# NEET

**TEST code: 14**

**Time** : 03:00:00 **PCB** **Marks** : 720

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1. The dimensions of *calorie* are
   a) $ML^2T^{-2}$ b) $MLT^{-2}$ c) $ML^2T^{-1}$ d) $ML^2T^{-3}$

2. The length, breadth and thickness of a metal block is given by $l = 90$ cm, $b = 8\ cm$, $t = 2.45$ cm. The volume of the block is
   a) $2\times10^2 cm^3$ b) $1.8\times10^2 cm^3$
   c) $1.77\times10^2 cm^3$ d) $1.764\times10^2 cm^3$

3. A body dropped from a height $h$ with an initial speed zero, strikes the ground with a velocity $3\ km/h$. Another body of same mass is dropped from the same height $h$ with an initial speed $-u' = 4km/h$. Find the final velocity of second body with which it strikes the ground
   a) $3\ km/h$ b) $4\ km/h$ c) $5\ km/h$ d) $12\ km/h$

4. A mass is supported on a frictionless horizontal surface. It is attached to a string and rotates about a fixed centre at an angular velocity $\omega_0$. If the length of the string and angular velocity both are doubled, the tension in the string which was initially $T_0$ is now
   a) $T_0$ b) $T_0/2$ c) $4T_0$ d) $8T_0$

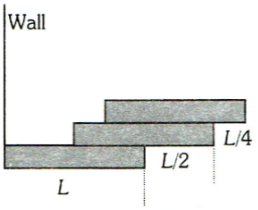
5. A 2 kg stone tied at the end of a string 1 m long is whirled along a vertical circle at a constant speed of $4\ ms^{-1}$. The tension in the string has a value of 52 N when the stone is
   a) At the top of the circle b) Half way down c) At the bottom of the circle d) None of the above

6. A nucleus disintegrates into two nuclear parts which have their velocities in the ratio 2 : 1. The ratio of their nuclear sizes will be
   a) $2^{1/3}:1$ b) $1:3^{1/2}$ c) $3^{1/2}:1$ d) $1:2^{1/3}$

7. A machine gun fires 20 bullets per second into a target. Each bullet weighs 150 $gms$ and has a speed of 800 $m/sec$. Find the force necessary to hold the gun in position
   a) 800 $N$ b) 1000 $N$ c) 1200 $N$ d) 2400 $N$

8. Four smooth steel balls of equal mass at rest are free to move along a straight line without friction. The first ball is given a velocity of 0.4 $ms^{-1}$. It collides head on with the second one elastically, the second one similarly with the third and so on. The velocity of the last ball is
   a) $0.4ms^{-1}$ b) $0.2ms^{-1}$
   c) $0.1ms^{-1}$ d) $0.05ms^{-1}$

9. Three bricks each of length $L$ and mass $M$ are arranged as shown from the wall. The distance of the centre of mass of the system from the wall is




   a) $L/4$ b) $L/2$
   c) $(3/2)L$ d) $(11/12)L$

10. A particle of mass $m$ is rotating in a plane in circular path of radius $r$. Its angular momentum is $L$. The central force acting on the particle is
    a) $L^2/mr$ b) $L^2m/r$ c) $L^2/m^2r^2$ d) $L^2/mr^3$

11. The mass of the earth is $6.00\times10^{22}$ kg. The constant of gravitation $g = 6.67\times10^{-11}Nm^2kg^{-2}$. The potential energy of the system is $-7.73\times10^{28}$ J. The mean distance between earth and moon is
    a) $3.80\times10^8 m$ b) $3.37\times10^6 m$
    c) $7.60\times10^4 m$ d) $1.90\times10^2 m$

12. There is no change in the volume of a wire due to the change in its length on stretching. The Poisson's ratio of the material of the wire is
    a) $+\frac{1}{2}$ b) $-\frac{1}{2}$ c) $+\frac{1}{4}$ d) $-\frac{1}{4}$

13. Two rain drops of same radii '$r$', falling with terminal velocity '$v$' merge and form a bigger

drops of radius $R$. The terminal velocity of the bigger drop is

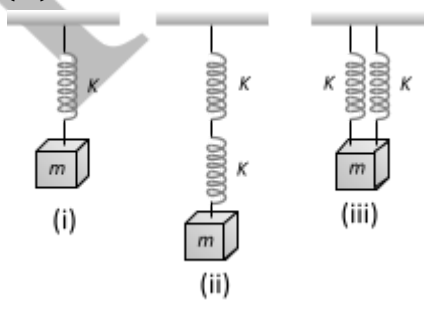
a) $v\frac{R}{r}$ b) $v\frac{R^2}{r^2}$ c) $v$ d) $2v$

14. Angle of contact of a liquid with a solid depend on
    a) solid only
    b) liquid only
    c) both on solid and liquid
    d) orientation of the solid surface in liquid
15. A composite rod made of copper ( $\alpha = 1.8\times10^{-5}\,K^{-1}$) and steel ( $\alpha = 1.2\times10^{-5}\,K^{-1}$) is heated. Then
    a) It bends with steel on concave side
    b) It bends with copper on concave side
    c) It does not expand
    d) Data is insufficient
16. A thermally insulated vessel contains an ideal gas of molecular mass $M$ and ratio of specific heats γ. It is moving with speed $v$ and is suddenly brought to rest. Assuming no heat is lost to the surroundings, its temperature increases by

    a) $\frac{(\gamma-1)}{2(\gamma+1)R}Mv^2$ b) $\frac{(\gamma-1)}{2\gamma R}Mv^2$

    c) $\frac{\gamma Mv^2}{2R}$ d) $\frac{(\gamma-1)}{2R}Mv^2$

17. 200 $cal$ of heat is given to a heat engine so that it rejects 150 $cal$ of heat, if source temperature is 400 $K$, then the sink temperature is
    a) 300 $K$ b) 200 $K$ c) 100 $K$ d) 50 $K$
18. When the temperature of a gas is raised from 27°C to 90°C, the percentage increase in the $r.m.s.$ velocity of the molecules will be
    a) 10% b) 15% c) 20% d) 17.5%
19. Five identical springs are used in the following three configurations. The time periods of vertical oscillations in configurations (i), (ii) and (iii) are in the ratio




    a) $1:\sqrt{2}:\frac{1}{\sqrt{2}}$ b) $2:\sqrt{2}:\frac{1}{\sqrt{2}}$

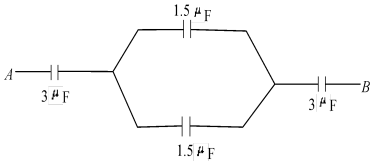
    c) $\frac{1}{\sqrt{2}}:2:1$ d) $2:\frac{1}{\sqrt{2}}:1$

20. The length of a spring is $l$ and its force constant is $k$. When a weight $W$ is suspended from it, its length increases by $x$. If the spring is cut into two equal parts and put in parallel and the same weight $W$ is suspended from them, then the extension will be
    a) $2x$ b) $x$ c) $\frac{x}{2}$ d) $\frac{x}{4}$
21. A closed Prgan pipe and an open organ pipe of same length produce 2 beats/second while vibrating in their fundamental modes. The length of the open organ pipe is halved and that of closed pipe is doubled. Then the number of beats produced per second while vibrating in the fundamental mode is
    a) 2 b) 6 c) 8 d) 7
22. There are two charges $+\ 1\ \mu C$ and $+\ 5\ \mu C$ respectively. The ratio of the forces acting on them will be
    a) 1 : 5 b) 1 : 1 c) 5 : 1 d) 1 : 25
23. A simple pendulum has a length $l$ and the mass of the bob is $m$. The bob is given a charge $q$ coulomb. The pendulum is suspended between the vertical plates of a charged parallel plate capacitor. If $E$ is the electric field strength between the plates, the time period of the pendulum is given by

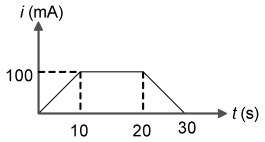
    a) $2\pi\sqrt{\frac{1}{g}}$ b) $2\pi\sqrt{\frac{l}{\sqrt{g+\frac{qE}{m}}}}$

    c) $2\pi\sqrt{\frac{l}{\sqrt{g-\frac{qE}{m}}}}$ d) $2\pi\sqrt{\frac{l}{\sqrt{g^2+\left(\frac{qE}{m}\right)^2}}}$

24. The equivalent capacitance between the points $A$ and $B$ in the following circuit is




    a) 1 μ$F$ b) 2 μ$F$ c) 4 μ$F$ d) 8 μ$F$
25. In a copper voltmeter, the mass deposited in 30 s is $m$ gram. If the current-time graph is as shown in figure, the electrochemical equivalent of copper, in $gC^{-1}$ is

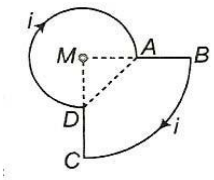



a) $0.1\ m$ b) $0.6\ m$ c) $\frac{m}{2}$ d) $m$

26. Two similar cells, whether joined in series or in parallel, have the same current through an external resistance of 2 Ω. The internal resistance of each cell is
a) 1 Ω b) 2 Ω c) 0.5 Ω d) 1.5 Ω

27. Silver and copper voltameter are connected in parallel with a battery of *e*.m.f. 12 $V$. In 30 $minutes$, $1g$ of silver and $1.8g$ of copper are liberated. The power supplied by the battery is ($Z_{Cu} = 6.6\times10^{-4} g/C$ and $Z_{Ag} = 11.2\times10^{-4} g/C$)
a) $24.13\ J/sec$ b) $2.413\ J/sec$
c) $0.2413\ J/sec$ d) $2413\ J/sec$

28. A current $i$ is flowing through the loop. The direction of the current and the shape of the loop are as shown in the figure.
The magnetic field at the centre of the loop is $\frac{\mu_0 i}{R}$ times.
($MA = R,\ MB = 2R,\ \angle DMA = 90°$




a) $\frac{5}{16}$, but out of the plane of the paper
b) $\frac{5}{16}$, but into the plane of the paper
c) $\frac{7}{16}$, but out of the plane of the paper
d) $\frac{7}{16}$, but into the plane of the paper

29. The bob of a simple pendulum is replaced by a magnet. The oscillation are set along the length of the magnet. A copper coil is added so that one pole of the magnet passes in and out of the coil. The coil is short-circuited. Then which one of the following happens
a) Period decreases
b) Period does not change
c) Oscillations are damped
d) Amplitude increases

30. At a place, if one earth's horizontal and vertical components of magnetic fields are equal, then the angle of dip will be
a) 30° b) 90° c) 45° d) 0°

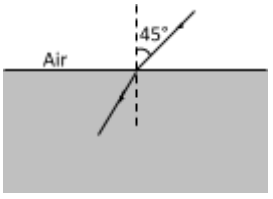
31. A uniformly wound solenoid coil of self-inductance $1.8\times10^{-4} H$ and resistance 6Ω is broken up into two identical coils. These identical coils are then connected in parallel across a 12 V battery of negligible resistance. The time constant for the current in the circuit is
a) $0.1\times10^{-4}$s b) $0.2\times10^{-4} s$
c) $0.3\times10^{-4} s$ d) $0.4\times10^{-4} s$

32. Two coil $X$ *and* $Y$ are placed in a circuit such that a current changes by 2 A in coil $X$ and magnetic flux change of 0.4 Wb occurs in $Y$. The value of mutual inductance of the coils is
a) 0.8 H
b) 0.2 Wb
c) 0.2 H
d) 5 H

33. If an 8 Ω resistance and 6 Ω reactance are present in an ac series circuit then the impedance of the circuit will be
a) 20 $ohm$ b) 5 $ohm$
c) 10 $ohm$ d) $14\sqrt{2}\ ohm$

34. The atmosphere between the heights of 50 km and 80 km is called
a) Mesosphere b) Ozonosphere
c) Ionosphere d) Troposphere

35. In the figure shown, for an angle of incidence 45°, at the top surface, what is the minimum refractive index needed for total internal reflection at vertical face




a) $\frac{\sqrt{2}+1}{2}$ b) $\sqrt{\frac{3}{2}}$ c) $\sqrt{\frac{1}{2}}$ d) $\sqrt{2}+1$

36. Which of the following is a wrong statement?
a) $D = 1/f$ where, $f$ is the focal length and $D$ is called the refractive power of a lens
b) Power is expressed in a diopter when $f$ is in metre

c) Power is expressed in diopter and does not depend on the system of unit used to measure $f$

d) $D$ is positive for convergent lens and negative for divergent lens

37. If white light is used in Young's double slit experiment

a) No interference pattern is formed
b) White fringes are formed
c) Central bright fringe is white
d) Central bright fringe is coloured

38. The photoelectric threshold frequency of a metal is $v$. When light of frequency $4v$ is incident on the metal. The maximum kinetic energy of the emitted photoelectrons is

a) $4\ hv$ b) $3\ hv$ c) $5\ hv$ d) $\frac{5}{2}\ hv$

39. Positive rays are very identical to

a) α-particle rays b) β-rays
c) γ-rays d) None of above

40. In a hydrogen atom, the electron moves around the nucleus in a circular orbit of radius $5\ \times 10^{-11}$m. Its time period is $1.5\ \times\ 10^{-16}$ .The current associated with the electron motion is (charge of electron is $1.6\ \times\ 10^{-16}\ C$)

a) 1.00 A
b) $1.066 \times 10^{-3}\ A$
c) $1.81\ \times 10^{-3}\ A$
d) $1.66\times 10^{-3}\ A$

41. The half-life period of radium is 1600 $years$. Its average life time will be

a) $3200\ years$
b) $4800\ years$
c) $2319\ years$
d) $4217\ years$

42. The half-life for the α-decay of uranium $_{92}U^{238}$ is $4.47\times10^{9}$ yr. If a rock contains sixty percent of its original $_{92}U^{238}$ atoms, its age is [$\log log\ 6 = 0.778;\ \log log\ 2 = 0.3$]

a) $3.3\times10^{9}\ yr$
b) $6.6\times10^{9}\ yr$
c) $1.2\times10^{8}\ yr$
d) $5.4\times10^{7}\ yr$

43. Based on the energy band description, a solid can be classified as a semiconductor if the energy gap between the valence band and conduction band is

a) $3eV < E_g < 6\ eV$
b) $E_g > 6\ eV$
c) $E_g < 3\ eV$
d) $E_g = 0eV$

44. A TV tower has a height of 75 m. What is the maximum area upto which this TV communication can be possible?

a) $1509\ km^2$
b) $3018\ km^2$
c) $2254\ km^2$
d) $6036\ km^2$

45. If an electromagnetic wave is transmitted to the height equal to 150 km with maximum frequency 300 kHz and critical frequency 100 kHz, the skip distance is

a) 426 km b) 636 km c) 824 km d) 849 km

46. For the reaction,

$X + 2Y \longrightarrow Z$

5 Moles of $X$ and 9 moles of $Y$ will produce

a) 5 moles of $Z$
b) 8 moles of $Z$
c) 14 moles of $Z$
d) 4 moles of $Z$

47. The formula mass of Mohr's salt is 392. The iron present in it is oxidised by $KMnO_4$ in acid medium. The equivalent mass of Mohr's salt is

a) 392 b) 31.6 c) 278 d) 156

48. Wave nature of electrons was demonstrated by

a) Schrodinger
b) De-Broglie
c) Davisson and Garmer
d) Heisenberg

49. Which of the following is non-permissible?

a) $n = 4,\ l = 3,\ m = 0$
b) $n = 4,\ l = 2,\ m =$
c) $n = 4,\ l = 4,\ m = 1$
d) $n = 4,\ l = 0,\ m =$

50. Which is the correct order of electronegativity?

a) $F > N < O > C$
b) $F > N > O > C$
c) $F > N > O < C$
d) $F < N < O = C$

51. Valence bond theory of metallic bond was given by

a) Dalton
b) Drudel
c) Fajan
d) Pauling

52. In which of the following hydrogen bond is present?

a) $H_2$
b) Ice
c) Sulphur
d) Hydrocarbon

53. In a face centred cubic cell, an atom at the face contributes to the unit cell

a) 1 part b) $\frac{1}{2}$ part c) $\frac{1}{4}$ part d) $\frac{1}{8}$ part

54. For the reaction at 298 K.

$$A(g) + B(g) \rightarrow C(g)$$

$\Delta E = -5\ cal\ and\ \Delta S = -10\ cal\ K^{-1}$

a) $\Delta G = +2612$ cal b) $\Delta G = -2612$ cal
c) $\Delta G = +261.2$ cal d) None of these

55. Carbon cannot reduce $Fe_2O_3$ to Fe at a temperature below 983 K because

a) Free energy change for the formation of CO is more negative than that of $Fe_2O_3$
b) CO is thermodynamically more stable than $Fe_2O_3$
c) Carbon has higher affinity towards oxygen than iron
d) Iron has higher affinity towards oxygen than carbon

56. For $PCl_5 \rightleftharpoons PCl_3 + Cl_2$, initial concentration of each reactant and product is 1 M. If $K_{eq} = 0.41$ then

a) More $PCl_3$ will form b) More $Cl_2$ will form
c) More $PCl_5$ will form d) No change

57. The oxidation state of chromium in the final product formed by the reaction between KI and acidified potassium dichromate solution is

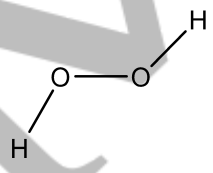
a) +3 b) +2 c) +6 d) +4

58. In which of the following reactions, hydrogen is acting as an oxidising agent?

a) With Li to form LiH b) With $I_2$ to give HI
c) With S to give $H_2S$ d) None of the above

59. The equilibrium molecular structure of hydrogen peroxide is

a) Planar as given below




b) Linear
c) Tetrahedral
d) Non-planar

60. Soda lime is

a) $NaOH$ b) $NaOH\ and\ CaO$
c) $CaO$ d) $Na_2CO_3$

61. Carbon suboxide $C_3O_2$ has

a) Bent structure
b) Trigonal planar structure
c) Linear structure
d) Distorted tetrahedral structure

62. Aluminium is obtained by

a) Reducing $Al_2O_3$ with coke
b) Electrolysing $Al_2O_3$ dissolved in $Na_3AlF_6$
c) Reducing $Al_2O_3$ with chromium
d) Heating alumina with cryolite

63. During a nitration of benzene, the attacking electrophile is

a) $NO_3^-$ b) $NO_2^-$ c) $NO_2^+$ d) $HNO_3$

64. $CH_3 - CH_2 - C \equiv CH \xrightarrow[H_2SO_4]{HgSO_4} A$

The compound $A$ is

a) $CH_3 - CH_2 - \overset{\overset{O}{\|}}{C} - CH_3$
b) $CH_3 - CH_2 - CH_2 - CHO$
c) $CH_3 - CH_2 - CH_2 - COOH$
d) None of the above

65. The reaction of toluene with chlorine in presence of ferric chloride gives predominantly

a) benzoyl chloride
b) *m*-chlorotoluene
c) Benzyl chloride
d) *o*-and *p*-chlorotoluene

66. Gas released during Bhopal tragedy was

a) Methyl isocyanate
b) Potassium isothiocyanate
c) Sodium isothiocyanate
d) Ethyl isothiocyanate

67. The crystalline structure of $NaCl$ is

a) Hexagonal close packing
b) Face centred cubic
c) Square planar
d) Body centred cubic

68. In a cubic structure of diamond which is made from *X* and *Y*, where *X* atoms are at the corners of the cube and *Y* at the face centres of the cube. The molecular formula of the compound is

a) $X_2Y$ b) $X_3Y$ c) $XY_2$ d) $XY_3$

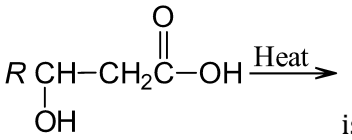
69. The vapour pressure of water at 20°C is 17.54 mm. When 20 g of a non-ionic, substance is

dissolved in 100 g of water, the vapour pressure is lowered by 0.30 mm. What is the molecular mass of the substance?

a) 200.8 b) 206.88 c) 210.5 d) 215.2

70. Which of the following concentration units is independent of temperature?
    a) Normality b) Molarity
    c) Molality d) ppm
71. The specific conductance of 0.1 N $KCl$ solution at 23°C is 0. 012 $ohm^{-1}\ cm^{-1}$. The resistance of cell containing the solution at the same temperature was found to be 55 ohm. The cell constant will be
    a) 0. 66 $cm^{-1}$ b) 1. 12 $cm^{-1}$
    c) 0. 918 $cm^{-1}$ d) 1. 66 $cm^{-1}$
72. For a reaction between gaseous compounds, $2A + B \rightarrow C + D$

    The reaction rate=k[A][B]. If the volume of the container is made $\frac{1}{4}$ of the initial, then what will be the rate of reaction as compared to the initial rate?
    a) 16 times b) 4 times
    c) 1/8 times d) 1/16 times
73. The rate law for the reaction $RCl + NaOH \rightarrow ROH + NaCl$ is given by $Rate = k[RCl]$. The rate of this reaction
    a) Is doubled by doubling the concentration of $NaOH$
    b) Is halved by reducing the concentration of $RCl$ by one half
    c) Is increased by increasing the temperature of the reaction
    d) In unaffected by change in temperature
74. Term catalyst was given by
    a) Rutherford b) Berzilius
    c) Wohler d) Kolbe
75. Pb and Sn are extracted from their chief ore by
    a) Electrolysis and self reduction
    b) Self reduction and electrolysis
    c) Carbon reduction and self reduction
    d) Self reduction and carbon reduction
76. Cryolite is
    a) Sodium borofluride
    b) Magnesium silicate
    c) Aluminium
    d) Sodium aluminium fluoride
77. Each of the following is true for white and red phosphorus except that they
    a) Can be oxidised by heating in air
    b) Are both soluble in $CS_2$
    c) Consists of same kind of atoms
    d) Can be converted into one another
78. Brass is an alloy of Cu with
    a) Al b) Sn c) Ag d) Zn
79. Which of the following may be colourless?
    a) $Fe^{3+}$ b) $Cr^{3+}$ c) $Cu^{2+}$ d) $Cu^{+}$
80. The type of magnetism exhibited by $\left[Mn(H_2O]^{2+}\right]$ ion is
    a) Paramagnetism b) Diamagnetism
    c) Both (a) and (b) d) None of these
81. $CHCl_3$ reacts with conc. $HNO_3$ to give
    a) $CCl_3NO_2$ b) $CH_3NO_2$
    c) $CH_3CN$ d) $CH_3CH_2NO_2$
82. An ether is more volatile than an alcohol having the same molecule formula. This is due to
    a) Intermolecular hydrogen bonding in alcohols
    b) Dipolar character of ethers
    c) Alcohols having resonance structures
    d) Intermolecular hydrogen bonding in ether
83. Picric acid is a stronger acid than acetic acid and benzoic acid. It contains
    a) $-\ SO_3H$ group
    b) Two $-COOH$ groups
    c) Phenolic group
    d)
84. The product obtained in the reaction



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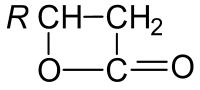
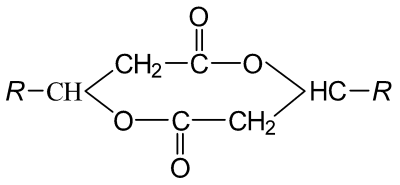
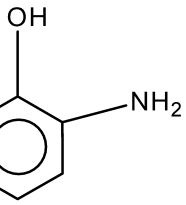
    a) 
    b) 
    c) $RCH = CHCOOH$
    d) None of the above
85. In the reaction

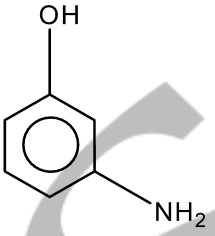
$R - C\equiv N + 4(H)\, X \rightarrow RCH_2NH_2$

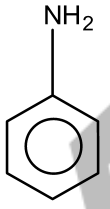
$X$ can be

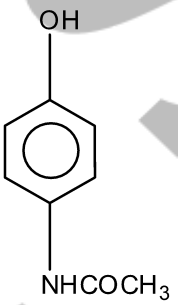
a) $LiAlH_4$ b) $H_2SO_4$ c) $Ni$ d) $2KBr$

86. Name of method use to separate primary, secondary and tertiary amines is
    a) Hofmann method b) Lucas method
    c) Victor Meyer method d) Kolbe method
87. An example of a sulphur containing amino acid is
    a) Lysine b) Serine c) Cysteine d) Tyrosine
88. An example of natural biopolymer is
    a) Teflon b) Nylon-6 6 c) Rubber d) DNA
89. Terylene is a polymer obtained from
    a) Ethylene glycol and glycerol
    b) Ethylene glycol and glyceraldehydes
    c) Ethylene glycol and terephthalic acid
    d) None of the above
90. Which of the following gives paracetamol on acetylation?

a) 


b) 


c) 


d) 


91. The term 'Taxonomy' was introduced by
    a) de Candolle b) Bentham and Hooker
    c) Linnaeus d) Huxley
92. …A… is a collection of pressed, dried and preserved plants …B… labelled arranged systematically for further reference
    A and B in the above statement refers to
    a) A-Herbarium; B-mounted on thin film
    b) A-herbarium; B-mounted on a paper sheet
    c) A-Museum; B-mounted on a iron sheet
    d) A-Garden; B-mounted on a paper sheet
93. In plants growth occur by … throughout their life span.
    Choose an appropriate option to complete the given NCERT statement
    a) Cell dedifferentiation b) Cell differentiation
    c) Cell multiplication d) None of these
94. The 'witches broom' is caused by a
    a) Virus b) Mycoplasma
    c) Bacterium d) Fungus
95. Deuteromycetes is commonly known as imperfect fungi because
    a) Only the asexual phase of these fungi is known
    b) Only the vegetative phase of these fungi is known
    c) Only the asexual or vegetative phases of these fungi are known
    d) Only sexual phase of these fungi are known
96. The characteristic features of bryophytes are
    I. main plant body is gametophytic
    II. main plant body is sporophytic
    III. requirement of water for fertilisation
    Which of the statements given above are correct?
    a) I and II
    b) I and III
    c) II and III
    d) I, II and III
97. Mannitol is the stored food in
    a) *Chara* b) *Porphyra*
    c) *Fucus* d) *Gracillaria*
98. Which of the following is correctly states as it happens in the common cockroach?
    a) Oxygen is transported by haemoglobin in blood
    b) Nitrogenous excretory product is urea
    c) The food is ground by mandibles and gizzard
    d) Malpighian tubules are excretory organs projecting out from the colon
99. Which of the following is correct for the circulatory system of cockroach?
    a) It is present on the dorsal side and it has thirteen units of heart in abdominal region
    b) It is present on the ventral side and it has ten abdominal and three thoracic units of heart
    c) It is present on the ventral side and it has thirteen units of heart in abdominal region
    d) It is present on the dorsal side and it has ten abdominal and three thoracic units of heart

100. In coelomates, the problem of diffusion of food from gut to tissues is solved by
   a) The presence of coelomic fluid.
   b) Churning the food within the body cavity.
   c) Developing a circulatory system.
   d) Developing gut associated glands.

101. What is the botanical name of mulberry?
   a) *Morus* b) *Anthere a* c) *Attacus* d) *Solanum*

102. The plumule and radicle are enclosed in sheath which are called
   a) Aleurone layer, scutellum
   b) Aleurone layer, coleoptile
   c) Aleurone layer, coleorhiza
   d) Coleoptile, coleorhiza

103. Perigynous type of ovary is found in
   a) Plum b) Rose
   c) Pearch d) All of these

104. Presence of persistent calyx is a feature of family
   a) Solanaceae b) Gramineae
   c) Malvaceae d) Compositae

105. Fascicular, interfascicular and extra-stelar cambium together constitutes
   a) Ground meristem b) Apical meristem
   c) Intercalary meristem d) Lateral meristem

106. Secondary phloem remains functional generally
   a) For one year
   b) For less than one year
   c) For many years
   d) As long as plant is alive

107. The number of vasa efferentia that arises from testes in frog's male reproductive system is
   a) 9 – 12 b) 10 – 12 c) 13 – 16 d) 16 – 19

108. Cells of areolar tissues that produces or secrete fibres are called
   a) Fibroblast
   b) Mast cells
   c) Macrophage
   d) Adipocytes

109. Which of the following cellular organelles is/are bound by a single membrane?
   Peroxisomes, lysosomes, mitochondria
   a) Only peroxisomes but not lysosomes and mitochondria
   b) Both peroxisomes and lysosomes but not mitochondria
   c) All of the three organelles
   d) None of the three organelles

110. Which one is referred to as soluble RNA?
   a) $m$RNA b) $t$RNA c) $r$RNA d) $ss$RNA

111. Select the correct constituents of protein
   a) Carbon, hydrogen, oxygen and nitrogen
   b) Carbon, hydrogen, nitrogen and sulphur
   c) Carbon, hydrogen, nitrogen, oxygen and sulphur
   d) Carbon, hydrogen and oxygen

112. A bond formed between carboxyl group of one amino acid and amino group of adjacent amino acid, is called
   a) Peptide bond b) Hydrogen bond
   c) Covalent bond d) All of these

113. Which one of the following precedes re-formation of the nuclear envelope during M-phase of the cell cycle?
   a) Decondensation from chromosome and reassembly of the nuclear lamina
   b) Transcription from chromosomes and reassembly of the nuclear lamina
   c) Formation of the contractile ring and formation of the phragmoplast
   d) Formation of the contractile ring and transcription from chromosomes

114. The plane of alignment of chromosome at the metaphase stage of cell cycle is referred to as the
   a) Prophase plate b) Metaphase plate
   c) Anaphase plate d) Telophase plate

115. Plants growing on hills are likely to show
   a) Higher rates of transpiration
   b) Lower rates of transpiration
   c) Same rate of transpiration as in plains
   d) Lower rates of transpiration provided the stomata are sunken

116. Cohesion theory of water movement in plants was put forth by
   a) Melvin cycle b) F F Blackman
   c) T W Engelmann d) Henry Dixon

117. Which of the following get accumulated in the vacuoles of guard cells during stomatal opening?
   a) Water, calcium and magnesium
   b) Starch, potassium and chloride ions
   c) Malate, sodium and potassium ions
   d) Malate, potassium and chloride ions

118. Soilless culture helps in knowing
   a) Toxicity caused by an element
   b) Deficiency symptoms caused by an element
   c) Essentially of an element
   d) All of the above

119. An element playing important role in nitrogen fixation is
a) Molybdenum b) Copper
c) Manganese d) Zinc

120. $C_4$ pathway for $CO_2$-fixation was proposed by
a) Benson and associates
b) Arnon and associates
c) Rouhani et *al.,*
d) Hatch et *al.,*

121. Solarisation is
a) Formation of chlorophyll b) Destruction of chlorophyll
c) Utilization of sunlight d) Effects of solar light

122. In plants the cells in the interior parts are
a) Dead and for mechanical support
b) Live and for various purpose
c) Both (a) and (b)
d) None of the above

123. Cyanide resistant pathway is
a) Anaerobic respiration b) Aerobic respiration c) Both (a) and (b) d) None of these

124. Environment heterophylly is seen in
a) Cotton b) Coriander
c) Larkspur d) Buttercup

125. Identify two physiological processes induced by two different phytohormones having a common precursor, which is formed due to the catalytic activity of pyruvic dehydrogenase complex.
I. more female folwers in cucumber.
II. a-amylase production in barley grain.
III. Acceleration of fruit ripening in tomato.
IV. Delay in sprouting of potato tubers. the correct combination is
a) I and II b) I and III c) II and IV d) III and IV

126. The study of different aspects or appearance of plants in different seasons of the year is called
a) Ecology b) Ecosystem
c) Phenology d) Demography

127. Improper balance diet may cause
a) Self-poisoning
b) Scarcity of moisture in eyes
c) Feeble muscles
d) All of the above

128. Note the following
I. Dentition is heterodont.
II. Canines are poorly developed.
III. Incisors are chisel-like poorly developed.
IV. Herbivorous and diastema is present.
V. The dental formula is I 2/1, C 0/0, Pm 3/2, M 3/3
Which of the above are true for *Oryctolagus*?
a) I, II and IV b) I, IV and V
c) I, II, IV and V d) III, IV and V

129. Breathing involves ...A... during which atmospheric air is drawn in and ...B... by which the alveolar air is released out.
Choose the correct option for A and B to complete the given NCERT statement
a) A-expiration; B-osmosis
b) A-expiration; B-inspiration
c) A-inspiration; B-expiration
d) A-inspiration; B-diffusion

130. Which one of the following has the smallest diameter?
a) Right primary bronchus
b) Left primary bronchus
c) Trachea
d) Respiratory bronchiole

131. Which of the following blood vessels in the circulatory system of frog has more deoxygenated blood?
a) Pulmonary artery
b) Precaval veins
c) Pulmocutaneous artery
d) Pulmocutaneous vein

132. Bicuspid and tricuspid valve opens when
a) Blood from the pulmonary artery and vena cava flows into the left and right ventricles, respectively
b) Blood from the pulmonary vein and vena cava flows into left and right ventricles, respectively
c) Blood from the pulmonary vein and vena cava flows into left and right atrium, respectively
d) Oxygen from the pulmonary vein and vena cava flows into left and right atrium, respectively

133. Human urine as compared to human blood is
a) Hypotonic b) Hypertonic
c) Isotonic d) All of these

134. GFR (Glomerular Filtration Rate) is the amount of filtrate formed by the kidney per
a) Hour b) Second
c) Minute d) 10 seconds

135. Major nitrogenous waste product in ureotelic animals like rabbit and other mammals is

a) Uric acid b) Urea
c) Ammonia d) Amino acids

136. I. Sarcoplasmic reticulum are abundant
II. Myoglobin content is high
III. Sarcoplasmic reticulum are moderate
IV. Aerobic muscles
V. Depends on anaerobic respiration for energy
VI. Less myoglobin content
Select the option with correct statements for red muscle
a) I, II and IV b) I, II and III
c) II, III and IV d) II and IV

137. In the centre of each I-band there is an elastic fibre called
a) I-line b) Z-line c) A-line d) H-zone

138. Neural canal is
a) Solid portion of vertebrae through which the neural canal passes
b) Hollow portion of vertebrae through which the neural canal passes
c) Both (a) and (b)
d) None of the above

139. The respiratory rhythm centre is present in the
a) Cerebrum
b) Cerebellum
c) Hypothalamus
d) Medulla oblongata

140. Which of the following parts of a neuron is covered by fatty sheath?
a) Axon b) Cyton
c) Dendrite d) Node of Ranvier

141. Hormone responsible for the secretion of milk after parturition is
a) ICSH b) Prolactin
c) ACTH d) LH

142. Which is not involved as second messenger in $Ca^{2+}$ mediated hormone
a) $c$AMP b) DAG
c) Phospholipase d) $IP_3$

143. Even in absence of pollinating agents seed-setting is assured in:
a) *Zostera* b) *Salvia*
c) Fig d) *Commellina*

144. Oestrus cycle is cyclic changes in the activities of ovaries and accessory duct during
a) Reproductive (seasonal) period
b) Maturation period
c) Ageing period
d) Juvenile period

145. PEC (Primary Endosperm Cell) is formed
a) After triple fusion b) Before triple fusion c) At the time of syngamy d) Always persiste d

146. Which of these cells is the largest cell of the ovule?
a) Antipodal cell
b) Central cell
c) Megaspore mother cell
d) The size of the cells varies from species to species and none of the given above can be treated as largest

147. What is pollen grain?
a) Microspore mother cell
b) Male gamete
c) Male gametophyte
d) Partially developed embryo

148. Which of the following statement is correct?
a) $hCG$, $hPL$ and relaxin are produced women only during pregnancy
b) During pregnancy the level of other hormones like oestrogens, progestogens, cortisol, prolactin, thyroxine, etc., are increased several folds in the maternal blood
c) Increased production of hcG, hPL, progesterone, etc., is essential for supporting the foetal growth, metabolic changes in the mother and maintenance of pregnancy
d) All of the above

149. Male pronucleus is
I. Head of sperm
II. Neek of sperm
III. Middle piece of sperm
IV. Tail of sperm
a) I and III
b) III and IV
c) I
d) II and IV

150. Exact time of human gestation period is
a) 9 month $\pm$ 15 days b) 9 month $\pm$ 20 days
c) 9 month $\pm$ 7 days d) 9 month $\pm$ 1 days

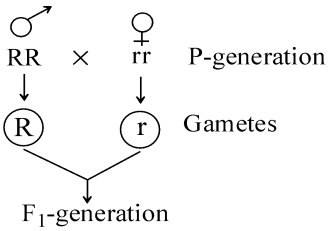
151. Cushion of fatty tissue covered by skin and pubic hair is called
a) Mono pubis b) Labia majora
c) Labia minora d) Clitoris

152. Identify the correct statements
I. Infertility is the inability to produce viable offsprings due to the defects in the female partner

II. Complete lactation helps in contraception
III. Spreading awareness can help to create a reproductively healthy society
a) II only
b) I, II and III
c) II and III
d) I and III

153. Condoms are one of the most popular contraceptives because of the following reasons:
a) These are effective harriers for insemination
b) They do not interfere with coital act
c) These help in reducing the risk of STDs
d) All of the above

154. Find out the genotype and phenotype of $F_1$ -generation (R = dominant and red, r = recessive and white) from the given cross




a) Rr and white b) Rr and red
c) Rr and pink d) Can not predict

155. In previous question find out the ratio between round and wrinkled seed texture
a) 3 : 1 b) 2 : 2 c) 1 : 1 d) 9 : 6 : 1

156. Single gene can produce more than one effect. Like starch synthesis in pea plant. It has two alleles (B and b) for starch synthesis the phenotypes of which are also given below
B B, b b, B b
I. BB – round seed, large starch synthesis
II. bb – wrinkle seed, less starch synthesis
III. Bb – intermediate size seed, intermediate less starch synthesis
Choose the correct option
a) I and II
b) II and III
c) III and I
d) I, II and III

157. During transcription, RNA polymerase holoenzyme binds to a gene promoter and assumes a saddle-like structure. What is its DNA-binding sequence?
a) TTAA b) AATT c) CACC d) TATA

158. Who coined the term 'cistron'?
a) Muller b) Benzer c) Khorana d) Sutton

159. Which species of human ancestor was named lucy?
a) Heidelberg man b) Cro-magnon man
c) *Australopithecus africanus* d) *Ramapithecus punjabicus*

160. Theory of continuity of germplasm was given by
a) August Weismann
b) Lamarck
c) Darwin
d) Wallace

161. Short lived immunity acquired from mother to foetus across placenta or through mother's milk to the infant is categorized as
a) Active immunity
b) Passive immunity
c) Cellular immunity
d) Innate or non-specific immunity

162. The specific parts of the antibody molecule that binds the antigen are called
a) Heavy chain
b) Small chain
c) Antigen binding site
d) Antibody bindings side

163. MRI is not allowed in the following conditions except one. Identify the exception
a) Presence of pace-maker in the body
b) Pregnant women
c) Person suffering from stroke
d) Presence of metallic plate in the body from treatment of broken bones

164. An old breeding technique is:
a) Introduction b) Selection
c) Mutation breeding d) Hybridisation

165. The domesticated birds used for food or for their eggs are called
a) Poultry b) Egg farming
c) Apiculture d) Dairy farming

166. By which of the following methods, new and better varieties of plants can be formed?
a) Selection
b) Grafting
c) Hybridization
d) Hybridization followed by selection

167. Somatic hybridization is a technique of
a) Natural breeding
b) Natural pollination
c) Artificial pollination
d) Somatic cells Hybridization

168. Two microbes found to be very useful in genetic engineering are:
a) Diplococcus sp. and Pseudomonas sp.

b) Crown gall bacterium and Caenorhabditis elegans
c) Escherichia coli and Agrobacterium tumefaciens
d) Vibrio cholerae and a tailed bacteriophage

169. Which of the following would not be used in preparing recombinant DNA?
a) Plasmids
b) Phages
c) Restriction enzymes
d) DNA polymerase III

170. Which one of the following can help in the diagnosis of a genetical disorder?
a) ELISA b) ABO blood group
c) PCR d) NMR

171. Which variety of rice was patented by a US company even through the highest number of varieties of this rice is found in India?
a) Basmati
b) Parmal
c) Lerma Roja
d) CO-668

172. Which of the following transgenic human protein product has been used to treat emphysema?
a) α-1 antitrypsin b) α-1 globulin
c) Cry I Ab protein d) Cry II Ac protein

173. I. Biochemical adaptation are seen in organisms living in great depth of the ocean to face crushing pressure
II. Allen's rule is explain mammals living in colder climates
III. Altitude sickness is caused because of body not getting enough oxygen due to low atmospheric pressure at high altitude
IV. Desert lizards lack behavioural means to manage to their body temperature
Choose the correct option for above adaptations
a) I, II and III b) I, II and IV
c) II, III and IV d) I, III and IV

174. Choose the wrong statement
a) Natality and immigration increases the population density
b) Mortality and emigration decreases the population density
c) Adverse condition does not effect the population density
d) Food availability and predation pressure affect population density

175. A plant is
a) An autotroph b) A heterotroph
c) A primary producer d) Both (a) and (c)

176. Primary productivity is
a) The rate of formation of new organic matter by consumers
b) The rate of conversion of light into chemical energy in an ecosystem
c) The rate of energy production per unit area over a time period during photosynthesis
d) None of the above

177. Plants like *Aegle marmelos*, *Ocimum sanctum* and *Ficus religiosa* are a group of plants designated as
a) Medicinal plant species
b) Lesser known food plants
c) Traditional food crops
d) Sacred species of plants

178. An inexhaustible, non-conventional universal source of energy is
a) Wind energy b) Solar energy
c) Hydrothermal energy d) Tidal energy

179. Which are sensitive to $SO_2$ pollution?
a) Mosses b) Algae c) Lichen d) Ferns

180. Cigarette smoking causes
a) Skin cancer b) Blood cancer
c) Bone cancer d) Lung cancer

# Mukesh Sir's Group Tuitions

**Date** : 14/05/2016 **NEET - 2016** **TEST ID: 14**

**Time** : 03:00:00 **PCB** **Marks** : 720

## : ANSWER KEY :

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1) | a | 2) | a | 3) | c | 4) | d | 5) | c | 6) | d | 7) | d |
| 8) | a | 9) | d | 10) | d | 11) | a | 12) | b | 13) | b | 14) | d |
| 15) | a | 16) | d | 17) | a | 18) | a | 19) | a | 20) | d | 21) | d |
| 22) | b | 23) | d | 24) | a | 25) | c | 26) | b | 27) | a | 28) | d |
| 29) | c | 30) | c | 31) | c | 32) | c | 33) | c | 34) | a | 35) | b |
| 36) | c | 37) | c | 38) | b | 39) | a | 40) | d | 41) | c | 42) | a |
| 43) | c | 44) | b | 45) | d | 46) | d | 47) | a | 48) | b | 49) | c |
| 50) | a | 51) | d | 52) | b | 53) | b | 54) | d | 55) | c | 56) | c |
| 57) | a | 58) | a | 59) | d | 60) | b | 61) | c | 62) | b | 63) | c |
| 64) | a | 65) | d | 66) | a | 67) | b | 68) | d | 69) | c | 70) | c |
| 71) | a | 72) | a | 73) | b | 74) | b | 75) | d | 76) | d | 77) | b |
| 78) | d | 79) | d | 80) | a | 81) | a | 82) | a | 83) | d | 84) | c |
| 85) | a | 86) | a | 87) | c | 88) | d | 89) | c | 90) | d | 91) | a |
| 92) | b | 93) | c | 94) | d | 95) | c | 96) | b | 97) | c | 98) | c |
| 99) | d | 100) | c | 101) | a | 102) | d | 103) | d | 104) | a | 105) | d |
| 106) | d | 107) | b | 108) | a | 109) | b | 110) | b | 111) | c | 112) | a |
| 113) | a | 114) | b | 115) | a | 116) | d | 117) | d | 118) | d | 119) | a |
| 120) | d | 121) | b | 122) | c | 123) | a | 124) | d | 125) | d | 126) | c |
| 127) | d | 128) | b | 129) | c | 130) | d | 131) | a | 132) | c | 133) | b |
| 134) | c | 135) | b | 136) | a | 137) | b | 138) | b | 139) | d | 140) | a |
| 141) | b | 142) | a | 143) | c | 144) | a | 145) | a | 146) | d | 147) | c |
| 148) | d | 149) | c | 150) | c | 151) | a | 152) | c | 153) | d | 154) | b |
| 155) | a | 156) | d | 157) | d | 158) | b | 159) | c | 160) | a | 161) | b |
| 162) | c | 163) | a | 164) | b | 165) | a | 166) | d | 167) | d | 168) | c |
| 169) | d | 170) | c | 171) | a | 172) | a | 173) | a | 174) | c | 175) | d |
| 176) | b | 177) | d | 178) | b | 179) | c | 180) | d | | | | |

## : HINTS AND SOLUTIONS :

**Single Correct Answer Type**

1 **(a)**

$Calorie$ is the unit of heat *i. e.*, energy

So dimensions of energy $= ML^2T^{-2}$

2 **(a)**

The result has to be in one significant umber only.

3 **(c)**

For first case $v^2 - 0^2 = 2gh \Rightarrow (3)^2 = 2gh$

For second case

$v^2 = (-u)^2 + 2gh = 4^2 + 3^2 \therefore v = 5km/h$

4 **(d)**

Tension in the string $T_0 = mR\omega_0^2$

In the second case

$T = m(2R)\left(4\omega_0^2\right) = 8mR\omega_0^2 = 8T_0$

5 **(c)**

Here, $m = 2\ kg, r = 1\ m, v = 4\ ms^{-1}$

Tension at the bottom of the circle,

$T_L = mg + \frac{mv^2}{r}$

$= 2\times10 + \frac{2\times4^2}{1} = 52N$

6 **(d)**

law of conservation of momentum gives

$m_1v_1 = m_2v_2$

$\Rightarrow \frac{m_1}{m_2} = \frac{v_2}{v_1}$

$But,\ \ m = \frac{4}{3}\pi r^3\rho$

$or\ m \propto r^3$

$\therefore \frac{m_1}{m_2} = \frac{r_1^3}{r_2^3} = \frac{v_2}{v_1}$

$\Rightarrow \frac{r_1}{r_2} = \left(\frac{1}{2}\right)^{1/3}$

$\therefore r_1 : r_2 = 1 : 2^{1/3}$

7 **(d)**

$F = mnv = 150\times10^{-3}\times20\times800 = 2400\ N$

8 **(a)**

If after the collision of two bodies, the total kinetic energy of the bodies remains the same as it was before the collision, and also momentum remains same, then it is a case of perfectly elastic collision.

Momentum before collision= Momentum after collision

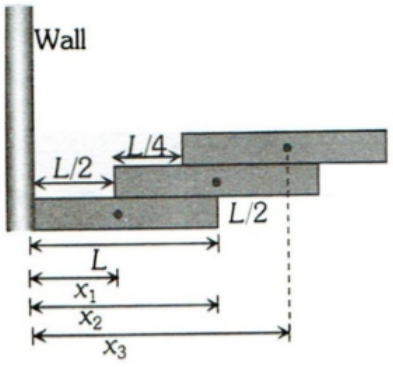
Kinetic energy before collision

=Kinetic energy after collision

Also, $u_1 - u_2 = -\left(v_1 - v_2\right)$

Where $(u_1 - u_2)$ is the relative velocity before the collision and $(v_1 - v_2)$is the relative velocity after the collision. Thus, in a perfectly elastic collision the relative velocity remains unchanged in magnitude, but is reserved in direction. Hence, velocity of the last ball is $-\ 0.4\ ms^{-1}$.

9 **(d)**




From figure, $x_1 = \frac{L}{2},\ x_2 = \frac{L}{2} + \frac{L}{2} = L$

$$x_3 = \frac{L}{2} + \frac{L}{4} + \frac{L}{2} = \frac{5L}{4}$$

$$\therefore X_{CM} = \frac{m_1x_1+m_2x_2+m_3x_3}{m_1+m_2+m_3}$$

$$= \frac{M\times\frac{L}{2}+M\times L+M\times\frac{5L}{4}}{M+M+M} = \frac{\frac{11}{4}ML}{3M} = \frac{11L}{12}$$

10 **(d)**

Centripetal force $F = \frac{mv^2}{r} = \frac{m}{r}\frac{L^2}{m^2r^2} = \frac{L^2}{mr^3}$

$$\left[As\ L = mvr \therefore v = \frac{L}{mr}\right]$$

11 **(a)**

$U = \frac{-GMm}{r}$ or $r = \frac{-GMm}{U}$

$$r = \frac{-6.67\times10^{-11}\times6\times10^{24}\times7.4\times10^{22}}{-7.79\times10^{38}}$$

$$= 3.8\times10^{8}m$$

12 **(b)**

Volume of cylindrical wire, $V = \frac{\pi r^2 L}{4}$,

where $x$ is the diameter of wire

Differentiating both sides

$\frac{dV}{dx} = \frac{\pi}{4}\left[2xL + x^2 \bullet \frac{dL}{dx}\right]$

Also, volume remains constant

$\therefore \frac{dV}{dx} = 0$

$\therefore 2xL + x^2\frac{dL}{dx} = 0$

$\Longrightarrow 2xL = -x^2\frac{dL}{dx}$

$\Longrightarrow \frac{\frac{dx}{x}}{\frac{dL}{L}} = -\frac{1}{2}$

Poisson's ratio $= -\frac{1}{2}$.

13 **(b)**

Terminal velocity

$v = \frac{2}{9}\frac{r^2(\rho-\sigma)g}{\eta}$

$v\alpha r^2$

$\frac{v}{V} = \frac{r^2}{R^2} \Rightarrow V = \frac{vR^2}{r^2}$

14 **(d)**

Angel of contact is defined as the angle inside the liquid between the tangent to the solid surface and the tangent to the liquid surface at the point contact.

Hence, it depends on orientation of solid surface in liquid.

15 **(a)**

If $l_t$ be length of rod at $t$°C and $l_0$ at 0°C, then

$$l_t = l_0(1 + \alpha t)$$

Where α is coefficient of linear expansion.

$\Rightarrow l_t$ is proportional to α. Since $\alpha_c > \alpha_s$, therefore copper will expand more, so rod bends with copper on convex side and steel on concave side.

16 **(d)**

$\frac{1}{2}Mv^2 = C_V.\Delta T$

$\frac{1}{2}Mv^2 = \frac{R}{\gamma-1}.\Delta T \Rightarrow \Delta T = \frac{M.v^2(\gamma-1)}{2R} = \frac{(\gamma-1)Mv^2}{2R}$

17 **(a)**

Here, $Q_1 = 200cal,\ Q_2 = 150cal,\ T_1 = 400K$

As $\frac{Q_1}{Q_2} = \frac{T_1}{T_2}$

$\therefore T_2 = \frac{Q_2}{Q_1} \times T_1 = \frac{150}{200}\times400 = 300K$

18 **(a)**

$v_{rms} = \sqrt{\frac{3RT}{M}} \Rightarrow \frac{v_2}{v_1} = \sqrt{\frac{T_2}{T_1}} = \sqrt{\frac{(273+90)}{(273+27)}} = 1.1$

% increase $= \left(\frac{v_2}{v_1} - 1\right)\times100 = 0.1\times100 = 10\%$

19 **(a)**

$T \propto \frac{1}{\sqrt{k}} \Rightarrow T_1 : T_2 : T_3 = \frac{1}{\sqrt{k}} : \frac{1}{\sqrt{k/2}} : \frac{1}{\sqrt{2k}} = 1 : \sqrt{2} : \frac{1}{\sqrt{2}}$

20 **(d)**

Spring is cut into two equal halves so spring constant of each part $= 2k$

These parts are in parallel so

$K_{eq} = 2K + 2K = 4K$

Extension force ($i.e.\ W$) is same hence by using $F = kx$

$\Rightarrow 4k \times x' = kx \Rightarrow x' = \frac{x}{4}$

21 **(d)**

$Given,\ f_0 - f_c = 2 \quad ...(i)$

Frequency of fundamental mode for a closed organ pipe,

$f_c = \frac{v}{4L_c}$

Similarly frequency of fundamental mode an open orgen pipe,

$f_0 = \frac{v}{2L_0}$

Given $L_c = L_0$

$\Rightarrow f_0 = 2f_c \quad ...(ii)$

From Eqs. (i) and (ii), we get

$f_0 = 4Hz$

And $f_c = 2Hz$

When the length of the open pipe is halved, its frequency of fundamental mode is

$f_0^{'} = \frac{v}{2\left[\frac{L_0}{2}\right]}$

$= 2f_0 = 2\times4Hz = 8Hz$

When the length of the closed pipe is doubled, its frequency of fundamental mode is

$f_0^{'} = \frac{v}{4(2L_c)}$

$= \frac{1}{2}f_c = \frac{1}{2}\times2 = 1Hz$

Hence, number of beats produced per second is

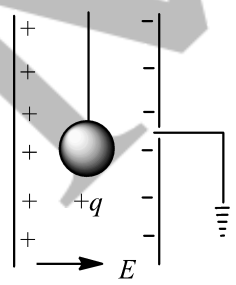
$f_0^{'} = f^{'} = 8 - 1 = 7$

22 **(b)**

The same force will act on both bodies although their directions will be different

23 **(d)**

Time period of simple pendulum in air




$T = 2\pi\sqrt{\frac{l}{g}}$

When it is suspended between vertical plates of a charged parallel plate capacitor, then acceleration due to electric field,

$a = \frac{qE}{m}$

This acceleration is acting horizontally and acceleration due to gravity is acting vertically. So effective acceleration.

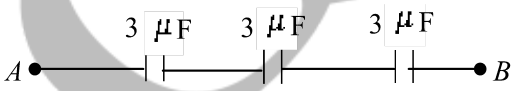
$g^{''} = \sqrt{g^2 + a^2} = \sqrt{g^2 + \left(\frac{qE}{m}\right)^2}$

Hence,

$T^{''} = 2\pi\sqrt{\frac{1}{\sqrt{g^2+\left(\frac{qE}{m}\right)^2}}}$

24 **(a)**

The two capacitors each of value $1.5\mu F$ are in parallel. So, their equivalent capacitance




$= 1.5 + 1.5 = 3\,\mu F$

Now, three capacitors each of value $3\mu F$ are in series. Hence, their equivalent capacitance is given by

$\frac{1}{C} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$

or $\frac{1}{C} = \frac{3}{3}$

or $c = 1\mu F$

25 **(c)**

Average current

$i = \frac{50+100+50}{3} = \frac{200}{3}\text{mA}$

$z = \frac{m}{it} = \frac{3m}{200\times10^{-3}\times30} = \frac{m}{2}$

26 **(b)**

In series, current,

$i_1 = \frac{2E}{2+2r}$

In parallel, current,

$i_2 = \frac{E}{2+\frac{r}{2}} = \frac{2E}{4+r}$

According to the question

$i_1 = i_2$

$\Rightarrow \frac{2E}{4+r} = \frac{2E}{2+2r}$

$\Rightarrow \quad r = 2\Omega$

27 **(a)**

The current taken by the silver voltameter

$I_1 = \frac{n}{Zt} = \frac{1}{11.2\times10^{-4}\times30\times60} = 0.496\ A$

and by copper voltameter

$I_2 = \frac{1.8}{6.6\times10^{-4}\times30\times60} = 1.515\ A$

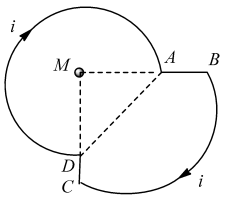
The current $I = \left(I_1 + I_2\right) = 2.011\ A$

Power $P = IV = 2.011\times12 = 24.132\ J/sec$

28 **(d)**

(i) Magnetic field at the centre due to the curved portion $DA = \frac{\mu_0 i}{4\pi R}\left(\frac{3\pi}{2}\right)$

According to right hand screw rule, the magnetic field will be into the plane of paper.




(ii) Magnetic field at $M$ due to $AB$ is zero.

(iii) Magnetic field at the centre due to the curved portion $BC$ is $\frac{\mu_0 i}{4\pi 2R}\left(\frac{\pi}{2}\right)$. According to

right hand screw rule, the magnetic field will be into the plane of paper.

(iv) Magnetic field at $M$ due to $DC$ is zero.

Hence, the resultant magnetic field at $M$

$= \frac{3\mu_0 i}{8R} + 0 + \frac{\mu_0 i}{16R} + 0 = \frac{7\mu_0 i}{16R}$

29 **(c)**

It is due to the magnetic field produced by coil

30 **(c)**

$B_V = B_H \tan\tan\phi$ ; If $B_V = B_H$, then

$\tan\tan\phi = 1$ or $\phi = 45°$

31 **(c)**

Given, self inductance, $L = 1.8\times10^{-4}H$

Resistance, $R = 6\Omega$

When self inductance and resistance is broken up into identical coils.

Then, self inductance of each oil

$= \frac{1.8\times10^{-4}}{2}H$

Resistance of each oil

$= \frac{6\Omega}{2} = 3\Omega$

Coil are then connected in parallel

$\therefore \quad L' = \frac{\frac{1.8}{2}\times10^{-4}\times\frac{1.8}{2}\times10^{-4}}{\frac{1.8}{2}\times10^{-4}+\frac{1.8}{2}\times10^{-4}}$

$= 0.45\times10^{-4}H$

and $R' = \frac{3\times3}{3+3} = 1.5\Omega$

Time constant $= \frac{L'}{R'}$

$= \frac{0.45\times10^{-4}}{1.5} = 0.3\times10^{-4}s$

32 **(c)**

$\therefore \ \phi = Mi$

$\therefore \ M = \frac{\phi}{i} = \frac{0.4}{2} = 0.2$ H

33 **(c)**

Impedance $Z = \sqrt{R^2 + X^2} = \sqrt{(8)^2 + (6)^2} = 10\Omega$

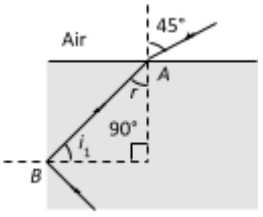
35 **(b)**

At point $A$, by Snell's law

$\mu = \frac{\sin\sin 45}{\sin\sin r} \Rightarrow \sin\sin r = \frac{1}{\mu\sqrt{2}} \quad ...(i)$

At point $B$, for total internal reflection

$\sin\sin i_1 = \frac{1}{\mu}$




From figure, $i_1 = 90 - r$

$\therefore \sin\sin(90° - r) = \frac{1}{\mu}$

$\Rightarrow \cos\cos r = \frac{1}{\mu} \quad ...(ii)$

Now $\cos\cos r = \sqrt{1 - r} = \sqrt{1 - \frac{1}{2\mu^2}}$

$= \sqrt{\frac{2\mu^2-1}{2\mu^2}}$ ...(iii)

From equation (ii) and (iii), $\frac{1}{\mu} = \sqrt{\frac{2\mu^2-1}{2\mu^2}}$

Squaring both side and then solving, we get

$\mu = \sqrt{\frac{3}{2}}$

37 **(c)**

When white light is used in Young's double slit experiment, then different coloures will be split up on the viewing screen according to their wavelength while the central fringe will be white.

38 **(b)**

From Einstein's photoelectric equation the maximum kinetic energy of photoelectrons emitted from metal surface is given by

$$E_k = hv_1 - W$$

Where $W$ is work function of metal.

Given, $W = hv$ and $v_1 = 4v$

$\therefore \quad E_k = 4hv - hv = 3hv$

41 **(c)**

Average life $\frac{1}{\lambda} = \frac{1600}{0.693} = 2308 \approx 2319\ years$

42 **(a)**

Here, $T = 4.47\times10^9 yr$

$\frac{N}{N_0} = \frac{60}{100} = \left(\frac{1}{2}\right)^n or\ 2^n = \frac{10}{6}$

$n \log log\ 2 = \log log\ 10 - \log log\ 6 = 1 - 0.77$

$n = \frac{0.222}{\log log\ 2} = \frac{0.222}{0.3} = 0.74$

$t = nT = 0.74\times4.47\times10^9 yr$

$= 3.3\times10^9 yr$

44 **(b)**

Area covered= $\pi\times2Rh$

$= \frac{22}{7}\times2\times6.4\times10^6\times75$

$= 3017.1\ km^2$

45 **(d)**

Here, $h = 150\ km,\ v = 300\ kHz,$

$v_c = 100\ kHz$

$D_{skip} = 2h\sqrt{\left(\frac{v}{v_c}\right)^2 - 1}$

$= 2\times150\times10^3\sqrt{\left(\frac{300\times10^2}{100\times10^3}\right) - 1}$

$= 849\ Hz$

46 **(d)**

In a chemical reaction, coefficient represents mole of that substance.

$X + 2Y \longrightarrow Z$

This indicates 1 mole of $X$ reacts with 2 moles of $Y$ to form 1 mole of$Z$.

So, 5 moles of $X$ will require 10 moles of$Y$. But we have taken only 9 moles of $Y$.

Hence, $Y$ is in limiting quantity. Hence, we determine product from $Y$.

Thus, 5 moles of $X$ react with 9 moles of $Y$ to form 4 moles of $Z$.

47 **(a)**

Mohr's salt is $\left(NH_4\right)_2 SO_4.FeSO_4.6H_2O$

The equation is

$5Fe^{2+} + MnO_4^- + 8H^+ \rightarrow 5Fe^{3+} + Mn^{2+} + 4H_2O$

Total change in oxidation number of iron

$= (+3) - (+2)$

$= +1$

So, equivalent wt. of Mohr's salt

$= \frac{Mol.wt.of\ Mohr's\ salt}{1}$

$= \frac{392}{1}$

$= 392$

48 **(b)**

Wave-nature of electrons was first demonstrated by de-Broglie's who gave following equation for the wavelength of electrons

$$\lambda = \frac{h}{mv}$$

49 **(c)**

According to rules of quantum number the possible values of $n, l, m\ and\ s\ are$

$n = 1$ to $\infty$ any whole number
$l = 0$ to $(n - 1)$ for every value of $n$
$m = -l$ to zero to $+l$ for every value of $l$
$s = \frac{1}{2} or -\frac{1}{2}$

. $n = 4, l = 3, m = 0$

All the values are according to rules.

. $n = 4, l = 2, m = 1$

All the values are according to rules.

. $n = 4, l = 4, m = 1$

$\because$The value of $l$ can have maximum $(n - 1)$ value *i. e.*, 3 in this case.

$\therefore$ This set of quantum numbers is non-permissible.

. $n = 4, l = 0, m = 0$

All the values are according to rules.

$\therefore$ Choice (a), (b) and (d) are permissible.

50 **(a)**
Element F O N C
Electronegativity 4.0 3.5 3.1 2.5
$\therefore$ Correct order of electronegativity
F>O>N>C or F>N<O>C

51 **(d)**
Valence bond theory (Resonance theory) of metallic bond was given by Pauling (1937). According to this theory, the metallic bonding is essentially covalent in origin and metallic structure exhibits resonance of electro-pair bonds between each atom and its nearest neighbours. In other words, there is a resonance of a large number of canonical forms.

52 **(b)**
Hydrogen bonding $\propto$ electronegativity

53 **(b)**
In face centred cubic structure, contribution of $\frac{1}{8}$ by each atompresent on the corner and $\frac{1}{2}$ by each atom present on the face

54 **(d)**
Given, $\Delta E = -5\ cal,\ \Delta S = -10\ cal\ K^{-1}$

$$A(g) + B(g) \rightarrow C(g)$$
$$\Delta H = \Delta E + \Delta nRT$$
$$= -5 - 1\times2.0\times298 = -601$$
$$\Delta G = \Delta H - T\Delta S$$
$$= -601 - 298\times(-10) = 2379$$

cal
So, none of the given option is correct.

55 **(c)**
Above 983 K, free energy change for the formation of $CO_2$ is more negative than that for ferric oxide. Thus, above this temperature, carbon has a higher affinity towards oxidation than iron.

56 **(c)**
$K_c = \frac{[product]}{[reactant]}$
$0.41 = \frac{[product]}{[reactant]}$
$\Rightarrow \quad [product] = 0.41\times[reactant]$
$\Rightarrow \quad [product] < [reactant]$
Therefore, reaction proceeds in backward direction, *i.e.*, more $PCl_5$ will be formed.

57 **(a)**
$$Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow 2Cr^{3+} + 7H_2O + 3I_2$$

$Cr_2O_7^{2-}$ is reduced to $Cr^{3+}$.
Thus, final state of Cr is +3. Hence, (a)

58 **(a)**
$$\overset{0}{Li} + H_2 \longrightarrow \overset{+1\ -1}{2LiH}$$

Oxidation number of hydrogen is decreasing from 0 to $-1$. So, $H_2$ is acting as oxidising agent in this reaction.

60 **(b)**
$NaOH + CaO$ is called soda lime. 3 : 1

61 **(c)**
Carbon suboxide has linear structure with C−C bond length equal to 130 Å and C−O bond length equal to 120 Å
$$O = C = C = C = O \leftrightarrow {}^{-}O - C{\equiv}C - C{\equiv}O^{+}$$

62 **(b)**

Aluminium is obtained by electrolysing alumina dissolved in cryolite ($Na_3AlF_6$)

$$4Na_3AlF_6 \rightleftharpoons 12\,Na^+ + 4Al^{3+} + 12F^-$$

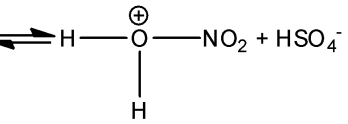
$4Al^{3+} + 12e^- \longrightarrow 4Al$ (at cathode)

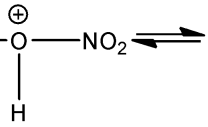
$12F^- \longrightarrow 6F_2 + 12e^-$ (at anode)

$2Al_2O_3 + 6F_2 \longrightarrow 4AlF_3 + 3O_2$

63 **(c)**

During nitration of benzene the attacking electrophile is $NO_2^+$. It is formed as follows by reaction between $HNO_3$ and $H_2SO_4$.

(I) $HNO_3 + H_2SO_4 \rightleftharpoons$  $+ HSO_4^-$

(II)  $\rightleftharpoons H_2O + NO_2^+$ (nitronium ion)

66 **(a)**

Methyl isocyanate (MIC) gas was released during Bhopal tragedy

67 **(b)**

Sodium chloride ($NaCl$) has face centred cubic structure. It contains 4 $Na^+$ and 4 $Cl^-$ in the unit cell. Each $Na^+$ is surrounded by 6 $Cl^-$ ions and $vice - versa.$

68 **(d)**

Number of atoms at corner $= 8\times\frac{1}{8} = 1$

Number of atoms at face centres $= 6\times\frac{1}{2} = 3$

$\therefore$ The formula of the compound is $XY_3$.

69 **(c)**

$$\frac{p^0 - p_s}{p^0} = \frac{w}{m} \times \frac{M}{w}$$

$$\frac{0.30\,mm}{17.54\,mm} = \frac{20}{m} \times \frac{18}{100} \Rightarrow m = \frac{20\times18\times17.54}{0.30\times100} = 210.4$$

70 **(c)**

Molality depends only upon weights, not on volumes whereas other given concentration terms depend upon the volume of solution. Volume of solution increases with rise in temperature but temperature does not affect the weights, therefore molality is independent of temperature .

71 **(a)**

$\kappa = \frac{1}{R} \times$cell constant

$\therefore$ Cell constant$= \kappa\times R = 0.012\times55 = 0.66\,cm^{-1}$

72 **(a)**

When volume is reduced to one fourth, concentration become four times. Hence, the rate of reaction becomes 16 times as compared to the initial rate.

73 **(b)**

$RCl + NaOH \rightarrow ROH + NaCl$

$Rate = k[RCl]$

For this reaction rate of reaction is depends upon the concentration of $RCl$

It means, the rate of reaction is halved by reducing the concentration of $RCl$ by one half

75 **(d)**

$PbO$ and $PbSO_4$ get reduced by $PbS$ itself which is already present in mixture, because the reduction takes place by mixture itself, hence is known as self reduction

$2PbO + PbS\,\Delta\rightarrow 3Pb + SO_2\uparrow$

$PbSO_4 + PbS\,\Delta\rightarrow 2Pb + 2SO_2\uparrow$

77 **(b)**

White phosphorus is soluble in $CS_2$ whereas red phosphorus is insoluble in it

78 **(d)**

Brass is an alloy of copper with zinc.

79 **(d)**

Cu

$3d^{10}$ $4s^1$

| ↿⇂ | ↿⇂ | ↿⇂ | ↿⇂ | ↿⇂ | | 1 |
|---|---|---|---|---|---|---|

$Cu^+$

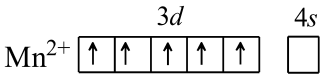
$3d^{10}$ $4s^0$

| ↿⇂ | ↿⇂ | ↿⇂ | ↿⇂ | ↿⇂ | | |
|---|---|---|---|---|---|---|

$Cu^{+}$ is colourless due to the absence of unpaired electron

80 **(a)**

In presence of $H_2O$ which is a weak ligand no pairing occurs which results in unpaired electrons left in the compound, due to which it shows paramagnetism




81 **(a)**

Chloroform reacts with conc. $HNO_3$ to give chloropicrin which is used as tear gas.

$$CHCl_3 + HNO_3 \xrightarrow{\Delta} CCl_3NO_2 + H_2O$$

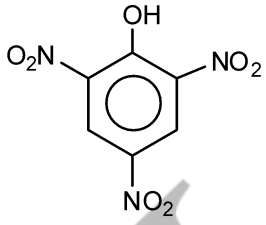
chloropicrin

82 **(a)**

Due to intermolecular hydrogen bonding, alcohols are less volatile than ether

83 **(d)**

Picric acid is 2, 4, 6-trinitrophenol. It is due to presence of three $-I$ showing $-NO_2$ groups, is more acidic than acetic acid and benzoic acid.




2,4,6-trinitrophenol
(picric acid)

85 **(a)**

$$R - C\equiv N + 4[H] \xrightarrow{LiAlH_4} RCH_2NH_2$$

86 **(a)**

5. In Hofmann method, a mixture of primary, secondary and tertiary amines is treated with diethyloxalate, when primary amine forms solid oxamide, secondary amine forms a liquid oxamic ester whereas tertiary amine remains unaffected.

$$\left(COOC_2H_5\right)_2 + 2HNHR \rightarrow (CONHR)_2 + 2C_2H_5OH$$

Diethyl oxalate 1° amine solid

$$CONR_2$$

$$\left(COOC_2H_5\right)_2 + HNR_2 \rightarrow |$$

$$COOC_2H_5 + C_2H_5OH$$

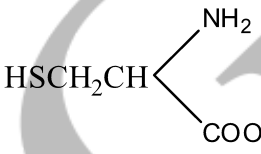
2°amine liquid

$$\left(COOC_2H_5\right)_2 + NR_3 \rightarrow \text{No reaction}$$

3° amino

87 **(c)**

Structure of cysteine is




88 **(d)**

DNA is a natural biopolymer.

89 **(c)**

Ethylene glycol on reaction with terephthalic acid forms the polymer terylene(also known as Dacron or terene) which is used as synthetic fibre.

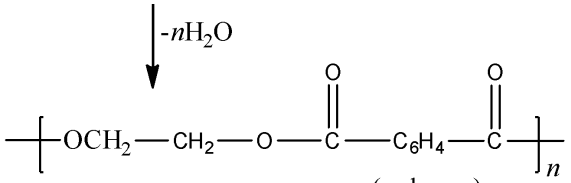
$$n\,HOCH_2\,.\,CH_2OH + n\,HOOC\,.\,C_6H_4\,.\,COOH$$

Ethylene glycol terephthalic acid

$$\downarrow -\,n\,H_2O$$

$n$ HOCH$_2$.CH$_2$OH + $n$HOOC.C$_6$H$_4$.COOH

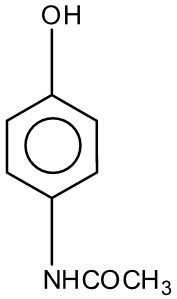
ethylene glycol terephthalic acid




(polymer)
terylene

90 **(d)**

The structure of an important antipyretic, paracetamol is




So, *p*-amino phenol gives paracetamol on acetylation.

91 **(a)**
The term 'taxonomy' was introduced by **A P de Candolle** (1813)in his book, **'TheorieElementarie de la Botanique' (Theory of Elementary Botany)**. Father of taxonomy is regarded to **Carolus Linnaeus.**

92 **(b)**
A **herbarium** (A) is a collection/place of pressed dried and preserved plants specimen **mounted on a paper sheets** (B) labelled and arranged systematically for further reference

93 **(c)**
In plant growth occurs by cell division or multiplication continuously in all parts throughout their life span

94 **(d)**
Witches broom is a disease of cherries caused by *Taphrina cerasi*, a member of fungal class-Ascomycetes.

95 **(c)**
Deuteromycetes are commonly known as imperfect fungi because only the sexual or vegetative phases of these fungi are known

96 **(b)**
In bryophytes, the haploid gametophyte is dominant, long lived, green and independent whereas the diploid sporophyte is short lived and dependent upon the gametophyte. Water is essential for reproduction. The sex organs are multicellular and jacketed with sterile jacket

97 **(c)**
*Fucus* belongs to class-Phaeophyceae, in which reserve food is found in form of laminarian, mannitol and oil.

98 **(c)**
In cockroach, mandibles are a pair of hard, strong, large, dark coloured triangular structures which move in horizontal motion and crush food between them. Gizzard or proventriculus has an outer layer of thick circular muscles and thick inner cuticle forming six highly chitinous plate called teeth. The gizzard acts as the grinding chamber and helps in grinding the food particles.

99 **(d)**
Circulatory system of cockroach is open or lacunar type. The blood flows through haemocoelic system. Heart of cockroach is a dorsal, pulsatile 13 chambered (ten abdominal and three thoracic chambers) structure.

100 **(c)**
In coelomates, the problem of diffusion of food from gut to tissues is solved by developing a circulatory system. After digestion and absorption, most of the absorbed food materials are passed into paracellular spaces (in between the enterocytes) from where they enter blood capillaries and then transported to tissues.

101 **(a)**
Botanical name of mulberry is *Morus alba*, it belongs to family-Moraceae.

102 **(d)**
In monocotyledonous seeds, the embryo is small and situated in a groove at one end of the endosperm. Embryo consists of one large and shield shaped cotyledon known as scutellum and a short axis with a plumule and a radicle. The plumule and radicle are enclosed in sheaths which are called coleoptile and coleorhiza, respectively

103 **(d)**
In perigynous ovary, the gynoecium is situated in the centre and other part are located on the rim of thalamus having same level. This type of ovary is called half inferior. *e*. *g*., plum, rose and peach

104 **(a)**
The calyx of family-Solanaceae is gamosepalous, persistant and after much enlarged in fruit.

105 **(d)**
**Lateral meristem** is that meristem, which occur on the sides and helpful in increasing width of stem and root. They divide mainly in one plane (periclinal), **increasing the diameter** of an organ, *e.g.,* cambium (fascicular and interfascicular

cambium), extra stellar cambium, cork cambium and marginal meristem of some leaves.

106 **(d)**
Secondary phloem remains functional as long as plant is alive.

107 **(b)**
The number of vasa efferentia that arises from the testes in frog's male reproductive system is 10-12. They enter the kidneys on their sides and open into the Bidder's canal and finally, it communicates with the urinogenital duct that comes out of the kidneys and opens into the cloaca

108 **(a)**
The fibroblasts are the principle cells of the areolar tissue. They are large, flat, stellate cells with long processes and oval nucleus. They secrete matrix and the material of which, the fibres are formed

109 **(b)**
The lysosomes are bound by a single unit membrane of 75Å. The peroxisomes are also surrounded by a single unit membrane of about 60Å thickness. The mitochondria is surrounded by double layered membrane.

110 **(b)**
*t*RNA is referred to as soluble RNA.

111 **(c)**
The proteins are composed of carbon, hydrogen, oxygen, nitrogen and sulphur. Certain proteins may contain phosphorous, iron or other elements also

112 **(a)**
A peptide bond is a chemical bond formed between two molecules when the carboxyl group of one molecule reacts with the amino group of the other molecule; thereby releasing a molecule of $H_2O$. This is a dehydration synthesis reaction and usually occurs between amino acids. The resulting bond is a peptide bond and the resulting molecules is an amide.

113 **(a)**
At telophase stage, nuclear membrane vesicles associate with the surface of individual chromosome and fuse to reform the nuclear membranes, which partially enclose cluster of chromosomes before coalescing to reform the complete nuclear envelope. During this process, the nuclear pores reassemble and reassociate to form the nuclear lamina. One of the lamina proteins (lamina-B) remains with the nuclear membrane fragments throughout mitosis and may help nucleate reassembly. After the nucleus reforms, the pores pump in nuclear proteins, the chromosome decondense and RNA synthesis resumes, causing the nucleolus to reappear.

114 **(b)**
The plane of alignment of the chromosomes at metaphase is referred to as the **metaphase plat.**
*They key features of metaphase are*
(i) Spindle fibres attach to kinetochores of chromosomes
(ii) Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibres to both poles

115 **(a)**
Because of low atmospheric pressure which permits more rapid diffusion of water. Such plants develop xerophytic characters to avoid this situation

116 **(d)**
The cohesion tension theory for ascent of sap (water movement) in plants was proposed by **Henry Dixon** and **Jolly** (1894) and greatly supported and elaborated by **Dixon** (1914, 1924). At present, it is most acceptable theory for ascent of sap, according to which continuous water column, cohesion and adhesion forces and transpiration pull are responsible for movement of water in the xylem.

117 **(d)**
**Levitt** (1974) proposed the proton transport concept to explain the mechanism of opening of stomata uptake of $K^+$ takes place. The uptake of $K^+$ is balanced by $Cl^-$ uptake. The malic acid dissociate into hydrogen and malate ion. The synthesis of malic acid in

guard cells accompanies the influx of potassium ions.

118 **(d)**
Soilless culture helps in knowing the essentially of an element as well as the diseases it may cause due to its deficiency and the toxicity caused by an element

119 **(a)**
**Molybdenum** is absorbed as molybdate by plants. It is involved in nitrogen metabolism including nitrogen fixation. It is a component of enzyme nitrogenase and acts as enzyme activator. Its deficiency causes chlorosis and necrosis, whiptail of cauliflower and premature leaf fall.

120 **(d)**
The detailed study of $C_4$-cycle was introduced by **M D Hatch** and **C R Slack** (1966).

121 **(b)**
Photosynthesis starts at quite low intensity of light but very high intensity cause solarisation, *i.e.*, disintegration of chlorophyll molecules. Solarisation may reduce the photosynthetic activity.

122 **(c)**
It is a fact that the living cells are organised in thin layers inside and beneath the bark. They also have dead cells in the interior which provide mechanical support

123 **(a)**
Cyanide is a deadly poison of respiration and inhibit the activity of cytochrome-c oxidase complex (which contains cytochrome-a and cytochrome-$a_3$) of electron transport chain of aerobic respiration. Thus, no proton gradient will be established and no ATP will be formed. Along with as the reduction of NADH and FAD$H_2$ is also ceased due to blockage of ETS, the availability of hydrogen acceptors like NA$D^+$ and FAD is ceased for Krebs' cycle and glycolysis. Cyanide resistance pathway is anaerobic respiration.

124 **(d)**
Environmental heterophylly is the difference in shapes of leaves produced in air and water. Buttercup represents the heterophyllous development due to environment

125 **(d)**
Ethylene causes acceleration of fruit ripening in tomato and maleic hydrazide (an auxin) delays sprouting of potato tubers. Precursors of both of these phytohormones are produced due to the catalytic activity of pyruvate dehydrogenase complex.

126 **(c)**
A calendar year plant shows the period of active vegetative, growth, flowering, fruiting, senescence and dormancy. The different aspects or appearances of plants in different seasons of year is called phenology. They are controlled not only by seasons and other environmental factors, but also by metabolism, heredity, and internal signals

127 **(d)**
Balance diet possesses the major component it of the food in requisite proportion, which is required for the maintenance of health, activity, growth and development. Therefore, it must contain carbohydrates (60-70%), fats (15-25%), proteins (10-15%), vitamins, minerals electrolytes, etc.

128 **(b)**
*Oryctolagus cuniculus* (rabbit) is a good representative of class-mammalia. Dentituion in all the mammals are heterodont (*i. e*., dissimilar teeth). Canine is one, pointed in each maxillary of upper jaw and each dentary of lowar jaw. In rabbit and other herbivorous mammals, canines are absent. Hence, some parts of gums between incisors and other teeth remain teethless and called diastema.
Rabbit possesses three pairs of wall developed, sharp, chisel like incisors, two pairs in the premaxillaries of upper jaw and one pair in denteries of lowar jaw. Dental formula of rabbit is :
$I\frac{2}{1},\ C\frac{0}{0},\ Pm\frac{3}{2}, M\frac{3}{3} \times 2 = 28$

129 **(c)**
A-inspiration; B-expiration

131 **(a)**
In frog, **pulmonary artery** is a paired artery that carry more deoxygenated blood from the right ventricle of the heart to the lungs.

133 **(b)**
The urine is hypertonic (*i. e*, it has higher osmotic pressure than the blood plasma).

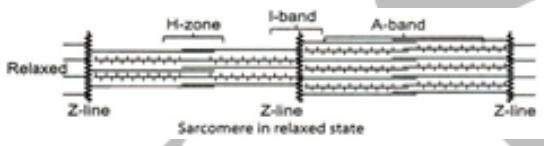
134 **(c)**
**GFR** The amount of the filtrate formed by the kidneys per minute is called glomerular filtration rate. GFR in healthy individual is 125 mL/minute, *i.e.*, 180 litres per day

135 **(b)**

| Animal | Excretory Product | Example |
|---|---|---|
| Uricotelic | Uric acid | Reptiles |
| Ammonot-elic | Urea | Sponges |
| Ureotelic | Ammonia | Mammals like rabbit |
| Aminoteli-c | Amino -acids | In some animal, amino acids are excreted in small amount |

136 **(a)**
Red muscle certain high myoglobin arobically respire and have high number of sarcoplasmic reticulum

137 **(b)**




The thick filaments lies parallel to one another and thin filaments are present in orderly array between the thick filaments. In the centre of the I-band, there is a band of amorphous material called Z-line. In the middle of the A-band a comparatively less dark zone called H-zone of band is present. The area between the two Z-lines is called sarcomere. M-line is present, in the middle of H-zone

138 **(b)**
Hollow portion of vertebrae through which the neural canal passes

139 **(d)**
Medulla oblongata is the centre for heart beats, respiration, blood pressure, etc.

140 **(a)**
Neuron or nerve cell is the longest cell and and forms unit of nervous tissue.
Neurons consists of two main parts:
(i)Main body, which has cell organelles like nucleus, cyton.
(ii)Long process, known as axon, which conducts impulse away from the cell body and remains covered by a fatty sheath known as myelin sheath.
Dendrites are processes that arise from the cell body.

141 **(b)**
Prolactin is secreted by the lactotopes cells of anterior pituitary. In humans, it may act as a mild growth hormone but its main physiological effect is to activate growth of breast during pregnancy and secretion of milk by mammary glands after childbirth. That's why, it is often referred to as 'maternity hormone'.

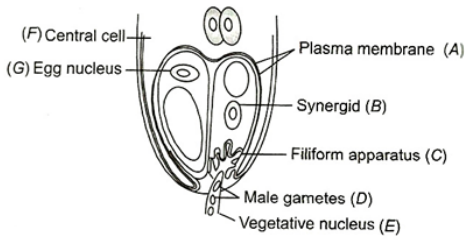
142 **(a)**
Second messengers are molecules that relay signals received at receptors on the cell surface-such as the arrival of protein hormones, growth factors etc to larger in the cytosol or nucleus. The major second messengers are *c*AMP, *c*GMP, $IP_3$,DAG and $Ca^{2+}$.

*c*AMP is not involved as second messenger in $Ca^{2+}$ mediated hormone action.

144 **(a)**
Generally, the oestrus cycle takes place in the seasonal breeders. It is the cyclic change in the activity of ovaries and accessory duct during reproductive (seasonal) period

145 **(a)**
Primary endosperm cell ($3n$) formed by fusion of male and polar nuclei.
After entering the ovule the pollen tube is attracted toward the micropylar end. The attractant is secreted by filiform apparatus. The pollen tube pierce one of the two synergid and releases its gametes. Out of the two male gametes one fuses with egg to perform generative fertilization (syngamy)
It gives rise to the diploid zygote. The nucleus of the second male gametes fuses with the two haploid polar nuclei to form triploid endosperm

nucleus. This second fertilization is called vegetative fertilization



Egg apparatus showing entry of pollen tube into a synergid

146 **(d)**

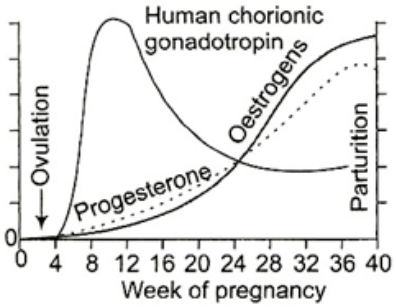
**Central cell** is the largest cell of embryo sac and is mother cell of endosperm. The enlargement of the embryo sac after the last nuclear division is largely due to inflation of the large central vacuole of central cell.

147 **(c)**

Pollen grain is the haploid ($n$) small, male gametophyte covered by two membrane outer 'exine' and inner 'intine'.

148 **(d)**

*hCG*, *hpG*, and relaxin are produced during pregnancy. During pregnancy the level of other hormone like oestrogen, progesterone, cortisol, prolactin, thyroxin, etc., are increased several folds in maternal blood. Increased production of these hormones is essential for supporting the foetal growth, metabolic changes in the mother and maintenance of pregnancy




149 **(c)**

Sperm entry stimulates the secondary oocyte to complete the suspended second meiotic division. This produces a haploid mature ovum and a second polar body. The head of the sperm which contains the nucleus separates from the middle piece and tail and becomes male pronucleus. The second polar body and the sperm tail degenerates. The nucleus of the ovum is now called female pronucleus. The male and female pronucleus move towards each other. Their nuclear membrane disintegrates; mixing up of the chromosome of a sperm and an ovum is called *karyogamy* or amphimixis. The fertilized ovum (egg) is now called zygote

150 **(c)**

The duration of pregnancy in human being is about 9 month $\pm$7 days, which is called gestation period. Infact, the gestation period is the time from conception till birth

151 **(a)**

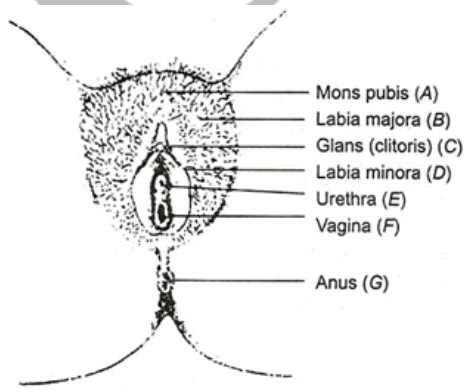
*External genitalia (vulva) of female has following parts*

(i) **Mons Pubis** It is the anteriormost portion of the external genitalia which is covered by the skin and pubic hairs. It acts as a cushion during intercourse

(ii) **Labia Majora** These are fleshy folds of tissue which extend down from the mons pubis and surrounds the vaginal opening

(iii) **Labia Minora** These are paired folds of tissue under the labia majora

(iv) **Hymen** The opening of vagina covered partially by a membrane called hymen



External genitalia of female

(v) **Clitoris** is a tiny finger-like structure which lies at the upper junction of the two labia minora above urethral opening

152 **(c)**

Infertility is the inability to produce viable offspring due to the defects in its female or male partner

154 **(b)**

Rr and red because the R is dominant r so, the $F_1$ -hybrid will be red

155 **(a)**

3 : 1

**Law of Independent Assortment**

Mendel also worked with and crossed pea plants that different in two characters/factor.

He crossed between pea plant that has seeds with yellow colour and round shape and other that has seeds of green colour and wrinkled shaped.
Ratio appeared as 9 : 3 : 3 : 1 such ratio appeared for several character that Mendel studied
9/16 = Yellow round  3/16 = Yellow wrinkled
3/16 = Green yellow  1/16 = Green wrinkled
Based on such observation Mendel concluded second law of inheritance called law of independent assortment.
According to this principle or law the two factors of each character assort or separate independent of the factors of other characters at the time of gamete formation and get randomly re-arranged in the offspring producing both parental and new combination of traits.
Thus, the phenotypic ratio of a dihybrid cross is 9 : 3 : 3 : 1. The occurrence of four types of plants (more than parental types) in the $F_2$ generation of dihybrid cross shows that the factors of each of the two characters assort independent of the others as if the other pair of factors are not present. It can also be proved by studying the individual characters of seed colour and seed texture sepraterly.
**Seed colour** Yellow (9+3 = 12) : Green (3+1 = 4) or 3 : 1
**Seed Texture** Round (9+3 = 12) : Wrinkled (3+1 = 4) or 3 : 1
The result of each character similar to monohybrid ratio. Generally, the dihybrid cross used to study the independent assortment of genes

156 **(d)**
All the given statements are correct.
Occasionally a single gene product may produce more than one effect. For example starch synthesis in pea seeds is controlled by one gene. It has two allele (B and b). Starch is synthesized effectively by BB and have bigger grains. In contrast bb homozygous have lesser efficiency in starch synthesis and produce smaller grains
*In starch synthesis gene following condition to seen*
BB – rounded (due to more starch synthesis)
bb – wrinkled (due to less starch synthesis)
Bb – in between rounded of wrinkled size. It produce starch of intermediate quantity between BB to bb homozygous condition. So, it is incomplete dominance.
Therefore, dominance is not an autonomous feature of a gene or the product that it has information for. It depends as much on the gene product and the production of a particular phenotype from this product as it does on the particular phenotype that we choose to examine, in case more than one phenotype is influenced by the same gene

157 **(d)**
**TATA** box is present in eukaryotic promoter region. It has a resemblance with Pribnow box of prokaryotes. TATA box was identified by **Dr. Hogness** and so, it is called as Hogness box. It is a 7 bp long region located 20bp upstream to the start point. During the process of transcription, the RNA polymerase (aholoenzyme, which has a core unit and a sigma factor for proper initiation of transcription) binds to TATA box due to which DNA assumes a saddle, like structure at this place.

158 **(b)**
The term 'cistron' was first introduced by **Benzer**. It refers to a portion of DNA coding for one polypeptide chain or other gene product.

159 **(c)**
In 1981 Donald Johanson found a 3.2 million years old skeleton of a female human ancestor. He nick named it Lucy. Lucy's scientific name is *Australopithecus africanus*

160 **(a)**
Theory of continuity of germplasm was give by **August Weismann** (1834-1914).
Theory of continuity of germplasm by **August Weismann** (1834-1914). A German biologist, was the main opposer of the inheritance of acquired characters. He put forward the theory of continuity of germplasm. According to Weismann, the characters influencing the germ cells are only inherited. There is a continuity of germplasm (protoplasm of germ cells) but the somatoplams (protoplasm of somatic cells) is not transmitted to the next generation. Hence, it do not carry characters to the next generation. Weismann cut off the tails of rats for as many as 22 generations and allowed them to breed, but tailless rats were never born

161 **(b)**
Passive immunity involves either the transfer of antibodies or of WBCs from an immune to a non-immune person. It may be natural, *e.g.,*

transferred from mother to child across the placenta or through mother's milk to the infant or artificial, *e.g.,* cultured antibodies, antivenoms etc.

162 **(c)**
Antigen binding site.
At the tip of each arm of the Y-shaped molecule is an area called the antigen binding site, which is formed by a portion of the heavy and light chains. Every immunoglobulin molecule has at least two of these sites, which are identical to one another

165 **(a)**
Poultry.
Poultry includes the class of domesticated fowl (birds) used for food or for their eggs. The common poultry birds are chickens, turkeys, ducks, geese, quinea-fowls and pigeons

167 **(d)**
**Somatic hybridization** is a process of obtaining hybrids by fusion of protoplast *in vitro.*

170 **(c)**
PCR is a technique, in which a small fragment of DNA is rapidly cloned or duplicated to produce multiple DNA copies. Thus, it helps in the diagnosis of a genetical disorder. This technique was conceived by American biochemist **Kary B Mullis.**

171 **(a)**
The diversity of rice in India is one of the richest in the world. Basmati rice is distinct for its aroma and flavour and 27 documented varieties of Basmati are grown in India. There is reference to Basmati in ancient books as it has been grown for centuries.
In 1997, an American company got patent rights on Basmati rice through the US patent and Trademark office. This allowed the company to sell a new variety of Basmati, in the US and abroad. This new variety of basmati had actually been derived from Indian farmer's varieties. Indian Basmati was crossed with semi dwarf varieties and claimed as an invention or a novelty

172 **(a)**
Useful biological products can be produced by introducing into transgenic animals the portion of DNA (or genes), which codes for a particular product.
For example, Human protein (4-1-antitrypsin) is used to treat emphysema

173 **(a)**
Desert lizard lack the physiological condition to deal with high temperature of their habitat, but manage to keep their body temperature fairly constant by behavioural means

174 **(c)**
Adverse condition affect the population by influencing on natality and mortality of the population. It also effects the immigration and emigration

175 **(d)**
In a food chain a plant is primary producer. Producers are autotrophic organisms, which alone are able to manufacture organic food from inorganic raw materials in the process of photosynthesis

176 **(b)**
Primary Productivity (PP) is defined as the rate at which radiant energy is converted by the photosynthetic and chemosynthetic autotrophs to organic substances

177 **(d)**
*Aegle marmelos*, *Ocimum sanctum* and *Ficus religiosa* are sacred species of plants. *Aegle marmelos and Ocimum sanctum* are also used as medicinal plants.

178 **(b)**
Energy obtained from sunlight is known as solar energy. It can be exploited as an inexhaustible, non-conventional source of energy.

179 **(c)**
Lichens are sensitive to $SO_2$environment. They cannot grow in sulphur dioxide polluted area. So, lichens are called pollution indicating plants.

180 **(d)**

| Carcinogen | | Cancer tissue |
|---|---|---|
| Cigarette smoke | - | lungs |
| Soot, coal tar | - | Skin |

Leukamemia is blood cancer resulted due to unchecked proliferation of White Blood Cells(WBCs).