



SATISH SCIENCE ACADEMY  
DHANORI PUNE - 411015

NEET PAPER 3  
ENTRANCE EXAM - NEET-UG

**Time Allowed:** 3 hours and 20 minutes

**Maximum Marks :** 720

**General Instructions:**

- The test is of 3 hours and 20 minutes and it contains 200 questions. Internal choice is given within the sections.
- For each correct response, the candidate will get 4 marks.
- For each incorrect response, one mark will be deducted from the total scores.
- The maximum marks are 720.

**PHYSICS (Section-A)**

1) The velocity  $v$  (in cm/sec) of a particle is given in terms of time  $t$  (in sec) by the equation:  $v = at + \frac{b}{t} + c$ . The dimensions of  $a$ ,  $b$  and  $c$  are: [4]

- a)  $A = [L^2]$ ,  $b = [T]$ ,  $c = [LT^2]$   
 b)  $A = [LT^{-2}]$ ,  $b = [L]$ ,  $c = [T]$   
 c)  $A = [L]$ ,  $b = [LT]$ ,  $c = [T^2]$   
 d)  $A = [LT^2]$ ,  $b = [LT]$ ,  $c = [L]$

2) Joule  $\times$  second is the unit of: [4]

- a) Momentum                      b) Plank's constant  
 c) Energy                              d) Angular Velocity

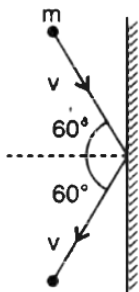
3) A particle moves in a straight line with a constant acceleration. It changes its velocity from  $10 \text{ ms}^{-1}$  to  $20 \text{ ms}^{-1}$  while passing through a distance 135 m in  $t$  second. The value of  $t$  is: [4]

- a) 12 s                                  b) 9 s  
 c) 10 s                                  d) 1.8 s

4) A projectile can have the same range  $R$  for two angles of projection. If  $t_1$  and  $t_2$  be the times of flight in the two cases, then what is the product of two times of flight? [4]

- a)  $T_1 t_2 \propto R^2$   
 b)  $T_1 t_2 \propto \frac{1}{R^2}$   
 c)  $T_1 t_2 \propto R$   
 d)  $T_1 t_2 \propto \frac{1}{R}$

5) A rigid ball of mass  $m$  strikes a rigid wall at  $60^\circ$  and gets reflected without loss of speed as shown in the figure.



The value of impulse imparted by the wall in the ball will be: [4]

- a)  $\frac{mv}{2}$                                   b)  $Mv$   
 c)  $\frac{mv}{3}$                                   d)  $2mv$

6) A body of mass 1 kg is thrown upwards with a velocity 20 m/s. It momentarily comes to rest after attaining a height of 18 m. How much energy is lost due to air friction? ( $g = 10 \text{ m/s}^2$ ) [4]

- a) 30 J                                  b) 20 J  
 c) 10 J                                  d) 40 J

7) A body of mass 2.0 kg makes an elastic collision with another body at rest and continues to move in the original direction but with one - fourth of its original speed  $v$ . What is the mass of other body and the speed of the two body center of mass? [4]

- a) 1.0 kg and  $\frac{2}{3}v$   
 b) 1.5 kg and  $\frac{4}{7}v$   
 c) 1.4 kg and  $\frac{10}{17}v$   
 d) 1.2 kg and  $\frac{5}{8}v$

8) When a ceiling fan is switched off, its angular velocity falls to half while it makes 36 rotations. How many more rotations will it make before coming to rest? [4]

- a) 18                                      b) 24  
 c) 12                                      d) 36

9) Two stones of masses  $m$  and  $2m$  are whirled in horizontal circles, the heavier one in a radius  $\frac{r}{2}$  and the lighter one in radius  $r$ . The tangential speed of lighter stone is  $n$  times that of the value of heavier stone when they experience same centripetal forces. The value of  $n$  is: [4]

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

10) A satellite is orbiting around the earth with total energy  $E$ . What will happen if the satellite's kinetic energy is made  $2E$ ? [4]

- a) Radius of the orbit is halved  
 b) Period of revolution is doubled  
 c) Satellite escapes away  
 d) Radius of the orbit is doubled

11) According to Kepler's law, the period of revolution of a planet ( $T$ ) and its mean distance from the sun ( $R$ ) are related by the equation: [4]

- a)  $T^3 R^3 = \text{constant}$                       b)  $T^2 R = \text{constant}$   
 c)  $TR^3 = \text{constant}$                       d)  $T^2 R^{-3} = \text{constant}$

12) The aerofoils are so designed that the speed of air:  
 i. On the top side is more than on the lower side  
 ii. On the top side is less than on the lower side  
 iii. Is same on both sides  
 iv. Is turbulent

[4]

- a) Iii and iv                                  b) Only i  
 c) Iv and i                                      d) Only ii

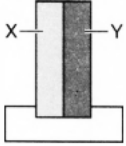
13) During melting process, the heat given to a body is utilized in:

- i. Increasing the temperature  
 ii. Increasing the density of material  
 iii. Increasing the average distance of the molecules  
 iv. Decreasing the mass of the body

[4]

- a) Iv and i                      b) Ii and iii  
c) I and ii                        d) Only iii

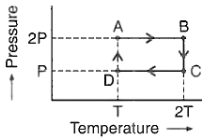
- 14) A bimetallic strip consists of metals X and Y. It is mounted rigidly at the base as shown in the figure. The metal X has a higher coefficient of expansion as compared to that for metal Y. When the bimetallic strip is placed in a cold bath?



[4]

- a) It will not bend but shrink  
b) It will bend towards the right  
c) It will bend towards the left  
d) It will bend but shrink

- 15) An ideal monoatomic gas is taken through the thermodynamic states  $A \rightarrow B \rightarrow C \rightarrow D$  via the paths shown in the figure. If  $U_A$ ,  $U_B$ ,  $U_C$  and  $U_D$  represent the internal energy of the gas in state A, B, C and D respectively, then which of the following is not true?



[4]

- a)  $U_B < U_A$                       b)  $U_B = U_C$   
c)  $U_C = U_D$                         d)  $U_A = U_D$

- 16) A cylinder contains hydrogen gas at pressure of 249 kPa and temperature  $27^\circ\text{C}$ . Its density is: ( $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ ) [4]

- a)  $0.2 \text{ kg/m}^3$                         b)  $0.02 \text{ kg/m}^3$   
c)  $0.5 \text{ kg/m}^3$                         d)  $0.1 \text{ kg/m}^3$

- 17) Total energy of a particle performing SHM depends on: [4]

- a) Amplitude and time period  
b) Amplitude and displacement  
c) Amplitude and time period and displacement  
d) Time period and displacement

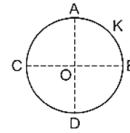
- 18) The velocity of sound in a gaseous medium is  $330 \text{ ms}^{-1}$ . If the pressure is increased by 4 times without a change in temperature, the velocity of sound in the gas is: [4]

- a)  $660 \text{ ms}^{-1}$                         b)  $156 \text{ ms}^{-1}$   
c)  $330 \text{ ms}^{-1}$                         d)  $990 \text{ ms}^{-1}$

- 19) A person speaking normally produces a sound intensity of 40 dB at a distance of 1 m. If the threshold intensity for reasonable audibility is 20 dB, the maximum distance at which he can be heard clearly is: [4]

- a) 20 m                                b) 5 m  
c) 10 m                                d) 4 m

- 20) A thin conducting ring of radius R is given a charge +Q. The electric field at the centre O of the ring due to the charge on the part AKB of the ring is E. The electric field at the centre due to the charge on the part ACDB of the ring is:



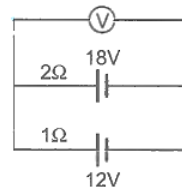
[4]

- a)  $3E$  along OK                      b)  $3E$  along KO  
c)  $E$  along OK                        d)  $E$  along KO

- 21) A parallel plate capacitor of capacitance  $20 \mu\text{F}$  is being charged by a voltage source whose potential is changing at the rate of  $3 \text{ V/s}$ . The conduction current through the connecting wires, and the displacement current through the plates of the capacitor, would be, respectively: [4]

- a) Zero,  $60 \mu\text{A}$                         b)  $60 \mu\text{A}$ , zero  
c)  $60 \mu\text{A}$ ,  $60 \mu\text{A}$                     d) Zero, zero

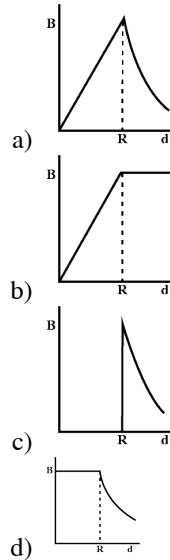
- 22) Two batteries, one of emf 18 volt and internal resistance  $2 \Omega$  and the other of emf 12 volt and internal resistance  $1 \Omega$ , are connected as shown in the adjoining figure. The voltmeter V will record a reading of:



[4]

- a) 15 volt                                b) 14 volt  
c) 18 volt                                d) 30 volt

- 23) A cylindrical conductor of radius R is carrying a constant current. The plot of the magnitude of the magnetic field, B with the distance, d, from the centre of the conductor, is correctly represented by the figure: [4]



- 24) In a moving coil galvanometer the deflection of the coil is related to the electric current I by the relation: [4]

- a)  $I \propto \theta^2$   
b)  $I \propto \theta$   
c)  $I \propto \sqrt{\theta}$   
d)  $I \propto \tan \theta$

- 25) A long magnetic needle of length  $2L$ , magnetic moment M and pole strength m units is broken into two pieces at the middle. The magnetic moment and pole strength of each piece will be: [4]

- a)  $\frac{M}{2}, \frac{m}{2}$                                 b) M, m  
c)  $M, \frac{m}{2}$                                 d)  $\frac{M}{2}, m$

- 26) Induced emf in the coil depends upon:

- i. The conductivity of the coil
- ii. Amount of flux
- iii. Rate of change of linked flux
- iv. Resistance of coil

[4]

- a) Ii and iii
- b) I and ii
- c) Only iii
- d) Iv and i

27) A current of 1 amp flows through an inductor of inductance 0.1 H. What is the maximum magnetic energy stored in the inductor? [4]

- a) 0.01 J
- b) 0.5 J
- c) 0.1 J
- d) 0.05 J

28) The instantaneous current in a circuit is,  $I = \sqrt{2} \sin(\omega t + \phi)$  ampere. The rms value of current (in ampere) is: [4]

- a) 2
- b)  $\frac{1}{\sqrt{2}}$
- c) 1
- d)  $\sqrt{2}$

29) The quality factor of LCR circuit having resistance (R) and inductance (L) at resonance frequency ( $\omega$ ) is given by: [4]

- a)  $\frac{R}{\omega L}$
- b)  $(\frac{\omega L}{R})^{\frac{1}{2}}$
- c)  $\frac{\omega L}{R}$
- d)  $(\frac{\omega L}{R})^2$

30) The frequencies of X - rays,  $\gamma$  - rays and ultraviolet rays are respectively a, b and c. Then: [4]

- a)  $A < b, b < c$
- b)  $A > b, b > c$
- c)  $A > b, b < c$
- d)  $A < b, b > c$

31) A disc is placed on the surface of the pond which has a refractive index of  $5/3$ . A source of light is placed 4 m below the surface of the liquid. The minimum radius of disc needed so that light is not coming out is: [4]

- a) 3 m
- b) 6 m
- c) 4 m
- d)  $\infty$

32) Diffraction and interference of light suggest [4]

- a) Wave nature
- b) Nature of light is electro - magnetic
- c) Nature is quantum
- d) Nature of light is transverse

33) A photoelectric surface is illuminated successively by monochromatic light of wavelength  $\lambda$  and  $\frac{\lambda}{2}$ . If the maximum kinetic energy of the emitted photoelectrons in the second case is 3 times that in the first case, the work function of the surface of the material is: ( $h$  = Planck's constant,  $c$  = speed of light) [4]

- a)  $\frac{hc}{3\lambda}$
- b)  $\frac{hc}{\lambda}$
- c)  $\frac{2hc}{\lambda}$
- d)  $\frac{hc}{2\lambda}$

34) The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is: [4]

- a) 0.5
- b) 4
- c) 1
- d) 2

35) The Binding energy per nucleon of  ${}^7_3\text{Li}$  and  ${}^4_2\text{He}$  nuclei are 5.60 MeV and 7.06 MeV, respectively. In the nuclear reaction  ${}^7_3\text{Li} + {}^1_1\text{H} \rightarrow {}^4_2\text{He} + {}^3_2\text{He} + Q$  the value of energy Q released is: [4]

- a) 8.4 MeV
- b) 19.6 MeV
- c) - 2.4 MeV
- d) 17.3 MeV

### PHYSICS (Section-B)

#### Attempt any 10 questions

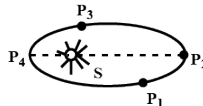
36) The slope of the kinetic energy versus position vector gives the rate of change of: [4]

- a) Work
- b) Force
- c) Velocity
- d) Momentum

37) A solid cylinder of mass M and radius R rolls down an inclined plane without slipping. The speed of its centre of mass when it reaches the bottom is: (h is the height of inclined plane) [4]

- a)  $\sqrt{2gh}$
- b)  $\sqrt{\frac{4}{3}gh}$
- c)  $\sqrt{\frac{3}{4}gh}$
- d)  $\sqrt{\frac{4g}{h}}$

38) The figure shows a planet in an elliptical orbit around the sun S. Where is the kinetic energy of the planet maximum?



[4]

- a) P<sub>4</sub>
- b) P<sub>2</sub>
- c) P<sub>3</sub>
- d) P<sub>1</sub>

39) The unit of thermal conductivity is: [4]

- a)  $\text{J m}^{-1} \text{K}^{-1}$
- b)  $\text{W m K}^{-1}$
- c)  $\text{J m K}^{-1}$
- d)  $\text{W m}^{-1} \text{K}^{-1}$

40) In stationary waves, antinodes are the points where there is:

- i. Minimum displacement and minimum pressure change
- ii. Minimum displacement and maximum pressure change
- iii. Maximum displacement and maximum pressure change
- iv. Maximum displacement and minimum pressure change

[4]

- a) Only iv
- b) I and ii
- c) Iii and iv
- d) Ii and iii

41) Apparatus used to find out velocity of sound in gas is: [4]

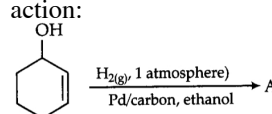
- a) Quincke's tube
- b) Kundt's apparatus
- c) Melde's apparatus
- d) Kundt's tube

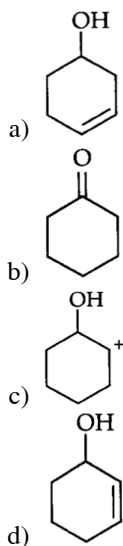
42) Two long parallel wires P and Q are both perpendicular to the plane of the paper with a distance of 5 m between them. If P and Q carry current of 2.5 amp and 5 amp respectively in the same direction, then the magnetic field at a point half - way between the wires is: [4]

- a)  $(\frac{\mu_0}{\pi})$
- b)  $(\frac{\sqrt{3}\mu_0}{2\pi})$
- c)  $(\frac{3\mu_0}{2\pi})$
- d)  $(\frac{\mu_0}{2\pi})$

43) Nickel shows ferromagnetic property at room temperature. If the temperature is increased beyond Curie temperature, then it will show: [4]



- d) Similar amounts of reactants products
- 59) Which of the following reactions disproportionation reaction?
- $2\text{Cu}^+ \rightarrow \text{Cu}^{2+} + \text{Cu}^0$
  - $3\text{MnO}_4^{2-} + 4\text{H}^+ \rightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2$
  - $2\text{KMnO}_4 \xrightarrow{\Delta} \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}$
  - $2\text{MnO}_4^- + 3\text{Mn}^{2+} + 2\text{H}_2\text{O} \rightarrow 5\text{MnO}_2 + 4\text{H}$
- Select the correct option from the following is: [4]
- I, ii and iii
  - I and ii only
  - I and iv only
  - I, iii and iv
- 60) The correct order of N - compounds in its decreasing order of oxidation states is: [4]
- $\text{HNO}_3, \text{NH}_4\text{Cl}, \text{NO}, \text{N}_2$
  - $\text{HNO}_3, \text{NO}, \text{NH}_4\text{Cl}, \text{N}_2$
  - $\text{NH}_4\text{Cl}, \text{N}_2, \text{NO}, \text{HNO}_3$
  - $\text{HNO}_3, \text{NO}, \text{N}_2, \text{NH}_4\text{Cl}$
- 61) Which of the following is the most basic oxide? [4]
- $\text{Sb}_2\text{O}_3$
  - $\text{SeO}_2$
  - $\text{Bi}_2\text{O}_3$
  - $\text{Al}_2\text{O}_3$
- 62) Which of the following structure is similar to graphite? [4]
- B
  - $\text{B}_2\text{H}_6$
  - BN
  - $\text{B}_4\text{C}$
- 63) Correct increasing order of acidity is given as:
- $\text{H}_2\text{O}, \text{C}_2\text{H}_2, \text{H}_2\text{CO}_3, \text{phenol}$
  - $\text{C}_2\text{H}_2, \text{H}_2\text{O}, \text{H}_2\text{CO}_3, \text{phenol}$
  - Phenol,  $\text{C}_2\text{H}_2, \text{H}_2\text{CO}_3, \text{H}_2\text{O}$
  - $\text{C}_2\text{H}_2, \text{H}_2\text{O}, \text{phenol and H}_2\text{CO}_3$
- [4]
- Only B or A correct
  - Only C correct
  - Only A correct
  - Only D correct
- 64) The cylindrical shape of an alkyne is due to: [4]
- Three sigma C - C bonds
  - Three  $\pi$  C - C bonds
  - Two sigma C - C and one  $\pi$  C - C bonds
  - One sigma C - C and two  $\pi$  C - C bonds
- 65) Dihedral angle of least stable conformer of ethane is: [4]
- $0^\circ$
  - $120^\circ$
  - $180^\circ$
  - $60^\circ$
- 66) A solution has a 1 : 4 mole ratio of pentane to hexane. The vapour pressures of pure hydrocarbons at  $20^\circ\text{C}$  are 440 mm Hg for pentane and 120 mm Hg for hexane. The mole fraction of pentane in vapour phase would be: [4]
- 0.549
  - 0.786
  - 0.478
  - 0.200
- 67) If 8 g of a non - electrolyte solute is dissolved in 114 g of n - octane to reduce its vapour pressure to 80%, the molar mass (in  $\text{g mol}^{-1}$ ) of the solute is: [Given that molar mass of n - octane is  $114 \text{ g mol}^{-1}$ ][4]
- 40
  - 80
  - 20
  - 60
- 68) A solution contains  $\text{Fe}^{2+}, \text{Fe}^{3+}$  and  $\text{I}^-$  ions. This solution was treated with iodine at  $35^\circ\text{C}$ .  $E^\circ$  for  $\text{Fe}^{3+}/\text{Fe}^{2+}$  is 0.77V and  $E^\circ$  for  $\text{I}_2/2\text{I}^- = 0.536 \text{ V}$ . The favourable redox reaction is: [4]
- $\text{I}^-$  will be oxidised to  $\text{I}_2$
  - There will be no redox reaction
  - $\text{Fe}^{2+}$  will be oxidised to  $\text{Fe}^{3+}$
  - $\text{I}_2$  will be reduced to  $\text{I}^-$
- 69) The pressure of  $\text{H}_2$  required to make the potential of  $\text{H}_2$  - electrode zero in pure water at 298 K is: [4]
- $10^{-14} \text{ atm}$
  - $10^{-12} \text{ atm}$
  - $10^{-10} \text{ atm}$
  - $10^{-4} \text{ atm}$
- 70) An increase in the concentration of the reactants of a reaction leads to change in [4]
- Threshold energy.
  - Activation energy.
  - Heat of reaction.
  - Collision frequency.
- 71) In a reaction,  $\text{A} + \text{B} \rightarrow \text{Product}$ , rate is doubled when the concentration of B is doubled, and rate increases by a factor of 8 when the concentrations of both the reactants (A and B) are doubled, rate law for the reaction can be written as: [4]
- Rate =  $k[\text{A}][\text{B}]$
  - Rate =  $k[\text{A}]^2 [\text{B}]$
  - Rate =  $k[\text{A}]^2 [\text{B}]^2$
  - Rate =  $k[\text{A}][\text{B}]^2$
- 72) Calomel on reaction with  $\text{NH}_4\text{OH}$  gives: [4]
- $\text{HgNH}_2\text{Cl}$
  - $\text{Hg}_2\text{O}$
  - $\text{NH}_2\text{—Hg—Hg—Cl}$
  - $\text{HgO}$
- 73) Which of the following bonds will be most polar? [4]
- O—F
  - N—N
  - N—F
  - N—Cl
- 74) The correct order of ionic radii of  $\text{Y}^{3+}, \text{La}^{3+}, \text{Eu}^{3+}$  and  $\text{Lu}^{3+}$  is:  
(Atomic no's. Y = 39, La = 57, Eu = 63, Lu = 71) [4]
- $\text{Y}^{3+} < \text{La}^{3+} < \text{Eu}^{3+} < \text{Lu}^{3+}$
  - $\text{La}^{3+} < \text{Eu}^{3+} < \text{Lu}^{3+} < \text{Y}^{3+}$
  - $\text{Y}^{3+} < \text{Lu}^{3+} < \text{Eu}^{3+} < \text{La}^{3+}$
  - $\text{Lu}^{3+} < \text{Eu}^{3+} < \text{La}^{3+} < \text{Y}^{3+}$
- 75) The structure and hybridisation of  $\text{Si}(\text{CH}_3)_4$  is: [4]
- Tetrahedral,  $\text{sp}^3$
  - Trigonal,  $\text{sp}^2$
  - Bent, sp
  - Octahedral,  $\text{sp}^3\text{d}$
- 76) Which complex compound will give four isomers? [4]
- $[\text{Fe}(\text{en})_3]\text{Cl}_3$
  - $[\text{Fe}(\text{PPh}_3)_3 \text{NH}_3\text{ClBr}]\text{Cl}$
  - $[\text{Co}(\text{PPh}_3)_3 \text{Cl}]\text{Cl}_3$
  - $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$
- 77) If there is no rotation of plane polarized light by a compound in a specific solvent, though to be chiral, it may mean that: [4]
- The compound is certainly a chiral.
  - The compound is certainly meso
  - There is no compound in the solvent
  - The compound may be a racemic mixture
- 78) Among the following four compounds
- Phenol
  - Methyl phenol
  - Meta nitrophenol
  - Para - nitrophenol
- The acidity order is: [4]
- (i) > (iv) > (iii) > (ii)
  - (iv) > (iii) > (i) > (ii)
  - (iii) > (iv) > (i) > (ii)
  - (ii) > (i) > (iii) > (iv)
- 79) The correct structure of the product A formed in the reaction:
- 
- [4]



80) Aniline is reacted with bromine water and the resulting product is treated with an aqueous solution of sodium nitrite in presence of dilute hydrochloric acid. The compound so formed is converted into a tetrafluoroborate which is subsequently heated. The final product is: [4]

- a) 1,3,5 - tribromobenzene  
 b) P - bromoaniline  
 c) 2,4,6 - tribromofluorobenzene  
 d) P - bromofluorobenzen

81) A reagent suitable for the determination of N - terminal residue of a peptide is: [4]

- a) Carboxypeptidase  
 b) 2, 4 - dinitrophenyl hydrazine  
 c) P - toluene sulphonyl chloride  
 d) 2, 4 - dinitro fluorobenzene

82) The non - essential amino acid among the following is: [4]

- a) Alanine  
 b) Leucine  
 c) Lysine  
 d) Valine

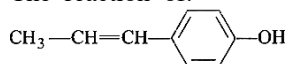
83) The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals. [4]

- a) Copper  
 b) Potassium  
 c) Iron  
 d) Calcium

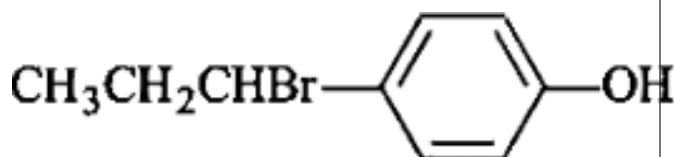
84) Which of the following compounds has the lowest boiling point? [4]

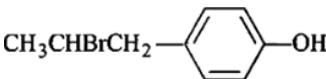
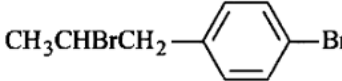
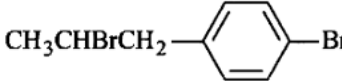
- a)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$   
 b)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$   
 c)  $\text{CH}_3\text{CH}=\text{CH}-\text{CH}_2\text{CH}_3$   
 d)  $\text{CH}_3\text{CH}=\text{CH}-\text{CH}=\text{CH}_2$

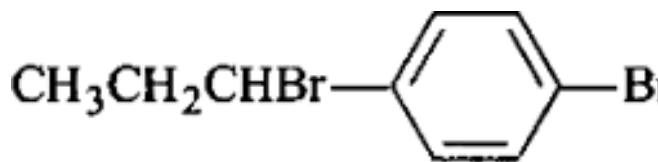
85) The reaction of:



with HBr gives: [4]



- a)   
 b)   
 c) 



d)

### CHEMISTRY (Section-B)

Attempt any 10 questions

86) Which of the following species is paramagnetic?

- i. CO  
 ii.  $\text{CN}^-$   
 iii.  $\text{O}_2^{2-}$   
 iv. NO

[4]

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

87) Which one of the following statements is correct when  $\text{SO}_2$  is passed through acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  solution?

- i. Green  $\text{Cr}_2(\text{SO}_4)_3$  is formed  
 ii. The solution turns blue  
 iii. The solution is decolourized  
 iv.  $\text{SO}_2$  is reduced

[4]

- a) Only iv  
 b) Iii and iv  
 c) Only i  
 d) Ii and iv

88) Which of the following oxidation states are the most characteristic for lead and tin respectively? [4]

- a) +2, +2  
 b) +2, +4  
 c) +4, +2  
 d) +4, +4

89) Identify the correct order of the size of the following:

- i.  $\text{Ca}^{2+} < \text{K}^+ < \text{Ar} < \text{Cl}^- < \text{S}^{2-}$   
 ii.  $\text{Ar} < \text{Ca}^{2+} < \text{K}^+ < \text{Cl}^- < \text{S}^{2-}$   
 iii.  $\text{Ca}^{2+} < \text{Ar} < \text{K}^+ < \text{Cl}^- < \text{S}^{2-}$   
 iv.  $\text{Ca}^{2+} < \text{K}^+ < \text{Ar} < \text{S}^{2-} < \text{Cl}^-$

[4]

- a) Only C  
 b) Only A  
 c) Only B  
 d) Only D

90) Maximum number of electrons in a sub - shell of an atom is determined by the following: [4]

- a)  $4l + 2$   
 b)  $2n^2$   
 c)  $2l + 1$   
 d)  $4l - 2$

91) Boron compounds behave as Lewis acids, because of their: [4]

- a) Acidic nature  
 b) Electron deficient nature  
 c) Covalent nature  
 d) Ionisation property

92) A first - order reaction has a specific reaction rate of  $10^{-2} \text{ sec}^{-1}$ . How much time will it take for 20 g of the reaction to reduce to 5g? [4]

- a) 138.6 sec  
 b) 693.0 sec  
 c) 238.6 sec  
 d) 346.5 sec

93) The half - life period of a first - order reaction is 1386 seconds. The specific rate constant of the reaction is: [4]

- a)  $0.5 \times 10^{-2} \text{ s}^{-1}$   
 b)  $5.0 \times 10^{-2} \text{ s}^{-1}$   
 c)  $5.0 \times 10^{-3} \text{ s}^{-1}$   
 d)  $0.5 \times 10^{-3} \text{ s}^{-1}$

94) The correct order of the mobility of the alkali metal ions in aqueous solution is: [4]

- a)  $\text{K}^+ > \text{Rb}^+ > \text{Na}^+ > \text{Li}^+$   
 b)  $\text{Rb}^+ > \text{K}^+ > \text{Na}^+ > \text{Li}^+$   
 c)  $\text{Na}^+ > \text{K}^+ > \text{Rb}^+ > \text{Li}^+$







- a) M phase                      b) G<sub>1</sub> phase  
c) S phase                        d) G<sub>2</sub> phase
- 130) Which of the following statements is incorrect?  
i. Cyclic photophosphorylation involves both PS I and PS II.  
ii. Both ATP and NADPH + H<sup>+</sup> are synthesized during non - cyclic photophosphorylation.  
iii. Stroma lamellae have PS I only and lack NADP reductase.  
iv. Grana lamellae have both PS I and PS II.
- [4]  
a) Statement c is incorrect.  
b) Statement a is incorrect.  
c) Statement b is incorrect.  
d) Statement d is incorrect.
- 131) A process that makes important difference between C<sub>3</sub> and C<sub>4</sub> plants is: [4]  
a) Photorespiration              b) Photosynthesis  
c) Glycolysis                        d) Transpiration
- 132) If the total incident solar radiation the proportion of PAR is: [4]  
a) About 70%                      b) Less than 50%  
c) About 60%                      d) More than 80%
- 133) Pyruvate dehydrogenase activity during aerobic respiration requires [4]  
a) Iron                                b) Calcium  
c) Cobalt                              d) Magnesium
- 134) Inhibitory substances in dormant seeds cannot be removed by subjecting seeds to [4]  
a) Nitrate                            b) Ascorbic acid  
c) Gibberellic acid                d) Chilling conditions
- 135) Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop. [4]  
a) Abscisic acid                    b) Ethylene  
c) Gibberellin                      d) Cytokinin

### BOTANY (Section-B)

#### Attempt any 10 questions

- 136) In which group of organisms the cell wall form two thin overlapping shells which fit together? [4]  
a) Slime moulds                    b) Euglenoids  
c) Dinoflagellates                d) Chrysophytes
- 137) Which one of the following statements about viruses is correct? [4]  
a) Viruses are obligate parasites.  
b) Viruses possess their own metabolic system  
c) Nucleic acid of viruses is known as capsid.  
d) All viruses contain both RNA and DNA.
- 138) Which one is wrongly matched? [4]  
a) Unicellular organism - Chlorella  
b) Uniflagellate gametes - Polysiphonia  
c) Biflagellate zoospores - Brown algae  
d) Gemma cups - Marchantia
- 139) Flowers which have single ovule in the ovary and are packed into inflorescence are usually pollinated by: [4]  
a) Water                              b) Bee  
c) Bat                                 d) Wind
- 140) Which of the following is not a stem modification? [4]

- a) Thorns of citrus  
b) Flattened structures of Opuntia  
c) Pitcher of Nepenthes  
d) Tendrils of cucumber

- 141) Fruit colour in squash is an example of: [4]  
a) Dominant epistasis              b) Recessive epistasis  
c) Inhibitory genes                d) Complementary genes
- 142) In sea urchin DNA, which is double stranded, 17% of the bases were shown to be cytosine. The percentages of the other three bases expected to be present in this DNA are: [4]  
a) G 17%, A 16.5%, T 32.5%  
b) G 17%, A 33%, T 33%  
c) G 8.5%, A 50%, T 24.5%  
d) G 34%, A 24.5%, T 24.5%
- 143) Nuclear envelope is a derivative of: [4]  
a) Smooth endoplasmic reticulum  
b) Rough endoplasmic reticulum  
c) Membrane of Golgi complex  
d) Microtubules
- 144) Select the mismatch: [4]  
a) Anabaena - Nitrogen fixer  
b) Rhizobium - Alfalfa  
c) Frankia - Alnus  
d) Rhodospirillum - Mycorrhiza
- 145) The most common substrate used in distilleries for the production of ethanol is: [4]  
a) Soya meal                        b) Com meal  
c) Ground gram                    d) Molasses
- 146) The three boxes in this diagram represent the three major biosynthetic pathways in aerobic respiration. Arrows represent net reactants or products.
- 
- Arrows numbered 4, 8, and 12 can all be: [4]  
a) H<sub>2</sub>O                                b) ATP  
c) FAD<sup>+</sup> or FADH<sub>2</sub>                d) NADH
- 147) Which of the following statements is incorrect?  
i. Biomass decreases from first to fourth trophic level.  
ii. Energy content gradually increases from first to fourth trophic level.  
iii. Number of individuals decreases from first trophic level to fourth trophic level.  
iv. Energy content gradually decreases from first to fourth trophic level.
- [4]  
a) Statement d is incorrect.  
b) Statement c is incorrect.  
c) Statement b is incorrect.  
d) Statement a is incorrect.
- 148) Phototropic curvature is the result of uneven distribution of: [4]  
a) Auxin                              b) Phytochrome  
c) Cytokinins                        d) Gibberellin
- 149) Which of the following is not an inhibitory substance governing seed dormancy? [4]  
a) Para - ascorbic acid              b) Abscisic acid  
c) Phenolic acid                      d) Gibberellic acid

- 150) Which of the following statements is incorrect?
- RuBisCO is a bifunctional enzyme.
  - In  $C_4$  plants, the site of RuBisCO activity is mesophyll cell.
  - The substrate molecule for RuBisCO activity is a 5 - carbon compound.
  - RuBisCO action requires ATP and NADPH.

[4]

- Statement (a) is incorrect.
- Statement (d) is incorrect.
- Statement (c) is incorrect.
- Statement (b) is incorrect.

### ZOOLOGY (Section-A)

- 151) Match List - I with List - II

List - I	List - II
(a) Physalia	(i) Pearl oyster
(b) Limulus	(ii) Portuguese Man of War
(c) Ancylostoma	(iii) Living fossil
(d) Pinctada	(iv) Hookworm

Choose the correct answer from the options given below:

[4]

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

- 152) The terga, sterna, and pleura of cockroach body are joined by: [4]

- Muscular tissue
- Cartilage
- Cementing glue
- Arthroial membrane

- 153) An important characteristic that Hemichordates share with Chordates is: [4]

- Pharynx with gill slits
- Pharynx without gill slits
- Absence of notochord
- Ventral tubular nerve cord

- 154) Identify the types of cell junctions that help to stop the leakage of the substances across a tissue and facilitation of communication with neighbouring cells via rapid transfer of ions and molecules. [4]

- Adhering junctions and Tight junctions, respectively.
- Tight junctions and Gap junctions, respectively.
- Gap junctions and Adhering junctions, respectively.
- Adhering junctions and Gap junctions, respectively.

- 155) Choose the correctly matched pair: [4]

- Adipose Tissue - Dense connective tissue
- Areolar tissue - Loose connective tissue
- Cartilage - Loose connective tissue
- Tendon - Specialized connective tissue

- 156) Due to increasing air - borne allergens and pollutants, many people in urban areas are suffering from respiratory disorder causing wheezing due to [4]

- Inflammation of bronchi and bronchioles.
- Benign growth on mucous lining of nasal cavity.

- Proliferation of fibrous tissues and damage of the alveolar walls.
- Reduction in the secretion of surfactants by pneumocytes.

- 157) When you hold your breath, which of the following gas changes in blood would first lead to the urge to breathe? [4]

- Falling  $CO_2$  concentration
- Rising  $CO_2$  concentration
- Falling  $O_2$  concentration
- Rising  $CO_2$  and falling  $O_2$  concentration

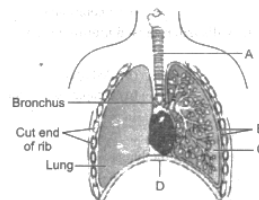
- 158) Which one of the following is a possibility for most of us in regard to breathing, by making a conscious effort? [4]

- The lungs can be made fully empty by forcefully breathing out all air from them
- One can breathe out air through Eustachian tubes by closing both the nose and the mouth
- One can breathe out air totally without oxygen
- One can consciously breathe in and breathe out by moving the diaphragm alone, without moving the ribs at all

- 159) Lungs are made up of air - filled sacs the alveoli, they do not collapse even after forceful expiration, because of: [4]

- Tidal volume
- Residual volume
- Inspiratory reserve volume
- Expiratory reserve volume

- 160) The figure shows a diagrammatic view of the human respiratory system with labels A, B, C, and D. Select the option which gives correct identification and main function and/or characteristic.



[4]

- B - pleural membrane - surround ribs on both sides to provide cushion against rubbing
- D - Lower end of lungs - diaphragm pulls it down during inspiration
- A - trachea - long tube supported by complete cartilaginous rings for conducting inspired air
- C - Alveoli - thin walled vascular bag like structures for exchange of gases

- 161) GnRH, a hypothalamic hormone, needed in reproduction acts on: [4]

- Posterior pituitary gland and stimulates secretion of oxytocin and FSH
- Anterior pituitary gland and stimulates secretion of LH and FSH
- Posterior pituitary gland and stimulates secretion of LH and relaxin
- Anterior pituitary gland and stimulates secretion of LH and oxytocin

- 162) In human adult females, oxytocin: [4]

- Stimulates pituitary to secrete vasopressin

- b) Causes strong uterine contractions during parturition
- c) Is secreted by embryo.
- d) Stimulates the growth of mammary glands

163) In human female, the blastocyst: [4]

- a) Gets implanted into uterus 3 days after ovulation.
- b) Forms placenta even before implantation.
- c) Gets implanted in endometrium by the trophoblast cell.
- d) Gets nutrition from uterine endometrial secretion only after implantation.

164) Which of the following sexually transmitted diseases is not completely curable? [4]

- a) Genital warts
- b) Genital herpes
- c) Gonorrhoea
- d) Chlamydia

165) Artificial insemination means: [4]

- a) Introduction of sperms of a healthy donor directly into the ovary
- b) Transfer of sperms of a healthy donor to a test tube containing ova
- c) Artificial introduction of sperms of a healthy donor into the vagina
- d) Transfer of sperms of husband to a test tube containing ova.

166) The eye of Octopus and eye of Cat shows different patterns of structure, yet they perform a similar function. This is an example of: [4]

- a) Homologous organs that have evolved due to convergent evolution.
- b) Homologous organs that have evolved due to divergent evolution.
- c) Analogous organs that have evolved due to convergent evolution.
- d) Analogous organs that have evolved due to divergent evolution.

167) The extinct human who lived 1,00,000 to 40,000 years ago, in Europe, Asia and parts of Africa, with short stature, heavy eye brows, retreating fore heads, large jaws with heavy teeth, stocky bodies, a lumbering gait and stooped posture was: [4]

- a) Ramapithecus
- b) Neanderthal human
- c) Homo habilis
- d) Cro - magnon humans

168) Which of the following causes an increase in sodium reabsorption in the distal convoluted tubule? [4]

- a) Increase in antidiuretic hormone levels
- b) Decrease in antidiuretic hormone levels
- c) Decrease in aldosterone levels
- d) Increase in aldosterone levels

169) Human urine is usually acidic because: [4]

- a) Excreted plasma proteins are acidic
- b) The sodium transporter exchanges one hydrogen ion for each sodium ion, in peritubular capillaries
- c) Hydrogen ions are actively secreted into the filtrate
- d) Potassium and sodium exchange generates acidity

170) Use of an artificial kidney during hemodialysis may result in:

- i. Nitrogenous waste build - up in the body
- ii. Non - elimination of excess potassium ions
- iii. Reduced absorption of calcium ions from the gastrointestinal tract

iv. Reduced RBC production

Which of the following options is the most appropriate? [4]

- a) (iii) and (iv) are correct
- b) (i) and (iv) are correct
- c) (ii) and (iii) are correct
- d) (i) and (ii) are correct

171) Glenoid cavity articulates: [4]

- a) Scapula with acromion
- b) Clavicle with scapula
- c) Clavicle with acromion
- d) Humerus with scapula

172) Select the correct statement with respect to locomotion in humans:

- i. A decreased level of progesterone causes osteoporosis in old people
- ii. Accumulation of uric acid crystals in joints causes their inflammation
- iii. The vertebral column has 10 thoracic vertebrae
- iv. The joint between adjacent vertebrae is a fibrous joint

[4]

- a) Only C
- b) Only B
- c) Only A
- d) Only D

173) Lack of relaxation between successive stimuli in sustained muscle contraction is known as: [4]

- a) Tonus
- b) Spasm
- c) Tetanus
- d) Fatigue

174) Injury localized to the hypothalamus would most likely disrupt: [4]

- a) Executive functions, such as decision making
- b) Regulation of body temperature
- c) Co - ordination during locomotion
- d) Short - term memory

175) Stimulation of a muscle fibre by a motor neuron occurs at: [4]

- a) The sarcoplasmic reticulum
- b) The neuromuscular junction
- c) The transverse tubules
- d) The myofibril

176) Which of the following structures of regions is incorrectly paired with its function?



- a) Extension                      b) Denaturation  
c) Ligation                        d) Annealing

- 184) The laws and rules to prevent unauthorised exploitation of bio - resources are termed as - [4]  
a) Bioethics                        b) Biopatenting  
c) Bioengineering                d) Biopiracy
- 185) The crops engineered for glyphosate are resistant/tolerant to : [4]  
a) Fungi                              b) Insects  
c) Herbicides                        d) Bacteria

### ZOOLOGY (Section-B)

#### Attempt any 10 questions

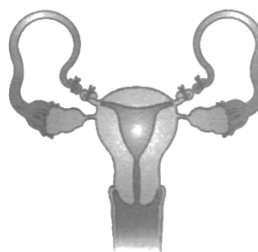
- 186) Which one of these animals is not a homeotherm? [4]  
a) Macropus                        b) Psittacula  
c) Chelone                         d) Camelus
- 187) In male cockroaches, sperms are stored in which part of the reproductive system? [4]  
a) Seminal vesicle                b) Testes  
c) Vas deferens                    d) Mushroom glands
- 188) Match the items given in column - I with those in column - II and select the correct option given below :

Column - I	Column - II
(I) Tricuspid valve	(i) Between left atrium and left ventricle
(II) Bicuspid valve	(ii) Between right ventricle and pulmonary artery
(III) Semilunar valve	(iii) Between right atrium and right ventricle

Codes: [4]

- a) (I) - (i), (II) - (iii), (III) - (ii)  
b) (I) - (ii), (II) - (i), (III) - (iii)  
c) (I) - (iii), (II) - (i), (III) - (ii)  
d) (I) - (i), (II) - (ii), (III) - (iii)
- 189) Two friends are eating together on a dining table. One of them suddenly starts coughing while swallowing some food. This coughing would have been due to improper movement of [4]  
a) Tongue                            b) Neck  
c) Epiglottis                        d) Diaphragm
- 190) Which one of the following is the most likely root cause why menstruation is not taking place in regularly cycling human female? [4]  
a) Fertilization of the ovum.  
b) Maintenance of the hypertrophical endometrial lining.  
c) Maintenance of high concentration of sex hormones in the blood streams.  
d) Retention of well developed corpus luteum.

- 191) What is the figure given below showing in particular?



- [4]  
a) Tubectomy                        b) Vasectomy  
c) Uterine cancer                    d) Ovarian cancer

- 192) Forelimbs of the cat, lizard used in walking, forelimbs of a whale used in swimming and forelimbs of bats used in flying are an example of: [4]  
a) Convergent evolution        b) Homologous organs  
c) Analogous organs              d) Adaptive radiation
- 193) Match the item given in column - I with those in column - II and select the correct option given below :

Column - I	Column - II
(I) Glycouria	(i) Accumulation of uric acid in joints
(II) Gout	(ii) Mass of crystallised salts within the kidney
(III) Renal calculi	(iii) Inflammation in glomeruli
(IV) Glomerular nephritis	(iv) Presence of glucose in urine

- [4]  
a) (I) - (i), (II) - (ii), (III) - (iii), (IV) - (iv)  
b) (I) - (iv), (II) - (i), (III) - (ii), (IV) - (iii)  
c) (I) - (ii), (II) - (iii), (III) - (i), (IV) - (iv)  
d) (I) - (iii), (II) - (ii), (III) - (iv), (IV) - (i)

- 194) Three of the following pairs of the human skeletal parts are correctly matched with their respective inclusive skeletal category and one pair is not matched. Identify the non - matching pair.

Column I	Column II
(A) Humerus and ulna	Appendicular skeleton
(B) Malleus and stapes	Ear ossicles
(C) Sternum and ribs	Axial skeleton
(D) Clavicle and Glenoid cavity	Pelvic girdle

- [4]  
a) Only B                              b) Only A  
c) Only D                              d) Only C

- 195) When a neuron is in resting state, i.e., not conducting any impulse, then axonal membrane is: [4]  
a) Equally permeable to both Na<sup>+</sup> and K<sup>+</sup> ions  
b) Comparatively more permeable to Na<sup>+</sup> ions and nearly impermeable to K<sup>+</sup> ions  
c) Comparatively more permeable to K<sup>+</sup> ions and nearly impermeable to Na<sup>+</sup> ions

d) Impermeable to both  $\text{Na}^+$  and  $\text{K}^+$  ions

196) Select the correct statement. [4]

- a) Insulin is associated with hyperglycemia.
- b) Insulin acts on pancreatic cells and adipocytes.
- c) Glucocorticoids stimulate gluconeogenesis.
- d) Glucagon is associated with hypoglycemia.

197) Injury to adrenal cortex is not likely to affect the secretion of which one of the following? [4]

- a) Aldosterone
- b) Cortisol
- c) Both androstenedione and dehydroepiandrosterone
- d) Adrenaline

198) How do parasympathetic neural signals affect the working of the heart? [4]

- a) Reduce both heart rate and cardiac output
- b) Both heart rate and cardiac output increase

c) Heart rate is increased without affecting the cardiac output

d) Heart rate decreases but cardiac output increases

199) The colonies of recombinant bacteria appear white in contrast to blue colonies of non - recombinant bacteria because of: [4]

- a) Non - recombinant bacteria containing beta galactosidase
- b) Inactivation of glycosidase enzyme in recombinant bacteria
- c) Insertional inactivation of alpha - galactosidase in recombinant bacteria
- d) Insertional inactivation of alpha - galactosidase in non - recombinant bacteria

200) Which of the following RNAs is not required for the synthesis of protein? [4]

- a) SiRNA
- b) TRNA
- c) RRNA
- d) MRNA