

# Model Test Paper-5



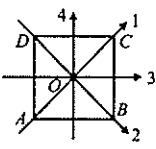
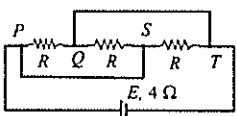
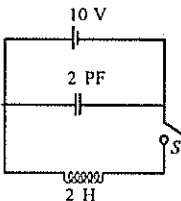
Time : 3½ hours.

Maximum Marks : 200

## PHYSICS

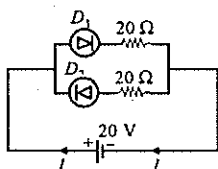
- Light of wavelength  $0.4 \mu\text{m}$  from a mercury vapour lamp falls on a photocell and causes the emission of photoelectrons for which the stopping potential is 1.5 volt. With light of wavelength  $0.6 \mu\text{m}$  from a sodium lamp, the stopping potential is 0.5 V. The work function of the photoelectric material used in the photocell is
  - 1.5 eV
  - 2.0 eV
  - 2.5 eV
  - 3.0 eV.
- Suppose we convert the masses of a proton and a neutron completely into energies  $E_p$  and  $E_n$  respectively. Then  $(E_p - E_n)$  is
  - positive
  - zero
  - negative
  - positive or negative depending on the proton and the neutron come from the nucleus.
- The earth's magnetic field acts as if the earth is a bar magnet. Then the equivalent S-pole
  - lies in Australia
  - is in the northern hemisphere
  - is located near the equator
  - coincides with the geographical south pole of the earth.
- A neutral point is one at which two or more magnetic fields
  - cancel one another
  - act in the same direction
  - combine to give minimum intensity
  - combine to give maximum intensity.
- A transparent material has three refractive indices 1.665, 1.650 and 1.68 for yellow, red and blue light respectively. The dispersive power of the substance is
  - 0.03
  - 0.018
  - 2.0
  - 0.045.
- A lens of power +4.00 D is kept in contact with another lens. The combination has the focal length of 40 cm. The power of the second lens is
  - 2.00 D
  - 1.50 D
  - 2.50 D
  - 3.00 D.
- The maximum velocity of an electron ejected from a photoelectric emitter when radiation falls on the latter is found to be  $2 \times 10^6 \text{ ms}^{-1}$ . Assuming the charge to mass ratio of electron ( $e/m$ ) to be  $1.8 \times 10^{11}$  coulomb/kg, the stopping potential is (in volt)
  - 1.2
  - 2.1
  - 11.1
  - 16.3.
- Energy is not carried by
  - longitudinal progressive waves
  - electromagnetic waves
  - transverse progressive waves
  - stationary waves.
- In nuclear reaction, which is conserved?
  - charge only
  - momentum only
  - sum of mass and energy
  - all of the above.
- How will the image formed by a convex lens be affected if the upper half of the lens is wrapped in black paper?
  - the upper half of the image will be absent
  - size of the image will be reduced to one half
  - the brightness of image is reduced
  - there will be no effect.
- Suppose there are 4 branches of 5 identical cells

- connected in series, the internal resistance of each cell being 10 ohm. If the group of cells sends a current of 0.2 ampere through an external resistance of 25 ohm, then the e.m.f of each cell is (in volt)
- (a) 1.5 (b) 1.25  
(c) 2.5 (d) 1.75.
12. An unknown resistance  $R_1$  is connected in series with a resistance 10 ohm. This combination is connected to one gap of a metre bridge while the other gap is connected to another resistance  $R_2$ . The balance point is at 50 cm. Now, when the 10 ohm resistance is removed, the balance point shifts to 40 cm. Then the value of  $R_1$  (in ohm) is
- (a) 60 (b) 40  
(c) 20 (d) 10.
13. Around a temperature of 25°C, a  $p$ -type semiconductor has
- (a) neither electrons nor holes  
(b) a few free electrons and many holes  
(c) a few holes and many free electrons  
(d) many holes and many free electrons.
14. Suppose the binding energy per nucleon is plotted as a function of atomic mass number. The curve will have a sharp maximum for helium nucleus. This indicates
- (a) helium is radioactive  
(b) helium fissions very easily  
(c) helium is very stable  
(d) the rare occurrence of helium.
15. Two men talk on moon
- (a) they hear each other with lower frequency  
(b) they hear each other with higher frequency  
(c) they can hear each other  
(d) they can't hear each other at all.
16. 24 cells, each of internal resistance 0.5  $\Omega$ , are to be used to send maximum current through an external resistance of 3  $\Omega$ . The cells should be arranged
- (a) all in series (b) all in parallel  
(c) two rows of 12 cells each  
(d) three rows of 8 cells each.
17. A bullet is shot from a gun when the angle of elevation of the gun is 30° and another when the angle of elevation is 60°. For the two cases, which of the following is true?
- (a) horizontal range as well as vertical height attained in both the cases will be same.  
(b) horizontal range is same in both the cases but vertical height attained in the second case is three times than in the first case  
(c) horizontal range in both the cases will be same but vertical height attained in the second case is two times than in the first case  
(d) none of the above.
18. Amount of charge in coulomb required to deposit one gram equivalent in electrolysis is
- (a) 96,490 (b) 48.0  $\sqrt{10^{-10}}$   
(c)  $6 \times 10^{29}$  (d) 9608.
19. Given the relativistic mass of a particle
- $$m = \frac{m_0}{\left(1 - \frac{v^2}{c^2}\right)^{1/2}}$$
- where  $m_0$  = rest mass,  $v$  = its velocity and  $c$  = velocity of light. Which of the following statements is true?
- (a) increase in mass is due to its increase in potential energy  
(b) increases in mass is equal to the increased in the kinetic energy divided by  $c^2$   
(c) there is no increase in mass  
(d) mass increases when  $v = 0$ .
20. A particle is moving eastwards with a velocity of 5  $\text{ms}^{-1}$ . In 10 second, the velocity changes to 5  $\text{ms}^{-1}$  northwards. The average acceleration in this time is
- (a)  $\frac{1}{2}$   $\text{ms}^{-2}$  towards N  
(b) zero  
(c)  $\frac{1}{\sqrt{2}}$   $\text{ms}^{-2}$  towards NE

- (d)  $\frac{1}{\sqrt{2}} \text{ ms}^{-2}$  towards NW.
21. The moment of inertia of a thin square plate  $ABCD$  of uniform thickness about an axis passing through the centre  $O$  and perpendicular to the plane of the plate is
- 
- (a)  $I_1 + I_2$  (b)  $I_3 + I_4$   
(c)  $I_1 + I_3$  (d)  $I_1 + I_2 + I_3 + I_4$ .
22. An open and wide glass tube is immersed vertically in mercury in such a way that length 0.05 m extends above mercury level. The open end of the tube is closed and the tube is raised further by 0.43 m. The length of air column above mercury level in tube will be
- (a) 0.215 m (b) 0.2 m  
(c) 0.1 m (d) 0.4 m.
23. An equiconvex lens is made of material which has a refractive index of 1.6 for blue light and 1.5 for red light. Its focal length for red light is 0.20 m. What is the ratio of focal length for red light to focal length for blue light?
- (a) 5/6 (b) 15/16  
(c) 1 (d) 6/5.
24. A battery of internal resistance  $4 \Omega$  is connected to the network of resistance as shown in the figure. In order that the maximum power can be delivered to the network, the value of  $R$  in  $\Omega$  should be
- 
- (a)  $6 \Omega$  (b)  $12 \Omega$   
(c)  $8/3 \Omega$  (d)  $4/3 \Omega$ .
25. A particle of mass 0.1 kg is projected with a velocity  $U = \sqrt{10} \text{ ms}^{-1}$  making an angle of  $30^\circ$  with the horizontal in  $x$ - $y$  plane. The magnitude of the angular momentum of the particle about the point of projection when the particle is at its maximum height ( $H$ ) is
- (a)  $\sqrt{\frac{30}{160}}(-\hat{k}) \text{ kg m}^2 \text{ s}^{-1}$  (b)  $\frac{\sqrt{30}}{160}(-\hat{k}) \text{ kg m}^2 \text{ s}^{-1}$
- (c) zero (d)  $\frac{\sqrt{30}}{160}(+\hat{k}) \text{ kg m}^2 \text{ s}^{-1}$ .
26. An  $LC$  circuit has an inductance of 2 H and a capacitance of 2 PF. The capacitor is initially charged with a 10 V battery when the switch  $S$  is open. The battery is then removed from the circuit, and the switch is closed so that the capacitor is shorted across the inductor
- 
- (a) the frequency of oscillation of the circuit is  $\frac{10^6}{4\pi} \text{ Hz}$   
(b) the maximum charge on the capacitor is  $2 \times 10^{-11} \text{ C}$   
(c) the maximum current in the circuit is  $10^{-5} \text{ A}$   
(d) the maximum current in the circuit is  $\frac{10^{-5}}{\pi} \text{ A}$ .
27. An incubator made of material of thermal conductivity  $2.5 \times 10^{-4} \text{ Wm}^{-1}\text{K}^{-1}$  has the following dimension  $l = 1 \text{ m}$ ,  $b = 0.5 \text{ m}$ ,  $h = 0.5 \text{ m}$  and wall thickness  $= 1 \times 10^{-2} \text{ m}$ . The interior of incubator is to be maintained at  $40^\circ\text{C}$  by a heater coil placed inside, connected across 100 V supply. If the outside temperature is  $20^\circ\text{C}$ , what is the resistance of the heater coil?
- (a) 2 k $\Omega$  (b) 3 k $\Omega$   
(c) 4 k $\Omega$  (d) 5 k $\Omega$ .
28. The  $K_\alpha$  line from molybdenum ( $Z = 42$ ) has a wavelength 0.7078  $\text{\AA}$ . What will be the wavelength of  $K_\alpha$  line of an element whose atomic number is 30?
- (a) 1.414  $\text{\AA}$  (b) 2.12  $\text{\AA}$   
(c) 2.8  $\text{\AA}$  (d) 3.5390  $\text{\AA}$ .
29. An achromatic prism is made by combining two prisms  $P_1$  ( $\mu_f = 1.523$ ,  $\mu_c = 1.515$ ) and  $P_2$  ( $\mu_f = 1.666$ ,  $\mu_c = 1.650$ ). If the angle of prism  $P_1$  is  $10^\circ$  then the angle of the prism  $P_2$  will be
- (a)  $5^\circ$  (b)  $7.8^\circ$   
(c)  $10.6^\circ$  (d)  $20^\circ$ .

30. In the circuit shown in figure, the value of the current  $I$  is

- (a) 2 A
- (b) 1 A
- (c) zero
- (d) 0.5 A.



31. Number of condensers, each of capacitance  $1 \mu\text{F}$  and each one which gets punctured if a potential difference just exceeding 500 volt is applied, are provided. Then an arrangement suitable for giving a capacitor  $2 \mu\text{F}$  across which 300 volt may be applied requires atleast

- (a) 2 component capacitors
- (b) 12 component capacitors
- (c) 72 component capacitors
- (d) 6 component capacitors.

32. In Young's double slit experiment, the intensity of central maximum is  $I_0$ . What will be the intensity at the same site when one slit is closed?

- (a)  $I_0$
- (b)  $I_0/2$
- (c)  $I_0/4$
- (d)  $I_0/16$ .

33. The total energy of a particle executing simple harmonic motion is proportional to

- (a) displacement from equilibrium position
- (b) frequency of oscillation
- (c) velocity in equilibrium position
- (d) square of amplitude of motion.

34. Two racing cars of masses  $M_1$  and  $M_2$  are moving in circles of radii  $r_1$  and  $r_2$  respectively. Their speeds are such that they each move a complete circle in the same time  $t$ . The ratio of angular speed of the first to second car is

- (a)  $M_1 : M_2$
- (b)  $r_1 : r_2$
- (c) 1 : 1
- (d)  $M_1v_1 : M_2v_2$ .

35. If the coefficient of friction of a plane inclined at  $45^\circ$  is 0.5, the acceleration of a body sliding freely on it is

- (a)  $\frac{9.8}{\sqrt{2}} \text{ m/s}^2$
- (b)  $9.8 \text{ m/s}^2$
- (c)  $4.9 \text{ m/s}^2$
- (d)  $\frac{9.8}{2\sqrt{2}} \text{ m/s}^2$ .

36. The moment of inertia of a body (initially at rest) about a given axis is  $1.2 \text{ kg}\cdot\text{m}^2$ . In order to produce a rotational kinetic energy of 1500 J, an angular acceleration of  $25 \text{ rad/sec}^2$  must be applied about that axis for a period of

- (a) 8 sec
- (b) 2 sec
- (c) 1 sec
- (d) 10 sec.

37. R.M.S. velocity of a particle is  $V$  at pressure  $P$ . If the pressure increases by two times, then R.M.S. velocity will become

- (a)  $2V$
- (b)  $V$
- (c)  $0.5V$
- (d)  $4V$ .

38. If the density of oxygen is 16 times that of hydrogen, what will be the corresponding ratio of their velocities of sound waves?

- (a) 16 : 1
- (b) 4 : 1
- (c) 1 : 4
- (d) 1 : 16.

39. Hydrogen balloon will carry which of the following body most easily?

- (a) 10 kg feather
- (b) 10 kg iron
- (c) 10 kg cotton
- (d) all of these.

40. Electromotive force is the force, which is able to maintain a constant

- (a) resistance
- (b) power
- (c) current
- (d) potential difference.

**Instructions for Q. No. 41 to 60**

*Directions : Each of the questions given below consists of two statements, an assertions (A) and reason (R). Select the number corresponding to the appropriate response in the answer sheet as follows.*

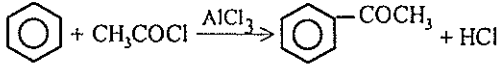
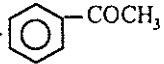
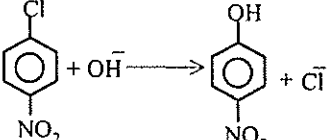
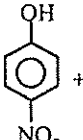
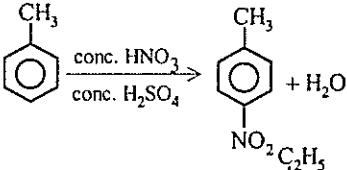
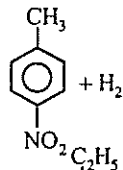
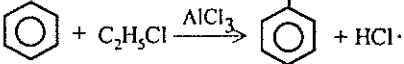

- (a) If both assertion and reason are true and the reason is a correct explanation of the assertion
- (b) If both assertion and reason are true but the reason is not a correct explanation of the assertion
- (c) If the assertion is true, but the reason is false
- (d) If both assertion and reason are false

41. *Assertion (A)* : In a nuclear reactor graphite is used as moderator.  
*Reason (R)* : Successive collisions of neutrons with the graphite nuclei result in loss of energy which slows the neutrons down.
42. *Assertion (A)* : White light contains the range of colours in light from violet with a wavelength of  $4 \times 10^{-7}$  m to red light with a wavelength of  $7 \times 10^{-7}$  m.  
*Reason (R)* : When Young's double slit experiment is carried out with white light, multicoloured fringes are formed.
43. *Assertion (A)* : Insulators do not conduct electricity.  
*Reason (R)* : In insulators the forbidden energy gap between the conduction and valence band is wide. On application of electric field the electrons fail to get required energy to cross over to conduction band which, therefore, remains empty.
44. *Assertion (A)* : Soft magnetic materials (e.g., iron) have a high coercivity and do not demagnetise easily.  
*Reason (R)* : Hard magnetic materials (e.g., steel) have a low coercivity and become temporary magnets.
45. *Assertion (A)* : Laser can be used to measure huge distances by the method of pulse reflection.  
*Reason (R)* : Light beam obtained from laser is highly collimative.
46. *Assertion (A)* : The velocity of an electron in an orbit is inversely proportional to the square of the radius of the orbit.  
*Reason (R)* : The angular velocity of the electron is proportional to the radius of the orbit.
47. *Assertion (A)* : The maximum number of electrons in an orbit is  $2n^2$  and the maximum number of electrons in a subshell is  $2(2l + 1)$   
*Reason (R)* : According to Pauli's exclusion principle no two electrons can have all their quantum numbers identical.
48. *Assertion (A)* : An ammeter is connected in series in an electrical circuit and it should have a low resistance.  
*Reason (R)* : The introduction of the ammeter must not affect the main current.
49. *Assertion (A)* : In series A.C. circuit, the voltage across the combination of capacitor and inductor is zero at resonance.  
*Reason (R)* : At series resonance the current in the circuit is zero.
50. *Assertion (A)* : If two or more different gases are mixed at the same temperature, there will be no exchange of energy among their molecules.  
*Reason (R)* : Different gases at the same temperature have the same average kinetic energy per molecule and this energy is directly proportional to the absolute temperature of the gas.
51. *Assertion (A)* : When energy of hydrogen atom increases from  $-13.6$  eV to  $-1.51$  eV, its radius increases by  $4.24 \text{ \AA}$ .  
*Reason (R)* : The energy of hydrogen atom is given by  $E = -\frac{13.6}{n^2}$  eV and the radius is given by  $r = 0.53 n^2$  :
52. *Assertion (A)* : The force with which one plate of a parallel plate capacitor is attracted towards the other plate is given by  $s^2/\epsilon_0$  per unit area where  $s$  is the surface density of charge.  
*Reason (R)* : The electric field due to one charged plate of the capacitor at the location of the other is  $E = \sigma/\epsilon_0$  and the force per unit area is given by  $F = \sigma E$ .
53. *Assertion (A)* : Air is more elastic than iron.  
*Reason (R)* : Elasticity is directly proportional to compressibility and air is more compressible than iron.
54. *Assertion (A)* : A solid floats in a liquid so that it is just submerged. When the liquid is heated the solid sinks to the bottom.  
*Reason (R)* : Weight of the solid increases with the rise in temperature.
55. *Assertion (A)* : When a man walks on a rough horizontal surface towards east, the frictional force on him is directed towards east.  
*Reason (R)* : Frictional force always opposes the relative motion.

56. *Assertion (A)* : According to special theory of relativity a particle cannot travel with speed of light.  
*Reason (R)* : In that case mass of the particle will be reduced to zero.
57. *Assertion (A)* : Electrons and protons having negligible initial velocity are accelerated through a certain potential difference. Protons will have larger momentum.  
*Reason (R)* : An electron has negative charge while a proton has positive charge.
58. *Assertion (A)* : The velocity of sound in air increases due to the presence of moisture.  
*Reason (R)* : The presence of moisture in air lowers the density of air.
59. *Assertion (A)* : Two systems which are both in thermal equilibrium with a third system are in thermal equilibrium with each other.  
*Reason (R)* : The heat flows spontaneously from a system at a higher temperature to a system at lower temperature.
60. *Assertion (A)* : Tiny drops of liquid resist deforming forces better than bigger drops.  
*Reason (R)* : Excess pressure inside a drop is directly proportional to surface tension.
- (a) CO (b) N<sub>2</sub>O<sub>4</sub>  
(c) O<sub>3</sub> (d) O<sub>2</sub>.
64. One mole of methanol, when burnt in oxygen, gives out 723 kJ mole<sup>-1</sup> heat. If one mole of oxygen is used, what will be the amount of heat evolved?  
(a) 723 kJ (b) 482 kJ  
(c) 964 kJ (d) 241 kJ.
65. Chlorine can be liberated from potassium chloride solution by the action of  
(a) iodine solution (b) fluorine  
(c) sodium chloride (d) potassium iodide.
66. Atomic number of an element is 30. Therefore its possible group in the periodic table is  
(a) I A (b) II B  
(c) II A (d) I B.
67. Oxygen is obtained when one of the following compound is heated.  
(a) SiO<sub>2</sub> (b) Fe<sub>2</sub>O<sub>3</sub>  
(c) KNO<sub>2</sub> (d) KMnO<sub>4</sub>.
68. The electronic configuration 1s<sup>1</sup> 2s<sup>2</sup> 2p<sup>5</sup> 3s<sup>1</sup> describes which one of the following?  
(a) an excited state of fluorine  
(b) the ground state of neon atom  
(c) an excited state of neon atom  
(d) the ground state of fluoride ion.

### CHEMISTRY

61. The mass of a neutron is  
(a) less than that of a proton  
(b) equal to that of an electron  
(c) about one quarter of that of a helium atom  
(d) much less than that of a hydrogen atom.
62. The difference between heats of reaction at constant pressure and constant volume for the reaction  
 $2C_6H_6(l) + 15O_2(g) \rightarrow 12CO_2(l) + 6H_2O(g)$  at 25° C in kJ is  
(a) -7.43 (b) +3.72  
(c) -3.72 (d) +7.43.
63. Which one of the following molecules is paramagnetic?  
(a) O<sub>2</sub> (b) SO<sub>2</sub>  
(c) NO (d) C<sub>4</sub>H<sub>10</sub>.
69. The molecular weight of a gas is 128. The weight of 8.21 litres at 3 atmospheric pressure and 27° C is  
(a) 64 g (b) 128 g  
(c) 82.1 g (d) 821 g.
70. For the reaction  
 $2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$   
 $K_c = 32$ . If [SO<sub>3</sub>] = [O<sub>2</sub>] = 2 M, then [SO<sub>2</sub>] is  
(a) 4 M (b) 8 M  
(c) 16 M (d) 0.8 M.
71. 0.2 g of gas X occupies a volume of 440 ml and 0.1 g of carbon dioxide occupies 320 ml at the same temperature and pressure. The gas X could be  
(a) O<sub>2</sub> (b) SO<sub>2</sub>  
(c) NO (d) C<sub>4</sub>H<sub>10</sub>.

72. Ammonia is considered to be a Lewis base because of  
 (a) polarity of the molecule  
 (b) high volatility  
 (c) presence of lone pair of electrons  
 (d) the peculiar shape of the molecule.
73. Which of the following oxides of nitrogen is a white solid?  
 (a) NO (b) NO<sub>2</sub>  
 (c) N<sub>2</sub>O<sub>5</sub> (d) N<sub>2</sub>O<sub>3</sub>.
74. The base catalysed aldol condensation will not occur with  
 (a) propionaldehyde  
 (b) benzaldehyde  
 (c) 2 - methyl propionaldehyde  
 (d) acetone.
75. When a colourless gas is passed through bromine water only decolourisation takes place. The gas is  
 (a) SO<sub>2</sub> (b) HCl  
 (c) HBr (d) H<sub>2</sub>S.
76. The mass of a molecule of oxygen in g is  
 (a)  $5.3 \times 10^{23}$  (b)  $1.92 \times 10^{-23}$   
 (c)  $10.6 \times 10^{-23}$  (d)  $5.3 \times 10^{-23}$ .
77. Which of the following statements is correct?  
 (a)  $\Delta H$  is positive for exothermic reactions  
 (b)  $\Delta H$  is negative for endothermic reactions  
 (c) enthalpy of fusion is negative  
 (d) enthalpy of neutralisation of strong acid with a strong base is always the same.
78. An ion, which has 18 electrons in the outermost shell is  
 (a) Th<sup>4+</sup> (b) K<sup>+</sup>  
 (c) Cs<sup>+</sup> (d) Cu<sup>+</sup>.
79. Hydrogen acts as an oxidising agent in its reaction with  
 (a) bromine (b) calcium  
 (c) nitrogen (d) sulphur.
80. pH of 10<sup>-8</sup> M HCl solution is  
 (a) 8 (b) 7  
 (c) 4 (d) between 6 and 7.
81. Which of the following is not an electrophilic substitution ?  
 (a)  + CH<sub>3</sub>COCl  $\xrightarrow{\text{AlCl}_3}$   + HCl
- (b)  + OH<sup>-</sup>  $\longrightarrow$   + Cl<sup>-</sup>
- (c)   $\xrightarrow[\text{conc. H}_2\text{SO}_4]{\text{conc. HNO}_3}$   + H<sub>2</sub>O
- (d)  + C<sub>2</sub>H<sub>5</sub>Cl  $\xrightarrow{\text{AlCl}_3}$   + HCl.
82. Which of the following is the most reactive towards ring nitration?  
 (a) benzene (b) toluene  
 (c) mesitylene (d) *m* - xylene.
83. Which of the following is the strongest acid?  
 (a) *o* - methoxybenzoic acid  
 (b) salicylic acid  
 (c) 2, 6 - dihydroxy benzoic acid  
 (d) benzoic acid.
84. Alkanes and alkenes can be distinguished by their solubility in  
 (a) alcohol (b) ether  
 (c) H<sub>2</sub>SO<sub>4</sub> (d) water.
85. Which of the following compounds is least soluble in water?  
 (a) phenol (b) benzene  
 (c) ethanol (d) benzoic acid.
86. Oils and fats in our food not only provide us energy but also act as carriers of certain vitamins, such as  
 (a) A and B (b) A and C  
 (c) B and C (d) A and D.
87. Thermite process is used to extract metals  
 (a) when their oxides cannot be reduced by carbon

- (b) when their carbonates do not yield oxides by thermal decomposition  
 (c) when their sulphides cannot be converted into oxides by roasting  
 (d) when their melting points are very high.
88. A sodium salt was mixed with ammonium sulphate and heated. A colourless gas was evolved which was insoluble in hot water. But it dissolved in cold water to give a neutral solution. The sodium salt was  
 (a) sodium chloride (b) sodium carbonate  
 (c) sodium nitrate (d) sodium phosphate.
89. A colourless water-soluble organic liquid decomposes sodium carbonate and liberates carbon dioxide. It produces a black precipitate with Tollen's reagent. The liquid is  
 (a) acetaldehyde (b) acetic acid  
 (c) formaldehyde (d) formic acid.
90. Among naturally occurring carbohydrates, an instance of a furanose ring is found in  
 (a) the galactose unit of lactose  
 (b) the glucose unit of cellulose  
 (c) the fructose unit of canesugar  
 (d) the glucose unit of canesugar.
91. If  $\Delta H$  is the change in enthalpy and  $\Delta E$  the change in the internal energy accompanying a gaseous reaction,  
 (a)  $\Delta H$  is always greater than  $\Delta E$   
 (b)  $\Delta H$  is always less than  $\Delta E$   
 (c)  $\Delta H < \Delta E$  only if the number of moles of the products is greater than the number of moles of the reactants  
 (d)  $\Delta H < \Delta E$  only if the number of moles of the products is less than the number of moles of the reactants.
92. Two useful by-products, obtained in the Solvay process of manufacturing sodium carbonate are  
 (a) quicklime and carbon dioxide  
 (b) sodium bicarbonate and ammonium chloride  
 (c) ammonium chloride solution and quicklime  
 (d) sodium bicarbonate and carbon dioxide.
93. Two moles of nitrogen and two moles of hydrogen are taken in a closed vessel of five litre capacity and suitable conditions are provided for the reaction. When equilibrium is reached, it is found that half a mole of nitrogen is used up. The equilibrium concentration of ammonia is  
 (a) 0.4 (b) 0.3  
 (c) 0.2 (d) 0.1.
94. Which of the following statements does not apply for weak electrolytes?  
 (a) conductivity of weak electrolytes at moderate concentration is extremely poor  
 (b) law of chemical equilibrium can be applied to the dissociation of weak electrolytes  
 (c) dissociation constant for weak electrolyte is very low  
 (d) degree of dissociation of weak electrolyte is appreciably high at higher concentration.
95. An aqueous solution of colourless metal sulphate M, gives a white precipitate with  $\text{NH}_4\text{OH}$ . This was soluble in excess of  $\text{NH}_4\text{OH}$ . On passing  $\text{H}_2\text{S}$  through this solution a white precipitate is formed. The metal in the metal salt is  
 (a) aluminium (b) calcium  
 (c) barium (d) zinc.
96. Formaldehyde and acetaldehyde are manufactured by dehydrogenation of methanol and ethanol respectively. The catalyst used in this reaction is  
 (a) conc.  $\text{H}_2\text{SO}_4$  (b) copper  
 (c) nickel (d)  $\text{H}_3\text{PO}_4$ .
97. Nessler's reagent is  
 (a) an alkaline solution of  $\text{HgCl}_2$  and KI  
 (b) a solution of ammonium hydroxide  
 (c) a solution of KI and sodium thiosulphate  
 (d) a solution of  $\text{I}_2$ .
98. The reaction in which the yield of the product cannot be increased by the application of high pressure is  
 (a)  $\text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons \text{PCl}_5(\text{g})$   
 (b)  $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$   
 (c)  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$   
 (d)  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$



99. The half-life for the reaction  $\text{N}_2\text{O}_5 \rightleftharpoons 2\text{NO}_2 + \frac{1}{2}\text{O}_2$  is 24 hrs at 30°C. Starting with 10 g of  $\text{N}_2\text{O}_5$ , how many grams of  $\text{N}_2\text{O}_5$  will remain after a period of 96 hours
- (a) 1.25 g                      (b) 0.63 g  
(c) 1.77 g                      (d) 0.5 g.

100. Aqua regia is a mixture
- (a) 1 volume of conc. HCl + 3 volumes of conc.  $\text{HNO}_3$   
(b) 1 volume of conc.  $\text{HNO}_3$  + 3 volumes of conc. HCl  
(c) equal volumes of conc. HCl and conc.  $\text{HNO}_3$   
(d) 1 volume of conc. HCl + 3 volumes of conc.  $\text{H}_2\text{SO}_4$ .

#### Instructions for Q. No. 101 to 120

*Directions : Each of the questions given below consists of two statements, an assertions (A) and reason (R). Select the number corresponding to the appropriate response in the answer sheet as follows.*

- (a) If both assertion and reason are true and the reason is a correct explanation of the assertion  
(b) If both assertion and reason are true but the reason is not a correct explanation of the assertion  
(c) If the assertion is true, but the reason is false  
(d) If both assertion and reason are false
101. *Assertion (A) :* To separate from the more abundant isotope, all the uranium is converted into  $\text{UF}_6$ .  
*Reason (R) :*  $\text{UF}_6$  is one of the few compounds that exists of gaseous state under ordinary conditions.
102. *Assertion (A) :* One mole of helium atoms should occupy 22.4 litre volume at STP.  
*Reason (R) :* Taking 31 pm as radius of helium atom, if we pack together a mole of helium atoms, the mole of atoms should have a volume of 22.4 litre.
103. *Assertion (A) :* A sample of 8.00 moles of chlorine gas in a 4.00 litre tank at 27°C leads to a pressure of 49.2 atm according to ideal gas law.  
*Reason (R) :* The actual pressure of the sample of chlorine is nearly 20 atmosphere less than the ideal pressure.
104. *Assertion (A) :* The pressure of a gas is inversely proportional to its volume at constant temperature and  $n$ .  
*Reason (R) :* The gas volume is directly proportional to  $n$  at constant temperature and pressure.
105. *Assertion (A) :* Not only is the fraction of oxygen is reduced in diving gases, but nitrogen of normal air is replaced by helium.  
*Reason (R) :* Nitrogen becomes more soluble in the body fluids at high pressure and causes a condition similar to alcohol intoxication.
106. *Assertion (A) :* When one talks after breathing helium, the sound becomes like that of Donald Duck.  
*Reason (R) :* The vocal cords vibrate faster in an atmosphere less dense than air and the pitch of voice is raised.
107. *Assertion (A) :* The reacting gases combine in volumes that are ratios of small whole numbers.  
*Reason (R) :* The partial pressure of a gas in a mixture is given by its mole fraction times the total pressure of the mixture.
108. *Assertion (A) :* The oxidation numbers are artificial, they are useful as a 'book-keeping' device of electron in reactions.  
*Reason (R) :* The oxidation numbers do not usually represent real charges on atoms, they are simply conventions that indicate what the maximum charge could possibly be on an atom in a molecule.
109. *Assertion (A) :* The structural-pair geometry of Formaldehyde molecule is trigonal planar.  
*Reason (R) :* In  $\text{H}_2\text{CO}$  molecule, the carbon atom is surrounded by 3 sigma bonding electron pairs.
110. *Assertion (A) :* The conjugated dienes are more stable than the corresponding alkenes containing one double bond or even the dienes containing two isolated double bonds.  
*Reason (R) :* Conjugated dienes are regarded as hybrids of several contributing structures.

111. *Assertion (A)* : As mole is the basic chemical unit, the concentration of the dissolved solute is usually specified in terms of number of moles of solute.  
*Reason (R)* : The total number of molecules of reactants involved in a balanced chemical equation is known as molecularity of the reaction.
112. *Assertion (A)* : Ionic compounds are made of positive and negative ions arranged in a manner so as to acquire maximum potential energy.  
*Reason (R)* : In order to acquire maximum stability ions in a crystal should be arranged in such a way that the forces of repulsion should overweight the forces of attraction.
113. *Assertion (A)* : When a trace amount of 'As' is added to extremely pure germanium a *n*-type of semiconductor is obtained.  
*Reason (R)* : Four electrons of impurity are used in forming bonds and fifth electron remains free. This extra electron can serve to conduct electricity.
114. *Assertion (A)* : The half-life time of a first order reaction is always constant and it does not depend upon the initial concentration of reactants.  
*Reason (R)* : For the first order reaction the half-life time is expressed as -
- $$t_{1/2} = \frac{2.303}{k} \log 2$$
115. *Assertion (A)* : The kinetics of the reaction -  
 $mA + nB + pC \rightarrow m'X + n'Y + p'Z$   
obeys the rate expression as -
- $$\frac{dx}{dt} = k[A]^m[B]^n$$
- Reason (R)* : The rate of reaction does not depend upon the concentration of C.
116. *Assertion (A)* : The atoms of different elements having same mass number but different atomic number are known as isobars.  
*Reason (R)* : The sum of protons and neutrons, in the isobars is always different.
117. *Assertion (A)* : The nuclear isomers are the atoms with the same atomic number and same mass number, but with different radioactive properties.  
*Reason (R)* : The nucleus in the excited state will evidently have a different half-life as compared to that in the ground state.
118. *Assertion (A)* : In case of isoelectronic ions the ionic size increases with the increase in atomic number.  
*Reason (R)* : The greater the attraction of nucleus, greater is the ionic radius.
119. *Assertion (A)* : Neither pure  $H_2SO_4$  nor pure  $HClO_4$  conducts electric current but a mixture of two does.  
*Reason (R)* : Stronger acid  $HClO_4$  donates a proton to  $H_2SO_4$  which acts as a base.
120. *Assertion (A)* : The neutrons are better initiators of nuclear reactions than the protons, deuterons or  $\alpha$ -particles of the same energy.  
*Reason (R)* : Neutrons are uncharged particles and hence, they are not repelled by positively charged nucleus.

### BIOLOGY

121. Which of the following contains hydrolytic enzyme?  
(a) mitochondrion (b) lysosome  
(c) ribosome (d) peroxisome.
122. Interferon is  
(a) anti-viral (b) anti-bacterial  
(c) anti-animal cell (d) bacteria.
123. What is the function of centrosome?  
(a) cell wall formation (b) cell plate formation  
(c) cell differentiation (d) cell division.
124. The vegetation of Rajasthan is  
(a) xerophytic (b) deciduous  
(c) alpine (d) arctic.
125. Which of the following gas is necessary for germination of pea seeds?  
(a)  $H_2$  (b)  $N_2$   
(c)  $O_2$  (d) water vapour.
126. If the cell of root in wheat plant has 42 chromosomes, then the number of chromosomes in the synergid cell is

- (a) 14 (b) 21  
(c) 28 (d) 42.
127. Which of the following represents the correct order in prophase I?  
(a) leptotene, zygotene, diplotene, pachytene, diakinesis  
(b) leptotene, zygotene, pachytene, diplotene, diakinesis  
(c) zygotene, diplotene, pachytene, leptotene, diakinesis  
(d) diakinesis, zygotene, diplotene, leptotene, pachytene.
128. Which state in India is the maximum producer of peanut?  
(a) Rajasthan (b) Gujarat  
(c) Bihar (d) Uttar Pradesh.
129. The genetic preservation of extinct species is done in  
(a) gene bank (b) national park  
(c) herbarium (d) none of these.
130. Meiosis is best shown in  
(a) anther wall (b) pollen grain  
(c) gamete (d) microsporangium.
131. If a red eyed wild type *Drosophila* mates with a simple blue eyed (red is dominant while blue is recessive), then the ratio of red and blue eyed is  
(a) 3 : 1 (b) 2 : 2  
(c) 1 : 2 (d) 1 : 3.
132. Stalk of the ovule is called  
(a) hilum (b) tigellum  
(c) funicle (d) none of these.
133. Cypsella fruit develops from  
(a) superior syncarpous ovary  
(b) superior apocarpous ovary  
(c) both (a) and (b)  
(d) none of these.
134. System of binomial nomenclature in plants was given by  
(a) Carolus Linnaeus  
(b) Bentham and Hooker  
(c) Robert Hooke  
(d) Engler and Prantl.
135. The number of ATP formed after combustion of 1 mole of glucose is  
(a) 36 (b) 38  
(c) 40 (d) 30.
136. Which of the following plant is used in study of the photosynthesis?  
(a) *Chlorella* (b) *Asparagus*  
(c) *Amaranthus* (d) sunflower.
137. One quantasome contains  
(a) 230 chlorophyll molecules  
(b) 233 chlorophyll molecules  
(c) 330 chlorophyll molecules  
(d) some molecules of chlorophyll.
138. The leaf of *Mimosa* on touching becomes flaccid and droops down. This is due to  
(a) water goes out of pulvini  
(b) water movement  
(c) based on water concentration  
(d) none of these.
139. The proteins, which regulate life processes, are called  
(a) structural protein (b) functional protein  
(c) skeletal protein (d) all of these
140. In sex linkage, the speciality is  
(a) gene flow  
(b) criss-cross inheritance  
(c) atavism (d) reversion
141. The modern theory of organic evolution is based on  
(a) natural selection (b) genetic variation  
(c) isolation (d) all of these
142. Which one of the following pairs is not correctly matched ?  
(a) syphilis - *Trichuris trichura*  
(b) sleeping sickness - *Trypanosoma gambiense*  
(c) dengue fever - *Arbovirus*  
(d) plague - *Yersinia pestis*
143. Animals, with radial symmetry in adult and bilateral symmetry in larva, are  
(a) coelenterates (b) echinoderms  
(c) annelids (d) platyhelminthes

144. In which of the following solution a cell get deplasmolyzed ?  
 (a) isotonic (b) detonic  
 (c) hypotonic (d) hypertonic
145. Linolenic acid is unsaturated fatty acid and its content is highest in  
 (a) sunflower oil (b) coconut oil  
 (c) cotton oil (d) groundnut oil
146. Common cold is caused by  
 (a) protozoa (b) unicellular algae  
 (c) bacteria (d) virus
147. Auxanometer is used to measure  
 (a) respiration (b) ascent of sap  
 (c) growth (d) transpiration
148. Stilt roots are present in  
 (a) *Helianthus* (b) maize  
 (c) banyan (d) *Tridax*
149. Commissural stigma is present in the family  
 (a) fabaceae (b) cruciferae  
 (c) solanaceae (d) liliaceae
150. The geranium oil is obtained from which part of *Pelargonium* ?  
 (a) roots (b) stem  
 (c) flower (d) leaves
151. The speed of development and metamorphosis of tadpole into adult frog is controlled by  
 (a) salinity of water (b) food availability  
 (c) pH of water (d) thyroid hormone
152. In which of the following, the calcified cartilage is found?  
 (a) vertebrae of shark  
 (b) suprascapula of pectoral girdle of frog  
 (c) scapula of pectoral girdle of man  
 (d) both 'a' and 'b'
153. Which of the following is a vestigial organ of human ?  
 (a) wisdom teeth (b) muscle of glottis  
 (c) hairs (d) intestine
154. A fungal disease of the poultry is  
 (a) Monoliasis (b) Coccidiosis  
 (c) Mareks (d) Coryza
155. Which of the following is prototherian ?  
 (a) *Opposum* (b) kangaroo  
 (c) *Platypus* (d) all of these
156. *Taenia saginata* differs from *T. solium* in the absence of  
 (a) hooks upon scolex (b) suckers upon scolex  
 (c) scolex (d) none of these
157. The term zymase for enzymes, in yeast, was coined by  
 (a) Louis Pasteur (b) Edward Buchner  
 (c) Sumner (d) Kuhne
158. Which one of the following is a structural protein?  
 (a) keratin (b) haemoglobin  
 (c) amino acid (d) gelatin.
159. Chromosomes start moving towards the pole in ..... of mitosis.  
 (a) anaphase (b) metaphase  
 (c) prophase (d) telophase.
160. The function of chalaza in hen's egg is to  
 (a) nourish the embryo  
 (b) to keep the blastoderm on top  
 (c) to balance the egg  
 (d) has no function at all.
- Instructions for Q. No. 161 to 180**  
*Directions : Each of the questions given below consists of two statements, an assertions (A) and reason (R). Select the number corresponding to the appropriate response in the answer sheet as follows.*
- (a) If both assertion and reason are true and the reason is a correct explanation of the assertion  
 (b) If both assertion and reason are true but the reason is not a correct explanation of the assertion  
 (c) If the assertion is true, but the reason is false  
 (d) If both assertion and reason are false
161. Assertion (A) : Bryophytes rarely attains a height of 20 cm.

- Reason (R)* : Largest bryophyte is *Dawsonia*.
162. *Assertion (A)* : Pyramid of energy is always upright.  
*Reason (R)* : Loss of energy always takes place from one trophic level to another trophic level.
163. *Assertion (A)* : Self pollination takes place in cleistogamous flower.  
*Reason (R)* : Cross pollination is the transfer of pollen grains in two genetically dissimilar flower.
164. *Assertion (A)* : In xerosere lichens are the pioneer.  
*Reason (R)* : No other life form can survive on bare rock substratum.
165. *Assertion (A)* : Mycoplasmas are categorised under kingdom monera.  
*Reason (R)* : They lack rigid cell wall.
166. *Assertion (A)* : PET scanning is more useful than CT scanning.  
*Reason (R)* : PET is a computerised scanning technique.
167. *Assertion (A)* : In zero population growth the size of the population remains same or constant.  
*Reason (R)* : Emigration is equal to immigration.
168. *Assertion (A)* : Bacteria do not have true sexual reproduction.  
*Reason (R)* : Bacteria reproduce only by asexual means.
169. *Assertion (A)* : Karyotyping is done at mitotic metaphase.  
*Reason (R)* : Karyotyping can detect the defect such as monosomy or trisomy.
170. *Assertion (A)* : In insects like bees, ants, & wasps the ploidy level is different in males & females.  
*Reason (R)* : Males show arrhenotoky.
171. *Assertion (A)* : A body of nervous tissue integrating animal sensory and motor functions and providing through conduction pathways to transmit impulses rapidly, along the body.  
*Reason (R)* : In vertebrates it comprises the brain and spinal cord, and in certain invertebrates a pair of solid ventral nerve chains.
172. *Assertion (A)* : The plasmalemmas of animal cells typically have the oligosaccharide chains of their glycolipids and glycoproteins exposed freely on their surfaces.  
*Reason (R)* : These play important roles in immunological responses, in cell-cell adhesion and identification of cell surface changes.
173. *Assertion (A)* : A group of phosphorylated compounds transferring chemical energy required for cell work which depends upon their tendency to donate their phosphate group to water.  
*Reason (R)* : Phosphate bond energy indicates the difference between free energies of reactants and products respectively before and after hydrolysis of a phosphorylated compound.
174. *Assertion (A)* : In placental mammals the placenta is connected to the embryo by the umbilical cord and has an essential role in the immunological protection of the embryo.  
*Reason (R)* : In mammals foetal components of the placenta derive initially from the chondroblast connected with embryonic blood stream either through its contact with the yolk sac.
175. *Assertion (A)* : Some bacterial and eukaryotic DNA polymerases can replace a nucleotide and insert incorrectly. DNA ligase then seals the phosphodiester bond. To avoid removing the nucleotide from the wrong strand, cells methylate DNA which has been formed some while; repair enzymes thus distinguish old from new DNA.  
*Reason (R)* : Mutant lacking repair mechanisms are likely to be more susceptible to irradiating sources and express mutations so induced.
176. *Assertion (A)* : The first photochemical reaction in photosynthesis is the evolution of molecular oxygen.  
*Reason (R)* : PS-II consists of the particle coloured dark green and the light gathering pigment complex shown to one side.
177. *Assertion (A)* : Synandrous condition is found in cucurbits.  
*Reason (R)* : The male flower of cucurbits, generally, contains five stamens which are laterally fused (anthers and filaments both).
178. *Assertion (A)* : Hershey and Chase experiment showed that protein is the genetic material of T<sub>2</sub> bacteriophage.  
*Reason (R)* : According to Hershey and Chase, RNA is the genetic material in T<sub>2</sub> bacteriophage.

179. *Assertion (A)* : Many globular proteins also undergo small conformational changes in the course of their biological function.

*Reason (R)* : These changes are associated with the binding of a ligand.

180. *Assertion (A)* : Elongation and division of cells are promoted by gibberellins.

*Reason (R)* : Gibberellins increase the formation of hydrolytic enzymes that release energy necessary for growth.

### GENERAL KNOWLEDGE

181. The first Indian to receive the Megasaysay award was

- (a) Dr. M.C. Modi (b) Vinoba Bhave  
(c) Rabindra Nath Tagore  
(d) Swami Vivekanand.

182. The first Indian woman to win an Olympic medal is

- (a) Karnam Malleswari (b) P.T. Usha  
(c) Ashwani Nachppa (d) None of these

183. How many years did Nehru spend in jails ?

- (a) fifteen (b) nine  
(c) ten (d) five

184. Where is the Louvre Museum ?

- (a) Paris (b) India  
(c) New York (d) China

185. What does a bibliophile collect ?

- (a) coins (b) stamps  
(c) books (d) pens

186. The only category in which either an Indian or a person of Indian origin has not got a Nobel prize is

- (a) medicine (b) chemistry  
(c) physics (d) literature

187. Which of the following is not been crowned as Miss World

- (a) Diana Hayden (b) Ashwarya Rai  
(c) Yukta Mukhi (d) Sushmita Sen

188. 'Alpha and Omega' means

- (a) come and go  
(b) the beginning and the end  
(c) to win and to lose  
(d) none of these

189. Gopichand and Aparna Popat play

- (a) tennis (b) badminton  
(c) chess (d) Table Tennis

190. The common name of iron oxide is

- (a) magnetite (b) haematite  
(c) rust (d) smut

191. One megawatt is equal to

- (a) 1,000,000 watts (b) 1000,000 watts  
(c) 1,000,000,000 watts (d) 1000 watts

192. The instrument of music in which Ustad Amjad Ali Khan has distinguished himself is

- (a) sarod (b) violin  
(c) sitar (d) shehnai

193. The longest railway platform in the world is in

- (a) India (b) United States  
(c) Italy (d) Australia

194. The date which is considered as the date when India became small pox free was

- (a) June 5, 1998 (b) July 5, 1995  
(c) Dec 1, 1993 (d) Aug 13, 1990

195. The length of the river Indus is the same as

- (a) Mahanadi (b) Brahmaputra  
(c) Kaveri (d) Ganga

196. Which of the following computer viruses is named after cherry and caffeine soft drink popular with programmers ?

- (a) Sircam (b) Code Pink  
(c) Code Red (d) Malis

197. 'Rambola' is the original name of poet

- (a) Tulsi Das (b) Ram Das  
(c) Soordas (d) Kabir

198. Another name for the inherited blood disease thalassaemia ?

- (a) Looley's anaemia (b) Grave's disease  
(c) Haemophilia (d) Dypnoea

199. The most powerful supercomputer ever made in India is

- (a) Param 1000 (b) Java 2000  
(c) Arjun 100 (d) Vaibhav 2C.

200. The writer associated with 'Rally for the valley' (Narmada) is

- (a) Salman Rushdie (b) Naipul  
(c) Arundhati Roy (d) Isbal Perons