SOLVED PAPER
AIIMS - 2008

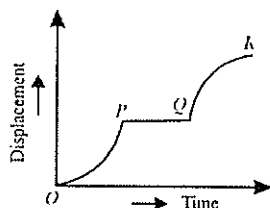Time : 3½ Hours   Max. Marks : 200

PHYSICS

1. In an electrical circuit containing L, C and R which of the following does not denote the dimensions of frequency?

   (a) LC

   (b) $\dfrac{1}{\sqrt{LC}}$

   (c) $\dfrac{1}{RC}$

   (d) $\dfrac{R}{L}$

2. The displacement time graph of a particle moving along a straight line is drawn below.

   The accelerations of the particle during the regions OP, PQ and QR are

	OP	PQ	QR
(a)	–	0	+
(b)	+	0	+
(c)	+	0	–
(d)	–	0	–

3. A particle of mass m moves with constant speed along a circular path of radius r under the action of force F. Its speed is

   (a) $\sqrt{\dfrac{Fr}{m}}$

   (b) $\sqrt{\dfrac{F}{r}}$

   (c) $\sqrt{Fmr}$

   (d) $\sqrt{\dfrac{F}{mr}}$

4. A bullet is fired from a rifle and the rifle recoils. Kinetic energy of rifle is
   (a) less than K.E. of bullet
   (b) greater than K.E. of bullet
   (c) equal to K.E. of bullet
   (d) none of the above

5. Side of an equilateral triangle is l. Three point masses, each of magnitude m, are placed at the three vertices of the triangle. Moment of inertia of this system about one side of the triangle as axis is given by

   (a) $\dfrac{3ml^2}{4}$

   (b) $\dfrac{4}{3}ml^2$

   (c) $\dfrac{3}{2}ml^2$

   (d) $\dfrac{2}{3}ml^2$

6. P, Q and R are three coplanar forces acting at a point and are in equilibium. Given $P = 1.9318$ kg wt $[\sin\theta_1 = 0.9659]$, the value of R (in kg wt) is

   (a) 0.9659
   (b) 2
   (c) 1
   (d) 1/2.
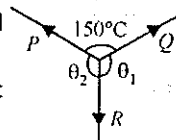
7. Suppose the gravitational force varies inversely as the nth power of distance. Then the time period of a planet in circular orbit of radius R around the sun will be proportional to
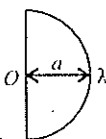
   (a) $R^{\left(\frac{n+1}{2}\right)}$

   (b) $R^{\left(\frac{n-1}{2}\right)}$

   (c) R^n

   (d) $R^{\left(\frac{n-2}{2}\right)}$

8. A Ge specimen is doped with Al. The concentration of acceptor atoms is $\sim 10^{21}$ atoms/m^3. Given that the intrinsic concentration of electron hole pairs is 10^{19}/m^3, the concentration of electrons in the specimen is
   (a) 10^{17}/m^3
   (b) 10^{15}/m^3
   (c) 10^4/m^3
   (d) 10^2/m^3.

9. A slab consists of two layers of different materials of the same thickness and having thermal conductivities K_1 and K_2 are connected in series.
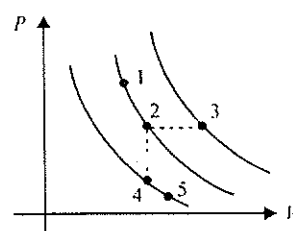
The equivalent thermal conductivity of the slab is

(a) $\dfrac{2K_1K_2}{K_1+K_2}$ (b) $\sqrt{K_1K_2}$

(c) $\dfrac{K_1K_2}{K_1+K_2}$ (d) K_1+K_2.

10. In Young's double slit experiment, the distance between two slits is made three times then the fringe width will become
   (a) 9 times   (b) 1/9 times
   (c) 3 times   (d) 1/3 times.

11. A laser beam is used for carrying out surgery because, it
   (a) is highly monochromatic
   (b) is highly coherent
   (c) is highly directional
   (d) can be sharply focussed.

12. A converging lens forms a real image I of an object on its principal axis. A rectangular slab of refractive index μ and thickness x is introduced between I and the lens, I will move
   (a) towards the lens $(\mu-1)x$
   (b) towards the lens by $\left(1-\dfrac{1}{\mu}\right)x$
   (c) away from the lens by $(\mu-1)x$
   (d) away from the lens by $\left(1-\dfrac{1}{\mu}\right)x$.

13. The velocity of electromagnetic radiation in a medium of permittivity ε_0 and permeability μ_0 is given by
   (a) $\dfrac{1}{\sqrt{\mu_0\varepsilon_0}}$ (b) $\sqrt{\dfrac{\mu_0}{\varepsilon_0}}$

   (c) $\sqrt{\dfrac{\varepsilon_0}{\mu_0}}$ (d) $\sqrt{\mu_0\varepsilon_0}$

14. Electric field at centre of a uniformly charged semicircle of radius a is

   (a) $\dfrac{\lambda}{2\pi\varepsilon_0 a^2}$ (b) $\dfrac{\lambda}{4\pi^2\varepsilon_0 a^2}$

   (c) $\dfrac{\lambda^2}{2\pi\varepsilon_0 a}$ (d) $\dfrac{\lambda}{2\pi\varepsilon_0 a}$

15. If frequency of $R-L$ circuit is f then impedence will be

(a) $\sqrt{R^2+(2\pi fL)^2}$ (b) $R^2+(2\pi f^2)^2$

(c) $\sqrt{(R^2+L\pi f^2)}$ (d) $R^2+(2\pi f)^2$.

16. Two closed organ pipes of length 100 cm and 101 cm produces 16 beats in 20 sec. When each pipe is sounded in its fundamental mode calculate the velocity of sound.
   (a) 303 ms^{-1} (b) 332 ms^{-1}
   (c) 323.2 ms^{-1} (d) 300 ms^{-1}.

17. A certain gas is taken to the five states represented by dots in the graph. The plotted lines are isotherms. Order of the most probable speed v_p of the molecules at these five states is
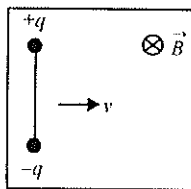

   (a) $v_{p\,at\,3} > v_{p\,at\,1} = v_{p\,at\,2} > v_{p\,at\,4} = v_{p\,at\,5}$
   (b) $v_{p\,at\,1} > v_{p\,at\,2} = v_{p\,at\,3} > v_{p\,at\,4} = v_{p\,at\,5}$
   (c) $v_{p\,at\,3} > v_{p\,at\,2} = v_{p\,at\,4} > v_{p\,at\,1} = v_{p\,at\,5}$
   (d) insufficient information to predict the result.

18. N_1 atoms of a radioactive element emit N_2 beta particles per second. The decay constant of the element is (in s^{-1})
   (a) N_1/N_2 (b) N_2/N_1
   (c) $N_1(\ln 2)$ (d) $N_2(\ln 2)$

19. Figure shows the variation of energy with the orbit radius r of a satellite in a circular motion. Mark the correct statement.
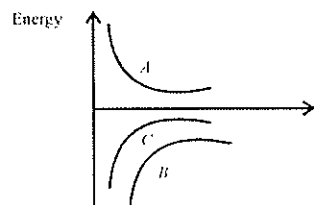

   (a) C is total energy, B kinetic energy and A is potential energy
   (b) A is kinetic energy, B total energy and C potential energy
   (c) A and B are the kinetic and potential energies and C the total energy of the satellite.
   (d) C and A are kinetic and potential energy respectively and B the total energy of the satellite.

20. Two changes $+q$ and $-q$ are attached to the two ends of a light rod of length L, as shown in figure. The system is given a velocity v perpendicular to magnetic field $\vec{B}$. The magnetic force on the system of charges and magnitude of force on one charge by the rod, are respectively
(a) zero, zero
(b) zero, qvB
(c) $2qvB$, 0
(d) $2qvB$, qvB

21. If a wire is extended to a new length l, the work done is
(a) $\dfrac{YA}{l}(l-l')$
(b) $\dfrac{YA}{l}(l-l')^2$
(c) $\dfrac{1}{2}\dfrac{YA}{l}(l-l')^2$
(d) $2\cdot\dfrac{YA}{l}(l-l')^2$.

22. The equivalent resistance between the points X and Y in the following circuit diagram will be
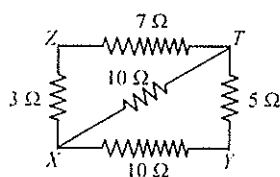
(a) $10\ \Omega$
(b) $5\ \Omega$
(c) $7\ \Omega$
(d) $3\ \Omega$.

23. The intensity of magnetic field due to an isolated pole of strength m_p at a point distant r from it will be
(a) m_p/r^2
(b) m_pr^2
(c) r^2/m_p
(d) m_p/r.

24. A bulb and a condenser are connected in series with an A.C. source. On increasing the frequency of the source its brightness will
(a) increase
(b) decrease
(c) sometimes increase and sometimes decrease
(d) neither increase nor decrease.

25. Two heater wires, made of the same material and having the same length and the same radius, are first connected in series and then in parallel to a constant potential difference. If the rates of heat produced in the two cases are H_s and H_p respectively, then H_s/H_p will be

(a) 1/2
(b) 2
(c) 1/4
(d) 4.

26. The ratio of magnetic fields on the axis of a circular current carrying coil of radius a to the magnetic field at its centre will be
(a) $\dfrac{1}{\left(1+\dfrac{x^2}{a^2}\right)^{3/2}}$
(b) $\dfrac{1}{\left(1+\dfrac{a^2}{x^2}\right)^{1/2}}$
(c) $\dfrac{1}{\left(1+\dfrac{a^2}{x^2}\right)^{2}}$
(d) $\dfrac{1}{\left(1+\dfrac{a^2}{x^2}\right)^{3}}$

27. Lumen is the unit of
(a) luminous flux
(b) luminosity
(c) illumination
(d) quantity of light.

28. A charge q is uniformly distributed on a ring of radius r. A sphere of an equal radius is constructed with its centre lying on the periphery of the ring. The flux of electric field through the surface of the sphere will be
(a) $\dfrac{q}{\varepsilon_0}$
(b) $\dfrac{q}{2\varepsilon_0}$
(c) $\dfrac{q}{3\varepsilon_0}$
(d) $\dfrac{q}{4\varepsilon_0}$

29. When 100 V d.c. is applied across a coil, a current of 1 A flows through it. When 100 V a.c. of 50 Hz is applied to the same coil only 0.5 A flows. The inductance of the coil is
(a) 0.55 H
(b) 5.5 mH
(c) 0.55 mH
(d) 55 mH.

30. A bulb of 25 W, 200 V and another bulb of 100 W, 200 V are connected in series with a supply line of 220 V. Then
(a) both bulbs will glow with same brightness
(b) both bulbs will get fused
(c) 25 W bulb will glow more brightly
(d) 100 W bulb will glow more brightly.

31. Which of the following is matched wrongly?
(a) oil drop experiment → Millikan
(b) dual nature of light → de Brogile
(c) uncertainty principle → Heisenberg
(d) none of these

32. The forbidden gap in the energy bands of silicon is
    (a) 2.6 eV   (b) 1.1 eV
    (c) 0.1 eV   (d) 6 eV

33. When white light passes through a prism, the deviation is maximum for
    (a) violet light   (b) green light
    (c) red light   (d) yellow light

34. Which of the following gates correspond to the truth table given below?

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

   (a) NAND   (b) OR
    (c) XOR   (d) NOR

35. Light is incident normally on a diffraction grating through which the first diffraction is seen at 32°. In this case the second order diffraction will be
    (a) at 80°   (b) at 64°
    (c) at 48°
    (d) there is no second order diffraction

36. If there were no atmosphere, the average temperature on earth surface would be
    (a) lower   (b) higher
    (c) same   (d) 0°C.

37. The current curve between $\log_e \frac{J}{T^2}$ and $\frac{1}{T}$ is

    (a)   (b)

    (c)   (d)
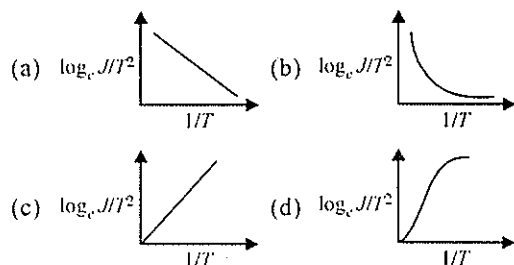
38. An object 5 cm tall is placed 1 m from a concave spherical mirror which has a radius of curvature of 20 cm. The size of the image is
    (a) 0.11 cm   (b) 0.50 cm
    (c) 0.55 cm   (d) 0.60 cm.

39. The magnifying power of a compound microscope increase with
    (a) the focal length of objective lens is increased and that of eye lens is decreased
    (b) the focal length of eye lens is increased and that of objective lens is decreased
    (c) focal lengths of both objects and eye-piece are increased
    (d) focal lengths of both objects and eye-piece are decreased.

40. A thread is tied slightly loose to a wire frame as in figure and the frame is dropped into a soap solution and taken out. The frame is completely covered with the film. When the portion A is punctured with a pin, the thread
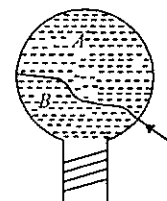
    (a) becomes concave towards A
    (b) becomes convex towards A
    (c) either (a) or (b) depending on the size of A with respect to B
    (d) remains in the initial position.

Directions : In the following questions (41-60), a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as :
(a) If both assertion and reason are true and reason is the correct explanation of assertion
(b) If both assertion and reason are true but reason is not the correct explanation of assertion
(c) If assertion is true but reason is false
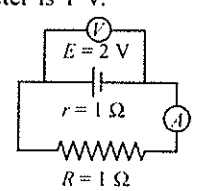(d) If both assertion and reason are false.

41. **Assertion** : In the relation $f = \frac{1}{2l}\sqrt{\frac{T}{\mu}}$, where symbols have standard meaning, m represent linear mass density.
    Reason : The frequency has the dimensions of inverse of time.

42. **Assertion** : When the velocity of projection of a body is made *n* times, its time of flight becomes *n* times.
    Reason : Range of projectile does not depend on the initial velocity of a body.

43. **Assertion** : A needle placed carefully on the

surface of water may float, whereas a ball of the same material will always sink.

Reason : The buoyancy of an object depends both on the material and shape of the object.

44. **Assertion** : The colour of the green flower seen through red glass appears to be dark.

    Reason : Red glass transmits only red light.

45. **Assertion** : The alternating current lags behind the e.m.f. by a phase angle of $\pi/2$, when AC flows through an inductor.

    Reason : The inductive reactance increases as the frequency of AC source decreases.

46. **Assertion** : A spark occur between the poles of a switch when the switch is opened.

    Reason : Current flowing in the conductor produces magnetic field.

47. **Assertion** : X-rays can penetrate through the flesh but not through the bones.

    Reason : The penetrating power of X-rays depends on voltage.

48. **Assertion** : It is essential that all the lines available in the emission spectrum will also be available in the absorption spectrum.

    Reason : The spectrum of hydrogen atom is only absorption spectrum.

49. **Assertion** : A double convex lens ($\mu = 1.5$) has focal length 10 cm. When the lens is immersed in water ($\mu = 4/3$) its focal length becomes 77 cm.

    Reason : $\dfrac{1}{f} = \dfrac{\mu_v - \mu_m}{\mu_m}\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

50. **Assertion** : Diode lasers are used as optical sources in optical communication.

    Reason : Diode lasers consume less energy.

51. **Assertion** : We cannot think of magnetic field configuration with three poles.

    Reason : A bar magnet does exert a torque on itself due to its own field.

52. **Assertion** : In a SHM, kinetic and potential energies become equal when the displacement is $1/\sqrt{2}$ times the amplitude.

    Reason : In SHM, kinetic energy is zero when potential energy is maximum.

53. **Assertion** : A bird perches on a high power line and nothing happens to the bird.

    Reason : The level of bird is very high from the ground.

54. **Assertion** : Stopping potential depends upon the frequency of incident light but is independent of the intensity of the light.

    Reason : The maximum kinetic energy of the photoelectrons is proportional to stopping potential.

55. **Assertion** : Inductance coils are usually made of thick copper wire.

    Reason : Induced current is more in wire having less resistance.

56. **Assertion** : When radius of circular loop carrying current is doubled, its magnetic moment becomes four times.

    Reason : Magnetic moment depends on area of the loop.

57. **Assertion** : In the following circuit, emf is 2 V and internal resistance of the cell is 1 Ω and $R = 1\ \Omega$, then reading of the voltmeter is 1 V.

    Reason : $V = E - IR$ where $E = 2$ V, $I = 2/2 = 1$ A.

58. **Assertion** : A domestic electrical appliance, working on a three pin will continue working even if the top pin is removed.

    Reason : The third pin is used only as a safety device.

59. **Assertion** : The energy of charged particle

moving in a uniform magnetic field does not change.

Reason : Work done by magnetic field on the charge is zero.

60. Assertion : ^{90}Sr from the radioactive fall out from a nuclear bomb ends up in the bones of human beings through the milk consumed by them. It causes impairment of production of red blood cells.
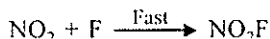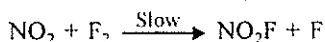
Reason : The energies β-particles emitted in the decay of ^{90}Sr damage the bone marrow.

CHEMISTRY

61. Identify Z in the reaction.
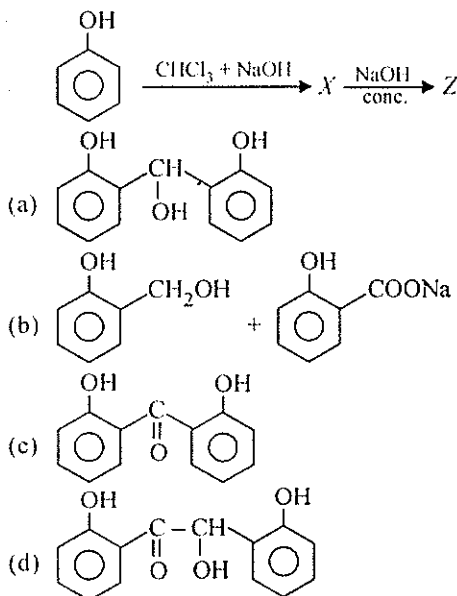
62. For the reaction, $2NO_2 + F_2 \rightarrow 2NO_2F$, following mechanism has been provided.

$NO_2 + F_2 \xrightarrow{Slow} NO_2F + F$

$NO_2 + F \xrightarrow{Fast} NO_2F$

Thus, rate expression of the above reaction can be written as

(a) $r = K[NO_2]_2[F_2]$ (b) $r = K[NO_2][F_2]$
(c) $r = K[NO_2]$ (d) $r = K[F_2]$.

63. What is the correct relationship between the pHs of isomolar solutions of sodium oxide (pH_1),

sodium sulphide (pH_2), sodium selenide (pH_3) and sodium telluride (pH_4)?

(a) $pH_1 > pH_2 = pH_3 = pH_4$
(b) $pH_1 < pH_2 < pH_3 < pH_4$
(c) $pH_1 < pH_2 > pH_3 < pH_4$
(d) $pH_1 > pH_2 > pH_3 > pH_4$.

64. Toluene is nitrated and the resulting product is reduced with tin and hydrochloric acid. The product so obtained is diazotised and then heated with cuprous bromide. The reaction mixture so formed contains

(a) mixture of o- and m-bromotoluenes
(b) mixture of o- and p-bromotoluenes
(c) mixture of o- and p-dibromobenzenes
(d) mixture of o- and p-bromo anilines.

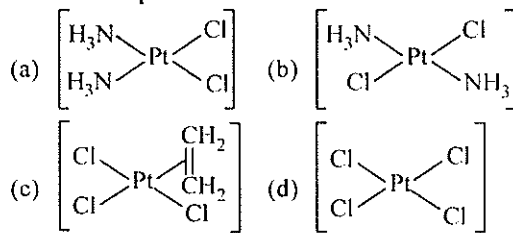**65.** The dissociation equilibrium of a gas AB_2 can be represented as

$2AB_{2(g)} \rightleftharpoons 2AB_{(g)} + B_{2(g)}$
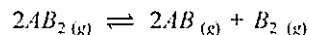
The degree of dissociation is x and is small compared to 1. The expression relating the degree of dissociation (x) with equilibrium constant K_p and total pressure p is

(a) $(2K_p/p)^{1/2}$ (b) K_p/p
(c) $2K_p/p$ (d) $(2K_p/p)^{1/3}$.

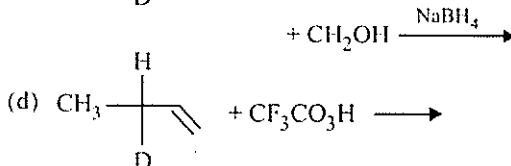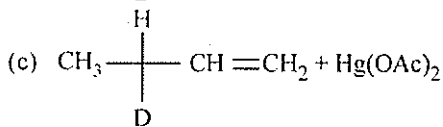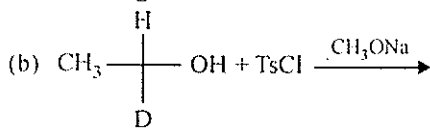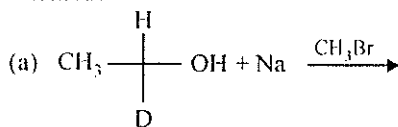**66.** Which of the following is considered as an anticancer species?

67. $CH_3CH = CHCH_3 + CHCl_3 + t\text{-BuOK} \rightarrow A$. A is
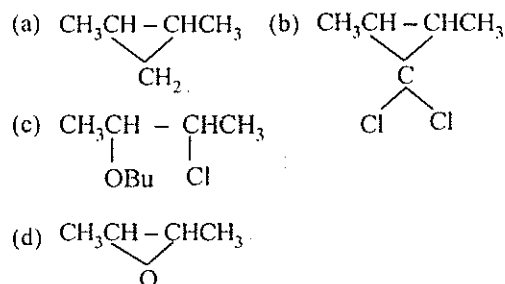
68. In which of the following preparations of ether,

the configuration about chiral centre is not retained?

(a) CH_3—|(H/D)—$OH + Na \xrightarrow{CH_3Br}$

(b) CH_3—|(H/D)—$OH + TsCl \xrightarrow{CH_3ONa}$

(c) CH_3—|(H/D)—$CH=CH_2 + Hg(OAc)_2$

$+ CH_2OH \xrightarrow{NaBH_4}$

(d) CH_3—|(H/D)⟍ $+ CF_3CO_3H \longrightarrow$

69. Toluene on treatment with CrO_3 and $(CH_3CO)_2O$ followed by hydrolysis with dil. HCl gives
(a) benzaldehyde   (b) benzoic acid
(c) phenol
(d) phenylacetaldehyde.

70. The time period to coat a metal surface of 80 cm² with 5×10^{-3} cm thick layer of silver (density 1.05 g cm⁻³) with the passage of 3 A current through a silver nitrate solution is
(a) 115 sec   (b) 125 sec
(c) 135 sec   (d) 145 sec.
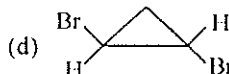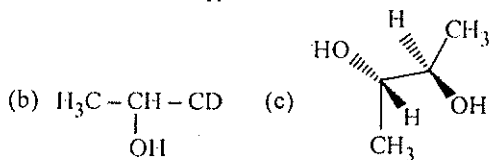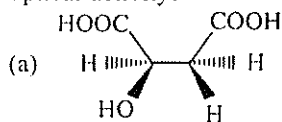
71. Correct equation of Freundlich isotherm is

(a) $\log\left(\dfrac{m}{x}\right) = \log k + \dfrac{1}{n}\log c$

(b) $\log\left(\dfrac{x}{m}\right) = \log c + \dfrac{1}{n}\log k$

(c) $\log\left(\dfrac{x}{m}\right) = \log c + \dfrac{1}{k}\log c$

(d) $\log\left(\dfrac{x}{m}\right) = \log k + \dfrac{1}{k}\log c$

72. Which of the following compounds is not chiral?
(a) 1-Chloropentane
(b) 2-Chloropentane
(c) 1-Chloro-2-methyl pentane
(d) 3-Chloro-2-methyl pentane.

73. Which of the following molecules will not show optical activity?

(a) HOOC—H⦙⦙⦙ ⦙⦙⦙H—COOH with HO and H

(b) $H_3C-CH-CD$ with OH

(c) structure with HO, H, CH₃, OH, CH₃

(d) Br—(cyclopropane)—H with H and Br

74. Green chemistry means such reactions which
(a) are related to the depletion of ozone layer
(b) study the reactions in plants
(c) produce colour during reactions
(d) reduce the use and production of hazardous chemicals.

75. Identify the final product.

H_3C⟍$=$⟋CH_3 ... $\xrightarrow{(i)\,m\text{-CPBA}}{(ii)\,H_3O^+}$

(a) H_3C...H...HO...H...CH_2COCH_3 with OH

(b) H_3C...H...HO...CH_2COCH_3 with H, OH

(c) H_3C...H...HO...CH_2COCH_3 with OH, H
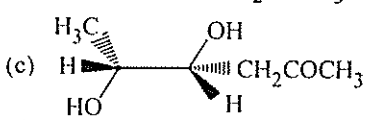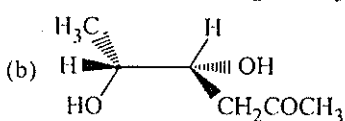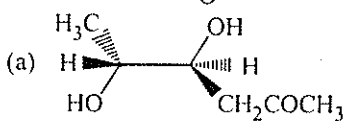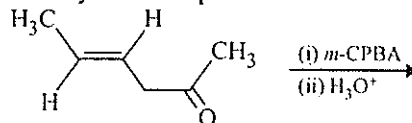
(d) none of these.

76. The flame colours of metal ions are due to
(a) Frenkel defect   (b) Schottky defect
(c) metal deficiency defect
(d) metal excess defect.

77. The reaction of an organic compound with ammonia followed by nitration of the product gives a powerful explosive called RDX. The organic compound is
(a) phenol   (b) toluene
(c) glycerine   (d) formaldehyde.

78. Cumene process is the most important commercial method for the manufacture of phenol. Cumene is
(a) *iso*-propyl benzene (b) ethyl benzene
(c) vinyl benzene (d) propyl benzene.

79. Prolonged exposure of fat or oil in moist air and light causes bad smell (rancidity). It is due to
(a) formation of $C_6 - C_{12}$ fatty acids
(b) formation of ketone and aldehyde
(c) both of these causes
(d) formation of glycerol.

80. Acid hydrolysis of sucrose is a
(a) pseudo first order reaction
(b) zero order reaction
(c) second order reaction
(d) unimolecular reaction.

81. Which of these compounds is synthesised by chloral?
(a) DDT (b) BHC
(c) chloroform (d) Michlers ketone.

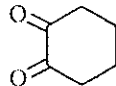82. When phenol reacts with phthalic anhydride in presence of H_2SO_4 and heated and hot reaction mixture is poured in NaOH solution, then product formed is
(a) alizarin (b) methyl orange
(c) fluorescein (d) phenolphthalein.

83. The function of $AlCl_3$ in Friedel-Craft's reaction is to
(a) absorb HCl (b) absorb water
(c) produce nucleophile
(d) produce electrophile.

84. The correct order of increasing $[H_3O^+]$ in the following aqueous solutions is
(a) 0.01 M H_2S < 0.01 M H_2SO_4 < 0.01 M NaCl < 0.01 M $NaNO_2$
(b) 0.01 M NaCl < 0.01 M $NaNO_2$ < 0.01 M H_2S < 0.01 M H_2SO_4
(c) 0.01 M $NaNO_2$ < 0.01 M NaCl < 0.01 M H_2S < 0.01 M H_2SO_4
(d) 0.01 M H_2S < 0.01 M $NaNO_2$ < 0.01 M NaCl < 0.01 M H_2SO_4.

85. Percentage of Se (at. mass = 78.4) in peroxidase anhydrase enzyme is 0.5% by weight, then minimum molecular mass of peroxidase anhydrase enzyme is

(a) 1.576×10^4 (b) 1.576×10^3
(c) 15.76 (d) 2.136×10^4.

86. The number of S – S bonds in sulphur trioxide trimer (S_3O_9) is
(a) three (b) two
(c) one (d) zero.

87. Oxidation product 1,2-cyclopentanediol with HIO_4 gives
(a) $HC - CH_2 - CH_2 - CH_2 - C - H$ with two =O groups
(b)
(c) $O = C - CH - CH_2 - CH_2 - C = O$ with OH groups
(d) none of these.

88. The correct order of dipole moment is
(a) $CH_4 < NF_3 < NH_3 \leq H_2O$
(b) $NF_3 < CH_4 < NH_3 < H_2O$
(c) $NH_3 < NF_3 < CH_4 < H_2O$
(d) $H_2O < NH_3 < NF_3 < CH_4$.

89. The root mean square speed of the molecules of diatomic gas is u. When the temperature is doubled, the molecules dissociate into two atoms. The new rms speed of the atom is
(a) $\sqrt{2}u$ (b) u
(c) $2u$ (d) $4u$.

90. For the following concentration cell, to be spontaneous $Pt(H_2)P_1$ atm. $|HCl|Pt(H_2)P_2$ atm. Which of the following is correct?
(a) $P_1 = P_2$ (b) $P_1 < P_2$
(c) $P_1 > P_2$ (d) can't be predicted.

91. Which one of the following is not a surfactant?
(a) $CH_3 - (CH_2)_{15} - \overset{\oplus}{\underset{CH_3}{\overset{CH_3}{N}}} - CH_3Br$
(b) $CH_3 - (CH_2)_{14} - CH_2 - NH_2$
(c) $CH_3 - (CH_2)_{16} - CH_2OSO_2^- Na^+$
(d) $OHC - (CH_2)_{14} - CH_2 - COO^- Na^+$.

92. The standard oxidation potential $E°$ for the half cell reaction are
$Zn \rightarrow Zn^{2+} + 2e^-$; $E° = +0.76V$
$Fe \rightarrow Fe^{2+} + 2e^-$; $E° = +0.41V$

EMF of the cell reaction is

Zn + Fe^{2+} → Zn^{2+} + Fe
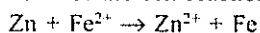
(a) − 0.35 V   (b) + 0.35 V

(c) 0.17 V   (d) 1.17 V.

93. To observe the effect of concentration on the conductivity electrolytes of different nature were taken in two vessels *A* and *B*. *A* contains weak electrolyte NH$_4$OH and *B* contains strong electrolyte NaCl. In both containers, concentration of respective electrolyte was increased and conductivity observed.

(a) in *A* conductivity increases, in *B* conductivity decreases

(b) in *A* conductivity decreases, while in *B* conductivity increases

(c) in both *A* and *B* conductivity increase

(d) in both *A* and *B* conductivity decreases.

94. A unit cell of sodium chloride has four formula units. The edge length of the unit cell is 0.0564 nm. What is the density of sodium chloride?

(a) 1.2 g/cm^3 (b) 2.165 g/cm^3

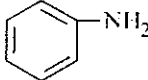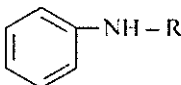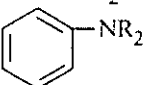(c) 3.64 g/cm^3 (d) 4.56 g/cm^3.

95. The reaction

$$R - \underset{\underset{O}{\|}}{C} - R \xrightarrow[H_2SO_4]{N_3H} RCONHR + N_2$$
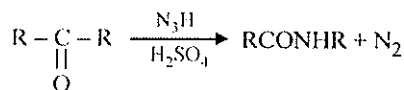
is called

(a) Claisen-Schmidt reaction

(b) Kolbe-Schmidt reaction

(c) Schmidt reaction

(d) Kolbe's reaction.

96. Which of the following amines, can give N-nitrosoamine on treatment with HNO$_2$?

(a) [benzene ring]—NH$_2$

(b) CH$_3$ – CH – CH$_3$ with NH$_2$ below

(c) [benzene ring]—NH – R

(d) [benzene ring]—NR$_2$

97. The purification of alumina is called

(a) Baeyer's process   (b) Bosch process

(c) Castner process   (d) Hoop's process.

98. Which acid has P – P linkage?
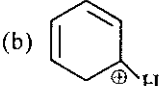
(a) Hypophosphoric acid

(b) Pyrophosphoric acid

(c) Metaphosphoric acid

(d) Orthophosphoric acid.

99. $C_6H_6 \xrightarrow[H_2SO_4]{HNO_3} X \xrightarrow[FeCl_3]{Cl_2} Y$. In the above sequence *Y* can be

(a) 3-nitrochlorobenzene

(b) 1-nitrochlorobenzene

(c) 4-nitrochlorobenzene

(d) none of these.

100. Which of the following is aromatic?

(a) [cyclohexadienyl cation, ⊕]

(b) [structure with ⊕ and H]

(c) [triangle/cyclopropane structure]

(d) [cyclopentadiene structure]

Directions : In the following questions (101-120), a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as :

(a) If both assertion and reason are true and reason is the correct explanation of assertion

(b) If both assertion and reason are true but reason is not the correct explanation of assertion

(c) If assertion is true but reason is false

(d) If both assertion and reason are false.

101. **Assertion** : (CH$_3$)$_3$CCOC(CH$_3$)$_3$ and acetone can be distinguished by the reaction with NaHSO$_3$.

Reason : HSO$_3^-$ is the nucleophile in bisulphite addition.

102. **Assertion** : Tertiary carbonium ions are generally formed more easily than primary carbonium ions.

Reason : Hyperconjugation as well as inductive effect due to additional alkyl groups stabilize tertiary carbonium ions.

103. **Assertion** : If H$_2$ and Cl$_2$ enclosed separately in the same vessel exert pressure of 100 and 200 mm respectively, their mixture in the same vessel at the same temperature will exert a pressure of 300 mm.

Reason : Dalton's law of partial pressures states that total pressure is the sum of partial pressures.

104. Assertion : The quantized energy of an electron is largely determined by its principal quantum number.

Reason : The principal quantum number n is a measure of the most probable distance of finding the electron around the nucleus.

105. Assertion : According to Le-Chatelier's principle addition of heat to an equilibrium solid $\rightleftharpoons$ liquid results in decrease in the amount of solid.

Reason : Reaction is endothermic, so on heating forward reaction is favoured.

106. Assertion : Cyclohexanone exhibits keto-enol tautomerism.

Reason : In cyclohexanone, one form contains the keto group (C=O) while other contains enolic group (– C=C – OH).

107. Assertion : Phenol is more reactive than benzene towards electrophilic substitution reaction.

Reason : In the case of phenol, the intermediate carbocation is more resonance stabilised.

108. Assertion : Many endothermic reactions that are not spontaneous at room temperature become spontaneous at high temperature.

Reason : Entropy of the system increases with increase in temperature.

109. Assertion : Benzaldehyde is more reactive than ethanal towards nucleophilic attack.

Reason : The overall effect of $-I$ and $+R$ effect of phenyl group decreases the electron density on the carbon atom of $>C = O$ group in benzaldehyde.

110. Assertion : Bleaching powder reacts with dilute acids to evolve chlorine.

Reason : The chlorine liberated by the action of dilute acids on bleaching powder is called available chlorine.

111. Assertion : Teflon has high thermal stability and chemical inertness.

Reason : Teflon is a thermoplastic.

112. Assertion : In high spin situation, configuration of d^5 ions will be $t_{2g}^3 e_g^2$.

Reason : In high spin situation, pairing energy is less than crystal field energy.

113. Assertion : Copper metal gets readily corroded in acidic aqueous solution.

Reason : Free energy change for this process is negative.

114. Assertion : When a concentrated solution is diluted by adding more water, molarity of the solution remains unchanged.

Reason : Product of moles of a solute and volume is equal to the molarity.

115. Assertion : Anilinium chloride is more acidic than ammonium chloride.

Reason : Anilinium chloride is resonance stabilised.

116. Assertion : Pyrrole is an aromatic heterocyclic compound.

Reason : It has cyclic delocalised 6π electrons.

117. Assertion : 2-Butanol on heating with H_2SO_4 gives 1-butene and 2-butene.

Reason : Dehydration of 2-butanol follows Saytzeff's rule.

118. Assertion : $SeCl_4$ does not have a tetrahedral structure.

Reason : Se in $SeCl_4$ has two lone pairs.

119. Assertion : Liquid NH_3 is used for refrigeration.

Reason : Liquid NH_3 quickly vapourises.

120. Assertion : Ethers behave as bases in the presence of mineral acids.

Reason : It is due to the presence of lone pair of electrons on the oxygen.

BIOLOGY

121. Two opposite forces operate in the growth and development of every population. One of them is related to the ability to reproduce at a given rate. The force opposite to it is called
    (a) fecundity
    (b) environmental resistances
    (c) biotic control   (d) mortality.

122. Acrosome reaction in sperm is triggered by
    (a) capacitation   (b) release of lysin
    (c) influx of Na^+ (d) release of fertilizin.

123. What is a keystone species?
    (a) a species which makes up only a small proportion of the total biomass of a community, yet has a huge impact on the community's organization and survival
    (b) a common species that has plenty of biomass, yet has a fairly low impact on the community's organization
    (c) a rare species that has minimal impact on the biomass and on other species in the community
    (d) a dominant species that constitutes a large proportion of the biomass and which affects many other species.

124. Which one of the following pairs is not correctly matched?
    (a) *Streptomyces*   -   Antibiotic
    (b) *Serratia*   -   Drug addiction
    (c) *Spirulina*   -   Single cell protein
    (d) *Rhizobium*   -   Biofertilizer.

125. You are required to draw blood from a patient and to keep it in a test tube for analysis of blood corpuscles and plasma. You are also provided with the following four types of test tubes. Which of these will you not use for the purpose?
    (a) test tube containing calcium bicarbonate
    (b) chilled test tube
    (c) test tube containing heparin
    (d) test tube containing sodium oxalate.

126. Smoking addiction is harmful because it produces polycyclic aromatic hydrocarbons, which cause
    (a) reduction in oxygen transport
    (b) increase in blood pressure
    (c) cancer
    (d) retardation of growth of foetus.

127. The main reason why antibiotics could not solve all the problems of bacteria mediated diseases is
    (a) insensitivity of the individual following prolonged exposure to antibiotics
    (b) inactivation of antibiotics by bacterial enzymes
    (c) decreased efficiency of the immune system
    (d) the development of mutant strains resistant to antibiotics.

128. Which of the following sets includes the bacterial disease?
    (a) cholera, typhoid, mumps
    (b) tetanus, tuberculosis, measles
    (c) malaria, mumps, poliomyelitis
    (d) diphtheria, leprosy, plague.

129. The binding of antibodies to the antigens to produce a large insoluble complex is known as
    (a) antibody-antigen complex
    (b) agglutination   (c) immunization
    (d) suppressor cell reaction.

130. One of the major difficulties in the biological control of insect pest is that
    (a) the predator develops a preference to other diets and may itself become a pest
    (b) the predator does not always survive when transferred to a new environment
    (c) the method is less effective as compared with the use of insecticides
    (d) the practical difficulty of introducing the predator to specific areas.

131. Cattle fed with spoilt hay of sweet clover which contains dicumarol
    (a) are healthier due to a good diet
    (b) catch infections easily
    (c) may suffer vitamin K deficiency and prolonged bleeding
    (d) may suffer from beri-beri due to deficiency of vitamin B_1.

132. Which one of the following methods is commonly used to maintain the genetic traits of a given plant?
    (a) by propagating through seed germination
    (b) by propagating through vegetative multiplication
    (c) by generating hybrids through intergeneric pollination
    (d) by treating the seeds with gamma radiations.

133. The bacteria which attack dead animals are
    (a) first link of the food chain and are known as primary producers
    (b) second link of the food chain and are herbivorous
    (c) third link of the food chain and are tertiary consumers
    (d) the end of food chain and are decomposers.

134. Which of the following statements is incorrect?
    (a) lichen, an association of fungus and algae is an example of mutualism.
    (b) those epiphytes which use other plants for support only and not for water or food supply and are examples of commensalism.
    (c) sea-anemone on hermit-crab is an example of protocooperation.
    (d) mutualism, protocooperation, commensalism cannot be included under symbiosis.

135. How many sperms are formed from a secondary spermatocyte?
    (a) 4   (b) 8
    (c) 2   (d) 1.

136. Phytohormones are
    (a) hormones regulating growth from seed to adulthood
    (b) growth regulators synthesised by plants and influencing physiological process
    (c) hormones regulating flowering
    (d) hormones regulating secondary growth.

137. Grey crescent is the area
    (a) at the point of entry of sperm into ovum
    (b) just opposite to the site of entry of sperm into ovum
    (c) at the animal pole   (d) at the vegetal pole.

138. Even after killing the generative cell with a laser beam, the pollen grain of a flowering plant germinates and produces normal pollen tube because
    (a) laser beam stimulates pollen germination and pollen tube growth
    (b) the laser beam does not damage the region from which pollen tube emerges
    (c) the contents of killed generative cell permits germination and pollen tube growth

    (d) the vegetative cell has not been damaged.

139. One common example of simple reflex is
    (a) tying your shoe laces while talking to another person and not looking at them
    (b) watering of mouth at the sight of a favourite food
    (c) climbing up a stairs in dark without stumbling
    (d) closing of eyes when strong light is flashed across them.

140. Select one of the following pairs of important features distinguishing *Gnetum* from *Cycas* and *Pinus* and showing affinities with angiosperms.
    (a) Perianth and two integuments.
    (b) Embryo development and apical meristem.
    (c) Absence of resin duct and leaf venation.
    (d) Presence of vessel elements and absence of archegonia.

141. Injury to vagus nerve in humans is not likely to affect
    (a) tongue movements
    (b) gastrointestinal movements
    (c) pancreatic secretion
    (d) cardiac movements.

142. Which one of the following is a matching pair?
    (a) Lubb-Sharp closure of AV valves at the beginning of ventricular systole.
    (b) Dup-Sudden opening of semilunar valves at the beginning of ventricular diastole.
    (c) Pulsation of the radial artery-Valves in the blood vessels.
    (d) Initiation of the heart beat - Purkinje fibres.

143. A lake near a village suffered heavy mortality of fishes within a few days. Consider the following reasons for this?
    (a) lots of urea and phosphate fertilizer were used in the vicinity.
    (b) the area was sprayed with DDT by an aircraft.
    (c) the lake water turned green and stinky.
    (d) phytoplankton polulations in the lake declined initially thereby greatly reducing photosynthesis.

144. Which one of the following pairs of plant structures has haploid number of chromosomes?

(a) nucellus and antipodal cells.

(b) egg nucleus and secondary nucleus.

(c) megaspore mother cell and antipodal cells.

(d) egg cell and antipodal cells.

145. When a man inhales air containing normal concentration of O_2 as well as CO he suffers from suffocation because

(a) CO reacts with O_2 reducing its percentage in air

(b) haemoglobin combines with CO instead of O_2 and forms carboxyhaemoglobin

(c) CO affects diaphragm and intercostal muscles

(d) CO affects the nerves of the lungs.

146. A patient of diabetes mellitus excretes glucose in urine even when he is kept in a carbohydrate free diet. It is because

(a) fats are catabolised in adipose tissues to form glucose

(b) amino acids are catabolised in kidney to form glucose

(c) amino acids are discharged in blood stream from liver

(d) glycogen from muscles is released in blood stream.

147. During the life-cycle, *Fasciola hepatica* (liver fluke) infects its intermediate host and primary host at the following larval stages respectively

(a) redia and miracidium

(b) cercaria and redia

(c) metacercaria and cercaria

(d) miracidium and metacercaria

148. Enzymes, vitamins and hormones can be classified into a single category of biological chemicals because of all of these

(a) enhance oxidative metabolism

(b) are conjugated proteins

(c) are exclusively synthesised in the body of a living organism as at present

(d) help in regulating metabolism.

149. Cut surfaces of fruit and vegetables often become dark because

(a) dirty knife makes it dark

(b) oxidation of tannic acid in the presence of trace of iron from the knife makes it dark

(c) dust of the air makes it dark

(d) none of the above.

150. *Nicotiana sylvestris* flowers only during long days and *N. tabacum* flowers only during short days. If raised in the laboratory under different photoperiods, they can be induced to flower at the same time and can be cross-fertilized to produce self-fertile offspring. What is the best reason for considering *N. sylvestris* and *N. tabacum* to be separate species ?

(a) they cannot interbreed in nature

(b) they are reproductively distinct

(c) they are physiologically distinct

(d) they are morphologically distinct

151. Which one of the following is the correct statement regarding the particular psychotropic drug specified?

(a) morphine leads to delusions and disturbed emotions.

(b) barbiturates cause relaxation and temporary euphoria.

(c) hashish causes alteration of thoughts, perceptions and hallucinations.

(d) opium stimulates nervous system and causes hallucinations.

152. In succulent plants the stomata open in night and close in day. Which among the following would be best hypothesis to explain the mechanism of stomatal action in night only?

(a) CO_2 accumulates, reduces pH, stimulate enzymes resulting in accumulation of sugars.

(b) increase in CO_2 concentration, conversion of organic acids into starch resulting in the increased conversion into sugars resulting in K^+ transport.

(c) low CO_2 concentration accumulates organic acids resulting in the increased concentration of cell sap.

(d) CO_2 used up, increase pH results in accumulation of sugars.

153. The cells of the quiescent centre are characterised by

(a) having dense cytoplasm and prominent nuclei

(b) having light cytoplasm and small nuclei

(c) dividing regularly to add to the corpus

(d) dividing regularly to add to tunica

154. *Thermococcus, Methanococcus* and *Methanobacterium* exemplify

(a) bacteria whose DNA is relaxed or positively supercoiled but which have a cytoskeleton as well as mitochondria

(b) bacteria that contain a cytoskeleton and ribosomes

(c) archaebacteria that contains protein homologous to eukaryotic core histones

(d) archaebacteria that lack any histones resembling those found in eukaryotes but whose DNA is negatively supercoiled.

155. Ectophloic siphonostele is found in

(a) *Osmunda* and *Equisetum*

(b) *Marsilea* and *Botrychium*

(c) *Adiantum* and *Cucurbitaceae*

(d) *Dicksonia* and *Maidenhair fern*.

156. Chlorenchyma is known to develop in the

(a) cytoplasm of *Chlorella*

(b) mycelium of a green mould such as *Aspergillus*

(c) spore capsule of a moss

(d) pollen tube of *Pinus*

157. The distance between two genes in a chromosome is measured in cross-over units which represent

(a) ratio of crossing over between them

(b) percentage of crossing over between them

(c) number of crossing over between them

(d) none of these.

158. In transgenics, expression of transgene in target tissue is determined by

(a) enhancer   (b) transgene

(c) promoter   (d) reporter.

159. How many genome types are present in a typical green plants cell?

(a) more than five   (b) more than ten

(c) two   (d) three.

160. The growth curve of bacterial population in lab is plotted against time. What will be the shape of graph?

(a) sigmoid   (b) hyperbolic

(c) ascending straight line

(d) descending straight line.

Directions : In the following questions (161-180), a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as :

(a) If both assertion and reason are true and reason is the correct explanation of assertion

(b) If both assertion and reason are true but reason is not the correct explanation of assertion

(c) If assertion is true but reason is false

(d) If both assertion and reason are false.

161. **Assertion** : Protoplasmic continuity is maintained in perforated septum.

     Reason : Usually a small pore remains in the centre of the septum.

162. **Assertion** : The primary protenema of moss by death and decay of cells may break into fragments.

     Reason : Each fragment gives rise to leafy gametophyte.

163. **Assertion** : Cephalization is advantageous to an animal.

     Reason : It improves the appearance of the animal.

164. **Assertion** : Koel does not build nest for egg laying.

     Reason : Koel lays its eggs in the nest of tailor bird.

165. **Assertion** : Competitive inhibitor is also called as substrate analogue.

     Reason : It resembles the enzymes in structure.

166. **Assertion** : Persons suffering from haemophilia fail to produce blood clotting factor VIII.

     Reason : Prothrombin producing platelets in such persons are found in very low concentration.

167. **Assertion** : Hybridoma cells are shifted to a medium deficient in nutrient which cannot be synthesized by myeloma cells.

     Reason : This medium allows selection of hybridoma cells.

168. **Assertion** : Maize is an albuminous seed.

Reason : Endosperm is completely absorbed by its growing embryo.

169. **Assertion** : Ciliated epithelium is present in the inner lining of trachea and large bronchi.
Reason : Ciliary movement propel the mucus and foreign particle towards the larynx.

170. **Assertion** : Light is one of the important factor in transpiration.
Reason : It induces stomatal opening and closing. Therefore, transpiration increases in light and decreases in dark.

171. **Assertion** : The higher concentration of O_2 in the atmosphere is inhibitory to photosynthesis.
Reason : CO_2 is the main substrate of photosynthesis.

172. **Assertion** : F_1 particles are present in the inner mitochondrial membrane.
Reason : An electron gradient formed on the inner·mitochondrial membrane, forms ATP.

173. **Assertion** : Rhabdome is present in *Palaemon*.
Reason : Rhabdome has an important role in digestion.

174. **Assertion** : Pituitary is attached to hypothalamus by a vein.
Reason : This attachment is done through a hypophysial portal vein.

175. **Assertion** : Rabies is acute infectious disease of warm blooded mammals characterised by involvement of central nervous system resulting in paralysis and finally death.
Reason : This is caused due to neurotropic filterable bacteria in saliva of rabid animals.

176. **Assertion** : Many plants are propagated vegetatively even though they bear seeds.
Reason : Potatoes multiply by tubers and apple by cutting.

177. **Assertion** : Nuclear endosperm is formed by subsequent nuclear division without wall formation.
Reason : Coconut is an example of such endosperm, where the endosperm remains nuclear throughout the development of the fruit.

178. **Assertion** : In mammals the female secondary sexual characters are developed by gonadotropins.
Reason : Gonadotropins are secreted by graafian follicle.

179. **Assertion** : The plant biomass which serves as the food of herbivores and decomposers is said to result from the gross primary productivity.
Reason : Gross primary productivity is the rate of net production of organic material (biomass).

180. **Assertion** : Methyl mercury is a highly persistent pollutant that accumulates in food chains.
Reason : Mercury pollution is responsible for minamata.

GENERAL KNOWLEDGE

181. The first of the GAEL (Global Alliance for the elimination of Leprosy) was held in
(a) New Delhi   (b) Bombay
(c) Culcutta   (d) Paris.

182. Megger is an instrument to measure
(a) very low resistance
(b) insulation resistance
(c) inductance of a coil
(d) all of the above.

183. Terminator technology promotes sale of which of the following that is/are generated by it?
(a) gransgenic fertile seed.
(b) gene modified plants.
(c) genetically engineered seeds fertilized in next generation.
(d) all of these.

184. Which among the following has become the third

tiger reserve of Assam?
(a) Manas Wildlife Sanctury
(b) Kaziranga National Park
(c) Nameri National Park
(d) none of these.

185. To make the acidic soil suitable for agricultural, one of the following material is used.
(a) lime   (b) gypsum
(c) calcium superphosphate
(d) vegetable compost.

186. The landform which is not associated with wind erosion is
(a) sand dune   (b) inselberg
(c) drumlin   (d) mushroom rock.

187. BCG vaccination is to be given to a new born child
(a) immediately after child birth
(b) within 48 hours
(c) within seven days
(d) within six months.

188. For reproducing sound, CD (compact disc) audioplayer uses a
(a) quartz crystal   (b) titanium needle
(c) laser beam
(d) barium titanate ceramic

189. In a three pin electrical plug, longest pin should be connected to
(a) ground terminal   (b) live terminal
(c) neutral terminal   (d) any terminal.

190. The new addition to the commonwealth games 2010 is
(a) shooting   (b) hockey
(c) wrestling   (d) football.

191. The name of the player who established record in World Cup Cricket 2007 of making six sixes is
(a) Sanath Jaisurya   (b) Virendra Sehwag
(c) Adam Gilchrist   (d) Hershelle Gibbs.

192. The lateral meaning of the word Arya is
(a) superior   (b) learned
(c) priest   (d) warrior.

193. When T.V. is switched on
(a) audio and video both start simultaneously
(b) audio is heard immediately but video starts later because video needs some warm up time
(c) video starts immediately but audio is heard later because sound travels at a lesser speed than light
(d) it depends on the T.V. stand.

194. The instrument of music in which Ustad Amjad Ali Khan has distinguished himself is
(a) sarod   (b) violin
(c) sitar   (d) shehnai.

195. A deep and narrow river valley with steep bank is called
(a) geyser   (b) bluff
(c) delta   (d) canyon.

196. A 'breath test' used by traffic police to check drunken drivers uses -
(a) potassium dichormate-sulphuric acid
(b) potassium permanganate sulphuric acid
(c) turmeric on filter paper
(d) silica gel coated with silver nitrate

197. In which of the following books is 'Knowledge is Power' written?
(a) Essay on Man   (b) Paradise Lost
(c) Leviathan   (d) Das Capital.

198. Who said "where weather accumulates, men decay"?
(a) Abraham Lincoln   (b) Mao Tsetung
(c) Karl Marx   (d) Goldsmith.

199. Which of the following computer viruses is named after cherry and caffein soft drink popular with programmers ?
(a) sircam   (b) code pink
(c) code red   (d) malisa

200. The fourth Buddist council was held during the reign of
(a) Ashoka
(b) Chandragupta
(c) Kanishka
(d) Chandragupta Vikramaditya