

SEAL

Test Booklet Number

21139

[Time : 3 Hours]

Subject Code - 1402

**PHYSICS, CHEMISTRY &
BIOLOGY**

Roll Number

[Maximum Marks : 600]

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you answer the questions given in this Test Booklet :

1. Answers to questions in this Test Booklet are to be given on an **OMR Answer Sheet** provided to the candidate **separately**.
2. Candidate must fill up Name, Category, Test Booklet Number, Subject Code and Roll Number in the Answer Sheet carefully as per instructions given.
3. This Test Booklet consists of 150 questions. All questions are compulsory and carry equal marks.
4. Each question in this Test Booklet has four possible alternative answers namely, (A), (B), (C) and (D), one of which is correct. Candidate should choose the correct answer against each question out of four alternative answers.
5. Candidate is instructed to answer the questions by **darkening (●)** with **Ball Point Pen** only in the circle bearing the correct answer.
6. Candidate should not attempt more than one answer in each question. More than one attempt in any form against a question shall be treated as incorrect.
7. Marking of answer other than darkening shall be cancelled and darkening should remain within the circle or otherwise computer shall not accept during evaluation of answer-script.
8. Rough work must not be done on the Answer Sheet. Use the blank space given in the Test Booklet for rough work.
9. Candidate is to hand over the Answer Sheet to the Invigilator before leaving the Examination Hall.
10. **NEGATIVE MARKING** : Each question carries 4 (four) marks for correct response. For each incorrect response, 1 (one) mark will be deducted from the total score. More than one answer indicated against a question will be deemed as incorrect response and will be negatively marked.

P.T.O.

SEAL**SEAL**

PHYSICS

1. Which of the following quantities is **not** a vector ?
 (A) Displacement
 (B) Torque
 (C) Momentum
 (D) Moment of Inertia
2. A body is executing uniform circular motions at any instant of time. Its velocity and acceleration vectors are
 (A) along the same direction
 (B) in opposite directions
 (C) normal to each other
 (D) not related to each other
3. A body is moved along a straight line by a machine delivering constant power. The distance moved by the body in time t is proportional to
 (A) $t^{1/2}$
 (B) $t^{3/4}$
 (C) $t^{3/2}$
 (D) t^2
4. A radius of the orbit of a satellite is R . Its kinetic energy is proportional to
 (A) $\frac{1}{\sqrt{R}}$
 (B) $\frac{1}{R}$
 (C) R
 (D) $\frac{1}{R^{3/2}}$
5. A mass M is moving with a constant velocity parallel to x -axis. Its angular momentum with respect to origin
 (A) is constant
 (B) is zero
 (C) goes on increasing
 (D) goes on decreasing
6. A block is placed on a plane inclined at 12° to the horizontal. What is the maximum value of coefficient of static friction for which the block slides down the plane ?
 (A) $\tan 12^\circ$
 (B) $\cos 12^\circ$
 (C) $\sin 12^\circ$
 (D) 1
7. The ratio of the inertial mass to the gravitational mass of a body is
 (A) $1 : g$
 (B) $g : 1$
 (C) $(1 + g) : (g - 1)$
 (D) $1 : 1$
8. A number of droplets, each of radius r , combine to form a drop of radius R . If T is the surface tension, the rise in temperature will be
 (A) $3T \left(\frac{1}{r} - \frac{1}{R} \right)$
 (B) $2T \left(\frac{1}{r} - \frac{1}{R} \right)$
 (C) $\frac{3T}{R}$
 (D) $\frac{2T}{r}$

9. The lift of an airplane is based on
 - (A) Torricelli's theorem
 - (B) Bernoulli's theorem
 - (C) law of gravitation
 - (D) conservation of linear momentum
10. A 5 m long wire is fixed to the ceiling. A weight of 10 kg is hung at the lower end and is 1 m above the floor. The wire was elongated by 1 mm. The energy stored in the wire due to stretching is
 - (A) zero
 - (B) 0.05 J
 - (C) 100 J
 - (D) 500 J
11. A pendulum of time period T is kept suspended in a train accelerating uniformly. Then its time period
 - (A) remains unchanged
 - (B) increases
 - (C) decreases
 - (D) will depend on the mass of the bob
12. If a non-zero constant net horizontal force is acting on a body sitting at rest on a frictionless table, the body will
 - (A) sometimes accelerate
 - (B) always move off at a constant speed
 - (C) always accelerate at a constant rate
 - (D) accelerate whenever the force exceeds the weight
13. For the net force acting on a body to result in purely linear motion
 - (A) it must be zero
 - (B) it must pass through the centre of mass
 - (C) it must be less than the weight of the body
 - (D) it must not pass through the centre of mass
14. Four students found set of C_p and C_v (in cal/deg mole) as given below. Which of the following set is correct?
 - (A) $C_v = 4, C_p = 2$
 - (B) $C_v = 2, C_p = 4$
 - (C) $C_v = 3, C_p = 3$
 - (D) $C_p = 5, C_v = 3$
15. Real gases obey ideal gas laws more closely at
 - (A) high pressure and low temperature
 - (B) low pressure and high temperature
 - (C) high pressure and high temperature
 - (D) low pressure and low temperature
16. The ratio of mean kinetic energies of hydrogen and oxygen at a given temperature is
 - (A) 1 : 16
 - (B) 1 : 8
 - (C) 1 : 4
 - (D) 1 : 1

17. When a gas is adiabatically compressed such that its temperature rises, then
- no work is done against the gas
 - heat is transferred to the gas
 - internal energy of the gas increases
 - pressure of the gas does not increase
18. If the emissive power and the absorptivity of a body at temperature T is E and A respectively, then the emissive power of the black body at temperature T will be
- $\frac{E}{A}$
 - $\frac{E}{A} \cdot T$
 - EA
 - $\frac{EA}{T}$
19. A bucket of hot water cools down from 75°C to 70°C in T_1 minutes, from 70°C to 65°C in T_2 minutes and from 65°C to 60°C in T_3 minutes, then
- $T_1 = T_2 = T_3$
 - $T_1 > T_2 > T_3$
 - $T_1 < T_2 < T_3$
 - The relationship will depend on the volume of the bucket
20. When two sound waves with a phase difference of $\frac{\pi}{2}$, and each having amplitude A and frequency ω are superimposed on each other, then the maximum amplitude and frequency of the resulting wave is
- $\frac{A}{\sqrt{2}}, \frac{\omega}{2}$
 - $\frac{A}{\sqrt{2}}, \omega$
 - $\sqrt{2} A, \frac{\omega}{2}$
 - $\sqrt{2} A, \omega$
21. A wave of frequency 500 Hz has velocity 360 m/s . The distance between two nearest points 60° out of phase is
- 0.6 cm
 - 12 cm
 - 60 cm
 - 120 cm
22. Tie a little piece of paper to the middle of a long horizontal taut string. Now send a transverse pulse down the string. The piece of paper will suddenly rise upward as the wave passes, proving that the disturbance transports
- mass
 - weight
 - density
 - momentum

23. A doubly-open organ pipe, in comparison to a singly-open pipe of the same length, has a fundamental frequency that is
- half as great
 - twice as great
 - three times greater
 - $\frac{1}{\pi}$ times smaller
24. If n_1 , n_2 and n_3 are the fundamental frequencies of three segments into which a string is divided, then the original fundamental frequency n of the string is given by
- $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$
 - $n = n_1 + n_2 + n_3$
 - $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$
 - $\sqrt{n} = \sqrt{n_1} + \sqrt{n_2} + \sqrt{n_3}$
25. Two trains, one coming towards and another going away from an observer both at 4 m/s, whistle simultaneously at a frequency 290 Hz. The number of beats produced is (velocity of sound = 330 m/s)
- 5
 - 6
 - 7
 - 12
26. A sphere of radius r is charged to a potential V . The outward pull per unit area of its surface is given by
- $4\pi\epsilon_0 \frac{V^2}{r^2}$
 - $\frac{\epsilon_0 V^2}{4\pi r^2}$
 - $\frac{2\epsilon_0 V^2}{r^2}$
 - $\frac{\epsilon_0 V^2}{2r^2}$
27. A charge Q is placed at the centre of the cube. The electric flux through one of the face is
- $\frac{Q}{6(4\pi\epsilon_0)}$
 - $\frac{2\pi Q}{6(4\pi\epsilon_0)}$
 - $\frac{4\pi Q}{6(4\pi\epsilon_0)}$
 - $\frac{\pi Q}{6(4\pi\epsilon_0)}$
28. The fuse wire is a wire of
- low resistance and high melting point
 - high resistance and high melting point
 - high resistance and low melting point
 - low resistance and low melting point

29. Two wires of same material have length l and $2l$ and area of cross-section $4A$ and A respectively. The ratio of their specific resistances would be
- (A) 1 : 2
(B) 8 : 1
(C) 1 : 8
(D) 1 : 1
30. A magnet of length l and dipole moment M is bent into a semi-circle. New dipole moment will be
- (A) M
(B) πM
(C) $\frac{M}{\pi}$
(D) $\frac{2M}{\pi}$
31. When a magnetic needle is kept in a non-uniform magnetic field, it experiences
- (A) a force and a torque
(B) only a force
(C) only a torque
(D) neither a force nor a torque
32. Of the following, the paramagnetic substance is
- (A) iron
(B) aluminium
(C) nickel
(D) copper
33. Two beams of protons moving parallel and in the same direction will
- (A) attract each other
(B) exert no force
(C) repel each other
(D) deflect perpendicular to the plane of the beams
34. Eddy currents are produced in a material when it is
- (A) heated
(B) placed in a time-varying magnetic field
(C) placed in an electric field
(D) placed in a uniform magnetic field
35. A heater coil is cut into two parts of equal length and only one of them is used in the heater. The ratio of the heat produced by this half coil to that of the original coil is
- (A) 2 : 1
(B) 1 : 2
(C) 4 : 1
(D) 1 : 4
36. The root mean square value of a signal $v(t) = A \sin(\omega t + \theta)$ depends
- (A) only on A
(B) only on ω
(C) A and ω both
(D) A , ω and θ all

37. In a hydrogen bomb, following type of reactions takes place
- Only fission
 - Only fusion
 - Fission and fusion both
 - Only chemical
38. The graph between intensity of incident light and photoelectric current is a / an
- parabola
 - ellipse
 - circle
 - straight line
39. A radioactive substance decays by two different processes. Half-life for the first process is t_1 and for the second process is t_2 . The effective half-life is
- $\frac{t_1 + t_2}{2}$
 - $t_1 + t_2$
 - $\frac{t_1 t_2}{2(t_1 + t_2)}$
 - $\frac{t_1 t_2}{t_1 + t_2}$
40. Average binding energy per nucleon for a heavy nucleus is
- 8×10^{-3} eV
 - 0.5 eV
 - 7.6 MeV
 - 13.5 eV
41. If the momentum of an electron is changed by P , then the de Broglie wavelength associated with it changes by 0.5%. The initial momentum of electron will be
- $100P$
 - $200P$
 - $400P$
 - $\frac{P}{200}$
42. Which of the following transitions will have the highest emission wavelength?
- $n = 1$ to $n = 2$
 - $n = 2$ to $n = 1$
 - $n = 5$ to $n = 2$
 - $n = 2$ to $n = 5$
43. If $I = 0.1 [e^{V/V_T} - 1]$ mA is valid for a p - n junction, then when $V = 0.5$ V and $V_T = 0.025$ V, the resistance is almost
- 50Ω
 - 25Ω
 - 10Ω
 - zero

44. Two thin converging lenses of focal lengths 10 cm each are in contact and coaxial. The combination is equivalent to a single lens of power
- (A) 20 D
(B) 30 D
(C) 10 D
(D) 5 D
45. You are given four convex lenses of focal lengths 0.3 cm, 4 cm, 10 cm and 100 cm. Which two would you prefer for telescope for maximum magnification?
- (A) 0.3 cm and 4 cm
(B) 10 cm and 100 cm
(C) 4 cm and 10 cm
(D) 0.3 cm and 100 cm
46. A prism of refractive index $\sqrt{2}$ has a refracting angle 60° . At what angle must a ray be incident on it so that it suffers a minimum deviation?
- (A) 30°
(B) 45°
(C) 60°
(D) 75°
47. When sunlight enters the earth's atmosphere, the rays which scattered most are
- (A) violet and red
(B) yellow and green
(C) red and orange
(D) violet and blue
48. The intensity at a point, where the path difference is $\frac{\lambda}{6}$ ($\lambda =$ wavelength of light), is I . If I_0 is the maximum intensity, then $\frac{I}{I_0}$ is equal to
- (A) $\frac{\sqrt{3}}{2}$
(B) $\frac{1}{2}$
(C) $\frac{3}{4}$
(D) $\frac{1}{\sqrt{2}}$
49. Unpolarised light is incident on a dielectric of refractive index $\sqrt{3}$. If the reflected beam is completely polarised, the angle of incidence is
- (A) 30°
(B) 45°
(C) 60°
(D) 70°
50. If Young's double slit experiment is performed in water, then
- (A) fringes will be smaller in number
(B) fringes will be broader
(C) fringes will be narrower
(D) no fringes will be obtained

CHEMISTRY

51. Mole fraction of ethanol in a solution containing 46 g of ethanol and 90 g of water is (molar mass of $C_2H_5OH = 46 \text{ g mol}^{-1}$)
- (A) 0.117
(B) 0.167
(C) 0.800
(D) 0.267
52. If the concentration of glucose ($C_6H_{12}O_6$) in the blood is 0.9 g L^{-1} , what is the molarity of glucose in the blood?
- (A) 0.005 M
(B) 0.5 M
(C) 0.05 M
(D) 5.00 M
53. Orbital angular momentum depends on
- (A) l
(B) n and l
(C) n and m
(D) m and s
54. In presence of a catalyst, ammonia reacts with oxygen. The observed volume increase is about 11 percent when neither gas is in excess. Assuming that the products as well as the reactants are all gases, which one of the following reactions, could be the correct one?
- (A) $4 \text{ NH}_3 + 3 \text{ O}_2 \rightarrow 2 \text{ N}_2 + 6 \text{ H}_2\text{O}$
(B) $4 \text{ NH}_3 + 7 \text{ O}_2 \rightarrow 4 \text{ NO}_2 + 6 \text{ H}_2\text{O}$
(C) $4 \text{ NH}_3 + 5 \text{ O}_2 \rightarrow 4 \text{ NO} + 6 \text{ H}_2\text{O}$
(D) $2 \text{ NH}_3 + \text{O}_2 \rightarrow 3 \text{ H}_2 + 2 \text{ NO}$
55. The pair of ions having same electron configuration is
- (A) $\text{Cr}^{3+}, \text{Fe}^{3+}$
(B) $\text{Fe}^{3+}, \text{Mn}^{2+}$
(C) $\text{Fe}^{3+}, \text{Co}^{3+}$
(D) $\text{Se}^{3+}, \text{Cr}^{3+}$
56. Which one of the following values could be used to estimate the strength of hydrogen bond in water?
- (A) Strength of an O-H bond in H_2O
(B) Heat evolved when one mole of H_2O is formed from its elements
(C) Enthalpy change of vapourisation of water
(D) The melting point of ice
57. Given
- | Gases | H_2 | He | O_2 | N_2 |
|----------------------------------|--------------|-----|--------------|--------------|
| Critical temperature (in Kelvin) | 33.2 | 5.3 | 154.3 | 126 |
- From the above data what would be the order of liquefaction of these gases? (Starting from the gas liquefying first)
- (A) He, O_2 , H_2 , N_2
(B) H_2 , He, O_2 , N_2
(C) N_2 , O_2 , He, H_2
(D) O_2 , N_2 , H_2 , He

58. Which one of the following is correct option for free expansion of an ideal gas under adiabatic conditions ? (Thermodynamic quantities have their usual meanings.)
- (A) $q = 0, \Delta T < 0, w \neq 0$
 (B) $q = 0, \Delta T \neq 0, w = 0$
 (C) $q \neq 0, \Delta T = 0, w = 0$
 (D) $q = 0, \Delta T = 0, w = 0$
59. Which of the following statements is **not** correct regarding a catalyst ?
- (A) A catalyst is a homogeneous catalyst when reactants, products and catalyst all have the same state
 (B) Mass of a catalyst, before and after the reaction, is found the same
 (C) A catalyst alters the value of equilibrium constant in a reversible reaction
 (D) A catalyst lowers the value of energy of activation of a reaction by providing an alternate path
60. Hybridization is mentioned against each molecule / ion below. Which one of them is **not** correct ?
- (A) $\text{BCl}_3 - sp^2$
 (B) $\text{PCl}_5 - sp^3d$
 (C) $\text{SO}_4^{2-} - sp^3$
 (D) $\text{ClO}_4^- - dsp^2$
61. Aluminium crystallises in a cubic close packed (ccp) structure. If the radius of the aluminium atom is 12.5 pm, edge length of the unit cell will be
- (A) 30.0 pm
 (B) 35.35 pm
 (C) 20.5 pm
 (D) 45.25 pm
62. If $[R]_0$ is the initial concentration and k is rate constant, half-life, $t_{1/2}$ for a zero order reaction is given by the expression
- (A) $t_{1/2} = \frac{[R]_0}{k}$
 (B) $t_{1/2} = \frac{0.693}{k} [R]_0$
 (C) $t_{1/2} = \frac{[R]_0}{2k}$
 (D) $t_{1/2} = \frac{[R]_0}{k^2}$
63. The pH of an aqueous solution of $\text{Ba}(\text{OH})_2$ is 10. If solubility product (K_p) of $\text{Ba}(\text{OH})_2$ is 1×10^{-9} , the concentration of Ba^{2+} ion in solution is
- (A) $1 \times 10^{-4} M$
 (B) $1 \times 10^{-3} M$
 (C) $1 \times 10^{-2} M$
 (D) $1 \times 10^{-1} M$

64. Standard electrode potential for two couples are given below :

(i) $E_{\text{Sn}^{4+}/\text{Sn}^{2+}}^{\circ} = +0.15 \text{ V}$

(ii) $E_{\text{Cr}^{3+}/\text{Cr}}^{\circ} = -0.74 \text{ V}$

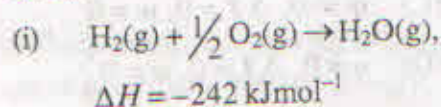
If two couples (i) and (ii) in their standard state are connected to make a cell, the cell potential will be

- (A) +0.59 V
(B) +1.83 V
(C) +0.89 V
(D) 0.18 V
65. According to molecular orbital theory, electronic configuration of O_2 will be
- (A) $(\sigma 1s^2)(\sigma^* 1s^2)(\sigma 2s^2)(\sigma^* 2s^2)(\sigma 2p_z^2)(\pi 2p_x^2, \pi 2p_y^2)(\pi^* 2p_x^1, \pi^* 2p_y^1)$
- (B) $(\sigma 1s^2)(\sigma^* 1s^2)(\sigma 2s^2)(\sigma^* 2s^2)(\sigma 2p_z^2)(\pi 2p_x^2, \pi 2p_y^2)(\pi^* 2p_x^1)$
- (C) $(\sigma 1s^2)(\sigma^* 1s^2)(\sigma 2s^2)(\sigma^* 2s^2)(\sigma 2p_z^2)(\pi 2p_x^2, \pi 2p_y^2)(\pi^* 2p_x^2, \pi^* 2p_y^1)$
- (D) $(\sigma 1s^2)(\sigma^* 1s^2)(\sigma 2s^2)(\sigma^* 2s^2)(\sigma 2p_z^2)(\pi 2p_x^2, \pi 2p_y^2)(\pi^* 2p_x^2, \pi^* 2p_y^2)$
66. In an exothermic reaction $A \rightarrow B$, the activation energy is 100 kJ mol^{-1} of A. The enthalpy change ($\Delta_r H$) of the reaction is 140 kJ mol^{-1} . The activation energy of the reverse reaction on, $B \rightarrow A$, will be
- (A) 40 kJ mol^{-1}
(B) 340 kJ mol^{-1}
(C) 240 kJ mol^{-1}
(D) 100 kJ mol^{-1}

67. Which of the following pairs of the molecules is paramagnetic ?

- (A) B_2 and C_2
(B) C_2 and O_2
(C) B_2 and O_2
(D) O_2 and F_2

68. Given



- (ii) The enthalpy of dissociation of $\text{H}_2(\text{g})$ and $\text{O}_2(\text{g})$ are $+436 \text{ kJ mol}^{-1}$ and $+500 \text{ kJ mol}^{-1}$ respectively

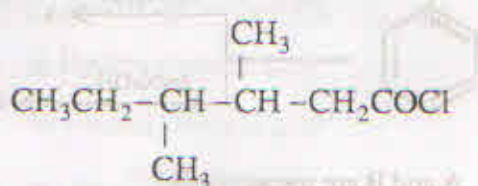
The bond enthalpy of O-H bond in water is

- (A) $+121 \text{ kJ mol}^{-1}$
(B) $+222 \text{ kJ mol}^{-1}$
(C) $+444 \text{ kJ mol}^{-1}$
(D) $+464 \text{ kJ mol}^{-1}$
69. Which of the following statements is **not** correct in relation to periodic table ?
- (A) Ionization enthalpies generally increase across a period and decreased down a group
- (B) In general, electron gain enthalpies become more negative across a period and less negative down a group
- (C) Atomic radius increases from left to right across a period and within a group decreases with increase in atomic number
- (D) Metallic character increases as we go down a group

70. Oxidation state of sulphur in anions SO_3^{2-} , $\text{S}_2\text{O}_4^{2-}$ and $\text{S}_2\text{O}_6^{2-}$ varies in order
- (A) $\text{SO}_3^{2-} < \text{S}_2\text{O}_4^{2-} < \text{S}_2\text{O}_6^{2-}$
 (B) $\text{S}_2\text{O}_4^{2-} < \text{S}_2\text{O}_6^{2-} < \text{SO}_3^{2-}$
 (C) $\text{S}_2\text{O}_6^{2-} < \text{S}_2\text{O}_4^{2-} < \text{SO}_3^{2-}$
 (D) $\text{S}_2\text{O}_4^{2-} < \text{SO}_3^{2-} < \text{S}_2\text{O}_6^{2-}$
71. Electronegativity of the elements C, Si, N and P increases in the order
- (A) $\text{C} < \text{N} < \text{Si} < \text{P}$
 (B) $\text{N} < \text{Si} < \text{C} < \text{P}$
 (C) $\text{Si} < \text{P} < \text{C} < \text{N}$
 (D) $\text{P} < \text{Si} < \text{N} < \text{C}$
72. Among the trihalides of nitrogen, which one is least basic ?
- (A) NF_3
 (B) NCl_3
 (C) NBr_3
 (D) NI_3
73. When sodium is dissolved in liquid ammonia, a solution of deep blue colour is obtained. The colour of the solution is due to
- (A) ammoniated electron
 (B) sodium ion
 (C) sodium amide
 (D) ammoniated sodium ion
74. Formula of soda ash is
- (A) $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
 (B) $\text{Na}_2\text{CO}_3 \cdot 2\text{H}_2\text{O}$
 (C) $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$
 (D) Na_2CO_3
75. Silicon is purified by
- (A) vapour phase refining
 (B) Mond's process of refining
 (C) zone refining
 (D) Van Arkel method of refining
76. In the extraction of copper from its sulphide ore, the metal is formed by the reduction of Cu_2O with
- (A) FeS
 (B) CO
 (C) Cu_2S
 (D) SO_2
77. Which one of the following statements is wrong ?
- (A) PH_3 can act as ligand in the formation of coordination compounds
 (B) NO_2 is of paramagnetic nature
 (C) Covalency of nitrogen in N_2O_5 is four
 (D) Oxidation state of phosphorus in H_3PO_2 is +3

78. On heating ammonium dichromate $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$, the gas evolved is
- oxygen
 - ammonia
 - nitrous oxide
 - nitrogen
79. Titanium shows magnetic moment of 1.73 BM in its compound. The oxidation state of titanium in the compound is (At no. of Ti = 22)
- +1
 - +2
 - +3
 - +4
80. Which one of the following oxides will be acidic in nature?
- MnO
 - Mn_2O_3
 - MnO_2
 - Mn_2O_7
81. The correct IUPAC name of $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ is
- Diamminedichloridoplatinum(II)
 - Diamminedichloridoplatinum(IV)
 - Diamminedichloridoplatinum(0)
 - Dichloridodiammineplatinum(IV)
82. Zirconium belongs to 4d transition series and hafnium belongs to 5d transition series still they show similar physical and chemical properties. Reason is
- both belong to d-block
 - both have same number of electrons
 - both have similar atomic radius
 - both belong to same group of periodic table
83. Which one of the following is the ionization isomer of $[\text{Co}(\text{NH}_3)_5\text{Br}]^{2+}\text{SO}_4^{2-}$?
- $[\text{Co}(\text{NH}_3)_5\text{BrSO}_4]$
 - $[\text{Co}(\text{NH}_3)_5\text{BrSO}_4] \cdot 2\text{H}_2\text{O}$
 - $[\text{Co}(\text{SO}_4)\text{Br}(\text{H}_2\text{O})_5]$
 - $[\text{Co}(\text{NH}_3)_5\text{SO}_4]^+ \text{Br}^-$
84. The element of the lanthanoid series which is well known to exhibit +4 oxidation state is
- samarium
 - cerium
 - gadolinium
 - holmium

85. The IUPAC name of the following compound



- (A) 3,4-dimethylpentanoyl chloride
 (B) 2,3-dimethylpentanoyl chloride
 (C) 3,4-dimethylhexanoyl chloride
 (D) 4-ethyl-3-methylpentanoyl chloride
86. Carbenes are isoelectronic with
- (A) carbanions
 (B) carbocations
 (C) carbon free radical
 (D) ammonium ion
87. Which of the following statements is **not** true about enantiomers?
- (A) They have a same melting / boiling points
 (B) They have mirror image relationship
 (C) They react differently with chiral reagent
 (D) They react differently with achiral reagent

88. Pent-1-yne and pent-2-yne can be distinguished chemically by using

- (A) Molish reagent
 (B) Lucas reagent
 (C) ammonical cuprous chloride
 (D) Wz reagent

89. Consider the following reaction:



Product 'A' is

- (A) cis-2-butene
 (B) trans-2-butene
 (C) 2-butanone
 (D) but-1-yne
90. Nitrogen dioxide is responsible for
- (A) depletion of ozone layer
 (B) nerve disease in humans
 (C) global warming
 (D) acid rain
91. Glycerol when treated with excess of Hg, yields
- (A) allyl iodide
 (B) 1,2,3-Triiodopropane
 (C) propylene
 (D) 2-iodopropane

92. A compound 'X' when treated with I_2 in alkaline medium yields 'Y'. Compound 'Y' when heated with Ag gives 'Z' which when treated with dil. H_2SO_4 in presence of Hg^{2+} gives back 'X'. The compound 'X' could be

(A) $CH_3CH_2COCH_3$
 (B) $(CH_3)_3COH$
 (C) CH_3CHO
 (D) CH_3CH_2OH

93. *m*-Chlorobenzaldehyde on reaction with concentrated KOH at room temperature gives

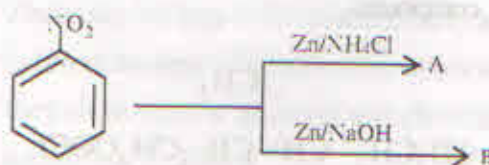
(A) *m*-chlorobenzyl alcohol and *m*-hydroxybenzyl alcohol
 (B) *m*-hydroxybenzaldehyde and *m*-chlorobenzyl alcohol
 (C) potassium *m*-chlorobenzoate and *m*-chlorobenzyl alcohol
 (D) potassium *m*-chlorobenzoate and *m*-hydroxybenzyl alcohol

94. Consider the following reaction:

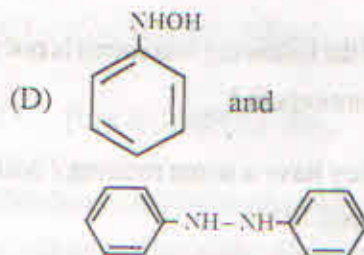
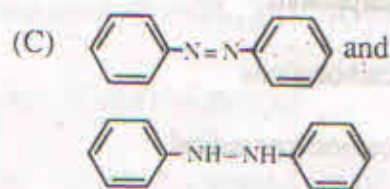
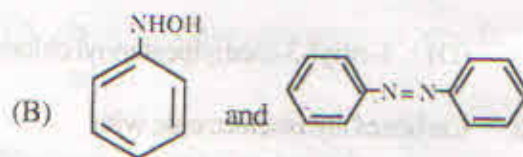
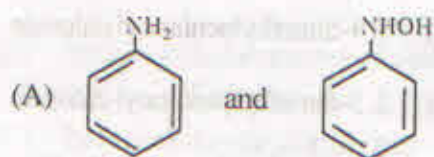


(A) $C_6H_5CH_2CH_2CH_2OH$
 (B) $C_6H_5CH=CHCH_2OH$
 (C) $C_6H_5CH_2CH_2CHO$
 (D) $C_6H_5CH_2CH_2CH_3$

95. Consider the following reaction:



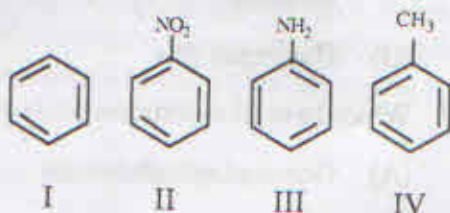
A and B are respectively



96. Which of the following polymers of glucose is stored by animals?

(A) Cellulose
 (B) Amylose
 (C) Amylopectin
 (D) Glycogen

97. Which of the following compounds would undergo acetylation to form aspirin ?
- o*-Hydroxybenzoic acid
 - m*-Hydroxybenzoic acid
 - o*-Dihydroxybenzene
 - o*-Hydroxybenzaldehyde
98. Cannizzaro reaction is not given by
- formaldehyde
 - acetaldehyde
 - benzaldehyde
 - trimethylacetaldehyde
99. Arrange the following compounds in decreasing order of reacting towards electrophilic substitution reaction



- I > II > III > IV
- III > IV > I > II
- III > I > IV > II
- II > I > IV > III

100. Which of the following compounds a chiral centre ?

- 2-Chlorobutanoic acid
- 3-Chlorobutanoic acid
- 4-Chlorobutanoic acid
- 4-Chloropentanoic acid

BIOLOGY

101. What is emasculation ?
- (A) Pollination between flowers of same plant
 - (B) Removal of stigma to prevent fertilization
 - (C) Removal of stamens of a flower to prevent self-fertilization
 - (D) Pollination between flowers of different plants
102. In the binomial nomenclature a plant or animal is given its name in two words which designate
- (A) genus and species
 - (B) family and species
 - (C) order and family
 - (D) family and genus
103. Female gametophyte of a typical dicot plant at the time of fertilization is
- (A) 8 celled
 - (B) 7 celled
 - (C) 6 celled
 - (D) 4 celled
104. Haplo-diplontic cycle is found in
- (A) Algae
 - (B) Angiosperms
 - (C) Gymnosperms
 - (D) Bryophytes and Pteridophytes
105. Which is **not** correct for a human sperm ?
- (A) The sperm head contains a diploid elongated nucleus
 - (B) Acrosome is filled with enzymes that help in fertilization of ovum
 - (C) The middle piece contains mitochondria which provide energy for the movement of tail
 - (D) During coitus about 200 to 300 million sperms are ejaculated
106. Which of the following is **not** a characteristics of all chordates ?
- (A) Presence of notochord
 - (B) Dorsal nerve cord
 - (C) Diaphragm between thorax and abdomen
 - (D) Pharyngeal gills
107. Which have 23 chromosomes ?
- (A) Germinal epithelium cells
 - (B) Secondary spermocytes
 - (C) Spermatogonial cells
 - (D) Primary spermocytes
108. Phylloclade is a modification of
- (A) root
 - (B) stem
 - (C) leaf
 - (D) flower

109. IUT involves
- transfer of ova in Fallopian tube
 - transfer of embryo into uterus
 - transfer of zygote into uterus
 - transfer of zygote into Fallopian tube
110. In a dihybrid cross between two heterozygous Tall and Round seeded pea plants (in which Tall is dominant over dwarf and Round is dominant over wrinkled) 9 : 3 : 3 : 1 ratio was obtained. If the progeny has 800 members, how many of them are likely to be wrinkled ?
- 50
 - 200
 - 150
 - 300
111. Trimerous flower and presence of perianth often united into tube are important floral characters of the plants belonging to the family
- Liliaceae
 - Fabaceae
 - Solanaceae
 - Brassicaceae
112. A child has 'O' blood group. What will not be the blood group of parents ?
- A and A
 - B and B
 - A and B
 - AB and O
113. Extra stelar secondary growth in dicot stem is caused by
- intrafascicular cambium
 - intercalary meristem
 - phellogen
 - interfascicular cambium
114. Exchange of chromosomal segment between non-homologous pairs is called
- duplication
 - inversion
 - translocation
 - deletion
115. Co-dominant genes are
- Alleles each of which produces an co-ordination effect on homozygous
 - Dominant genes but don't exhibit the dominant character in the generation
 - Dominant genes which produce abnormal morphological characters in the F_2 progeny
 - Alleles, each one of which produces an independant effect in heterozygous
116. Male and female cockroach can be distinguished externally by the presence of
- caudal styles in female
 - antennae in female
 - caudal styles in male
 - antennae in male

117. The three structural genes *z*, *y* and *a* of *lac operon* code respectively for the enzymes
- permease, transacetylase, β -galactosidase
 - transacetylase, permease, β -galactosidase
 - β -galactosidase, permease, transacetylase
 - β -galactosidase, transacetylase, permease
118. If a DNA molecule has 300 base pairs and there are 120 pairs of adenine and thymine, the total number of guanine-cytosine base pairs would be
- 120
 - 180
 - 150
 - 60
119. Which of the following cell organelles have their own DNA and ribosomes?
- Plastids
 - Golgi apparatus
 - Mitochondria
 - Endoplasmic reticulum
- I and II
 - I and III
 - II and III
 - II and IV
120. In a transcription unit, which one of the following statements is **wrong**?
- The promoter is located towards 5'-end and terminator is located towards 3'-end of the coding strand
 - Template strand has a polarity 3' \rightarrow 5'
 - It is the presence of structural gene in a transcription unit that defines the template and coding strand
 - Promoter and terminator flank the structural gene
121. In meiosis, the chromatids separate during
- metaphase I
 - anaphase I
 - metaphase II
 - anaphase II
122. A region of an eukaryotic gene which does not form a part of mRNA and is removed during a process called splicing before mRNA formation is called
- intron
 - muton
 - cistron
 - exon
123. Movement of water from one cell to the adjacent cell occurs due to
- transpirational pull
 - water potential difference
 - turgor pressure
 - wall pressure

124. Hugo de Vries propounded his mutation theory based on his observation in
 (A) *Mirabilis jalapa*
 (B) *Drosophila melanogaster*
 (C) *Pisum sativum*
 (D) *Oenothera lamarckiana*
125. The evolution from a single ancestral species to a variety of forms that occupy different habitats is
 (A) adaptive radiation
 (B) continuous distribution
 (C) gene migration
 (D) adaptive convergence
126. Plants require calcium for
 (A) holding its cells together
 (B) synthesizing chlorophyll
 (C) nitrogen fixation
 (D) opening and closing its stomata
127. Miller in his experiment used
 (A) methane, ammonia, hydrogen and water vapour
 (B) methane, ammonia, carbon dioxide and nitrogen
 (C) methane, ammonia, helium, hydrogen and water
 (D) only water and ammonia
128. Under high oxygen and low carbon dioxide concentration, the enzyme "Rubisco" acts as
 (A) carboxylase
 (B) oxygenase
 (C) hydrogenase
 (D) decarboxylase
129. Elephantiasis disease is caused by
 (A) *Trypanosoma gambiense*
 (B) *Taenia solium*
 (C) *Leishmania donovani*
 (D) *Wuchereria bancrofti*
130. Before entering the Krebs cycle pyruvic acid is changed to
 (A) acetyl-CoA
 (B) citric acid
 (C) succinic acid
 (D) malic acid
131. The conformatory test for AIDS is
 (A) ESR
 (B) PCR
 (C) ELISA
 (D) Western blot
132. Both B- and T-lymphocytes of immune system are produced in
 (A) lymph nodes
 (B) bone marrow
 (C) spleen
 (D) thymus
133. Which of the following hormone has negative effect on apical dominance?
 (A) Cytokinin
 (B) Auxin
 (C) Gibberellin
 (D) Ethylene

134. The best way to control the pests is
 (A) use of chemicals in soil
 (B) spray of chemicals on leaves of plants
 (C) biological control
 (D) use of chemicals in water
135. Soil fertility is needed by
 (A) crop rotation
 (B) nitrogen fixing bacteria
 (C) decaying organic matter
 (D) intensive agriculture
136. When a piece of bread is chewed long enough, it begins to taste sweet because
 (A) lipases are forming fatty acids
 (B) maltase is breaking down maltose
 (C) amylase is breaking down starches to disaccharides
 (D) disaccharides are forming glucose
137. Spirulina is a
 (A) biofertiliser
 (B) single cell protein
 (C) biopesticide
 (D) edible fungus
138. Which one of the following is the correctly matched pair of a product and the micro-organism responsible for it?
 (A) Ethyl alcohol – yeast
 (B) Acetic acid – Lactobacillus
 (C) Cheese – Aspergillus
 (D) Curd – Azotobacter
139. The volume of air that will remain in lungs after a normal expiration is
 (A) inspiratory capacity
 (B) expiratory capacity
 (C) residual volume
 (D) functional residual capacity
140. The interaction between the two species in which both the species are benefitted from each other is
 (A) mutualism
 (B) commensalism
 (C) amensalism
 (D) parasitism
141. The two main functions of the human kidney are
 (A) osmoregulation and defaecation
 (B) osmoregulation and urea manufacture
 (C) excretion and osmoregulation
 (D) urea manufacture and excretion
142. Primary consumers are also known as
 (A) Heterotrophs
 (B) Autotrophs
 (C) Herbivores
 (D) Carnivores
143. The vertebral column formed of 26 serially arranged vertebra is differentiated into
 (A) cervical(7), thoracic(12), lumber (5), sacral (1) fused and coccyx(1) fused
 (B) cervical(7), thoracic(10), lumber (7), sacral (1) fused and coccyx(1) fused
 (C) cervical(9), thoracic(10), lumber (5), sacral (1) fused and coccyx(1) fused
 (D) cervical(7), thoracic(9), lumber (5), sacral (1) fused and coccyx(1) fused

144. Identify the false statement
- (A) Herbivores are primary consumers
 - (B) Producers are present at the base of the trophic level
 - (C) Fungus and bacteria play the role of decomposers in an ecosystem
 - (D) One of the examples of primary consumer is snake
145. The hormone that helps a person to face emergency situation of flight or fight is
- (A) progesterone
 - (B) insulin
 - (C) adrenaline
 - (D) thyroxine
146. Which one of the following is **not** usually regarded as an air pollutant ?
- (A) Soot
 - (B) Carbon dioxide
 - (C) Carbon monoxide
 - (D) Oxides of nitrogen
147. Consider an aquatic food chain
 phytoplanktons → zooplanktons → small fish → large fish → fish-eating birds
 If large amount of pesticides like DDT enters in an aquatic body by human activities, at which level of the above food chain maximum biomagnification will be observed ?
- (A) Phytoplankton
 - (B) Zooplankton
 - (C) Large fish
 - (D) Fish-eating birds
148. The movement of Tehri Garhwal area of Uttar Pradesh for preventing cutting of forest is
- (A) Planting Movement
 - (B) Reforestation
 - (C) Chipko Movement
 - (D) Deforestation Movement
149. The region of the vertebrate eye, where the optic nerve passes out of retina, is called the
- (A) blind spot
 - (B) iris
 - (C) fovea
 - (D) optic chiasma
150. Accumulation of nitrogen and phosphorus in a fish breeding lake leads to heavy growth of algal and other aquatic plants. After sometime decline of fish population in the lake was reported. It is due to
- (A) depletion of oxygen
 - (B) the fish does not consume plants
 - (C) availability of light is reduced
 - (D) no nutrients are available