esterification
- (4) Acidification

Ans. (2)

111. Which of the following events takes place during Diplotene stage of prophase I of meiosis?

- (1) Compaction of chromosomes
- (2) Formation of synaptonemal complexes
- (3) Formation of recombinational nodules
- (4) Dissolution of synaptonemal complex

Ans. (4)

125. Restriction enzymes

- (1) Restrict elongation of DNA
- (2) Cut DNA at specific locations
- (3) Link together two pieces of DNA
- (4) Restrict DNA replication

Ans. (2)

126. Which one of the following does not *play* any role in photosynthesis?

- (1) Phycocyanin
- (2) Xanthophylls
- (3) Phycoerythrin
- (4) Anthocyanin

Ans. (4)

127. Biogas produced by fermentation of manure, sewage, cattle dung, etc. predominantly comprises

- (1) Methane, nitrogen and hydrogen
- (2) Methane and carbon dioxide
- (3) Methane and carbon monoxide
- (4) Methane and nitric oxide

Ans. (2)

128. *Lactobacillus* mediated conversion of milk to curd results because of

- (1) Coagulation and partial digestion of milk fats
- (2) Coagulation and partial digestion of milk proteins
- (3) Coagulation of milk proteins and complete digestion of milk fats
- (4) Coagulation of milk fats and complete digestion milk protein

Ans. (2)

129. The species of *Saccharum* originally grown in India was

- (1) *S. officinarum*
- (2) *S. berberi*
- (3) *S. bouldardii*
- (4) *S. munja*

Ans. (1)

130. Single cell protein refers to

- (1) A specific protein extracted from pure culture of single type of cells
- (2) Sources of mixed proteins extracted from pure or mixed culture of organisms or cells
- (3) Proteins extracted from a single cell
- (4) A specific protein extracted from a single cell

Ans. (2)

131. The total number of species, that are known and described, range between

- (1) 0.5 - 1.0 million
- (2) 1.1 - 1.2 million
- (3) 1.7 - 1.8 million
- (4) 2.5 - 3.0 million

Ans. (3)

132. Which of the following combinations is *correct* for wheat?

- (1) Genus : *Triticum*, Family : Anacardiaceae, Order : Poales, Class : Monocotyledonae
- (2) Genus : *Triticum*, Family : Poaceae, Order : Poales, Class : Dicotyledonae
- (3) Genus : *Triticum*, Family : Poaceae, Order : Sapindales, Class : Monocotyledonae
- (4) Genus : *Triticum*, Family : Poaceae, Order : Poales, Class : Monocotyledonae

Ans. (4)

133. IUCN stands for

- (1) Indian Union for Conservation of Nature
- (2) International Union for Conservation of Nature
- (3) Indian Union for Chemical Nomenclature
- (4) International Union for Conservation of Nutrients

Ans. (2)

134. A group of related genera, with still less number of similarities as compared to the genus and species, constitutes

- (1) Order
- (2) Class
- (3) Family
- (4) Division

Ans. (3)

135. The timing of seasonal activities of plants in relation to change in environmental conditions is termed as

- (1) Dendrochronology
- (2) Biological clock
- (3) Lapse rate
- (4) Phenology

Ans. (4)

136. Who is considered as the Father of Ecology in India?

- (1) Ramdeo Misra
- (2) M.S. Swaminathan
- (3) P. Maheshwari
- (4) S.L. Mehta

Ans. (1)

137. A large regional unit characterized by a major vegetation type and associated fauna found in a specific climatic zone constitutes

- (1) Ecosystem
- (2) Biological community
- (3) Biome
- (4) Habitat

Ans. (3)

138. Cold-blooded animals fall under the category of

- (1) Ectotherms (2) Psychrotherms
 (3) Endotherms (4) Thermophiles

Ans. (1)

139. Figs belong to

- (1) Critical Link species, as they form connecting link between trees and herbs
 (2) Critical Link species, as they establish essential link in the absorbance of nutrients from soil and organic residues
 (3) Keystone species, as they produce large quantity of fruits; and their protection leads to conservation of animals dependent on them
 (4) Keystone species, as they have high degree of animal-dependent pollination

Ans. (3)

140. Which of the following is a mismatch with respect to inexhaustible natural resources ?

- (1) Solar energy (2) Water
 (3) Rainfall (4) Wind power

Ans. (2)

141. The Wildlife (Protection) Act 1972 was first amended in

- (1) 1991 (2) 1995
 (3) 2001 (4) 2007

Ans. (1)

142. In primary succession on rocks, the pioneer species are usually

- (1) Algae (2) Fungi
 (3) Lichens (4) Bryophytes

Ans. (3)

143. The "10 per cent law" is related to

- (1) Mendelian genetics
 (2) Non-Mendelian genetics
 (3) Energy transfer from lower trophic level to higher trophic level
 (4) Energy consumption during photosynthesis in C_4 plants

Ans. (3)

144. A nucleoside differs from a nucleotide in *not* having

- (1) Sugar (2) Glucose
 (3) Nitrogen base (4) Phosphate group

Ans. (4)

145. *Trichoderma* species are potentially useful as

- (1) Biopesticides
 (2) Biofertilizers
 (3) Methanogens
 (4) Vectors for genetic engineering

Ans. (1)

146. A pea plant parent having violet coloured flowers with unknown genotype was crossed with a plant having white coloured flowers, in the progeny 50% of the flowers were violet and 50% were white. The genotypic constitution of the parent having violet coloured flowers was

- (1) Homozygous (2) Merozygous
 (3) Heterozygous (4) Hemizygous

Ans. (3)

147. If the total amount of adenine and thymine in a double-stranded DNA is 45%, the amount of guanine in this DNA will be

- (1) 22.5% (2) 27.5%
 (3) 45% (4) 55%

Ans. (2)

148. Typhoid fever is caused by a species of

- (1) *Streptococcus* (2) *Staphylococcus*
 (3) *Salmonella* (4) *Mycobacterium*

Ans. (3)

149. HIV is a member of a group of viruses called

- (1) Bacteriophages (2) Geminiviruses
 (3) Lysogenic viruses (4) Retroviruses

Ans. (4)

150. The number of linkage group(s) present in *Escherichia coli* is

- (1) One (2) Two
 (3) Four (4) Seven

Ans. (1)

151. Hyaline cartilage does not have

- (1) Fibres (2) Lacunae
 (3) Cells (4) Blood capillaries

Ans. (1)

152. "All enzymes are proteins." This statement is now modified because an apparent exception to this biological truth is

- (1) Arylsulfatase (2) Dehydrogenase
 (3) Ribozyme (4) Nitroreductase

Ans. (3)

153. Aging of the skin results in

- (1) An increase in collagen and elastic fibres
- (2) A decrease in activity of sebaceous glands
- (3) A thickening of the skin
- (4) An increase in toenail growth

Ans. (1)

154. The example of pivot joint is

- (1) Hip joints
- (2) Metacarpophalangeal joints
- (3) Ankle joints
- (4) Radioulnar joints

Ans. (4)

155. The major function of the intervertebral discs is to

- (1) Absorb shock
- (2) String the vertebrae together
- (3) Prevent injuries
- (4) Prevent hyperextension

Ans. (1)

156. Bile contribution to digestion is

- (1) Nucleic acid metabolism
- (2) Phagocytosis
- (3) Emulsification of dietary lipids
- (4) Carbohydrate digestion

Ans. (3)

157. The first fossil evidence of life dates from about

- (1) 4.0 billion years ago
- (2) 3.5 billion years ago
- (3) 4.5 billion years ago
- (4) 2.5 billion years ago

Ans. (2)

158. What will be the *correct* gene expression pathway?

- (1) Gene—mRNA—transcription—translation—protein
- (2) Transcription—Gene—translation—mRNA—protein
- (3) Gene—transcription—mRNA—translation—protein
- (4) Gene—translation—mRNA—transcription—protein

Ans. (3)

159. Cloning gene is a process where

- (1) Gene is cloned in an animal
- (2) Fragments of DNA are transferred from one organism to another, usually carried on a DNA vector
- (3) Fragments of DNA cloned in the same organism using carrier
- (4) DNA is cloned in plants

Ans. (2)

160. Enzyme that cleaves nucleic acids within the polynucleotide chain is known as

- (1) Endonuclease
- (2) Exonuclease
- (3) Arylsulfatase
- (4) Phosphotriesterase

Ans. (1)

161. Phylum mollusca can be distinguished from other invertebrates by the presence of

- (1) Bilateral symmetry and exoskeleton
- (2) A mantle and gills
- (3) Shell and non-segmented body
- (4) A mantle and non-segmented body

Ans. (4)

162. A logistic growth curve depicting a population that is limited by a definite carrying capacity is shaped like the letter

- (1) J
- (2) L
- (3) M
- (4) S

Ans. (4)

163. The urge to inhale in humans results from

- (1) Rising PCO_2
- (2) Rising PO_2
- (3) Falling PCO_2
- (4) Falling PO_2

Ans. (1)

164. Rotenone is a

- (1) Bioherbicide
- (2) Commonly used biofertilizer
- (3) Bioinsecticide
- (4) Juvenile hormone

Ans. (3)

165. A phenomenon when parasite parasitizes themselves is known as

- (1) Hyperparasitism
- (2) Parasitoids
- (3) Monoxenous parasitism
- (4) Polyxenous parasitism

Ans. (1)

166. Phosphorus-32 emits

- (1) α -particles (2) β -particles
 (3) γ -particles (4) X-rays

Ans. (2)

167. The long and short arms of chromosome are designated respectively as

- (1) *p* and *q* arms (2) *q* and *p* arms
 (3) *m* and *p* arms (4) *l* and *s* arms

Ans. (2)

168. The amino acid that acts as a carrier of ammonia from skeletal muscle to liver

- (1) Alanine (2) Methionine
 (3) Arginine (4) Glutamine

Ans. (4)

169. The major cause of evolution of genes and protein is

- (1) Point mutation
 (2) Chromosomal aberration
 (3) Sexual reproduction
 (4) Gene duplication and divergence

Ans. (1)

170. The type of ecosystem with the highest mean plant productivity is

- (1) Desert
 (2) Temperate grassland
 (3) Tropical rain forest
 (4) Tundra

Ans. (3)

171. A common means of sympatric speciation is

- (1) Polyploidy
 (2) Temporal segregation of breeding season
 (3) Spatial segregation of mating sites
 (4) Imposition of geographic barrier

Ans. (2)

172. *Bacillus thuringiensis* is used to control

- (1) Bacterial pathogens (2) Fungal pathogens
 (3) Nematodes (4) Insect pests

Ans. (4)

173. Bell-shaped polygonal pyramid indicates

- (1) High percentage of young individuals
 (2) Moderate percentage of young individuals
 (3) Low percentage of young individuals
 (4) Low percentage of old individuals

Ans. (2)

174. Probiotics are

- (1) Cancer inducing microbes
 (2) Safe antibiotics
 (3) Food allergens
 (4) Live microbial food supplements

Ans. (4)

175. Molecules that bear charged groups of opposite polarity are known as

- (1) Zwitterions (2) Cations
 (3) Anions (4) Negative ions

Ans. (1)

176. Hotspots of biodiversity means

- (1) Areas of the earth that contain many endemic species
 (2) Species severes as proxy for entire communities in particular area
 (3) Species in particular niche/area
 (4) Species diversity at particular area

Ans. (1)

177. Polio is caused by a

- (1) Bacteriophage
 (2) Virus with a single strand RNA
 (3) Virus with a single strand DNA
 (4) Virus with double strand DNA

Ans. (2)

178. Disadvantage of MRI is its inability to image

- (1) Bone (2) Parts of brain
 (3) Spinal cord (4) Cancerous tissues

Ans. (1)

179. Which of the following is an *r*-strategist ?

- (1) Human (2) Insect
 (3) Rhinoceros (4) Whale

Ans. (2)

180. The internal cavity commonly formed by cell division prior to gastrulation is the

- (1) Enteron (2) Blastopore
 (3) Blastocoel (4) Coelom

Ans. (3)

181. Mendel's principle of segregation means that the germ cells always receive

- (1) One pair of alleles
 (2) One quarter of the genes
 (3) One of the" paired alleles
 (4) Any pair of alleles

Ans. (3)

182. Aggregates of lymphoid tissue present in the distal portion of the small intestine are known as

- (1) Villi (2) Peyer's patches
(3) Rugae (4) Choroid plexus

Ans. (2)

183. Microfilaments in eukaryotic cells are made up of

- (1) Actin (2) Albumin
(3) Globulin (4) Fibrin

Ans. (1)

184. The membranous areas between the cranial bones of the fetal skull are called

- (1) Areolas (2) Foramina
(3) Sutures (4) Fontanelle

Ans. (4)

185. The predominant antibody in saliva is

- (1) IgG (2) IgA
(3) IgM (4) IgD

Ans. (2)

186. In order for the blood to flow from right ventricle to left ventricle in mammalian heart, it must flow through

- (1) Right ventricle, Pulmonary arteries, Lungs, Pulmonary veins, Left atrium
(2) Right ventricle, Pulmonary veins, Lungs, Pulmonary arteries, Left atrium
(3) Right ventricle, Right atrium, Lungs, Pulmonary veins, Left atrium
(4) Right ventricle, Systemic aorta, Lungs, Pulmonary veins, Left atrium

Ans. (1)

187. Air bladder is present in

- (1) Chondrichthyes (2) Star fishes
(3) Actinopterygii (4) Flying fishes

Ans. (3)

188. Which of the following is the key intermediate compound linking glycolysis to the Krebs's cycle ?

- (1) NADH (2) ATP
(3) Acetyl CoA (4) Malic acid

Ans. (3)

189. Urea synthesis takes place primarily in liver because

- (1) NH_3 and CO_2 are present in liver only
(2) Hormone ADH is found in liver only
(3) Enzyme arginase is present in liver only
(4) Kidney is smaller than liver

Ans. (3)

190. A particular enzyme molecule interacts with a specific substrate molecule is explained by

- (1) Enzyme-substrate concept
(2) Activation energy concept
(3) Destroyed and re-synthesised concept
(4) Lock and key concept

Ans. (4)

191. Mature erythrocytes cannot utilize glucose because they lack

- (1) Golgi complex (2) Enzymes
(3) Mitochondria (4) Nucleus

Ans. (3)

192. Oral contraceptive pills help in birth control by

- (1) Killing sperms
(2) Killing ova
(3) Preventing ovulation
(4) Forming barrier between sperms and ova

Ans. (3)

193. Colour perception in man is due to

- (1) Rhodopsin pigment in rod cells
(2) Iodopsin pigment in cone cells
(3) Iodopsin pigment in rod cells
(4) Rhodopsin pigment in cone cells

Ans. (2)

194. Which of the following induces parturition ?

- (1) Vasopressin (2) Oxytocin
(3) GH (4) TSH

Ans. (2)

195. Excess carbohydrates and proteins are stored in the body as

- (1) Amino acids (2) Fats
(3) Starch (4) Monosaccharide

Ans. (2)

196. Which of the following vitamins has some physiological effects similar to those of parathormone?

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

Ans. (2)

197. Which of the following microbes is used for commercial production of ethanol ?

- (1) *Clostridium butylicum*
(2) *Streptococcus*
(3) *Trichoderma polysporum*
(4) *Saccharomyces cerevisiae*

Ans. (4)

198. Appropriate measures to reduce overall greenhouse gas emissions are the commitments of the

- (1) Montreal Protocol (2) Environment Act
(3) Kyoto Protocol (4) Earth Summit

Ans. (3)

199. Which one of the following pairs of diseases is viral as well as transmitted by mosquitoes ?

- (1) Elephantiasis and Dengue
(2) Yellow fever and sleeping sickness
(3) Encephalitis and sleeping sickness
(4) Yellow fever and Dengue

Ans. (4)

200. Classification of organisms based on evolutionary as well as genetic relationships is called

- (1) Biosystematics
(2) Phenetics
(3) Numerical taxonomy
(4) Cladistics

Ans. (4)

