Meritstore

NEET

TEST ID: Day 27 – Test 2

Time : 03:00:00 **FULL PORTION** **Marks : 720**

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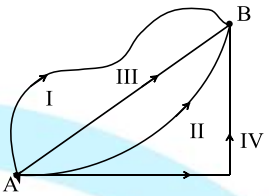
1. There are atomic clocks capab**S**le of measuring time with an accuracy of 1 part in 10^{11}. If two such clocks are operated with precision, then after running for 5000 years, these will record
   a) A difference of nearly 1 s
   b) A difference of 1 day
   c) A difference of 10^{11} s
   d) A difference of 1 year
2. A student performs an experiment for determination of g $\left(=\frac{4\pi^2 l}{T^2}\right)$, $l \approx 1$m, and he commits an error of Δl. For T he takes the time of n oscillations with the stop watch of least count ΔT and he commits a human error of 0.1 s. For which of the following data, the measurement of g will be most accurate?
   a) $\Delta L = 0.5, \Delta T = 0.1, n = 20$
   b) $\Delta L = 0.5, \Delta T = 0.1, n = 50$
   c) $\Delta L = 0.5, \Delta T = 0.01, n = 20$
   d) $\Delta L = 0.5, \Delta T = 0.05, n = 50$
3. A particle starts its motion from rest under the action of a constant force. If the distance covered in first 10 $seconds$ is S_1 and that covered in the first 20 $seconds$ is S_2, then
   a) $S_2 = 2S_1$ b) $S_2 = 3S_1$ c) $S_2 = 4S_1$ d) $S_2 = S_1$
4. When a ceiling fan is switched off its angular velocity reduces to 50% while it makes 36 rotations. How many more rotation will it make before coming to rest (Assume uniform angular retardation)
   a) 18 b) 12 c) 36 d) 48
5. A bullet is to be fired with a speed of 2000 ms^{-1} to hit a target 200 m away on a level ground. If $g = 10\ ms^{-2}$, the gun should be aimed
   a) Directly at the target b) 5 cm below the target
   c) 5 cm above the target d) 2 cm above the target
6. In a gravitational force field a particle is taken from A to B along different paths as shown in figure. Then



   a) Work done along path I will be maximum
   b) Work done along path III will be minimum
   c) Work done along path IV will be minimum
   d) Work done along all the paths will be the same
7. A monkey climbs up and another monkey climbs down a rope hanging from a tree with same uniform acceleration separately. If the respective masses of monkeys are in the ratio 2 : 3, the common acceleration must be
   a) $g/5$ b) $6g$ c) $g/2$ d) g
8. A body falling from a height of $10m$ rebounds from hard floor. If it loses 20% energy in the impact, then coefficient of restitution is
   a) 0.89 b) 0.56 c) 0.23 d) 0.18
9. Moment of inertia of a disc about a diameter is I. Find the moment of inertia of disc about an axis perpendicular to its plane and passing through its rim?
   a) 6 I b) 4 I c) 2 I d) 8 I
10. Two particles of masses 1 kg and 2 kg are located at $x_1 = 0, y_1 = 0$ and $x_2 = 1, y_2 = 0$ respectively. The centre of mass of the system is at
    a) $x = 1, y = 2$ b) $x = 2, y = 1$
    c) $x = \frac{1}{3}, y = \frac{2}{3}$ d) $x = \frac{2}{3}, y = 0$
11. A body of mass 500 g is thrown upward with a velocity 20ms^{-1} and reaches back to the surface of a planet after 20 s. Then the weight of the body on that planet is
    a) 2 N b) 4 N c) 5 N d) 1 N
12. Two wires of same diameter of the same material having the length l and $2l$. If the force F is applied on each, the ratio of the work done in the two wires will be
    a) 1 : 2 b) 1 : 4 c) 2 : 1 d) 1 : 1
13. Eight drops of a density ρ and each of radius a

are falling through air with a constant velocity 375cm s^{-1}. When the eight drops coalesce to from a single drop the terminal velocity of the new drop will be

a) 1.5×10^{-2} ms^{-1} b) 2.4×10^{-2} ms^{-1}
c) 0.75×10^{-2} ms^{-1} d) 25×10^{-2} ms^{-1}

14. A metallic sphere of mass M falls through glycerine with a terminal velocity v. If we drop a ball of mass 8 M of same metal into a column of glycerine, the terminal velocity of the ball will be

a) $2\,v$ b) $4\,v$ c) $8\,v$ d) $16\,v$

15. Calorimeters are made of which of the following

a) Glass b) Metal
c) Wood d) Either (a) or (c)

16. A Carnot engine works between 600 K and 300 K. In each cycle of operation, the engine draws 1000 J of heat energy from the source. The efficiency of the engine is

a) 50% b) 70% c) 20% d) 80%

17. At N.T.P. one mole of diatomic gas is compressed adiabatically to half of its volume, $\gamma = 1.41$. The work done on gas will be

a) $1280\,J$ b) $1610\,J$ c) $1815\,J$ d) $2025\,J$

18. For ideal gas, which statement is not true

a) It obeys Boyle's law
b) If follows $PV = RT$
c) Internal energy depends on temperature only
d) It follows Vander-Waal's equation

19. The kinetic energy of a particle executing S.H.M. is 16 J when it is in its mean position. If the amplitude of oscillations is 25 cm and the mass of the particle is 5.12 kg, the time period of its oscillation is

a) $\frac{\pi}{5}s$ b) $2\pi\ s$ c) $20\pi\ s$ d) $5\pi\ s$

20. Two points are located at a distance of 10 m and 15 m from the source of oscillation. The period of oscillation is 0.05 sec and the velocity of the wave is 300 m/sec. What is the phase difference between the oscillations of two points

a) π b) $\frac{\pi}{6}$ c) $\frac{\pi}{3}$ d) $\frac{2\pi}{3}$

21. In a stationary wave, all particles are

a) At rest at the same time twice in every period of oscillation
b) At rest at the same time only once in every period of oscillation
c) Never at rest at the same time
d) Never at rest at all

22. 4 point charges each $+q$ is placed on the circumference of a circle of diameter $2d$ in such a way that they form a square. The potential at the centre is

a) 0 b) $\frac{4q}{d}$ c) $\frac{4d}{q}$ d) $\frac{q}{4d}$

23. Two charges each equal to $\eta q\left(\eta^{-1} < \sqrt{3}\right)$ are placed at corners of an equilateral triangle of side a. The electric field at the third corner is E_3 then (where $E_0 = q/4\pi\varepsilon_0 a^2$)

a) $E_3 = E_0$ b) $E_3 < E_0$ c) $E_3 > E_0$ d) $E_3 \geq E_0$

24. There are 10 condensers each of capacity 5 μF. The radio between maximum and minimum capacities obtained from these condenses will be

a) 25 : 5 b) 40 : 1 c) 60 : 3 d) 100 : 1

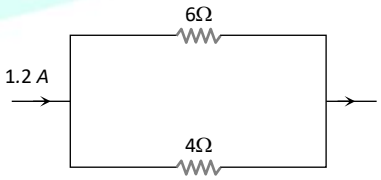
25. The thermo emf of a thermo-couple is found to depend on temperature T (in degree Celsius) as $E = 4T - \frac{T^2}{200}$, where T°C is the temperature of the hot junction. The neutral and inversion temperature of the thermocouple are (in degree celsius)

a) 100, 200 b) 200, 400 c) 300, 600 d) 400, 800

26. A dry cell of emf 1.5 V and internal resistance 0.10Ω is connected across a resistor in series with a very low resistance ammeter. When the circuit is switched on, the ammeter reading settles to a steady rate of 2A. Find (i) chemical energy consumption of the cell (ii) energy dissipation inside the cell (iii) energy dissipation inside the resistor (iv) power output of source is

a) (i) 3 W (ii) 0.4 W (iii) 2.6 W (iv) 2.6 W
b) (i) 0.4 W (ii) 3 W (iii) 2.6 W (iv) 2.6 W
c) (i) 2.6 W (ii) 0.4 W (iii) 9 W (iv) 1 W
d) None of the above

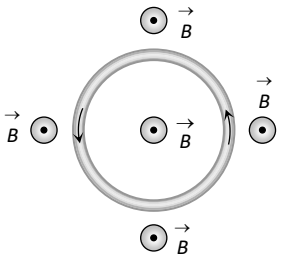
27. In the figure given below, the current passing through 6Ω resistor is



a) 0.40 $ampere$ b) 0.48 $ampere$
c) 0.72 $ampere$ d) 0.80 $ampere$

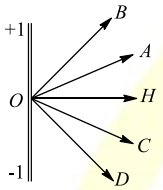
28. An elastic circular wire of length l carries a current I. It is placed in a uniform magnetic field $\vec{B}$ (out of paper) such that its plane is

perpendicular to the direction of $\vec{B}$. The wire will experience



a) No force b) A stretching force
c) A compressive force d) A torque

29. The variation of intensity of magnetization (I) with respect to the magnetizing field (H) in a diamagnetic substance is described by the graph in figure.

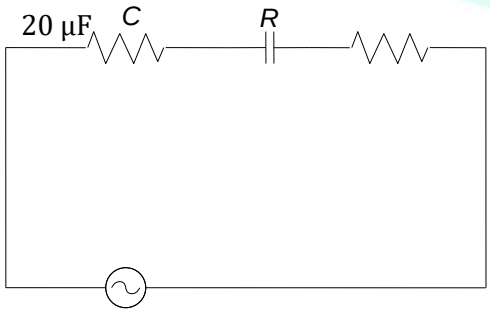


a) OD b) OC c) OB d) OA

30. A magnet is placed on a paper in a horizontal plane for locating neutral points. A dip needle placed at the neutral point will be horizontal at the
a) Magnetic poles b) Magnetic equator
c) Latitude angle 45° d) Latitude angle of 60°

31. The two rails of a railway track insulated from each other and the ground are connected to a milli-voltmeter. What is the reading of the mV, when a train travels at a speed of 180 kmh^{-1} along the track, given that the horizontal components of earth's magnetic field is 0.2×10^{-4} Wbm^{-2} and the rails are separated by 1 m
a) 10^{-2} mV
b) 10 mV
c) 100 mV
d) 1 m V

32. In the L-C-R circuit shown, the impedance is



a) 500 Ω b) 300 Ω c) 100 Ω d) 200 Ω

33. A resistor R, an inductor L and a capacitor C are connected in series to an oscillator of frequency n, if the resonant frequency is n_r, then the current lags behind voltage, when
a) $n = 0$ b) $n < n_r$ c) $n = n_r$ d) $n > n_r$

34. If the earth did not have atmosphere, its surface temperature on a day time would be
a) Higher b) Lower
c) Same as now d) Not sure

35. The band spectra (characteristic of molecular species) is due to emission of radiation
a) Gaseous state b) Liquid state
c) Solid state d) All of three states

36. A point source of light is kept below the surfaces of water in a pond
a) Light emerges from every point of the surface of the pond
b) No light is transmitted from the surface of the pond
c) All the light emitted by the source emerges from a circular region of the pond
d) Some of the light emitted by the source emerges from a circular region of pond

37. Which of the following generates a plane wave front?
a) $\alpha-$ rays b) $\beta-$ rays
c) $\gamma-$ rays d) None of these

38. In Milikan's experiment, an oil drop having charge q gets stationary on applying a potential difference V in between two plates separated by a distance 'd'. The weight of the drop is
a) qVd b) $q\frac{d}{V}$ c) $\frac{q}{Vd}$ d) $q\frac{V}{d}$

39. A photon of energy 8 eV is incident on a metal surface of threshold frequency $1.6 \times 10^{15} Hz$, then the maximum kinetic energy of photoelectrons emitted is ($h = 6.6 \times 10^{-34} Js$)
a) 4.8 eV b) 2.4 eV c) 1.4 eV d) 0.8 eV

40. The ratio of minimum to maximum wavelength in Balmer series is
a) 5: 9 b) 5: 36 c) 1: 4 d) 3: 4

41. The velocity of an electron in the second orbit of sodium atom (atomic number = 11) is v. The velocity of an electron in its fifth orbit will be
a) v b) $\frac{22}{5}v$ c) $\frac{5}{2}v$ d) $\frac{2}{5}v$

42. In hydrogen atom, electron makes transition from $n = 4$ to $n = 1$ level. Recoil momentum of the H atom will be

a) $3.4 \times 10^{-27} N-s$ b) $6.8 \times 10^{-27} N-s$
c) $3.4 \times 10^{-24} N-s$ d) $6.8 \times 10^{-24} N-s$

43. The PN junction diode is used as
a) An amplifier b) A rectifier
c) An oscillator d) A modulator

44. The modulation index of a FM signal is 0.25. If modulating frequency is 2kHz, the maximum derivative in frequency would be
a) 500 Hz b) 1000 Hz c) 1500 Hz d) 500 kHz

45. Numerical aperture of optical fiber is a measure of
a) Its resolving power
b) Its light gathering power
c) The pulse dispersion
d) The attenuation of light through it

46. An unknown element forms an oxide. What will be the equivalent weight of the element if the oxygen content is 20% by weight?
a) 16 b) 32 c) 8 d) 64

47. A sample of AlF_3 contains 3.0×10^{24} F ions. The number of formula units of this sample are
a) 9.0×10^{24} b) 3.0×10^{24}
c) 0.75×10^{24} d) 1.0×10^{24}

48. The energy required to break one mode of $Cl-Cl$ bonds in Cl_2 is 242kJmol^{-1}. The longest wavelength of light capable of breaking a single $Cl-Cl$ bond is
a) 594 nm b) 640 nm c) 700 nm d) 494 nm

49. An electron with values $4, 3, -2$ and $+\frac{1}{2}$ for the set of four quantum numbers n, l, m_1 and m_s, respectively, belongs to
a) $4s$ orbital b) $4p$ orbital
c) $4d$ orbital d) $4f$ orbital

50. The correct decreasing order of first ionisation enthalpies of five elements of the second period is
a) Be > B > C > N > F b) N > F > C > B > Be
c) F > N > C > Be > B d) N > F > B > C > Be

51. Which of the following diatomic molecules would be stabilized by the removal of an electron?
a) C_2
b) CN
c) N_2
d) O_2

52. The d-orbital involed in sp^3d hybridization is
a) $d_{x^2-y^2}$
b) d_{xy}
c) d_{z^2}
d) d_{zx}

53. If a gas contains only three molecules that move with velocities of 100, 200, 500 ms^{-1}. What is the rms velocity of that gas in ms^{-1}?
a) $100\frac{\sqrt{8}}{3}$ b) $100\sqrt{30}$
c) $100\sqrt{10}$ d) $\frac{800}{3}$

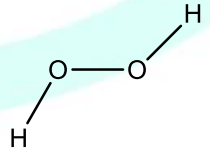
54. If gas, at constant temperature and pressure expands then its
a) Entropy increases and then decreases
b) Internal energy increases
c) Internal energy remains the same
d) Internal energy decreases

55. The heat of combustion of carbon to CO_2 is -393.5 kJ/mol. The heat released upon formation of 35.2 g of CO_2 from carbon and oxygen gas is
a) +315 kJ b) −31.5 kJ c) −315 kJ d) +31.5 kJ

56. For a reaction equilibrium, $N_2O_4(g) \rightleftharpoons 2NO_2(g)$, the concentrations of N_2O_4 and NO_2 at equilibrium are 4.8×10^{-2} and 1.2×10^{-2} mol/L respectively. The value of K_c for the reaction is
a) 3×10^{-3} mol/L b) 3.3×10^{-3} mol/L
c) 3×10^{-1} mol/L d) 3.3×10^{-1} mol/L

57. Which of the following acts as an oxidising as well as reducing agent?
a) Na_2O b) Na_2O_2 c) $NaNO_3$ d) $NaNO_2$

58. Among NH_3, HNO_3, NaN_3 and Mg_3N_2; the number of molecules having nitrogen in negative oxidation state is
a) 1 b) 2 c) 3 d) 4

59. The equilibrium molecular structure of hydrogen peroxide is
Planar as given below
a) 

b) Linear
c) Tetrahedral
d) Non-planar

60. Which of the following is known as dead burnt plaster?
a) Gypsum b) Plaster of Paris
c) Anhydrite d) None of these

61. Which of the following is a mixed oxide?

a) Fe_2O_3 b) PbO_2 c) Pb_3O_4 d) BaO_2

62. Which one shows most pronounced inert pair effect?
a) Si b) Sn c) Pb d) C

63. 5.6 g of an organic compound on burning with excess of oxygen gave 17.6g of CO_2 and 7.2 g of H_2O. The organic compound is
a) C_6H_6 b) C_4H_8
c) C_3H_8 d) CH_3COOH

64. What is the molecular formula of the product formed when benzene is reacted with ethyl chloride in presence of anhydrous aluminium chloride?
a) C_8H_{10} b) C_6H_6 c) C_8H_8 d) C_6H_5Cl

65. Which of the following is present in natural gas?
a) n-butane b) Ethane
c) Methane d) Propane

66. Which of the following is not regarded as a pollutant?
a) NO_2 b) CO_2
c) O_3 d) Hydrocarbons

67. The maximum proportion of available volume that can be filled by hard spheres in diamond is
a) 0.52 b) 0.34 c) 0.32 d) 0.68

68. Which is the wrong statement regarding a crystal containing Schottky defect?
a) Electrical neutrality of the crystal is maintained
b) Entropy of the crystal increases
c) The density of the overall crystal remains the same
d) The density of the overall crystal reduces

69. At low concentrations, the statements that equimolal solutions under a given set of experimental conditions have equal osmotic pressure is true for
a) Solutions of non-electrolytes only
b) Solutions of electrolytes only
c) All solutions
d) None of the above

70. How many grams of sulphuric acid is to be dissolved to prepare 200 mL aqueous solution having concentration of $[H_3O^+]$ ions 1 M at 25°C temperature.
$[H = 1, O = 16, S = 32\ g.mol^{-1}]$
a) 4.9g b) 19.6g c) 9.8g d) 0.98g

71. $Zn^{2+} + 2e^- \rightarrow Zn(s), E° = -0.76$
$Fe^{3+} + e^- \rightarrow Fe^{2+}, E° = -0.77$
$Cr^{3+} + 3e^- \rightarrow Cr, E° = -0.79$
$H^+ + e^- \rightarrow \frac{1}{2} H_2, E° = 0.00$
Strongest reducing agent is
a) H_2 b) Zn c) Fe^{2+} d) Cr

72. Acid hydrolysis of sucrose is a
a) Pseudo first order reaction
b) Zero order reaction
c) Second order reaction
d) Unimolecular reaction

73. The term $\frac{-dc}{dt}$ in a rate equation refers to
a) The decrease in concentration of the reactant with time
b) The concentration of the reactant
c) The change in concentration of the reactant
d) The velocity constant of the reaction

74. In homogeneous catalysis
a) The reactant, catalyst and products are in the same phase
b) The catalyst and reactants are in the same phase
c) The catalyst and products are in the same phase
d) The reactants and products are in the same phase

75. Refractory materials are generally used in furnaces because
a) They can withstand high temperature
b) They are chemically inert
c) They do not require replacement
d) They possess great structural strength

76. Main function of roasting is
a) Oxidation
b) Reduction
c) Slag formation
d) To remove volatile substance

77. Calcium cyanamide on treatment with steam produces
a) $NH_3 + CaO$ b) $NH_3 + CaHCO_3$
c) $NH_3 + CaCO_3$ d) $NH_3 + Ca(OH)_2$

78. The radius of La^{3+} (Atomic number of La = 57) is 1.06 Å. Which one of the following given values will be closest to the radius of Lu^{3+}? (Atomic number of Lu=71)
a) 1.60 Å b) 1.40 Å c) 1.06 Å d) 0.85 Å

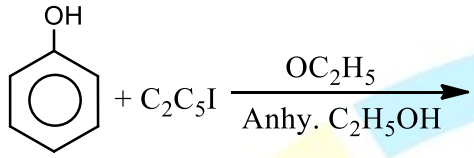
79. Formation of coloured solution is possible when metal ion in the compound contains
a) Paired electrons
b) Lone pair of electrons
c) Unpaired electrons

d) None of these

80. The oxidation state of iron in $K_4[Fe(CN)_6]$ is
a) 1 b) 4 c) 3 d) 2

81. $CH_3Br + KCN(alc.) \rightarrow X \xrightarrow[Na+C_2H_5OH]{Reduction} Y$

What is Y in the series?
a) CH_3CN b) C_2H_5CN
c) $C_2H_5NH_2$ d) CH_3NH_2

82. 

a) $C_6H_5OC_2H_5$ b) $C_2H_5OC_2H_5$
c) $C_6H_5OC_6H_5$ d) C_6H_5I

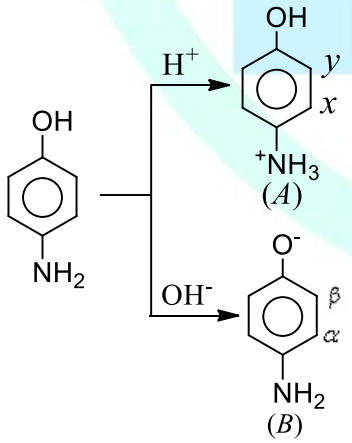
83. Lucas reagent is
a) Conc. HCI and anhydrous $ZnCI_2$
b) Conc. HNO_3 and hydrous $ZnCI_2$
c) Conc. HCI and hydrous $ZnCI_2$
d) Conc. HNO_3 and anhydrous $ZnCI_2$

84. $CH_3COOH \xrightarrow{LiAlH_4} A + CH_3COOH \xrightarrow{H_3O^+} B + H_2O$

In the above reactions '*A*' and '*B*' respectively are
a) $CH_3COOC_2H_5, C_2H_5OH$ b) CH_3CHO, C_2H_5OH
c) C_2H_5OH, CH_3CHO d) C_2H_5OH, CH_3COOC_2H

85. Which of the following compound reacts with chloroform and a base to form phenyl isocyanide?
a) Phenol b) Aniline
c) Benzene d) Nitrobenzene

86. Consider *p*-aminophenol



Which positions are activated for coupling reaction in acidic and basic media respectively?
a) x in A and β in B b) x in A and α in B
c) y in A and α in B d) y in A and β in B

87. Calciferol is
a) Vitamin b) Antibiotic
c) Hormone d) Antipyretic

88. Number average molecular mass, $\overline{M_n}$ and weight average molecular mass $(\overline{M}_w)$ of synthetic polymers are related as
a) $\bar{M}_n = (\overline{M_w})^{1/2}$ b) $\bar{M}_n = \bar{M}_w$
c) $\bar{M}_w > \bar{M}_n$ d) $\bar{M}_w < \bar{M}_n$

89. A high molecular weight molecule, made up of a large number of smaller unis, is known as
a) Monomer b) Biomolecule
c) Polymer d) Both (b)and(c)

90. Antiseptic are different from disinfectants as
a) Antiseptic merely inhibit the growth and disinfectant kill the microorganism
b) Antiseptic are used against microorganism while disinfectants are used against insects
c) Antiseptic are used only over skin while disinfectants can be taken orally also
d) Antiseptic are used over living tissues while disinfectants cannot be used over living tissues

91. In *Solanum tuberosum*, first and second word stand for, respectively
a) Genus, generic name b) Specific epithet species c) Specific name and generic name d) Generic name and specific name

92. *Solanum* and *Panthera* are
a) Genus and species b) Genus and genus
c) Species and species d) Only species

93. Arrange the following in ascending similar characteristic
I. Family II. Genus III. Class IV. Species
a) Class < Family < Genus < Species b) Family < Class < Genus < Species
c) Species < Genus < Family < Class d) Class < Genus < Species < Family

94. The autonomously independent self-replicating extra nuclear DNA imparting certain factors to some bacterium is called
a) Plastid b) Plasmid
c) Phagemid d) Cosmid

95. Bakanae disease is caused by
a) Fungus b) Alga
c) Bacterium d) Virus

96. Choose the correct statement about liverworts
I. In liverworts sexual reproduction occurs by the fusion of antherozoids and egg, which are produced in anthridium and archegonium,

respectively
II. Both male and female sex organs may be present on same thalli or different thalli
III. Zygote give rise to sporophyte, which is differentiated into food, seta and capsule
IV. Some cells of capsule undergoes meiosis and give rise to haploid spores

a) I, II and III b) II, III and IV
c) I, III and IV d) I, II, III and IV

97. The number of prothallial cells in male gametophyte of *Pinus* is

a) 2 b) 1 c) 3 d) 0

98. Which one of the following match is incorrect?

	Column I	Column I
a)	Garden lizard	*Hemidactylus flavirisidis*
b)	Mountain lizard	*Varanus*
c)	Worm lizard	*Rhineura*
d)	Collared lizard	*Iguana*

99. Earthworms are

a) Ureotelic, when plenty of water is available
b) Uricotelic, when plenty of water is available
c) Uricotelic under conditions of water scarcity
d) Ammonotelic when plenty of water is available

100. What will you look for to identity the sex of the following?

a) Male frog – a copulatory pad on the first digit of the hind limb
b) Female cockroach – anul ceri
c) Male shark – claspers borne on pelvic fins
d) Female *Ascaris* – sharply curved posterior end

101. Which of the following represents the floral characters of Liliaceae?

a) Six tepals, zygomorphic, six stamens, bilocular ovary, axile placentation
b) Tetramerous, actinomorphic, polyphyllous, unilocular ovary, axile placentation
c) Trimerous, actinomorphic, polyandrous, superior ovary, axile placentation
d) Bisexual, zygomorphic, gomophyllous, inferior ovary, axile placentation

102. A hyaline bisexual and self-fertilized flower that does not open at all, is

a) Chasmogamous b) Apogamous
c) Cleistogamous d) Polygamous

103. Aggregate fruit develops from

a) Multicarpellary, apocarpous ovary
b) Multicarpellary ovary
c) Multicarpellary, syncarpous ovary
d) Monocarpellary ovary

104. A simple one seeded fruit in which pericarp is fused with seed coat is

a) Achene b) Caryopsis
c) Cypsela d) Nut

105. The number of stomata and epidermal cells in 1 mm^2 leaf area of lower epidermis of the leaves of X, Y and Z plants are given below. Arrange the plants in decreasing order of their stomatal index.

Plant	Number of Stomata	Number of Epidermal Cell
X	30	150
Y	60	240
Z	90	400

a) X, Y, Z b) Y, Z, X c) Z, Y, X d) Y, X, Z

106. Casparian strip is found in

a) Epidermis b) Pericycle
c) Endodermis d) Endothecium

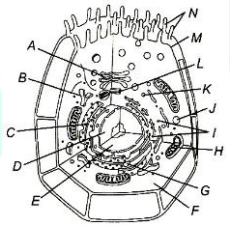
107. Which of the following tissues provides a covering layer for some of the body parts?

a) Connective tissues b) Muscular tissues c) Epithelial tissues d) Neural tissues

108. In animals, gametes are derived from

a) Germinal epithelial tissue
b) Nervous tissue
c) Connective tissue
d) Muscular tissue

109. Correlate the given features of animal cells (I to VII) with their respective parts (*A* to *N*)



I. The structure replicates during mitosis and generates the spindle
II. Major site for synthesis of lipid
III. Power house of the cell
IV. store house of digestive enzyme
V. Increase the surface are for the absorption of materials

VI. Site of glycolysis
VII. Site for active ribosomal RNA synthesis
The correct option is
I II III IV V VI VII
a) L G H J N F D b) M G H J N F D
c) L B H J N F D d) M A H J N F D

11 Which one is single membrane cell organelle?
0.
a) Endoplasmic reticulum
b) Mitochondria
c) Lysosomes
d) Chloroplast

11 Name the disaccharide which is the major
1. sugar of insect haemolymph
a) Trehalose b) Chitin
c) Cellulose d) All of these

11 The free energy of a system, in a spontaneous
2. reaction
a) Decreases
b) Increases
c) Becomes equal to zero
d) Remains unchanged

11 Which one of the following stages corresponds
3. to Mendel's law of independent assortment?
a) Anaphase-II b) Anaphase-I c) Metaphase-I d) Telophase-I

11 Alleles of different genes that are on the
4. same chromosome may occasionally separated by a phenomenon known as
a) Pleiotropy
b) Epistasis
c) Continuous variation
d) Crossing over

11 How would you differentiate between apoplast
5. and symplast?
a) Apoplast relies on active transport
b) Symplast deals in non-living spaces and cell walls
c) Apoplast prevents passive diffusion
d) Apoplasts deals in non-living spaces and cell walls

11 The first process responsible for the entry of
6. water into a seed, when it is placed in a suitable environment for germination is
a) Absorption
b) Imbibition
c) Active transport
d) Osmosis and diffusion

11 Plants growing on hills are likely to show
7.
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

11 Maximum amount of macronutrients that are
8. generally present in plant tissue is
a) 10.5 m mole kg^{-1} of dry matter b) 9.5 m mole kg^{-1} of dry matter c) 1.0 m mole kg^{-1} of dry matter d) 10 m mole kg^{-1} of dry matter

11 Quantity of macronutrients that is generally
9. found in plant is
a) Very small b) Large
c) Varying d) None of these

12 Photosynthesis is maximum in
0.
a) Green light
b) Blue followed by red right
c) Red followed by blue light
d) Blue light

12 Photolysis of water releases
1. I. electron
II. proton
III. oxygen
Select the correct option
a) I and II b) II and III
c) I and III d) I, II and III

12 Which one of the following reactions is an
2. example of oxidative Decarboxylation?
a) Conversion of succinate to fumarate
b) Conversion of fumarate to malate
c) Conversion of pyruvate to acetyl Co-A
d) Conversion of citrate to isocitrate

12 The number of ATP produced when a molecule
3. of glucose undergoes fermentation
a) 4 b) 36 c) 2 d) 38

12 I. Cell elongation
4. II. Cell division
III. Cell differentiation
Among the above mentioned, what is/are the function(s) of auxin?
a) I and II b) III and I
c) II and III d) I, II and III

12 Exponential growth can't be sustained for
5. much time due to
I. limited space and nutrient

II. accumulation of toxic agent
III. unlimited space and nutrient
IV. accumulation of nutrient agent
Choose the correct combination of options
a) I and III b) III and IV c) I and II d) IV and II

12 6. Growth period of plant is generally divided into
a) Four phases b) Three phases
c) Two phases d) Five phases

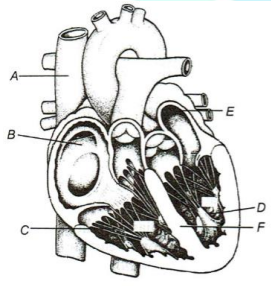
12 7. Which of the following is an organic molecule needed by the body in small amounts?
a) Protein b) Zinc
c) Vitamin-C d) Monosaccharide

12 8. Pancreatic secretion and gall bladder contraction are stimulated by
a) Gastrin b) Enterocrinin
c) Enterogasterone d) Cholecystokinin

12 9. $CO_2 + H_2O \overset{A}{\rightleftharpoons} H_2CO_3 \overset{B}{\rightleftharpoons} HCO_3^- + H^+$
Name the enzymes A and B in the above equation
a) A-Carbonic anhydrase, B-Carbonic hydratase
b) A-Carbonic hydratase, B-Carbonic anhydrase
c) A-Carbonic anhydrase, B-Carbonic anhydrase
d) A-Carbonic hydratase, B-Carbonic hydratase

13 0. Which vein contains the oxygenated blood in humans?
a) Cardiac vein
b) Hepato pancreatic vein
c) Portal vein
d) Pulmonary vein

13 1. Identify *A* to *F* in the given diagram of human heart and choose the correct option



a) A-Vena cava, B-Right atrium, C-Left atrium, D-Right ventricle, E-Left ventricle, F-Interventricular septum
b) A-Vena cava, B-Right atrium, C-Right ventricle, D-Left ventricle, E-Left auricle, F-Interventricular septum
c) A-Vena cava, B-Right atrium, C-Right ventricle, D-Left atrium, E-Left ventricle, F-Interventricular septum
d) A-Vena cava, B-Left atrium, C-Right ventricle, D-Left ventricle, E-Right atrium, F-Interventricular septum

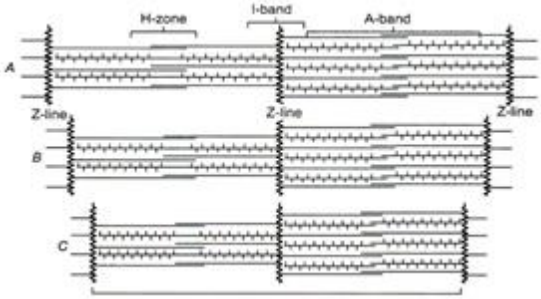
13 2. Select the lymphoid organs from the given choices
I. Lymph node II. Thymus gland
III. Red bone marrow IV. liver
V. Spleen VI. Osteocytes
VII. Peyer's patches
The correct option with correct choices is
a) I, II, III and IV b) III, IV, V and VI
c) IV, V, VI and VII d) I, II, IV, V and VII

13 3. Medullary gradient is mainly developed due to
a) NaCl and urea
b) NaCl and glucose
c) Glucose and urea
d) Ammonia and glucose

13 4. The human kidney
a) Is responsible for the storage of nutrients such as glycogen
b) Concentrates the urine by actively transporting water out of the filtrate
c) Produces more dilute urine when the collection ducts become less permeable to water
d) Responds to antidiuretic hormone by increasing urine output

13 5. Malpighian tubules are the excretory structures of
a) Insects b) Mammals
c) Birds d) Reptiles

13 6. Identify the state of sarcomere in the diagram and choose the correct option accordingly



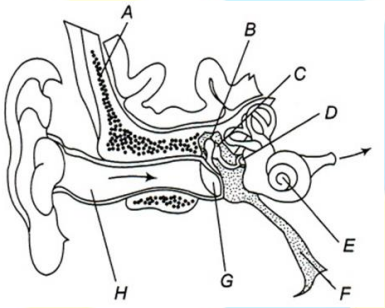
a) A-Contracting, B-Relaxed, C-Maximally contracted
b) A-Maximally contracted, B-Contracting, C-Relaxed
c) A-Relaxed, B-Contracting, C-Maximally contracted
d) A-Relaxed, B-Maximally contracted, C-Contracting

13 7. During muscle contraction, ATP provides energy for
a) Cross bridge detachment
b) Building up action potential
c) Releasing Ca^{2+} from sarcoplasmic reticulum
d) Cross-bridge attachment of myosin to actin

13 8. For how long, contraction of the muscles continues in sliding filament theory?
a) Till ATP binds to myosin head
b) Till ADP binds to myosin head
c) Till Ca^{2+} present in sarcoplasm
d) Till polymerization of myosin head is going on

13 9. Association areas of the brain are
a) Always sensory areas
b) Always motor areas
c) Neither sensory nor motor areas
d) None of the above

14 10. Given is the diagram of ear. Identify *A* to *H*



Choose the correct option
a) A-Temporal bone, B-Malleus, C-Incus, D-Stapes, E-Cochlea, F-Eustachian tube, G-Tympanic membrane, H-External auditory canal
b) A-Tympanic membrane, B-Malleus, C-Incus, D-Stapes, E-Cochlea, F-Eustachian tube, G-Temporal bone, H-External auditory canal
c) A-Tympanic membrane, B-Incus, C-Malleus, D-Stapes, E-Cochlea, F-Eustachian tube, G-Temporal bone, H-External auditory canal
d) A-Temporal bone, B-Malleus, C-Incus, D-Cochlea, E-Stapes, F-Eustachian tube, G-lympanic membrane, H-External auditory canal

14 11. Which one is not a placental hormone?
a) HCG b) HCS
c) Progesterone d) Melatonin

14 12. Oxytocin and vasopressin is stored and released by
a) Anterior lobe of pituitary
b) Posterior lobe of pituitary
c) Intermediate lobe of pituitary
d) Hypothalamus lobe of pituitary

14 13. In oviparous individuals the fertilized egg is covered by
a) Calcareous shell
b) Phosphorus cell
c) Both (a) and (b)
d) Hard shell

14 14. Embryogenesis is the process of development of
a) Embryo b) Endosperm
c) Individual d) Internal organs

14 15. The fusion of male and female pronuclei of the gametes is called
a) Fertilization b) Conjugation
c) Amphimixis d) Panmixis

14 16. Pollination is
a) Shedding of pollens b) Maturing of anther
c) Transfer of pollen to stigma d) Formation of pollen

14 17. In artificial hybridization the steps involved are
I. Bagging
II. Emasculation
III. Rebagging
Their right arrangement is
a) I → II → III b) II → I → III
c) III → II → I d) II → III → I

14 18. 'XX' is a thick structure of male reproductive system which arises from cauda epididymis. 'XX' are 2 in number and its lining has many stereocilia. Identify 'XX'
a) Vasa efferentia
b) Vasa deferentia
c) Penis
d) Scrotum

14 19. Sertoli's cells are found in
a) Ovaries and secrete progesterone
b) Adrenal cortex and secrete adrenaline
c) Seminiferous tubules and provide nutrition to germ cells
d) Pancreas and secrete cholecystokinin

15 20. Process of delivery of the foetus is called
a) Parturition b) Implantation
c) Fertilization d) Lactation

15 21. Select the correct statement.
a) Cleavage follows gastrulation

b) Yolk content in egg has no role in cleavage
c) Cleavage is repeated mitotic division of zygote
d) Gastrulation and blastulation are followed by each other

15 Study of population trends is:
2.
a) Kalography b) Psychobiology
c) Biography d) Demograghy

15 Zero growth means:
3.
a) Natality is zero
b) Natality balances mortality
c) Natality is less than mortality
d) Natality is more than mortality

15 Genetic counsellors can identify heterozygous
4. individuals by
a) Height of individuals
b) Colour of individuals
c) Screening procedures
d) All of these

15 Which have great importance in genetics?
5.
a) *Penicillium* b) *Claviceps*
c) *Neurospora* d) None of these

15 TtRr represents (heterozygous tall,
6. heterozygous pink). If this plant is self crossed then
(T-dominant, t-recessive, R-dominant, r-recessive)
I. 25% plant have red flower
II. 25% plant have white flower
III. 50% plant have pink flower
IV. 50% plant are tall
Choose the correct option
a) I and II b) I, II and III c) II, III and IV d) I, II, III and IV

15 Okazaki fragments are joined together by an
7. enzyme called polynucleotide
a) Ligase
b) Helicase
c) Replicase
d) Primase

15 According to Jacob and Monod (*lac* operon)
8. model of gene regulation, inducer substances in bacterial cells probably
a) Combines with the operator regions, activating the associated operons
b) Combines with the structural genes, stimulating them to synthesis messenger RNA
c) Combines with the repressor proteins, inactivating the activated *lac* operon
d) Combines with the promoter regions, activating RNA polymerase

15 Which of the set represents vestigial organs?
9.
a) Vermiform appendix, body hair and patella
b) Wisdom teeth, body hair and atlas vertebre
c) Ear muscles, cochlea and coccyx
d) Vermiform appendix, ear muscles and coccyx

16 Which one is linked to evolution?
0.
a) Extinction b) Competition
c) Variation d) Reproduction

16 Regarding common cold consider the following
1. statements
I. Rhinovirus is responsible for common cold which infects the nasal epithelium and respiratory passage but not the lungs
II. The symptoms of common cold included nasal congestion and discharge, sore throat, gruffiness, cough, headache and tiredness
Which of the statement given above is/are correct?
a) Only I
b) Only II
c) I and II
d) None of these

16 Which of the following pairs is correct?
2.
a) *E. coli* - *Entamoeba histolytica*
b) *Culex* - Elephantiasis
c) Bed bug - Kala-azar
d) *Plasmodium* - sleeping sickness

16 Regarding lymphocytes consider the following
3. statement
I. The T-lymphocytes form Cell Mediated Immune System (CMIS)
II. The T-lymphocytes cells do not secrete antibodies but help the B-lymphocyte cell to produce them
Which of the statement given above is/are correct?
a) Only I
b) Only II
c) I and II
d) None of these

16 Consider the following statements
4. I. The honey bees are pollinators of many crop species such as sunflower, *Brassica*, apple and

pear

II. Keeping beehives in crop fields during flowering period increases both crop yield and honey yield

III. A successful bee keeping requires management of beehives during different seasons

Which of the statements given above are correct?

a) I, II and III b) I and II

c) II and III d) I and III

16 Silkworm spins its cocoon:

5.

a) From inside to outside

b) Outside to inside

c) Random

d) Inside

16 Powdery mildew of wheat is caused by species

6. of

a) *Puccinia* b) *Erysiphe* c) *Ustilago* d) *Albugo*

16 In rice fields biological nitrogen fixation is

7. chiefly brought by

a) Lichen b) Brown algae

c) Cyanobacteria d) *Rhizobium*

16 The restriction enzyme responsible for the

8. cleavage of following sequence is

$5' - G - T - C - G - A - C - 3'$

$3' - C - A - G - C - T - G - 5'$

a) *Alu* I b) *Bam* HI c) *Hind* II d) *Eco* RI

16 Which one of the following is related with

9. genetic engineering?

a) Plasmids b) Mitochondria

c) Mutations d) Ribosomes

17 *Bacillus thuringiensis* forms the protein

0. crystals which contains a toxic insecticidal protein. This protein

I. is activated by alkaline pH of the gut of the insect pest

II. binds with the epithelial cells of the midgut of the insect pest ultimately killing it

III. does not kill the carrier bacterium which is itself resistance to this toxin

Which of the statement given above are correct?

a) I and II b) I and III

c) II and III d) I, II and III

17 Treatment of a genetic disorder by

1. manipulating genes is called

a) Gene therapy b) Gene replacement therapy

c) Bone marrow d) Enzyme transplantation replacement therapy

17 The mobile genetic element is

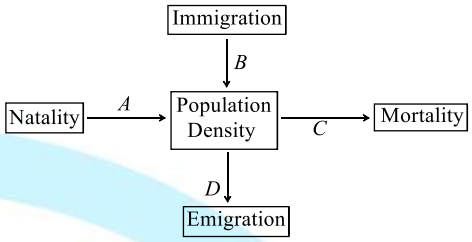
2.

a) Transposon b) Mutation

c) Endonuclease d) Variation

17 Study the figure and identify *A* and *B*

3.



a) A-Increase, B-Decrease, C-Increase, D-Decrease

b) A-Decrease, B-Increase, C-Decrease, D-Increase

c) A-Increase, B-Increase, C-Decrease, D-Decrease

d) A-Decrease, B-Decrease, C-Increase, D-Increase

17 Which competition is more intense?

4.

a) Intraspecific competition

b) Interspecific competition

c) Both (a) and (b)

d) Predation

17 Choose the correct statements

5. I. Productivity is expressed in $gm^{-2}yr^{-1}$ or $(kcal\ m^{-2})yr^{-1}$

II. The amount of biomass or organic matter produced per unit area over a time period in plants during photosynthesis is called primary production

III. Primary production is expressed in term of weight (g^{-2}) or energy ($kcal\ m^{-2}$)

IV. Sugarcane have more efficiency to trap sunlight, so they accumulate more primary productivity

Choose the correct option

a) I and II b) I and IV

c) I, II, III and IV d) None of these

17 Consider the following statements

6. I. In a food chain one organism holds only one position

II. In a food chain the flow of energy can be easily calculated

III. In food chain competition is limited to the members of same trophic level

Which of the statements given above are

correct?

a) I, II and III b) I and II

c) I and III d) II and III

17 7. From high latitude to low latitude, biodiversity

a) Decreases

b) Increases

c) Remains same

d) First decreases then increases

17 8. The soil which is transported by wind is known as

a) Colluvial soil b) Eolian soil

c) Alluvial soil d) Glacial soil

17 9. In 1984, the Bhopal gas tragedy took place because methyl isocyanate

a) Reacted with DDT b) Reacted with NH_3

c) Reacted with CO_2 d) Reacted with H_2O

18 0. Green house effect is the cumulative result of the influences of certain gases. Identify the gas, which is not involved in this influence?

a) Methane b) Chlorofluorocarbons

c) Nitrogen d) Carbon dioxide

Mukesh Sir's Group Tuitions

Date : 16/05/2016 NEET 2016 **TEST ID: 27**

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

: ANSWER KEY :

1)	a	2)	d	3)	c	4)	b	5)	c	6)	d	7)	d
8)	a	9)	a	10)	d	11)	d	12)	a	13)	d	14)	b
15)	b	16)	a	17)	c	18)	d	19)	a	20)	d	21)	a
22)	b	23)	c	24)	d	25)	d	26)	a	27)	b	28)	b
29)	b	30)	b	31)	d	32)	a	33)	d	34)	a	35)	a
36)	d	37)	d	38)	d	39)	c	40)	a	41)	d	42)	b
43)	b	44)	a	45)	b	46)	b	47)	d	48)	d	49)	d
50)	c	51)	d	52)	c	53)	c	54)	c	55)	c	56)	a
57)	d	58)	c	59)	d	60)	c	61)	c	62)	c	63)	b
64)	a	65)	c	66)	b	67)	b	68)	c	69)	a	70)	c
71)	d	72)	a	73)	a	74)	b	75)	a	76)	d	77)	c
78)	d	79)	c	80)	d	81)	c	82)	b	83)	a	84)	d
85)	b	86)	b	87)	a	88)	c	89)	b	90)	d	91)	d
92)	b	93)	a	94)	b	95)	a	96)	d9	97)	a	98)	a
99)	d	100)	c	101)	c	102)	c	103)	a	104)	b	105)	b
106)	c	107)	c	108)	a	109)	c	110)	c	111)	a	112)	a
113)	b	114)	d	115)	d	116)	b	117)	a	118)	d	119)	b
120)	c	121)	c	122)	c	123)	c	124)	d	125)	c	126)	b
127)	c	128)	d	129)	c	130)	d	131)	c	132)	d	133)	a
134)	c	135)	a	136)	c	137)	a	138)	c	139)	c	140)	b
141)	d	142)	b	143)	d	144)	a	145)	c	146)	c	147)	a
148)	b	149)	c	150)	a	151)	c	152)	d153)	b	154)	c	
155)	a	156)	a										

157)	a	158)	c	159)	d	160)	c						
161)	c	162)	b	163)	c	164)	a						
165)	b	166)	b	167)	c	168)	c						
169)	a	170)	a	171)	a	172)	a						
173)	c	174)	a	175)	b	176)	a						
177)	b	178)	b	179)	d	180)	c						

: HINTS AND SOLUTIONS :

Single Correct Answer Type

1 **(a)**

Required time $= \frac{5000\times86400\times365.25}{10^{11}}\text{s} = 1.6\text{s}$

2 **(d)**

$\frac{\Delta g}{g} = \frac{\Delta l}{l} + 2\frac{\Delta T}{T}$

In option (d) error in Δg is minimum and number of observations made are maximum. Hence, in this case error in g will be minimum.

3 **(c)**

$S \propto t^2 \Rightarrow \frac{S_1}{S_2} = \left(\frac{10}{20}\right)^2 \Rightarrow S_2 = 4S_1$

4 **(b)**

By using equation $\omega^2 = \omega_0^2 - 2\alpha\theta$

$\left(\frac{\omega_0}{2}\right)^2 = \omega_0^2 - 2\alpha(2\pi n) \Rightarrow \alpha = \frac{3}{4}\frac{\omega_0^2}{4\pi\times36}, (n = 36)$ ..(i)

Now let fan completes total n' revolution from the starting to come to rest

$0 = \omega_0^2 - 2\alpha(2\pi n') \Rightarrow n' = \frac{\omega_0^2}{4\alpha\pi}$

Substituting the value of α from equation (i)

$n' = \frac{\omega_0^2}{4\pi}\frac{4\times4\pi\times36}{3\omega_0^2} = 48$ revolution

Number of rotation $= 48 - 36 = 12$

5 **(c)**

Let t be time taken by the bullet to hit the target

$\therefore 200\ m = 2000\ ms^{-1}t$

$\Rightarrow t = \frac{200m}{2000ms^{-1}} = \frac{1}{10}s$

For vertical motion,

Here $u = 0$

$\therefore h = \frac{1}{2}gt^2$

$h = \frac{1}{2}\times10\times\left(\frac{1}{10}\right)^2 = \frac{1}{20}m = 5\ cm$

$\therefore$ Gun should be aimed 5 cm above the target

6 **(d)**

Gravitational field is a conservative field. Therefore work done in moving a particle from A to B is independent of path chosen

7 **(d)**

Gravity is the force by which earth attracts all bodies towards itself. It is same for all bodies and does not depend upon the mass of body.

8 **(a)**

As 20% energy lost in collision therefore

$mgh_2 = 80\%$ of $mgh_1 \Rightarrow \frac{h_2}{h_1} = 0.8$

But $e = \sqrt{\frac{h_2}{h_1}} = \sqrt{0.8} = 0.89$

9 **(a)**

Moment of inertia of a disc about a diameter is

$\frac{1}{4}MR^2 = I$ (given)

$\therefore$ $MR^2 = 4I$

Now, required moment of inertia $= \frac{3}{2}MR^2$

$= \frac{3}{2}(4I) = 6I$

11 **(d)**

Here, $u = 20\ \text{ms}^{-1}, m = 500\text{g} = 0.5\text{kg}, t = 20\ \text{s}$

Using Newton's equation of motion

$s = ut + \frac{1}{2}gt^2$

$0 = 20\times20 + \frac{1}{2}(-g)(20)^2$

or $g = 2\ \text{ms}^{-2}$

$\therefore$ Weight of body on planet $= mg$

$= 0.5\times2 = 1\ \text{N}$

12 **(a)**

$W = \frac{1}{2}\frac{(\text{Stress})^2}{Y}\times\text{Volume}$

As F, A and Y are same $\Rightarrow W \propto$ Volume [area is same]

$W \propto l \quad (V = Al)$

$\frac{W_1}{W_2} = \frac{l_1}{l_2} = \frac{l}{2l} = \frac{1}{2}$

13 **(d)**

Terminal velocity of single drop,

$v = 3.75\text{cms}^{-1} = 3.75\times10^{-2}\ \text{ms}^{-1}$

Terminal velocity of the big drop

$V = n^{\frac{2}{3}}v$

$= (8)^{2/3}\times3.75\times10^{-2}$

$= 4 \times 3.75 \times 10^{-2} = 15 \times 10^{-2} \text{ms}^{-1}$

14 **(b)**

$M = \frac{4}{3}\pi r^3 \rho$ and $8M = \frac{4}{3}\pi R^3 \rho$

So $R^3 = 8r^3$

So $R = 2r$; Now $v \propto r^2$ so,

$\frac{v_1}{v} = \left(\frac{2r}{r}\right)^2 = 4$ or $v_1 = 4v$

15 **(b)**

Calorimeters are made by conducting materials

16 **(a)**

$$\eta = 1 - \frac{T_2}{T} = 1 - \frac{300}{600} = \frac{1}{2} = 50\%$$

17 **(c)**

$$T_2 = T_1\left(\frac{V_1}{V_2}\right)^{\gamma-1} = 273(2)^{0.41} = 273 \times 1.328$$

$$= 363\ K$$

$$W = \frac{R(T_1 - T_2)}{\gamma - 1} = \frac{8.31(273 - 363)}{1.41 - 1} = -1824$$

$\Rightarrow |W| \approx 1815\ J$

18 **(d)**

Vander waal's equation is followed by real gases

19 **(a)**

At mean position, the kinetic energy is maximum

Hence $\frac{1}{2}ma^2\omega^2 = 16$

On putting the values we get

$\omega = 10 \Rightarrow T = \frac{2\pi}{\omega} = \frac{\pi}{5}s$

20 **(d)**

Wave length = velocity of wave × Time period

$\lambda = 300 \times 0.05 \Rightarrow \lambda = 15$ metre

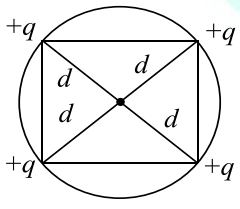
According to problem path difference between two points $= 15 - 10 = 5m$

$\therefore$ Phase difference $= \frac{2\pi}{\lambda} \times$ Path difference

$$= \frac{2\pi}{15} \times 5 = \frac{2\pi}{3}$$

22 **(b)**

Potential at centre due to all charges are



$$= \frac{1}{4\pi\varepsilon_0}\left[\frac{q}{d} + \frac{q}{d} + \frac{q}{d} + \frac{q}{d}\right]$$

$= \frac{1}{4\pi\varepsilon_0}\frac{4q}{d}$ in S.I. unit

$= \frac{4q}{d}$ in C.G.S. unit

23 **(c)**

$E_1 = \frac{\eta q}{4\pi\varepsilon_0 a^2}, E_2 = \frac{\eta q}{4\pi\varepsilon_0 a^2}$. Therefore $E = \vec{E}_1 + \vec{E}_2$

$$= \sqrt{E_1^2 + E_2^2 + 2E_1E_2\cos 60^\circ} = \frac{\sqrt{3}\eta q}{4\pi\varepsilon_0 a^2}$$

Since $\eta^{-1} < \sqrt{3}, 1 < \sqrt{3}\eta, \sqrt{3}\eta > 1$

$\Rightarrow \frac{\sqrt{3}\eta q}{4\pi\varepsilon_0 a^2} > \frac{q}{4\pi\varepsilon_0 a^2} \Rightarrow E_3 > E_0 \left(E_0 = \frac{q}{4\pi\varepsilon_0 a^2}\right)$

24 **(d)**

Minimum capacity, $C_s = \frac{5}{10} = 0.5\ \mu\text{F}$

Maximum capacity, $C_p = 10 \times 5 = 50\ \mu\text{F}$

$\frac{C_p}{C_s} = \frac{50}{0.5} = 100$

25 **(d)**

$\frac{dE}{dT} = 4 - \frac{2T}{200}4 - \frac{T}{100}$;

At neutral point, $T = T_n$.

$\frac{dT}{dT} = 0 = 4 - T_n/100$

or $T_n = 400°\text{C}, T_i = 2T_n - T_0$

$= 2 \times 400 - 0 = 800°\text{C}$

26 **(a)**

(i) Rate of chemical energy consumption

$= 1.5 \times 2 = 3$ W

(ii) Rate of energy dissipation inside the cell

$= 2 \times 2 \times 0.1 = 0.4$ W

(iii) Rate of energy dissipation inside the resistor

$= (3 - 0.4)$ W $= 2.6$ W

(iv) Power output of source $= (3 - 0.4)$ W $= 2.6$ W

$*$ EI represents rate of chemical energy consumption of the cell.

$* I^2r$ represents the rate of energy dissipation inside the cell.

$* (EI - I^2r)$ represents the power output of the source of emf.

27 **(b)**

P.d. across the circuit $= 1.2 \times \frac{6\times4}{6+4} = 2.88\ volt$

Current through 6 ohm resistance $= \frac{2.88}{6} = 0.48\ A$

28 **(b)**

On applying Fleming's left hand rule

29 **(b)**

For a dia-magnetic substance, I is negative and $-I \propto H$. Therefore, the variation is represented by OC or OD. As magnetisation is small, OC is better choice.

30 **(b)**

Dip needle at neutral point will be horizontal at magnetic equator where angle of dip is zero degree.

31 **(d)**

$v = 180\ \text{kmh}^{-1} = \dfrac{180 \times 1000}{60 \times 60} = 50\ \text{ms}^{-1}$

$l = 1\text{m}, B = 0.2 \times 10^{-4}\ \text{Wbm}^{-2}$

$e = Blv = 002 \times 10^{-4} \times 1 \times 50 = 10^{-3}\text{V} = 1\text{mV}$

32 **(a)**

$X_L = 2\pi fL = 2\pi\left(\dfrac{50}{\pi}\right) \times 1 = 100\Omega$

$X_C = \dfrac{1}{2\pi fC}$

$= \dfrac{1}{2\pi\left(\frac{50}{\pi}\right) \times 20 \times 10^{-6}}$

$= 500\ \Omega$

Impedence $Z = \sqrt{(R)^2 + (X_c - X_L)^2}$

$= \sqrt{(300)^2 + (400)^2}$

$= 500\ \Omega$

33 **(d)**

The current will lag behind the voltage when reactance of inductance is more than the reactance of condenser.

Thus, $\omega L > \frac{1}{\omega C}$ or $\omega > \frac{1}{\sqrt{LC}}$

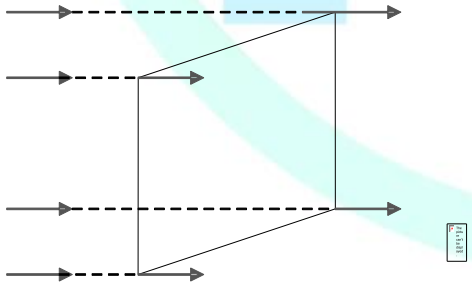
or $n > \frac{1}{2\pi\sqrt{LC}}$ or $n > n_r$ where n_r = resonant frequency

35 **(a)**

Solids and liquids given continuous and line spectra. Only gases are known to given band spectra

37 **(d)**

In the given options none of sources generates plane wavefront, it can be artificially produced by reflection from a mirror or by refraction through a lens.



38 **(d)**

$QE = mg \Rightarrow mg = \dfrac{QV}{d}$

39 **(c)**

Work function $W_0 = hv_0 = 6.6 \times 10^{-34} \times 1.6 \times 10^{15}$

$= 1.056 \times 10^{-18} J = 6.6\ eV$

From $E = W_0 + K_{\max} \Rightarrow K_{\max} = E - W_0 = 1.4\ eV$

40 **(a)**

$\dfrac{1}{\lambda_{\min}} = R\left[\dfrac{1}{2^2} - \dfrac{1}{3^2}\right] = \dfrac{R \times 5}{36}$

$\dfrac{1}{\lambda_{\max}} = R\left[\dfrac{1}{2^2} - \dfrac{1}{\infty}\right] = \dfrac{R}{4}$

$\dfrac{\lambda_{\min}}{\lambda_{\max}} = \dfrac{R \times 5}{36} \times \dfrac{4}{R} = \dfrac{5}{9}$

41 **(d)**

$v_n \propto \dfrac{1}{n} \Rightarrow \dfrac{v_5}{v_2} = \dfrac{2}{5} \Rightarrow v_5 = \dfrac{2}{5}v_2 = \dfrac{2}{5}v$

42 **(b)**

Recoil momentum = momentum of photon $= \frac{h}{\lambda}$

$= hR\left(\dfrac{1}{n_1^2} - \dfrac{1}{n_2^2}\right) = \dfrac{hR \times 15}{16} = 6.8 \times 10^{-27} N \times s$

43 **(b)**

It is used to convert ac into dc (rectifier)

44 **(a)**

As, $m_f = \frac{\delta_{\max}}{f_m}$

$\therefore\ \delta_{\max} = m_f \times f_m = 0.25 \times 2000$ Hz

$= 500$ Hz

46 **(b)**

Given that, oxygen contents in element oxide is 20% by weight.

Hence, element contents in element oxide is 80% by weight.

Then, equivalent weight of unknown element= $\frac{80}{20} \times 8$

$\therefore$ Equivalent weight of unknown element=32

47 **(d)**

$3F^- \equiv 1$ Formula unit (AlF_3)

$3.0 \times 10^{24} F^- = 1 \times 10^{24}$ Formula units (AlF_3)

48 **(d)**

Energy required for 1 Cl_2 molecule $= \frac{242 \times 10^3}{N_A}$ J

$E = \dfrac{hc}{\lambda}$

or $\lambda = \dfrac{hc}{E}$

$= \dfrac{6.626 \times 10^{-34} \times 3 \times 10^8 \times 6.02 \times 10^{23}}{242 \times 10^3}$

$= 494 \times 10^{-9}\text{m} = 494\ \text{nm}$

49 **(d)**

The value of 'n' and 'l' equal to 4 and 3 respectively corresponds to $4f$-orbital, hence the electron will belong to $4f$-orbital.

50 **(c)**

In general ionisation energy increases as we move from left to right in a period. It is due to the increase in effective nuclear charge. IE_1 of Be and N is high due to stable configuration. Hence, the order is as follows F > N > C > Be > B

51 **(d)**

In O_2, there are two electrons in antibonding orbitals. Removal of one electron from the O_2 molecular gives O_2^+ in which the number of antibonding electrons is one less and hence, BO increases. Thus, removal of the electron from O_2 stabilized the molecule

53 **(c)**

$C_1 = 100\ \text{ms}^{-1}, C_2 = 200\ \text{ms}^{-1}, C_3 = 500\ \text{ms}^{-1}$

rms velocity (C) =?

$$\text{rms velocity } (C) = \sqrt{\frac{C_1^2 + C_2^2 + C_3^2}{n}}$$

$$= \sqrt{\frac{(100)^2 + (200)^2 + (500)^2}{3}}$$

$$= \sqrt{1{,}00{,}000} = 100\sqrt{10}\ \text{ms}^{-1}$$

54 **(c)**

Internal energy of a gas depends upon its pressure and temperature. Thus, if a gas expands at constant temperature and pressure, then its internal energy remains same.

55 **(c)**

Heat of combustion is amount of heat released when 1 mole = molecular weight in gram, of substance is completely burnt in excess of oxygen.

Given,

Heat of combustion of C to $CO_2 = -395.5$ kJ/mol

Molecular mass of $CO_2 = 12 + 16 \times 2 = 44$ g

$$C(s) + O_2(g) \rightarrow CO_2(g); \quad \Delta H = -393.5\ \text{kJ}$$

∴ heat formation of (1 mole) 44 g

$$CO_2 = -393.5\ \text{kJ}$$

∴ Heat of formation of 1 g

$$CO_2 = \frac{-393.5}{44}\ \text{kJ}$$

∴ Heat of formation of

$$32.5\ \text{g}\ CO_2 = \frac{-393.5 \times 35.2}{44} = -314.8\ \text{kJ} = -315\ \text{kJ}$$

56 **(a)**

According to law of mass action

$$K_c = \frac{[NO_2]^2}{[N_2O_4]} = \frac{[1.2 \times 10^{-2}]^2}{4.8 \times 10^{-2}} =$$

$0.3 \times 10^{-2} = 3 \times 10^{-3}$ mol/L

57 **(d)**

$NaNO_2$ (Sodium nitrite) acts both as oxidising as well as reducing agent because in it N-atom is in +3 oxidation state (intermediate oxidation state).

Oxidising property

$$2NaNO_2 + 2KI + 2H_2SO_4 \longrightarrow Na_2SO_4 + K_2SO_4 + 2NO + 2H_2O + I_2$$

Reducing property

$$H_2O_2 + NaNO_2 \longrightarrow NaNO_3 + H_2O$$

58 **(c)**

The oxidation state of N in NH_3 is

$x + 3(+1) = 0$

$x = -3$

The oxidation state of N in HNO_3 is

$1 + x + 3(-2) = 0$

$x = 5$

The oxidation state in N in NaN_3 is

$+1 + 3x = 0$

$x = -1/3$

The oxidation state of N in Mg_3N_2 is

$3(2) + 2x = 0$

$6 + 2x = 0$

$x = -3$

Hence, three molecules $(i.e., NH_3, NaN_3, Mg_3N_2)$ have negative oxidation state.

60 **(c)**

$$CaSO_4.2H_2O \xrightarrow{120^\circ} CaSO_4.\frac{1}{2}H_2O \xrightarrow{200^\circ} CaSO_4$$

gypsum — plaster of Paris — anhydrite or dead burnt plaster

The anhydrous $CaSO_4$ is called dead burnt plaster because it does not set like plaster of Paris when moistened with water.

61 **(c)**

Pb_3O_4 is a mixed oxide. It can be represented as $2PbO.PbO_2$.

62 **(c)**

The reluctance of the *s*-electrons of the valence shell to take part in bonding is called inert pair effect. It increases on moving down in a group. Hence, Pb shows most pronounced inert pair effect.

63 **(b)**

Organic compound $\xrightarrow{[O]} CO_2 + H_2O$

17.6 g 7.2g

$\%of\ C = \frac{12}{44} \times \frac{17.6}{5.6} \times 100 = 85.7\%$

$\%\ of\ H = \frac{2}{18} \times \frac{7.2}{5.6} \times 100 = 14.28\%$

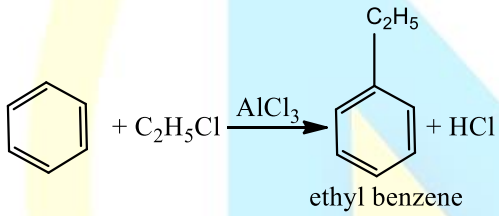
Element	Percentage	Relative no. of atoms	Simplest ratio
C	85.7	85.7/12=7.14	7.14/7.14=1
H	14.28	14.28/1=14.28	14.28/7.14=2

Hence, empirical formula of compound of $= CH_2$

$\therefore$ Molecular formula of compound $= C_4H_8$

64 **(a)**

In presence of a Lewis acid (like $AlCl_3$), benzene gives electrophilic substitution reaction with alkyle halide. This is called Friedel-Craft's alkylation.



65 **(c)**

Natural gas is a mixture of gaseous hydrocarbons. Methane (about 85%) is its main constituent.

66 **(b)**

Carbon dioxide, being limiting factor, when present in small amount (*ie*, 0.033%), has no adverse effect but when its concentration is slightly higher than 0.033%, it has an adverse effect on our climate. Thus, in normal conditions, CO_2 is not regarded as a pollutant

67 **(b)**

In diamond,

the maximum proportion of available volume that can be filled by hard spheres $= \frac{\pi\sqrt{3}}{16} = 0.34$

68 **(c)**

When equal number of cations and anions are missing from their position in a crystal lattice so that electrical neutrality is maintained, the defect is called Schottky defect. Due to missing of ions, the overall density of the crystal decreases. Moreover, defect leads to randomness, thus entropy also increases.

69 **(a)**

Equal osmatic pressure only applicable to non-electrolytes solution at low concentration

70 **(c)**

Molarity, $M = \frac{W_2 \times 1000}{M_2 \times Vol.(mL)}$; where w_2 mass of H_2SO_4 in g, M_2 is the molar mass of H_2SO_4

$w_2 = \frac{1 \times 98 \times 200}{1000} = 19.6\ g$

$H_2SO_4 + 2H_2O \rightleftharpoons 2H_3O^+ + SO_4^{2-}$

But according to equation 1 mole of H_2SO_4 gives 2 mole of $[H_2O^+]$ ions. So, the amount of H_2SO_4 to prepare 200 mL solution having the 1 M concentration oH_3O^+ ions is $19.6/2 = 9.8$ g.

72 **(a)**

Acid hydrolysis of sucrose is a pseudo unimolecular or pseudo first order reaction. Hydrolysis of sucrose in presence of mineral acid is a biomolecular reaction. But as water is taken in large excess, so the rate of reaction only depends upon concentration of sucrose. Hence, order of the reaction is one.

Therefore, it is called a pseudo first order reaction.

73 **(a)**

$\frac{dc}{dt}$ represent the change in concentration of reactant with time. As, in a reaction, concentration of reactant always decrease with time hence, rate of reaction is represented as $\frac{-dc}{dt}$.

74 **(b)**

Homogenous catalysis Whenthe reactants and catalyst are in the same phase, the catalysis is known as homogeneous catalysis.

Example $2KClO_3(s) \xrightarrow{MnO_2(s)} 2KCl(s) + 3O_2(g)$

75 **(a)**

Refractory materials are the substances which can withstand very high temperature without melting or becoming salt

76 **(d)**

Roasting is mainly employed to remove volatile substances

$S_8 + 8O_2 \rightarrow 8SO_2 \uparrow$

$P_4 + 5O_2 \rightarrow P_4O_{10} \uparrow$

$4As + 3O_2 \rightarrow 2As_2O_3 \uparrow$

77 **(c)**

Calcium cyanamide on treatment with steam produces NH_3 and $CaCO_3$.

$CaNCN + 3H_2O \longrightarrow 2NH_3 + CaCO_3$

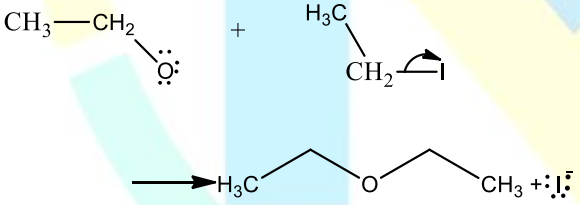
78 **(d)**
Due to lanthanide contraction there occurs net decrease in size. Only one 0.85 Å is smaller one.

79 **(c)**
Formation of coloured solution is possible when metal ion in the compound contains unpaired electrons *e. g.*,
$Cu^{+}: 3d^{10}\ 4s^{0}$ colourless
$Cu^{2+}: 3d^{9}\ 4s^{0}$ blue

80 **(d)**
Let the oxidation state of iron in $K_4[Fe(CN)_6]$is *x*.
$$4(+1)+x+6(-1)=0$$
$$4+x-6=0$$
$$x=+2$$

81 **(c)**
$$CH_3Br \xrightarrow{\text{Alc.KCN}} \underset{(X)}{CH_3CN} \xrightarrow[\text{reduction}]{Na/C_2H_5OH} \underset{(Y)}{CH_3CH_2\ NH_2}$$

82 **(b)**
$C_2H_5O^-$ will attract the proton from phenol converting the later into phenoxide ion. This would then make nucleophilic attack on the methylene carbon of alkyl iodide, but $C_2H_5O^-$ is in excess $C_2H_5O^-$ is better nucleophile than $C_6H_5O^-$(phenoxide) ion since while in the former the negative charge is localised over oxygen and in the later it is delocalised over the whole molecular frame work. So, it is $C_2H_5O^-$ ion that would make nucleophilic attack at ethyl iodide to give diethyl ether (Williamson's synthesis).



83 **(a)**
Conc. HCl+ anhydrous $ZnCl_2$ is called as Lucas reagent. It is used to distinguish primary, secondary and tertiary alcohol.

84 **(d)**
$$CH_3COOH + 4H \xrightarrow{LiAlH_4} \underset{(A)}{CH_3CH_2OH} + H_2O$$
$$CH_3CH_2OH + CH_3COOH \xrightarrow{H_3O^+} \underset{(B)}{CH_3COOC_2H_5} + H_2O$$

85 **(b)**
$$C_2H_5NH_2 + CHCl_3 + 3KOH \rightarrow C_6H_5NC + 3KCl + 3H_2O$$
Aniline chloroform phenyl isocyanide
Thus in this reaction phenyl isocyanide is produced. This is called carbylamine reaction.

87 **(a)**
Calciferol is the chemical name of vitamin D.

88 **(c)**
$$PDI = \frac{\bar{M}_w}{\bar{M}_n}$$
For synthetic polymer, PDI>1
$$\therefore\ \bar{M}_w > \bar{M}_n$$

90 **(d)**
Antiseptics and disinfectants both inhibit and kill the microorganisms but disinfectants are not safe to apply over living tissues

91 **(d)**
In a scientific name, the first name denote/indicates the generic name of the organism, while second name indicates or stands for specific epithet or specific names

92 **(b)**
Solanum and *Panthera* are genera of family—Solanaceae and Felidae, respectively

93 **(a)**
The ascending hierarchy in similar characteristic is Class < Family < Genus < Species, *i.e.*, specificity is increasing

94 **(b)**
Plasmid is a small, autonomously independent, self-replicating extranuclear DNA, imparting certain factors to some bacterium. It is carried by the bacterium in addition to its genomic DNA.

95 **(a)**
Bakanae disease or foolish seedling disease is caused by the fungus
Gibberella fujikuroi (*Fusarium moniliforme*)

96 **(d)**
All the statements are correct.
Sexual reproduction occurs by the formation of sex organs born on special branches.
The male antheridia are produced on antheridiophore and the female reproductive organs are 'archegonia'. They are borne on special stalked structures called archegoniophore. Both male and female sex organ may be present on same thalli or different thalli.
After fertilisation, the egg becomes zygote, which grow to form sporophyte. It is differentiated into foot, seta and capsule. Inside the capsule, the diploid spore mother cells divide by meiosis and produce haploid spores. These spores germinate

to form free-living gametophytes

97 **(a)**
The unicelled microspore of *Pinus* undergoes three divisions of microgametogenesis, so as to form a four celled pollen grains or male gametophyte. There are two prothallial cells, a generative cell and a tube cell.

98 **(a)**
Garden lizard—*Calotes*

House lizard—*Hemidactylus*

99 **(d)**
Class – **Oligochaeta** includes terrestrial earthworms and some other species that live in freshwater. Aquatic oligochaetes excrete ammonia, while terrestrial oligochates excrete urea but *Lumbricus* produces both ammonia and urea.

100 **(c)**
A clasper is a male anatomical structure found in some groups of animals, and used in mating. Male cartilaginous fish like shark have claspers formed from the posterior portion of their pelvic fin which serves as intromittent organs used to channel semen into the female's cloaca during mating.

101 **(c)**
The flower in family-Liliaceae I complete, actinomorphic, trimerous, hypogynous and the gynoecium is tricarpellary, syncarpous having superior ovary with axile placentation.

102 **(c)**
A hyaline, bisexual and self-fertilized flower that never opens is called cleistogamous flower, while chasmogamous flowers expose their mature stigma and anthers to the pollinating agents.

103 **(a)**
Aggregate fruit is formed from a single flower, in which gynoecium is apocarpous.

104 **(b)**
Caryopsis fruits develop from unilocular, single-ovuled, superior ovary of Multicarpellary gynoecium. They are small and single-seeded. Their pericarp is completely fused with the seed-coat or testa.

105 **(b)**
Stomatal index (SI) $= \frac{S}{S+E} \times 100$

Plant	Number of Stomata (S)	Number of Epidermal Cell (E)	SI
X	30	150	16.6
Y	60	240	20.0
Z	90	400	18.3

So, the arrangement of plants in decreasing order of their stomatal index in Y, Z, X.

106 **(c)**
Endodermis is the last layer of cortex and is single layered. It is characterized by presence of **Casparian strips.**

107 **(c)**
Epithelial tissue has a free surface, which faces either a body fluid or the outside environment and thus provides a covering to body parts

108 **(a)**
In animals, gametes are derived from germinal epithelial tissue. Epithelial tissue covers whole body surface or tissues, lines body cavities and form glands.

109 **(c)**
(i) The structure replicates during mitosis and generates the spindle – L
(ii) Major site for synthesis of lipid – B
(iii) Power house of the cell – H
(iv) Store house of digestive enzyme – J
(v) Increase the surface area for the absorption materials – N
(vi) Site of glycolysis – F
(vii) Site for active ribosomal RNA synthesis – D

110 **(c)**
Single membrane cell organelles are known as microbodies *eg*, lysosomes, peroxisomes, glyoxysomes and spherosomes.

111 **(a)**
Trehalose is the major sugar of insect haemolymph, in disaccharide form

112 **(a)**
The free energy of a system decreases in a spontaneous reaction

113 **(b)**
Independent Assortment of Chromosomes The paternal and maternal chromosomes of each homologous pairs segregates during anaphase-I independently of the other chromosomes. Anaphase-I is the cytological event that corresponds to Mendel's law of independent assortment.
Although the paternal and maternal chromosomes of a homologous pair have the genes for the same traits, either chromosome of a

pair may carry different alleles of the same genes. Therefore, independent assortment of homologous chromosomes in anaphase-I introduces genetic variability

114 **(d)**

The reciprocal exchange of chromosomal material between homologous chromosome is termed as **crossing over**.

115 **(d)**

Apoplast pathway consists of interconnecting cell wall, intercellular spaces, cell wall of endodermis excluding the casparian strips, xylem and tracheary elements. This system is considered non-living and is continuous throughout the plant. Symplast pathway consists of the living parts of the plant and is made up of interconnected protoplast adjacent cells

116 **(b)**

Imbibition is a special type of diffusion when water is absorbed by solids-colloids causing them to enormously increase in volume. The classical example of imbibition are absorption of water by seeds and dry wood

117 **(a)**

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

118 **(d)**

Macronutrients are generally present in plant tissues in large amount (in excess of 10 m mole kg^{-1} of dry matter)

119 **(b)**

Large.

Macronutrients are generally present in plant tissues in large amount (in excess of 10 m mole kg^{-1} of dry matter)

120 **(c)**

Maximum photosynthetic rate has been observed in the full spectrum. Regarding the effect of the different wavelengths, maximum photosynthesis occurs in **red** light (660 nm) second maximum in **blue** (440 nm) and minimum in **green**.

121 **(c)**

During the photolysis of water, the release of electrons, protons and oxygen takes place. Reaction during the photolysis of water is follows

$2H_2O \rightarrow 4H^+ + O_2 + 4e^-$

122 **(c)**

The pyruvic acid formed during glycolysis enters to mitochondria where oxidative Decarboxylation takes place and acetyl Co-A is formed. It occurs in presence of NAD^+, pyruvic acid Dehydrogenase complex and coenzyme-A. pyruvic acid + NAD^+ → Acetyl Co-A + NADH + H^+ + CO_2

123 **(c)**

In microorganisms, the term anaerobic respiration is replaced by fermentation. The pyruvic acid formed in glycolysis is transformed to ethyl alcohol and release 2 ATP molecules.

124 **(d)**

Auxin elongates the cells present just below the apical part of shoot. It also do cell division and cell differentiation

125 **(c)**

Exponential or log phase can not sustain for long period because the nutrients and space are limited and there is competition as well. Microorganisms, when nutrients get exhausted, secrete toxic chemicals which inhibit the growth of other organisms

126 **(b)**

The period of growth is generally divided in to three phases

(i) Meristematic phase

(ii) Elongation phase

(iii) Maturation phase

127 **(c)**

Vitamin-C is a water soluble Vitamin needed to be taken into the body in small amount.

128 **(d)**

Cholecystokinin- pancreozymine hormone is secreted by the epithelium of entire small intestine. It stimulates the gall bladder to release bile and pancreas to secrete and release digestive enzymes in the pancreatic juice.

129 **(c)**

RBCs contain very high concentration of enzymes, carbonic anhydrase and minute quantities of the same is present in the plasma too. *This enzyme facilities the following reaction in both directions*

$$CO_2 + HO_2 \xrightleftharpoons{\text{Carbonic anhydrase}} H_2CO_3 \xrightleftharpoons{\text{Carbonic anhydrase}} HCO_3^- + H^+$$

130 **(d)**

Pulmonary vein is the only vein in body, which carries oxygenated blood rather than deoxygenated blood. It carries the blood from the lungs to the left auricle of heart. From left auricle, blood goes to the left ventricle. Left ventricle distributes that blood all over the body

131 **(c)**
A-vena cava, B-left atrium, C-right ventricle, D-left ventricle, E-right atrium, F-interventricular septum

132 **(d)**
Lymphoid Organs The organs which secretes lymph are called lymphoid organs. Beside the lymph nodes, tonsils, thymus gland. Payer's patches, liver and spleen are the other lymphoid organs which secretes lymph

133 **(a)**
Medullary gradient is mainly developed by NaCl and urea and this is developed by counter current mechanism of vasa recta and Henle loop

134 **(c)**
From the distal convoluted tubule, the filtrate enters the collecting tubule, where further reabsorption of water takes place. Now the filtration become more concentrated which place. Now the filtration become more concentrated which makes the filtrate hypertonic. When the collecting duct become less permeable to water it produces more dilute urine.

135 **(a)**
Insects.
A survey of animal kingdom presented a variety of excretory structures
(i) **Invertebrate** have simple tubular type of excretory organs
(ii) **Vertebrate** have complex tubular form called the kidney
(iii) **Platyhelminthes** (Flatworm planaria) Protonephridia of flame cells are excretory organs
(iv) **Some Annelids and Cephalochordate** Protonephridia concerned primarily osmoregulations
(v) **Earthworm and Annelids** Nephridia is the excretory organ
(vi) **Insect** Malpighian tubules are the excretory organs. Antennal glands or green glands performs the excretory functions in crustaceans like prawn

136 **(c)**
A-Relaxed, B-Contracting, C-Maximally contracted

137 **(a)**
Cross-bridge ditachment.
When ATP binds to myosin filament there is a detachment of myosin and actin filament. Due to detachment, the sliding (contraction) takes place and the hydrolysis of ATP to ADP takes place. In that step again, the cross bridge formation between actin and myosin takes place

138 **(c)**
Sliding of actin and myosin filaments constitutes till the Ca^{2+} ions are pumped back to the sarcoplasmic cisternae, resulting in masking the actin filaments. This causes the return of Z lines back to their original position, *i.e.,* relaxation

139 **(c)**
The cerebral cortex contains motor areas, sensory areas and large regions that are neither clearly sensory motor in function. These regions are called as the association areas. These are responsible for complex functions like intersensory associations, memory and communication

141 **(d)**
Melatonin is a naturally occurring compound found in animals, plants and microbes. In mammals melatonin is secreted by the pineal gland in the brain. It is commonly known as 'Hormone of darkness". It may also be produced by a variety of peripheral cells, such as bone marrow cells, lymphocytes and epithelial cells.

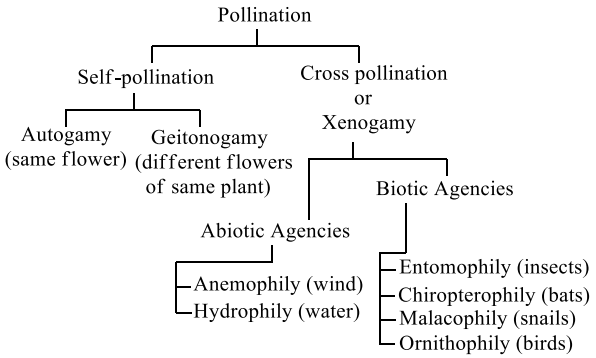
142 **(b)**
Neurohypophysis (pars nervosa) also known as posterior lobe of pituitary, stores and releases two hormones called oxytocin and vasopressin. Which are actually synthesised by hypothalamus and are transported axonally to neurohypophysis

143 **(d)**
As we know oviparous individuals lay eggs with white hard shell around it and this white hard shell is made up of calcium

144 **(a)**
Embryogenesis refers to the development of embryo from the zygote. During embryogenesis, zygote undergoes cell division (mitosis) and cell differentiation. Cell division of zygote is called **cleavage**

145 **(c)**
The term **amphimixis** is used in the sense of a true sexual reproduction. It involves the fusion of male and female pronuclei of the gametes and the formation of a zygote.

146 **(c)**
Pollination Transfer of pollen grains to the stigma is called pollination



147 **(a)**

Artificial Hybridisation In such crossing experiments where it is important to make sure that only the desired pollen grains are used for pollination and stigma is protecting from contaimination (from unwanted pollen), this technique is used.

Steps in Artificial Hybridisation

(i) **Emasculation** Removal of anthers from the flower bud before the anther dehiscence using forceps. This step referred to as emasculation

(ii) **Bagging** Emasculated flowers have to be covered with a bag of suitable size, generally made up of butter paper to prevent contamination of its stigma with unwanted pollen. This process is called bagging.

(iii) **Rebagging** When the stigma of bagged flower attains receptivity, mature pollen grains collected from the anthers of the male parent are dusted on the stigma and the flowers are rebagged, and the fruits allowed to developed

148 **(b)**

Vasa deferentia emerges from the cauda epididymis on each side and leaves the scrotal sac and enters the abdominal cavity through inguinal canal. It is lined by many stereocilia to transport the sperms from testis to the outside through urethra

149 **(c)**

The epithelium of seminiferous tubule is made up of two types of cells- Sertoli's cells and spermatogenic cells. Sertoli's cells nourish spermatozoa, act as nurse cells for differentiating spermatozoa phagocytize defective sperm and secrete protein hormone inhibin (which inhibits FSH secretion).

150 **(a)**

The process of giving birth to a baby or delivery of foetus is called parturition. It starts with rise in oestrogen/progesterone ratio, increase in the level of oxytocin secretion by both mother and foetus.

151 **(c)**

Fertilized zygote is divided by special type of mitotic divisions, known as **cleavage**. Cleavage increases the number of cells.

154 **(c)**

Genetic counselling is the giving of information and advice about the risk of genetic diseases like colour blindness, haemophilia, albinism and outcomes.Genetic screening is a part of genetic counselling, which includes parental diagnosis (like amniocentesis),carrier diagnosis and predictive diagnosis.

155 **(a)**

Neurospora complete their sexual life cycle in a few days and thus, make ideal organism for the study of laws of heredity. Penicillin, a potent antibiotic is obtained from *Penicillium notatum* and LSD is obtained from *Claviceps purpurea*.

156 **(a)**

Tr Rr (heterozygous tall and pink)

↓ (self crossed)

Tt Rr × Tt Rr

Gametes TR Tr tR tr

TR	TTRR (Red)	TTRr (Pink)	TrRR (Pink)	TrRr (Pink)
Tr	TTR (Pink)	TTrr	TrRr (Pink)	Ttrr
tR	TrRR	TrRr	ttRR	ttrR (Pink)
tr	TrRr	Ttrr	ttRr (Pink)	ttrr

1/16 TTRR
2/16 TTRr
2/16 TtRR
4/16 TtRr } 9/16 – 75%

1/16 TTrr
2/16 Ttrr } 3/16 – 25%

2/16 ttRR
2/16 ttRr } 3/16 – 50%

1/16 ttrr 1/16 – 50%

157 **(a)**

Short segments of replicated DNA are called Okazaki fragments (Okazaki segment, Reiji Okazaki; 1968). Each of them contains 1000-2000 bp in prokaryotes and 100-200 bp in eukaryotes. An RNA primer is also required every time to built a new Okazaki fragment.

After replacing RNA primer with deoxyribonucleic acid and their polymerisation, Okazaki fragments are joined together by means of enzymes. DNA ligase (Khorana; 1967). DNA

strand built up of Okazaki fragment is called lagging strand

158 **(c)**
Inducer binds with the repressor and make it unsuitable to bind with the operator

159 **(d)**
Vestigial structures are those structures, which were functionally active in ancestral organisms but now become non-functional, *e.g.*, vermiform appendix, ear muscles and coccyx.

160 **(c)**
It is difficult to find out any of the two individuals alike. Even the progeny of the same parents are not exactly alike in all respects. These differences are known as **variations**. Without variations changes could not occur and there will be no possibility of evolution to occur certain variations, which once appeared in the parent generation, continue to appear in the progeny generation after generation.

161 **(c)**
Rhinovirus represents one such group of viruses, which causes one of the most infectious human ailments- the common cold. They infect the nose and respiratory passage. Symptoms of common cold are nasal congestion and discharge, sore throat, hoarseness, cough, headache, tiredness, etc.

162 **(b)**
Elephantiasis or filariasis is a pathogenic disease. Its pathogen is *Wuchereria bancrofti* and infection occurs by the bit of *Culex* mosquitoes

163 **(c)**
The T-lymphocytes mediate Cell Mediated Immune System (CMI). The B-lymphocytes produce an army of proteins in response to pathogens into our blood to fight with them. These proteins are called antibodies. The T-cells themselves do not secrete antibodies but help B-cells produce them

164 **(a)**
Usually the most common places for keeping beehives are courtyard, on the verandah of the house, on the roof, in the crop fields during flowering period, etc.
The beehives when kept in the fields of sunflower, *Brassica,* apple and pear, increase the pollination efficiency of flowering plants and improve the yields. A successful bee keeping requires management of beehives during different seasons

166 **(b)**
Powdery mildew of wheat-*Erysiphe graminis.*
Loose smut of wheat-*Ustilago tritici.*

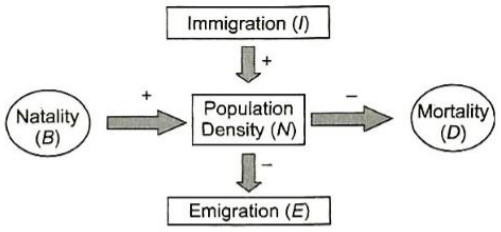
167 **(c)**
The most suitable source of biofertiliser is achieved by the use of blue-green algae (cyanobacteria), particularly in rice fields. These organisms grow well in symbiotic association with other plants or as free living individuals on the surface of moist soil or under water logged conditions

170 **(a)**
Bacillus thuringiensis froms the protein crystals, which contains a toxic insecticidal protein. *Bt* toxins are initially inactive protoxins but after ingestion by the insects their inactive toxin becomes active due to the alkaline pH of the gut, which solubilise the crystals. The activated toxin binds to the surface of the midgut epithelial cells thus creating pores, which causes cell swelling and lysis, further leading to death of the insect

171 **(a)**
Genetic engineering may one day enable the medical scientists to replace the defective genes responsible for heredity diseases (haemophilia, phenylketonuria) with the normal genes.
The improved techniques for gene manipulation and deeper understanding of gene function in the body, may some day enable the medical biotechnologists to correct gene disorders in humans. Treatment of a genetic disorder by manipulating genes is called **gene therapy**

172 **(a)**
Mobile genetic element is broadly any genetic element capable of moving itself, with or without duplication, from one site in a genome to another. Mobile genetic elements include plasmids, viruses, transposable genetic elements (transposons), short interspread elements, pathogenicity islands and so on. The term 'transposon' was introduced by **R W Hedges** and **A E Jacob** in 1974, to 'controlling' elements' or jumping genes, discovered by **Barbara McClintock** (1950) in maize.

173 **(c)**
A-Increases, B-Increases, C-Decreases, D-Decreases



(−) Sign indicates factors decreasing population density

(+) Sign indicates factors increasing population density

174 **(a)**

Competition Rivalary between two or more organisms for obtaining the same resources. Competition is of two types *e*. *g*., intraspecific and interspecific

Differences between Intraspecific and Interspecific Competition

Intraspecific Competition	Interspecific Competition
It is competition among individuals of the same species.	The competition is amongst the members of different species.
The competition is for all the requirements	The competition is for one or a few requirements.
The competing individuals have similar type of adaptation.	The competing individuals have different types of adaptations.
It is more severe due to similar needs and adaptations.	It is less severe as the similar needs are a few and the adaptations are different.

175 **(b)**

The rate of synthesis of energy containing organic matter by any trophic level per unit area in unit time is described its productivity. It is measured as weight (*e*. *g*., g/m^2/yr) or energy (*e*. *g*., kcal/m^2/yr). The amount of energy accumulation in green plants as biomass or organic matter per unit area over a time period through the process of photosynthesis is known as primary productivity. Primary productivity is expressed in term of weight (g^{-2}) or energy (kacl m^{-2}). C_4-plants area more productive that C_3 plants. Sugar cane is most productive crop being efficient in trapping light

176 **(a)**

The transfer of energy from producers to top consumers through a series of organisms is called food chain. One organism holds only one position. The flow of energy can be easily calculated. It is always straight and proceeds in a progressive straight line. Competition is limited to the members of same trophic level

177 **(b)**

From high latitude to low latitude, biodiversity increases.

Biodiversity increases from poles to equator, *i.e.,* from high to low altitude

178 **(b)**

Soil transportion by wind is common in dry regions where soil is chiefly sandy and the vegetation is very poor. Transported soils are those where the weathered material is taken away at other places. Depending on the nature of these transporting agents, the transported soil may be

(i)**Glacial**, transported by glaciers (large mass of snow ice)

(ii)**Eolian,** transported by wind

(iii)**Aluvial**, transported by running water

(iv) **Colluvial**, transportation by gravity.

179 **(d)**

Bhopal gas tragedy occurred (3 Dec, 1984) when MIC (Methyl Isocyanate) reacted with water in tank, an exothermic chemical reaction started and producing a lot of heat. As a result, the safety valve of tank burst because of increasing in pressure. It gave rise to a heavy gas leak which rapidly rank to the ground.

180 **(c)**

'Green house effect' refers to selective energy absorption by green house gases(e.g., carbon dioxide, methane , nitrogen oxide, chlorofluorocarbons and water vapour) in the atmosphere, which allows short wavelength energy to pass through but absorbs longer wavelength and reflect heat back to earth.