

# HORIZON ACADEMY<sup>®</sup> Since 2003

## Medical | IIT-JEE | Foundations

(Divisions of Horizon Study Circle Pvt. Ltd.)

Name.:

Date :   /   /

Test No.:

Test Code :

Time : 3 Hrs.

M.M. : 720

# HORIZON TEST SERIES for Medical Entrance Exam. 2016

[ Test No. 2 ]

### 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 not 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. 2**

## Topics of The Test

**Physics**

Unit, Dimension and Error in Measurement, Motion in One D Topic covered till Friday).

**Chemistry**

States of Matter (General properties of Gases and Liquids, Gas Laws and Ideal Gas equations, Kinetic Molecular Theory of Gases and Molecular speeds).

**Biology**

Zoology : Types of Nutrition, Nutrients (Carbohydrate, Protein, Fats), Vitamins.  
Botany : Principles of Inheritance.

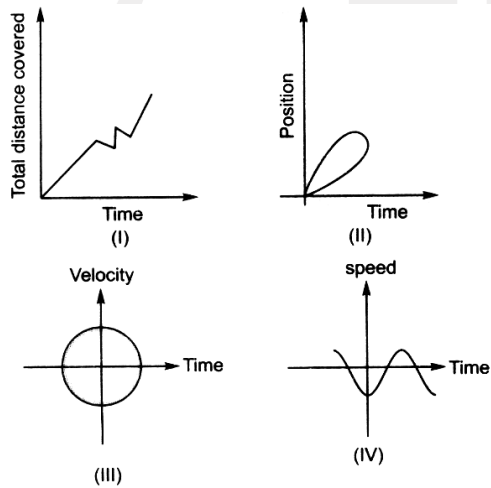
# Test No. 2

## [PHYSICS]

1. Given that  $y = A \sin \left[ \left( \frac{2\pi}{\lambda} (ct - x) \right) \right]$  where  $y$  and  $x$  are measured in metre. Which of the following statements is true ?
  - (A) The unit of  $\lambda$  is same as that of  $x$  and  $A$
  - (B) The unit of  $\lambda$  is same as that of  $x$  but not of  $A$
  - (C) The unit of  $c$  is same as that of  $\frac{2\pi}{\lambda}$
  - (D) The unit of  $(ct - x)$  is same as that of  $\frac{2\pi}{\lambda}$
  
2. The dimensions of  $(\mu_0 \epsilon_0)^{-1/2}$  are
  - (A)  $[L^{-1}T]$                       (B)  $[LT^{-1}]$
  - (C)  $[L^{-1/2}T^{1/2}]$                 (D)  $[L^{1/2}T^{-1/2}]$
  
3. If increase in linear momentum of a body is 50%, then change in its kinetic energy is
  - (A) 25%                                (B) 125%
  - (C) 150%                               (D) 50%
  
4. The values of two resistors are  $R_1 = (6 \pm 0.3)k\Omega$  and  $R_2 = (10 \pm 0.2)k\Omega$ . The percentage error in the equivalent resistance when they are connected in parallel is
  - (A) 5.125%                              (B) 2%
  - (C) 10.125%                            (D) 7%
  
5. From the top of a tower, a particle is thrown vertically downwards with a velocity of 10 m/s. The ratio of distances covered by it in the 3rd and 2nd seconds of its motion is (Take  $g = 10 \text{ m/s}^2$ )
  - (A) 5 : 7                                (B) 7 : 5
  - (C) 3 : 6                                (D) 6 : 3
  
6. The distance travelled by a particle starting from rest and moving with an acceleration  $\frac{4}{3} \text{ ms}^{-2}$ , in the third second is
  - (A) 6 m                                    (B) 4 m
  - (C)  $\frac{10}{3} \text{ m}$                               (D)  $\frac{19}{3} \text{ m}$
  
7. A body is projected vertically upwards. The times corresponding to height  $h$  while ascending and while descending are  $t_1$  and  $t_2$  respectively. Then the velocity of projection is ( $g$  is acceleration due to gravity)
  - (A)  $g\sqrt{t_1 t_2}$                             (B)  $\frac{gt_1 t_2}{t_1 + t_2}$
  - (C)  $\frac{g\sqrt{t_1 t_2}}{2}$                                 (D)  $\frac{g(t_1 + t_2)}{2}$
  
8. The coordinates of a moving particle at any time  $t$  are given by  $x = \alpha t^3$  and  $y = \beta t^3$ . The speed of the particle at time  $t$  is given by
  - (A)  $3t\sqrt{\alpha^2 + \beta^2}$                       (B)  $3t^2\sqrt{\alpha^2 + \beta^2}$
  - (C)  $t^2\sqrt{\alpha^2 + \beta^2}$                       (D)  $\sqrt{\alpha^2 + \beta^2}$

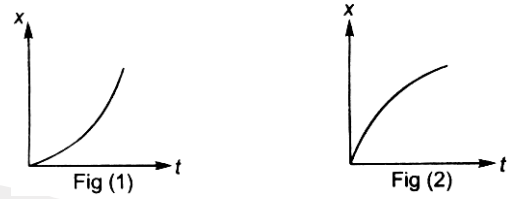
Space for Rough Work

9. A ball is thrown from height  $h$  and another from  $2h$ . The ratio of time taken by the two balls to reach ground is  
 (A)  $1 : \sqrt{2}$  (B)  $\sqrt{2} : 1$   
 (C)  $2 : 1$  (D)  $1 : 2$
10. A bullet loses  $1/20$  of its velocity after penetrating a plank. How many planks are required to stop the bullet?  
 (A) 6 (B) 9  
 (C) 11 (D) 13
11. If the velocity of a particle is given by  $v = (180 - 16x)^{1/2}$   $\text{ms}^{-1}$ , then its acceleration will be  
 (A) zero (B)  $8 \text{ ms}^{-2}$   
 (C)  $-8 \text{ ms}^{-2}$  (D)  $4 \text{ ms}^{-2}$
12. Which of the following graphs cannot possibly represent one dimensional motion of a particle?

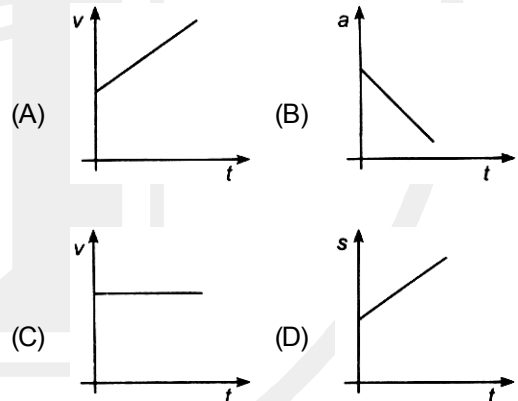


- (A) I and II (B) II and III  
 (C) II and IV (D) All the above four

13. Figures (1) and (2) show the displacement-time graphs of two particles moving along the x-axis. We can say that



- (A) both the particles are having an uniformly accelerated motion  
 (B) both the particles are having an uniformly retarded motion  
 (C) particle (1) is having an uniformly accelerated motion which particle (2) is having an uniformly retarded motion  
 (D) particle (1) is having an uniformly retarded motion while particle (2) is having an uniformly accelerated motion.
14. A body moves with uniform acceleration, then which of the following graphs is correct ?



Space for Rough Work

15. A food packet is released from a helicopter which is rising steadily at  $2 \text{ ms}^{-1}$ . After two seconds (i) What is the velocity of the packet ? (ii) How far is it below the helicopter ? Take  $g = 9.8 \text{ ms}^{-2}$ .
- (A) 15.6 m (B)  $15.6 \text{ ms}^{-1}$   
(C) 19.6 m (D)  $17.6 \text{ ms}^{-1}$
16. The velocity-time relation of an electron starting from rest is given by  $v = kt$ , where  $k = 2 \text{ ms}^{-2}$ . Calculate the distance traversed in 3 s.
- (A) 3 m (B) 6 m  
(C) 9 m (D) 15 m
17. A ball is released from the top of a tower of height  $h$  metres. It takes  $T$  seconds to reach the ground. What is the position of the ball in  $T/3$  seconds ?
- (A)  $\frac{h}{9}$  (B)  $\frac{2h}{9}$   
(C)  $\frac{5h}{9}$  (D)  $\frac{8h}{9}$
18. Points P, Q and R are in a vertical line such that  $PQ = QR$ . A ball at P is allowed to fall freely. What is the ratio of the times of descent through PQ and QR ?
- (A)  $1:\sqrt{2}$  (B)  $(\sqrt{2}-1):1$   
(C)  $1:(\sqrt{2}-1)$  (D)  $\sqrt{2}:1$
19. The mass and volume of a body are 4.237 g and  $2.5 \text{ cm}^3$ , respectively. The density of the material of the body in correct significant figures is :
- (A)  $1.6048 \text{ g/cm}^3$  (B)  $1.69 \text{ g/cm}^3$   
(C)  $1.7 \text{ g/cm}^3$  (D)  $1.695 \text{ g/cm}^3$
20. Young's modulus of steel is  $1.9 \times 10^{11} \text{ N/m}^2$ . When expressed in cgs units of  $\text{dynes/cm}^2$ , it will be equal to :
- ( $1 \text{ N} = 10^5 \text{ dyne}$ ,  $1 \text{ m}^2 = 10^4 \text{ cm}^2$ )
- (A)  $1.9 \times 10^{10}$  (B)  $1.9 \times 10^{11}$   
(C)  $1.9 \times 10^{12}$  (D)  $1.9 \times 10^{13}$
21. When a copper sphere is heated, maximum percentage change will be observed in :
- (A) radius (B) area  
(C) volume (D) none of these
22. If the unit of force and length are doubled, the unit of energy will be
- (A)  $1/4$  times the original  
(B)  $1/2$  times the original  
(C) 2 times the original  
(D) 4 times the original
23. The dimension of impulse is
- (A)  $[\text{MLT}^{-1}]$  (B)  $[\text{ML}^2\text{T}^{-1}]$   
(C)  $[\text{ML}^{-1}\text{T}^{-1}]$  (D)  $[\text{MT}^{-1}]$
24. Pressure gradient has the same dimensions as that of
- (A) velocity gradient (B) potential gradient  
(C) energy gradient (D) none of these
25. Write dimensional formula for the intensity of radiation
- (A)  $[\text{ML}^0\text{T}^{-3}]$  (B)  $[\text{ML}^0\text{T}^{-3}]$   
(C)  $[\text{ML}^2\text{T}^{-2}]$  (D)  $[\text{ML}^2\text{T}^{-3}]$
26. The dimensions of  $\frac{a}{b}$  in the equation  $p = \frac{a-t^2}{bx}$ , where  $p$  is pressure,  $x$  is distance and  $t$  is time, are
- (A)  $[\text{M}^2\text{LT}^{-3}]$  (B)  $[\text{MT}^{-2}]$   
(C)  $[\text{LT}^{-3}]$  (D)  $[\text{ML}^3\text{T}^{-1}]$
27. An object travels north with a velocity of  $10 \text{ ms}^{-1}$  and then speeds up to a velocity of  $25 \text{ ms}^{-1}$  in 5 s. The acceleration of the object in these 5 s is
- (A)  $12 \text{ ms}^{-2}$  in north direction  
(B)  $3 \text{ ms}^{-2}$  in north direction  
(C)  $15 \text{ ms}^{-2}$  in north direction  
(D)  $3 \text{ ms}^{-2}$  in south direction

Space for Rough Work

28. A particle moves along X-axis as

$$x = 4(t - 2) + a(t - 2)^2$$

Which of the following is true ?

- (A) The initial velocity of particle is 4
- (B) The acceleration of particle is 2a
- (C) The particle is at origin when  $t = 0$
- (D) None of the above

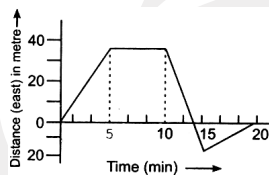
29. A body is moving with uniform velocity of  $10 \text{ ms}^{-1}$ . When this body just crosses another body the second one starts and moves with uniform acceleration of  $5 \text{ ms}^{-2}$ . They meet after how much time ?

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

30. When a bullet is fixed at a target, its velocity decreases by half after penetrating 30 cm into it. The additional thickness it will penetrate before coming to rest is

- (A) 30 cm
- (B) 40 cm
- (C) 10 cm
- (D) 50 cm

31. A boy begins to walk eastward along a street in front of his house and the graph of his displacement from home is shown in the following figure. His average speed for the whole time interval is equal to



- (A)  $8 \text{ m min}^{-1}$
- (B)  $6 \text{ m min}^{-1}$
- (C)  $\frac{8}{3} \text{ m min}^{-1}$
- (D)  $2 \text{ m min}^{-1}$

32. A train is moving slowly on a straight track with a constant speed of  $2 \text{ m/s}$ . A passenger in that train starts walking at a steady speed of  $2 \text{ m/s}$  to the back of the train in the opposite direction of the motion of the train so to an observer standing on the platform directly in front of that passenger, the velocity of the passenger appears to be

- (A)  $4 \text{ ms}^{-1}$
- (B)  $2 \text{ ms}^{-1}$
- (C)  $2 \text{ ms}^{-1}$  in the opposite direction of the train
- (D) zero

33. A stone is thrown vertically upwards. When the stone is at a height equal to half of its maximum height, its speed will be  $10 \text{ m/s}$ , then the maximum height attained by the stone is (Take  $g = 10 \text{ m/s}^2$ )

- (A) 5 m
- (B) 150 m
- (C) 20 m
- (D) 10 m

34. If the error in the measurement of radius of a sphere is 2%, then the error in the determination of volume of the sphere will be

- (A) 4%
- (B) 6%
- (C) 8%
- (D) 2%

35. Choose the incorrect statement out of the following.

- (A) Every measurement by any measuring instrument has some errors
- (B) Every calculated physical quantity that is based on measured values has some error
- (C) A measurement can have more accuracy but less precision and vice versa
- (D) The percentage error is different from relative error


36. The ratio of the dimensions of Planck's constant and that of the moment of inertia is the dimension of

- (A) frequency
- (B) velocity
- (C) angular momentum
- (D) time

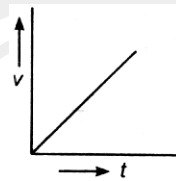
37. Density of liquid in CGS system is  $0.625 \text{ g cm}^{-3}$ . What is its magnitude in SI system ?

- (A) 0.625
- (B) 0.0625
- (C) 0.00625
- (D) 625

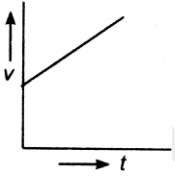
Space for Rough Work

38. If  $C$  and  $R$  denote capacity and resistance, the dimensions of  $CR$  are  
 (A)  $[M^0L^0T]$   
 (B)  $[ML^0T]$   
 (C)  $[M^0L^0T^2]$   
 (D) not expressible in terms of  $M$ ,  $L$  and  $T$
39. A car accelerates from rest at constant rate for first 10 s and covers a distance  $x$ . It covers a distance  $y$  in next 10 s at the same acceleration. Which of the following is true ?  
 (A)  $x = 3y$  (B)  $y = 3x$   
 (C)  $x = y$  (D)  $y = 2x$
40. A ball which is at rest is dropped from a height  $h$  metre. As it bounces off the floor its speed is 80% of what is just before touching the ground. The ball will then rise to nearly a height  
 (A) 0.94  $h$  (B) 0.80  $h$   
 (C) 0.75  $h$  (D) 0.64  $h$
41. A body starts from rest and moves with uniform acceleration. Which of the following graphs represent its motion ?
- 

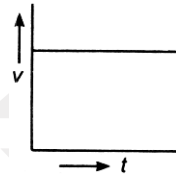
(A)



(B)



(C)



(D)
42. Velocity-time curve for a body, projected vertically upwards, is  
 (A) parabola (B) ellipse  
 (C) hyperbola (D) straight line
43. A particle covers 150 m in 8th second starting from rest, its acceleration is  
 (A)  $15 \text{ ms}^{-2}$  (B)  $20 \text{ ms}^{-2}$   
 (C)  $10 \text{ ms}^{-2}$  (D)  $8 \text{ ms}^{-2}$
44. From a balloon rising vertically upwards as  $5 \text{ ms}^{-1}$  stone is thrown up at  $10 \text{ ms}^{-1}$  relative to the balloon. Its velocity with respect to ground after 2 s is (Assume  $g = 10 \text{ ms}^{-2}$ )  
 (A) zero (B)  $5 \text{ ms}^{-1}$   
 (C)  $10 \text{ ms}^{-1}$  (D)  $20 \text{ ms}^{-1}$
45. If an iron ball and a wooden ball of the same radius are released from a height  $h$  in vacuum, then time taken by both of them, to reach the ground will be  
 (A) zero (B) unequal  
 (C) roughly equal (D) exactly equal

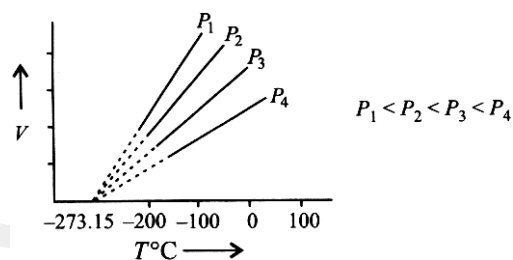
**[CHEMISTRY]**

46. Representing  $P$ ,  $V$  and  $T$  as pressure, volume and temperature, which of the following is the correct representation of Boyle's law ?  
 (A)  $V \propto \frac{1}{T}$  ( $P$  constant)  
 (B)  $V \propto \frac{1}{P}$  ( $T$  constant)  
 (C)  $PV = RT$   
 (D)  $PV = nRT$
47. What is the density of  $\text{CO}_2$  at  $27^\circ\text{C}$  and 2.5 atm pressure ?  
 (A)  $5.2 \text{ g L}^{-1}$  (B)  $6.2 \text{ g L}^{-1}$   
 (C)  $7.3 \text{ g L}^{-1}$  (D)  $4.46 \text{ g L}^{-1}$
48. Which of the following does not express the properties of gases ?  
 (A) Gases are highly compressible.  
 (B) Gases exert pressure equally in all directions.  
 (C) Gases have much higher density than liquids and solids.  
 (D) Gases mix evenly and completely in all proportions.

Space for Rough Work

49. A gas that follows Boyle's law, Charles' law and Avogadro's law is called an ideal gas. Under what conditions a real gas behaves as ideal gas ?
- (A) Under low pressure and temperature.  
 (B) Under high pressure and temperature.  
 (C) Under high pressure and low temperature.  
 (D) Under low pressure and high temperature.
50. What is the effect on chemical properties and physical properties of water when temperature is changed ?
- (A) Chemical properties of water remain same but the physical state changes with change in temperature.  
 (B) Chemical properties of water change with change in temperature but physical properties remain same.  
 (C) There is no effect on chemical or physical properties of water when temperature is changed.  
 (D) Both chemical and physical properties of water change with change in temperature.
51. What is the effect on the pressure of a gas if its temperature is increased at constant volume ?
- (A) The pressure of the gas increases.  
 (B) The pressure of the gas decreases.  
 (C) The pressure of the gas remains same.  
 (D) The pressure of the gas becomes double.
52. Which of the following postulates of kinetic theory of gases is not correct ?
- (A) Gases consist of particles which are in continuous, random motion.  
 (B) The particles are infinitely small and very close to each other.  
 (C) The collisions of the particles with each other are elastic.  
 (D) The pressure of a gas is caused by the collisions of gas particles with the wall of the container.

53. Study the following graph and mark the incorrect statement following it.



- (A) At zero volume all lines meet at  $-273.15^{\circ}\text{C}$ . This temperature is known as absolute zero.  
 (B) Each line of the volume vs temperature at constant pressure of graph is called isotherm.  
 (C) All gases obey Charles' law at very low pressure and high temperature.  
 (D) Pressure remaining constant, volume of a gas is directly proportional to its absolute temperature.
54. At NTP the volume of a gas is 40 mL. If pressure is increased to 800 mm of Hg at the same temperature, what will be the volume of the gas ?
- (A) 38 mL                      (B) 22400 mL  
 (C) 240 mL                      (D) 431 mL
55. At any particular time, different particles in the gas
- (A) have same speed and kinetic energy  
 (B) have same speed but different kinetic energies  
 (C) have different speeds but same kinetic energy  
 (D) have different speeds and hence different kinetic energies
56. A closed container contains equal number of moles of two gases X and Y at a total pressure of 710 mm of Hg. If gas X is removed from the mixture, the pressure will
- (A) become double    (B) become half  
 (C) remains same    (D) becomes one fourth

Space for Rough Work



57. Read the following statements and identify the incorrect statement.
- (A) Volume of one mole of a gas at critical temperature is called molar volume  
 (B) Pressure of a gas at critical temperature is called critical pressure.  
 (C) The critical temperature, pressure and volume are called critical constants.  
 (D) Critical temperature is the highest temperature at which a gas can exist as liquid, above this temperature it is a gas.
58. Density of a gas is found to be  $5.46 \text{ g dm}^{-3}$  at  $27^\circ\text{C}$  at 2 bar pressure. What will be its density at STP ?
- (A)  $3.0 \text{ g dm}^{-3}$  (B)  $5.0 \text{ g dm}^{-3}$   
 (C)  $6.0 \text{ g dm}^{-3}$  (D)  $10.82 \text{ g dm}^{-3}$
59. An open flask contains air at  $27^\circ\text{C}$ . At what temperature should it be heated so that  $1/3$ rd of air present in it goes out ?
- (A)  $177^\circ\text{C}$  (B)  $100^\circ\text{C}$   
 (C)  $300^\circ\text{C}$  (D)  $150^\circ\text{C}$
60. Under what conditions gases generally deviate from ideal behaviour ?
- (A) At high temperature and low pressure.  
 (B) At low temperature and high pressure.  
 (C) At high temperature and high pressure.  
 (D) At low temperature and low pressure.
61. A container of 1 L capacity contains a mixture of 4 g of  $\text{O}_2$  and 2 g of  $\text{H}_2$  at  $0^\circ\text{C}$ . What will be the total pressure of the mixture ?
- (A) 50.42 atm (B) 25.21 atm  
 (C) 15.2 atm (D) 12.5 atm
62. Ideal gas equation is also called equation of states because
- (A) it depends on states of matter  
 (B) it is a relation between four variables and describes the state of any gas  
 (C) it is combination of various gas laws and any variable can be calculated  
 (D) it is applicable to only ideal gases under STP conditions.
63. A curve drawn at constant temperature is called an isotherm. This shows the relationship between:
- (A)  $P$  and  $\frac{1}{V}$  (B)  $PV$  and  $V$   
 (C)  $V$  and  $\frac{1}{P}$  (D)  $P$  and  $V$
64. Charles' law is represented mathematically as :
- (A)  $V_t = KV_0t$  (B)  $V_t = \frac{KV_0}{t}$   
 (C)  $V_t = V_0\left(1 + \frac{273}{t}\right)$  (D)  $V_t = V_0\left(1 + \frac{t}{273}\right)$
65. The value of gas constant per degree per mol is approximately :
- (A) 1 cal (B) 2 cal  
 (C) 3 cal (D) 4 cal
66. Which one of the following is not the value of R ?
- (A)  $1.99 \text{ cal K}^{-1} \text{ mol}^{-1}$   
 (B)  $0.0821 \text{ litre-atm K}^{-1} \text{ mol}^{-1}$   
 (C)  $9.8 \text{ kcal k}^{-1} \text{ mol}^{-1}$   
 (D)  $8.3 \text{ J K}^{-1} \text{ mol}^{-1}$
67. One litre of a gas collected at NTP will occupy at 2 atmospheric pressure and  $27^\circ\text{C}$ :
- (A)  $\frac{300}{2 \times 273}$  litre (B)  $\frac{2 \times 300}{273}$  litre  
 (C)  $\frac{273}{2 \times 300}$  litre (D)  $\frac{2 \times 273}{300}$  litre
68. The density of a gas is  $1.964 \text{ g dm}^{-3}$  at 273 K and 76 cm Hg. The gas is :
- (A)  $\text{CH}_4$  (B)  $\text{C}_2\text{H}_6$   
 (C)  $\text{CO}_2$  (D)  $\text{Xe}$
69. Compressed oxygen is sold at a pressure of 100 atmosphere in a cylinder of 49 litre. The number of moles of oxygen in the cylinder is :
- (A) 400 (B) 100  
 (C) 300 (D) 200

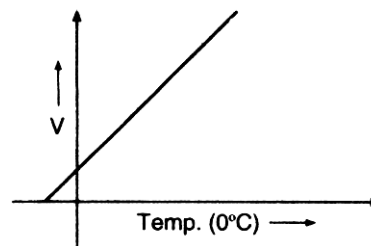
Space for Rough Work

70. A gaseous mixture of 2 moles of A, 3 moles of B, 5 moles of C and 10 moles of D is contained in a vessel. Assuming that gases are ideal and the partial pressure of C is 1.5 atm, the total pressure is :
- (A) 3 atm (B) 6 atm  
(C) 9 atm (D) 15 atm
71. Two sealed containers of same capacity at the same temperature are filled with 44 g of hydrogen gas in one and 44 g of CO<sub>2</sub> in the other. If the pressure of CO<sub>2</sub> is 1 atm, what is the pressure in the hydrogen container?
- (A) 1 atm (B) Zero atm  
(C) 22 atm (D) 44 atm
72. Density of neon will be highest at :
- (A) STP (B) 0°C, 2 atm  
(C) 273°C, 1 atm (D) 273°C, 2 atm
73. A helium atom is two times heavier than a hydrogen molecule. At 298 K, the average kinetic energy of a helium atom is :
- (A) two times that of a hydrogen molecule  
(B) four times that of a hydrogen molecule  
(C) half that of a hydrogen molecule  
(D) same as that of a hydrogen molecule
74. In a closed vessel, a gas is heated from 300 K to 600 K; the kinetic energy becomes/remains:
- (A) double (B) half  
(C) same (D) four times
75. Most probable speed, average speed and rms speed are related as :
- (A) 1 : 1.224 : 1.128 (B) 1.128 : 1 : 1.224  
(C) 1 : 1.128 : 1.224 (D) 1.224 : 1.128 : 1
76. The molecules of which of the following gas have highest speed ?
- (A) Hydrogen at -50°C  
(B) Methane at 298 K  
(C) Nitrogen at 1000°C  
(D) Oxygen at 0°C
77. The van der Waals' equation for a real gas is :
- (A)  $\left(P + \frac{a}{V^2}\right)(V - b) = nRT$   
(B)  $\left(P + \frac{an^2}{V^2}\right)(V - b) = nRT$   
(C)  $\left(P + \frac{a}{V^2}\right)(V + b) = nRT$   
(D)  $P = \frac{nRT}{(V - nb)} - \frac{n^2a}{V^2}$
78. A balloon filled with N<sub>2</sub>O is pricked with a sharper point and plunged into a tank of CO<sub>2</sub> under the same pressure and temperature. The balloon will :
- (A) be enlarged  
(B) shrink  
(C) collapse completely  
(D) remain unchanged in size
79. At constant temperature in a given mass of an ideal gas :
- (A) the ratio of pressure and volume always remains constant  
(B) volume always remains constant  
(C) pressure always remains constant  
(D) the product of pressure and volume always remains constant
80. In a closed flask of 5 litre, 1.0 g of H<sub>2</sub> is heated from 300 – 600 K. Which statement is not correct ?
- (A) The rate of collision increases  
(B) The energy of gaseous molecules increases  
(C) The number of mole of the gas increases  
(D) Pressure of the gas increases
81. If the pressure and absolute temperature of 2 litre of carbon dioxide are doubled, the volume of carbon dioxide would become :
- (A) 7 litre (B) 5 litre  
(C) 4 litre (D) 2 litre

Space for Rough Work

82. Which one of the following relation is correct for the rate of diffusion of a gas ( $r$ ) ?
- (A)  $r \propto \sqrt{d}$       (B)  $r \propto \sqrt{1/d}$   
 (C)  $r = d$       (D)  $r \propto d$
83. An ideal gas, obeying kinetic theory of gases cannot be liquefied, because :
- (A) its critical temperature is above  $0^\circ\text{C}$   
 (B) its molecules are relatively small in size  
 (C) it solidifies before becoming a liquid  
 (D) forces acting between its molecules are negligible
84. A real gas most closely approaches the behaviour of an ideal gas at :
- (A) 1 atm and 273 K (B) 0.5 atm and 500 K  
 (C) 15 atm and 200 K (D) 15 atm and 500 K
85. Which of the following mixture of gases does not obey Dalton's law of partial pressure ?
- (A)  $\text{O}_2$  and  $\text{CO}_2$       (B)  $\text{N}_2$  and  $\text{O}_2$   
 (C)  $\text{Cl}_2$  and  $\text{SO}_2$       (D)  $\text{NH}_3$  and  $\text{HCl}$
86. A gaseous mixture in a gas cylinder contain 20% oxygen, 25%  $\text{CO}_2$  and 55% nitrogen by volume. If the total pressure in the gas cylinder is 760 mm, then the partial pressure of oxygen is :
- (A) 110 mm      (B) 125 mm  
 (C) 142 mm      (D) 152 mm
87. A gas occupies 100 mL at 720 mm pressure. At what pressure it occupies a volume of 84 mL ?
- (A) 857.14 mm      (B) 875.41 mm  
 (C) 825.4 mm      (D) 895.15 mm
88. A gas mixture contains  $\text{O}_2$  and  $\text{N}_2$  in the ratio of 1 : 4 by weight. The ratio of their number of molecules is :
- (A) 1 : 8      (B) 1 : 4  
 (C) 3 : 16      (D) 7 : 32

89. The following graph illustrates :



- (A) Dalton's law      (B) Charles' law  
 (C) Boyle's law      (D) Gay-Lussac's law
90. Equation of Boyle's law is :

(A)  $\frac{dP}{P} = -\frac{dV}{V}$       (B)  $\frac{dP}{P} = +\frac{dV}{V}$   
 (C)  $\frac{d^2P}{P} = -\frac{dV}{dT}$       (D)  $\frac{d^2P}{P} = +\frac{d^2V}{dT}$

### [ZOOLOGY]

91. When the body is engaged in long-duration, low-intensity exercise, the principal energy source is
- (A) carbohydrates      (B) fats  
 (C) proteins      (D) glycogen
92. Per unit weight, which contains the most energy ?
- (A) carbohydrate      (B) proteins  
 (C) fats      (D) vitamins
93. Reduced growth, hair loss, and vomiting may result from a deficiency of
- (A) iron      (B) copper  
 (C) potassium      (D) zinc
94. A respiratory quotient of 0.70 would indicate that the main source of food was
- (A) carbohydrates  
 (B) fats  
 (C) proteins  
 (D) a mixture of carbohydrates and proteins

Space for Rough Work

95. The ratio of the carbon dioxide volume produced to the oxygen volume consumed is called  
 (A) the bomb calorimeter  
 (B) the metabolic rate  
 (C) the direct quotient  
 (D) the respiratory quotient
96. What fraction of the energy released during catabolism of glucose is captured by ATP ?  
 (A) 25% (B) 40%  
 (C) 75% (D) 100%
97. Beriberi is caused by a deficiency of vitamin  
 (A) A (B) B<sub>1</sub>  
 (C) B<sub>12</sub> (D) B<sub>6</sub>
98. The synthesis of glycogen molecules for cellular storage is referred to as  
 (A) glycogenolysis (B) beta oxidation  
 (C) glyconeogenesis (D) glycogenesis
99. Liver stores :  
 (A) Vitamin-A (B) Vitamin-B<sub>12</sub>  
 (C) Vitamin-D (D) All of these
100. Heparin is produced by :  
 (A) Kidney cells (B) Blood cells  
 (C) Bone marrow (D) Liver cells
101. All are essential amino acid except.  
 (A) Tryptophane (B) Phenyl alanine  
 (C) Valine (D) Glycine
102. A person loses weight if :  
 (A) Energy output exceeds calorie intake.  
 (B) If calorie intake exceeds energy output.  
 (C) When energy output and calorie intake are equal.  
 (D) When there is positive balance.
103. Vitamins like A, D and K (fat soluble) are absorbed in:  
 (A) Blood capillaries of villi.  
 (B) In blood directly like hormones.  
 (C) In lacteals of villi.  
 (D) In interstitial fluid.
104. Pernicious anaemia results due to deficiency of :  
 (A) Vit-B<sub>1</sub> (B) Vit-A  
 (C) Vit-C (D) Iron
105. Pellagra is caused due to deficiency of vitamin:  
 (A) Thiamin (B) Niacin  
 (C) Pyridoxine (D) Biotin
106. Which one the following is a fat soluble vitamin and its related deficiency disease ?  
 (A) Retinol - Xerophthalmia  
 (B) Cobalamine - Beri-beri  
 (C) Calciferol - Pellagra  
 (D) Ascorbic acid - Scurvy
107. A patient is generally advised to specially consume more meat, lentils, milk and eggs in diet only when he suffers from :  
 (A) Scurvy (B) Kwashiorkor  
 (C) Rickets (D) Anaemia
108. Which of the following is a protein deficiency disease?  
 (A) Eczema (B) Cirrhosis  
 (C) Kwashiorkor (D) Night blindness
109. Which of the following group contain first class proteins?  
 (A) Maize - Beans - Eggs  
 (B) Fish - Eggs - Milk products  
 (C) Milk products - Vegetables - Beans  
 (D) Liver - Fish - Maize
110. The most important natural antioxidant is.  
 (A) vitamin D (B) vitamin E  
 (C) vitamin B<sup>12</sup> (D) vitamin K
111. Find out the wrong statement with reference to Kwashiorkor :  
 (A) There large swelling giving moon faced appearance.  
 (B) The hair is not affected and there is no oedema.  
 (C) Hair changes, become thin, sparce and easily removed.  
 (D) Swollen abdomen and reduced hight.

Space for Rough Work

112. One of the following is not the symptom of marasmus:
- (A) Severely wasted muscles.  
 (B) No oedema.  
 (C) Swollen abdomen fatty liver and rough skin.  
 (D) Wizened appearance and very under weight.
113. To prevent constipation which one of the following is useful :
- (A) Fast food (B) Drinking ample water  
 (C) Fibre rich diet (D) Both b and c
114. Vitamin B<sub>12</sub> consists of which type of mineral :
- (A) CO<sub>2</sub> (B) Ni  
 (C) Fe (D) None of these
115. A person who is on a long hunger strike and is surviving only on water, will have :
- (A) Less amino acids in his urine.  
 (B) More glucose in his blood.  
 (C) Less urea in his urine.  
 (D) More sodium in his urine.
116. Which of the following vitamins is water soluble as well as an antioxidant ?
- (A) Vitamin-B<sub>1</sub> (B) Vitamin-A  
 (C) Vitamin-D (D) Vitamin-C
117. The richest sources of vitamin B<sub>12</sub> are :
- (A) Rice and hen's egg  
 (B) Carrot and chicken breast  
 (C) Goat's liver and spirullina  
 (D) Chocolate and green gram
118. What is one important function of fat in the body ?
- (A) To provide precursors for glucose synthesis  
 (B) To build muscle tissue  
 (C) To regulate blood glucose  
 (D) To protect vital organs against shock
119. Vitamin C serves as a (n)
- (A) coenzyme (B) antagonist  
 (C) antioxidant (D) intrinsic factor
120. Which of the following nutrients show a dramatic increase in absorption during pregnancy ?
- (A) Salt and sugar  
 (B) Protein and fat  
 (C) Calcium and iron  
 (D) Thiamin and ascorbic acid
121. What is one of the most significant nutritional concerns for older adults ?
- (A) Depression caused by the death of a spouse, sibling, or friend  
 (B) Dehydration caused by lack of thirst  
 (C) Insufficient intake of carbohydrates to maintain adequate weight  
 (D) Excess intake of high-dose multivitamins
122. When there is insufficient glucose consumed to support metabolism, fat fragments combine to form
- (A) ketone bodies (B) glycerol  
 (C) chylomicrons (D) triglycerides
123. Who is the most appropriate person to consult regarding nutritional information ?
- (A) Chiropractor  
 (B) Medical doctor  
 (C) Health food store owner  
 (D) Registered dietitian
124. Glycogen is mainly stored in
- (A) muscle and liver tissue  
 (B) pancreas and kidney tissue  
 (C) stomach and intestine tissue  
 (D) brain and red blood cell tissue
125. In what population group are the effects of vitamin A deficiency most severe ?
- (A) Newborns (B) Adolescents  
 (C) Adults (D) Elderly
126. Which of the following foods requires the LEAST energy to produce ?
- (A) Fruit (B) Vegetables  
 (C) Grains (D) Meat

Space for Rough Work

127. Which of the following vitamins is most likely to be missing from a vegan diet ?  
 (A) A (B) B<sup>12</sup>  
 (C) C (D) E
128. The vitamin which would most likely become deficient in an individual who develops a completely carnivorous life style is  
 (A) Thiamin (B) Niacin  
 (C) Vitamin C (D) Cobalamin
129. Pellagra occurs in population dependent on  
 (A) Wheat (B) Rice  
 (C) Maize (D) Milk
130. Vitamin B<sub>12</sub> is synthesized by  
 (A) Bacteria (B) Plants only  
 (C) Animals only (D) Both (A) and (C)
131. Vitamin E stored in  
 (A) Mitochondria (B) Microsome  
 (C) Both (A) and (B) (D) None of these
132. The symptoms of scurvy are  
 (A) poor healing of wounds  
 (B) loosening of teeth  
 (C) Anaemia  
 (D) all of these
133. A non essential amino acid is not  
 (A) Absorbed in the intestines  
 (B) Required in the diet  
 (C) Incorporated into the protein  
 (D) Metabolized by the body
134. The number of nutritionally essential amino acid for man is  
 (A) 6 (B) 8  
 (C) 10 (D) 12
135. The action of vitamin K in formation of clotting factor is through.  
 (A) Post transcription  
 (B) Post translation  
 (C) Golgi complex  
 (D) Endoplasmic reticulum

**[BOTANY]**

136. If two pea plants having red (dominant) coloured flowers with unknown genotypes are crossed, 75% of the flowers are red and 25% are white. The genotypic constitution of the parents having red coloured flowers will be  
 (A) both homozygous  
 (B) one homozygous and other heterozygous  
 (C) both heterozygous  
 (D) both hemizygous
137. Mendel does not get linkage due to  
 (A) dominance  
 (B) independent assortment  
 (C) segregation  
 (D) genes on same chromosome
138. Multiple phenotype seen in  
 (A) pleiotropy (B) incomplete dominance  
 (C) multiple allelism (D) polygenic inheritance
139. Genotypic and phenotypic ratio in monohybrid cross remains same in case of  
 (A) sex linked genes  
 (B) pseudoallelic genes  
 (C) intermediate inheritance  
 (D) dominant and recessive genes
140. Four children belonging to the same parents have the following blood groups A, B, AB and O. Hence, the genotypes of the parents are  
 (A) both parents are homozygous for 'A' group  
 (B) one parent is homozygous for 'A' and another parent is homozygous for 'B'  
 (C) one parent is heterozygous for 'A' and another parent is heterozygous for 'B'  
 (D) Both parents are homozygous for 'B' group.

Space for Rough Work

141. If heterozygous tall plant is crossed with a homozygous dwarf plant, then the percentage of progeny having dwarf character, is  
 (A) 0% (B) 25%  
 (C) 50% (D) 100%
142. Test cross is a cross between  
 (A) Hybrid × Dominant parent  
 (B) Hybrid × Recessive parent  
 (C) Hybrid × Hybrid parent  
 (D) Two distantly related species
143. In garden pea, yellow colour of cotyledons is dominant over green and round shape of seed is dominant over wrinkled. When a plant with yellow and round seeds is crossed with a plant having yellow and wrinkled seeds, the progeny showed segregation for all the four characters. The probability of obtaining green round seeds in the progeny of this cross, is  
 (A) 1/4 (B) 1/8  
 (C) 1/16 (D) 3/16
144. A true breeding plant producing red flowers is crossed with a pure plant producing white flowers. Allele for red colour of flower is dominant. After selfing the plants of first filial generation, the proportion of plants producing white flowers in the progeny would be  
 (A) 3/4 (B) 1/4  
 (C) 1/3 (D) 1/2
145. In which one of the following, complementary gene interaction ratio of 9 : 7 is observed ?  
 (A) Fruit shape in Shepherd's purse  
 (B) Coat colour in mouse  
 (C) Feather colour in fowl  
 (D) Flower colour in pea
146. In Guinea pigs, black short hair (BBSS) is dominant over white long hair (bbss). During a dihybrid cross, the F<sub>2</sub>-generation individuals with genotypes BBSS, BbSS, BBSs and BbSs are in the ratio of  
 (A) 9 : 3 : 3 : 1 (B) 4 : 2 : 1 : 2  
 (C) 1 : 2 : 1 : 2 (D) 1 : 2 : 2 : 4
147. If AAbb × aaBB, then phenotypic ratio of its progeny will be  
 (A) 9 : 3 : 3 : 1 (B) 1 : 2 : 1  
 (C) 1 : 1 : 1 : 1 (D) 4 : 1
148. In pea plants, yellow seeds are dominant to green. If a heterozygous yellow seeded plant is crossed with a green seeded plant, what ratio of yellow and green seeded plants would you expect in F<sub>1</sub> - generation ?  
 (A) 50 : 50 (B) 9 : 1  
 (C) 1 : 3 (D) 3 : 1
149. Rrrr progeny : Red (dominant) flowered heterozygous crossed with white flower  
 (A) 350 @ red : 350 @ white  
 (B) 450 @ red : 250 @ white  
 (C) 380 @ red : 320 @ white  
 (D) None of the above.
150. When a cross is conducted between black feathered hen and white feathered cock, blue feathered fowls are formed. When these fowls are allowed for interbreeding, in F<sub>2</sub>-generation, there are 20 blue fowls. What would be the number of black and white fowls ?  
 (A) Black 20, white 10  
 (B) Black 20, white 20  
 (C) Black 10, white 10  
 (D) Black 10, white 20

Space for Rough Work

151. In Mendel's experiments with garden pea, round seed shape (RR) was dominant over wrinkled seeds (rr), yellow cotyledon (YY) was dominant over green cotyledon (yy). What are the expected phenotypes in the F<sub>2</sub>-generation of the cross RRYy x rryy ?
- (A) only round seeds with green cotyledons  
 (B) only wrinkled seeds with yellow cotyledons  
 (C) only wrinkled seeds with green cotyledons  
 (D) round seeds with yellow cotyledons and wrinkled seeds with yellow cotyledons
152. Assertion : An organism with lethal mutation may not even develop beyond the zygote stage.  
 Reason : All types of gene mutations are lethal.
- (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 the correct explanation of Assertion.  
 (C) Assertion is true but Reason is false  
 (D) Both Assertion and Reason are false.
153. Leaf colour in *Mirabilis jalapa* is an example of
- (A) non-Mendelian inheritance  
 (B) Mendelian inheritance  
 (C) chemical inheritance  
 (D) both (b) and (c)
154. Two pea plants were subjected for cross pollination. Of the 183 plants produced in the next generation, 94 plants were found to be tall and 89 plants were found to be dwarf. The genotypes of the two parental plants are likely to be
- (A) TT and tt      (B) Tt and Tt  
 (C) Tt and tt      (D) TT and TT
155. Pure tall plants are crossed with pure dwarf plants. In the F<sub>1</sub>-generation, all plants were tall. These tall plants of F<sub>1</sub>-generation were selfed and the ratio of tall to dwarf plants obtained was 3 : 1. This is called

- (A) dominance      (B) inheritance  
 (C) codominance      (D) heredity
156. Probability of genotype TTrr in F<sub>2</sub>-generation of a dihybrid cross is
- (A)  $\frac{1}{16}$       (B)  $\frac{3}{16}$   
 (C)  $\frac{9}{16}$       (D)  $\frac{6}{16}$
157. The linkage map of X-chromosomes of fruit fly has 66 units, with yellow body gene (y) at one end and bobbed hair (b) gene at the other end. The recombination frequency between these two genes (y and b) should be
- (A) 50%      (B) 100%  
 (C) 66%      (D) >50%
158. In F<sub>2</sub>-generation, quantitative inheritance 1 : 4 : 6 : 4 : 1 is obtained instead of
- (A) 9 : 3 : 3 : 1      (B) 8 : 6 : 4 : 1  
 (C) 7 : 4 : 1 : 4      (D) 6 : 6 : 4 : 7
159. Match the items given in column I with those listed in column II. Choose the answer with correct combination of alphabets of the two columns.

Columns I (Character)	Columns II (Genotype)
--------------------------	--------------------------

- |                     |             |
|---------------------|-------------|
| (a) Monohybrid      | (1) T and t |
| (b) Test cross      | (2) TT      |
| (c) Alleles         | (3) Tt × Tt |
| (d) Homozygous tall | (4) tt      |
|                     | (5) Tt × tt |
| a                   | b    c    d |
| (A) 3               | 5    4    2 |
| (B) 5               | 3    2    4 |
| (C) 3               | 5    1    2 |
| (D) 3               | 1    5    2 |

Space for Rough Work



160. Inheritance of skin colour in human is an example of  
(A) chromosomal aberration  
(B) codominance  
(C) point mutation  
(D) polygenic inheritance
161. Walter Sutton is famous for his contribution to  
(A) genetic engineering  
(B) totipotency  
(C) quantitative genetics  
(D) chromosomal theory of inheritance.
162. A person with unknown blood group under ABO system, has suffered much blood loss in an accident and needs immediate blood transfusion. His one friend who has a valid certificate of his own blood type, offers for blood donation without delay. What would have been the type of blood group of the donor friend ?  
(A) Type AB (B) Type O  
(C) Type A (D) Type B
163. A hereditary disease which is never passed on from father to son is  
(A) X-chromosomal linked disease  
(B) Autosomal linked disease  
(C) Y-chromosomal linked disease  
(D) None of the above
164. Allelism refers to  
(A) genic interactions controlling a character  
(B) multiple genes controlling a character  
(C) Expression of many characters by a single gene  
(D) alternative forms of a gene at a given locus.
165. Which one of the following genotypes does not produce any sugar polymer on the surface of the RBC ?  
(A)  $I^A I^A$  (B)  $I^B i$   
(C)  $I^A I^B$  (D)  $i i$
166. A woman is married for the second time. Her first husband was ABO blood type A, and her child by that marriage was type O. Her new husband is type B and their child is type AB.  
What is the woman's ABO genotype and blood type?  
(A)  $I^A I^O$ ; Blood type A  
(B)  $I^A I^B$ ; Blood type AB  
(C)  $I^B I^O$ ; Blood type B  
(D)  $I^O I^O$ ; Blood type O
167. Sickle cell anaemia is  
(A) an autosomal linked dominant trait  
(B) cause by substitution of valine by glutamic acid in the b-globin chain of haemoglobin.  
(C) caused by a change in base pair of DNA  
(D) characterized by elongated sickle like RBCs with a nucleus
168. Genetic map is one that  
(A) shows the stages during the cell division  
(B) shows the distribution of various species in a region  
(C) establishes sites of the genes on a chromosome  
(D) establishes the various stages in gene evolution
169. Mutations can be induced with  
(A) IAA  
(B) ethylene  
(C) gamma radiations  
(D) infra red radiations

Space for Rough Work

170. Point mutation involves  
(A) insertion  
(B) change in single base pair  
(C) duplication  
(D) deletion
171. Who postulated the mutation theory ?  
(A) Mendel (B) Darwin  
(C) Lamarck (D) Hugo de Vries
172. Haploids are more suitable for mutation studies than the diploids. This is because  
(A) haploids are reproductively more stable than diploids  
(B) mutagens penetrate in haploids more effectively than in diploids  
(C) haploids are more abundant in nature than diploids  
(D) all mutations whether dominant or recessive are expressed in haploids.
173. Mutation can not change  
(A) RNA (B) environment  
(C) enzyme (D) DNA
174. After a mutation at a genetic locus character of an organism changes due to the change in  
(A) protein structure  
(B) DNA replication  
(C) protein synthesis pattern  
(D) RNA transcription pattern
175. Plant which used by Hugo de Vries for mutation experiment was  
(A) *Oenothera lamarckiana*  
(B) *Solanum tuberosum*  
(C) *Ficus elastica*  
(D) None of the above.
176. The  $F_1$  generation has all tall, and  $F_2$  ratio is 3 : 1, it proves  
(A) law of dominance (B) independent assortment  
(C) law of segregation (D) linkage
177. Allelism refers to  
(A) genic interactions controlling a character  
(B) multiple genes controlling a character  
(C) expression of many characters by a single gene  
(D) alternative forms of a gene at a given locus
178. The  $F_2$  genotypic ratio of monohybrid cross is  
(A) 1 : 1 (B) 1 : 2 : 1  
(C) 2 : 1 : 2 (D) 9 : 3 : 3 : 1
179. In case of incomplete dominance, what will be the phenotypic ratio of  $F_2$  generation ?  
(A) 3 : 1 (B) 1 : 2 : 1  
(C) 1 : 1 : 1 : 1 (D) 2 : 2
180. A character, which is expressed in a hybrid is called  
(A) dominant (B) recessive  
(C) codominant (D) epistatic



Space for Rough Work