HORIZON ACADEMY®

Since 2003

Medical | IIT-JEE | Foundations

(Divisions of Horizon Study Circle Pvt. Ltd.)

Name.: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Date : 11/10/2015

Test No.: 0 9

Subject Code.: 2 2 2

Time : 3 Hrs. **M.M. : 720**

HORIZON TEST SERIES

for

Medical Entrance Exam. 2016

[Test No. 9 Batch I]

INSTRUCTIONS FOR STUDENTS

1. Read each question carefully.
2. It is mandatory to use Blue/Black Ball Point Pen to darken the appropriate circle in the answer sheet.
3. Mark should be dark and should complete fill the circle.
4. Rough work must be done on the Question Paper, no additional sheet will be provided for this purpose.
5. Do not use white-fluid or any other rubbing material on answer sheet. No change in the answer once marked.
6. Student cannot use log tables and calculators or any other material in the examination hall.
7. Before attempting the question paper, student should ensure that the test paper contains all pages and no page is missing.
8. Each correct answer carries four marks. One mark will be deducted for each incorrect answer from the total score.
9. Before handing over the answer sheet to the invigilator, candidate should check the particulars have been filled and marked correctly.
10. Immediately after the prescribed examination time is over, the answer sheet to be returned to the invigilator.
11. Use of Calculator and other Electronic device is not permitted.

Test No. 9

Topics of The Test

Physics	Work, Energy and Power.
Chemistry	Solutions.
Biology	Zoology : Respiration system in humans + Circulation. Botany : Transportation + Plant Respiration + Photosynthesis.

Test No. 9

[PHYSICS]

1. A string of length L and force constant K is stretched to obtain extension l. It is further stretched to obtain extension l_1. The work done in second stretching is

(A) $\frac{1}{2}Kl_1(2l + l_1)$ (B) $\frac{1}{2}Kl_1^2$

(C) $\frac{1}{2}K(l^2 + l_1^2)$ (D) $\frac{1}{2}K(l_1^2 - l^2)$

2. A uniform force of $(3\hat{\mathbf{i}} + \hat{\mathbf{j}})$ N acts on a particle of mass 2 kg. Hence, the particle is displaced from position $(2\hat{\mathbf{i}} + \hat{\mathbf{k}})$ m to position $(4\hat{\mathbf{i}} + 3\hat{\mathbf{i}} - \hat{\mathbf{k}})$ m. The work done by the force on the particle is

(A) 9 J (B) 6 J

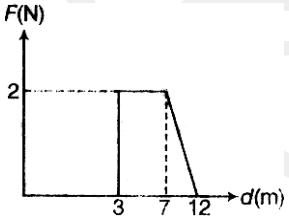
(C) 13 J (D) 15 J

3. How much work must be done by a force on 50 kg body in order to accelerate it from rest to 20 m/s is 10 s ?

(A) 10^{-3} J (B) 10^4 J

(C) 2×10^3 J (D) 4×10^4 J

4. Force F on a particle moving in a straight line varies with distance d as shown in the figure. The work done on the particle during its displacement of 12 m is



(A) 21 J (B) 26 J

(C) 13 J (D) 18 J

5. A batsman hits back a ball straight in the direction of the bowler without changing its initial speed of 12 ms^{-1}. If the mass of the ball is 0.15 kg, the imparted to the ball is

(A) 36 N-s (B) 3.6 N-s

(C) 0.36 N-s (D) 0.036 N-s

6. The work done by an applied variable force, $F = x + x^3$ from x = 0 m to x = 2m, where x is displacement, is

(A) 6 J (B) 8 J

(C) 10 J (D) 12 J

7. A plate of mass m, length b and breadth a is initially lying on a horizontal floor with length parallel to the floor and breadth perpendicular to the floor. The work done to place it on its breadth is

(A) $mg\left[\frac{b}{2}\right]$ (B) $mg\left[a + \frac{b}{2}\right]$

(C) $mg\left[\frac{b-a}{2}\right]$ (D) $mg\left[\frac{b+a}{2}\right]$

8. A quarter horse power motor runs at a speed of 600 rpm. Assuming 40% efficiency, the work done by the motor in one rotation will be

(A) 7.46 J (B) 7400 J

(C) 7.46 erg (D) 74.6 J

9. A particle of mass 100 g is thrown vertically upwards with a speed of 5 ms^{-1}. The work done by the force of gravity during the time, the particle goes up is

(A) –0.5 J (B) –1.25 J

(C) 1.25 J (D) 0.5 J

Space for Rough Work

10. A body of mass 10 kg initially at rest acquires velocity 10 ms^{-1}. What is the work done ?

(A) –500 J (B) 500 J

(C) 50 J (D) –50 J

11. When a spring is stretched by a distance x, it exerts a force, given by $F = (-5x - 16x^3)$ N. The work done, when the spring is stretched from 0.1 m to 0.2 m is

(A) 8.7×10^{-2}J (B) 12.2×10^{-2}J

(C) 8.7×10^{-1}J (D) 12.2×10^{-1}J

12. A vertical spring with force constant *k* is fixed on a table. A ball of mass *m* at a height *h* above the free upper end of the spring falls vertically on the spring, so that the spring is compressed by a distance *d*. The net work done in the process is

(A) $mg(h+d)+\frac{1}{2}kd^2$ (B) $mg(h+d)-\frac{1}{2}kd^2$

(C) $mg(h-d)-\frac{1}{2}kd^2$ (D) $mg(h-d)+\frac{1}{2}kd^2$

13. A body moves a distance of 10 m along a straight line under an action of 5 N force. If, work done is 25 J, then angle between the force and direction of motion of the body will be

(A) 75° (B) 60°

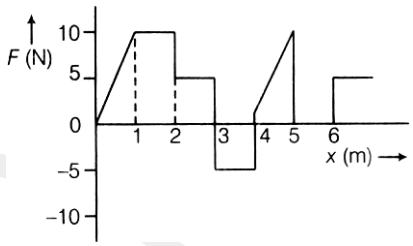
(C) 45° (D) 30°

14. A particle accelerating uniformly has velocity v at time t_1. What is work done in time *t* ?

(A) $\frac{1}{2}\left(\frac{mv^2}{t_1^2}\right)t^2$ (B) $\frac{1}{2}\left(\frac{mv}{t_1}\right)^2 t^2$

(C) $\left(\frac{mv^2}{t_1^2}\right)t^2$ (D) $\left(\frac{2mv^2}{t_1^2}\right)t^2$

15. The relationship between the force *F* and position *x* of a body is as shown in figure. The work done in displacing the body from x = 1 m to x = 5 m will be



(A) 30 J (B) 15 J

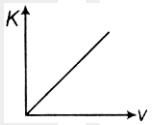
(C) 25 J (D) 20 J

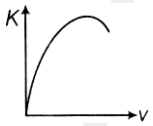
16. Two bodies of mass *m* and 2*m* have equal kinetic energies. The ratio of their linear momentum is

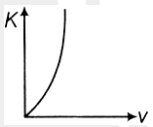
(A) 1 (B) $\frac{1}{2}$

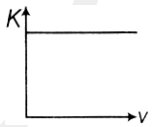
(C) $\frac{1}{\sqrt{2}}$ (D) 2

17. The graph of kinetic energy (*K*) of a body versus velocity (v) is represented as

(A) 

(B) 

(C) 

(D) 

18. A body of mass 5 kg is thrown vertically up with a kinetic energy of 490 J. The height at which the kinetic energy of the body becomes half of the original value is (acceleration due to gravity = 9.8 ms^{-2})

(A) 5 m (B) 2.5 m

(C) 10 m (D) 12.5 m

Space for Rough Work

19. A bomb of 12 kg explodes into two pieces of masses 4 kg and 8 kg. The velocity of 8 kg mass is 6 ms^{-1}. The kinetic energy of the other mass is
(A) 348 J (B) 332 J
(C) 324 J (D) 288 J

20. An open water tight railway wagon of mass 5×10^3 kg coasts at an initial velocity of 1.2 m/s without friction on a railway track. Rain falls vertically downwards into the wagon. What change occurs in kinetic energy of the wagon, when it has collected 10^3 kg of water ?
(A) 900 J (B) 300 J
(C) 600 J (D) 1200 J

21. A rod of length *L* and mass *m* is kept vertically on the ground. Its potential energy is
(A) mgL (B) $mg\frac{L}{2}$
(C) $mg\frac{L}{3}$ (D) $mg\frac{L}{4}$

22. The driver of a car travelling at velocity v suddenly sees a broad wall infront of him at a distance *d*. He should
(A) brake sharply (B) turn sharply
(C) Both (A) and (B) (D) None of these

23. An open knife edge of mass *m* is dropped from a height *h* on a wooden floor. If the blade penetrates *s* into the wood, the average resistance offered by the wood to the blade is
(A) Mg (B) $Mg\left(\frac{h}{s}\right)$
(C) $Mg\left(1-\frac{h}{s}\right)$ (D) $Mg\left(1+\frac{h}{s}\right)^2$

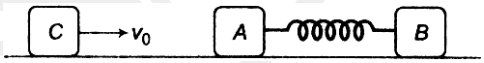
24. A stationary particle explodes into two particles of masses m_1 and m_2 which move in opposite directions with velocities, v_1 and v_2. The ratio of their kinetic energies E_1/E_2 is
(A) 1 (B) m_1v_2/m_2v_1
(C) m_2/m_1 (D) m_1/m_2

25. A ball of mass 2 kg and another of mass 4 kg are dropped together from a 60 ft tall building. After a fall of 30 ft each towards the earth, their respective kinetic energies will be in the ratio of
(A) $\sqrt{2}:1$ (B) 1 : 4
(C) 1 : 2 (D) $1:\sqrt{2}$

26. A particle of mass m_1 is moving with a velocity, v_1 and another particle of mass, m_2 is moving with a velocity, v_2. Both of them have the same momentum but their different kinetic energies are E_1 and E_2, respectively. If, $m_1 > m_2$, then
(A) $E_1 < E_2$ (B) $\frac{E_1}{E_2}=\frac{m_1}{m_2}$
(C) $E_1 > E_2$ (D) $E_1 = E_2$

27. If we throw a body upwards with velocity of 4 ms^{-1}, at what height does its kinetic energy reduce to half of the initial value ? (Take g = 10 ms^{-2})
(A) 4 m (B) 2 m
(C) 1 m (D) 0.4 m

28. A block C of mass *m* is moving with velocity v_0 and collides elastically with block A of mass *m* and connected to another block *B* of mass 2*m* through spring of spring constant *k*. What is the value of *k*, if x_0 is compression of spring when, velocity of *A* and *B* is same ?



(A) $\frac{mv_0^2}{x_0^2}$ (B) $\frac{mv_0^2}{2x_0^2}$
(C) $\frac{3}{2}\frac{mv_0^2}{x_0^2}$ (D) $\frac{2}{3}\frac{mv_0^2}{x_0^2}$

Space for Rough Work

29. A block of mass 10 kg is moving in x-direction with a constant speed of 10 ms^{-1}. It is subjected to a retarding force F = –0.1x Jm^{-1} during its travel from x = 20 m to x = 30 m. Its final kinetic energy will be
(A) 475 J (B) 450 J
(C) 275 J (D) 250 J

30. A body of mass 1 kg is moving in a vertical circular path of radius 1 m. The difference between the kinetic energies at its highest and lowest position is
(A) 20 J (B) 10 J
(C) $4\sqrt{5}$ J (D) $10(\sqrt{5}-1)$ J

31. A machine is delivering constant power to drive a body along a straight line. What is the relation between the distance travelled by the body against time ?
(A) $s^2 \propto t^3$ (B) $s^2 \propto t^{-3}$
(C) $s^3 \propto t^2$ (D) $s \propto t^3$

32. The machine gun fires 240 bullets per minute. If the mass of each bullet is 10 g and the velocity of the bullets is 600 ms^{-1}, the power (in kW) of the gun is
(A) 43200 (B) 432
(C) 72 (D) 7.2

33. A body of mass 10 kg moves with a velocity v of 2 ms^{-1} along a circular path of radius 8 m. The power produced by the body will be
(A) 10 Js^{-1} (B) 98 Js^{-1}
(C) 49 Js^{-1} (D) zero

34. A body is initially at rest. It undergoes one-dimensional motion with constant acceleration. The power delivered to it at time *t* is proportional to
(A) $t^{1/2}$ (B) t
(C) $t^{3/2}$ (D) t^2

35. A body of mass 2 kg is projected at 20 ms^{-1} at an angle 60° above the horizontal. Power due to the gravitational force at its highest point is
(A) 200 W (B) $100\sqrt{3}$ W
(C) 50 W (D) zero

36. An explosion breaks a rock into three parts in a horizontal plane. Two of them go off at right angles to each other. The first part of mass 1 kg moves with a speed of 12 ms^{-1} and second part of mass 2 kg moves with 8 ms^{-1} speed. If the third part lies off which 4 ms^{-1} speed, then its mass is
(A) 3 kg (B) 5 kg
(C) 7 kg (D) 17 kg

37. A ball of mass *m* elastically collides with a wall with velocity v, then change in its momentum is equal to
(A) $2m$ (B) $2mv$
(C) $8mv$ (D) zero

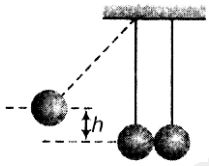
38. Two spheres *A* and *B* of masses m_1 and m_2, respectively collide. *A* is at rest initially and *B* is moving with velocity v along x-axis. After collision, *B* has a velocity $v/2$ in a direction perpendicular to the original direction. The mass *A* moves after collision in the direction
(A) same as that of *B*
(B) opposite to that of *B*
(C) $\theta = \tan^{-1}(1/2)$ to the x-axis
(D) $\theta = \tan^{-1}\left(\frac{-1}{2}\right)$ to the x-axis

39. A particle of mass m_1 moves with velocity v_1 and collides with another particle at rest of equal mass. The velocity of the second particle after the elastic collision is
(A) $2v_1$ (B) v_1
(C) $-v_1$ (D) 0

40. **Assertion** (A) quick collision between two bodies is more violent than a slow collision; even when the initial and final velocities are identical.
Reason (R) The momentum is greater in first case.
(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is not the correct explanation of A
(C) A is true but R is false
(D) Both A and R are false

Space for Rough Work

41. In the figure, pendulum bob on left side is pulled a side to a height h from its initial position. After it is released it collides with the right pendulum bob at rest, which is of same mass. After the collision, the two bobs stick together and rise to a height



(A) $\frac{3h}{4}$ (B) $\frac{2h}{3}$

(C) $\frac{h}{2}$ (D) $\frac{h}{4}$

42. A bomb of mass 3.0 kg explodes in air into two pieces of masses 2.0 kg and 1.0 kg. The smaller mass goes at a speed of 80 ms^{-1}. The total energy imparted to the fragments is

(A) 1.07 kJ (B) 2.14 kJ
(C) 2.4 kJ (D) 4.8 kJ

43. A body of mass m_1 collides elastically with another body of mass m_2 at rest. If the velocity of m_1 after collision becomes 2/3 times its initial velocity, the ratio of their masses, is

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

44. A ball falling freely from a height of 4.9 m hits a horizontal surface. If $e = \frac{3}{4}$, then the ball will hit the surface second time after

(A) 0.5 s (B) 1.5 s
(C) 3.5 s (D) 3.4 s

45. A body of mass 4 kg moving with velocity 12 ms^{-1} collides with another body of mass 6 kg at rest. If two bodies stick together after collision, then the loss of kinetic energy of system is

(A) zero (B) 288 J
(C) 172.8 J (D) 144 J

[CHEMISTRY]

46. What is the molality of a solution containing 200 mg of urea (molar mass 60 g mol^{-1}) dissolved in 40 g of water?

(A) 0.0833 (B) 0.825
(C) 0.498 (D) 0.0013

47. How many gram of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M HNO_3. The concentrated acid is 70% HNO_3 ?

(A) 45.0 g conc. HNO_3
(B) 90.0 g conc. HNO_3
(C) 70.0g conc. HNO_3
(D) 50.0 g conc. HNO_3

48. Molarity of a given orthophosphoric acid solution is 3 M. Its normality is

(A) 9 N (B) 0.3 N
(C) 3 N (D) 1 N

49. 25.3 g of sodium carbonate, Na_2CO_3 is dissolved in enough water to make 250 mL of solution. If sodium carbonate dissociates completely, molar concentration of sodium ion, Na^+ and carbonate ions, CO_3^{2-} are respectively (Molar mass of Na_2CO_3= 106 g mol^{-1})

(A) 0.477 M and 0.477 M
(B) 0.955 M and 1.910 M
(C) 1.910 M and 0.955 M
(D) 1.90 M and 1.910 M

50. 4.0 g of NaOH is dissolved in 100 mL solution. The normality of the solution is

(A) 0.1 N (B) 0.5 N
(C) 4.0 N (D) 1.0 N

51. The change of energy on freezing 1.00 kg of liquid water at 0°C and 1 atm is

(A) 236.7 kJ kg^{-1} (B) 333.4 kJ kg^{-1}
(C) –333.4 kJ kg^{-1} (D) –236.7 kJ kg^{-1}

Space for Rough Work

52. **Assertion** (A) 1.575 g $H_2C_2O_4 \cdot 2H_2O$ in 250 mL solution makes it 0.1 N.

Reason (R) $H_2C_2O_4 \cdot 2H_2O$ is a dihydrate organic acid.

(A) Both A and R are correct and R is the correct explanation of A

(B) Both A and R are correct, but R is not the correct explanation of A

(C) A is correct, but R is incorrect

(D) Both A and R are incorrect

53. 0.126 g of an acid is titrated with 0.1 N 20 mL of an base. The equivalent weight of the acid is

(A) 63 (B) 50

(C) 53 (D) 23

54. 60 mL of $\frac{N}{5}$ H_2SO_4, 10 mL of $\frac{N}{2}$ HNO_3 and 30 mL of $\frac{N}{10}$ HCl are mixed together. The strength of the resulting mixture is

(A) 0.10 N (B) 0.2 N

(C) 0.3 N (D) 0.4 N

55. Two bottles A and B contains 1 M and 1 m aqueous solution of sulphuric acid respectively.

(A) A is more concentrated than B

(B) B is more concentrated than A

(C) concentration of A is equal to concentration of B

(D) it is not possible to compare the concentration

56. The volume of 10 N and 4 N HCl required to make 1 L of 7 N HCl are

(A) 0.50 L of 10 N HCl and 0.50 L of 4 N HCl

(B) 0.60 L of 10 N HCl and 0.40 L of 4 N HCl

(C) 0.80 L of 10 N HCl and 0.20 L of 4 N HCl

(D) 0.75 L of 10 N HCl and 0.25 L of 4 N HCl

57. To prepare a solution of concentration of 0.03 g/mL of $AgNO_3$, what amount of $AgNO_3$ should be added in 60 mL of solution ?

(A) 1.8 g (B) 0.8 g

(C) 0.18 g (D) None of these

58. 5 L of a solution contains 25 mg of $CaCO_3$. What is its concentration in ppm ?

(Molecular weight of $CaCO_3$ is 100).

(A) 25 (B) 1

(C) 5 (D) 2500

59. The volume strength of 1.5 N H_2O_2 solution is

(A) 4.8 (B) 8.4

(C) 3.0 (D) 8.0

60. How much volume of 1 M H_2SO_4 is required to neutralise 20 mL of 1 M NaOH ?

(A) 10 mL (B) 20 mL

(C) 5 mL (D) 15 mL

61. p_A and p_B are the vapour pressure of pure liquid components A and B respectively of an ideal binary solution. If χ_A represents the mole fraction of component A, the total pressure of the solution will be

(A) $p_A + \chi_A(p_B - p_A)$ (B) $p_A + \chi_A(p_A - p_B)$

(C) $p_B + \chi_A(p_B - p_A)$ (D) $p_B + \chi_A(p_A - p_B)$

62. In which case Raoult's law is not applicable ?

(A) 1 M NaCl (B) 1 M urea

(C) 1 M glucose (D) 1 M sucrose

63. Which of the following will show a negative deviation from Raoult's law ?

(A) Acetone-benzene

(B) Acetone-ethanol

(C) Benzene-methanol

(D) Acetone-chloroform

64. Which one of the following gases has the lowest value of Henry's law constant ?

(A) N_2 (B) He

(C) CO_2 (D) O_2

65. Among the following, the azeotropic mixture is

(A) CCl_4 + $CHCl_3$

(B) C_6H_{14} + C_7H_{16}

(C) C_2H_5Br + C_2H_5Cl

(D) chlorobenzene + bromobenzene

Space for Rough Work

66. Which of the following gas mixture ions used by the divers inside the sea ?
(A) O_2 + He (B) O_2 + Xe
(C) O_2 + Ar (D) O_2 + N_2

67. Which of the following is the expression of Raoult's law ?
(p = vapour pressure of pure solvent,
p_s = vapour pressure of the solution)
(A) $\frac{p-p_s}{p}=\frac{n}{n+N}$ (B) $\frac{p_s-p}{p}=\frac{N}{N+n}$
(C) $\frac{p-p_s}{p_s}=\frac{N}{N-n}$ (D) $\frac{p_s-p}{p_s}=\frac{N-n}{N}$

68. Which of the following azeotropic solutions has the boiling point less than boiling point of the constituents A and B ?
(A) $CHCl_3$ and CH_3COCH_3
(B) CS_2 and CH_3COCH_3
(C) CH_3CH_2OH and CH_3COCH_3
(D) CH_3CHO and CS_2

69. An aqueous solution of methanol in water has vapour pressure
(A) equal to that of water
(B) equal to that of methanol
(C) more than that of water
(D) less than that of water

70. If two substances A and B have $p_A^\circ : p_B^\circ = 1:2$ and have mole fraction in solution 1:2 then mole fraction of A in vapours is
(A) 0.33 (B) 0.25
(C) 0.52 (D) 0.2

71. Of the following 0.10 m aqueous solutions, which one will exhibit the largest freezing point depression ?
(A) KCl (B) $C_6H_{12}O_6$
(C) $Al_2(SO_4)_3$ (D) K_2SO_4

72. The unit of ebullioscopic constant is
(A) K kg mol^{-1} (B) mol kg K^{-1}
(C) kg mol^{-1} K^{-1} (D) K mol kg^{-1}

73. van't Hoff factor, (i), of a 0.5% (w/W) aqueous solution of KCl which freezes at –0.24°C is
(K_f of water = 1.86 K kg mol^{-1}, molecular weight of KCl = 74.5)
(A) 1.52 (B) 2.32
(C) 1.92 (D) 1.32

74. Which one of the statements given below concerning properties of solution, describes a colligative effect ?
(A) Boiling point of pure water decreases by the addition of ethanol
(B) Vapour pressure of pure water decreases by the addition of nitric acid
(C) Vapour pressure of pure benzene decreases by the addition of naphthalene
(D) Boiling point of pure benzene increases by the addition of toluene

75. Which of the following is not a colligative property
(A) Depression in freezing point
(B) Osmotic pressure
(C) Elevation in boiling point
(D) Increase in freezing point

76. The vapour pressure lowering caused by the addition of 100 g of sucrose (molecular mass = 342) to 1000 g of water, if the vapour pressure of water at 25°C is 23.8 mm Hg is
(A) 0.12 mm Hg (B) 0.125 mm Hg
(C) 1.15 mm Hg (D) 1.25 mm Hg

77. The freezing point of one molal NaCl assuming NaCl to be 100% dissociated in water is (molal depression constant is 1.86).
(A) –2.72°C (B) –3.72°C
(C) 2.72°C (D) 3.72°C

Space for Rough Work

78. The mass of non-volatile solute of molar mass 40 g/mol that should be dissolved in 114 g of octane to lower its vapour pressure by 20% is

(A) 11.4 g (B) 9.8 g

(C) 12.8 g (D) 10 g

79. The freezing point depression constant for water is –1.86° cm^{-1}. If 5.00 g Na_2SO_4 is dissolved in 45.0 g H_2O, the freezing point is changed by –3.82°C. Calculate the van't Hoff factor for Na_2SO_4

(A) 0.381 (B) 2.05

(C) 2.63 (D) 3.11

80. The empirical formula of a non-electrolyte is CH_2O. A solution containing 3 g of the compound exerts the same osmotic pressure as that of 0.05 M glucose solution. The molecular formula of the compound is

(A) CH_2O (B) $C_2H_4O_2$

(C) $C_4H_8O_4$ (D) $C_3H_6O_3$

81. Pure benzene freezes at 5.3°C. A solution of 0.223 g of phenylacetic acid ($C_6H_5CH_2COOH$) in 4.4 g of benzene (K_f = 5.12 kg mol^{-1}) freezes at 4.47°C. From the observation, one can conclude that

(A) phenylacetic acid exists as such in benzene

(B) phenylacetic acid undergoes partial ionisation in benzene

(C) phenylacetic acid undergoes complete ionisation in benzene

(D) phenylacetic acid dimerises in benzene

82. Which has the least freezing point ?

(A) 1% sucrose (B) 1% NaCl

(C) 1% $CaCl_2$ (D) 1% glucose

83. What happens when an egg is kept in saturated solution of NaCl after removing its hard shell in dilute HCl ?

(A) Egg will swell

(B) Egg will shrink

(C) Egg will remain same

(D) Egg will first shrink and then swell

84. Four solutions of K_2SO_4 with the following concentration 0.1 m, 0.01 m, 0.001 m and 0.0001 m are available. The maximum value of van't Hoff factor, *i*, corresponds to

(A) 0.0001 m solution

(B) 0.001 m solution

(C) 0.01 m solution

(D) 0.1 m solution

85. 0.1 M NaCl and 0.05 M $BaCl_2$ solutions are separated by a semipermeable membrane in a container. For this system, choose the correct answer.

(A) There is no movement of any solution across the membrane

(B) Water flows from $BaCl_2$ solution towards NaCl solution

(C) Water flows from NaCl solution towards $BaCl_2$ solution

(D) Osmotic pressure of 0.1 M NaCl is lower than the osmotic pressure of $BaCl_2$ (assume complete dissociation)

86. A 0.0020 m aqueous solution of an ionic compound $[Co(NH_3)_5(NO_2)]Cl$ freezes at –0.00732°C. Number of moles of ions which one mole of ionic compound produces on being dissolved in water will be (K_f =1.86°C/m)

(A) 2 (B) 3

(C) 4 (D) 1

87. The order of boiling points of four equimolar aqueous solutions is $C < B < A < D$. The correct order of their freezing points is

(A) $D < C < B < A$ (B) $D > C < B < A$

(C) $D < B > A < C$ (D) $D > A > B > C$

88. Maximum lowering of vapour pressure is observed in the case of

(A) 0.1 M glucose (B) 0.1 M $BaCl_2$

(C) 0.1 M $MgSO_4$ (D) 0.1 M NaCl

Space for Rough Work

89. A solution contains non-volatile solute of molecular mass M_2. Which of the following can be used to calculate the molecular mass of solute in terms of osmotic pressure ?

(A) $M_2 = \left[\frac{m_2}{\pi}\right]VRT$ (B) $M_2 = \left[\frac{m_2}{V}\right]\frac{RT}{\pi}$

(C) $M_2 = \left[\frac{m_2}{V}\right]\pi RT$ (D) $M_2 = \left[\frac{m_2}{V}\right]\frac{\pi}{RT}$

90. KBr is 80% dissociated in aqueous solution of 0.5 m concentration. (Given, K_f for water = 1.86 K kg mol^{-1}). The solution freezes at

(A) 271.326 K (B) 272 K
(C) 270.5 K (D) 268.5 K

[ZOOLOGY]

91. Choose the wrong statement.
(A) Solubility of CO_2 in blood is 20-25 times higher than that of O_2
(B) The total volume of air accommodated in the lungs at the end of a forced inspiration is called the 'vital capacity'
(C) O_2 can bind with haemoglobin in a reversible manner to form oxyhaemoglobin
(D) Every 100 mL of deoxygenated blood delivers approximately 4 mL of CO_2 to the alveoli

92. What is the p_{O_2} and p_{CO_2} in the systemic arteries ?

(A) p_{O_2} 40 mm Hg; p_{CO_2} 45 mm Hg

(B) p_{O_2} 95 mm Hg; p_{CO_2} 40 mm Hg

(C) p_{O_2} 40 mm Hg; p_{CO_2} 40 mm Hg

(D) p_{O_2} 45 mm Hg; p_{CO_2} 40 mm Hg

93. The volume of air that can be breathed in by maximum forced inspiration over and above the normal inspiration is called
(A) expiratory reserve volume
(B) inspiratory reserve volume
(C) vital capacity
(D) inspiratory capacity

94. Amount of oxygen supplied by 100 mL arterial blood while passing through the tissues is
(A) 0.4 – 0.6 mL (B) 4 – 6 mL
(C) 14 – 15 mL (D) 19 – 20 mL

95. Hiccups can be best described as
(A) forceful sudden expiration
(B) jerky incomplete inspiration
(C) vibration of the soft palate during breathing
(D) sign of indigestion

96. **Assertion** (A) CO_2 transport occurs very fast through RBCs.
Reason (R) Enzyme carbonic anhydrase is absent in blood plasma.
(A) Both A and R are correct and R is the correct explanation of A
(B) Both A and R are correct, but R is not correct explanation of A
(C) A is correct, but R is incorrect
(D) A is incorrect, but R is correct

97. What is true about RBCs in humans ?
(A) They carry about 20-25% of carbon dioxide
(B) They transport 99.5% of oxygen
(C) They transport about 80% oxygen only and the rest 20% of it is transported in dissolved state in blood plasma
(D) They do not carry carbon dioxide at all

98. Pick the correct statement.
(A) The contraction of internal intercostal muscles lifts up the ribs
(B) The RBCs transport oxygen only
(C) The thoracic cavity is anatomically an air tight chamber
(D) Healthy man can inspire approximately 500 mL of air per minute

99. Which one is the cofactor of carbonic anhydrase ?
(A) Iron (B) Zinc
(C) Copper (D) Magnesium

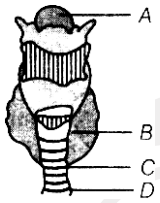
Space for Rough Work

100. Which is called Hamburger shift ?
(A) Hydrogen shift (B) Bicarbonate shift
(C) Chloride shift (D) Sodium shift

101. Left shift of oxyhaemoglobin curve is noticed under
(A) normal temperature and pH
(B) low temperature and high pH
(C) low pH and high temperature
(D) low pH and low temperature

102. Severe Acute Respiratory Syndrome (SARS)
(A) is caused by a variant of Pneumococcus pneumoniae
(B) is caused by a variant of the common cold virus (corona virus)
(C) is an acute form of asthma
(D) affects non-vegetarians much faster than vegetarians

103. The alongside diagram represents the human larynx along side. Choose the correct combination of labelling from the options given.



(A) A–Larynx
B–Parathyroid
C–Tracheal cartilage
D–Trachea
(B) A–Nasopharynx
B–Thyroid gland
C–Cartilage
D–Trachea
(C) A–Trachea
B–Thyroid gland
C–Bronchiole
D–Tracheal cartilage
(D) A–Epiglottis
B–Thyroid gland
C–Tracheal cartilage
D–Trachea

104. After a deep inspiration and maximum expiration, the capacity of lungs is known as
(A) Vital capacity (B) tidal volume
(C) IRV (D) ERV

105. Arrange the following in the order of increasing volume
I. Tidal volume
II. Residual volume
III. Expiratory reserve volume
IV. Vital capacity
(A) I<II<III<IV (B) I<III<II<IV
(C) I<IV<III<II (D) I<IV<II<III

106. The percentage of oxygen in inhaled air is about
(A) 21% (B) 16%
(C) 79% (D) 4%

107. Respiratory centre is present in
(A) cerebellum
(B) cerebrum
(C) medulla oblongata
(D) hypothalamus

108. Blood analysis of a patient reveals an unusually high quantity of carboxyhaemoglobin content. Which of the following conclusions is most likely to be correct ?
(A) The patient has been inhaling polluted air containing usually high content of carbon disulphide
(B) The patient has been inhaling polluted air containing usually high content of chloroform
(C) The patient has been inhaling polluted air containing usually high content of carbon dioxide
(D) The patient has been inhaling polluted air containing usually high content of carbon monoxide

109. Which of the following statements is not true ?
(A) The partial pressure of oxygen in deoxygenated blood is 40 mm Hg
(B) The partial pressure of oxygen in oxygenated blood is 95 mm Hg
(C) The partial pressure of oxygen in the alveolar air is 104 mm Hg
(D) The partial pressure of carbon dioxide in deoxygenated blood is 95 mm Hg

Space for Rough Work

110. Which of the following statements are correct/ incorrect?
I. The blood transports carbon dioxide comparatively easily because of its highest solubility.
II. Approximately 89% of carbon dioxide is transported being dissolved in the plasma of blood.
III. The carbon dioxide produced by the tissues, diffuses passively into the blood stream and passes into red blood corpuscles and react with water to form H_2CO_3.
IV. The oxyhaemoglobin (HbO_2) of the erythrocytes is basic.
V. The chloride ions diffuse from plasma into the erythrocytes to maintain ionic balance.
(A) I, III and V are correct, II and IV are incorrect
(B) I, III and V are incorrect, II and IV are correct
(C) I, II and IV are correct, III and V are incorrect
(D) I, II and IV are incorrect, III and V are correct

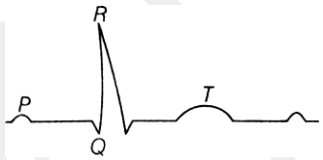
111. About 1000 mL of air is always known to remain inside the human lungs. It is described as
(A) inspiratory reserve volume
(B) expiratory reserve volume
(C) residual volume
(D) tidal volume

112. Although much carbon dioxide is carried in blood, yet blood does not become acidic because
(A) CO_2 is continuously diffused through the tissues and is not allowed to accumulate
(B) CO_2 combines with water to form H_2CO_3, which is neutralised by Na_2CO_3
(C) in CO_2 transport, blood buffers play an important role
(D) CO_2 is absorbed by leucocytes

113. Thrombokinase is associated with
(A) elimination of urea and other excretory products from the body
(B) production of erythrocytes from the bone marrow
(C) pulmonary and systemic circulation
(D) enzymatic reactions in coagulations of blood

114. Identify the correct statement regarding cardiac activity
(A) normal activities of the human heart is regulated intrinsically, hence it is neurogenic
(B) a special neural centre in the medulla oblongata can moderate the cardiac function through the CNS
(C) parasympathetic neural signals increase the rate of heartbeat
(D) adrenal medullarly hormones can increase cardiac output

115. The diagram given here is the standard ECG of a normal person. The P-wave represents the



(A) contraction of both the atria
(B) initiation of the ventricular contraction
(C) beginning of the systole
(D) end of systole

116. Which of the following matches correctly ?
(A) Inferior vena cava - Receives deoxygenated blood from the head and body
(B) Superior vena cava - Receives deoxygenated blood from the lower body and organs
(C) Pulmonary artery - Carries deoxygenated blood to the lungs
(D) Hepatic artery - Carries deoxygenated blood to the gut

Space for Rough Work

117. WBC is true cell due to
(A) absence of nucleus
(B) devoid of haemoglobin
(C) absence of cell wall
(D) presence of nucleus

118. Mast cells of connective tissue contain
(A) vasopressin and relaxin
(B) heparin and histamine
(C) heparin and calcitonin
(D) serotonin and melanine

119. Which of the following factors has little effect on blood flow in arteries ?
(A) Heartbeat
(B) Blood pressure
(C) Skeletal muscle contraction
(D) Total cross sectional area of vessels

120. In a normal adult human, the average stroke volume is
(A) 47 mL (B) 70 mL
(C) 5 mL (D) 3.3 mL

121. Which one of the following plasma proteins is involved in the coagulation of blood ?
(A) Serum amylase (B) A globulin
(C) Fibrinogen (D) An albumin

122. Pacemaker is
(A) instrument for measuring heartbeat
(B) instrument for measuring pulse rate
(C) AV node that provides impulse for heartbeat
(D) Sino-auricular node that provides impulse for heartbeat

123. If due to some injury the chordae tendinae of the tricuspid value of the human heart is partially non-functional, what will be the immediate effect ?
(A) The flow of blood into the aorta will be slowed down
(B) The 'pacemaker' will stop working
(C) The blood will tend to flow back into the left atrium
(D) The flow of blood into the pulmonary artery will be reduced

124. Which of the following are located in tunica media of human blood vessels ?
(A) Collagen fibres and smooth muscle
(B) Squamous epithelium and striated muscle
(C) Yellow fibres and smooth muscle
(D) Yellow fibres and striated muscle

125. The deposition of lipids on the wall lining, the lumen of large and medium-sized arteries is referred to as
(A) deep vein thrombosis
(B) Stokes-Adam's syndrome
(C) osteoporosis
(D) atherosclerosis

126. The cardiac cycle in normal person is about
(A) 0.5 sec (B) 0.8 sec
(C) 1.0 sec (D) 1.2 sec

127. The cardiac pacemaker in a patient fails to function normally. The doctors find that an artificial pacemaker is to be grafted in him. It is likely that it will be grafted at the site of
(A) atrioventricular bundle
(B) Purkinje system
(C) sino-atrial node
(D) atrioventricular node

128. **Assertion** (A) Smaller the organism higher is the rate of metabolism per gram weight.
Reason (R) The heart rate of six months old baby is much higher than that of an old person.
(A) Both A and R are correct and R is the correct explanation of A
(B) Both A and R are correct, but R is not correct explanation of A
(C) A is correct, but R is incorrect
(D) Both A and R are incorrect

129. In diastole, heart is filled by
(A) mixed blood
(B) venous blood
(C) oxygenated blood
(D) deoxygenated blood

Space for Rough Work

130. Maximum surface area of circulating system is seen in
(A) heart (B) capillaries
(C) arterioles (D) veins

131. A heart murmur indicates a defective
(A) bundle of His (B) heart valves
(C) sino-atrial node (D) atrio-ventricular node

132. The largest RBCs have been seen in
(A) elephant (B) whale
(C) amphibians (D) man

133. How many double circulations are normally completed by the human heart, in one minute ?
(A) Eight (B) Sixteen
(C) Seventy two (D) Thirty six

134. 'Heart of Heart' is
(A) SA-node (B) AV-node
(C) bundle of His (D) Purkinje fibres

135. Maximum pressure of blood experienced during when blood enters from
(A) right ventricle to aorta
(B) right auricle to aorta
(C) left ventricle to aorta
(D) left auricle to aorta

[BOTANY]

136. What is correct
(A) Chl *a* is blue green, $C_{55}H_{70}O_6N_4Mg$
(B) Xanthin is $C_{40}H_{56}$
(C) Chl *a* is blue green $C_{55}H_{72}O_5N_4Mg$
(D) Chl *b* is yellow green $C_{55}H_{70}O_5N_4Mg$

137. During photosynthesis
(A) O_2 comes from CO_2
(B) ATP is formed
(C) ATP is not formed
(D) Water is not required as reactant but only as a medium.

138. First transitory chemical formed by reaction between CO_2 and RuBP is
(A) PGAL/GAP
(B) PGA
(C) 2-carboxy 3-keto, 1,5-biphosphoribotol
(D) DiHAP

139. Red colour of tomato is due to
(A) Lycopene
(B) Phytochrome
(C) Chromatochrome
(D) Anthocyanin

140. Electrons lost by PS II are regained from
(A) O_2 (B) CO_2
(C) H_2O (D) None of the above

141. Photoautotrophs lacking chlorophyll *a* are
(A) Cyanobacteria (B) Red alagae
(C) Brown algae (D) Bacteria

142. Chlorophyll appears green because it
(A) Reflects green light
(B) Transmits green light
(C) Absorbs green light
(D) Transforms green light

143. In photosynthesis, energy for passage of electron is the one that is absorbed by
(A) Chlorophyll (B) RuBP
(C) Water (D) ATP

144. ADP $\longrightarrow$ ATP reaction occurs when protons (H^+) are passed from
(A) Thylakoid to cytosol
(B) Thylakoid to lumen
(C) Lumen of thylakoid to stroma
(D) Stroma to thylakoid lumen

Space for Rough Work

145. What is true
(A) PEP-pyruvate causes substrate phosphorylation
(B) PS II has oxygen producing complex
(C) NADPH is assimilatory power
(D) All the above

146. ETC of photosynthesis process is
(A) Bound to thylakoid membrane
(B) Present in stroma
(C) Bound to outer chloroplast membrane
(D) Dispersed in cytosol.

147. Maximum starch is manufactured by
(A) Spongy parenchyma
(B) Palisade parenchyma
(C) Guard cells
(D) Vascular tissue

148. The process by which excess energy is lost is
(A) Fluorescence
(B) Photooxidation
(C) Photolysis
(D) Photophosphorylation

149. Which one is photophosphorylation
(A) ADP + AMP $\xrightarrow{\text{Light energy}}$ ATP
(B) ADP + Inorganic phosphate $\xrightarrow{\text{Light energy}}$ ATP
(C) ADP + Inorganic PO_4 $\xrightarrow{\text{Light energy}}$ ATP
(D) AMP + Inorganic PO_4 $\xrightarrow{\text{Light energy}}$ ATP

150. Stomata of CAM plants
(A) Are always open
(B) Open during day and close a night
(C) Open during night and close during day
(D) Both A and B

151. Anaerobic respiration takes place in
(A) Ribosome (B) Nucleus
(C) Vacuole (D) Cytoplasm.

152. What is required in both photosynthesis and respiration
(A) Chlorophyll (B) CO_2
(C) O_2 (D) Cytochromes

153. When malic acid is respiratory substrate, the amount of CO_2 released is
(A) More than O_2 consumed
(B) Less than O_2 released
(C) Equal to O_2 consumed
(D) CO_2 is not released.

154. At the end of citric acid cycle most of the energy is transferred to
(A) NADH and $FADH_2$
(B) Oxaloacetic acid
(C) Citric acid
(D) ATP

155. End product of anaerobic respiration is
(A) $C_2H_5OH + CO_2$ (B) Lactic acid + H_2O
(C) CO_2 (D) A or B

156. In aerobic respiration one glucose produces
(A) 8 NADH + 2 $FADH_2$ + 2ATP
(B) 12 NADH + 2$FADH_2$ + 38 ATP
(C) 12 NADH + 30 ATP + H_2O
(D) 10 NADH + 2 $FADH_2$ + 2ATP + 2 GTP

157. What occurs in glycolysis
(A) Fixation
(B) Reduction
(C) Dehydrogenation
(D) Oxidation

Space for Rough Work

158. Match the items of column I and II and choose the correct option.

	Column I		Column II
a	Krebs cycle	*p*	Stroma
b	Glycolysis	*q*	Grana
c	Calvin cycle	*r*	Mitochondrial matrix
		s	Cytoplasm

(A) a – s, b – r, c – q

(B) a – r, b –s, c – p

(C) a – s, b – r, c – p

(D) a – r, b – s, c – q

159. RQ of sprouting potato is

(A) 1 (B) > 1

(C) < 1 (D) Zero

160. In a fully turgid cell

(A) TP = 0 (B) WP = 0

(C) DPD = 0 (D) OP = 0

161. Water in the soil available to plants is

(A) gravitational water

(B) capillary water

(C) hygroscopic water

(D) None of these

162. When a cell is plasmolysed, it becomes

(A) flaccid and its TP becomes zero

(B) turgid and its TP becomes zero

(C) turgid and TP becomes equal to OP

(D) flaccid and DPD becomes zero

163. The space between the plasma membrane and the cell wall of a plasmolyzed cell surrounded by a hypertonic solution is occupied by the

(A) hypotonic solution

(B) isotonic solution

(C) hypertonic solution

(D) water

164. RBC and a plant cell (with thick cell wall) are placed in distilled water. The solute concentration is the same in both the cells. What changes would be observed in them ?

(A) Both plant cell and RBC would not undergo any change

(B) The RBC would increase in size and burst, while the plant cell would remain about the same size.

(C) The plant cell would increase in size and burst, while the RBC would remain about the same size.

(D) Both plant cell and RBC would decrease in size and collapse.

165. Which one is incorrect statement ?

(A) Movement of water is expressed in terms of free energy

(B) Free energy determines the direction by which physical and chemical changes should occur

(C) Water potential is the sum of free energy of water molecules in pure water and in any other system

(D) Water potential of pure water is zero.

166. Osmosis involves flow of

(A) water without a membrane

(B) solute from a semi-permeable membrane

(C) solvent (H_2O) through a semi-permeable membrane

(D) None of the above.

167. Study the following table showing the components of water potential in closely arranged mesophyll cells namely A, B and C.

Cell	Osmotic Potential MPa	Pressure Potential MPa
A	–0.21	0.05
B	–0.22	0.02
C	–0.23	0.05

Identify two of the following, which show correct direction of water movement between two cells.

I. $A \rightarrow B$ II. $B \rightarrow C$

III. $C \rightarrow A$ IV. $C \rightarrow B$

(A) I, II (B) II, III

(C) I, IV (D) II, IV

Space for Rough Work

168. A cell swells up when kept in
(A) hypotonic solution
(B) hypertonic solution
(C) isotonic solution
(D) All of these

169. Two cells A and B are contiguous. Cell-A has osmotic pressure-10 atm, turgor pressure -7 atm and diffusion pressure deficit-3 atm. Cell-B has os motic pressure-8 atm, turgor pressure-3 atm and diffusion pressure deficit 5 atm. The result will be
(A) movement of water from cell-B to A
(B) no movement of water
(C) equilibrium between the two
(D) movement of water from cell-A to B

170. **Assertion :** When dried seeds of pea are placed in a tin and water added up to their upper level and then a lid is put tightly over it. Within an hour, the lid will be blown off.
Reason : Due to rapid cell division in pea seeds.
(A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(B) Both Assertion and Reason are true but Reason is not correct explanation of Assertion.
(C) Assertion is true but Reason is false
(D) Both Assertion and Reason are false.

171. Root hair absorbs water from soil through
(A) turgor pressure
(B) ion exchange
(C) osmosis
(D) DPD

172. Which one of the following denotes the water potential of the mesophyll cell in wilted condition?
(A) Equal to the value of osmotic potential
(B) Equal to the value of pressure potential
(C) Greater than the value of its osmotic potential
(D) Equal to zero

173. Which of the following maintains the shape of cell?
(A) Osmotic pressure
(B) Turgor pressure
(C) Wall pressure
(D) Osmosis

174. Identify the correct relationship with reference to water potential of a plant cell.
(A) $\Psi_w = \Psi_m + \Psi_s + \Psi_p$
(B) $\Psi_w = \Psi_m + \Psi_s - \Psi_p$
(C) $\Psi_w = \Psi_m - \Psi_s + \Psi_p$
(D) $\Psi_w = \Psi_m - \Psi_s - \Psi_p$

175. Match the following columns and choose the correct option.

	Column I		Column II
A.	Water potential of 10% salt solution	1.	Positive
B.	Pressure potential in a normal cell	2.	Negative
C.	Pressure potential in a plasmolysed cell	3.	Positive
D.	Metric potential on the surface of the wood	4.	Negative
		5.	Zero

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

176. Match the following columns and select the correct option.

Column I	Column II
A. Hypotonic	1. Water
B. Hypertonic	2. Sucrose
C. Solute	3. Lower tonicity
D. Solvent	4. Higher tonicity

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

Space for Rough Work

177. The values of osmotic potential (π) and pressure potential (ρ) of cells A, B, C and D are given below:

Cell	π	ρ
A	–1.0	0.5
B	–0.6	0.3
C	–1.2	0.6
D	–0.8	0.4

Identify the correct sequence that shows the path of movement of water from among the following :
(A) $D \rightarrow C \rightarrow A \rightarrow B$
(B) $B \rightarrow D \rightarrow A \rightarrow C$
(C) $B \rightarrow C \rightarrow D \rightarrow A$
(D) $C \rightarrow B \rightarrow A \rightarrow D$

178. If water enters in a cell, the pressure exerted by its swollen protoplast is
(A) turgor pressure
(B) DPD
(C) osmotic pressure
(D) imbibition

179. Which of the following statements is correct ?
(A) DPD = OP – WP
(B) DPD = OP + WP
(C) DPD = WP – OP
(D) DPD = TP + OP

180. Which of the following has maximum water potential ?
(A) Pure water
(B) 2% sucrose solution
(C) 4% glucose soltion
(D) 10% sodium chloride solution.

❑ ❑ ❑

Space for Rough Work