

Test Series HMC-8 [Option -2]

MM : 720

Test - 03

Time : 3 hrs. 20 min.

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| PHYSICS | : MECHANICAL & THERMAL PROPERTIES OF MATTER, KTG, THERMODYNAMICS |
| CHEMISTRY | : CHEMICAL BONDING, PERIODIC PROPERTIES, S-BLOCK, P-BLOCK |
| ZOOLOGY | : LOCOMOTION AND MOVEMENT, CELL: THE UNIT OF LIFE, CELL CYCLE & CELL DIVISION |
| BOTANY | : PLANT GROWTH & DEVELOPMENT, MINERAL NUTRITION, ANATOMY OF FLOWERING PLANTS |

PHYSICS : SECTION-A

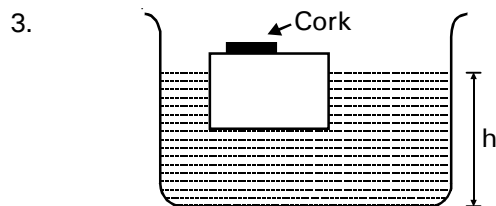
All questions are compulsory in section A

1. Increase in length of a wire of weight W , length L & area of cross-section A under its own weight is

(1) $\frac{WL}{AY}$ (2) $\frac{WL}{2AY}$
(3) $\frac{2WL}{AY}$ (4) $\frac{WL}{gAY}$

2. A system is provided with 200 cal of heat and the work done by the surrounding on the system is 40 J. Then its internal energy ($J = 4.2 \text{ J/cal}$)

- (1) increases by 600 J (2) decreases by 800 J
(3) increases by 800 J (4) increases by 880 J



A wooden block with a cork placed on its top, floats in water as shown. If after some time the cork falls into the water, then

- (1) h increases
(2) h decreases
(3) h remains same
(4) h may increase or decrease

4. A uniform cube is subjected to volume compression. If each side is decreased by 1%, then bulk strain is

- (1) 0.01 (2) 0.06
(3) 0.02 (4) 0.03

5. A platinum resistance thermometer has a resistance 2Ω at 10°C and 3Ω at 100°C . What is the temperature when the resistance is 2.2Ω ?

- (1) 18°C (2) 28°C
(3) 38°C (4) 48°C

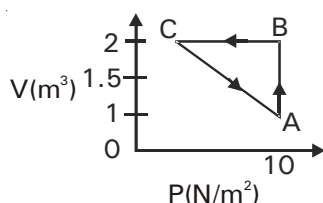
6. Let the wavelengths corresponding to maximum intensity of radiation emitted by two stars A and B be 400 \AA and 6000 \AA respectively. Then the ratio of temperature of A to that of B is

- (1) 15 : 1 (2) 1 : 15
(3) 1 : 1 (4) 225 : 1

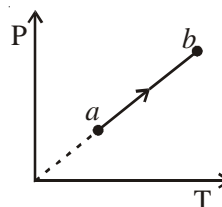
7. A steel ring of radius ' r ' and cross-sectional area A is fitted on to a wooden disc of radius R ($R > r$). If Young's modulus be Y , then the force with which the steel ring is expanded, is

(1) $AY\frac{R}{r}$ (2) $AY\left(\frac{R-r}{r}\right)$
(3) $\frac{Y}{A}\left(\frac{R-r}{r}\right)$ (4) $\frac{Yr}{AR}$

8. **Assertion** : Two spheres of same size and material, one solid and other hollow, are at same temperature θ_1 . At another temperature θ_2 , their outer radii will still be same.
Reason : All materials expand on heating.
- (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
 (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
 (3) Assertion is true statement but Reason is false
 (4) Assertion is false
9. An open vessel containing water is given a constant acceleration 'a' in the horizontal direction. Then the free surface of water gets sloped with the horizontal at an angle θ , given by
- (1) $\theta = \cos^{-1} g/a$ (2) $\theta = \tan^{-1} a/g$
 (3) $\theta = \sin^{-1} a/g$ (4) $\theta = \tan^{-1} g/a$
10. An elastic material of young's modulus Y is subjected to a stress S. The elastic energy stored per unit volume of the material is
- (1) $\frac{2Y}{S^2}$ (2) $\frac{S^2}{2Y}$
 (3) $\frac{S}{2Y}$ (4) $\frac{S^2}{Y}$
11. An ideal gas is taken through the cycle $A \rightarrow B \rightarrow C \rightarrow A$ as shown in the figure. If the net heat supplied to the gas in the cycle is 5 J, the work done by the gas in the process $C \rightarrow A$ is
12. To what temperature should the hydrogen at 327°C be cooled at constant pressure, so that the root mean square velocity of its molecules become half of its previous value
 (1) -123°C (2) 123°C
 (3) -100°C (4) 0°C
13. A body cools from 60°C to 50°C in 10 minutes when kept in air at 30°C . In the next 10 minutes its temperature will be
 (1) below 40°C
 (2) 40°C
 (3) above 40°C
 (4) cannot be predicted
14. When two soap bubbles of radius r_1 and r_2 ($r_2 > r_1$) come into contact, radius of curvature of common surface is
 (1) $(r_2 - r_1)$ (2) $(r_2 + r_1)$
 (3) $\frac{r_2 - r_1}{r_1 r_2}$ (4) $\frac{r_1 r_2}{r_2 - r_1}$
15. If temperature on Celsius scale is 25°C , the corresponding temperature on the Fahrenheit scale is
 (1) 40°F (2) 77°F
 (3) 50°F (4) 45°F
16. A water fall is 126 metres high. If half of the potential energy of the falling water gets converted to heat, the rise in temperature of water will be
 (1) 0.15°C (2) 0.1°C
 (3) 15°C (4) 1.5°C
17. Work done by the gas during the process $a \rightarrow b$ in the figure shown



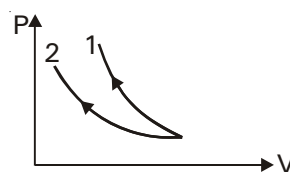
- (1) -5 J (2) -10 J
 (3) -15 J (4) -20 J



- (1) +ve (2) -ve
 (3) Zero (4) None of these

18. During the adiabatic expansion of 2 moles of a gas, the internal energy was found to have decreased by 100 J. The work done by the gas in this process is
 (1) Zero (2) -100 J
 (3) 200 J (4) 100 J
19. The reading of a manometer fitted to a closed tap is $3.5 \times 10^5 \text{ N/m}^2$. If the valve is opened, the reading of the manometer falls to $3 \times 10^5 \text{ N/m}^2$. The velocity of water is
 (1) 1 m/s (2) 10 m/s
 (3) 100 m/s (4) 0.1 m/s
20. Latent heat of ice is 80 cal/gm. A man melts 60 g of ice by chewing in 1 minute. His power is
 (1) 4800 W (2) 336 W
 (3) 80 W (4) 0.75W
21. The thermal conductivity of a material in CGS system is 0.4. In steady state, the rate of flow of heat 10 cal/sec-cm^2 , then the thermal gradient will be
 (1) 10°C/cm (2) 12°C/cm
 (3) 25°C/cm (4) 20°C/cm
22. A square plate of 0.2 m side moves parallel to a second plate with a velocity 1m/s, both plates being immersed in water. If the viscous force is 0.05 N and the coefficient of viscosity is 0.01 poise, distance between the plates is
 (1) 0.1mm (2) 0.8 mm
 (3) 0.4 mm (4) 1 mm
23. Gas at a pressure P_0 is contained in a vessel. If the masses of all the molecules are halved and their speeds are doubled, the resulting pressure P will be equal to
 (1) $4P_0$ (2) $2P_0$
 (3) P_0 (4) $0.5 P_0$

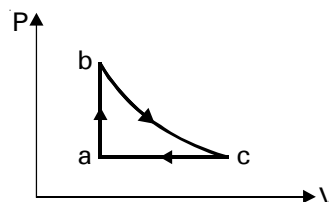
24.



P-V plots for two gases during adiabatic process are shown in figure. Plots 1 and 2 should correspond respectively to

- (1) He and O_2 (2) O_2 and He
 (3) He and Ar (4) O_2 and H_2

25.



In the above cycle carried out on a diatomic gas, bc is an isothermal process. The gas absorbs 5000J of heat as its temperature increases from 300 K to 800 K in going from a to b. The quantity of heat rejected by the gas during the process ca is

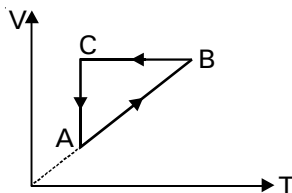
- (1) 3000 J (2) 5000 J
 (3) 7000 J (4) 10000 J

26.

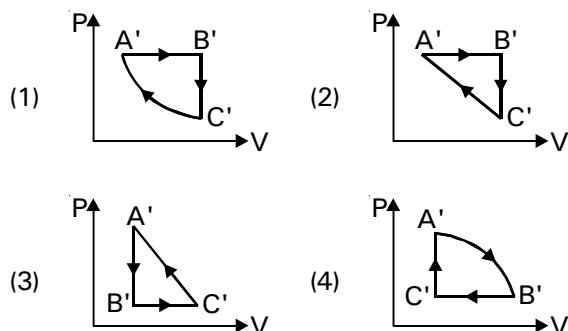
A bob of mass 2 kg is attached to wire 2 m long. Its breaking stress is $4 \times 10^7 \text{ N/m}^2$. The area of cross section of the wire is 10^{-5} m^2 . The maximum angular velocity with which it can be rotated in a horizontal circle

- (1) 8 rad/s (2) 14 rad/s
 (3) 12 rad/s (4) 10 rad/s

27.



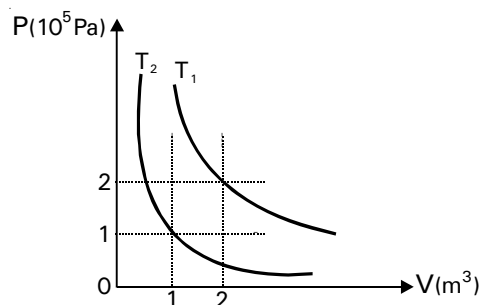
A cyclic process ABCA as shown in V-T diagram is performed with a constant mass of an ideal gas. Which of the following graphs represents the corresponding process on a P-V diagram?



28. A spherical liquid drop of density ρ (in kg/m^3) is floating half immersed in a liquid of density σ and surface tension $7.5 \times 10^{-4} \text{ N/cm}$. Radius of drop (in m) will be (Take $g = 10 \text{ m/s}^2$)

- (1) $\frac{0.15}{\sqrt{2\rho - \sigma}}$ (2) $\frac{3}{20\sqrt{2\rho - \sigma}}$
 (3) $\frac{1.5}{\sqrt{\sigma - 2\rho}}$ (4) $\frac{15}{\sqrt{\sigma - \rho}}$

29.



The graphs shows two isotherms for a fixed mass of an ideal gas. The ratio of r.m.s. speed of the molecules at temperatures T_1 to that at T_2 is

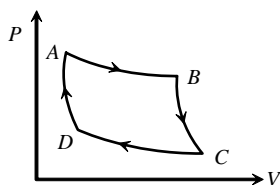
- (1) $2\sqrt{2}$ (2) $\sqrt{2}$
 (3) 2 (4) 4

30. An inverted bell lying at the bottom of a lake 20 m deep has 50 cm^3 of air trapped in it. The bell is brought to the surface of the lake. The volume of the trapped air will be (atmospheric pressure = 70 cm of Hg and density of Hg = 13.6 g/cm^3)
 (1) 135 cm^3 (2) 120 cm^3
 (3) 180 cm^3 (4) 155 cm^3
31. A gas is enclosed in a cylinder fitted with a frictionless piston. The gas is slowly heated for some time. During the process 10 J of heat is supplied and the piston is found to move out 10 cm. find the increase in the internal energy of the gas (Area of cross-section of piston = 4 cm^2 , atm pressure = 100 kPa)
 (1) 6 J (2) 10 J
 (3) 7 J (4) 8 J
32. In an isothermal reversible expansion, if the volume of 96 gm of oxygen at 27°C is increased from 70 litres to 140 litres, then the work done by the gas will be
 (1) $300 R \log_{10} 2$ (2) $81 R \log_{10} 2$
 (3) $900 R \log_{10} 2$ (4) $2.3 \times 900 R \log_{10} 2$

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

33.



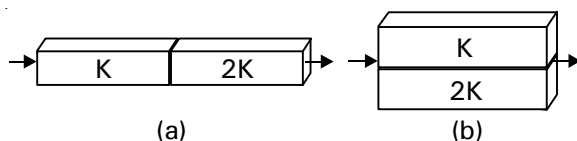
Carnot cycle (reversible) of a gas is shown in the diagram. Consider the following statements

- I. Area ABCD = Work done on the gas
 - II. Area ABCD = Net heat absorbed
 - III. Change in the internal energy in cycle = 0
- (1) I only (2) II only
(3) II and III (4) I, II and III

34. A hollow spherical shell of outer radius R floats just submerged under the water surface. The inner radius of the shell is ' r '. If the specific gravity of the shell material is $\frac{27}{8}$, then $r =$

- (1) $R \left(\frac{4}{3} \right)^{\frac{1}{3}}$ (2) $R \left(\frac{2}{3} \right)^{\frac{1}{3}}$
(3) $R \left(\frac{6}{17} \right)^{\frac{1}{3}}$ (4) $R \left(\frac{19}{27} \right)^{\frac{1}{3}}$

35.



Equivalent thermal conductivities of the composite rods shown above each consisting of two rods of different materials having same physical dimensions are respectively

- (1) $3K$ and $3K$ (2) $1.5K$ and $1.5K$
(3) $1.5K$ and $1.33K$ (4) $1.33K$ and $1.5K$

- (1) $f = \frac{2}{\gamma - 1}$ (2) $f = \frac{\gamma + 1}{2}$
(3) $f = \frac{2}{\gamma + 1}$ (4) $f = \frac{1}{\gamma + 1}$

37. In a hydraulic press, a force of 100 N is applied on one of the pistons of cross-section area 200 cm². To lift a car of weight 1000 kg, the cross-section area of the other piston should be

- (1) 1 m² (2) 2 m²
(3) 4 m² (4) 0.5 m²

38. An ideal gas at 27°C is compressed adiabatically to $\frac{8}{27}$ of its original volume. If $\gamma = \frac{5}{3}$, then the

rise in temperature is

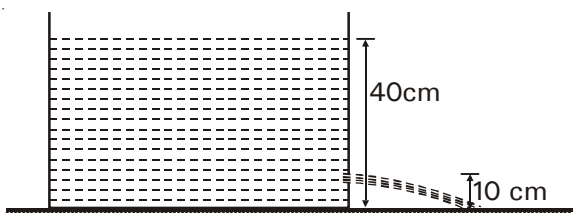
- (1) 450 K (2) 375 K
(3) 225 K (4) 405 K

39. A barometer tube reads 76 cm of mercury. If the tube is gradually inclined at an angle of 60° with vertical, keeping the open end immersed in the mercury reservoir, the length of the mercury column will be

- (1) 152 cm (2) 76 cm
(3) 38 cm (4) $38\sqrt{3}$ cm

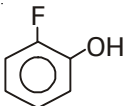
40. How many grams of a liquid of specific heat 0.2 at a temperature 40°C must be mixed with 100 gm of a liquid of specific heat 0.5 at a temperature 20°C, so that the final temperature of the mixture becomes 32°C

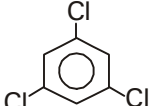
- (1) 175 gm (2) 300 g
(3) 295 gm (4) 375 g

41. The total internal energy of oxygen gas is a combination of translational and rotational energies. Their respective shares are
 (1) 60% and 40% (2) 40% and 60%
 (3) 50% and 50% (4) 100% and 0%
42. Specific heat of a gas
 (1) has only two values C_p and C_v
 (2) has a unique value at a given temperature
 (3) can have any value positive, negative or zero
 (4) depends upon the mass of the gas
43. A uniform metal rod is used as a bar pendulum. If the room temperature rises by 10°C , and the coefficient of linear expansion of the metal of the rod is 2×10^{-6} per $^\circ\text{C}$, the period of the pendulum will have percentage change of
 (1) -2×10^{-3} (2) -1×10^{-3}
 (3) 2×10^{-3} (4) 1×10^{-3}
44. **Assertion** : Spraying of water causes cooling.
Reason : For an isolated system, surface energy increase on the expense of internal energy.
 (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
 (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
 (3) Assertion is true statement but Reason is false
 (4) Assertion is false
45. A metal ball of surface area 200 cm^2 and temperature 227°C is surrounded by a vessel at 127°C . If the emissivity of the metal is 0.5, then the rate of loss of heat from the ball is (take $\sigma = 6 \times 10^{-8} \text{ J/m}^2\text{-s-K}^4$)
 (1) 22.1 W (2) 37.5 W
 (3) 18.2 W (4) 32.4 W
46. A carnot engine whose sink is at 300 K has an efficiency of 40%. By how much should the temperature of source be increased so as to increase its efficiency by 50% of original efficiency?
 (1) 300 K (2) 275 K
 (3) 250 K (4) 225 K
47. In the state of weightlessness, a capillary tube is dipped in water, then water will
 (1) not rise at all
 (2) rise to same height as at atmospheric pressure
 (3) rise to less height than at atmospheric pressure
 (4) rise up to the upper end of the capillary tube of any length
48. 
 A liquid is filled in a container to a height of 40 cm. The cross-sectional area of the orifice shown is $1/4^{\text{th}}$ that of the beaker. The orifice is at a height 10 cm above the base of container. Square of the speed of the liquid coming out from the orifice is ($g = 10 \text{ m/s}^2$)
 (1) $6 \text{ m}^2/\text{s}^2$ (2) $6.2 \text{ m}^2/\text{s}^2$
 (3) $6.4 \text{ m}^2/\text{s}^2$ (4) $6.6 \text{ m}^2/\text{s}^2$
49. Calculate the least amount of work that must be done to freeze one gram of water at 0°C by means of a refrigerator. Temperature of surrounding is 27°C .
 (1) 7.9 cal (2) 11.9 cal
 (3) 13.9 cal (4) 15.9 cal
50. A cube at 0°C is compressed equally from all sides by external pressure ' p '. Bulk modulus of cube is ' k ' and coefficient of linear expansion is ' α '. By what amount should its temperature be raised to bring it back to its original size?
 (1) $\frac{p}{k\alpha}$ (2) $\frac{p}{3k\alpha}$
 (3) $\frac{3p\alpha}{k}$ (4) $\frac{3k\alpha}{p}$

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. IUPAC name of element with atomic no. 112 is
 (1) unnilbium (2) unbibium
 (3) ununbium (4) unbiniium
52. Which of the following is an example of super octet molecule?
 (1) IF (2) PCl_3
 (3) IF_7 (4) All the three
53. The true statement about magnesium is
 (1) it is more electropositive than sodium
 (2) it is manufactured by electrolysis of aqueous MgCl_2
 (3) it gives brick red colour in the flame
 (4) it produces pungent smelling gas when its nitride is hydrolysed
54. **Statement-I** : Both N and F have higher 1st ionisation energy than oxygen.
Statement-II : N has half filled configuration and F has higher nuclear charge.
 (1) Both statement-I and statement-II are correct
 (2) Both statement-I and statement-II are incorrect
 (3) Statement-I is correct but statement-II is incorrect
 (4) Statement-I is incorrect but statement-II is correct
55. Ratio of lone pairs in molecules PCl_3 and XeF_6 is
 (1) 1 : 2 (2) 10 : 19
 (3) 2 : 1 (4) 19 : 10
56. Which of the following transition involves maximum amount of energy
 (1) $\text{M}^+(\text{g}) \rightarrow \text{M}(\text{g})$ (2) $\text{M}(\text{g}) \rightarrow \text{M}^+(\text{g})$
 (3) $\text{M}^+(\text{g}) \rightarrow \text{M}^{2+}(\text{g})$ (4) $\text{M}^{+2}(\text{g}) \rightarrow \text{M}^{3+}(\text{g})$
57. The number of sigma and pi bonds in $\text{H}_2\text{C}=\text{CH}-\text{CH}_2-\text{CH}_3$ are
 (1) 12 sigma and 2 pi (2) 11 sigma and 1 pi
 (3) 10 sigma and 2 pi (4) 12 sigma and 1 pi
58. Which of the following molecules has a net dipole moment and can either show intermolecular or intramolecular hydrogen bonding?
- a. 

b. 
- c. NHF_2

(1) a and b
(3) a and c

d. XeO_4

(2) c and d
(4) a and d
59. Identify the correct statement
 (1) All alkali metal halides are covalent
 (2) Alkali metals are strong reducing agents, sodium being the most powerful
 (3) Alkali metals react with dihydrogen at 673K but lithium reacts at 1073K
 (4) All alkali metal hydrides are ionic solids with low melting point
60. The molecule which has maximum ratio of number of bond moments and number of orbital dipoles is
 (1) SO_2 (2) ClF_3
 (3) XeF_5^- (4) PCl_3
61. When sodium is dissolved in liquid ammonia, a solution of deep blue colour is obtained. The colour of the solution is due to
 (1) ammoniated electron
 (2) sodium ion
 (3) sodium amide
 (4) ammoniated sodium ion
62. Maximum bond angle is present in
 (1) NO_2 (2) NO_2^-
 (3) NO_2^+ (4) NO_3^-
63. Identify the correct order of the solubility of AlF_3 , AlCl_3 and AlBr_3 in water
 (1) $\text{AlF}_3 > \text{AlCl}_3 > \text{AlBr}_3$
 (2) $\text{AlBr}_3 > \text{AlCl}_3 > \text{AlF}_3$
 (3) $\text{AlCl}_3 > \text{AlF}_3 > \text{AlBr}_3$
 (4) $\text{AlF}_3 > \text{AlBr}_3 > \text{AlCl}_3$

64. The boiling points of hydrides of group 16 elements are in the order
 (1) $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Te} > \text{H}_2\text{Se}$
 (2) $\text{H}_2\text{Te} > \text{H}_2\text{Se} > \text{H}_2\text{S} > \text{H}_2\text{O}$
 (3) $\text{H}_2\text{O} > \text{H}_2\text{Te} > \text{H}_2\text{Se} > \text{H}_2\text{S}$
 (4) $\text{H}_2\text{Te} > \text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Se}$
65. Match the species in column-I with the bond order in column-II
- | Column-I | Column-II |
|----------------------------|----------------------------|
| i. NO | a. 1.5 |
| ii. CO | b. 2.0 |
| iii. O_2^- | c. 2.5 |
| iv. O_2 | d. 3.0 |
| (1) i-c, ii-a, iii-b, iv-d | (2) i-a, ii-c, iii-b, iv-d |
| (3) i-c, ii-d, iii-a, iv-b | (4) i-a, ii-b, iii-c, iv-d |
66. Which of the following statement is incorrect about dipole moment of molecules?
 (1) XeF_2 has zero dipole moment
 (2) Dipole moment of H_2O is greater than NH_3
 (3) BeCl_2 molecule has non zero dipole moment
 (4) CH_4 has zero dipole moment
67. Which of the following is/are incorrect regarding structure of borax?
 (1) Its crystalline formula contains tetra nuclear units
 (2) B has two different hybridisations sp^2 and sp^3
 (3) It readily dissolves in water to give acidic solution
 (4) Both 1 and 3
68. The non-metal that does not exhibit positive oxidation state is :
 (1) Iodine (2) Fluorine
 (3) Oxygen (4) Chlorine
69. Which of the following statements are correct?
 a. Fullerenes have dangling bonds
 b. Fullerenes are cage-like molecules
 c. Graphite is thermodynamically most stable allotrope of carbon
 d. Graphite is slippery and hard and therefore used as a dry lubricant in machines
 (1) a & b (2) b & c
 (3) c & d (4) a & d
70. Which of the following oxidation states are the most characteristic for lead and tin respectively?
 (1) +2, +2 (2) +4, +2
 (3) +2, +4 (4) +4, +4
71. The tendency to catenate is less in N than in P because
 (1) N has no vacant d-orbitals
 (2) N has large electronegativity
 (3) of lone pair - lone pair repulsion in N
 (4) of lone pair - lone pair repulsion in P
72. In pyrophosphoric acid molecule, the number of P—O—P and P—O—H bonds present respectively are
 (1) 1 & 2 (2) 0 & 4
 (3) 1 & 4 (4) 1 & 8
73. In terms of period and group where would you locate the element with $Z = 114$?
 (1) Period-6th Gp-13th
 (2) Period-5th Gp-12th
 (3) Period-7th Gp-14th
 (4) Period-4th Gp-17th
74. The increasing order of the first ionization enthalpies of elements B, Be, N and O is
 (1) $\text{B} < \text{Be} < \text{N} < \text{O}$ (2) $\text{N} < \text{Be} < \text{O} < \text{N}$
 (3) $\text{B} < \text{Be} < \text{O} < \text{N}$ (4) $\text{B} < \text{O} < \text{N} < \text{Be}$
75. Which of the following metal ions has lowest ionic mobility in aqueous solution?
 (1) Li^+ (2) K^+
 (3) Na^+ (4) Cs^+
76. The correct order of electron affinity of the elements of oxygen family in the periodic table is
 (1) $\text{O} > \text{S} > \text{Se}$ (2) $\text{S} > \text{O} > \text{Se}$
 (3) $\text{S} > \text{Se} > \text{O}$ (4) $\text{Se} > \text{O} > \text{S}$
77. Identify the mismatch regarding the shape
 (1) SF_4 – see saw
 (2) BrF_5 – square pyramidal
 (3) XeF_4 – octahedral
 (4) H_2O – bent
78. Which of the following does not exist?
 (1) BeF_6^{2-} (2) AlF_6^{3-}
 (3) BeF_4^{2-} (4) BeF_2

79. Diborane reacts independently with O_2 and H_2O to produce, respectively
 (1) HBO_2 and H_3BO_3 (2) H_3BO_3 and B_2O_3
 (3) B_2O_3 and H_3BO_3 (4) B_2O_3 and $[BH_4]^-$
80. In P_4O_{10} each P atom is linked withO atoms
 (1) 2 (2) 3
 (3) 4 (4) 5
81. **Assertion** : BeO is an amphoteric oxide.
Reason : BeO reacts with HCl solution to produce $BeCl_2$ solution
 (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
 (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
 (3) Assertion is true statement but Reason is false
 (4) Assertion is false
82. Which of the following is most basic hydroxide?
 (1) LiOH (2) NaOH
 (3) KOH (4) CsOH
83. Which of the following statement is correct for all the alkali metals?
 (1) Their nitrates decompose on heating to give NO_2 and O_2
 (2) Their carbonates decompose on heating to give metal oxide and CO_2
 (3) They react with oxygen to give oxide MO_2
 (4) They react with halogens to give halides MX
84. Which of the following is the correct reaction which occurs at the cathode of the outer compartment in Castner Kellner process?
 (1) $2H^+ + 2e^- \rightarrow H_2$
 (2) $Na^+ + e^- \rightarrow Na \xrightarrow{Hg} Na(Hg)$
 (3) $OH^- \rightarrow OH + e^-$
 (4) $2Cl^- \rightarrow Cl_2 + 2e^-$
85. The reaction of Br_2 and hot conc. KOH results in the formation of the following products
 (1) KBrO (2) $KBrO_3$
 (3) O_2 (4) Br_2

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

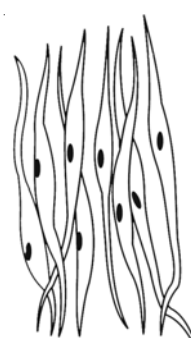
86. In which of the following ionisation processes, the bond order has increased and the magnetic behaviour has changed?
 (1) $N_2 \rightarrow N_2^+$ (2) $C_2 \rightarrow C_2^+$
 (3) $NO \rightarrow NO^+$ (4) $O_2 \rightarrow O_2^+$
87. In which of the following, Al is most electron deficient?
 (1) $AlCl_3$ (monomer) (2) Al_2Cl_6 (dimer)
 (3) $[Al(H_2O)_6]^{3+}$ (4) $[Al(OH)_4]^-$
88. **Assertion** : All molecular orbitals formed by side wise overlap have 2 nodal planes.
Reason : Bonding π -molecular orbitals have 1 nodal plane and antibonding π molecular orbitals have 2 nodal planes.
 (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
 (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
 (3) Assertion is true statement but Reason is false
 (4) Assertion is false
89. **Statement-I** : Chlorine reacts with dry slaked lime to give bleaching powder.
Statement-II : When one part of conc. HCl and three parts of conc HNO_3 mixed it gives aquaregia which is used to dissolve noble metals like gold, platinum.
 (1) Both statement-I and statement-II are correct
 (2) Both statement-I and statement-II are incorrect
 (3) Statement-I is correct but statement-II is incorrect
 (4) Statement-I is incorrect but statement-II is correct

90. When a chloride is heated with conc. H_2SO_4 , then HCl is obtained but when bromide is heated bromine gas is obtained and not HBr. This is because
 (1) HCl is a gas while HBr is a liquid
 (2) HBr is a stronger reducing agent than HCl
 (3) Br_2 is more stable than Cl_2
 (4) Br^- converts SO_4^{2-} to $\text{S}_2\text{O}_7^{2-}$
91. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \xrightarrow{\Delta} \text{N}_2 + \text{X} + 4\text{H}_2\text{O}$
 X in the above reaction is
 (1) Cr_2O_3 (2) CrO_5
 (3) $\text{Cr}_2\text{O}_7^{2-}$ (4) none of these
92. The value of IP_1 , IP_2 , IP_3 , IP_4 of an atom are respectively 7.5 eV, 25.6 eV, 48.2 eV, 170.6 eV. The configuration of atom is
 (1) $1s^2, 2s^2, 2p^6, 3s^1$
 (2) $1s^2, 2s^2, 2p^6, 3s^2, 3p^1$
 (3) $1s^2, 2s^2, 2p^6, 3s^2, 3p^4$
 (4) $1s^2, 2s^2, 2p^6, 3s^2$
93. Which of the following statement is incorrect about structure of ethylene?
 (1) One of the sp^2 hybrid orbital of carbon overlap axially with sp^2 hybrid orbital of another carbon atom to form π -bond
 (2) Two sp^2 hybrid orbital of each carbon atom are used for making sp^2 -s sigma bond with two hydrogen atoms
 (3) C-C bond is longer than C-H bond
 (4) H-C-C bond angle is larger than H-C-H bond angle
94. Match the species in column-I with the type of hybrid orbitals in column-II
- | Column-I | Column-II |
|----------------------------|----------------------------|
| i. SF_4 | a. sp^3d^2 |
| ii. IF_5 | b. d^2sp^3 |
| iii. NO_2^+ | c. sp^3d |
| iv. NH_4^+ | d. sp^3 |
| | e. sp |
| (1) i-c, ii-a, iii-e, iv-d | (2) i-a, ii-c, iii-e, iv-d |
| (3) i-c, ii-a, iii-d, iv-e | (4) i-a, ii-b, iii-c, iv-d |
95. Which of the following is not correct about calcium oxide?
 (1) It is a white amorphous solid
 (2) It absorbs moisture and carbon dioxide on exposure to atmosphere
 (3) It is a constituent of chewing gum
 (4) Addition of limited amount of water breaks the lump of lime
96. The correct order of ionic radii is
 (1) $\text{C}^{4-} > \text{N}^{3-} > \text{O}^{2-} > \text{F}^-$
 (2) $\text{O}^{2-} > \text{F}^- > \text{N}^{3-} > \text{C}^{4-}$
 (3) $\text{C}^{4-} > \text{O}^{2-} > \text{F}^- > \text{N}^{3-}$
 (4) $\text{F}^- > \text{O}^{2-} > \text{N}^{3-} > \text{C}^{4-}$
97. Number of crystal water in Gypsum and Plaster of Paris respectively are
 (1) 2, 0.5 (2) 7, 2
 (3) 7, 0.5 (4) 3, 4
98. In which of the following pairs, bond angle is more than normal tetrahedral angle?
 (1) OCl_2 and H_2O (2) OCl_2 and C_2H_2
 (3) H_2O and C_2H_2 (4) OCl_2 and OF_2
99. On combustion in excess of O_2 , lithium forms
 (1) Li_2O (2) Li_2O_2
 (3) LiO_2 (4) LiOH
100. SiO_2 reacts with NaOH to form the compound (x) and with HF to form (y). (x) & (y) respectively are
 (1) Na_2SiO_3 ; SiF_4 (2) SiF_4 ; Na_2SiO_3
 (3) SiF_2 ; Na_2SiO_4 (4) Na_2SiO_4 ; SiF_4

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. If a cell with $2n = 50$ condition undergoes Meiosis, number of Bivalents seen in zygotene stage is ____
 (1) 50 (2) 25
 (3) 100 (4) 75
102. What is the role of spindle fibres during mitosis?
 (1) To organize the chromatin material into discrete chromosomes
 (2) Attach to kinetochores on the chromosomes and help to move them to the poles
 (3) To pull the centriole
 (4) Help to synthesize new DNA

103. Mycoplasmas are
- smallest cells with $0.3\ \mu\text{m}$ length
 - largest cells with $7.0\ \mu\text{m}$ diameter
 - smallest cells with $0.1\ \mu\text{m}$ length
 - longest cell with $8.5\ \mu\text{m}$ length
104. Choose an odd member amongst a,b,c and select the right option.
- Bones present ventrally in body** – sternum, patella, scapula
 - Components of axial skeleton** – ribs, patella, ear ossicles
 - Unpaired bones** – Hyoid, vomer, maxilla
- Sternum, patella, vomer
 - Scapula, ribs, maxilla
 - Patella, ear ossicles, vomer
 - Scapula, patella, maxilla
105. Which of the following statements are correct
- Plants can show meiotic division in both haploid and diploid cells
 - Cell division is a progressive process
 - Very clear-cut lines cannot be drawn between various stages of mitosis
 - Centriole duplication occurs during S-phase in nucleus
 - Prophase follows the S and G_2 phases of interphase
- a, b and c
 - b, c and e
 - b, d and e
 - b, c and d
106. Select the correct matching in the following pairs
- Rough ER – synthesis of glycogen
 - Rough ER – oxidation of fatty acids
 - Smooth ER – oxidation of phospholipids
 - Smooth ER – synthesis of lipids
107. Which of these cells is not likely to have any DNA?
- Enucleated zygote
 - Mature mammalian RBC
 - Freshly released but enucleated egg
 - All of these
108. How many of the following statement are false?
- Locomotory structures are always different from those affecting other types of movements
 - Paramecium* shows presence of cilia which helps in movement of food through cytopharynx, but no role in locomotion
 - Movements and locomotion are always studied separately in all organisms
 - All movements are locomotion but all locomotions are not movements
- Two
 - Three
 - One
 - Four
109. What is not true about the given diagram ?
- 
- located in the walls of hollow visceral organs
 - heavily striated, fusiform and multinucleated
 - spindle shaped and uninucleated
 - cell junctions bind them together
110. Which of the following statements is correct?
- In anaphase I, homologous chromosomes separate while sister chromatids remain associated at their centromeres
 - Beginning of zygotene is recognised by dissolution of synaptonemal complex
 - Recombination nodules, the site of crossing over appear during leptotene
 - Telophase II produces a diad of cells
111. A cricket player is fast chasing a ball in the field, which one of the following groups of bones is directly contributing in his movement
- femur, malleus, scapula, tarsals
 - pelvis, radius, patella, humerus
 - tarsals, tibia, femur, metatarsals
 - sternum, ulna, fibula, pelvis
112. Anaphase II begins with
- Alignment of chromosome at equator
 - Simultaneous splitting of centromere
 - Reappearance of nuclear membrane
 - Attachment of spindle with kinetochores
113. What is the correct sequence in which you will see the bones from top to bottom of skull?
- parietal - frontal - zygomatic - mandible
 - parietal - frontal - mandible - maxilla
 - occipital - sphenoid - frontal - maxilla
 - frontal - parietal - sphenoid - mandible
114. Between a prokaryote and a eukaryote, which cell has a shorter cell division time?
- Eukaryote as there is no spindle formation
 - Prokaryote as there is no spindle formation
 - Eukaryote as the organism is complex
 - Prokaryote & eukaryote both have similar period duration in cell division

115. Which of the following structure in a muscle does not match with its feature?

| | Structure | Feature |
|-----|------------------|--|
| (1) | Muscle fibre | Anatomical unit of muscle |
| (2) | 'H' zone | Part of thick filament not overlapped by thin filament |
| (3) | Anisotropic band | Reduction in length during contraction |
| (4) | Thin filament | Comprise of actin, tropomyosin & troponin |

116. Number of tarsals, carpals, tibia and fibula in human body are respectively

- (1) 7, 8, 1, 1 (2) 8, 7, 2, 2
(3) 14, 16, 2, 2 (4) 16, 16, 1, 1

117. Which of the following statement is incorrect?

- (1) In plant cytokinesis, cell plate represents middle lamella
(2) Liquid endosperm of coconut is an example of syncytium
(3) Mitotic divisions in apical and lateral cambium results in continuous growth of plants throughout their life
(4) In plant cells, during cytokinesis, wall formations begins from periphery and extends towards centre

118. Find the correct statement about the prophase of mitosis

- (1) chromosomal material condenses to form compact mitotic chromosomes
(2) initiation of the assembly of mitotic spindle, the microtubules, the proteinaceous components of the cell cytoplasm help in the process
(3) cells at the end of prophase, when viewed under the microscope, do not show golgi complexes, ER, nucleolus & nuclear envelope
(4) all the above

119. Ribosomes are found within the two organelles i.e

- (1) Mitochondria and ER
(2) Chloroplast and mitochondria
(3) Chloroplast and ER
(4) Nucleus and perinuclear space

120. A cell has 16 chromosomes and is undergoing mitosis, how many chromosomes will the cell have at S phase and also what will be DNA content of cell in S phase, if initial amount of DNA was 2C?

- (1) 32, 4C (2) 32, 2C
(3) 16, 4C (4) 16, 2C

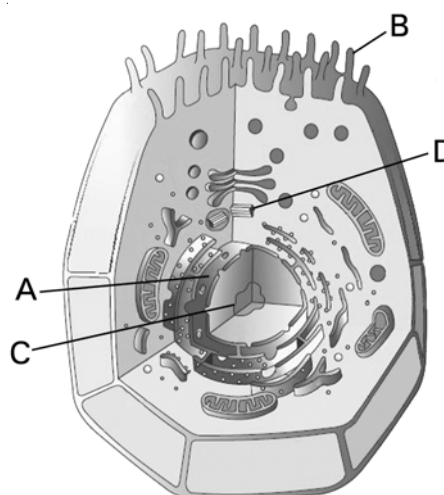
121. What marks the beginning of second stage of mitosis?

- (1) Complete disintegration of nuclear envelope
(2) Initiation of mitotic spindle
(3) Visibility of kinetochore proteins
(4) Visibility of nuclear envelope

122. Diploid chromosome number is 8. What shall be the number of chromatids in each daughter cell after meiosis?

- (1) 8 (2) 4
(3) 2 (4) 16

123. Identify the components labelled A, B, C and D in the diagram below from the list (i) to (v) given alongwith



Components

- (i) Nucleus (ii) Centriole
(iii) Nucleolus (iv) microvilli
(v) Lysosomes

The correct components are

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

124. Which of the following pairs is correctly matched

- (1) Fibrous joints – between phalanges
(2) Cartilaginous joints – between skull bones
(3) Gliding joint – between carpals
(4) Hinge joint – between vertebrae

125. Portion of myofibril between two successive Z lines is

- (1) Functional unit of contraction
(2) Henson zone
(3) Intercalated disc
(4) T-tubule

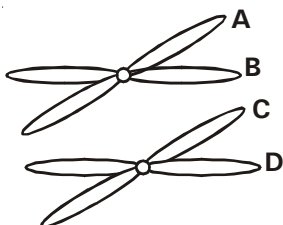
126. Identify the incorrect statement
- The interphase is called resting phase
 - Interphase is the time during which the cell is undergoing division
 - Cell growth and DNA replication occurs in an orderly manner during cell cycle
 - Both (1) & (2)
127. What is true for Golgi bodies?
- Cisternae are disc shaped
 - Cisternae are concentrically arranged near nucleus parallel to each other
 - Helps in transformation of membrane
 - Their membrane is half unit membrane
- a, b and d
 - b, c and d
 - a, c and d
 - a, b and c
128. Identify the correct statement w.r.t. skeletal muscles
- fascicles or muscle bundles are held together by a common collagenous connective tissue layer called fascia
 - each muscle fibre is lined by sarcolemma
 - muscle fibres are syncytial
 - sarcoplasmic reticulum is a storehouse of calcium ions
- a, b, c and d
 - c and d
 - a, b and d
 - b and d
129. How many among the following are unpaired bones in our body?
Ethmoid, Zygomatic, Hyoid, Occipital, Radius, Patella, Tibia, Sternum, Coxal bone, Scapula, Maxilla, Malleus, Mandible, Vomer, Lacrymal
- Nine
 - Eight
 - Six
 - Seven
130. Feature not applicable to sternum is
- Dagger shaped, flat bone
 - Articulate with vertebral column directly
 - Made up of manubrium, body & xiphoid process
 - part of rib cage
131. A motor unit consists of
- a motor neuron only
 - muscle fibres connected to a motor neuron
 - entire muscle fibres of a muscle
 - Muscle connected to motor neuron
132. **Statement-I** : Matrix of cartilage is solid, pliable and resists compression.
Statement-II : Pliable nature of matrix of cartilage is due to chondroitin salts.
- Both statement-I and statement-II are incorrect
 - Statement-I is correct but statement-II is incorrect
 - Both statement-I and statement-II are correct
 - Statement-I is incorrect but statement-II is correct
133. How is Troponin different from Tropomyosin, as
- it is made up of two filaments, that run close to F-actins
 - it is seen on myosin filaments only
 - it contains monomeric proteins, while tropomyosin is complex protein
 - it is distributed at regular intervals while tropomyosin runs close to F-actins throughout its length
134. Match the following correctly
- | | |
|---------------|--|
| a. troponin I | i. calcium binding protein |
| b. troponin T | ii. binds to tropomyosin |
| c. troponin C | iii. inhibits F-actin-myosin interaction |
- a-i, b-ii, c-iii
 - a-ii, b-iii, c-i
 - a-iii, b-ii, c-i
 - a-iii, b-i, c-ii
135. **Assertion** : In sexual reproduction when the two gametes fuse the chromosome number is restored to the value in the parent.
Reason : In the first meiotic division the homologous chromosome pair to form bivalents and undergo crossing over .
- Both Assertion and Reason are true and the reason is the correct explanation of the assertion
 - Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
 - Assertion is true statement but Reason is false
 - Assertion is false

ZOOLOGY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

136. Choose the incorrect option
- Neuromuscular junction– site of release of acetyl choline
 - Ca^{++} binding protein – tropomyosin
 - Globular head of HMM–contains active ATPase enzyme
 - 'F' actin– Polymer of monomeric 'G' actin
137. Bicelphalic rib has two articulating surfaces
- on its dorsal end
 - on its ventral end
 - one on ventral end and one on dorsal end
 - on sternal side
138. Which of the following is incorrectly matched ?
- Occipital bone – contains foramen magnum
 - Hyoid bone – U shaped bone
 - Clavicle – Flat bone of axial skeleton
 - Sphenoid bone – Sella tursica

139. What is the correct sequence of the following events?
 - (1) Synapsis, crossing over, tetrad, chiasmata
 - (2) Synapsis, tetrad, crossing over, chiasmata
 - (3) Chiasmata, Bivalent, synapsis, tetrad
 - (4) Chiasmata, crossing over, synapsis, bivalent
140. Select the correct statement regarding the specific disorder of muscular or skeletal system.
 - (1) Osteoporosis - decrease in bone mass & more chances of fracture with advancing age
 - (2) Rheumatoid arthritis– inhibits formation of synovial fluid
 - (3) Gout - Inflammation of joints due to extra deposition of calcium
 - (4) Tetany - wild contractions of muscles due to accumulation of uric acid
141. Choose the incorrect option
 - (1) Rudolf Virchow (1855) first explained *omnis cellula e cellula*
 - (2) Schiolden and Schwann proposed that bodies of animal and plants are composed of cell and products of cells
 - (3) In *Amoeba*, contractile vacuole is important for excretion
 - (4) Plasmid is extra genomic DNA present in both prokaryotes and eukaryotes
142. The eukaryotic ribosomes are 80s while the prokaryotic ribosomes are 70s. Here 'S' stands for
 - (1) Svedberg's unit and direct measure of density
 - (2) Sedimentation co-efficient and direct measure of size
 - (3) Sedimentation co-efficient and indirect measure of size
 - (4) Satellite and indirect measure of density
143. A, B, C & D are chromatids in a bivalent as shown below



Crossing over may not occur between

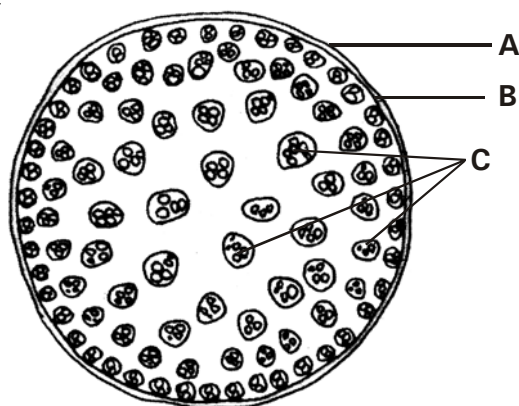
- (1) A and B (2) B and C
(3) A and D (4) B and D

144. Find the number of correct statement
- if the cell has diploid or $2n$ numbers of chromosomes at G_1 , after S phase the number of chromosomes are $2n$
 - During S phase both DNA replication and histone protein synthesis occur in cytoplasm
 - During G_2 phases proteins are used in preparation of spindle for mitosis
 - cell growth stops after G_1
- (1) 2 (2) 1
(3) 3 (4) 4
145. **Assertion** : Myasthenia gravis is an autoimmune disorder.
Reason : In Myasthenia gravis, neuromuscular junction is affected leading to paralysis of skeletal muscles.
- Both Assertion and Reason are true and the reason is the correct explanation of the assertion
 - Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
 - Assertion is true statement but Reason is false
 - Assertion is false
146. The event that does not occur during interkinesis is
- Protein synthesis
 - Cytoplasmic growth
 - DNA replication
 - Both (1) and (3)
147. Match column I with column II and select the correct option
- | Column-I | Column-II |
|-----------------------------|------------------------|
| a. Synaptonemal complex | i. Pachytene |
| b. Recombination nodules | ii. Diakinesis |
| c. Termination of chiasmata | iii. After telophase-I |
| e. Interkinesis | iv. Zygotene |
- (1) a-iv, b-i, c-ii, d-iii
(2) a-i, b-ii, c-iv, d-iii
(3) a-iv, b-iii, c-i, d-ii
(4) a-ii, b-iii, c-i, d-iv
148. **Statement-I** : The onion cell has a distinct cell membrane as its outer boundary and just within it is the cell wall.
Statement-II : The cells of human cheek have an outer membrane as a delimiting structure of the cell.
- Both statement-I and statement-II are correct
 - Both statement-I and statement-II are incorrect
 - Statement-I is correct but statement-II is incorrect
 - Statement-I is incorrect but statement-II is correct

149. Which of the following is present between the adjacent bones of the vertebral column ?
 (1) Intercalated discs (2) Cartilage
 (3) Areolar tissue (4) Smooth muscle
150. Chromosomes lose their identity as discrete elements during
 (1) prophase (2) telophase
 (3) anaphase (4) prophase-I
- BOTANY : SECTION-A**
- All questions are compulsory in section A**
151. Which of the following statement is incorrect w.r.t. sieve tubes?
 (1) Elongated tube like structure
 (2) Composed of sieve cells
 (3) Presence of sieve plate
 (4) Sieve elements has peripheral cytoplasm and large vacuole
152. _____ involves the transfer of amino group from one amino acid to keto group of a keto acid
 (1) Catalytic amidation
 (2) Reductive amination
 (3) Transamination
 (4) Amidation
153. Which is correct w.r.t. ethephon?
 a. Readily absorbable in aqueous solution to be transported in plant, it releases ethylene slowly
 b. It hastens fruit ripening in tomatoes & apples
 c. It accelerates abscission in flowers & leaves
 d. It promotes female flowers in ladyfinger thereby increasing the yield
 (1) b, c, d but not a (2) a, b, c & d
 (3) a, b, c but not d (4) both c & d
154. At certain regions, the phellogen cuts off closely arranged parenchymatous cells on the outer side instead of cork cells. These cells are
 (1) complementary cells
 (2) secondary cortex
 (3) phellem
 (4) phelloderm
155. Pick the incorrect match
 (1) Heart wood – Tyloses
 (2) Autumn wood – Late wood
 (3) Periderm – Secondary phloem
 (4) Cork – Dead suberised cells
156. Select the odd one out w.r.t. ethylene.
 (1) It breaks seed and bud dormancy
 (2) Induces flowering in mango
 (3) Promotes root growth & root hair formation
 (4) It helps in lateral shoot growth
157. Manganese toxicity is expressed by plants in the form of
 (1) Brown spots (2) Chlorotic veins
 (3) Dieback (4) Both (1) and (2)
158. How many of the following statements are incorrect?
 a. Cytokinin was discovered as kinetin
 b. Kinetin occur naturally in plants
 c. Zeatin was isolated from corn kernel
 d. Natural cytokinins are synthesized in root apices
 (1) One (2) Two
 (3) Three (4) Four
159. Conversion of NH_3 into nitrites is carried out by
 (1) *Bacillus mycoides* (2) *Rhizobium*
 (3) *Azotobacter* (4) *Nitrosomonas*
160. Identify the category of plant on the basis of following features
 a. cells of endodermis are rich in starch grains
 b. Collenchymatous hypodermis
 c. vascular bundles are arranged in a ring
 (1) Dicot stem (2) Dicot root
 (3) Dicot leaf (4) Monocot stem
161. Which element is wrongly matched with the enzyme it activates?
 (1) Mg -Phosphoenol pyruvate carboxylase
 (2) Mo -Nitrate reductase
 (3) Zn-Carbonic anhydrase
 (4) S -Alcohol dehydrogenase
162. **Statement-I** : During differentiation, cells undergo few to major structural changes both in their cell walls & protoplasm
Statement-II : During redifferentiation living differentiated cells, that by now have lost the capacity to divide can regain the capacity to divide under certain conditions.
 (1) Both statement-I and statement-II are correct
 (2) Both statement-I and statement-II are incorrect
 (3) Statement-I is correct but statement-II is incorrect
 (4) Statement-I is incorrect but statement-II is correct
163. Autumn wood can be distinguished from spring wood by having
 (1) broad vessels and tracheids
 (2) narrow vessels and tracheids
 (3) red colour of xylem
 (4) cambium
164. Hormone used to speed up the malting process in brewing industry is
 (1) IBA (2) 2, 4-D
 (3) Gibberellins (4) Zeatin

165. Sclereids are found in
 (1) fruit wall of nuts
 (2) pulp of fruits like guava
 (3) seed coat of legumes
 (4) all of these
166. Cortex and conjunctive tissue of dicot root are made up of
 (1) Sclerenchyma (2) Collenchyma
 (3) Parenchyma (4) Meristematic tissue
167. Which of the following statement is incorrect?
 (1) Development is the sum of growth and differentiation.
 (2) Growth can be defined as irreversible permanent increase in size of an organ or its parts or even of an individual cell.
 (3) Increased vacuolation, cell enlargement and new cell wall deposition are characteristics of meristematic phase of growth
 (4) In $W_1 = W_0 e^{rt}$, r is the relative growth rate and is also the measure of the ability of the plant to produce new plant material, referred to as efficiency index.

168.



In the above figure of a monocot stem, the parts labelled as A, B and C are respectively

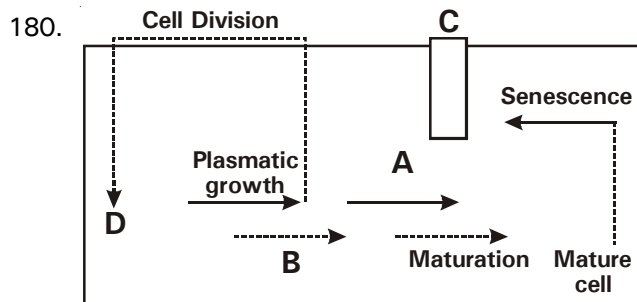
- (1) endodermis, epidermis, vascular bundles
 (2) epidermis, endodermis, ground tissue
 (3) epidermis, hypodermis, vascular bundles
 (4) endodermis, hypodermis, ground tissue
169. Vascular cambium, interfascicular cambium and cork cambium are examples of
 (1) Apical meristem
 (2) Lateral meristem
 (3) Intercalary meristem
 (4) Primary meristem
170. Which one of the following set has all the three micronutrients?
 (1) Mo, Mg, Mn (2) Fe, Cu, B
 (3) N, P, K (4) Ca, Cu, Co
171. Hydroponics has been successfully employed as a technique for commercial production of vegetables. Which vegetable is not covered in this?
 (1) Tomato (2) Seedless cucumber
 (3) Potato (4) Lettuce

172. Which of the following statements is/are correct w.r.t. bulliform cells in grasses?
 a. Certain abaxial epidermal cells along the veins modify themselves into large, empty, colourless cells
 b. When they absorb water and become turgid, the leaf surface is exposed
 c. When they are flaccid due to water stress, they make the leaves curl outwards to minimise water loss
 (1) a, b & c (2) b not a, c
 (3) c, not a, b (4) a not b, c
173. **Assertion** : The heart wood is dark brown coloured in comparison to sap wood.
Reason : Tannins, gums and resins make heart wood dark in colour
 (1) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
 (2) Assertion is true statement but Reason is false
 (3) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
 (4) Assertion is false
174. The formation of annual rings in dicot stem mainly depends on
 (1) difference of formation of unequal quantities of xylem and phloem
 (2) difference in activity of vascular cambium due to seasonal variations
 (3) difference in activity of cork cambium due to seasonal variations
 (4) difference of formation of unequal quantities of sapwood and heart wood
175. How many among the following are capable of biological nitrogen fixation?
 Alphalpa, sweet clover, sweet pea, lentils, Gloriosa, tulip, Alnus, tobacco, aloe, broadbean
 (1) 4 (2) 5
 (3) 6 (4) 7
176. After a series of experiments, by Darwin and Darwin, it was concluded that _____ was the site of transmittable influence that caused the bending of the entire coleoptile
 (1) tip of coleoptile (2) base of coleoptile
 (3) tip of coleorhiza (4) base of coleorhiza
177. Select the INCORRECT statement
 (1) Growth, at a cellular level, is principally a consequence of increase in the amount of protoplasm.
 (2) A single maize root apical meristem can give rise to 17,500 new cells/hour.
 (3) In watermelon growth is measured as increase in cell number.
 (4) An increase in surface area denotes the growth in a dorsiventral leaf.

178. How many of the following statement/s is/are incorrect?
- Ammonia produced following N_2 fixation is incorporated into amino acid as the amino group
 - Both *Rhizobium* & *Frankia* can fix nitrogen only as symbiont
 - 16 ATP are used for each NH_3 produced during biological nitrogen fixation
 - Nodules of some plants like soyabean export the fixed nitrogen as ureides
- (1) four (2) three
(3) two (4) one
179. Match the names of the phytohormones listed under Column I with the roles listed under Column II; choose the choice which gives the correct combination of the alphabets

| Column I (Hormone) | Column II (Role) |
|-----------------------|---|
| A. Auxin | p. hastens maturity period in juvenile conifers |
| B. Gibberellin | q. new chloroplast |
| C. Cytokinin | r. sprouting of potato tubers |
| D. Ethylene | s. flowering in pineapple |

- (1) A = s, B = p, C = q, D = r
(2) A = s, B = p, C = r, D = q
(3) A = s, B = r, C = p, D = q
(4) A = r, B = p, C = q, D = s



In the above figure, the terms labelled as A, B, C and D are respectively

- (1) Differentiation, Expansion, Death, Meristematic cell
(2) Expansion, Meristematic cell, Differentiation, Death
(3) Differentiation, Expansion, Meristematic cell, Death
(4) Death, Meristematic cell, Differentiation, Expansion

181. A narrow band of parenchyma that passes through the secondary xylem and secondary phloem in radial direction is called
- (1) medulla
(2) secondary medullary rays
(3) primary medullary rays
(4) primary phloem rays
182. Collateral bundles mean
- (1) phloem on outside of xylem
(2) phloem on inside of xylem
(3) xylem on outside of phloem
(4) phloem on both sides of xylem
183. The relative growth rate of a leaf is shown by
- (1) $\frac{\text{Growth in given time period}}{\text{Growth in the start of period}}$
(2) $\frac{\text{Growth in given time period}}{\text{Measurement at start of time period}}$
(3) $\frac{\text{Measurement at start of time period}}{\text{Measurement after that time period}}$
(4) $\frac{\text{Maximum growth rate}}{\text{Measurement after a time period}}$
184. For any organism growing in natural environment which growth curve do you expect?
- (1) S-shaped
(2) J-shaped
(3) rectangular hyperbola
(4) linear curve
185. Match the items in column-I with all possible respective parts of plant in column-II.

| column-I | column-II |
|--|-------------------|
| a. Secondary xylem | p. monocot stem |
| b. Polyarch | q. wood |
| c. Water containing cavities within vascular bundles | r. monocot roots |
| (1) a-p; b-q; c-r | (2) a-q; b-r; c-p |
| (3) a-q; b-p; c-r | (4) a-p; b-r; c-q |

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. Which of the following is incorrectly matched?
- (1) Cork cambium - phellogen
(2) Cork - phellem
(3) Secondary cortex - phelloderm
(4) Bark - vascular cambium
187. Vessels differ from tracheids
- (1) in being living
(2) in being dead
(3) in being multicellular
(4) because they conduct water

188. Collenchyma is absent in
 (1) Monocots (2) Roots
 (3) Dicot stem (4) Both (1) and (2)
189. **Statement-I** : Root apical meristem occupies the tip of a root while the shoot apical meristem occupies the distant most region of the stem axis.
Statement-II : The meristem which occurs between immature tissues is known as intercalary meristem.
 (1) Both statement-I and statement-II are correct
 (2) Both statement-I and statement-II are incorrect
 (3) Statement-I is correct but statement-II is incorrect
 (4) Statement-I is incorrect but statement-II is correct
190. Plants which require the exposure to light for a period exceeding a well defined critical duration are called
 (1) short day plants (2) long day plants
 (3) day neutral plants (4) indeterminate plant
191. Which is incorrect statement w.r.t. tracheids?
 (1) These are elongated or tube like cells with thick and lignified walls and tapering ends
 (2) These are dead and without protoplasm
 (3) Inner layers of the cell walls have thickenings which do not vary in form
 (4) Tracheids and vessels are the main water transporting elements in flowering plants
192. Growth in which new cells are always added by activity of meristem is
 (1) lateral growth
 (2) open growth
 (3) fundamental growth
 (4) primary growth
193. In botanical gardens and tea gardens, gardeners trim the plants regularly so that they remain bushy. Does this practice have any scientific explanation?
 (1) Trimming promotes apical dominance
 (2) Trimming removes apical dominance
 (3) Trimming induces apical bud growth
 (4) Trimming promotes lateral buds dormancy
194. Select the incorrect statement
 (1) Enzyme nitrogenase is MO-Fe protein
 (2) Ammonia is the first stable product of nitrogen fixation
 (3) Enzyme nitrogenase is highly sensitive to the molecular oxygen
 (4) The energy required for nitrogen fixation is obtained from the respiration of the bacterial cell
195. **Assertion** : Chlorine is essential for water splitting reaction of photosynthesis
Reason : chlorine is a beneficial element
 (1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
 (2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
 (3) Assertion is true statement but Reason is false
 (4) Assertion is false
196. Trichomes in the shoot system are
 (1) usually multicellular
 (2) may be branched or unbranched
 (3) soft or stiff
 (4) all of these
197. In typical dicot root, the
 (1) vascular bundles are usually 2 to 4
 (2) pith is wide and cortex is reduced
 (3) cambium occurs in vascular bundles for secondary growth
 (4) all of the above
198. Match the following w.r.t. function
- | column-I
(Element) | column-II
(Function) |
|------------------------|---|
| a. Phosphorus | p. Formation of middle lamella |
| b. Magnesium | q. Opening and closing of stomata |
| c. Potassium | r. Component of energy related compound |
| d. Calcium | s. Maintain ribosome structure |
| (1) a-p, b-r, c-q, d-s | (2) a-r, b-s, c-q, d-p |
| (3) a-r, b-q, c-s, d-p | (4) a-p, b-q, c-r, d-s |
199. Macroelements generally are present in plant tissues in concentrations of
 (1) above 10 mmole kg⁻¹ of dry matter
 (2) less than 10 mmole kg⁻¹ of dry matter
 (3) less than 1 mmole kg⁻¹ of dry matter
 (4) above 1 mmole kg⁻¹ of dry matter
200. Deficiency symptoms of an element tend to appear first in young leaves. It indicates that the element is relatively immobile. Which one of the following elemental deficiency would show such symptoms?
 (1) sulphur (2) magnesium
 (3) nitrogen (4) potassium