Model Test Paper-2

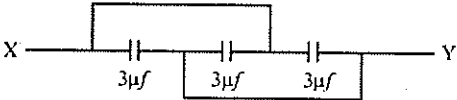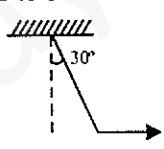*Time :* 3½ *hours.*   *Maximum Marks :* 200

PHYSICS

1. A person wants to see two pillars distant 11 km as separate and distinct. The distance between the pillars must be approximately
   (a) 0.25 m   (b) 3 m
   (c) 1 m   (d) 0.5 m

2. An electromagnetic radiation has an energy 14.4 keV. To which region of electromagnetic spectrum does it belong ?
   (a) *X*-rays region   (b) Visible region
   (c) Infra red region   (d) γ-ray region

3. A circuit element *X* when connected to an a.c. supply of peak voltage 200V gives a peak current of 5*A* which is in phase with the voltage. *A* second circuit element *Y*, when connected by itself with the same supply also gives the same value of the peak current, but the current now lags the voltage by 90°. If a series combination of *X* and *Y* is connected to the same supply, what will be the r.m.s. value of the current ?
   (a) 5 A   (b) $2.5\sqrt{2}$ A
   (c) 2.5 A   (d) $5\sqrt{2}$ A

4. If applied voltage on a motor is 200 volt and back e.m.f. is 160 volt. The efficiency of the motor is
   (a) 50%   (b) 80%
   (c) 100%   (d) 25%

5. The value of relative magnetic permeability (μ_r) for ferromagnetic materials is
   (a) $\mu_r = 1$ (b) $\mu_r \gg 1$
   (c) $\mu_r < 1$ (d) $\mu_r > 1$

6. A circular disc of area $\left(4\hat{i}+5\hat{j}\right) \times 10^{-3}\ m^2$ is placed in a uniform magnetic field of intensity $\left(0.2\hat{i}+0.3\hat{j}\right)$ tesla. The flux crossing the disc will be
   (a) 23×10^{-3} weber   (b) 23×10^{-2} weber
   (c) 23 weber   (d) 23×10^{-4} weber

7. The resistance required to be connected in parallel to an ammeter in order to increase its range 10 times, will be
   (a) Ten times the resistance of ammeter
   (b) Nine times the resistance of ammeter
   (c) One tenth of the resistance of ammeter
   (d) One ninth of the resistance of ammeter

8. The magnetic flux density applied in a cyclotron is 3.5 tesla. The frequency of the electric field that must be applied between the dees in order to accelerate protons, will be
   (a) 5.34×10^7 Hz   (b) 3.55×10^7 Hz
   (c) 6.53×10^7 Hz   (d) None of these

9. The cold junction of a thermocouple is maintained at 10°C. No thermo-e.m.f. is developed when the hot junction is maintined at 530°C. The neutral temperature is
   (a) 540°C   (b) 520°
   (c) 530°C   (d) 270°C

10. If two bulbs of wattage 25 and 100 respectively each rated at 220-volt are connected in series with the supply of 440 volt, then which of the bulbs will fuse ?
    (a) 100 watt bulb   (b) 25 watt bulb
    (c) None of these   (d) Both (a) and (b)

11. A cell of e.m.f 2 volt and internal resistance 1.5 Ω is connected to the ends of 1 m long wire. The resistance of wire is 0.5 Ω/m. The value of potential gradient on the wire will be
    (a) 0.05 V/m   (b) 5 V/m
    (c) 0.5 V/m   (d) 4.005 V/m

12. The resistance of a wire is 10 Ω. Its length is increased by 10% by stretching. The new resistance will now be
(a) 13 Ω (b) 1.2 Ω
(c) 12 Ω (d) 11 Ω

13. The equivalent capacity in the following figure between the points X and Y will be

(a) 1 μf (b) 9 μf
(c) 4.5 μf (d) 6 μf

14. Two small spheres each having the charge $+ Q$ are suspended by insulating threads of length L from a hook. This arrangement is taken in space where there is no gravitational effect, then the angle between the two suspensions and the tension in each thread will be

(a) $180°, \dfrac{1}{4\pi\varepsilon_0} \dfrac{Q^2}{2L^2}$ (b) $90°, \dfrac{1}{4\pi\varepsilon_0} \dfrac{Q^2}{L^2}$

(c) $180°, \dfrac{1}{4\pi\varepsilon_0} \dfrac{Q^2}{(2L)^2}$ (d) $\dfrac{1}{180°}, \dfrac{1}{4\pi\varepsilon_0} \dfrac{Q^2}{L^2}$

15. The electric flux entering and emanating out of a closed surface is 2×10^3 and 8×10^3 volt-meter respectively. The charge enclosed by the closed surface is
(a) 0.53 μC (b) Zero
(c) 1 coulomb (d) 0.053 μC

16. In Meldis experiment the string vibrates in 7 segments under tension of 9 gm-wt. If the string is to be vibrated in 3 segments, the tension required will be
(a) 61 gm-wt (b) 49 gm-wt
(c) 1.4 gm-wt (d) 13 gm-wt

17. The temperature of the filament of a lamp is 2100 K and its surface area is 4×10^{-4} m^2. If the emissivity of the filament is 0.453 then the power of lamp is
(a) 400 watt (b) 200 watt
(c) 100 watt (d) 0 watt

18. Equal volumes of monoatomic and diatomic gases of same initial temperature and pressure are mixed. The ratio of the specific heats of the mixture $\left(\dfrac{C_p}{C_v}\right)$ will be
(a) 1.52 (b) 1.5
(c) 1 (d) 1.53

19. 5 gm air is heated from 4°C to 6°C. If the specific heat of air at constant volume be 0.172 cal/gm-°C, the increase in the internal energy of air will be
(a) 7.2 calorie (b) 17.2 joule
(c) 7.2 erg (d) 1.72 calorie

20. At a certain instant of time the mass of a rocket going up vertically is 100 kg. If it is ejecting 5 kg or gas per second at a speed of 400 m/s, the acceleration of the rocket would be (Taking $g = 10$ m/s^2)
(a) 2 m/s^2 (b) 10 m/s^2
(c) 20 m/s^2 (d) 1 m/s^2

21. If the change in the value of 'g' at a height h above the surface of the earth is the same as at a depth x below its surface then (both x and h being much smaller than the radius of the Earth)
(a) $x = \dfrac{h}{2}$ (b) $x = 2h$
(c) $x = h$ (d) $x = h^2$

22. A constant torque acting on a circular wheel changes its angular momentum from A_0 to $4A_0$ in 4 second. The magnitude of this torque is
(a) 4 A_0 (b) A_0
(c) $\dfrac{3A_0}{4}$ (d) 12 A_0

23. A body of 5 kg moves on a frictionless horizontal surface with a speed 3 m/s. It compresses a spring put along its way and stops. What is the compession in spring ? The force constant of spring = 10 kg wt per metre.
(a) 0.2 m (b) 1 m
(c) 0.68 m (d) None of these.

24. A 12 HP motor has to be operated 8 hour/day. How much will it cost at the rate of 1.50 rupees per kilowatt-hour in 10 days ?
(a) Rs. 950 (b) Rs. 1500
(c) Rs. 1000 (d) Rs. 1074.24

25. A man is at rest in the middle of a pond on perfectly smooth ice. He can get himself to the shore by

making use of Newton's

(a) Third law   (b) Second law

(c) First law   (d) All the laws

26. The mass of a rocket is 10,000 kg. The velocity of the gases escaping from it is 1000 m/s. At what rate should the fuel be burnt so that the rocket may just take off ?

(a) 19.6 kg/minute   (b) 19.06 kg/s

(c) 9.8 kg/s   (d) 98 kg/s

27. A block of mass 2 kg rests on a rough inclined plane making an angle of 30° with the horizontal. The coefficient of static friction between the block and the plane is 0.7. The frictional force on the block is

(a) $9.8 \times \sqrt{3} \, N$ (b) $0.7 \times 9.8 \times \sqrt{3} \, N$

(c) $9.8 \, N$ (d) $0.7 \times 9.8 \, N$

28. Which of the following is an example of motion in three dimensions ?

(a) Motion in a vertical circle

(b) Motion of blades of rotating fan

(c) A vertically falling object

(d) Motion of an electron in the atom

29. A pendulum bob of weight $2N$ is pulled to the right by a horizontal force F until the string makes an angle of 30° to the vertical. What is the force and tension in the string needed to sit at 30°?

(a) 3 newton, 3.5 newton

(b) 4 newton, 3 newton

(c) 2 newton, 1 newton

(d) 1.2 newton, 2.3 newton

30. Dimensions of permeability of a medium are

(a) $[MLT^{-2}A^2]$ (b) $[MLT^{-2}A^{-2}]$

(c) $[ML^{-1}T^2A^{-2}]$ (d) $[ML^{-1}T^{-2}A^{-2}]$

31. What is the number of significant figures in 0.002305×10^{-27} kg ?

(a) 4   (b) 6

(c) 7   (d) 3

32. The maximum number of the photoelectrons released in a photocell is independent of

(a) Intensity of radiations incident on cathode surface

(b) Frequency of the incident ray

(c) Nature of the cathode surface

(d) None of the above

33. A transformer has 50 turns in its primary winding and 25 turns in its secondary winding. If the current in the secondary winding is 4 ampere, what is the current in primary winding ?

(a) 3 amp   (b) 2 amp

(c) 1 amp   (d) 4 amp

34. Calculate the resonant frequency of a circuit consisting of an inductor of 0.2 mH and a capacitor of 2µF capacitance

(a) 10112 Hz   (b) 9000 Hz

(c) 7962 Hz   (d) 5550 Hz

35. A circuit having a resistor, an inductor and a capacitor in series is connected to a 150 V A.C. mains. For the circuit $R = 9$ ohm, $X_L = 28$ ohm and $X_c = 16$ ohm. Calculate the current in the circuit

(a) 20 amp   (b) 15 amp

(c) 10 amp   (d) 7.5 amp

36. The armature current in D.C. motor is maximum when the motor has

(a) Intermediate speed

(b) Just started

(c) Picked up maximum speed

(d) Just been switched off

37. Iron is ferromagnetic

(a) More than 770°C

(b) At normal temperature

(c) At all temperatures

(d) Below 770°C

38. The magnetic moment of a magnet (10 cm × 2 cm × 1 cm) is 1 amp × m². What is the intensity of magnetisation ?

(a) 540 amp/m   (b) 4×10^5 amp/m

(c) 45 amp/m   (d) 5×10^4 amp/m

39. A long straight wire carries a current of 4 amp. A proton travels with a velocity of 4×10^4 m/s parallel to the wire 0.2 m from it and in a direction opposite to the current. What is the force on which the magnetic field of current exerts on the moving proton ?

(a) 2.56×10^{-20} newton

(b) 5.62×10^{-20} newton

(c) 6.52×10^{-20} newton

(d) 2.56×10^{-20} dyne

40. Which of the following planets is called the goddess of beauty ?

(a) Mars   (b) Mercury

(c) Venus   (d) Jupiter

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 falses

41. *Assertion (A) :* A pulsar is a source of radiowaves that vary in intensity at regular intervals.
Reason (R) : A pulsar is a rotating neutron star.

42. *Assertion (A) :* For a given mass of an ideal gas, at constant temperature the product of the pressure and volume is constant.
Reason (R) : The mean square velocity of the molecules is inversely proportional to their masses at constant temperature.

43. *Assertion (A) :* γ for a diatomic gas is more than for a monoatomic gas.
Reason (R) : The molecules of a monoatomic gas have more degrees of freedom than those of a diatomic gas.

44. *Assertion (A) :* Radio waves can be polarised.
Reason (R) : Sound waves are longitudinal waves.

45. *Assertion (A) :* In series LCR circuit, reasonance occurs when inductive reactance is equal to capacitive reactance.
Reason (R) : At resonance the impedance of the circuit is minimum and is purely resistive.

46. *Assertion (A) :* If a pendulum falls freely, then its time period becomes infinite.
Reason (R) : Free falling body has acceleration equal to g.

47. *Assertion (A) :* Sound waves can not propagate through vaccuum but light waves can.
Reason (R) : Sound waves can not be polarised but light waves can be.

48. *Assertion (A) :* The frequencies of incident, reflected and refracted beam of monochromatic light incident from one medium to another medium are same.
Reason (R) : The incident, reflected and refracted rays are coplanar.

49. *Assertion (A) :* Machine parts are jammed in winter.
Reason (R) : The viscosity of lubricant used in machine parts increases at low temperatures.

50. *Assertion (A) :* The comets do not obey Kepler's laws of planetary motion.
Reason (R) : The comets do not have elliptical orbits.

51. *Assertion (A) :* Lightening conductors are made pointed at the end.
Reason (R) : An oppositely charged electric wind starts from the pointed end.

52. *Assertion (A) :* The internal resistance of a cell depends on the concentration of the electrolyte used in the cell
Reason (R) : Dilution increases the ionisation of the electrolyte.

53. *Assertion (A) :* For a given mass of an ideal gas, the product of the pressure and volume is constant, at constant temperature.
Reason (R) : The root-mean-square speed of the molecules is inversely proportional to the square root of their mass.

54. *Assertion (A) :* The ratio of C_p/C_v for a diatomic gas is more than that for a monoatomic gas.
Reason (R) : The molecules of a monoatomic gas have more degrees of freedom than those of a diatomic gas.

55. *Assertion (A) :* Newton's corpuscular theory of light could not explain refraction of light.

Reason (R) : It predicted that light should travel faster in denser media than in rarer media.

56. *Assertion (A)* : When temperature of a semi-conductor is increased, then its resistance decreases.
Reason (R) : The energy gap between conduction band and valence band is very small.

57. *Assertion (A)* : Electric appliances with metallic body have three connections, whereas an electric bulb has a two pin connection.
Reason (R) : Three pin connections reduce heating of connecting wires.

58. *Assertion (A)* : Environmental damage has increased the amount of ozone in the atmosphere.
Reason (R) : Increase of ozone increases the amount of ultra violet radiation on earth.

59. *Assertion (A)* : The ratio of $\dfrac{C_p}{C_v}$ is more for helium than for hydrogen gas.
Reason (R) : Atomic mass of helium is more than that of hydrogen.

60. *Assertion (A)* : A number of T.V. programmes can be simultaneously transmitted through water by means of laser.
Reason (R) : Laser beam is not absorbed by water.

CHEMISTRY

61. For a dilute solution, Raoult's law states that
(a) The relative lowering of vapour pressure is proportional to the amount of solute in solution
(b) The relative lowering of vapour pressure is equal to the mole fraction of solute
(c) The lowering of vapour pressure is equal to the mole fraction of the solute
(d) The vapour pressure of the solution is equal to the mole fraction of the solvent

62. The formula of metallic hydroxide (eq. wt = 150) is $M(OH)_2 . xH_2O$. If the atomic wt. of metal is 176 then the value of x will be
(a) 3   (b) 5
(c) 2   (d) 6

63. Why are strong acids generally used as standard solutions in acid-base titrations ?
(a) Strong acids form more stable solutions than weak acids
(b) They can be used to titrate both strong and weak bases

(c) The pH of the equivalence point will always be 7
(d) The salts of the strong acids do not hydrolyse

64. For which of the following reactions $k_p = k_c$?
(a) $H_{2(g)} + Cl_{2(g)} \rightleftharpoons 2HCl_{(g)}$
(b) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$
(c) $2NOCl_{(g)} \rightleftharpoons 2NO_{(g)} + Cl_{2(g)}$
(d) $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$

65. The hydrogen ion concentration in weak acid of dissociation constant k_a and concentration C its nearly equal to
(a) $K_a C$ (b) $\dfrac{C}{K_a}$
(c) $\sqrt{\dfrac{K_a}{C}}$ (d) $\sqrt{K_a C}$

66. Diazonium salt decomposes as
$C_6H_5N_2^+Cl^- \rightarrow C_6H_5Cl + N_2$
At 0°C, the evolution of N_2 becomes two times faster when the initial concentration of the salt is doubled. Therefore, it is a
(a) First order reaction with molecularity two
(b) Second order reaction
(c) First order reaction
(d) Second order reaction with molecularity one

67. Milk is an example of
(a) Gel   (b) Emulsion
(c) Pure solution   (d) Suspension

68. If a chemical change is brought about by one or more methods, in one or more steps, then the amount of heat evolved or absorbed during complete change is the same, whichever method was followed. This rule is known as
(a) Joule Thomson effect
(b) Hess law
(c) Le Chatelier principle
(d) None of these

69. Out of Cu, Ag, Fe and Zn, the metal which can displace all other from their salt solutions is
(a) Zn   (b) Cu
(c) Ag   (d) Fe

70. Hydrogen oxygen fuel cells are used in space craft to supply
    (a) Oxygen
    (b) Power for pressure
    (c) Power for heat and light
    (d) Water

71. Ge(II) compounds are powerful reducing agents, whereas Pb(IV) compounds are strong oxidants. It can be due to
    (a) The ionic radii of Pb^{2+} and Pb^{4+} are larger than those of Ge^{2+} and Ge^{4+}
    (b) The ionisation potential of lead is less than that of germanium
    (c) Lead is moe electropositive than germanium
    (d) More pronounced inert pair effect in lead than in germanium

72. Glass reacts with
    (a) HNO_3
    (b) HF
    (c) Olium
    (d) $K_2Cr_2O_7$

73. Anhydrous $AlCl_3$ is prepared from
    (a) Dry HCl gas + Heated Al metal
    (b) Aluminium and Cl_2
    (c) Conc. HCl and Al metal
    (d) Dil. HCl and aluminium metal

74. In diborane, banana bond is formed between
    (a) 2 electrons, 2 atoms
    (b) 2 electrons, 1 atom
    (c) 2 electrons, 3 atom
    (d) 1 electron, 2 atoms

75. Lithopone is a combination of ZnS and
    (a) $SrSO_4$ (b) $CaSO_4$
    (c) $PbSO_4$ (d) $BaSO_4$

76. Microcosmic salt is
    (a) $(NH_4)_2 HPO_4.2H_2O$
    (b) $Na(NH_4)HPO_4.4H_2O$
    (c) $Na_2HPO_4.2H_2O$
    (d) None of the above

77. Which of the following statements is false for alkali metals ?
    (a) Li^+ ion is exceptionally small
    (b) Sodium is amphoteric in nature
    (c) Lithium is strongest reducing agent
    (d) All alkali metals give blue solution in liquid ammonia

78. Mac Arthur process is used for
    (a) Cl   (b) Fe
    (c) Ag   (d) O_2

79. Fenton reagent is
    (a) $CuSO_4 + NaOH$ (b) $AgNO_3 + NH_4 OH$
    (c) $SnCl_2 + HCl$ (d) $FeSO_4 + H_2O_2$

80. D_2O is used more in
    (a) Pharmaceutical preparations
    (b) Nuclear reactor
    (c) Chemical industry
    (d) Insecticide preparation

81. Arrange the elements in increasing order of atomic radius Na, Rb, K, Mg
    (a) Mg, Na, K Rb   (b) Na, K, Mg, Rb
    (c) Na, K, Mg, Rb   (d) Rb, K, Mg, Na

82. Which of the following is paramagnetic ?
    (a) Cu^+ (b) Ni^{2+}
    (c) Zn^{2+} (d) None of these.

83. Which of the following elements will have the lowest first ionisation energy ?
    (a) Li   (b) Rb
    (c) Mg   (d) Ca

84. An element with atomic number 20 will be placed in which period of periodic table ?
    (a) 2   (b) 3
    (c) 4   (d) 1

85. In modern periodic table, elements are arranged in
    (a) Increasing atomic number
    (b) Increasing volume
    (c) Increasing mass
    (d) Alphabetically

86. Anline when treated with HNO_2 and HCl at 0°C gives
    (a) A diazo compound
    (b) Nitro benzene
    (c) Phenol
    (d) None of these.

87. Oxalic acid may be distinguished from tartaric acid by
    (a) Litmus paper
    (b) Ammoniacal silver nitrate solution
    (c) Sodium bicarbonate solution
    (d) Phenolphthalein

88. The weakest acid among the following is
    (a) $CH_2ClCOOH$ (b) CH_3COOH
    (c) $CHCl_2COOH$ (d) CCl_3COOH

89. Which compound undergoes aldol condensation?
    (a) Ethyl methyl ketone
    (b) Phenyl acetaldehyde
    (c) Acetaldehyde
    (d) All of these

90. Phenol condenses with phthalic anhydride in presence of conc. H_2SO_4 to form
    (a) Phenyl red   (b) Phenolphthalein
    (c) Methyl orange   (d) Salicylic acid

91. A gas X at 1 atm is bubbled through a solution containing $1MY^-$ and $1MZ^-$ ions at 25°C. If reduction potential of $Z > Y > X$ then
    (a) Y will oxidise both X and Z
    (b) Y will oxidise Z and not X
    (c) Y will oxidise X and not Z
    (d) Y will reduce both X and Z

92. In an electroplating experiment m gram of silver is deposited when 4 amp current flows for 2 minutes. The amount (in grams) of silver deposited by 6 amp of current flowing for 40 sec will be
    (a) $\dfrac{m}{4}$ (b) $\dfrac{m}{2}$
    (c) $4m$ (d) $2m$

93. Identify the intensive quantity from the following
    (a) Enthalpy and volume
    (b) Volume and temperature
    (c) Enthalpy and temperature
    (d) Temperature and refractive index

94. The extra stability of lyophilic colloid is due to
    (a) The smaller size of their particles
    (b) A layer of medium of dispersion on their particles
    (c) Charge on their particles
    (d) The large size of their particles

95. The inversion of cane-sugar is represented by
    $C_{12}H_{22}O_{11} + H_2O \rightarrow C_6H_{12}O_6 + C_6H_{12}O_6$
    It is a reaction of
    (a) Pseudo unimolecular
    (b) Unimolecular   (c) Second order
    (d) None of these

96. The concentration of $[H^+]$ and concentration of $[OH^-]$ of 0.1 M aqueous solution of 2% ionised weak acid is (K_w for water $= 1 \times 10^{-14}$)
    (a) 2×10^{-3} M and 5×10^{-12} M
    (b) 1×10^{-3} M and 5×10^{-12} M
    (c) 0.02×10^{-2} M and 5×10^{-11} M
    (d) 3×10^{-12} M and 4×10^{-13} M

97. In which of the following case, does the reaction go farthest to completion ?
    (a) $K = 10$ (b) $K = 10^{-2}$
    (c) $K = 10^2$ (d) $K = 1$

98. 10 ml of conc. H_2SO_4 (18M) is diluted to one litre. The approx. strength of dilute acid could be
    (a) 0.09 N   (b) 0.36 N
    (c) 0.18 N   (d) 18.0 N

99. The hydrogen phosphate of certain metal has formula $MHPO_4$. The formula of metal chloride would be
    (a) M_2Cl_2 (b) MCl_2
    (c) MCl (d) MCl_3

100. Normality of 2M H_2SO_4 is
    (a) $\dfrac{N}{2}$ (b) 4N
    (c) 2N   (d) $\dfrac{N}{4}$

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 falses

101. *Assertion (A) :* Pure water obtained from different sources such as, river, well, spring, sea etc. always contains hydrogen and oxygen combined in the ratio 1 : 8 by mass.
    Reason (R) : A chemical compound always contain elements combined together in same proportion

by mass, it was discovered by French chemist, Joseph Proust (1799).

102. *Assertion (A)* : In CO molecule 12 parts by mass of carbon combine with 16 parts by mass of oxygen and in CO_2, 12 parts by mass of carbon combine with 32 parts by mass of oxygen.
Reason (R) : When two elements combine separately with a fixed mass of a third element, then the ratio of their masses in which they do so is either the same or whole number multiple of the ratio in which they combine with each other.

103. *Assertion (A)* : The ratio by volume of gaseous reactants and products is in agreement with their molar ratio.
Reason (R) : Volume of a gas is inversely proportional to the number of moles of a gas.

104. *Assertion (A)* : Enthalpy of graphite is lower than that of diamond.
Reason (R) : Entropy of graphite is greater than that of diamond.

105. *Assertion (A)* : For the combustion reactions, the value of ΔH is always negative.
Reason (R) : the combustion reactions are always endothermic.

106. *Assertion (A)* : The value of enthalpy of neutralisation of weak acid by strong base is numerically less than 57.1 kJ.
Reason (R) : All OH^- ions of strong base are not completely neutralised by H^+ ions obtained from acid.

107. *Assertion (A)* : Copper liberates hydrogen from the solution of dilute hydrochloric acid.
Reason (R) : Hydrogen is below copper in the electrochemical series.

108. *Assertion (A)* : The dehydration of alcohols by conc H_2SO_4 involves the formation of intermediate carbocation.
Reason (R) : The protonated alcohol molecule loses water molecule in the second step.

109. *Assertion (A)* : Acetylene on reacting with sodamide gives sodium acetylide and ammonia.
Reason (R) : Sp hybridised carbon atoms of acetylene are considerably electro-negative.

110. *Assertion (A)* : Chlorine and sulphur dioxide are both bleaching agents.
Reason (R) : Both are reducing agents.

111. *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.

112. *Assertion (A)* : Alkanes can have an infinite number of conformations.
Reason (R) : In configurational isomerism, the isomers are distinct individual substances.

113. *Assertion (A)* : As a salt such as NaCl dissolves, the Na^+ and Cl^- ions leaving the crystal lattice acquire far greater freedom.
Reason (R) : In thermodynamic terms, the formation of solution occurs with a favourable change in free energy *i.e.* ΔH has a high positive value and $T\Delta S$ a low negative value.

114. *Assertion (A)* : Water is specially effective in screening the electrostatic interactions between the dissolved ions.
Reason (R) : The force of ionic interactions depends upon the dielectric constant (e) of the solvent.

115. *Assertion (A)* : When two uncharged similar atoms are brought very close together, their surrounding electron clouds influence each other, and a force of attraction is built up between them.
Reason (R) : The random variation in the positions of electrons around one nucleus may create a transient electric dipole, which induces a transient opposite electric dipole in the nearby atom.

116. *Assertion (A)* : The equilibrium constant is fixed and a charascteristic for any given chemical reaction at a specified temperature.
Reason (R) : The composition of the final equilibrium mixture at a particular temperature depends upon the starting amount of reactants.

117. *Assertion (A)* : The degree of ionization of water is small at 25° C, only about one of every 10^7 molecules in pure water is ionized at any instant.
Reason (R) : In pure water at 25° C, the molar concentration of water is essentially constant.

118. *Assertion (A)* : The p^{ka} of a weak acid becomes equal to pH of the solution at the midpoint of of its titration.
Reason (R) : The molar concentrations of proton acceptor and proton donor become equal at the midpoint of titration of a weak acid.

119. *Assertion (A)* : Maleic and fumeric acids are well defined compounds. These two compound are stereo isomers but not enantiomers.
Reason (R) : Maleic and fumeric acids have same molecular formula but they are not mirror images of each other.

120. *Assertion (A)* : The nearly tetrahedral arrangement of the orbitals about the oxygen atom allows each water molecule to form hydrogen bonds with as many as four neighbouring water molecules.
Reason (R) : In ice each water molecule forms four hydrogen bonds as molecule is fixed in the space.

BIOLOGY

121. Group of related species with the potential, directly or indirectly, of forming fertile hybrids with one another, is called
(a) sibling species   (b) subspecies
(c) coenospecies   (d) none of these

122. The generalization that the evolution does not proceed back along its own path, or repeat routes is known as
(a) Cope's law   (b) Allen's law
(c) Dollo's law   (d) Gloger's law

123. Which of these is present only in the inert extracellular stage of the life cycle of virus ?
(a) ribosomes   (b) proteins
(c) capsid   (d) all of these

124. Erythropoietin hormone that stimulates red blood cell production is
(a) gamma-globulin   (b) beta-globulin
(c) alpha-globulin   (d) none of these

125. The term infusoria is applied to
(a) bacteria   (b) protozoa
(c) rotifers   (d) all of these

126. Salmon fish is
(a) anadromous   (b) catadromous
(c) both (a) and (b)   (d) none of these

127. In obese persons, the adipose (fat) tissues are present beneath the skin in
(a) hypodermis   (b) dermis
(c) epidermis   (d) all of these

128. Order salientia of phylum amphibia includes
(a) frogs   (b) toads
(c) salamanders   (d) both (a) and (b)

129. Platelets are derived from
(a) lymphoblast   (b) monoblast
(c) myeloblast   (d) megakaryoblast

130. ATP synthetase complex is found in inner mitochondrial membrane, and has two major cofactors, these are
(a) F_1 and F_2 (b) T_s and T_n
(c) F_1 and F_0 (d) R_1 and R_2

131. Fine branching protein fibres forming an extracellular network in many vertebrate connective tissues and holding tissues and organs together is called
(a) white elastic fibres
(b) yellow elastic fibres
(c) reticulin fibres   (d) none of these

132. Which of the following is cobalt and nucleotide containing vitamin ?
(a) thiamine   (b) cyanocobalamine
(c) ascorbic acid   (d) none of these

133. Gerdy's fibres are
(a) ligament of neck   (b) ligament of ankles
(c) ligament of palm   (d) ligament of face

134. Gerlach's valve is present
(a) between right auricle and right ventricle
(b) between aorta and left ventricle
(c) between appendix and caecum
(d) none of these

135. Which of the following is iron storing protein ?
(a) ferritin   (b) gamma-globulin
(c) alpha-globulin   (d) albumins

136. Which of these first enter lacteals of the villi and then pass into blood vessels in the shoulder area?
(a) glucose   (b) vitamin C
(c) amino acids   (d) cholesterol

137. Which of the following enzyme is secreted by infants but not by adults ?
(a) rennin   (b) pepsinogen
(c) lipase   (d) trypsin

138. Which of the following is characterized by an extremely under-weight condition by limiting food consumption ?
    (a) amenorrhea   (b) bulimina
    (c) anorexia nervosa   (d) none of these

139. The rare disease progeria is associated with
    (a) osteoporosis   (b) leukoplakia
    (c) premature old age (d) osteoarthritis

140. Synovial fluid is found in
    (a) intercellular spaces
    (b) around the brain
    (c) freely movable joints
    (d) internal ear

141. Pashmina wool is obtained from
    (a) rabbit   (b) goat
    (c) sheep   (d) deer

142. Desmosomes are related with
    (a) cell division   (b) cell excretion
    (c) cell adherence   (d) cytolysis

143. Action potential on outer surface of plasma membrane is
    (a) variable   (b) neutral
    (c) positive   (d) negative

144. Which of the following does not produce any digestive enzyme ?
    (a) pancreas   (b) gastric mucosa
    (c) mouth   (d) liver

145. Regulator of Basal Metabolic Rate (BMR) is
    (a) thyroid hormones
    (b) sympathetic nervous system
    (c) parasympathetic nervous system
    (d) adrenaline

146. Which of the following is a living fossil ?
    (a) *Sphenondon*   (b) *Latimaria*
    (c) *Heloderma*   (d) both (a) and (b)

147. Cleistogamy is found in
    (a) *Commelina*   (b) *Ficus*
    (c) *Vallisneria*   (d) all of these

148. Restriction enzymes are used in genetic engineering because
    (a) they can cut DNA at specific base sequence
    (b) they can join different DNA fragments
    (c) they are nuclease that cut DNA at variable sites
    (d) they are proteolytic enzymes which can degrade harmful proteins

149. Which of the following cell organelles is considered to be rich in hydrolytic enzymes ?
    (a) ribosomes   (b) ER
    (c) lysosomes   (d) chloroplast

150. Xanthophyll is chiefly responsible for
    (a) yellow colour   (b) green colour
    (c) red colour   (d) no colour

151. The green mould is commonly called
    (a) *Penicillium*   (b) *Polysiphonia*
    (c) *Aspergillus*   (d) *Spirogyra*

152. Detritus food chain accounts for more energy flow than grazing food chain because
    (a) no organism dies
    (b) most organisms die after having been eaten
    (c) most organisms die without having been eaten
    (d) all of the above are correct

153. The thermal algae can survive in a hot water spring at
    (a) 40°C   (b) 70°C
    (c) 60°C   (d) 15°C

154. Endodermal cells can be distinguished by the presence of
    (a) elongated cells
    (b) barrel shaped cells
    (c) thin-walled cells
    (d) cambial cells

155. Abscisic acid causes
    (a) retardation of growth
    (b) faster leaf fall
    (c) dormancy of tubers
    (d) all of the above

156. The first case of polyembryony was reported in certain
    (a) grape seed   (b) orange seed
    (c) pulse seed   (d) mango seed

157. The free energy change ΔG from the conversion of one molecule of glucose to 6 molecules of CO_2 is -686 k cal/mol, yet only about 266 k cal/mol of this is captured within ATP molecules. The rest is
    (a) transferred to H_2O molecules
    (b) converted to heat
    (c) used to form lactate
    (d) reutilized in the ATP formation

158. Which of the following plant's roots are medicinal and leaves, flowers and fruits are eaten as vegetables?
    (a) *Aleuritis fordii*
    (b) *Holostemma adakodien*
    (c) *Helianthus annuus*
    (d) all of the above

159. Hydrogen cyanide binds to the active site of an enzyme that is part of the pathway that forms ATP in the cells, in this way, it prevents the enzyme activity. Therefore, hydrogen cyanide can best be described as
    (a) coenzyme
    (b) cofactor
    (c) allosteric modulator
    (d) competitive inhibitor

160. Which gene sanctuary has been created for an insectivorous plant ?
    (a) Kumbhalgarh sanctuary
    (b) Bori sanctuary
    (b) Nepenthes sanctuary
    (c) all of the above

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 falses*

161. *Assertion (A) :* Xylem is made of four types of cells.
    Reason (R) : This type of composition of the xylem is extremely clear in hydrophytes.

162. *Assertion (A) : Raphanobrassica* is the cross between *Raphanus* and *Brassica*.
    Reason (R) : It is allopolyploid.

163. *Assertion (A) :* Auxins were the first growth hormones discovered in plants.
    Reason (R) : In most of plants tip movement in seedling stage led to the discovery of auxins.

164. *Assertion (A) :* The frequency of polyploidy is higher in plants than in animals.
    Reason (R) : Polyploidy is useful in the natural selection of new species of plants.

165. *Assertion (A) :* Housewives keep cut potatoes pieces submerged in water if not required for immediate use for cooking.
    Reason (R) : This helps in softening the potato pieces.

166. *Assertion (A) :* More elastic fibres are found in artery walls than vein walls.
    Reason (R) : Elastic fibres are absent from tendons.

167. *Assertion (A) :* The maximum change of potential difference across the membrane during an action potential is 110V approx.
    Reason (R) : Action potential is self propagating.

168. *Assertion (A) :* A man's urine turned green when treated with ferric chloride.
    Reason (R) : He is suffering from diabetes.

169. *Assertion (A) :* A woman is capable of sueing a man for refusing to own this child whose blood group is O. The blood group of woman is A and man is B.
    Reason (R) : Genetically she is right he can be father of the child.

170. *Assertion (A) :* In coronary heart disease, there is impairment of heart muscles.
    Reason (R) : Coronary heart disease is due to reduced blood supply.

171. *Assertion (A) : Fasciola hepatica* is hermaphrodite.
    Reason (R) : The gonads are well developed

and the male and female genital ducts open into a common chamber, the genital atium.

172. *Assertion (A)* : In mitotic division, most of the ordered sequence of phases takes place during interphase.

Reason (R) : Synthesis of m RNA, t RNA and ribosomes occurs during G_1-phase and replication of DNA occurs in S-phase.

173. *Assertion (A)* : Role of erythrocytes in CO_2 transport is primary to form HCO_3^- ions for carriage in the plasma and reconvert them back to CO_2.

Reason (R) : About 42% of CO_2 carried in human blood is in the form of erythrocytic carbamino-haemoglobin; which breaks down in the lungs to release oxygen again.

174. *Assertion (A)* : The chewing and lapping mouthparts consist of a long tongue which is formed from the glossae of the labium.

Reason (R) : The galeae are much elongated and coiled, each forming a half tube, which makes complete tube when both are locked together.

175. *Assertion (A)* : When a foreign object, such as a sand grain gets in between the shell and mantle, it results in the formation of a pearl.

Reason (R) : The inner nacreous layer of iridiscent nacre is called the 'mother of pearl' which is formed of many thin and alternating layers of calcium carbonate and concholin.

176. *Assertion (A)* : *Neurospora* is an ideal material for genetical and biochemical studies.

Reason (R) : Because of its suitability in the studies of heredity and genetic material contained within it.

177. *Assertion (A)* : Heterosis is defined as superiority of F_1 hybrid of two genetically dissimilar parents.

Reason (R) : Heterosis can be measured in terms of growth rate, size and yield.

178. *Assertion (A)* : Left-handed DNA is known as B-DNA.

Reason (R) : Right-handed DNA is known as Z-DNA.

179. *Assertion (A)* : Rhizoidal aggregates have been observed at distinct sites on curled root hairs.

Reason (R) : The infection thread is formed b a process of invagination of the hair cell walls ; the region of curling.

180. *Assertion (A)* : Mendelian recombinations are due to crossing over.

Reason (R) : Crossing over bring about exchange of genes through chiasmata formation.

GENERAL KNOWLEDGE

181. Which 13th Century Indian poet and disciple of Sufi Saint Hazrat Nizamuddin Aulia is buried next to his mentor in Delhi?
(a) Amir Khusro   (b) Salim Shah Chishti
(c) Moin-ud-din chishti
(d) Kublia Khan

182. Men's team final of the NTPC Commonwealth Table Tennis Championship, held during April 2001 in New Delhi, was won by
(a) England   (b) Singapore
(c) Nigeria   (d) India

183. Which one of the following liquid gases is used as a fuel for a cryogenic engine?
(a) liquid oxygen   (b) liquid hydrogen
(c) liquid nitrogen   (d) liquid chlorine

184. Who among the following is a Bharatnatyam dancer?
(a) Kaushalya Reddy   (b) Navtej Singh Johar
(c) Sunil Mehra   (d) Rajeev Lochan

185. Which of the following is not one of the three basic instruments carried by NASA's Mars mission—2001 : *A Space Odyssey*?
(a) MARIE   (b) GRS
(c) THEMIS   (d) DANICS

186. Osteoporosis is a disease that affects
(a) heart   (b) lungs
(c) bones   (d) kidneys

187. Which of the following is not a mascot for the 2002 Football World Cup?
(a) Ato   (b) Nik
(c) Kaz   (d) Mik

188. 'Darshak', which was in the news during April 2001, is a/an
   (a) indigenously-built hydrographic survey ship commissioned into the Indian Navy
   (b) indigenously-built submarine commissioned into the Indian Navy
   (c) indigenously-built missile frigate commissioned into the Indian Navy
   (d) none of these

189. Majuli, the world's largest riverine island, is surrounded by waters of the river
   (a) Amazon   (b) Ganga
   (c) Brahmaputra (d) Nile

190. Who among the following is the recipient of Saraswati Samman for the Year 2000 for his novel *Amruta Phala*?
   (a) Dr. Indira Parthasarathy
   (b) Manoj Das   (c) Shri Ramakant Rath
   (d) Subir Das

191. Most of the Ajanta paintings were completed during the rule of the
   (a) Vardhanas   (b) Sakas
   (c) Satvahanas   (d) Guptas

192. Budhism in Nepal was introduced in the reign of
   (a) Samudragupta (b) Ashoka
   (c) Chandragupta (d) Harsha

193. Which region of India receives rainfall due to western disturbance in winter?
   (a) western region   (b) central region
   (c) eastern region
   (d) north-western region

194. Which bank in India first introduced the Credit Card system?
   (a) Andhra Bank (b) Central Bank
   (c) Canara Bank (d) State Bank of India

195. The Association of South East Asian Nations (ASEAN) has its headquarters at
   (a) Manila   (b) Jakarta
   (c) Kuala Lumpur (d) Bangkok

196. Certain bacteria living in human digestive system are beneficial because they synthesize vitamin
   (a) D   (b) B-Complex
   (c) K   (d) A

197. Who among the following was recently crowned Miss Universe 2001
   (a) Miss Greece   (b) Miss U.S.A.
   (c) Miss Puerto Rico (d) Miss India

198. The Oscar Award for the Best Film for 2001 has been given to
   (a) Crouching Tiger, Hidden Dragon
   (b) American Beauty
   (c) Gladiator
   (d) Shakespeare in Love

199. Carnivorous animals are those that live on
   (a) gram and grains of different types
   (b) grass   (c) human flesh
   (d) animal flash

200. *Nag* is the name of the indigenously developed
   (a) medium range missile
   (b) anti-tank missile
   (c) torpedo
   (d) submarine