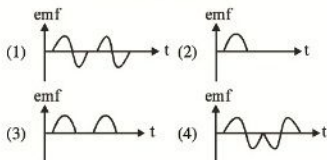
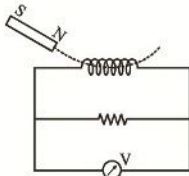


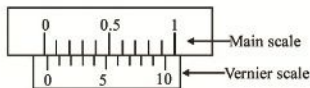


1. Find the viscosity of glycerine (having density 1.3 g cm^{-3}) if a steel ball of 2 mm radius (density 8 g cm^{-3}) acquires a terminal velocity of 4 cm s^{-1} in falling freely in the tank of glycerine
 (1) 14.6 poise (2) 12.2 poise
 (3) 10.4 poise (4) 9.8 poise
2. A H-atom and a Li^{++} ion are both in the second excited state. If l_{H} and l_{Li} are their respective electronic angular momenta, and E_{H} and E_{Li} their respective energies, then
 (1) $l_{\text{H}} > l_{\text{Li}}$ and $|E_{\text{H}}| > |E_{\text{Li}}|$
 (2) $l_{\text{H}} = l_{\text{Li}}$ and $|E_{\text{H}}| < |E_{\text{Li}}|$
 (3) $l_{\text{H}} = l_{\text{Li}}$ and $|E_{\text{H}}| > |E_{\text{Li}}|$
 (4) $l_{\text{H}} < l_{\text{Li}}$ and $|E_{\text{H}}| < |E_{\text{Li}}|$
3. A magnet is made to oscillate with a particular frequency, passing through a coil as shown in the figure. The variation of emf induced across the coil during one cycle with time is best represented by the graph.

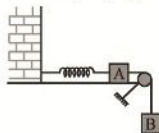


4. A and B are two metals with threshold frequencies $1.8 \times 10^{14} \text{ Hz}$ and $2.2 \times 10^{14} \text{ Hz}$. Identical photons of energy 0.825 eV each are incident on them. Then photoelectrons are emitted from
 (1) A alone
 (2) B alone
 (3) from both A and B
 (4) from neither A nor B

5. When an object is kept at a distance of 5 cm from the pole of a concave mirror, a virtual image is formed. If the object distance is 15 cm, a real image is formed. Both the images have same magnification. The focal length of the mirror is
 (1) -10 cm (2) -5 cm
 (3) -20 cm (4) -15 cm
6. In the reading shown in the figure, find the zero error

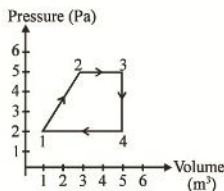


- (1) 0.05 cm (2) -0.05 cm
 (3) 0.03 cm (4) -0.03 cm
7. In single slit experiment, the width of the slit is reduced. Then, the linear width of the principal maxima
 (1) decreases but becomes less bright
 (2) increases but becomes less bright
 (3) decreases but becomes more bright
 (4) increases but becomes more bright
8. Consider the situation shown in figure. Mass of block A is m and that of block B is 2m. The force constant of the spring is k. Friction is absent everywhere. System is released from rest with the spring unstretched. The maximum extension of the spring x_m is

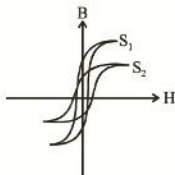


- (1) $\frac{2mg}{k}$ (2) $\frac{4mg}{k}$
 (3) $\frac{mg}{k}$ (4) $\frac{3mg}{2k}$

9. The graph of pressure versus volume of a monoatomic ideal gas is as shown. What is the internal energy of the system in state 1 and the heat given to the system during the process 4 to 1 ?



- (1) 15, -5 (2) 3, -20 (3) 7, 9 (4) 7, -10
10. The B-H curves S_1 and S_2 in the adjoining figure are associated with



- (1) diamagnetic and paramagnetic substances respectively
 (2) paramagnetic and ferromagnetic substances respectively
 (3) soft iron and steel respectively
 (4) steel and soft iron respectively
11. A boy on a cycle pedals around a circle of radius 20m at a speed of 20 ms^{-1} . The combined mass of the boy and the cycle is 90kg. The angle that the cyclist makes with the vertical so that it may not fall is ($g = 9.8 \text{ ms}^{-2}$)

- (1) 60.25° (2) 63.90°
 (3) 26.12° (4) 30.00°

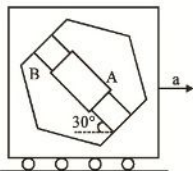
12. The de-Broglie wavelength of the electron in the ground state of a hydrogen atom is

- (1) 0.53 \AA (2) 1.06 \AA
 (3) 1.67 \AA (4) 3.33 \AA

13. In a resonance tube experiment two consecutive resonances are observed when the length of the air columns are 16cm and 49 cm. If the frequency of the tuning fork used is 500Hz, the velocity of sound in air is

- (1) 310 ms^{-1} (2) 320 ms^{-1}
 (3) 330 ms^{-1} (4) 340 ms^{-1}

14. The collar A is free to slide along the smooth rod B mounted in the frame. The plane of the frame is vertical. The horizontal acceleration 'a' of the frame necessary to maintain the collar in a fixed position on the shaft is :



- (1) $\frac{g}{\sqrt{3}} \text{ ms}^{-2}$ (2) $\frac{3g}{\sqrt{2}}$ (3) $\frac{g}{2\sqrt{3}}$ (4) $\frac{g}{\sqrt{5}}$

15. A series LCR circuit containing a resistance of 120Ω has resonance frequency $4 \times 10^5 \text{ rad s}^{-1}$. The voltages, at resonance, across resistance and inductance are 60V and 40V respectively. The values of L and C respectively are :

- (1) 0.3 mH, $0.0195 \mu\text{F}$
 (2) 0.1 mH, $0.4525 \mu\text{F}$
 (3) 0.2 mH, $0.03125 \mu\text{F}$
 (4) 0.4 mH, $0.5125 \mu\text{F}$

16. A proton enters a region of uniform magnetic field B of 0.5 T with a velocity u at an angle 45° with B. If P is the pitch of the helical path followed, the radius of the helix is :

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

17. The fringe widths of the interference patterns obtained on a screen due to two wavelengths λ_1 and λ_2 are β_1 and β_2 respectively. The radiation of wavelength λ_1 produces photoelectric effect in a metal surface, but λ_2 does not. Then

- (1) $\beta_1 > \beta_2$ (2) $\beta_1 < \beta_2$
 (3) $\beta_1 = \beta_2$ (4) $\beta_1 \geq \beta_2$

18. The velocities of three particles of masses 20g, 30g and 50g are $10\hat{i}$, $10\hat{j}$ and $10\hat{k}$ respectively. The velocity of the centre of mass of the three particles is :

(1) $2\hat{i} + 3\hat{j} + 5\hat{k}$ (2) $10(\hat{i} + \hat{j} + \hat{k})$
 (3) $20\hat{i} + 30\hat{j} + 5\hat{k}$ (4) $20\hat{i} + 30\hat{j} + 50\hat{k}$

19. When the load on a wire is slowly increased from 20N to 40N, the elongation increases from 0.6 mm to 1.0 mm. Work done during the extension is :

(1) 4×10^{-3} J (2) 1.4×10^{-2} J
 (3) 8×10^{-3} J (4) 2.8×10^{-2} J

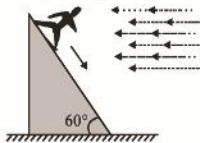
20. A block slides down an inclined plane of inclination θ with constant velocity. It is then projected up the inclined plane with an initial speed u . The distance up the plane it will move before coming to rest is

(1) $\frac{u^2}{g}$ (2) $\frac{u^2}{g \sin \theta}$
 (3) $\frac{u^2}{2g \sin \theta}$ (4) $\frac{u^2}{4g \sin \theta}$

21. 28g of N_2 gas is contained in a flask at a pressure of 10 atm and at a temperature of 57°C . It is found that due to leakage in the flask, the pressure is reduced to half the initial value and the temperature to 27°C . The quantity of N_2 gas that leaks out is :

(1) $\frac{5}{63}$ g (2) $\frac{63}{5}$ g (3) $\frac{11}{20}$ g (4) $\frac{20}{11}$ g

22. A man is moving down an incline with a speed v . He meets rain with the same speed but horizontally. The speed of rain is.

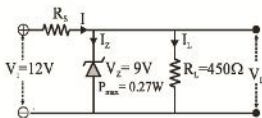


(1) v (2) $\sqrt{3}v$ (3) $\frac{\sqrt{3}}{2}v$ (4) $\frac{1}{2}v$

23. A capillary tube of radius r is immersed in water and water rises in it to a height h . The mass of water in the capillary tube is 5g. Another capillary tube of radius $2r$ is immersed in water. The mass of water that will rise in this tube is:

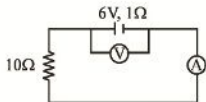
(1) 2.5 g (2) 5.0 g (3) 10 g (4) 20 g

24. A 9V stabilised voltage supply is required to run a car stereo system from the car's 12V battery. A zener diode with $V_z = 9\text{V}$ and $P_{\text{max}} = 0.27\text{W}$ is to be used as the voltage regulator. The load resistance is 450Ω . The value of series resistor is :



(1) 60Ω (2) 150Ω (3) 100Ω (4) 90Ω

25. In the circuit shown below, the readings of the ammeter and voltmeter are



(1) 6A, 60A (2) 0.6A, 6V
 (3) 6A, 6V (4) $\frac{6}{11}$ A, $\frac{60}{11}$ V

26. An aircraft is flying at a height of 3400 m above the ground. If the angle subtended at a ground observation centre by two positions of the aircraft is 10 s apart is 30° . What is the speed of the air craft. [The observation point is on the vertical line, which is midway between positions of aircraft.] [Given $\tan 15^\circ = 0.2679$]

(1) 262.4 ms^{-1} (2) 131.2 ms^{-1}
 (3) 91.1 ms^{-1} (4) 182.2 ms^{-1}

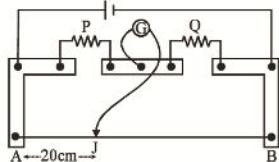
27. The resistance of a galvanometer is 50Ω and it requires $2\mu\text{A}$ per two division deflection. The value of the shunt required in order to convert this galvanometer into ammeter of range 5A is (The number of divisions on one side is 30)

(1) 0.2 Ω (2) 0.002 Ω
 (3) 3×10^{-4} Ω (4) 4×10^{-6} Ω

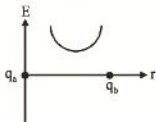
28. A metallic sphere of radius R_1 is charged to a potential V . If it is enclosed by a spherical conducting shell of radius R_2 and connected to it, its new potential will be :

(1) zero (2) $V \left(\frac{R_1}{R_2} \right)$
 (3) $V \left(\frac{R_2}{R_1} \right)$ (4) $V \left(\frac{R_1}{R_1 + R_2} \right)$

29. In a metre-bridge circuit shown in figure, the bridge is balanced when $AJ = 20$ cm. On interchanging P and Q , the balancing length shifts by :



- (1) zero (2) 20 cm (3) 40 cm (4) 60 cm
30. In an experiment to measure the internal resistance of a cell by potentiometer it is found that the balancing length is 2m when the cell is shunted by a 5Ω resistance and is 3m, when the cell is shunted by a 10Ω resistance. The internal resistance of the cell is :
- (1) 1Ω (2) 1.5Ω (3) 10Ω (4) 15Ω
31. Two point charges q_a and q_b whose strengths are equal in magnitude are positioned at a certain distance from each other. Assuming the field strength is positive in the direction coinciding with the positive direction of x -axis, determine the signs of charges for the distribution of the field strength between the charges shown in figure.

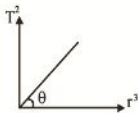


- (1) $q_a \rightarrow +ve, q_b \rightarrow -ve$
 (2) $q_a \rightarrow -ve, q_b \rightarrow +ve$
 (3) $q_a \rightarrow +ve, q_b \rightarrow +ve$
 (4) $q_a \rightarrow -ve, q_b \rightarrow -ve$

32. A conducting wire of uniform cross-section is bent to form an equilateral triangle ABC of side L . A current I enters at A and leaves at C. The magnetic field at the centroid O of the triangle is:

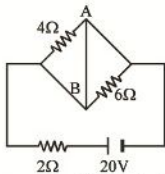
(1) $2\sqrt{3} \frac{\mu_0 I}{4\pi L}$ (2) $\frac{\mu_0 I}{4\pi L}$
 (3) $\sqrt{3} \frac{\mu_0 I}{4\pi L}$ (4) zero

33. If a graph is plotted between T^2 and r^3 for a planet, then its slope will be ____



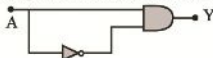
- (1) $\frac{4\pi^2}{GM}$ (2) $\frac{GM}{4\pi^2}$ (3) $4\pi GM$ (4) $\frac{3\pi^2}{GM}$
34. Wien's displacement law tells us that an extremely hot star looks
- (1) violet or indigo
 (2) green or yellow
 (3) orange or red
 (4) white
35. Choose the wrong statement.
- (1) Nuclear force is the strongest force in nature
 (2) Nuclear force is spin dependent
 (3) Nuclear force is charge dependent
 (4) Nuclear force is a saturated force
36. A ball is dropped from the top of a tower when there is a high speed wind. If the wind exerts a constant force on the ball, the path traced by the ball is
- (1) a parabola
 (2) a straight line
 (3) elliptical arc
 (4) a circular arc
37. A plane electromagnetic wave propagating along x -direction can have the following pairs of E and B
- (1) E_x, B_y (2) E_y, B_x (3) B_x, E_y (4) E_x, B_x

38. A circuit is shown in figure. Identify the incorrect statement among the following.

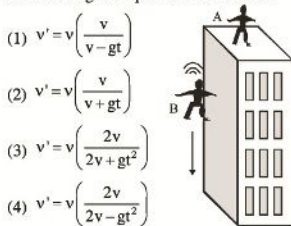


- (1) The power supplied by the battery is 200W.
 (2) The current flowing in the circuit is 10A
 (3) The potential difference across 4Ω resistance is equal to the potential difference across 6Ω resistance
 (4) Current in the wire AB is zero.
39. The simple harmonic motion of a particle is represented by an equation $x = 10\sin\left(10t + \frac{\pi}{3}\right)$, and the motion starts at $t = 0$. When does the particle first come to rest?

- (1) $\frac{\pi}{30}$ s (2) $\frac{\pi}{60}$ s (3) $\frac{\pi}{40}$ s (4) $\frac{\pi}{80}$ s
40. What is the Boolean expression for the output for the gate circuit shown in the figure ?



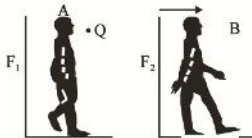
- (1) $A \cdot 0 = 0$ (2) $A \cdot \bar{A} = 0$
 (3) $A \cdot 1 = A$ (4) $A \cdot A = A$
41. A person B accidentally slips from a large building and screams with a sound of constant frequency ν as he falls as shown in the figure. The apparent frequency of the sound of the scream as heard by the person A, at the top of the building is dependent on time as



42. Water enters a house through a pipe with 2.0 cm inside diameter, at an absolute pressure of 4×10^5 Pa. The pipe leading to the second floor bathroom 5m above is 1.0cm in diameter. When the flow velocity at the inlet pipe is 4ms^{-1} , find the flow velocity and pressure in the bathroom in ms^{-1} and Pa respectively
 (1) 16, 2.3×10^5 (2) 16, 3.2×10^5
 (3) 132, 2.3×10^5 (4) 32, 2.3×10^5

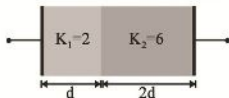
43. A uniform cube of side a and mass m rests on a rough horizontal table. A horizontal force F is applied normal to one of the faces at a point directly above the centre of the face, at a height $\frac{3a}{4}$ above the base. The minimum value of F for which the cube begins to tip about an edge is
 (1) $\frac{2}{3}mg$ (2) $\frac{1}{3}mg$ (3) $\frac{3}{4}mg$ (4) mg

44. An observer A and a charge Q are fixed in a stationary frame F_1 . An observer B is fixed in a frame F_2 which is moving with respect to F_1 . Read the following statements.
 (A) Both A and B will observe electric fields
 (B) Both A and B will observe magnetic fields
 (C) Neither A nor B will observe magnetic fields
 (D) B will observe a magnetic field, but A will not



The correct statement/statements is/are

- (1) A and B (2) A and C
 (3) Only A (4) A and D
45. A parallel plate capacitor has two layers of dielectric as shown in the figure. This capacitor is connected across a battery. The ratio of potential difference across the dielectric layers is:



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


46. Match the column :

	Element (outer most shell e ⁻ conf)		Successive value of I.E. (ev/atom)
(A)	3s ¹	(P)	22, 25, 36, 42, 250
(B)	3s ²	(Q)	18, 26, 32, 240, 260
(C)	3s ² 3p ¹	(R)	20, 24, 210, 230
(D)	3s ² 3p ²	(S)	15, 180, 200, 220

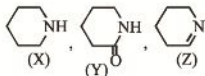
Match the type of element, with the corresponding successive value of I.E. :

- (1) A-S, B-P, C-Q, D-R (2) A-R, B-S, C-P, D-Q
 (3) A-S, B-R, C-Q, D-P (4) A-S, B-R, C-P, D-Q
47. Identify the incorrect are :-
 (1) Shielding constant (σ) : Li < Na < K < Rb
 (2) Z_{eff} : Li > Na > K > Rb
 (3) Ionic radius : O²⁻ > F⁻ > Na⁺ > Mg²⁺
 (4) Atomic size : Li < Na < K < Rb
48. The shape of a molecule which has EB₃L₂ molecular formula :-
 {E=Central atom, B=Terminal atom, L=Loan pair}
 (1) Square pyramidal
 (2) Pentagonal planar
 (3) Octahedral
 (4) Pentagonal bipyramidal
49. What is true about S₈ molecule ?
 I. There is no P_n-P_n bonds present in the molecule
 II. There are eight lone pair of electrons
 III. Each S atom is sp³ hybridised
 (1) I, III (2) II, III (3) I, II (4) only II
50. Which orders are correct :-
 (I) Thermal stability BeSO₄ < MgSO₄ < CaSO₄ < SrSO₄
 (II) Basic Nature ZnO > BeO > MgO > CaO
 (III) Solubility in water LiOH > NaOH > KOH > RbOH
 (IV) Melting point NaCl > KCl > RbCl > CsCl > LiCl
 (1) (I), (IV) (2) I, II and IV
 (3) II, III (4) All correct
51. The correct order of dipole moment is :-
 (1) CH₄ < NF₃ < NH₃ < H₂O
 (2) NF₃ < CH₄ < NH₃ < H₂O
 (3) NH₃ < NF₃ < CH₄ < H₂O
 (4) H₂O < NH₃ < NF₃ < CH₄
52. Electronic configuration of Gd(64) is :-
 (1) [Xe] 4f², 5d⁹, 6s² (2) [Xe] 4f⁷, 5d¹, 6s²
 (3) [Xe] 4f⁹, 5d², 6s² (4) [Xe] 4f⁷, 5d⁰, 6s²

53. Available Cl₂ is liberated from bleaching powder when it :-

- (1) Is heated
 (2) React with excess amount of acid
 (3) React with water
 (4) React with CO₂
54. Which of the following is Acetylide ion :
 (1) C²⁻ (2) C₂⁻ (3) C₂²⁻ (4) C₃⁴⁻
55. Cl₂ $\xrightarrow[\text{dil. NaOH}]{\text{cold and}}$ X; X is :-
 (1) NaClO₃ (2) NaOCl (3) NaClO₂ (4) NaClO
56. Which of the following reaction does not take place:
 (1) Na + H₂O $\xrightarrow{(\text{cold})}$ (2) Mg + H₂O $\xrightarrow{(\text{heat})}$
 (3) Be + H₂O $\xrightarrow{(\text{steam})}$ (4) Li + H₂O $\xrightarrow{(\text{heat})}$
57. Which of the following is more stable :-
 (1) Cr⁺⁴ (2) Cr⁺² (3) Cr⁺³ (4) Cr⁺⁵
58. D₂O is preferred to H₂O, as a moderator, in nuclear reactors because :-
 (1) D₂O slows down speed of neutrons then H₂O more effectively
 (2) D₂O has high specific heat
 (3) D₂O is cheaper
 (4) None
59. The zone refining of metal is based on the principle of :-
 (1) Greater mobility of pure metal than that of impurity
 (2) Higher melting point of the impurity than that of the pure metal.
 (3) Greater noble character of the solid metal than that of the impurity
 (4) Greater solubility of the impurity in the molten state than in the solid
60. Due to the presence of ambidentate ligands coordination compounds show isomerism. Palladium complexes of the type [Pd(C₆H₅)₂(SCN)₂] and [Pd(C₆H₅)₂(NCS)₂] are :-
 (1) linkage isomers (2) coordination isomers
 (3) ionisation isomers (4) geometrical isomers
61. Which of the following carbocation is most stable?
 (1) CH₃⁺CH₂⁺ (2) CH₂=⁺CH
 (3) CH⁺ (4) 

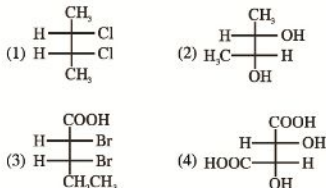
62. Correct order of basic strength for following compounds :-



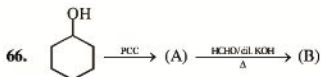
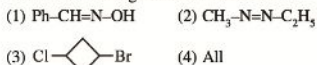
- (1) $X > Y > Z$ (2) $X > Z > Y$
 (3) $Y > X > Z$ (4) $Y > Z > X$
63. IUPAC name of following compound ?



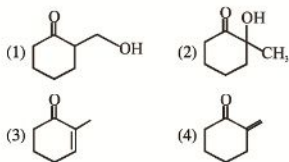
- (1) 3-Amino-2-formylbutane-1,4-dioic acid
 (2) 3-Amino-2,3-dicarboxypropanal
 (3) 2-Amino-3-formyl butane-1,4,-dioic acid
 (4) 1-Amino-2-formyl ethane-1,2-dicarboxylic acid
64. Which of the following is chiral :



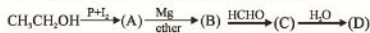
65. Which will show geometrical isomerism :-



structure of (B) is :-

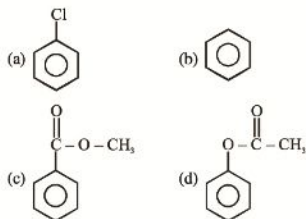


67. In the following sequence of reaction



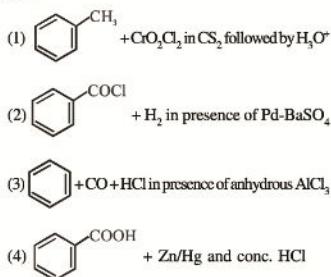
the compound 'D' is :-

- (1) Propanal (2) Butanal
 (3) n-butyl alcohol (4) n-propyl alcohol
68. Compare the rate of electrophilic substitution reaction?

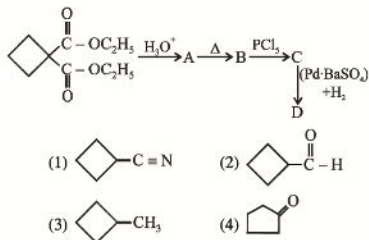


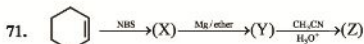
- (1) $a > b > c > d$ (2) $b > a > c > d$
 (3) $d > b > c > a$ (4) $d > b > a > c$

69. Reaction by which benzaldehyde cannot be prepared is :-

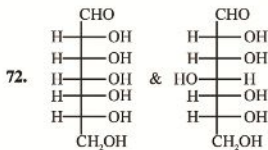
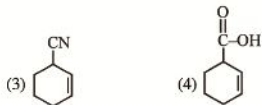
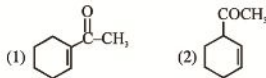


70. The end product of the sequence reactions is ?



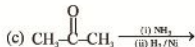
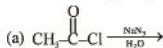


The product (Z) is :-



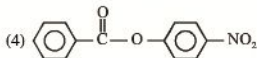
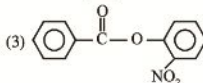
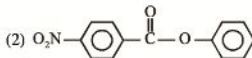
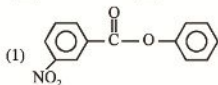
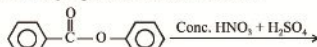
are C_n epimers. What is n ?

- (1) 3
 (2) 4
 (3) 2
 (4) The given statement is wrong, they are not epimers
73. Nylon is a :-
 (1) Polyester
 (2) Poly propylene
 (3) Polyamide
 (4) Poly carbonyl compound
74. Which reaction gives primary amines as product:



- (1) a, b, c, d (2) a, b, d
 (3) b, d (4) a, b, c

75. The major product in the reaction is :



76. For a reaction $pA + qB \rightarrow \text{products}$, the rate law expression is $r = k[A]^p[B]^q$, then :

- (1) $(p+1) < (1+m)$
 (2) $(p+q) > (1+m)$
 (3) $(p+q)$ may or may not be equal to $(1+m)$
 (4) $(p+q) = (1+m)$

77. Given that :

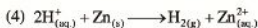
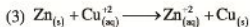
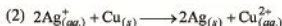
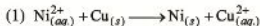
$$\text{Ni}^{2+} | \text{Ni} = -0.25 \text{ V;}$$

$$\text{Cu}^{2+} | \text{Cu} = 0.34 \text{ V}$$

$$\text{Ag}^+ | \text{Ag} = 0.80 \text{ V;}$$

$$\text{Zn}^{2+} | \text{Zn} = -0.76 \text{ V}$$

Which of the following reactions under standard condition will not take place in the specified direction:



78. When the electron of a hydrogen atom moves from $n = 4$ to $n = 1$ state, the number of spectral lines emitted is :-

- (1) 15 (2) 9 (3) 6 (4) 3

79. For mixing of two gases $\Delta H = 0$ in a closed container, for mixing of gases the correct statement is :-

- (1) Since disorderness increases so TAS becomes +ve & ΔG will be -ve.
- (2) Since disorderness decreases so TAS becomes +ve. so ΔG will be -ve.
- (3) Since TAS becomes -ve
- (4) Since $\Delta G > 0$; for reaction

80. Which of following salt will have maximum pH:-

- (1) NaNO_2 (2) $\text{CH}_3\text{COONH}_4$
- (3) NaClO_4 (4) MgCl_2

81. What will be the freezing point of 0.2 molal aqueous solution of MgBr_2 ? If salt shows 60% dissociation in solution and K_f for water is 1.86K Kg mol^{-1} .

- (1) -0.59°C (2) -0.67°C
- (3) -0.82°C (4) -1.04°C

82. 1 mol of $\text{N}_2\text{O}_{4(g)}$ at 100 K is kept in a closed container at 1 atm pressure. It is heated to 400 K, where 30% by mass of $\text{N}_2\text{O}_{4(g)}$ decomposes to $\text{NO}_{2(g)}$. The resultant pressure will be :-

- (1) 4.2 (2) 5.2 (3) 3.2 (4) 6.2

83. Rearrange the following (I to IV) in the order of increasing masses :-

- (I) 0.5 mole of O_3
- (II) 0.5 g atom of oxygen
- (III) 3.011×10^{23} molecules of O_2
- (IV) 5.6 litre of CO_2 at 1 atm and 273 K

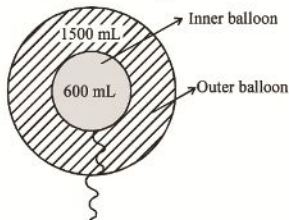
- (1) II < IV < III < I (2) II < I < IV < III
- (3) IV < II < III < I (4) I < II < III < IV

84. Following reaction describes the rusting of iron $4\text{Fe} + 3\text{O}_2 \rightarrow 4\text{Fe}^{3+} + 6\text{O}^{2-}$

Which one of the following statement is incorrect?

- (1) This is an example of redox reaction
- (2) Metallic iron is reduced to Fe^{3+}
- (3) Fe^{3+} is an oxidising agent
- (4) Metallic iron is a reducing agent

85. Two inflated balloons I and II (thin skin) having volume 600 mL and 1500 ml at 300 K are taken as shown in diagram. If maximum volume of inner and outer balloons are 800 mL and 1800 mL respectively then find the balloon which will burst first on gradual heating :-



- (1) Inner balloon (2) Outer balloon
- (3) Both simultaneously (4) Unpredictable

86. An atomic solid crystallizes in a body centre cubic lattice and the inner surface of the atoms at the adjacent corner are separated by 60.3 pm. If the atomic mass of A is 48, then density of the solid, is nearly :-

- (1) 2.7 g/cc (2) 5.07 g/cc
- (3) 3.5 g/cc (4) 1.75 g/cc

87. A detergent ($\text{C}_{12}\text{H}_{25}\text{SO}_4\text{Na}^+$) solution becomes a colloidal sol at a concentration of 10^{-3}M . On an average 10^{13} colloidal particles are present in 1mm^3 . What is the average number of ions which are contained by one colloidal particle (micelle)? [Given : $N_A = 6 \times 10^{23}$]

- (1) 6×10^7 (2) 10
- (3) 60 (4) None of these

88. $\text{XeF}_{2(g)} + \text{H}_{2(g)} \rightarrow 2\text{HF}_{(g)} + \text{Xe}_{(g)}$ $\Delta H^\circ = -430\text{ kJ}$

Bond energy $\rightarrow \text{H-H} = 435\text{ kJ/mol}$
 $\rightarrow \text{H-F} = 565\text{ kJ/mol}$

Calculate average bond energy of Xe-F bond:-

- (1) 267 kJ/mol (2) 562.5 kJ/mol
- (3) 132 kJ/mol (4) None of these

89. At 298 K the emf of cell is -

- $$\text{Pt} | \text{H}_{2(1\text{atm})} | \text{H}^+_{(0.02\text{M})} || \text{H}^+_{(0.1\text{M})} | \text{H}_{2(1\text{atm})} | \text{Pt}$$
- (1) 0.05 V (2) 0.0295 V
 - (3) 0.1 V (4) 0.059 V

90. The number of octahedral void in bcc structure is:-

- (1) 0 (2) 1 (3) 2 (4) 4

91. What is correct when number of chromosomes in leaves of angiosperms is 80 ?
 (1) 40 in stem cells (2) 40 in embryo
 (3) 30 in endosperm (4) 40 in gametes
92. Pollen grain of a flower is transferred to the stigma of another flower of the same plant. The phenomenon is :-
 (1) Genetically self pollination
 (2) Ecologically cross pollination
 (3) Genetically allogamy
 (4) (1) and (2) both
93. During early development of embryosac, the nuclear division is of
 (1) Free nuclear type (2) Cellular type
 (3) Amitotic type (4) meiotic type
94. More than one additional embryos are formed in polyembryony from :-
 (1) Nucellus (2) Integuments
 (3) Synergids (4) All of above
95. Pollination by act of "Pseudo copulation" occurs in:-
 (1) *Salvia* (2) *Yucca*
 (3) *Ophrys* (4) *Nicotia*
96. Which of the following structure is diploid ?
 (1) Antipodals (2) Synergids
 (3) Secondary nucleus (4) Gamete
97. Insect pollinated flowers have which of the following feature :-
 (1) Winged pollen
 (2) Large sized pollens
 (3) Sticky pollens with rough surface stigma
 (4) Small pollens with sticky surface stigma
98. What will be the ploidy of the cells of the nucellus and megaspore ?
 (1) n and 2n (2) 2n and n
 (3) n and n (4) 2n and 2n
99. Coconut plant has 24 chromosomes in leaves cells, then what is the number of chromosome in drinking part of coconut ?
 (1) 24 (2) 48
 (3) 36 (4) 72
100. A tetraploid male plant was crossed with a octaploid female plant, then the ploidy level of the endosperm will be :-
 (1) 8n (2) 10n (3) 7n (4) 9n
101. If an organism is Homozygous for autosomal gene (a) and Heterozygous for gene (B) & (C). What is the probability of gamete whose genotype is ABC.
 (1) $\frac{1}{4}$ (2) $\frac{1}{8}$ (3) $\frac{2}{4}$ (4) Zero
102. What is common between Mendelian monohybrid cross and dihybrid cross?
 (1) Dominance
 (2) Segregation
 (3) Independent assortment
 (4) More than one options are correct
103. Mutation can produce :-
 (1) Incomplete dominant allele
 (2) Recessive allele
 (3) Co-dominant allele
 (4) All of the above
104. Which statement is wrong about Turner's syndrome ?
 (1) It is a monosomic disorder
 (2) Associated with sex chromosome
 (3) Fertile female
 (4) Improper development of breast
105. "Segregation of one pair of characters is independent of the other pair of characters". This explains :-
 (1) Independent assortment
 (2) Law of segregation
 (3) Dominance phenomenon
 (4) Postulate of paired factors
106. A pure tall plant is planted in soil, which is poor in nutrition and reached the size of dwarf plant. This dwarf plant is crossed with another dwarf plant, the phenotype in F_2 - generation is most likely to be:-
 (1) All tall
 (2) 50% tall, 50% dwarf
 (3) 75% tall, 25% dwarf
 (4) Data insufficient
107. What will be the genotypes of parents whose offsprings have equal percentage of four phenotypes ?
 (1) AaBbCcDd \times aabbCCdd
 (2) AABbCc \times AaBbCc
 (3) AaBbCCDD \times aabbCCDD
 (4) AaBbCcDD \times AaBbCcDD

108. Consider the cross $CcDdEe \times ccddee$. What will be the probability of following respectively?
 (A) Heterozygous individuals
 (B) Homozygous recessive individuals
 (C) Individuals homozygous for first character & heterozygous for second and third characters
- (1) $\frac{4}{16}, \frac{1}{4}, \frac{2}{8}$ (2) $\frac{2}{16}, \frac{1}{16}, \frac{1}{8}$
 (3) $\frac{1}{8}, \frac{2}{16}, \frac{1}{8}$ (4) $\frac{1}{4}, \frac{1}{16}, \frac{1}{8}$
109. The inheritance of two genetic diseases namely phenylketonuria and haemophilia are to be studied in two different individuals. Both these studies will involve the use of :-
 (1) Autosomes
 (2) Sex chromosomes
 (3) Restriction endonuclease
 (4) Pedigree analysis
110. During meiosis-I, homologous chromosomes of one pair switch their position without affecting the position of another pair. This is known as -
 (1) Segregation
 (2) Separation
 (3) Co-dominance
 (4) Independent assortment
111. Some gene, which are transcribed, but not translated are those that produce :-
 (1) t-RNA and m-RNA
 (2) t-RNA and r-RNA
 (3) r-RNA and m-RNA
 (4) m-RNA
112. The enzyme primase is a :-
 (1) DNA dependent, DNA polymerase
 (2) RNA dependent, DNA polymerase
 (3) DNA dependent, RNA polymerase
 (4) RNA dependent, RNA polymerase
113. How many types of amino acyl synthetase enzyme are found in cell ?
 (1) 20 types (2) 61 types
 (3) 64 types (4) 100 types
114. Guanosine & Cytosine are respectively :-
 (1) Nucleotide, Nucleoside
 (2) Nucleoside, Nucleotide
 (3) Nucleoside, Nucleoside
 (4) None of the above
115. hnRNA is formed by which enzyme in prokaryotes?
 (1) RNA polymerase I (2) RNA polymerase II
 (3) RNA polymerase III (4) None of the above
116. Chargaff's equivalency rule is not applicable for which organism ?
 (1) *E. coli* (2) Human
 (3) Rat (4) TMV
117. If the total amount of adenine in a double stranded DNA is 22.5%, then find out the amount of cytosine(A), Base ratio (B) and kingdom(C) of this DNA sample
 (1) A \rightarrow 27.5%, B \rightarrow 0.81, C \rightarrow Prokaryote
 (2) A \rightarrow 25.7%, B \rightarrow 1.22, C \rightarrow Eukaryote
 (3) A \rightarrow 27.5%, B \rightarrow 1.22, C \rightarrow Protista
 (4) A \rightarrow 27.5%, B \rightarrow 0.81, C \rightarrow Monera
118. Unwinding of DNA double helix during replication is carried out by
 (1) ATP dependent DNA topoisomerase enzyme
 (2) ATP independent DNA helicase enzyme
 (3) ATP independent DNA topoisomerase enzyme
 (4) ATP dependent DNA helicase enzyme
119. Semiconservation mode of DNA was experimentally proved by using radioactive isotopes, by
 (1) Meselson and Stahl
 (2) Taylor et. al
 (3) Temin and Baltimore
 (4) Hersey and Chase
120. Unequivocal proof for biochemical nature of genetic material i.e., DNA, was provided by
 (1) Frederick Meiseher and Altman
 (2) Frederick Griffith
 (3) Avery, Macleod and McCarty
 (4) Hersey and Chase
121. Capping in hnRNA is catalysed by
 (1) Poly A polymerase (2) SnRNA
 (3) Guanyl transferase (4) Catalytic RNA
122. _____ of the genome codes for protein in human beings.
 (1) 98% (2) 50%
 (3) 24% (4) < 2%
123. Gause principle is correct when :-
 (a) Resources are unlimited.
 (b) Resources are limited.
 (c) Species are living in same habitat.
 (d) Species are living in different habitat.
 (1) a, c (2) b, c (3) a, d (4) b, d

124. Predator are important for a natural ecosystem because :-

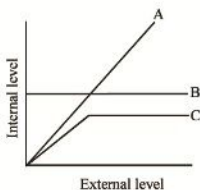
- (a) They keep pray population under control.
 (b) Help in maintaining species diversity
 (c) They are used in biological control method.
 (d) They reduce the intensity of competition among competing pray species.

- (1) Only a, c, d (2) Only a, b, c
 (3) Only a, b, d (4) All of the above

125. Which of the following alternatives used by zooplanktons to over come partial stressful conditions ?

- (1) Migration (2) Diapause
 (3) Hibernation (4) Aestivation

126.



What is A, B and C in above diagram?

A B C

- (1) Regulators Conformers Partial regulators
 (2) Regulators Conformers Partial conformers
 (3) Conformers Regulators Partial regulators
 (4) Conformers Regulators Partial conformers

127. A food web :-

- (1) Increases variety of food at each trophic level.
 (2) Imbalances the inter relationship amongst organisms.
 (3) Decreases variety of food, but increases quantity of food at each trophic level.
 (4) Increases variety as well as quantity of food at each trophic level.

128. Limitation of ecological pyramids is/are :-

- (1) it does not take into account the same species belonging to two or more trophic levels
 (2) it assumes a simple food chain, it does not accommodate a food web
 (3) saprophytes are not given any place
 (4) All of the above

129. Standing crop is -

- (i) Biomass in a unit area
 (ii) Number of living organism in unit area
 (iii) Amount of nutrient such as carbon, nitrogen, calcium in unit area
 (iv) Amount of Detritus in unit area
 (1) only (i) (2) (i) & (ii)
 (3) (i), (ii), (iii) (4) (i), (ii), (iv)

130. We have a moral duty to care for Biodiversity, well being and pass on our biological legacy in good order to future generation, this Biodiversity conservation argument is considered in :-

- (1) Narrowly utilitarian
 (2) Ethical argument
 (3) Broadly utilitarian
 (4) All of the above

131. Which one factor is not included in "Evil quartet"?

- (i) Habitat loss and fragmentation
 (ii) Over exploitation
 (iii) Alien species invasion
 (iv) Pollution and disturbance
 (v) Co-extinction

- (1) v (2) iv
 (3) ii (4) iii

132. Which one is not a secondary pollutant ?

- (1) Smog (2) Acid Rain
 (3) PAN (4) DDT

133. Match the items in column I and column II and choose the correct option :-

Column I	Column II
A. UV	(i) Biomagnification
B. Biodegradable organic matter	(ii) Eutrophication
C. DDT	(iii) Snow blindness
D. Phosphates	(iv) BOD

The correct match is :-

- (1) A-ii, B-i, C-iv, D-iii (2) A-iii, B-ii, C-iv, D-i
 (3) A-iii, B-iv, C-i, D-ii (4) A-iii, B-i, C-iv, D-i

134. Root of any plant breeding programme is

- (1) Mutation (2) Genetic variability
 (3) Hybridisation (4) Selection

135. Which chemical is used in somatic hybridisation ?

- (1) Poly Ethylene glycole
 (2) Acredine
 (3) HNO_2
 (4) Ehtenol

136. Select correct statement w.r.t. reproduction in organisms
- Asexual reproduction involve syngamy
 - Haploid-diploid alternation does not occur in asexual reproduction
 - Asexual reproduction does not introduce variability and it is slow method of reproduction
 - Sexual reproduction involve amitosis
137. Select correct match w.r.t. life span of organism
- | Column I | Column II |
|--------------|--------------------|
| a. Parrot | (i) 140 years |
| b. Crow | (ii) 60 years |
| c. Tortoise | (iii) 15 years |
| d. Crocodile | (iv) 100-150 years |
- a(ii), b(iii), c(i), d(iv)
 - a(iii), b(i), c(i), d(iv)
 - a(i), b(iii), c(iv), d(ii)
 - a(i), b(ii), c(iii), d(iv)
138. Organisms exhibiting external fertilisation are
- Sponges and Cnidarians
 - Mammals and Birds
 - Reptiles and Sponges
 - Echinoderms and Hemichordates
139. The male accessory ducts include
- Tubuli recti, vasa efferentia, epididymis and vas deferens
 - Tubuli recti, rete testis, vasa efferentia and vas deferens
 - Epididymis and vas deferens only
 - Rete testis, vasa efferentia, epididymis and vas deferens
140. Which of the following is incorrect for vas deferens?
- The seminiferous tubules of the testis open into vas deferens through rete testis
 - The vas deferens leave the testis and open into epididymis located along the posterior surface of each testis
 - They vary from 10 to 20 in number
 - All of the above
141. Find out the correct sequence in embryonic development of animal
- cleavage → zygote → fertilization → morula → blastula → gastrula
 - fertilization → cleavage → morula → zygote → blastula → gastrula
 - fertilization → zygote → blastula → morula → cleavage → gastrula
 - fertilization → zygote → cleavage → morula → blastula → gastrula
142. Seminal plasma
- Is not produced by the testes
 - Contains fructose which nourishes the sperm
 - Contains prostaglandins
 - All of the above
143. Which of the following statements regarding the sexual development of the foetus is correct?
- In the absence of a Y chromosome the sexual development of a fetus will follow the male pattern
 - The development of the fetal gonads into the male type depends on the presence of oestrogens.
 - The sex of an individual is determined by a set of genes on the X chromosome
 - The sex of an individual is determined by genes on the Y chromosome
144. Which of the following is incorrect statement?
- Positive feedback by oestrogen cause FSH surge
 - Relaxin is not secreted by corpus luteum of normal menstrual cycle
 - LH surge induce corpus luteum formation
 - Placenta is complex structure formed by maternal tissue only
145. Which one of the following is the incorrect matching of the events occur during menstrual cycle ?
- Menstruation : Breakdown of endometrium
 - Ovulation : LH and FSH attain peak level
 - Proliferative phase : Rapid regeneration of endometrium and maturation of Graafian follicle.
 - Development of corpus luteum : Luteal phase and increased secretion of FSH.

146. Just before ovulation in the human female, all the following are true except that :-

- (1) Meiosis-I has just completed
- (2) Second polar body has just been expelled
- (3) Meiosis-II is arrested at metaphase
- (4) Presence of graafian follicle in ovary

147. For prevention of STDs following simple principle should be followed except

- (1) Avoiding sex with multiple/unknown partners
- (2) Use of condoms
- (3) If STDs is detected one should get isolated from society
- (4) The infected person must consult a qualified doctor

148. Given below are four statements (a-d) regarding assisted reproductive technologies:-

- (a) ZIFT - The zygote or embryo (with upto 8 cells) transferred into the fallopian tube
- (b) ICSI - A sperm is directly injected into the ovum to form an embryo in the laboratory
- (c) AI - The semen collected either from the husband or healthy donor is artificially introduced into the uterus
- (d) GIFT - Transfer of ovum collected from a donor into the fallopian tube of another female who cannot produce ovum but can provide suitable environment for fertilisation and development

Which two of the above statements are correct:

- (1) a and d
- (2) b & c
- (3) a & c
- (4) a, b, c & d

149. Which of the following statement is incorrect?

- (1) MTPs are considered relatively safe during the first month
- (2) Pills are very effective with less side effects and are well accepted by the females
- (3) Natural methods of contraception work on the principle of preventing physical meeting of ovum and sperms
- (4) Surgical method of contraception prevents gamete transport

150. Which of the following contraceptive methods correctly matches with its mode of action?

Contraceptive method	Mode of action
(1) Vasectomy	Make the uterus unsuitable for implantation
(2) Condoms	Inhibit ovulation and implantation
(3) Diaphragm	Spermicidal and increases phagocytosis of sperms within the uterus
(4) IUDs	Increase phagocytosis of sperm

151. Acid in the stomach, saliva in the mouth, lysozyme in tears, all prevent microbial growth. These all are included in :-

- (1) Non-specific immunity
- (2) Specific immunity
- (3) Physiological barrier
- (4) (1) and (3) Both

152. Match Column -I with Column-II and select the correct answer from codes given below.

Column-I	Column-II
(A) Sporozoites	(i) Infectious form of <i>Plasmodium</i>
(B) Filariasis	(ii) <i>Aedes</i>
(C) Typhoid	(iii) <i>Wuchereria</i>
(D) Chikungunya	(iv) Widal test

(1) A-(iv), B-(ii), C-(i), D-(iii)
(2) A-(iii), B-(iv), C-(ii), D-(i)
(3) A-(i), B-(iii), C-(iv), D-(ii)
(4) A-(ii), B-(iii), C-(i), D-(iv)

153. Which one of the following immune system components does not correctly match with its respective role?

- (A) **Interferons**: secreted by virus-infected cells and protect virus-infected cells from further viral infection
 - (B) **Plasma cells**: Produce antibodies in response to pathogens into blood to fight with them
 - (C) **Macrophages**: Cytokine secreting cells that phagocytize microbes entering in the body
 - (D) **IgA**: Present in colostrum in early days of lactation to protect fetus from diseases
- (1) A & D (2) A & C
(3) B & D (4) Only C

154. How many of the following diseases can be controlled by eliminating the vectors and their breeding places
- | | |
|-----------------|--------------------|
| i. Dengue | ii. Chikungunya |
| iii. Ascariasis | iv. Filariasis |
| v. Typhoid | vi. Bubonic plague |
- (1) two (2) three
(3) four (4) five
155. Which one of the following options gives the correct matching of a disease with its causative organism and mode of infection

	Disease	Causative Organisms	Mode of Infection
(1)	Elephantiasis	<i>Wuchereria bancrofti</i>	Contaminated water and food
(2)	Malaria	<i>Plasmodium vivax</i>	Biting of male Anopheles mosquito
(3)	Typhoid	<i>Salmonella typhi</i>	contaminated air
(4)	Pneumonia	<i>Streptococcus Pneumoniae</i>	Droplet infection

156. Metastasis is
- (1) Transformation of normal cells to neoplastic cells
 - (2) When cancerous cells remain confined to their original location
 - (3) The movement of cancerous cells to distant sites through blood and lymph
 - (4) When normal cells starve and die due to the lack of nutrients
157. Which of the following is characteristic feature of cancerous/neoplastic cells?
- (1) Exhibit contact inhibition
 - (2) Starve the normal cells by competing for vital nutrients
 - (3) Never exhibit metastasis
 - (4) Regulated and controlled cell division
158. Find the correct statement
- (1) T-cells secrete antibodies and also help B-cells to produce them
 - (2) Innate immunity is pathogen specific and is based on memory
 - (3) Antibodies provide humoral immune response
 - (4) *Streptococcus pneumoniae* infects mainly kidney

159. Choose the statement not suitable for T-lymphocytes
- (1) Bone marrow and thymus both provide micro environments for the development and maturation of T-lymphocyte
 - (2) T-cells mediate cell mediated immunity
 - (3) T-lymphocytes secrete cytokines
 - (4) T-cells make clones consists of helper T-cells, killer-T cells and plasma cells
160. Which of the following is incorrect match regarding the drug and its source?

Drug	Source
(1) LSD (Lysergic acid diethylamide)	Fruiting bodies of the fungus <i>Claviceps purpurea</i>
(2) Opium	Latex of unripe capsule of <i>Papaver somniferum</i>
(3) Hashish	Dried leaves of <i>Erythroxylum coca</i>
(4) Ganja	Dried unfertilised female inflorescence of hemp plant

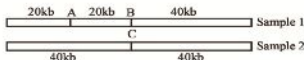
161. Which of the following imaging technique uses strong magnetic fields to accurately detect pathological and physiological changes in the living tissue and detect cancer?
- (1) MRI
 - (2) Sonography
 - (3) CT scanning
 - (4) Radiography
162. Increased lipid synthesis by liver in alcoholics gives rise to
- (1) Achalasia
 - (2) Peptic ulcer
 - (3) Osteoporosis
 - (4) Fatty liver syndrome
163. Following are the steps in MOET programme for herd improvement in which a cow has been administered hormones with FSH activity. What is the **correct** sequence of steps from A to D?
- A. Instead of one egg which they normally produce per cycle, it produces 6-8 eggs.
 - B. Fertilised eggs at 8-32 cells stage are recovered non-surgically
 - C. It is either mated with elite bull or artificially inseminated
 - D. Embryoes are transferred to surrogate mothers
- (1) A → C → D → B
 - (2) C → A → D → B
 - (3) C → A → B → D
 - (4) A → C → B → D

164. Miller made the first successful simulation experiment to assess the validity of the claim for origin of organic molecules in the earlier earth conditions. All the given statements are correct w.r.t Miller's experiment except
- (1) Mixture is heated to 800°C
 - (2) He found formation of amino acids
 - (3) He circulated the mixture under vacuum condition
 - (4) He used a mixture of H₂O, CH₄, NH₃, H₂ and CO₂ for his experiment
165. Select the correct statement
- (1) Analogous organs show divergent evolution
 - (2) Homologous organs have different fundamental structure but common function
 - (3) Thorn of *Bougainvillea* and Tendril of *Cucurbita* are homologous structure
 - (4) Wings of butterfly and birds are homologous to each other
166. Select the correct statement w.r.t. Lederberg's replica experiment
- (1) Mutations appears only after the exposure to the suitable environment
 - (2) The presence of penicillin causes change in DNA replication pattern that results in mutation
 - (3) Mutations occurred in the large numbers of bacteria due to penicillin
 - (4) The new environment only selects the preadaptive mutations that occurred earlier
167. Hardy-Weinberg equilibrium law states that the relative frequency of alleles in the population of sexually reproducing organisms remains constant from generation to generation if
- a. The population is large enough
 - b. Random mating occurs
 - c. No mutation occurs
 - d. No migration occurs
- (1) a, b & c are correct
 - (2) a, b & d are correct
 - (3) a, b, c, d are correct
 - (4) b, c & d are correct
168. Which of the following having highest cranial capacity?
- (1) *Homo habilis*
 - (2) *Homo erectus*
 - (3) *Homo sapiens neanderthalensis* (Neanderthal man)
 - (4) *Homo sapiens fossilis* (Cromagnon man)
169. How many followings statements are correct ?
- A. Hugo deVries brought forth the idea of mutations – large difference arising slowly and gradually in a population.
 - B. Mutations are random and directionless while Darwinian variations are small and directional.
 - C. Darwin believed mutation caused speciation and hence called it saltation (single step large mutation).
- (1) Three
 - (2) Two
 - (3) One
 - (4) None
170. Which of the followings statements are correct?
- A. Disturbance in genetic equilibrium, or Hardy-Weinberg equilibrium, i.e., change of frequency of alleles in a population would be interpreted as resulting in evolution.
 - B. There would be a gene flow if gene migration, happens multiple times.
 - C. Natural selection is a process in which heritable variations enabling better survival are enabled to reproduce and leave greater number of progeny.
- (1) A and B
 - (2) B and C
 - (3) A and C
 - (4) A, B and C
171. How many followings statements are correct ?
- A. T-lymphocytes are part of acquired immunity.
 - B. Each antibody molecule has four pairs peptide chains, two pairs small called light chains and two pairs long called heavy chains.
 - C. Antibody-mediated immune response is responsible for graft rejection.
- (1) Three
 - (2) Two
 - (3) Zero
 - (4) One
172. Which measure would be particularly useful for prevention and control of alcohol and drug abuse among adolescents ?
- (a) Avoid undue peer pressure
 - (b) Seeking professional and medical help
 - (c) Looking for danger sign
 - (d) Education and counselling
 - (e) Seeking help from parents and peers
- (1) a, b, d
 - (2) a, c, d, e
 - (3) c, e
 - (4) a, b, c, d, e

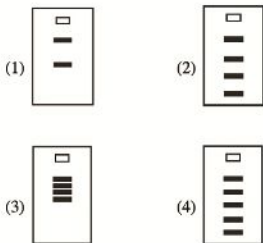
173. Which of the following is correctly matched :-

- (1) Gene gun method - suitable for plants
- (2) P.C.R. technique - cutting of D.N.A at specific location
- (3) Gel electrophoresis - Gene cloning
- (4) pBR322 - variety of virus

174. In the following diagram A,B and C are restriction sites and same DNA molecule is cut by restriction endonucleases



If both samples are loaded in a single well of gel after restriction digestion then find out correct band pattern in gel electrophoresis :-



175. A novel strategy was adopted to prevent nematode infestation in plant which was based on the process of RNA interference technique. Which of the following is not the part of this technique?

- (1) Involves silencing of specific mRNA due to complementary ds RNA molecule
- (2) Prevent the translation on the specific mRNA
- (3) Using *Salmonella typhimurium* nematode specific genes are introduced into the host plant.
- (4) Source of this complementary RNA could be from infection by viruses having RNA genomes or transposons

176. Which of the following statement is correct ?

- (1) *Bacillus thuringiensis* produces herbicidal protein
- (2) Bt toxin is encoded by a gene named *fry*.
- (3) Protein encoded by genes *cryIAC* & *cryIIAB* control the round worms.
- (4) Bt toxins can specifically kill specific pest (insects).

177. 'Rosie' a transgenic cow is known to produce a type of milk, which has all the following characteristics except :-

- (1) Protein content of 2.4 g / litre
- (2) Has human α -lactalbumin
- (3) Can be used for treatment of cystic fibrosis
- (4) More balanced diet than normal cow milk for babies

178. Match the column-I with column-II :

- | Column-I | Column-II |
|------------------------|---------------------------|
| (i) Golden rice | (A) Increased self life |
| (ii) Flavr savr tomato | (B) HGH |
| (iii) Mouse | (C) Vitamin A |
| (iv) Transgenic pig | (D) Organ transplantation |

- (1) (i) - C, (ii) - A, (iii) - B, (iv) - D
- (2) (i) - B, (ii) - A, (iii) - C, (iv) - D
- (3) (i) - B, (ii) - C, (iii) - A, (iv) - D
- (4) (i) - D, (ii) - A, (iii) - B, (iv) - C

179. Alcoholic beverages having maximum & minimum alcoholic concentration respectively are :-

- (1) Wine & Beer
- (2) Beer & Brandy
- (3) Wine & Vodka
- (4) Brandy & Beer

180. Select the incorrect match:-

- (1) Large holes - Cottage cheese.
- (2) Streptokinase - Clot buster
- (3) Glomus - Mycorrhizal fungus
- (4) Methanogens - Biogas



NEET GRAND TEST - KEY SHEET

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Ans.	1	2	1	1	1	3	2	2	3	2	4	3	1	3	1	3	1	2	1	2	4
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
Ans.	2	1	3	1	4	4	3	2	4	3	1	4	1	1	3	2	2	4	2	2	
Que.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
Ans.	2	1	1	4	2	3	2	2	1	1	1	1	2	3	2	3	3	1	4	1	
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	
Ans.	1	2	3	3	4	4	4	4	4	2	2	2	3	1	4	3	1	3	1	1	
Que.	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	
Ans.	3	2	1	2	2	4	3	3	1	1	4	4	1	4	3	3	3	2	3	2	
Que.	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	
Ans.	4	2	4	3	1	1	3	2	4	4	2	3	1	4	4	4	4	4	2	4	
Que.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	
Ans.	3	4	2	3	2	3	4	4	2	2	2	4	3	2	1	2	3	4	4	4	
Que.	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	
Ans.	4	4	4	4	4	2	3	4	3	4	4	3	1	3	4	3	2	3	4	3	
Que.	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	
Ans.	1	4	4	4	4	4	3	4	3	4	4	4	1	1	3	4	3	1	4	1	

$$1. \quad v_r = \frac{2g(\rho - \sigma)r^2}{9\eta} \quad \text{i.e., } \eta = \frac{2g(\rho - \sigma)r^2}{9v_r}$$

$$\text{So, } \eta = \frac{2}{9} \times \frac{980 \times (8 - 1.3) \times (0.2)^2}{4} = 14.6 \text{ Poise}$$

$$2. \quad mvr = \frac{nh}{2\pi} \Rightarrow \text{In second excited state.}$$

$$n = 3 \Rightarrow I_H = I_{Li^+}$$

Both H-atom and Li^{++} have same momenta

$$E = -13.6 \left(\frac{Z^2}{n^2} \right) \text{ eV} \Rightarrow (E_{Li^+} > E_{H\text{-atom}})_n$$

3. When north pole of the magnet approaches the coil, emf is induced such that left face behaves like north pole. When south pole leaves coil, the emf is induced such that right face behaves like north pole (thus left face like south pole). At the right side external bar is momentarily at rest and thus there has to be a break after half cycle. Similar arguments hold good when magnet moves from right to left. The correct option is (1)

$$4. \quad (v_p)_A = 1.8 \times 10^{14} \text{ Hz, } (v_p)_B = 2.2 \times 10^{14} \text{ Hz}$$

Work function (in eV)

$$= \frac{hv_0}{e} = \frac{6.6 \times 10^{-34}}{1.6 \times 10^{-19}} v_0 = 4 \times 10^{-15} v_0$$

$$\therefore W_A = 4 \times 10^{-15} \times 1.8 \times 10^{14} = 0.72 \text{ eV}$$

$$W_B = 4 \times 10^{-15} \times 2.2 \times 10^{14} = 0.88 \text{ eV}$$

$E_k =$ Energy of photon = 0.825 eV.

Since $E_k > 0.72$ eV, photoelectric effect is possible in metal A only.

$$5. \quad \text{Magnification, } m = \frac{1}{f - u}$$

When $u = -5$ cm, image virtual

$$m_1 = +m \quad m_1 = \frac{f}{(f - (-5))} = \frac{f}{(f + 5)}$$

When $u = -15$ cm, the image is real and

$$m_2 = -m$$

$$m_2 = \frac{-f}{(f - (-15))} = \frac{f}{(f + 15)}$$

$$\text{Given: } m_1 = m_2 \quad \frac{f}{(f + 5)} = -\frac{f}{(f + 15)}$$

$$f + 5 = -(f + 15) \Rightarrow 2f = -15 - 5 = -20 \Rightarrow f = -10 \text{ cm}$$

6. In the diagram, zero of the vernier scale lies to the right of zero of main scale. So it has positive zero error.

$N = 0$, Third division of vernier scale is coinciding with the main scale division.

\therefore zero error

$$= N + 3 \times \text{L.C} = 0 + 3 \times 0.01 = 0.03 \text{ cm}$$

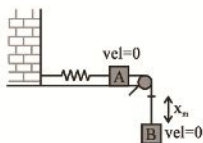
So zero correction = -0.3 cm.

That means, actual length will be 0.3 cm less than the measured length

$$7. \quad d \sin \theta = \lambda = \text{constant}$$

As d decreases, width increases \Rightarrow intensity decreases

8. When the extension is maximum A and B are momentarily at rest.



$$2mgx_m = \frac{1}{2}kx_m^2 \Rightarrow x_m = \frac{4mg}{k}$$

9. $U = \frac{3}{2}pV \Rightarrow U_1 = \frac{3}{2}(2 \times 1) = 3J$

Similarly $U_2 = 22.5 J$, $U_3 = 37.5 J$ and $U_4 = 15J$

Work done during a process is given by area under p-V curve.

$$W_{12} = \frac{1}{2}(2+5)(3-1) = 7J,$$

$$W_{23} = 5(5-3) = 10 J, W_{34} = 0$$

$$\text{and } W_{41} = -2(5-1) = -8J$$

$$Q_{41} = (\Delta U)_{41} + W_{41} = [3-15] + [-8] = -20J$$

11. $\tan\theta = \frac{v^2}{rg} = \frac{20^2}{20 \times 9.8} = 2.041$

$$\text{as } \tan 60^\circ = \sqrt{3} = 1.732$$

So possible answer is $\theta = 63.9^\circ$

12. When the electron is in the ground state of a hydrogen atom, then it is in the first orbit whose radius $r = 0.53\text{\AA}$. For first orbit, the circumference is equal to de-Broglie wavelength.

Therefore, $\lambda = 2\pi r$

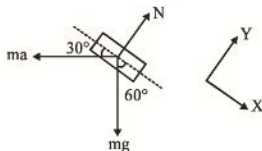
$$= 2 \times 3.14 \times 0.53\text{\AA} = 3.33\text{\AA}$$

13. If l_1 and l_2 are the consecutive resonant lengths, the wavelength of sound is given by

$$\lambda = 2(l_2 - l_1) = 2(49 - 16) = 66 \text{ cm}$$

$$v = \nu\lambda = 500 \times 66 = 330 \text{ ms}^{-1}$$

14. FBD of collar A w.r.t. moving frame.



Given w.r.t. shaft collar should be at rest.

$\therefore F_{\text{net}}$ in any direction is zero

Apply $\Sigma F_x = 0$

$$m\cos 30 = mg \cos 60;$$

$$a = g \frac{\cos 60}{\cos 30} = \frac{g}{\sqrt{3}} \text{ ms}^{-2}$$

15. At resonance $X_L = X_C$, $I = \frac{V_R}{R} = \frac{60}{120} = 0.5A$

$$V_L = iX_L = i\omega_0 L$$

$$\Rightarrow L = \frac{V_L}{I\omega_0} = \frac{40}{0.5 \times 4 \times 10^3} = 0.2\text{mH}$$

$$\frac{1}{\omega C} \times I = 40 \Rightarrow C = \frac{I}{40\omega} = \frac{0.5}{40 \times 4 \times 10^3}$$

$$= \frac{1}{32} \mu\text{F} = 0.03125 \mu\text{F}$$

16. The pitch of the helical path of a charged particle in a region of uniform magnetic field is given by

$$P = \frac{2\pi m(v \cos \theta)}{qB} \quad \dots(1)$$

The radius of the helix is

$$r = \frac{mv \sin \theta}{qB} \quad \dots(2)$$

From Eq.(1) and Eq.(2) and as $\theta = 45^\circ$, we get

$$r = \frac{P}{2\pi}$$

17. $\lambda_2 > \lambda_0$ (threshold wavelength), $\lambda_1 < \lambda_0$

$$\Rightarrow \lambda_2 > \lambda_1$$

$$\beta = D\lambda/d \Rightarrow \beta_1 < \beta_2$$

$$18. \quad \vec{v}_{cm} = \frac{m_1 \vec{v}_1 + m_2 \vec{v}_2 + m_3 \vec{v}_3}{m_1 + m_2 + m_3}$$

$$= \frac{20 \times 10 \hat{i} + 30 \times 10 \hat{j} + 50 \times 10 \hat{k}}{100}$$

$$\therefore v_{cm} = 2\hat{i} + 3\hat{j} + 5\hat{k}$$

$$19. \quad W = \frac{1}{2} F(\Delta L) ; W_1 = \frac{1}{2} (20)(0.6)10^{-3}$$

$$\text{and } W_2 = \frac{1}{2} (40)(1.0)10^{-3}$$

$$\therefore W_2 - W_1 = 1.4 \times 10^{-2} \text{ J}$$

20. As acceleration down the inclined plane is zero,
 $f = mg \sin \theta$

While moving up the plane

Work done by friction = $-(mg \sin \theta)l$
 and work done by gravity = $-(mg \sin \theta)l$

$$\therefore W_{net} = -2mg l \sin \theta$$

$$\Delta KE = 0 - \frac{1}{2} mu^2 = -\frac{1}{2} mu^2$$

$$\therefore \frac{1}{2} mu^2 = 2mg l \sin \theta \Rightarrow l = \frac{u^2}{4g \sin \theta}$$

21. $M_1 = 28g, T_1 = 57 + 273 = 330 \text{ K}, p_1 = 10 \text{ atm}$
 and $T_2 = 27 + 273 = 300 \text{ K}, p_2 = 5 \text{ atm}$

$$pV = nRT \Rightarrow pV = \frac{M}{M_0} RT \Rightarrow M \propto \frac{p}{T}$$

$$\frac{M_1}{M_2} = \frac{p_1}{p_2} \frac{T_2}{T_1} = \frac{10}{5} \times \frac{300}{330} = 1.82$$

$$\Rightarrow M_2 = \frac{M_1}{1.82} = \frac{28}{1.82} = 15.38g$$

$$\therefore \text{Gas leaked out is} = M_1 - M_2 = 28 - 15.38 = 12.6g$$

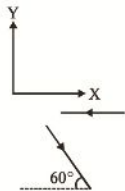
22. Velocity of man is

$$\vec{v}_M = v \cos 60^\circ \hat{i} - v \sin 60^\circ \hat{j} = \frac{v}{2} \hat{i} - \frac{\sqrt{3}}{2} v \hat{j}$$

Velocity of rain w.r.t man is $\vec{v}_{RM} = -v \hat{i}$

$$\text{or } \vec{v}_R - \vec{v}_M = -v \hat{i}$$

$$\vec{v}_R = -v \hat{i} + \left(\frac{v}{2} \hat{i} - \frac{\sqrt{3}}{2} v \hat{j} \right)$$



$$\therefore = -\frac{v}{2} \hat{i} - \frac{\sqrt{3}}{2} v \hat{j}$$

$$|\vec{v}_R| = \sqrt{\frac{v^2}{4} + \frac{3v^2}{4}} = v$$

23. Mass of water in the 1st tube, $m = \rho V = \rho \times \pi r^2 h$

$$T = \frac{h \rho g r}{2} = \frac{h' \rho g r'}{2}$$

where h' is the height to which water rises in the 2nd tube and r' is its radius

$$\text{Since } r' = 2r \Rightarrow h' = \frac{h}{2}$$

Mass of water in the 2nd tube is

$$m' = \pi r'^2 h' \rho = \pi (2r)^2 \left(\frac{h}{2} \right) \rho$$

$$\Rightarrow m' = 2\pi r^2 h \rho = 2(m) = 2 \times 5 = 10g$$

24. Zener current $I_Z = \frac{P_{max}}{V_{max}} = \frac{0.27}{9} = 0.03A$

$$\text{Current through } R_L = \frac{9}{450} = 0.02 \text{ A}$$

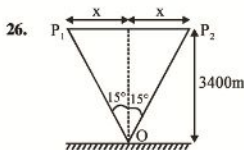
Current drawn from the battery,

$$I = I_L + I_Z = 0.02 + 0.03 = 0.05A$$

$$\therefore \text{Series resistor, } R_S = \frac{(V)_{R_S}}{I} = \frac{3}{0.05} = 60\Omega$$

25. $E = IR \Rightarrow I = \frac{6}{11} A$

$$\therefore V = E - Ir = 6 - \frac{6}{11} \times 1 = \frac{60}{11} V$$



$$\tan 15^\circ = \frac{x}{3400}$$

$$\Rightarrow x = 3400 \times 0.2679 = 910.86 \text{ m}$$

$$\text{Speed of aircraft} = \frac{2x}{10}$$

$$= \frac{2 \times 910.86}{10} = 182.2 \text{ ms}^{-1}$$

27. The shunt S to be connected is given by

$$S = \frac{I_g G}{I - I_g}$$

$$I_g = \left(\frac{1}{\theta}\right) \times N = \left(\frac{2 \times 10^{-6}}{2}\right) \times 30$$

$$\Rightarrow I_g = 30 \times 10^{-6} \text{ A}$$

$$\therefore S = \frac{30 \times 10^{-6} \times 50}{5 - 30 \times 10^{-6}} \approx 3 \times 10^{-4} \Omega$$

28. If Q is the charge on the metallic sphere, its

potential is given by $V = \frac{1}{4\pi\epsilon_0} \frac{Q}{R_1}$. When it is

surrounded by a spherical conducting shell of radius R_2 and connected to it, the charge on the sphere is completely transferred to the spherical shell. The potential of the spherical shell is given

by $V' = \frac{1}{4\pi\epsilon_0} \frac{Q}{R_2}$. All points inside the spherical

shell will be at this potential. Hence, the new potential of the metallic sphere will also be V' .

$$\therefore \frac{V'}{V} = \frac{R_1}{R_2}$$

$$\therefore V' = \left(\frac{R_1}{R_2}\right) V$$

29. Initially the balancing lengths AJ and JB are 20 cm and 80 cm. On interchanging P and Q , the balancing lengths become $AJ = 80$ cm, $JB = 20$ cm. Hence, the shift of balance point is $(80 - 20) = 60$ cm.

30. Suppose a cell of emf E and internal resistance r is shunted by a resistance R and balance point is obtained at a distance l of the potentiometer wire. Then, terminal potential difference of the cell is equal to p.d. across length l of the wire. If K is the potential gradient along the wire, then $xI =$

$$\left(\frac{E}{R+r}\right)R$$

$$\text{For the 1st case, } x \times 2 = \left(\frac{E}{5+r}\right) \times 5 \quad \dots(1)$$

$$\text{For the 2nd case, } x \times 3 = \left(\frac{E}{10+r}\right) \times 10 \quad \dots(2)$$

$$\frac{(1)}{(2)} \Rightarrow \frac{x \times 2}{x \times 3} = \frac{5}{10} \times \frac{(10+r)}{(5+r)} \Rightarrow r = 10 \Omega$$

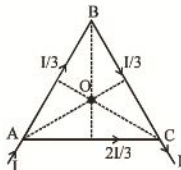
31. This problem is related to the graphical representation of electric field due to a system of charges.

To the right of q_a field is +ve

So q_a is +ve

To the left of q_b field is +ve so q_b is -ve

- 32.



B at O : (i) due to I_{AB} is $B_{AB} = K \frac{1}{3} \odot$

(ii) due to I_{BC} is $B_{BC} = K \frac{1}{3} \odot$

(iii) due to I_{AC} is $B_{AC} = K \times \frac{21}{3} \otimes$

\therefore net B at O = $K \frac{1}{3} + K \frac{1}{3} - K \frac{21}{3} = 0$

here K is any constant

33. We know $T^2 = \frac{4\pi^2}{GM} r^3$

\therefore Required slope = $\frac{4\pi^2}{GM}$

34. $\lambda_m T = \text{i.e.,}$ If T is very high λ_m will be very small. The shortest wavelengths in the visible region are violet and indigo.

35. The nuclear force is independent of the charge on the nucleons. The same nuclear force exists between proton-proton, proton-neutron and neutron-neutron.

36. The ball experiences two forces. One is force of gravity and the other is force due to the wind. Both of which are constants. Thus, the ball acquires constant acceleration along the resultant direction of force and traces a straight line.

37. In an electromagnetic wave \vec{E} and \vec{B} are perpendicular to each other and also perpendicular to the direction of propagation.

\therefore In a electromagnetic wave propagating along x-direction, a possible pair is E_y, B_z .

38. 4Ω and 6Ω resistances are short circuited. Therefore, no current will flow through these two resistances.

Current passing through the battery is

$$I = \left(\frac{20}{2}\right) = 10A$$

This is also the current passing in the wire AB from B to A.

Power supplied by the battery.

$$P = EI = (20)(10) = 200 \text{ watt}$$

Potential difference across 4Ω resistance = potential difference across 6Ω resistance = 0.

39. $x = 10\sin\left(10t + \frac{\pi}{3}\right); v = \frac{dx}{dt} = 100\cos\left(10t + \frac{\pi}{3}\right)$

$v = 0$ when

$$10t + \frac{\pi}{3} = \frac{\pi}{2} \Rightarrow 10t = \frac{\pi}{2} - \frac{\pi}{3} = \frac{\pi}{6} \Rightarrow t = \frac{\pi}{60} \text{ s}$$

41. The person B moves away from person A or the source of sound moves away from A. Hence, the apparent frequency is

$$v' = v_0 \left(\frac{v}{v + v_s} \right) v_0$$

where v_s is the speed of sound and v_0 is the speed of the person B(source)

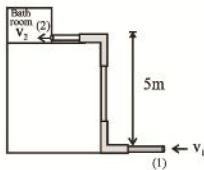
Since (from $v = u + at$ and $u = 0$)

$$v_B = gt,$$

we get, $v' = v_0 \left(\frac{v}{v + gt} \right)$

42. By continuity equation, the flow velocity

$$v_2 = \frac{A_1 v_1}{A_2} = \frac{\pi(0.01)^2}{\pi(0.005)^2} \times 4 = 16 \text{ ms}^{-1}$$



Using Bernoulli's equation between 1 and 2, we have

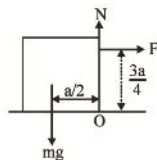
$$P_1 + \frac{1}{2}\rho v_1^2 + \rho gh_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho gh_2$$

$$\text{Or } P_2 = P_1 - \frac{1}{2}\rho(v_2^2 - v_1^2) - \rho g(h_2 - h_1)$$

$$= 4 \times 10^5 - \frac{1}{2} \times 1000(16^2 - 4^2) - 1000 \times 9.8 \times 5$$

$$= 2.3 \times 10^5 \text{ Pa}$$

43.



In the limiting case, normal reaction will pass through O. The cube will tip about O, if torque of F exceeds the torque of mg.

$$\therefore F\left(\frac{3a}{4}\right) > mg\left(\frac{a}{2}\right) \Rightarrow F > \frac{2}{3}mg$$

$$\text{So, } F_{\min} = \frac{2}{3}mg$$

44. A moving charge produces both an electric field and a magnetic field while a stationary charge produces only an electric field.

$$45. \text{ We have, } C = \frac{\epsilon_0 \epsilon_r A}{d} \quad C_1 = \frac{2\epsilon_0 A}{d} \quad C_2 = \frac{6\epsilon_0 A}{2d}$$

Thus, since the capacitors are in series the charge q on each capacitor is the same.

$$V_1 = \frac{q}{C_1} \quad \text{and} \quad V_2 = \frac{q}{C_2}$$

$$\therefore \frac{V_1}{V_2} = \frac{C_2}{C_1} = \frac{6\epsilon_0 A}{2d} \times \frac{d}{2\epsilon_0 A}$$

$$\therefore \frac{V_1}{V_2} = \frac{3}{2}$$

46. Concept

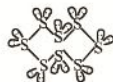
47. $Li > Na = K = Rb$ (Slater's Rule)

48. $5\sigma + 2f\pi$

as per VSEPR

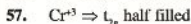
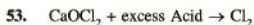
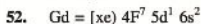
pentagonal planar

49. Crown structure.



50. Concept

51. Concept

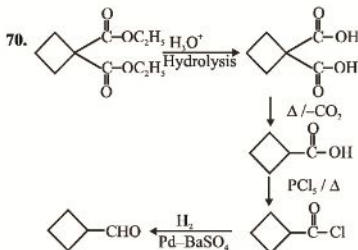
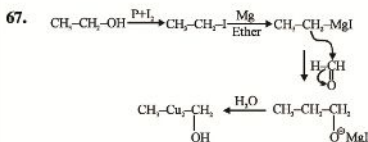
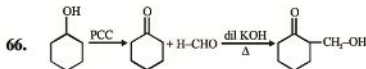
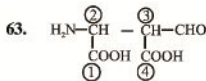


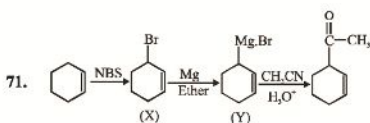
58. Concept

59. Concept

60. Concept

donor side different





76. Order of the reaction may or may not be equal to stoichiometric coefficient.

77. $E = -0.25 - 0.34$
 $= -0.59$ volt Nonspontaneous reaction

78. No. of spectral line = $\frac{n(n-1)}{2}$
 $= \frac{4 \times 3}{2} = 6$

79. On mixing of two gases $\Delta S = +ve$ and ΔG will be $-ve$ for spontaneous process.

80. NaNO_2 , $\text{CH}_3\text{COONH}_4$, NaClO_4 , MgCl_2
 WASB WAWB SASB SAWB
 $\text{MgCl}_2 < \text{NaClO}_4 \approx \text{CH}_3\text{COONH}_4 < \text{NaNO}_2$

83. (I) 0.5 mole $\text{O}_3 = 24$ g O_3 ;
 (II) 0.5 g atom of oxygen = 8 g

(III) $\frac{3.011 \times 10^{23}}{6.022 \times 10^{23}} \times 32 = 16$ g O_2

(IV) $\frac{5.6}{22.4} \times 44$ g $\text{CO}_2 = 11$ g CO_2

84. Metallic iron is oxidised to Fe^{3+}

85. Case I suppose inner balloon burst first

$$\frac{600}{300} = \frac{800}{T_2} \Rightarrow T_2 = 400 \text{ K}$$

Case II suppose outer balloon burst first

$$\frac{1500}{300} = \frac{1800}{T_2} ; T_2 = 360 \text{ K}$$

86. Given $a - 2r = 60.3$ and for bcc, $4r = \sqrt{3}a$

$$\Rightarrow a - \frac{\sqrt{3}}{2}a = 60.3 \Rightarrow a = 450 \text{ PM}$$

$$\text{Density}(\rho) = \frac{2 \times 48}{6.023 \times 10^{23} \times (4.5)^3 \times 10^{-24}}$$

$$= 1.75 \text{ g/cc}$$

87. Number of sodium lauryl sulphate molecules ($\text{CH}_3(\text{CH}_2)_{11}\text{SO}_4^- \text{Na}^+$) in 1 litre solution
 $= 10^{-3} \times 6 \times 10^{23}$
 $= 6 \times 10^{20}$

No. of sodium

lauryl sulphate molecule per $\text{mm}^3 = 6 \times 10^{14}$

Number of colloidal particles per $\text{mm}^3 = 10^{13}$

Number of molecules per colloidal particle

$$= \frac{6 \times 10^{14}}{10^{13}} = 60$$

88. $\Delta_r H = (2X + 435) - 2(565)$
 $-430 = 435 + 2X - 1130$
 $X = 132.5$ kJ/mol

89. $E = 0 - \frac{0.059}{2} \log \frac{(0.02)^2 \times 1}{(0.1)^2 \times 2}$

$$= -\frac{0.059}{2} \log \frac{4 \times 10^{-4}}{10^{-2} \times 2}$$

$$= -\frac{0.059}{2} \log 2 \times 10^{-2}$$

$$= \frac{0.059}{2} \times 1.7$$

$$= 0.05 \text{ V}$$

90. Tetrahedral and octahedral void are exist in desert pocked structure.