NTPL

ALL INDIA TEST SERIES

CODE - A

TEST ID 001903

AIIMS - 2019

PART TEST - 3

Time : $3^{1/2}$ Hours ***Maximum Marks : 200***

Syllabus Covered

Physics	: Work, Power & Energy, Modern Physics, LOM.
Chemistry	: Reaction Mechanism, Equilibrium I & II, Gaseous state.
Biology	: Locomotion and movement, Neural control and coordination, Chemical coordination and Integration, Human health and disease, Strategies for enhancement in food production, Microbes in human welfare, Human reproduction, Reproductive health.
G.K.	: Current affair.

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

1. This booklet is your Question Paper containing **200 questions**.
2. The test is of **$3^{1/2}$ hours** duration. The question paper consists of **4 sections** (Physics, Chemistry, Biology & General Knowledge).
3. Each question carries **1 mark**. For each correct response the candidate will get **1 mark**. For each incorrect response, **-1/3 mark** will be deducted. The maximum marks are **200.**
4. Fill the bubbles completely and properly using a **Blue/Black Ball Point Pen** only.
5. No additional sheets will be provided for rough work.
6. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers, and electronic gadgets in any form are not allowed to be carried inside the examination hall.
7. The answer sheet, a machine-readable Optical mark recognition sheet (OMR Sheet), is provided separately.
8. DO NOT TAMPER WITH / MUTILATE THE OMR OR THE BOOKLET.
9. Do not break the seals of the question-paper booklet before being instructed to do so by the invigilator.

Name of the Candidate (in Capitals) _____

Test Centre _____ Centre Code _____

Candidate's Signature _____ Invigilator's Signature _____

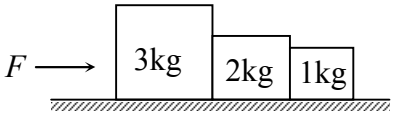
PHYSICS

SECTION – I

1. At a curved path of the road, the roadbed is raised a little on the side away from the center of the curved path. The slope of the roadbed is given by

(a) $\tan^{-1}\frac{v^2 g}{r}$ (b) $\tan^{-1}\frac{rg}{v^2}$ (c) $\tan^{-1}\frac{r}{gv^2}$ (d) $\tan^{-1}\frac{v^2}{rg}$

2. Consider the following statement about the blocks shown in the diagram that are being pushed by a constant force on a frictionless table.



A. All blocks move with the same acceleration.

B. The net force on each block is the same

which of these statement are/is correct

(a) A only (b) B only (c) both A and B (d) neither A nor B

3. A body of mass 2 kg moves vertically downwards with an acceleration $a = 19.6$ m/s^2. The force acting on the body simultaneously with the force of gravity is ($g = 9.8$ m/s^2, neglect air resistance)

(a) 19.6 N (b) 19.2 N (c) 59.2 N (d) 58.8 N

4. A girl of mass 50 kg stands on a measuring scale in a lift. At an instant, it is detected that the reading reduces to 40 kg for a while and then returns to original value. It can be said that

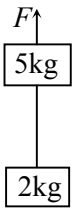
(a) the lift was in constant motion upwards

(b) the lift was in constant motion downwards

(c) the lift was suddenly started in downward motion

(d) the lift was suddenly started in upward motion

5. Two blocks of masses 5 kg and 2 kg are connected by a massless string as shown in figure. A vertical force F is applied on the 5kg block. Find the value of F if tension in the string is 40 N. ($g = 10$ m/s^2)



(a) 140 N

(b) 70 N

(c) 40 N

(d) 100 N

6. A body of mass m is kept stationary on a rough inclined plane of inclination θ. The magnitude of force acting on the body by the inclined plane is

(a) mg (b) $mg \sin\theta$ (c) $mg \cos\theta$ (d) $mg\sqrt{1+\cos^2\theta}$

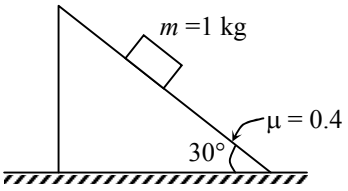
7. Two masses m and M are connected by a light string passing over a smooth pulley. When set free m moves up by 1.4 m in 2 s. The ratio $\frac{m}{M}$ is ($g = 9.8\ ms^{-2}$)

(a) $\frac{13}{15}$ (b) $\frac{15}{13}$ (c) $\frac{9}{7}$ (d) $\frac{7}{9}$

8. A block of mass m is attached to a massless spring of spring constant K. This system is accelerated upward with acceleration a. The elongation in spring will be

(a) $\frac{mg}{K}$ (b) $\frac{m(g-a)}{K}$ (c) $\frac{m(g+a)}{K}$ (d) $\frac{ma}{K}$

9. A block of mass 1 kg is placed on a rough incline as shown. The coefficient of friction between block and incline is 0.4. The acceleration of block is ($g = 10\ ms^{-2}$, $\sqrt{3} = 1.7$)



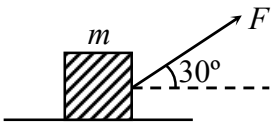
(a) zero

(b) 1.6 ms^{-2}

(c) 6.5 ms^{-2}

(d) 5 ms^{-2}

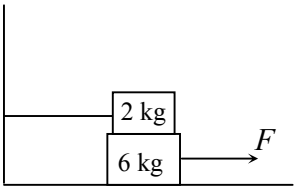
10. A mass m rests on a horizontal surface. The coefficient of friction between the mass and the surface is μ. If the mass is pulled by a force F as shown in figure, the limiting friction between the mass and the surface will be



(a) μmg (b) $\mu[mg - (\sqrt{3}/2)F]$

(c) $\mu[mg - (F/2)]$ (d) $\mu[mg + (F/2)]$

11. A block of mass 2 kg is resting over another block of mass 6 kg. 2 kg block is connected to one end of a string fixed to a vertical wall as shown. If the coefficient of friction between the blocks is 0.4, the force required to pull out the 6 kg block with an acceleration of 1.5 m/s^2 will be ($g = 10\ ms^{-2}$)



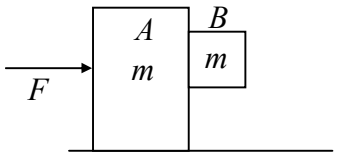
(a) 17 N

(b) 9 N

(c) 8 N

(d) 1 N

12. In figure shown all surfaces are smooth. A force $F = 2mg$ is acting on block A. If R is contact force between A and B and a is acceleration of B then



(a) $R = mg, a = g$ (b) $R = mg, a = \sqrt{2}g$

(c) $R = 2mg, a = g$ (d) $R = 2mg, a = \sqrt{2}g$

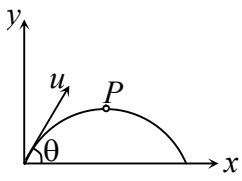
13. A motor car is traveling at 60 m/s on a circular road of radius 1200 m. It is increasing its speed at the rate of 4 m/s^2. The acceleration of the car is

(a) 3 m s^{-2} (b) 4 m s^{-2} (c) 5 m s^{-2} (d) 7 m s^{-2}

14. A particle of mass 0.1 kg is whirled at the end of a string in a vertical circle of radius 1.0 m at a constant speed of 5 m/s. The tension in the string at the highest point of its path is (g = 10 m/s^2)

(a) 0.5 N (b) 1.0 N (c) 1.5 N (d) 2.0 N

15. A particle projected with an initial velocity u at angle θ from the ground. What is the work done by gravity during the time it reaches the highest point P is:



(a) $\dfrac{-mu^2 \sin^2 \theta}{2}$ (b) $+\dfrac{mu^2 \sin^2 \theta}{2}$

(c) 0 (d) $+mu^2 \sin \theta$

16. A position dependent force $F = 7 - 2x + 3x^2 N$ acts on a small body of mass 2 kg and displaces it from x = 0 to x = 5m. The work done in joule is

(a) 70 J (b) 270 J (c) 35 J (d) 135 J

17. A particle is released from rest at origin. It moves under the influence of potential field $U = x^2 - 3x$, where U is in Joule and x is in metre. Kinetic energy at x = 2 m will be

(a) 2 J (b) 1 J (c) 1.5 J (d) 0 J

18. A cricket ball is hit for a six leaving the bat at an angle of 45º to the horizontal with kinetic energy K. At the top position the kinetic energy of the ball is

(a) zero (b) K (c) $K/2$ (d) $K/\sqrt{2}$

19. Choose the incorrect statement

(a) no work is done on moving a block uniformly on a smooth horizontal table.

(b) work done by earth's gravitational force on moon is zero, considering moon's orbit to be circular

(c) no work is done by weight lifter holding a 175 kg mass steadily on his shoulder for 30 s.

(d) work done by frictional force is always negative.

20. A particle of mass 2 kg starts moving in a straight line with an initial velocity of 2 m/s at a constant acceleration of 2 m/s^2. The rate of change of kinetic energy is

(a) four times the velocity at any moment

(b) two times the displacement at any moment

(c) four times the rate of change of velocity at any moment

(d) constant throughout

21. A block of mass m = 0.1 kg is released from a height of 4 m on a curved smooth surface. On the horizontal smooth surface it collides with a spring of force constant 800 N/m. The maximum compression in spring will be (g = 10 m/s^2)

(a) 1 cm (b) 5 cm

(c) 10 cm (d) 20 cm

22. An ideal spring with spring-constant k is hung from the ceiling and a block of mass M is attached to its lower end. The mass is released with the spring initially unstretched. Then the maximum extension in the spring is

(a) $\frac{4Mg}{k}$ (b) $\frac{2Mg}{k}$ (c) $\frac{Mg}{k}$ (d) $\frac{Mg}{2k}$

23. When a body moves in a circle, the work done by the centripetal force is always

(a) >0 (b) <0 (c) zero (d) none of these

24. A 1 kg block moves towards a light spring with a velocity of 8 m/s. When the spring is compressed by 3 m, its momentum becomes half of the original momentum. Spring constant of the spring is

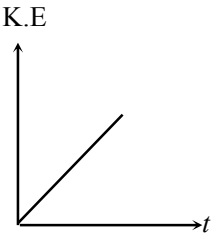
(a) 18/3 N/m

(b) 16/3 N/m

(c) 3 N/m

(d) 8 N/m

25. The kinetic energy of a body moving along a straight line varies with time as shown in the figure. The force acting on the body is



(a) zero

(b) constant

(c)directly proportional to velocity

(d) inversely proportional to velocity

26. An object is thrown horizontally from a tower H meter high with a velocity of $\sqrt{2gH}$ m/s. Its velocity on striking the ground will be

(a) $\sqrt{2gH}$ (b) $\sqrt{6gH}$ (c) $2\sqrt{gH}$ (d) $2\sqrt{2gH}$

27. The string of a pendulum of length l is displaced through 60° from the vertical and released. The minimum strength of the string in order to withstand the tension as the pendulum passes through the mean position is (mass of bob is m)

(a) 2 mg (b) 3 mg (c) 5 mg (d) 6 mg

28. The energy that should be added to an electron, to reduce its de-Broglie wavelengths from 10^{-10}m to 0.5×10^{-10} m, will be

(a) four times the initial energy (b) thrice the initial energy

(c) equal to the initial energy (d) twice the initial energy

29. When ${}_3Li^7$ nuclei are bombarded by protons, and the resultant nuclei are ${}_4Be^8$, the emitted particles will be

(a) neutrons (b) alpha particles (c) beta particles (d) gamma photons

30. Two electrons of kinetic energy 2.5 eV fall on a metal plate, which has work function of 4.0 eV. Number of electrons ejected from the metal surface is

(a) one (b) two (c) zero (d) more than two

31. Two radioactive substances X and Y initially contain equal number of nuclei. X has a half life of 1 hour and Y has half life of 2 hours. After two hours the ratio of the activity of X to the activity of Y will be

(a) 1 : 4 (b) 1 : 2 (c) 1 : 1 (d) 2 : 1

32. The binding energy per nucleon of deuteron (${}_1H^2$) and helium nucleus (${}_2He^4$) are 1.1 MeV and 7 MeV respectively. If two deuteron nuclei react to form a single helium nucleus, then energy released is

(a) 13.9 MeV (b) 26.9 MeV (c) 23.6 MeV (d) 19.2 MeV

33. An X-ray tube is operating at 2 million-volts. What is the wavelength of shortest wave produced?

(a) 6×10^{-3} m (b) 6×10^{-5} m (c) 6×10^{-1} m (d) None of these

34. If the deBroglie wavelength of a proton is 1.0×10^{-13}m, the electric potential through which it must have been accelerated is

(a) 4.07×10^4 V (b) 8.2×10^4 V (c) 8.2×10^3 V (d) 4.07×10^5 V

35. If proton and α-particles are accelerated by the same potential difference, then their De-Broglie wavelength will be in the ratio of

(a) $\sqrt{2}$ (b) 2 (c) $2\sqrt{2}$ (d) 4

36. If photons of energy 12.75 *eV* are passing through hydrogen gas in ground state then no. of lines in emission spectrum will be

(a) 6 (b) 4 (c) 3 (d) 2

37. A radiation of energy *E* falls normally on a perfectly absorbing surface. The momentum transferred to the surface is

(a) $\frac{E}{c}$ (b) $\frac{2E}{c}$ (c) Ec (d) $\frac{E}{c^2}$

38. If doubly ionized lithium atom is hydrogen like with atomic number 3, the wavelength of radiation required to excite the electron in Li^{++} from the first to the third Bohr orbit and the number of different spectral lines observed in the emission spectrum of the above excited system are

(a) 296 Å, 6 (b) 114 Å, 3 (c) 1026 Å, 6 (d) 8208 Å, 3

39. In a photoelectric experiment, the wavelength of incident radiation is reduced from 6000Å to 4000Å then

(a) Stopping potential will decrease

(b) Stopping potential will increase

(c) Kinetic energy of emitted electrons will decrease

(d) The value of work function will decrease

40. As per Bohr model, the minimum energy (in eV) required to remove an electron from the ground state of doubly ionized *Li* and ($Z = 3$) is

(a) 1.51 (b) 13.6 (c) 40.8 (d) 122.4

Directions : In the following questions (41–60), a statement of assertion is followed by a statement of reason. Mark the correct choice as :

(A) If **Assertion** and **Reason** are true and **Reason** is the correct explanation of the **Assertion.**

(B) If **Assertion** and **Reason** are true but **Reason** is not the correct explanation of the **Assertion.**

(C) If **Assertion** is true but **Reason** is false.

(D) **Assertion** is false.

41. **Assertion**: In uniform circular motion, work done by tension in a loop is zero.

Reason: In uniform motion, tension is always perpendicular to the velocity.

(a) (A) (b) (B) (c) (C) (d) (D)

42. **Assertion**: A block is at rest on an inclined plane of inclination θ, net contact force on the block is *mg*.

Reason: If block is at rest, then net force on the block is zero.

(a) (A) (b) (B) (c) (C) (d) (D)

43. **Assertion**: Without friction between our feet and the ground, it will not be possible to walk.

Reason: Frictional force is necessary to start motion.

(a) (A) (b) (B) (c) (C) (d) (D)

44. **Assertion**: A string can never remain horizontal, when loaded at the middle, howsoever large the tension may be

Reason: If string is horizontal, then there is no component of tension which can balance the weight of the body.

(a) (A) (b) (B) (c) (C) (d) (D)

45. **Assertion**: A body can move in a circular path without having acceleration.

Reason: In a uniform circular motion, the linear speed of the body is constant.

(a) (A) (b) (B) (c) (C) (d) (D)

46. **Assertion**: A block of mass *m* is placed on a horizontal surface and its free body diagram is shown in figure (b). Normal force and its weight is action and reaction pair.

Reason: Action and reaction forces are always equal in magnitude and opposite in direction.

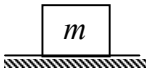
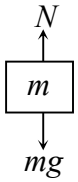
Fig. (a) 

Fig. (b) 

(a) (A) (b) (B) (c) (C) (d) (D)

47. **Assertion**: A monkey slides down a vertical rope with constant acceleration (< *g*). The tension force on the monkey is in upward direction.

Reason: In assertion, net force on the monkey is in downward direction.

(a) (A) (b) (B) (c) (C) (d) (D)

48. **Assertion**: Friction force is a non-conservative force.

Reason: When a body is moved on a rough surface in a closed path, the work done by friction force is zero.

(a) (A) (b) (B) (c) (C) (d) (D)

49. **Assertion**: Work done by frictional force on a sphere rolling without slipping on an inclined plane is negative.

Reason: Work done by the force F, $W = \int \vec{F}.d\vec{S}$

(a) (A) (b) (B) (c) (C) (d) (D)

50. **Assertion**: Work done by friction force may be positive.

Reason: Force of friction always opposes relative motion.

(a) (A) (b) (B) (c) (C) (d) (D)

51. **Assertion**: Work done by spring force is always negative.

Reason: In compression or stretching of a spring from its natural length, work is done on the spring against the restoring force.

(a) (A) (b) (B) (c) (C) (d) (D)

52. **Assertion**: Work done by a force in a certain interval of time may not depend on initial velocity.

Reason: Work done by a force is frame dependent.

(a) (A) (b) (B) (c) (C) (d) (D)

53. **Assertion**: Work done in moving a body over a smooth inclined plane depends upon slope of inclined plane if height is same.

Reason: $W = mgh = mgl \sin\theta$, where l is length of inclined plane and θ is inclination with the horizontal.

(a) (A) (b) (B) (c) (C) (d) (D)

54. **Assertion:** In a hydrogen atom energy of emitted photon corresponding to transition from $n = 2$ to $n = 1$ is much greater as compared to transition from $n = \infty$ to $n = 2$.

Reason: Wavelength of photon is directly proportional to the energy of emitted photon.

(a) (A) (b) (B) (c) (C) (d) (D)

55. **Assertion**: Time required for 75% radioactive disintegration $(t_{3/4}) = 2 \times t_{1/2}$.

Reason: Half life $(t_{1/2})$ of the radioactive disintegration is independent of temperature.

(a) (A) (b) (B) (c) (C) (d) (D)

56. **Assertion**: X-rays are not deflected by electric and magnetic field.

Reason: X-rays travel with velocity equal to that of light

(a) (A) (b) (B) (c) (C) (d) (D)

57. **Assertion:** Work function of aluminium is 4.2 eV. If two photons of each of energy 2.5 eV strike on an electron of aluminium, the electron is not emitted.

Reason: In photoelectric effect a single photon interacts with a single electron and electron is emitted only if energy of each of incident photon is greater than the work function.

(a) (A) (b) (B) (c) (C) (d) (D)

58. **Assertion**: ${}_ZX^A$ undergoes 2α-decays, 2β-decays and 2γ-decays and the daughter product is ${}_{Z-2}X^{A-8}$.

Reason: In α-decay the mass number decreases by 4 units and atomic number decreases by 2 units. In β-decay the mass number remains unchanged, but atomic number increases by 1 unit only. In γ-decay, mass number and atomic number remain unchanged.

(a) (A) (b) (B) (c) (C) (d) (D)

59. **Assertion**: In an isothermal process, heat supplied to an ideal gas is completely used.

Reason: In isothermal process, internal energy remains unchanged.

(a) (A) (b) (B) (c) (C) (d) (D)

60. **Assertion**: If takes lesser energy to ionize the electron of hydrogen atom that is in excited state than one in the ground state.

Reason: Kinetic energy of an electron in ground state of hydrogen atom is greater than that in the excited state of hydrogen atom.

(a) (A) (b) (B) (c) (C) (d) (D)

CHEMISTRY

SECTION – II

61. Chemical equilibrium is dynamic in nature because

(a) The equilibrium in maintained quickly

(b) Conc. of reactants and products become same at equilibrium

(c) Conc. of reactants and products are constant but different

(d) Both forward and backward reactions occur at all times with same speed

62. In a chemical equilibrium, the equilibrium constant is found to be 2.5. If the rate constant of backward reaction is 3.2×10^{-2}, the rate constant of forward reaction is –

(a) 8.0×10^{-2} (b) 4.0×10^{-2} (c) 3.5×10^{-2} (d) 7.6×10^{-3}

63. K_1 and K_2 are the rate constants of forward and backward reactions. The equilibrium constant K of the reaction is -

(a) $K_1 \times K_2$ (b) $K_1 - K_2$ (c) $\frac{K_1}{K_2}$ (d) $\frac{K_1 + K_2}{K_1 - K_2}$

64. For the reaction

$C(s) + CO_2(g) \rightleftharpoons 2CO(g)$ the partial pressure of CO_2 and CO are 2.0 and 4.0 atm respectively at equilibrium. The K_p for the reaction is

(a) 0.5 (b) 4.0 (c) 8.0 (d) 32.0

65. In the reaction, $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) + X$ cals, most favourable condition of temperature and pressure for greater yield of SO_3 are

(a) Low temperature and low pressure (b) High temperature and low pressure

(c) High temperature and high pressure (d) Low temperature and high pressure

66. At 250ºC and 1 atmospheric pressure, the vapour density of PCl_5 is 57.9. What will be the dissociation of PCl_5

(a) 1.00 (b) 0.90 (c) 0.80 (d) 0.65

67. During thermal dissociation of gas, the vapour density

(a) Remains same (b) Will be increased

(c) Will be decreased (d) Some times increases some times decreases

68. Which of the following reaction will be favoured at low pressure?

(a) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ (b) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

(c) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$ (d) $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$

69. The reversible reaction

$[Cu(NH_3)_4]^{2+} + SO_3^{2-} \rightleftharpoons [Cu(NH_3)_3SO_3] + NH_3$ is at equilibrium. What would not happen if ammonia is added

(a) $[SO_3^{2-}]$ would increase

(b) $[Cu(NH_3)_3SO_3]$ would increase

(c) The value of equilibrium constant would not change

(d) $[Cu(NH_3)_4]^{2+}$ would increase

70. K_P will be equal to K_C under which of the following conditions for the reaction

$aA + bB \rightleftharpoons cC + dD$

(a) $(a + b) > (c + d)$ (b) $(a + b) - (c + d) = 0$

(c) $(c + d) > (a + b)$ (d) $(a + c) = (b + d)$

71. 28 ml of 0.1M oxalic acid ($H_2C_2O_4$) solution requires 10 ml of $KMnO_4$ for titration. 10 ml of this sample of $KMnO_4$ when added to excess of NH_2OH (hyroxyl amine) liberates N_2 at STP. The volume of N_2 liberated at NTP is –

(a) 24 ml (b) 38 ml (c) 46 ml (d) 56 ml

72. What is the minimum pH required to prevent the precipitation of ZnS in a solution that is 0.01 M $ZnCl_2$ and saturated with 0.10 M H_2S ?

[Given $K_{sp} = 10^{-21}$, $K_{a_1} \times K_{a_2} = 10^{-20}$]

(a) 0 (b) 1 (c) 2 (d) 4

73. Which of the following constitutes a set amphoteric species.

(a) H_3O^+, $H_2PO_4^-$, HCO_3^- (b) H_2O, HPO_4^{2-}, $H_2PO_2^-$

(c) H_2O, $H_2PO_3^-$, HPO_4^{2-} (d) $HC_2O_4^-$, $H_2PO_4^-$, SO_4^{2-}

74. Which of the following is/are soft bases? H_2O, H^-, CO, CO_2, C_2H_4, CN^-

(a) C_2H_4 (b) H^-, CN^-, CO

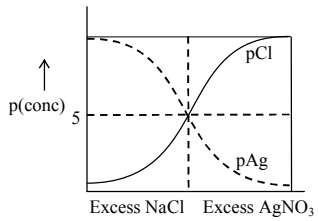
(c) H^-, CN^-, CO, C_2H_4 (d) H^-, CO, CO_2, C_2H_4

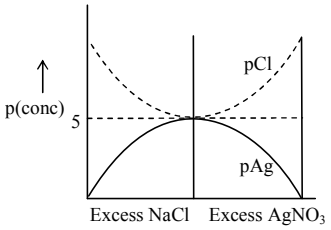
75. Fixed volume of 0.1 M benzoic acid ($pK_a = 4.2$) solution is added into 0.2 M sodium benzoate solution and formed a 300 ml, resultant acidic buffer solution. If pH of this buffer solution is 4.5 then find added volume of benzoic acid

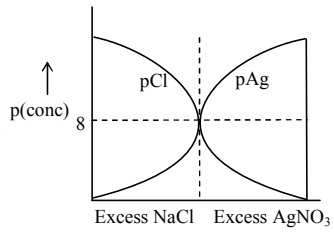
(a) 100 ml (b) 150 ml (c) 200 ml (d) None of these

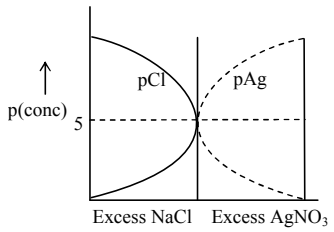
76. When 100 ml of 0.1 (N) NaCl solutions is titrated with 0.1 (N) $AgNO_3$ which of the following represent the titration plot?

Given K_{sp} of AgCl = 10^{-10}

(a) 

(b) 

(c) 

(d) 

77. The Ksp of FeS = 4×10^{-19} at 298 K. The minimum concentration of H^+ ions required to prevent the precipitation of FeS from a 0.01 M solution Fe^{2+} salt by passing H_2S is

(given $\frac{[H^+]^2[S^{-2}]}{0.1} = 1 \times 10^{-21}$)

(a) 1.6×10^{-3} M (b) 2.5×10^{-4} M (c) 2.0×10^{-2} M (d) 1.2×10^{-4} M

78. Which of the following constitutes a set amphoteric species?

(a) H_3O^+, $H_2PO_4^-$, HCO_3^- (b) H_2O, HPO_4^{2-}, $H_2PO_2^-$

(c) H_2O, $H_2PO_3^-$, HPO_4^{2-} (d) $HC_2O_4^-$, $H_2PO_4^-$, SO_4^{2-}

79. The pH of $Ba(OH)_2$ solution is 13. The number millimoles of $Ba(OH)_2$ present in 10 ml of solution would be

(a) 1.00 (b) 0.50 (c) 10.00 (d) 15.00

80. At certain temperature K_w for water 4×10^{-14} which of the following is incorrect for pure water at the given temperature?

log 2 = 0.3

(a) pH = 6.7 and water is acidic
(b) pH = 6.7 and water is neutral
(c) pOH = 6.7 and water is neutral
(d) pH + pOH = 13.4

81. A perfect gas exerting a pressure P atm and has density ρ (gL^{-1}). A plot of (P ρ) Versus P at constant T is drawn if $\left[\frac{d}{dp}(\rho P)\right]_{p=8.21\text{ atm}} = 5$ then the value of T is [Molar mass of gas = 4 g mol^{-1}]

(a) 40 K (b) 640 K (c) 160 K (d) 320 K

82. When one mole of an ideal gas is compressed to half its initial volume and simultaneously heated to twice to its initial temperature, the change in entropy (ΔS) is

(a) $C_v \ln 2$ (b) $C_p \ln 2$ (c) $R \ln 2$ (d) $(C_v - R) \ln 2$

83. A gas is heated in such a way that its pressure and volume both becomes double. Then by decreasing temperature, some of the molecules of air has been added in container to maintain the doubled volume and pressure. Assuming $\frac{1}{4}$th of initial number of moles has been added in for the purpose. By what fraction the temperature must has been raised finally of initial absolute temperatue?

(a) 4 times (b) $\frac{16}{5}$ times (c) $\frac{4}{5}$ times (d) $\frac{1}{5}$ times

84. The critical constants P_C & T_C for methane are 45 atm and 189 K. The correct statement is

(a) V_C = 2.4 L (b) b = 0.04 L/mol (c) V_C = 0.8 L (d) b = 0.8 L/mol

85. For a vessel at 1832 K containing 10 moles of steam at 50 atm. volume would be (Given: a = 5.46 atm. $L^2\ mol^{-2}$, b = 0.031 L mol^{-1})

(a) 10 L (b) 20 L (c) 30 L (d) 40 L

86. At low pressure if $RT = 2\sqrt{a.p}$, (a is vander Waal's constant) then the volume occupied by a real gas is

(a) $\frac{2RT}{P}$ (b) $\frac{2P}{RT}$ (c) $\frac{RT}{2P}$ (d) $\frac{2RT}{\sqrt{P}}$

87. My mass 100 kg. But I want to fly in the sky with the help of balloons. Each balloon contain 20 moles of $H_2(g)$ at the atmospheric temperature 300 K and at pressure of 0.05 atm. The mass of each balloon is 2.5 kg. The density of air = 1.25 gm/L and g = 10 m/s^2. How many minimum such balloon do I need to attach with myself to fly in the sky?

(a) 11 (b) 12 (c) 13 (d) 14

88. If the temperature of the gas is lesser than boyle's temperature, T_B, then

(a) at the very low pressure the Z decreases with pressure

(b) at the very low pressure the Z increases with Pressure

(c) at the very high pressure the Z decreases with pressure

(d) Z become independent on the pressure

89. One mole of a mono-atomic gas behaving as per PV = nRT at 27°C is subjected to reversible isoentropic compression untill final temperature reaches 327°C. If the initial pressure was 1.0 atm then the value of ℓnP (final) is (given ℓn 2 = 0.7)

(a) 1.75 (b) 0.176 (c) 1.0395 (d) 2.0

90. The partial pressure of three gases A, B and C enclosed in a container are in the ratio 1 : 2 : 3. If the molecular weights of A, B and C are in the ratio 6 : 3 : 2, then the ratio by weights they are taken in the container is –

(a) 1 : 1 : 1 (b) 1 : 3 : 9 (c) 1 : 4 : 9 (d) 36 : 9 : 4

91. Which of the following molecules can behave both as a nucleophile and an electrophile?

(a) CH_3NH_2 (b) CH_3Cl (c) CH_3CN (d) CH_3OH

92. Correct arrangement of the following nucleophiles in the order of their nucleophilic strength is:

(a) $C_6H_5O^- < CH_3O^- < CH_3COO^- < OH^-$ (b) $CH_3COO^- < C_6H_5O^- < CH_3O^- < OH^-$

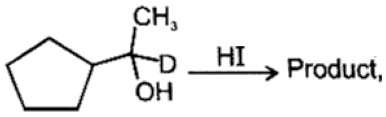
(c) $C_6H_5O^- < CH_3COO^- < CH_3O^- < OH^-$ (d) $CH_3COO^- < C_6H_5O^- < OH^- < CH_3O^-$

93. Which of the following is an electrophilic reagent?

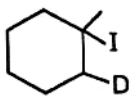
(a) H_2O (b) OH^- (c) CN_2^+ (d) none

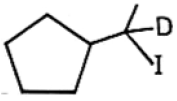
94. Which among the following species is an ambident nucleophile?

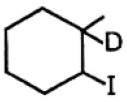
(a) $CH_3 - C\overset{\ominus}{H}_2$ (b) $CH_2 = CH_2$ (c) $\overset{\ominus}{C}N$ (d) $\ddot{N}H_3$

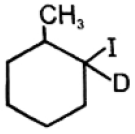
95. 

Identify the major product:

(a) 

(b) 

(c) 

(d) 

96. The decreasing order of rate of S_N2 reaction is:

CH_3-Cl $CH_3-\underset{\underset{O}{\|}}{C}-CH_2-Cl$ $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-Cl$ CH_3-CH_2-Cl

(I) (II) (III) (IV)

(a) $IV > III > II > I$ (b) $II > III > I > IV$ (c) $II > I > IV > III$ (d) none

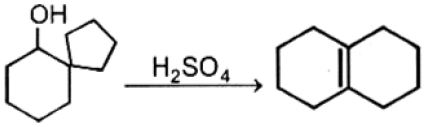
97. The given compound CH_3-O-CH_2-Br gives which one of the following reactions:

(a) Only S_N1 (b) Only S_N2 (c) S_N1 as well as S_N1 (d) E1

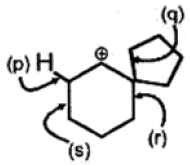
98. Which of the following conditions favour S_N2 mechanism?

(a) Polar protic solvent (b) High conc. of nucleophile

(c) 3° alkyl halide (d) All of these

99. 

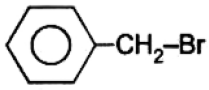
In the above reaction the product is shown, which is formed through the intermediate (carbocation) give below:

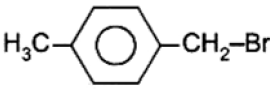


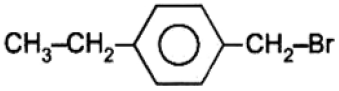
Which bond will migrate to form the above product?

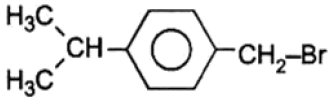
(a) p (b) q (c) r (d) s

100. Arrange the following compounds in order of decreasing rate of hydrolysis for S_N1 reaction:

(I) 

(II) 

(III) 

(IV) 

(a) $II > III > IV > I$ (b) $IV > III > II > I$ (c) $III > IV > II > I$ (d) $I > II > III > I$

Directions : The following questions (Q.101 to Q. 120) given below consist of an "Assertion" and "Reason" type questions. Use the following Key to choose the appropriate answer.

(A) If both **Assertion** and **Reason** are true and **Reason** is the correct explanation of the **Assertion.**

(B) If both **Assertion** and **Reason** are true but **Reason** is not correct explanation of the **Assertion.**

(C) If **Assertion** is true but **Reason** is false.

(D) If **Assertion** is false but **Reason** is true.

101. **Assertion:** A reaction which is spontaneous and accompanied by decrease of randomness, must be exothermic.

Reason : All exothermic reactions are accompanied by decrease of randomness

(a) (A) (b) (B) (c) (C) (d) (D)

102. **Assertion:** The formation of ozone gas from gaseous oxygen is a non spontaneous process.

Reason : The formation of ozone is initiated by the formation of atomic oxygen

(a) (A) (b) (B) (c) (C) (d) (D)

103. **Assertion :** For the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$, $K_p = K_c$.

Reason : K_p of all gaseous reactions is equal to K_c.

(a) (A) (b) (B) (c) (C) (d) (D)

104. **Assertion:** K_p is related to K_c by the relation, $K_p = K_c (RT)^{\Delta n}$

Reason : K_p has same units as K_c.

(a) (A) (b) (B) (c) (C) (d) (D)

105. **Assertion :** Reaction quotient Q is equal to K_{eq} when the reaction is in equilibrium.

Reason : If a catalyst is added to the reaction at equilibrium, the value of Q remains no longer equal to K_{eq}.

(a) (A) (b) (B) (c) (C) (d) (D)

106. **Assertion :** H_2SO_4, HCl and HNO_3 are all equally strong in water but not equally strong in acetic acid.

Reason : H_2O gives H^+ as well as OH^- ions, but CH_3 COOH gives only H^+ and no OH^- ions.

(a) (A) (b) (B) (c) (C) (d) (D)

107. **Assertion :** For S^{2-} only first step hydrolysis is considered.

Reason : The second step hydrolysis is negligible because of the common ion effect produced by the first step of hydrolysis.

(a) (A) (b) (B) (c) (C) (d) (D)

108. **Assertion :** At the higher concentration of $NaHCO_3$ in the aqueous solution, pH is independent on its concentration.

Reason : The extent of hydrolysis of HCO_3^- and the extent of ionization of HCO_3^- are dragged by each other.

(a) (A) (b) (B) (c) (C) (d) (D)

109. **Assertion :** The pK_a of weak acid (HA) becomes equal to pH of the solution at the midpoint of its titration.

Reason : The molar concentrations of proton acceptor and proton donar become equal at the midpoint of titration of weak acid.

(a) (A) (b) (B) (c) (C) (d) (D)

110. **Assertion :** H_2SO_4 is a strong acid.

Reason : H_2SO_4 undergoes almost complete ionization in aqueous solutions.

(a) (A) (b) (B) (c) (C) (d) (D)

111. **Assertion :** The kinetic energy of photoelectrons increases with increase in frequency of incident light.

Reason : The number of photoelectron ejected increases with increase in intensity of light.

(a) (A) (b) (B) (c) (C) (d) (D)

112. **Assertion :** Rate of effusion increases with the increase in temperature

Reason : Rate of effusion increases with the increase in pressure

(a) (A) (b) (B) (c) (C) (d) (D)

113. **Assertion :** Average velocity of gas molecules in a container moving in one dimension is zero.

Reason : Gas molecules are uniformaly distributed in the container at any given condition.

(a) (A) (b) (B) (c) (C) (d) (D)

114. **Assertion :** For linear molecule rotational energy is lesser than the rotational energy of non linear molecules.

Reason : For linear molecules vibrational energy is greater than the vibrational energy of non-linear molecule.

(a) (A) (b) (B) (c) (C) (d) (D)

115. **Assertion :** The critical temperature of water is higher than that of oxygen.

Reason : The molecular mass of oxygen is greater than that of H_2O.

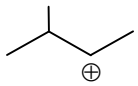
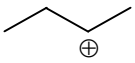
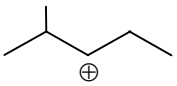
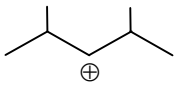
(a) (A) (b) (B) (c) (C) (d) (D)

116. **Assertion :** Furan has 8π electron

Reason : Furan follows huckel's rule and is aromatic

(a) (A) (b) (B) (c) (C) (d) (D)

117. **Assertion :** The order of stability of the carbocations :

(I)  (II)  (III)  (IV) 

is (IV) > (III) > (I) > (II)

Reason : Greater the electron releasing effect of groups on positive carbon more is stability.

(a) (A) (b) (B) (c) (C) (d) (D)

118. **Assertion :** Allyl free radical is more stable than simple alkyl free radical.

Reason : The allyl free radical stabilized by resonance.

(a) (A) (b) (B) (c) (C) (d) (D)

119. **Assertion :** Formaldehyde is a planar molecule.

Reason : Carbon atom in formaldehyde is sp^2-hybridized.

(a) (A) (b) (B) (c) (C) (d) (D)

120. Read the following statement and explanation and answer as per the option given below:

Assertion: Phenol is more reactive than benzene towards electrophilic substitution reaction.

Reason : In the case of phenol, the intermediate cabocation is more resonance stabilised.

(a) (A) (b) (B) (c) (C) (d) (D)

BIOLOGY

SECTION – III

121. Which of the following is not a male accessory sexual characteristics?

(a) Beard (b) Deep voice

(c) Broad shoulder (d) Increased fat in buttocks

122. In mammals, failure of testes to descend into the scrotum is known as :

(a) castration (b) impotency (c) paedogenesis (d) cryptorchidism

123. Which of the following is independent of testosterone?

(a) Spermatogenesis

(b) Development of penis

(c) The function of prostate glands

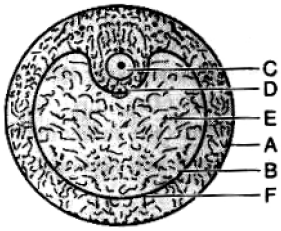
(d) Foetal development of the testis from a bipotential gonad

124. The primary regulator of Leydig cell secretion is :

(a) FSH releasing factor (b) Androgen-binding protein

(c) Luteinizing hormone (LH) (d) Follicle stimulating hormone

125. In the diagram of section of Graafian follicle, different parts are indicated by alphabets. Choose the answer in which these alphabets have been correctly matched with the parts they indicate :



(a) A = Theca externa, B = Theca interna, C = Ovum, D = Cumulus oophorus, E = Antrum, F = Membrane granulose

(b) A = Membrane granulosa, B = Theca externa, C = Ovum, D = Cumulus oophorus, E = Antrum, F = Theca interna

(c) A = Membrane granulosa, B = Theca interna, C = Ovum, D = Cumulus oophorus, E = Antrum, F = Theca externa

(d) A = Theca externa, B = Theca interna, C = Ovum, D = Membrane granulosa, E = Antrum, F = Cumulus oophorus

126. Which of these never present in frog's ovary?
(a) Oogonia (b) Corpus leteum
(c) Ovarian follicles (d) Germinal epithelium

127. Gestation period is the duration:
(a) of fertilization (b) between egg growth and ovulation
(c) between fertilization and parturition (d) of preparation of sex cells and fertilization

128. In India, "Family-Planning Programme" was started in:
(a) 1947 (b) 1950 (c) 1951 (d) 1955

129. Depo-Provera refers to:
(a) implant (b) oral contraceptive
(c) intrauterine device (d) injectable contraceptive

130. Copper-T / loop prevents:
(a) cleavage (b) fertilization (c) ovulation (d) zygote formation

131. Cholera, leprosy and diphtheria are:
(a) viral diseases (b) fungal diseases (c) bacterial diseases (d) functional diseases

132. Diphtheria is caused by:
(a) poisons released by living bacterial cells into the host tissue
(b) poisons released from dead bacterial cells into the host tissue
(c) poisons released by virus into the host tissues
(d) excessive immune response by the host's body

133. All of the following human diseases are due to members of the genus *Clostridium* except:
(a) tetanus (b) botulism (c) gangrene (d) tuberculosis

134. Toxin produced by tetanus affects:
(a) jaw bones (b) voluntary muscles
(c) involuntary muscles (d) both voluntary and involuntary muscles

135. Which of the following diseases is now considered eradicated from India?
(a) Plague (b) Smallpox (c) Kala-azar (d) Poliomyelitis

136. Which of the following T-cells are destroyed by HIV?
(a) Cytotoxic T-cells (b) Killer T-cells (c) Suppressor T-cells (d) Helper T-cells

137. Wild plants are as important as cultivated plants as they:
(a) Carry important genetic elements (DNA) or genes
(b) High yielding varieties
(c) Have hybrid vigour
(a) All of the above

138. Natural hexaploid crop is:
(a) Common wheat (*Triticum aestivum*)
(b) Maize (*Zea mays*)
(c) Paddy (*Oryza sativa*)
(d) Cotton (*Gossypium hirsutum*)

139. 'Sharbati Sonora' is a:
(a) High yielding wheat
(b) Dwarf wheat variety
(c) High percentage of proteins containing wheat
(d) All of the above

140. In which country, the 'DOGS' were once worshipped as 'GODS'?
(a) Italy (b) Egypt (c) Greece (d) Mangolia

141. Hormone used in sterile cows to induce lactation:
(a) relaxin (b) stilbesterol (c) oestrogen (d) progesterone

142. The larva of *Bombyx mori* is:
(a) caterpillar (b) cocoon (c) trochophore (d) nymph

143. Heating of milk or any other liquid at 63°C and then sudden cooling is known as:
(a) Preservation
(b) Sterilization
(c) Fermentation
(d) Pasteurization

144. Yeasts are economically important because these:
(a) are used in tobacco and tea factories
(b) are used in bakeries and breweries
(c) spread diseases in animals
(d) spread diseases in plants

145. Probiotics are:
(a) food allergens
(b) safe antibiotics
(c) cancer inducing microbes
(d) live microbial food supplements

146. Match the following list of bioactive substances and their roles:

Bioactive substance	Role
(i) Stalin	(a) Removal of oil stains
(ii) Cyclosporin A	(b) Removal of clots from blood vessels
(iii) Streptokinase	(c) Lowering of blood cholesterol
(iv) Lipase	(d) Immuno-suppressive agent

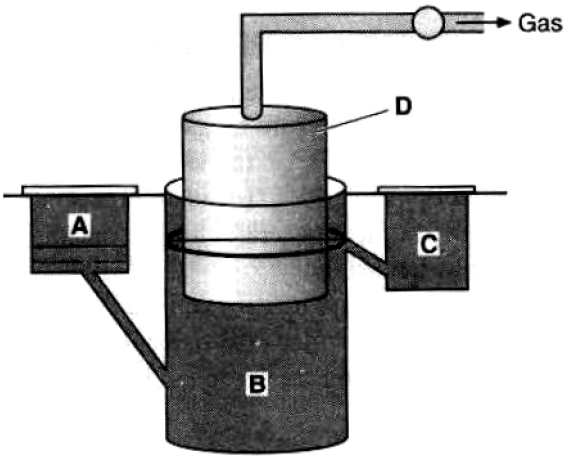
Choose the correct match:

(a) (i)-(b), (ii)-(c), (iii)-(a), (iv)-(d)
(b) (i)-(d), (ii)-(b), (iii)-(a), (iv)-(c)
(c) (i)-(d), (ii)-(a), (iii)-(d), (iv)-(c)
(d) (i)-(c), (ii)-(d), (iii)-(b), (iv)-(a)

147. Sir Alexander Fleming extracted penicillin from:

(a) *Bacillus brevis*
(b) *Penicillium notatum*
(c) *Penicillium chrysogenum*
(d) *Penicillium griseofulvin*

148. Diagram of a typical biogas plant is given below. Identify A, B, C and D:



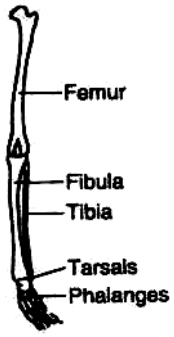
(a) A – Dung, Water, B – Digester, C – Sludge, D – Gas holder
(b) A – Digester, B – Dung, Water, C – Sludge, D – Gas holder
(c) A – Dung, Water, B – Sludge, C – Digester, D – Gas holder
(d) A – Gas holder, B – Dung, Water, C – Digester, D – Sludge

149. Striped muscle are:

(a) syncytial (b) uninucleate (c) spindle shaped (d) none of these

150. Myosin myofilaments are:
(a) attached to the Z-disk
(b) absent from the H-zone
(c) found primarily in the I-band
(d) attached to filaments that form the M-line

151. It is a diagram of the bones of the human left hindlimb as seen from front. It has certain mistakes in labeling. Two of the wrongly labeled bones are :



(a) tibia and tarsals
(b) femur and fibula
(c) fibula and phalanges
(d) tarsals and femur

152. Long bones of mammals provide :
(a) support only
(b) support and produce RBCs only
(c) support and produce WBCs only
(d) support and produce RBCs and WBCs

153. Which of these process is found in animals only?
(a) Diffusion (b) Respiration (c) Nervous control (d) Hormonal control

154. Membrane covering the brain and spinal chord is called:
(a) meninx (b) gray matter (c) white matter (d) arachnoid layer

155. In the brain of mammals, the genu and splenium are associated with:
(a) medulla (b) vermis (c) cerebrum (d) cerebellum

156. Cranial nerves in frog and man are:
(a) 10 and 08 pairs (b) 08 and 10 pairs (c) 10 and 12 pairs (d) 12 and 10 pairs

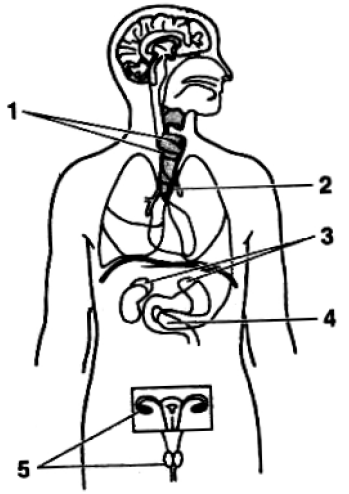
157. The hyposecretion of which hormones leads to loss of sodium and water through urine, low blood pressure and hypotension?
(a) Thyrotropic hormones
(b) Luteotrophic hormones
(c) Hormones of adrenal cortex
(d) Hormones of adrenal medulla

158. The term 'hormone' was suggested by:
(a) Abel (b) Karlson (c) Addison (d) Starling

159. Which of the following hormones is a derivative of amino acid?

(a) Estrogen (b) Epinephrine (c) Progesterone (d) Prostaglandin

160. Identify parts 1-5:



(a) 1 = parathyroid, 2 = thymus, 3 = gonads, 4 = pancreas, 5 = ovary

(b) 1 = parathyroid, 2 = thymus, 3 = adrenals, 4 = pancreas, 5 = gonads

(c) 1 = thymus, 2 = parathyroid, 3 = adrenals, 4 = kidney, 5 = gonads

(d) 1 = parathyroid, 2 = thymus, 3 = kidney, 4 = pancreas, 5 = ovary

Directions : In the following questions (161–180), a statement of assertion is followed by a statement of reason. Mark the correct choice as :

(A) If both the **Assertion** and the **Reason** are true and the **Reason** is a correct explanation of the **Assertion**

(B) If both the **Assertion** and **Reason** are true but the **Reason** is not a correct explanation of the **Assertion**

(C) If the **Assertion** is true but the **Reason** is false

(D) If both the **Assertion** and **Reason** are false

161. **Assertion**: Ball and socket joints are the most mobile joints.

Reason: Synovial fluid is present here.

(a) (A) (b) (B) (c) (C) (d) (D)

162. **Assertion**: Muscle contraction force increases with rise in strength of stimulus.

Reason: This is due to increased contraction of individual muscle fibres with increase in stimulus strength.

(a) (A) (b) (B) (c) (C) (d) (D)

163. **Assertion**: Tongue is a gustatoreceptor.

Reason: Receptors for gustatory sensations are located in the taste bud.

(a) (A) (b) (B) (c) (C) (d) (D)

164. **Assertion**: Medulla oblongata causes reflex actions like vomiting, coughing and sneezing.

Reason: It has many nerve cells which control autonomic reflexes.

(a) (A) (b) (B) (c) (C) (d) (D)

165. **Assertion**: Diabetes insipidus is marked by excessive urination and too much thirst of water.

Reason: Anti-diuretic hormone (ADH) is secreted by the posterior lobe of pituitary.

(a) (A) (b) (B) (c) (C) (d) (D)

166. **Assertion**: Oxytocin is also known as Anti Diuretic Hormone (ADH).

Reason: Oxytocin can cause an increase in the renal reabsorption of water.

(a) (A) (b) (B) (c) (C) (d) (D)

167. **Assertion**: STDs are also called silent diseases.

Reason: These remain asymptomatic during early stages.

(a) (A) (b) (B) (c) (C) (d) (D)

168. **Assertion**: Morphine is very effective and sedative painkiller.

Reason: It is very useful for the patients who have depression.

(a) (A) (b) (B) (c) (C) (d) (D)

169. **Assertion**: IgG is the most abundant class of Igs in the body.

Reason: IgG is mainly found in sweat, tears, saliva, mucus, colostrums and gastro intestinal secretions.

(a) (A) (b) (B) (c) (C) (d) (D)

170. **Assertion**: Hybridization is done between tow genetically different types of plants.

Reason: Hybridization is intraspecific.

(a) (A) (b) (B) (c) (C) (d) (D)

171. **Assertion**: Interspecific hybridization often fails to form normal embryos.

Reason: Such embryos can germinate in culture conditions.

(a) (A) (b) (B) (c) (C) (d) (D)

172. **Assertion**: Yeasts such as *Saccharomyces cerevisiae* are used in baking industry.

Reason: Carbon dioxide produced during fermentation causes bread dough to rise by thermal expansion.

(a) (A) (b) (B) (c) (C) (d) (D)

173. **Assertion**: Nitrogenase enzyme gets inactivated in presence of oxygen yet N_2 fixation occurs in aerobic cells of legume nodules.

Reason: Leghaemoglobin allows presence of oxygen just sufficient for cellular respiration only.

(a) (A) (b) (B) (c) (C) (d) (D)

174. **Assertion**: Acetic acid production involves both aerobic and anaerobic processes.

Reason: Production of alcohol from glucose is an aerobic process and production of acetic acid from alcohol is an anaerobic process.

(a) (A) (b) (B) (c) (C) (d) (D)

175. **Assertion**: Most orchid seedlings cannot develop well in the absence of fungal mycelium.

Reason: Fungal mycelium increases efficiency of absorption only.

(a) (A) (b) (B) (c) (C) (d) (D)

176. **Assertion**: The shape of the uterus is like an inverted pear.

Reason: The inner glandular layer that lines the uterine cavity is called as myometrium.

(a) (A) (b) (B) (c) (C) (d) (D)

177. **Assertion**: Generally, a woman do not conceive during lactation period.

Reason: The hormone prolactin initiates and maintain lactation in a woman.

(a) (A) (b) (B) (c) (C) (d) (D)

178. **Assertion**: The development in cockroach is heterometabolous metamorphosis.

Reason: Young ones resemble the adults in all characters.

(a) (A) (b) (B) (c) (C) (d) (D)

179. **Assertion**: Use of condom is a safeguard against AIDS and sexual diseases besides checking pregnancy.

Reason: Certain contraceptives are planted under the skin of the upper arm to prevent pregnancy.

(a) (A) (b) (B) (c) (C) (d) (D)

180. **Assertion**: Saheli, the new oral contraceptive for the females contains a steroidal preparation.

Reason: 'Saheli' is taken daily without a break.

(a) (A) (b) (B) (c) (C) (d) (D)

GENERAL KNOWLEDGE

SECTION – IV

181. Name the state government that has become first in India to launched "**She Pad**", a scheme to distribute free sanitary napkins to girl students from class VI to XII in government and aided private school affiliated to the state school board.

(a) Maharashtra (b) Kerela (c) Madhya Pradesh (d) Odisha

182. Which state became the first to use EVMs with VVPAT machines on all booths during Assembly elections?

(a) Gujarat (b) Madhya Pradesh (c) Himachal Pradesh (d) Rajasthan

183. Which Indian has been honoured with the "Entrepreneur of the Year Award 2017"?

(a) Azim Premji (b) Maya Swaminathan Sinha

(c) N R Narayana Murthy (d) Sachin Bansal

184. NASA Reported that the hole in the Ozone layer has been the smallest this year since 30 years. The whole is formed over which continent?

(a) Australia (b) United State of America

(c) Antarctica (d) Asia.

185. Which Indian film has been officially send for Oscar Award 2017 in foreign category?

(a) Newton (b) Visaranai (c) Vishwaroopam (d) Pink

186. What is the colour of "Black Box" who store the data in aeroplane.

(a) Black (b) Red (c) Blue (d) Orange

187. The battle of plassey was fought in:

(a) 1757 (b) 1782 (c) 1748 (d) 1857

188. Who invented the Television?

(a) Marconi (b) J.L. Baired (c) Graham Bell (d) Benjamin Franklin

189. Recently in which city 6th International Tourism Mart(ITM) had been organized?

(a) Kolkata (b) Jaipur (c) Chennai (d) Guwahati

190. The substrate of photorespiration is:
(a) Pyruvic acid (b) Glucose (c) Fructose (d) Glycolate

191. A device, used for converting a.c. into d.c is called:
(a) Transformer (b) Rectifier (c) Induction coil (d) Dynamo

192. The mercury and sodium street lamps light up because of:
(a) atomic absorption (b) atomic emission (c) electron absorption (d) electron emission

193. Pointing to the lady in the photograph, Mrinalini said, "Her sons father is the only son-in-law of my mother". How is Mrinalini related to the lady:
(a) Sister (b) Mother (c) Cousin (d) None of these.

194. Who amongst the following also had the name "Devanama Piyadarssi"?
(a) Mauryam king Ashoka (b) Mauryan king Chandragupta
(c) Gautam Buddha (d) Bhagwan Mahavir

195. The famous revolutionary song "Sarfaroshi ki tamanna ab hamare dil main hai…"was composed by
(a) Bhagat Singh (b) Khudiram Bose (c) Chandrasekhar Azad (d) Ram Prasad Bismil

196. The altitudes of heavenly bodies appear to the greater than they actually are:
(a) Atomospheric refraction (b) Atomospheric reflection
(c) Atomospheric defraction (d) Atomospheric amplification.

197. Who has the power to form a new state within the Union of India:
(a) Prime minister (b) President (c) Chief Justice of India (d) Governor.

198. Who was the first Indian women to swim across the English channel?
(a) Marry Komm (b) Rita Faria (c) Arati Saha (d) Babita Phogat

199. Where is the longest tunnel located in India?
(a) Jammu & Kashmir (b) Himachal Pradesh
(c) Assam (d) Orissa

200. What is the use of BHIM app?
(a) for surfing twitter (b) for digital payment
(c) for sending SMS (d) for send file transfer.

SOLUTION OF AITS AIIMS PART TEST – 3

PHYSICS

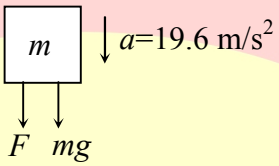
1. **(d)**

2. **(a)**

3. **(a)**

$F + mg = ma$

$F = m(a - g) = 2\,(19.6 - 9.8) = 19.6$ N



4. **(c)**

Reading reduces when the lift starts accelerating downwards and then original value is restored as lift moves with constant velocity.

Apparent weight $= m(g \pm a)$, where a is acceleration of lift.

5. **(a)**

$F - 7g = 7a,\ T - 2g = 2a$

On solving $F = 140$ N

6. **(a)**

The inclined plane exerts a force of $mg\cos\theta$ perpendicular to inclination and $mg\sin\theta$ along inclination.

7. **(a)**

$$a = \left(\frac{M-m}{M+m}\right)g,\ s = \frac{1}{2}at^2$$

$$\Rightarrow 1.4 = \frac{1}{2}\left(\frac{M-m}{M+m}\right)g(2)^2 \Rightarrow \frac{m}{M} = \frac{13}{15}$$

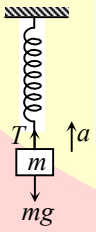
8. **(c)**

$T - mg = ma$

$T = mg + ma$

$Kx = m(g + a)$

$$x = \frac{m(g+a)}{K}$$



9. **(b)**

$mg\sin\theta = 5\text{N}$,

$f_l = \mu mg\cos\theta = 3.4\,\text{N}$,

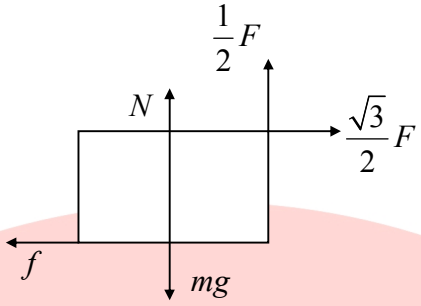
$$a = \frac{mg\sin\theta - f}{m} = 1.6\ \text{ms}^{-2}$$

10. **(c)**

$\frac{\sqrt{3}}{2}F = \mu N$

Also, $N = mg - \frac{1}{2}F$

$\Rightarrow f = \mu\left(mg - \frac{1}{2}F\right)$

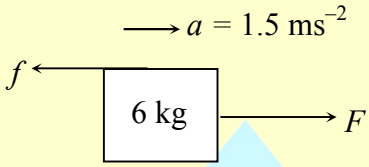


11. **(a)**

$f = 0.4 \times 2 \times 10 = 8N$

$F - 8 = 6 \times 1.5$

$F = 17N$

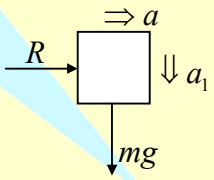


12. **(b)**

Acceleration of combined mass $a = \frac{F}{2m} = \frac{2mg}{2m} = g$

so, $R = ma = mg$

Vertical acceleration = g. so $a_{net} = \sqrt{2}g$



13. **(c)**

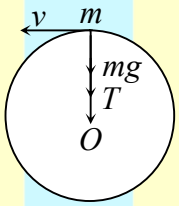
Tangential acceleration, $a_t = 4\ \text{m/s}^2$

Radial acceleration, $a_r = \frac{v^2}{r} = \frac{60 \times 60}{1200} = 3\ \text{m/s}^2$, $a = \sqrt{a_t^2 + a_r^2} = \sqrt{4^2 + 3^2} = 5\ \text{m/s}^2$

14. **(c)**

$T + mg = \frac{mv^2}{r}$

$T = \frac{mv^2}{r} - mg = 1.5\,\text{N}$



15. **(a)**

Work done = $-mgH_{\max} = -mg\frac{u^2 \sin^2\theta}{2g} = \frac{-mu^2 \sin^2\theta}{2}$

16. **(d)**

$w = \int_0^5 F.dx = \int_0^5 \left(7 - 2x + 3x^2\right)dx = 135\ \text{J}$

17. **(a)**

$F = -\frac{\delta U}{\delta x} = -2x + 3 \quad W = \int_0^2 F\,dx = \int_0^2 (-2x + 3)\,dx = [-x^2 + 3x]_0^2 = 2\ \text{J}$

18. **(c)**

$K' = \frac{1}{2}mu^2\cos^2\theta = \frac{K}{2}$

19. **(d)**

Work done by friction may be positive.

20. **(a)**

Rate of change of kinetic energy = Fv (For constant acceleration) = $mav = 4v$

21. **(c)**

Using work energy theorem,

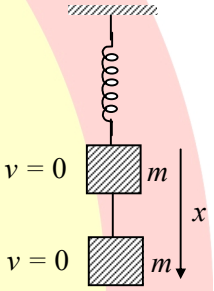
$mgh = \frac{1}{2}kx^2$

$x = \sqrt{\frac{2mgh}{k}} = 0.1\text{ m} = 10\text{ cm}$

22. **(b)**

Let x be the maximum extension of the spring. From conservation of mechanical energy decrease in gravitational potential energy = increase in elastic potential energy

$\therefore\ Mgx = \frac{1}{2}kx^2$ or $x = \frac{2Mg}{k}$



23. **(c)**

24. **(b)**

$\frac{1}{2}mv_1^2 - \frac{1}{2}mv_2^2 = \frac{1}{2}kx^2, P_1^2 - P_2^2 = mkx^2, \frac{3}{4}P_1^2 = mkx^2$

$\frac{3}{4}m^2v^2 = mkx^2,\ k = \frac{3}{4}\times 1\times\frac{64}{9} = \frac{16}{3}\text{ N/m}$

25. **(d)**

$\frac{1}{2}mv^2 = xt$ (k = constant)

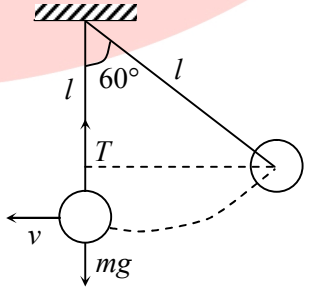
$a = \frac{dv}{dt} \propto \frac{1}{v}$

26. **(c)**

$v_x = \sqrt{2gH},\ v_y = \sqrt{2gH},\quad v = \sqrt{v_x^2 + v_y^2} = 2\sqrt{gH}$

27. **(a)**

By conservation of energy, $mgl(1-\cos 60°) = \frac{1}{2}mv^2$



$v = \sqrt{gl}$

$T = mg + \frac{mv^2}{l} = 2mg$

28. **(b)**

$$\lambda = \frac{h}{\sqrt{2mE}} \Rightarrow \lambda \propto \frac{1}{\sqrt{E}} \Rightarrow \frac{\lambda_1}{\lambda_2} = \sqrt{\frac{E_2}{E_1}} \Rightarrow \frac{10^{-10}}{0.5\times10^{-10}} = \sqrt{\frac{E_2}{E_1}} \Rightarrow E_2 = 4E_1$$

Hence added energy = $E_2 - E_1 = 3E_1$

29. **(d)**

Gamma-photon

30. **(c)**

Energy of photon is less than work function of material.

31. **(c)**

32. **(c)**

33. **(d)**

$$\lambda_{min} = \frac{hc}{eV} = \frac{6.64\times10^{-34}\times3\times10^{8}}{20\times10^{5}\times1.6\times10^{-19}} = \frac{6.64\times10^{-12}\times3}{32} \approx 6\times10^{-13}\ \text{m}$$

34. **(b)**

$$V = \frac{h^2}{2me\lambda^2} = 8.2\times10^{4}\ \text{V}$$

35. **(c)**

$$\lambda = \frac{h}{\sqrt{2mqV}}$$

$$\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{m_2V_2q_2}{m_1V_2q_2}} = \sqrt{\frac{(4m)(2e)}{m\,e}} = 2\sqrt{2}$$

36. **(a)**

$$12.75 = E_0 - \frac{E_0}{n^2} = -13.6 - \frac{(-13.6)}{n_1^2} \Rightarrow n = 4$$

$$\text{no. of lines} = \frac{n(n-1)}{2} = 6$$

37. **(a)**

38. **(b)**

$$\frac{1}{\lambda} = RZ^2\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$$

39. **(b)**

Stopping potential $V_0 = \frac{hc}{e}\left[\frac{1}{\lambda} - \frac{1}{\lambda_0}\right]$. As λ decreases so V_0 increases.

40. **(d)**

$$E = -Z^2\times13.6\,\text{eV} = -9\times13.6\,\text{eV} = -122.4\,\text{eV}$$

So, ionization energy = +122.4 eV

41. **(a)** 42. **(d)** 43. **(c)** 44. **(a)**
45. **(d)** 46. **(d)** 47. **(b)** 48. **(c)**
49. **(d)** 50. **(b)** 51. **(d)** 52. **(b)**
53. **(d)** 54. **(c)** 55. **(b)** 56. **(b)**
57. **(a)** 58. **(a)** 59. **(a)** 60. **(b)**

CHEMISTRY

61	62	63	64	65	66	67	68	69	70
B	**A**	**C**	**C**	**D**	**C**	**C**	**C**	**B**	**B**

71. **(b)**

In acidic medium $MnO_4^- \rightarrow Mn^{+2}$

So $(NV)_{KMnO_4} = (NV)_{H_2C_2O_4}$

$N \times 10 = 28 \times 0.1 \times 2$

$N = 0.56$

molarity $KMnO_4$ in acidic medium $= \frac{0.56}{5}$ with NH_2OH (medium is weakly basic).

$\overset{+7}{MnO_4^-} \rightarrow \overset{+4}{MnO_2}$

$\overset{-1}{NH_2OH} \rightarrow \overset{0}{N_2}$

$(NV)_{KMnO_4} = \frac{w}{E} \times 1000$

$\left(\frac{0.56}{5} \times 3\right) \times 10 = \frac{w}{M/2} \times 1000$

mole of $N_2 = 1.68 \times 10^{-3}$

volume at STP $= 1.68 \times 10^{-3} \times 22400 = 37.63 \simeq 38$ ml.

72. **(b)**

$K_{sp} = [Zn^{2+}][S^{2-}]$

$[S^{2-}] = \frac{10^{-21}}{0.01} = 10^{-19}$

for $K_{a_1} . K_{a_2} = \frac{[H^+]^2[S^{2-}]}{[H_2S]}$

$10^{-20} = \frac{[H^+]^2 \times 10^{-19}}{0.1} \Rightarrow [H^+] = 0.1$

or pH = 1

73. **(c)**

H_3O^+ can not take up proton ; $H_2PO_2^-$ can not give up proton, SO_4^{2-} can not give proton

74. **(c)**

Soft bases have the donor atom of highly polarisable and they preferably combine with the metal ions of lower oxidation states.

75. **(c)**

$$pH = pK_a + \frac{\log[C_6H_5COO^-]}{[C_6H_5COOH]}$$

$$\therefore \frac{[C_6H_5COO^-]}{[C_6H_5COOH]} = 2$$

Let volume of acid is V ml.

$$\frac{0.2\times(300-V)}{0.1\times V} = 2 \qquad \Rightarrow V = 200 \text{ ml.}$$

76. **(a)**

$AgNO_3$ solution	$[Cl^-]$	$[Ag^+]$	$p[Cl]$	$p[Ag^+]$
90	10^{-2}	10^{-8}	2	8
99	10^{-3}	10^{-7}	3	7
99.9	10^{-4}	10^{-6}	4	6
100	10^{-5}	10^{-5}	5	5
100.1	10^{-6}	10^{-4}	6	4
101.0	10^{-7}	10^{-3}	7	3
200	10^{-9}	10^{-1}	9	1

77. **(a)**

$$[Fe^{2+}]\,[S^{-2}] = 4\times10^{-19} \Rightarrow [S^{-2}] = \frac{4\times10^{-19}}{1\times10^{-2}} = 4\times10^{-17}\,M$$

In order to precipitate FeS, $[S^{-2}]$ required is 4×10^{-17} M from 0.01 M Fe^{2+} salts.

Now $\frac{[H^+]^2[4\times10^{-17}]}{0.1} = 1\times10^{-21} \Rightarrow [H^+]^2 = 2.5\times10^{-6} \Rightarrow [H^+] = 1.6\times10^{-3}$

78. **(c)**

H_3O^+ can not take up proton; $H_2PO_2^-$ can not give up proton, SO_4^{2-} can not give proton

79. **(b)**

$[OH^-] = 0.1$ And conc. of $Ba(OH)_2 = \frac{0.1}{2}$

$\therefore$ The no. of millimoles of $Ba(OH)_2$ present in 10 ml solution $= \frac{0.1}{2}\times10\times10^{-3}\times10^3 = 0.5$

80. **(a)**

$[H^+]\,[OH^-] = K_w = 4 \times 10^{-14}$

In pure water $[H^+] = [OH^-]$

$\therefore\ [H^+] = 2 \times 10^{-7}$

or $pH = 7 - \log 2 = 7 - 0.3 = 6.7 = Poh$

Pure water is neutral

81. (c)

$\because PM = \rho RT\ [M =]$

$\therefore\ p\rho = P^2\left(\frac{M}{RT}\right)$

Now, $\frac{d(P\rho)}{dP} = \frac{2PM}{RT} = 5$

$\therefore\ T = 160\ K.$

82. **(d)**

$\Delta S = nC_v \ln\frac{T_2}{T_1} + nR \ln\frac{V_2}{V_1}$

$\Delta S = C_v \ln 2 - R \ln 2$

$\Delta S = (C_v - R) \ln 2$

83. **(b)**

I initially: Pressure P volume V temp T moles x.

II on 2P 2V then temperature heating becomes 4T. After decreasing temperature

III Pressure volume Temperature moles 2P 2V T' (assume) $n + \frac{n}{4} = \frac{5n}{4}$ for II case ideal gas equation

$2P \times 2V = n \times R \times 4T$

III case

$2P \times 2V = \frac{5n}{4} \times R \times T' \Rightarrow T' = \frac{16}{5}\ T$

84. **(b)**

$P_C = \frac{a}{27b^2}$, $T_C = \frac{8a}{27Rb}$

$\Rightarrow \frac{P_C}{T_C} = \frac{R}{8b}$ $\Rightarrow b = 0.04$ L/mol.

85. **(c)**

$\left(50 + \frac{5.46\times10^2}{V^2}\right)(V - 0.31) = 10 \times 0.082 \times 1832 \Rightarrow V = 30\ L$

86. **(c)**

A low pressure,

$\left(P+\frac{a}{v^2}\right)(v) = RT$

$\therefore\ Pv^2 - RTv + a = 0$

$\therefore\ v = \frac{RT \pm \sqrt{R^2T^2 - 4Pa}}{2P} = \frac{RT}{2P}$

87. **(a)**

Press. of gas = 760 + 80 = 840 mm of Hg.

vol. of each balloon $= \frac{20\times0.082\times300}{0.05} = 9840$ L

Let n no. of balloon required.

$\therefore$ upward force = $n \times 9840 \times 1.25 \times 10^{-3} \times g$.

Downward force = $100 \times g + n \times 20 \times 2 \times 10^{-3} \times g + n \times 2.5 \times g$

$\therefore\ g \times n \times 9840 \times 1.25 \times 10^{-3} = 100g + 40n \times 10^{-3} \times g + 2.5\ ng$

or $12.3\ n - 2.5\ n - 0.04\ n, = 100$

or $9.76\ n = 100$

or $n = 10.24$

$\therefore$ Minimum 11 balloons are required.

88. **(a)**

$\left(P+\frac{a}{V_m^2}\right)(V_m - b) = RT$

or $\frac{PV_m}{RT} = Z = \frac{V_m}{(V_m - b)} - \frac{a}{RTV_m}$

or $Z = \left(1-\frac{b}{V_m}\right)^{-1} - \frac{a}{RTV_m} = 1 + \frac{b}{V_m} + \frac{b^2}{V_m^2} + \ldots\ldots - \frac{a}{RTV_m}$

or $Z = 1 + \left(b - \frac{a}{RT}\right)\frac{1}{V_m} + \frac{b^2}{V_m^2} + \ldots\ldots$

Neglecting the higher terms,

$Z = 1 + \left(b - \frac{a}{RT}\right)\frac{1}{V_m}\ ;\ \frac{PV_m}{RT} = Z$ or $\frac{1}{V_m} = \frac{P}{ZRT}$ or $Z = 1 + \left(b - \frac{a}{RT}\right)\frac{P}{ZRT}$ or $Z(Z-1) = \left(b - \frac{a}{RT}\right)\frac{P}{RT}$

or $Z^2 - Z = \left(b - \frac{a}{RT}\right)\frac{P}{RT}$ or $2Z\frac{dz}{dp} - \frac{dz}{dp} = \left(b - \frac{a}{RT}\right)\frac{1}{RT}$ or $\frac{dz}{dp} = \frac{1}{(2Z-1)} \times \left(b - \frac{a}{RT}\right)\frac{1}{RT}$

$\therefore \lim_{p\to o} \frac{dz}{dp} \simeq \left(b - \frac{a}{RT}\right) \frac{1}{RT}$

When $T < T_B$ then $T < \frac{a}{Rb}$ or $b < \frac{a}{RT}$

hence $b - \frac{a}{RT}$ is negative therefore $\lim_{p\to o} \frac{dz}{dp}$ is negative – it means at very low pressure Z decreases with pressure below the Boyle's temperature.

89. **(a)**

Isoentropic process is adiabatic process. So

$$\left(\frac{T_1}{T_2}\right)^{\gamma} = \left(\frac{P_1}{P_2}\right)^{\gamma-1} \Rightarrow \left(\frac{300}{600}\right)^{5/3} = \left(\frac{P_i}{P_f}\right)^{2/3} \Rightarrow \left(\frac{1}{2}\right)^{5/3} = \left(\frac{1}{P_f}\right)^{2/3}$$

$$\Rightarrow \frac{5}{3}\ell n\, 2 = \frac{2}{3}\ell n\, P_f \quad \Rightarrow \ell n P_f = \frac{5}{2}\ell n\, 2 = 1.75$$

90. **(a)**

We know that $P \propto n \Rightarrow n \propto P$

$\Rightarrow$ Ratio of moles of A : B : C = 1 : 2 : 3

and Ratio of molecular wt. of A, B, C = 6 : 3 : 2

$\Rightarrow$ Ratio of wt. of A, B & C = $1 \times 6 : 2 \times 3 : 3 \times 2$ = 6 : 6 : 6 = 1 : 1 : 1

91	92	93	94	95	96	97	98	99	100
C	**D**	**C**	**C**	**A**	**C**	**C**	**B**	**B**	**A**

101. **(c)**

102. **(a)**

$3O_2 \rightarrow 2O_3$ $\Delta_r H$ is positive and $\Delta_r S$ is negative therefore the formations of ozone from $O_2(g)$ is a non spontaneous process. By the application of UV or electrical discharge the formation of atomic oxygen occur from gaseous oxygen which initiate the formation of ozone.

$O_2(g) \xrightarrow{h\nu} 2O(g)$

$O_2(g) + O(g) \longrightarrow O_3(g)$

103. **(c)**

104. **(c)**

105. **(c)**

106. **(b)**

H_2SO_4, HCl and HNO_3 dissociate to different extent in acetic acid because acetic acid is a poor proton acceptor and hence acts as a differentiating solvent.

107. **(a)**

Assertion and reason both are correct and reason is the correct explanation of assertion.

$S^{2-} + H_2O \underset{}{\overset{K_{h_1}}{\rightleftharpoons}} HS^- + OH^-$

$K_{h_1} = \frac{K_w}{K_{a_2}}$

$HS^- \underset{}{\overset{K_{h_2}}{\rightleftharpoons}} H_2S + OH^- \; K_{h_2} = \frac{K_w}{K_{a_1}}$

Since $K_{a_2} << K_{a_1}$ the first step hydrolysis is significant and OH^- produced in the first step hydrolysis prevent the second of hydrolysis by the common ion effect.

108. **(a)**

Both Assertion and reason are correct and reason is the correct explanation of assertion.

$HCO_3^- \rightleftharpoons H^+ + CO_3^{2-}$

$HCO_3^- + H_2O \rightleftharpoons H_2CO_3 + OH^-$

During ionization H^+ produced drag the hydrolysis of HCO_3^- because H^+ & OH^- combine extensively

109. **(a)**

Assertion and reason both are correct and reason is the correct explanation of assertion.

At the mid point of titration, pH

$= pK_a + \log \frac{[A^-]}{[HA]}$

And $[A^-] = [HA]$, hence $pH = pK_a$

110 **(a)**

111. **(b)**

112. **(b)**

rate of effusion $\propto \left(\frac{\text{surface area}}{\text{of pore}}\right) \times u_{avg} \times P_{gas}$

Since $u_{avg} = \sqrt{\frac{8RT}{\pi M}}$ hence rate of effusion increases with the increase in temperature.

113. **(a)**

Since gas molecules are uniformly distributed in the container, therefore in one dimension $u_{avg} = 0$

114 **(b)**

For linear molecule	For non linear molecule
$\in_{trans} = 3/2\,kT$	$\in_{trans} = 3/2\,kT$

$\in_{rot} = k\,T \quad \in_{rot} = 3/2\,k\,T$

$\in_{vib} = (3N - 5)\,kT \; \in_{vib} = (3N - 6)\,kT$

Where N is total no. of atoms present in the molecule

115. **(b)**

Actually H_2O molecule has dipole moment, hence intermolecular attraction force among H_2O molecules is greater than that of O_2. Therefore 'a' value of H_2O is greater.

116. **(d)**

Both correct and correct explanation

117. **(a)**

118. **(a)**

119. **(a)**

120. **(a)**

BIOLOGY									
121	122	123	124	125	126	127	128	129	130
D	**D**	**D**	**C**	**A**	**B**	**C**	**C**	**D**	**B**
131	132	133	134	135	136	137	138	139	140
C	**A**	**D**	**B**	**B**	**D**	**A**	**A**	**A**	**B**
141	142	143	144	145	146	147	148	149	150
B	**A**	**D**	**B**	**D**	**D**	**B**	**A**	**A**	**D**
151	152	153	154	155	156	157	158	159	160
C	**D**	**C**	**A**	**C**	**C**	**C**	**D**	**B**	**B**
161	162	163	164	165	166	167	168	169	170
B	**C**	**A**	**A**	**B**	**D**	**A**	**C**	**C**	**D**
171	172	173	174	175	176	177	178	179	180
B	**A**	**A**	**C**	**C**	**C**	**B**	**C**	**B**	**D**
GENERAL KNOWLEDGE									
181	182	183	184	185	186	187	188	189	190
B	**C**	**B**	**C**	**A**	**D**	**A**	**B**	**D**	**A**
191	192	193	194	195	196	197	198	199	200
B	**B**	**D**	**A**	**D**	**A**	**B**	**C**	**A**	**B**