PHYSICS

1) Identify the pair whose dimensions are equal
   a) Torque and work b) Stress and energy
   c) Force and stress d) Force and work
2) Resistance of a given wire is obtained by measuring the current flowing in it and the voltage difference applied across it. If the percentage errors in the measurement of the current and the voltage difference are 3% each, then error in the value of resistance of the wire is:
   a) 6% b) zero
   c) 1% d) 3%
3) A boy can throw a stone up to a maximum height of 10 m. The maximum horizontal distance that the boy can throw the same stone up to will be
   a) $20\sqrt{2}$ m b) 10 m
   c) $10\sqrt{2}$ m d) 20 ms
4) A projectile is given an initial velocity of $(\hat{i}+2\hat{j})$ m/s, where, $\hat{i}$ is along the ground and $\hat{j}$ is along the vertical. If g =10m/s², the equation of its trajectory is
   a) $y = x-5x^2$ b) $y = 2x-5x^2$
   c) $4y = 2x-5x^2$ d) $4y = 2x-25x^2$
5) A particle starts sliding down a frictionless inclined plane. If S_n is the distance travelled by it from time t = n-1 sec to t = n sec, the ratio S_n/S_{n+1} is
   a) $\frac{2n-1}{2n+1}$ b) $\frac{2n+1}{2n}$
   c) $\frac{2n}{2n+1}$ d) $\frac{2n+1}{2n-1}$
6) A player caught a cricket ball of mass 150 g moving at a rate of 20ms^{-1}. If the catching process is completed in 0.1 s, the force of the blow exerted by the ball on the hand of the player is equal to
   a) 150 N b) 3 N
   c) 30 N d) 300 N
7) A block of base 10 cm x 10 cm and height 15 cm is kept on an inclined plane. The coefficient of friction between them is $\sqrt{3}$. The inclination θ of this inclined plane from the horizontal plane is gradually increased from 0°. Then
   a) at $\theta = 30°$, the block will start sliding down the plane.
   b) the block will remain at rest on the plane up to certain θ and then it will topple.
   c) at $\theta = 60°$, the block will start sliding down the plane and continue to do so at higher angles.
   d) at $\theta = 60°$, the block will start sliding down the plane and on further increasing θ, it will topple at certain θ.
8) A block of mass 0.50 kg is moving with a speed of 2.00 ms^{-1} on a smooth surface. It strikes another mass of 1.00 kg and then they move together as a single body. The energy loss during the collision is
   a) 0.16 J b) 1.00 J
   c) 0.67 J d) 0.34 J
9) A uniform chain of length 2 m is kept on a table such that a length of 60 cm hangs freely from the edge of the table. The total mass of the chain is 4 kg. What is the work done is pulling the entire chain on the table?
   a) 7.2 J b) 3.6 J
   c) 120 J d) 1200 J
10) A force $F = - K (y\hat{i} + x\hat{j})$ (where K is a positive constant) acts on a particle moving in the xy plane. Starting from the origin, the particle is taken along the positive x axis to the point (a,0), and then parallel to the y axis to the point (a,a), The total work done by the force F on the particle is
   a) $-2Ka^2$ b) $2Ka^2$
   c) $-Ka^2$ d) Ka^2
11) Angular momentum of the particle rotating with a central force is constant due to

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a) constant force
b) constant linear momentum
c) zero torque
d) constant torque

12) Two solid cylinder P and Q of same mass and same radius start rolling down a fixed inclined plane from the same height at the same time. Cylinder P has most of its mass concentrated near its surface, while Q has most of its mass concentrated near the axis. Which statement is correct?
a) Both cylinders P and Q reach the ground at the same time.
b) Cylinders P has larger linear acceleration than cylinder Q.
c) Both cylinders reach the ground with same translational kinetic energy.
d) Cylinder Q reaches the ground with larger angular speed

13) A carpet of mass M made of inextensible material is rolled along its length in the form of a cylinder of radius R and is kept on a rough floor. The carpet starts unrolling without sliding on the floor when a negligibly small push is given to it. Calculate the horizontal velocity of the axis of the cylindrical part of the carpet when its radius reduces to R/2.

a) $\sqrt{\frac{14}{3}Rg}$ b) $\sqrt{\frac{13}{3}Rg}$

c) $\sqrt{\frac{16}{3}Rg}$ d) $\sqrt{\frac{8}{3}Rg}$

14) A body is projected vertically upwards from the bottom of a crater of moon of depth R/100 where R is the radius of moon with a velocity equal to the escape velocity on the surface of moon. Calculate maximum height attained by the body from the surface of the moon.

a) 93.5R b) 99.5R
c) 87.5R d) 101.5R

15) Two bodies, each of mass M, are kept fixed with a separation 2L. A particle of mass m is projected from the midpoint of the line joining their centres, perpendicular to the line. The gravitational constant is G. The correct statement(s) is (are)
a) The minimum initial velocity of the mass m to escape the gravitational field of the two bodies is $4\sqrt{(GM/L)}$
b) The minimum initial velocity of the mass m to escape the gravitational field of the two bodies is $2\sqrt{(GM/L)}$
c) The minimum initial velocity of the mass m to escape the gravitational field of the two bodies is $\sqrt{(2GM/L)}$
d) The energy of the mass m remains constant

16) If two soap bubbles of different radii are connected by a tube
a) air flows from the bigger bubbles to the smaller bubble till the sizes becomes equal
b) air flows from bigger bubble to the smaller bubble till the sizes are interchanged
c) air flows from the smaller bubble to the bigger
d) there is no flows of air

17) One end of a horizontal thick copper wire of length 2L and radius 2R is welded to an end of another horizontal thin copper wire of length L and radius R. When the arrangement is stretched by applying forces at two ends, the ratio of the elongation in the thin wire to that in the thick wire is
a) 0.25 b) 0.50
c) 2.00 d) 4.00

18) The pressure that has to be applied to the ends of a steel wire of length 10 cm to keep its

length constant when its temperature is raised by 100°C is (For steel, Young's modulus is 2 x 10^{11} Nm^{-2} and coefficient of thermal expansion is 1.1 x 10^{-5} K^{-1})

a) 2.2 x 10^8 Pa b) 2.2 x 10^9 Pa
c) 2.2 x 10^7 Pa d) 2.2 x 10^6 Pa

19) A solid sphere of radius R made of a material of bulk modulus K is surrounded by a liquid in a cylindrical container. A massless piston of area A floats on the surface of the liquid. When a mass M is placed on the piston to compress the liquid the fractional change in the radius of the sphere $\frac{\partial R}{R}$ is

a) $\frac{Mg}{2AK}$ b) $\frac{3Mg}{AK}$
c) $\frac{Mg}{3AK}$ d) $\frac{3Mg}{2AK}$

20) At what temperature is the rms velocity of a hydrogen molecule equal to that of an oxygen molecule at 47°C?

a) 80 K b) -73 K
c) 3 K d) 20 K

21) A cylinder of radius R made of a material of thermal conductivity K_1 is surrounded by a cylindrical shell of inner radius R and outer radius 2R made of a material of thermal conductivity K_2. The two ends of the combined system are maintained at two different temperatures. There is no loss of heat across the cylindrical surface and the system is in steady state. The effective thermal conductivity of the system is

a) $K_1 + K_2$ b) $K_1 K_2 / (K_1 + K_2)$
c) $(K_1 + 3K_2) / 4$ d) $(3K_1 + 3K_2) /4$

22) For a simple pendulum, the graph between T^2 and L is

a) a straight line passing through the origin
b) parabola
c) circle d) ecllipse

23) A particle moves with simple harmonic motion in a straight line. In first τ sec, after starting from rest it travels a distance a and in next τ sec, it travels 2a, in same direction, then

a) amplitude of motion is 3a
b) time period of oscillations is 8π
c) amplitude of motion is 4a
d) time period of oscillations is 6π

24) A point mass is subjected to two simultaneous sinusoidal displacements in x-direction, $x_1(t)$ = A sin ωt and $x_2(t)$ = A sin (ωt+2π/3). Adding a third sinusoidal displacement x_3 (t) = B sin (ωt +φ) brings the mass to a complete rest. The values of B and φ are

a) √2A, 3π /4 b) A, 4π/3
c) √3A, 5π/6 d) A, π/3

25) Two spherical conductors A and B of radii 1 mm and 2 mm are separated by a distance of 5 cm and are uniformly charged. If the spheres are connected by a conducting wire then in equilibrium condition, the ratio of the magnitude of the electric fields at the surface of spheres A and B is

a) 4:1 b) 1:2
c) 2:1 d) 1:4

26) Two non-conducting solid spheres of radii R and 2R, having uniform volume charge densities p_1 and p_2 respectively, touch each other. The net electric field at a distance 2R from the centre of the smaller sphere, along the line joining the centres of the spheres, is zero. The ratio p_1/p_2 can be

a) -4 b) -32/55
c) 32/55 d) 4

27) A non-conducting solid sphere of radius R is uniformly charged. The magnitude of the electric field due to the sphere at a distance r

from its centre
a) decreases as r increases, for r < R
b) decreases as r increases, for 0 < r < (symbol missing)
c) decreases as r increases, for R < r < (symbol missing)
d) is discontinuous at r = R

28) An energy source will supply a constant current into the load, if its internal resistance is
a) equal to the resistance of the load
b) very large as compared to the load resistance
c) zero
d) non-zero but less than the resistance of the load

29) A resistance of 2Ωis connected across one gap of a metre-bridge (the length of the wire is 100 cm) and an unknown resistance, greater than 2Ω, is connected across the other gap. When these resistances are interchanged, the balance point shifts by 20 cm. Neglecting any corrections, the unknown resistance is
a) 3Ω b) 4Ω
c) 5Ω d) 6Ω

30) The magnetic flux linked with a coil of N turns of area of cross section A held with its plane parallel to the field B is
a) NAB/2 b) NAB
c) NAB/4 d) 0

31) Identify the correctly matched pair.

Material	Example
1) Diamagnetic	Gadolinium
2) Soft ferromagnetic	Alnico
3) Hard ferromagnetic	Copper
4) Paramagnetic	Sodium

a) 1 b) 2
c) 3 d) 4

32) A horizontal overhead powerline is at a height of 4 m from the ground and carries a current of 100 A from East to West. The magnetic field directly below it on the ground is ($\mu_0 = 4 \times 10^{-7}$ T-mA^{-1})
a) 2.5×10^{-7} T, Southward
b) 5.0×10^{-6} T, Northward
c) 5.0×10^{-6} T, Southward
d) 2.5×10^{-7} T, Northward

33) Identify the correct statement from the following.
a) Cyclotron frequency is dependent on speed of the charged particle
b) Kinetic energy of charged particle in cyclotron does not dependent on its mass
c) Cyclotron frequency does not depend on speed of charged particle
d) Kinetic energy of charged particle in cyclotron is independent of its charge

34) The core of a transformer is laminated to reduce
a) flux leakage b) eddy current
c) hysteresis d) copper loss

35) A small square loop of wire of side l is placed inside a large square loop of wire of side L (L>>I). The loops are co-planar and their centres coincide. The mutual inductance of the system is proportional to
a) l/L b) l^2/L
c) L/l d) L^2/l

36) A current carrying infinitely long wire is kept along the diameter of a circular wire loop, without touching it, the correct statement(s) is(are)
a) The emf induced in the loop is zero if the current is constant
b) The emf induced in the loop is finite if the current is constant

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c) The emf induced in the loop is zero if the current decreases at a steady rate
d) The emf induced in the loop is infinite if the current decreases at a steady rate

37) During the propagation of electromagnetic waves in a medium
a) electric energy density is double of the magnetic
b) electric energy density is half of the magnetic energy density
c) electric energy density is equal to the magnetic energy density
d) Both electric and magnetic energy densities are zero

38) A coil of inductance 8.4 mH and resistance 6Ω is connected to a 12 V battery. The current in the coil is 1.0 A at approximately the time
a) 500s b) 25s
c) 35ms d) 1ms

39) Lumen is the unit of
a) luminous flux b) luminosity
c) illuminance d) quantity of light

40) A ray of light travelling in water is incident on its surface open to air. The angle of incidence is θ, which is less than the critical angle. Then there will be
a) only a reflected ray and no refracted ray
b) only a refracted ray and no reflected ray
c) a reflected ray and a refracted ray and the angle between then would be less than 180°-2θ
d) a reflected ray and a refracted ray and the angle between then would be greater than 180°-2θ

41) A diminished image of an object is to be obtained on a screen 1.0 m from it. This can be achieved by appropriately placing
a) a concave mirror of suitable focal length
b) a convex mirror of suitable focal length
c) a convex lens of focal length less than 0.25 m
d) a concave lens of suitable focal length

42) Which one of the following statement is wrong in the context of X-rays generated from X-ray tube?
a) Wavelength of characteristic X-rays decreases when the atomic number of the target increases
b) Cut-off wavelength of the continuous X-rays depends on the atomic number of the target
c) Intensity of the characteristic X-rays depends on the electrical power given to the X-ray tube
d) Cut-off wavelength of the continuous X-rays depends on the energy of the electrons in the X-ray tube

43) The electric potential between a proton and an electron is given by $V = V_0 \, ln \, r/r_0$, where r_0 is a constant. Assuming Bohr's model to be applicable =, write variation of r_n with n, n being the principal quantum number?
a) $r_n \propto n$ b) $r_n \propto 1/n$
c) $r_n \propto n^2$ d) $r_n \propto 1/n^2$

44) The ratio between the radii of nuclei with mass number 27 and 125 is
a) 5:3 b) 3:5
c) 27:125 d) 125:27

45) What is the maximum energy of the anti-neutrino?
a) Zero
b) Much less that 0.8vx 10^6 eV
c) Nearly 0.8 x 10^6 eV
d) Much larger than 0.8 x 10^6 eV

46) The fussion process is possible at high temperatures, because at higher temperatures
a) the nucleus disintegrates
b) the molecules disintegrates

c) atoms become ionised
d) the nucleus get sufficient energy to overcome the strong forces of repulsion

47) A pulse of light of duration 100 ns is absorbed completely by a small object initially at rest. Power of the pulse is 30 mW and the speed of light is 3 x 10^8 ms^{-1}. The final momentum of the object is
a) $0.3x10^{-17}$kg ms^{-1} b) $1.0x10^{-17}$kg ms^{-1}
c) $3.0x10^{-17}$ kg ms^{-1} d) 9.0 x 10^{-17} kg ms^{-1}

48) Which of the following four alternatives is not correct?
a) to increase the selectivity
b) to reduce the time lag between transmission and reception of the information signal
c) to reduce the size of antenna
d) to reduce the fractional bandwidth, that is the ratio of the signal bandwidth to the centre frequency

49) The sky wave propagation is suitable for radio waves of frequency
a) upto 2 MHz
b) from 2 MHz to 20 MHz
c) between 2 MHz to 30 MHz
d) from 2 MHz to 50 MHz

50) During the propagation of electromagnetic waves in a medium:
a) Electric energy density is equal to the magnetic energy density.
b) Both electric and magnetic energy densities are zero
c) Electric energy density is double of the magnetic energy density
d) Electric energy density is half of the magnetic energy density

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51) The reaction, $3ClO^-(aq) \rightarrow ClO_3^-(aq) + 2Cl^-(aq)$, is an example of
a) oxidation reaction
b) reduction reaction
c) disproportionation reaction
d) decomposition reaction

52) If volume containing gas is compressed to half, how many moles of gas remained in the vessel?
a) Just double b) just half
c) same d) more than double

53) According to the kinetic theory of gases, in an ideal gas, between two successive collisions a gas molecule travels
a) in a circular path
b) in a wavy path
c) in a straight line path
d) with an accelerated velocity

54) If uncertainty in position and momentum are equal then uncertainty in velocity is
a) $\frac{1}{2m}\sqrt{\frac{h}{\pi}}$ b) $\sqrt{\frac{h}{2\pi}}$
c) $\frac{1}{m}\sqrt{\frac{h}{\pi}}$ d) $\sqrt{\frac{h}{\pi}}$

55) The wavelength association with a golf ball weighing 200 g and moving at a speed of 5 m/h is of the order
a) 10^{-10} m b) 10^{-20} m
c) 10^{-30} m d) 10^{-40} m

56) Main axis of a diatomic molecule is z, molecular orbital p_x and p_y overlaps to form, which of the following orbitals?
a)π- molecular orbital b) Ơ- molecular orbital
c)δ- molecular orbital d) No bond will form

57) Geometrical shapes of the complexes formed by the reaction of Ni^{2+} with Cl^-, CN^- and H_2O, respectively, are
a) octahedral, tetrahedral and square planar
b) tetrahedral, square planar and octahedral
c) square planar, tetrahedral and octahedral
d) octahedral, square planar and octahedral

58) The species which by definition has ZERO standard molar enthalpy of formation at 298 K is
a) Br_2 (g) b) Cl_2 (g)
c) H_2O (g) d) CH_4 (g)

59) Molar heat capacity of aluminum is $25JK^{-1}mol^{-1}$. The heat necessary to raise the temperature of 54 g of aluminum (Atomic mass 27 g mol^{-1}) from 30°C to 50°C is
a) 1.5 kJ b) 0.5 kJ
c) 1.0 kJ d) 2.5 kJ

60) For the equilibrium,
$H_2O(l) \rightleftharpoons H_2O(g)$ at 1 atm and 298 K
a) standard free energy change is equal to zero ($\Delta G°=0$)
b)free energy change is less than zero ($\Delta G<0$)
c) standard free energy change is less than zero ($\Delta G°<0$)
d)standard free energy change is greater than zero ($\Delta G°>0$)

61) For a dilute solution containing 2.5 g of a non-volatile non-electrolyte solute in 100 g of water, the elevation in boiling point at 1 atm pressure is 2°C. Assuming concentration of solute is much lower than the concentration of solvent, the vapour pressure (mm of Hg) of the solution is (take K_b =0.76 K kg mol^{-1})
a) 724 b) 740
c) 736 d) 718

62) The volume of water to be addes to 100 cm^3 of 0.5 N H_2SO_4 to get decinormal concentration is
a) 400 cm^3
b) 450 cm^3
c) 500 cm^3
d) 100 cm^3

63) Given the data at 25°C
$Ag + I^- \rightarrow AgI + e^-$ E° = 0.152 V
$Ag \rightarrow Ag^+ + e^-$ E° = -0.800 V
What is the value of log K_{sp} for AgI? (2.303

RT/F = 0.059 V)

a) -37.83 b) -16.13
c) -8.12 d) 8.612

64) The pH value of blood does not change appreciably by a small addition of an acid or base, because the blood
a) is a body fluid
b) can be easily coagulated
c) contains iron as a part of the molecule
d) contains serum protein that acts as buffer

65) Solubility product constant (K_{sp}) of salts of types MX, MX_2 and M_3X at temperature T are 4.0×10^{-8}, 3.2×10^{-14} & 2.7×10^{-15}, respectively. Solubilities (mol dm^{-3}) of the slats at temperature 'T' are in the order-
a) $MX > MX_2 > M_3X$
b) $M_3X > MX_2 > MX$
c) $MX_2 > M_3X > MX$
d) $MX > M_3X > MX_2$

66) In a fuel cell methanol is used as fuel and oxygen gas is used as an oxidizer. The reaction is: $CH_3OH(l) + 3/2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$ At 298 K standard Gibb's energies of formation for $CH_3OH(l)$, $H_2O(l)$ and $CO_2(g)$ are -166.2,-237.2 and -394.4 kJ mol^{-1} respectively. If standard enthalpy of combustion of methonal is -726 kJ mol^{-1}, efficiency of the fuel cell will be:
a) 87% b) 90%
c) 97% d) 80%

67) For a first order reaction A→P, the temperature (T) dependent rate constant (k) was found to follow the equation log k = -(2000)1/T + 6.0. The pre-exponential factor A and the activation energy E_a, respectively, are
a) 1.0×10^6 s^{-1} and 9.2 kJ mol^{-1}
b) 6.0 s^{-1} and 16.6 kJ mol^{-1}
c) 1.0×10^6 s^{-1} and 16.6 kJ mol^{-1}
d) 1.0×10^6 s^{-1} and 38.3 kJ mol^{-1}

68) $2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$

What is the ratio of the rate of decomposition of N_2O_5 to rate of formation of NO_2?

a) 1 : 2 b) 2 : 1
c) 1:4 d) 4:1

69) In the nuclear transmutation
$9/4Be + X \rightarrow 8/4Be + Y$, (X,Y) is
a) (p,n) b) (p,D)
c) (n,D) d) (y,p)

70) Which of the following forms cationic micelles above certain concentration?
a) Sodium ethyl sulphate
b) Sodium acetate
c) Urea
d) Cetyl trimethyl ammonium bromide

71) The incorrect statement among the following is
a) the first ionization potential of Al is less than the first ionisation potential of Mg
b) the second ionization potential of Mg is greater than the second ionisation potential of Na
c) the first ionization potential of Na is less than the first ionisation potential of Mg
d) the third ionization potential of Mg is greater than the third ionisation potential of Al

72) The first ionisation potential of Na is 5.1 eV. The value of electron gain enthalpy of Na^+ will be:
a) -2.55 eV b) -5.1 eV
c) -10.2 eV d) +2.55 eV

73) Identify the transition element.
a) $1s^2, 2s^2\ 2p^6, 3s^2\ 3p^6, 4s^2$
b) $1s^2, 2s^2\ 2p^6, 3s^2\ 3p^6\ 3d^2, 4s^2$
c) $1s^2, 2s^2\ 2p^6, 3s^2\ 3p^6\ 3d^{10}, 4s^2\ 4p^2$
d) $1s^2, 2s^2\ 2p^6, 3s^2\ 3p^6\ 3d^{10}, 4s^2\ 4p^1$

74) In the cyanide extraction process of silver from argentite ore, the oxidizing and reducing agents used are

a) O_2 and CO respectively
b) O_2 and Zn dust respectively
c) HNO_3 and Zn dust respectively
d) HNO_3 and CO respectively

75) When phenyl magnesium bromide reacts with tert- butanol, the product would be
a) Benzene b) Phenol
c) ter-butyl benzene
d) ter-butylphenyl ether

76) Tertiary alkyl halides are practically inert to substitution by S_{n2} mechanism because of
a) steric hindrance
b) inductive effect
c) instability
d) insolubility

77) The shape of XeO_2F_2 molecule is
a) trigonal bipyramidal
b) square planar
c) tetrahedral
d) see-saw

78) Washing soda has formula
a) $Na_2CO_3.\ 7H_2O$ b) $Na_2CO_3.\ 10H_2O$
c) $Na_2CO_3.\ 3H_2O$ d) Na_2CO_3

79) Which of the following statement is wrong?
a) The stability of hydride increases from NH_3 to BiH_3 in group 15 of the periodic table
b) Nitrogen cannot form $d\pi - p\pi$ bond
c) Single N-N bond is weaker than the single P-P bond
d) N_2O_4 has two resonance structures

80) The colour of light absorbed by an aqueous solution of $CuSO_4$ is:
a) orange-red b) blue-green
c) yellow d) violet

81) Ammonia forms the complex ion $[Cu(NH_3)_4]^{2+}$ with copper ions in alkaline solutions but not in acidic solutions. What is the reason for it?
a) In acidic solutions protons coordinate with ammonia molecules forming NH^+_4ions and NH_3 molecules are not available
b) In alkaline solutions insoluble $Cu(OH)_2$ is precipitated which is soluble in excess of any alkali
c) Copper hydroxide is an amphoteric substance
d) In acidic solutions hydration protects copper ions

82) $FeSO_4\ (NH_4)_2SO_4\ 6H_2O$ is called
a) green salt b) Glauber's salt
c) Mohr's salt d) alum

83) Among the following, the paramagnetic compound is
a) Na_2O_2 b) O_3
c) N_2O d) KO_2

84) The effective atomic number of Cr (At. No. = 24) in $[Cr(NH_3)_6]Cl_3$ is
a) 35 b) 27
c) 33 d) 36

85) How do we differentiate between Fe^{3+} and Cr^{3+} in group III?
a) by taking excess of NH_4OH solution
b) by increasing NH_4^+ ion concentration
c) by decreasing OH^- ion concentration
d) both (b) and (c)

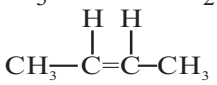
86) Identify the compound that exhibits tautomerism:
a) 2-Butene
b) Lactic acid
c) 2-Pentanone
d) Phenol

87) The number of stereoisomers obtained by bromination of trans-2-butene is
a) 1 b) 2
c) 3 d) 4

88) In allene (C_3H_4), the type(s) of hybridization of the carbon atoms is:
a) sp and sp^3 b) sp and sp^2
c) only sp^3 d) sp^2 and sp^3

89) Which one of these, is not compatible with

arenes?
a) Greater stability
b) Delocalisation of π-electrons
c) Electrophilic additions
d) Resonance

90) The treatment of CH_3MgX with $CH_3C \equiv C\text{-}H$ produces
a) $CH_3 - CH = CH_2$ b) $CH_3C \equiv C - CH_3$
c)  d) CH_4

91) Identify the set of reagent/ reaction conditions 'X' and 'Y' in the following set of transformations $CH_3\text{-}CH_2\text{-}CH_2Br \rightarrow$(x) Product →(y) $CH_3\text{-}CH\text{-}CH_3$
a) X= dilute aqueous NaOH, 20°C; Y = HBr/ acetic acid,20°C
b) X= concentrated alcoholic NaOH,80°C; Y = HBr/acetic acid, 20°C
c) X= dilute aqueous NaOH, 20°C; Y = Br/ $CHCl_3$, 0°C
d) X= concentrated alcoholic NaOH,80°C; Y = Br/$CHCl_3$, 0°C

92) Reaction of trans 2-phenly-1-bromocyclopentane on reaction with alcoholic KOH produces
a) 1- phenylcyclopentene
b) 3- phenylcyclopentene
c) 4- phenylcyclopentene
d) 2- phenylcyclopentene

93) The density of glycerol is higher than propanol due to
a) van der Waals' attraction
b) hydrogen bonding
c) ionic bonding
d) more number of covalent bonds

94) Benzenediazonium chloride on reaction with phenol in weakly basic medium gives
a) diphenyl ether b) p-hydroxyazobenzene
c) chlorobenzene d) benzene

95) A compound with molecular mass 180 is acylated with CH_3COCI to get a compound with molecular mass 390. The number of amino groups present per molecule of the former compound is:
a) 2 b) 5
c) 4 d) 6

96) Buna-N synthetic rubber is a copolymer of:
a) $H_2C = CH\text{-}CH{=}CH_2$ and $H_5C_6\text{-}CH{=}CH_2$
b) $H_2C = CH\text{-}CN$ and $H_5C{=}CH\text{-}CHCH_2$
c) $H_2C = CH\text{-}CN$ and $H_5C{=}CH\text{-}C{=}CH_2$
d) $H_2C{=}CH\text{-}C = CH_2$ and $H_2C{=}CH\text{-}CH{=}CH_2$

97) Assertion: Glycosides are hydrolysed in acidic conditions.
Reason: Glycosides are acetals
a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion
c) Both Assertion and Reason are false
d) Both Assertion and Reason are false

98) Which one of the following vitamins is water-soluble?
a) Vitamin B b) Vitamin E
c) Vitamin K d) Vitamin A

99) Aspirin is known as :
a) Acetyl salicylic acid
b) Phenyl salicylate
c) Acetyl salicylate
d) Methyl salicylic acid

100) The presence or absence of hydroxyl group on which carbon atom of sugar differentiates RNA and DNA?
a) 1^{st} b) 2^{nd}
c) 3^{rd} d) 4^{th}

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101) the mucosal layer in the stomach from irregular folds known as
a) villi b) lumen
c) rugae d) crypts of Liberkuhn

102) Which one of the following pairs is mismatched?
i) Fossil fuel burninf→release of CO_2
ii) Nuclear power→radioactive wastes
iii) Solar energy→green house effect
iv) Biomass burning→release of CO_2
a) i b) ii
c) iii d) iv

103) A cross section at the mid point of the middle piece of a human sperm will show
a) centriole, mitochondria and 9+2 arrangement of microtubules
b) centrioles and mitochondria
c) mitochondria and 9+2 arrangement of microtubules
d) 9+2 arrangement of microtubules only

104) Eutrophication is often seen in:
a) fresh water lakes b) ocean
c) mountains d) desert

105) In rabbit, the digestion of cellulose takes place in:
a) colon b) ileum
c) caecum d) secretin

106) In a diploid cell, at which stage of cell cycle , the amount of DNA is doubled?
a) G_1 and G_2 phase b) G_0 phase
c) S, G_2 and M phase d) S phase

107) What is diapedesis?
a) A kind of amoeboid movement
b) The process of filtration of urea in kidney
c) A type of locomotion found in hydra
d) Migration of WBCs into the tissue spaces from blood capillaries

108) Which of the following is not a concept of Lamarck?
a) Environmental pressure causes variation
b) Rate and survival of organism is different due to variation
c) Inheritance of acquired characters
d) If an organ is used constantly it will continuously increase its size

109) **Assertion :** Extra oxygen consumption in human body is known as oxygen debt.
Reason : The extra oxygen is required by the body to oxidize accumulated lactic acid produced during strenuous exercise.
a) Both assertion and reason are true and reason is correct explanation of assertion
b) Both assertion and reason are true but reason is not correct explanation of assertion
c) Assertion is true reason is false
d) Both Assertion and reason are false

110) Which of the following is true for excretion in humans?
a) Glucose and amino acids are reabsorbed in PCT by simple diffusion.
b) DCT is impermeable to water
c) On an average , 25-30 gm of urea is excreted out per day
d) Maximum reabsorption occurs in the loop of Henle

111) Sweat glands, in human skin, are located in the
a) malpighian layer of epidermis
b) dermis of skin
c) subdermal layer of fat cells
d) glandular layer of epidermis

112) The plasma membrane consists mainly of
a) phospholipids embedded in a protein bilayer
b) proteins embedded in a phospholipid bilayer
c) proteins embedded in a polymer of glucose molecules
d) proteins embedded in a carbohydrate bilayer

113) Laterally united anthers with free filaments is the characteristic feature of
a) pea b) marigold

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c) lily d) tobacco

114) The age of fossils or dating of fossils can be best estimated by
a) radioactive carbon (C^{14}) dating method
b) radioactive nitrogen method
c) radioactive clock method
d) None of the above

115) Mosses and ferns are found in moist and shady places because both
a) require presence of water for fertilization
b) do not need sunlight for photosynthesis
c) depend on microorganisms in water for their nutrition
d) cannot compete with sun loving plants

116) Phytohormones are
a) hormones regulating growth from seed to adulthood
b) growth regulators synthesized by plants and influencing physiological process
c) hormones regulating flowering
d) hormones regulating secondary growth

117) Which of the following statement pertaining to pollutants is correct?
a) DDT is a non- biodegradable pollutant
b) Excess fluoride in drinking water causes osteoporosis
c) Excess cadmium in drinking water causes black foot disease
d) Methyl mercury in water may cause 'Itai-Itai'disease

118) **Assertion :** Presently, the global atmosphere is warming up.
Reason : The depletion of stratospheric ozone layer has resulted in increase in ultraviolet radiations reaching the earth.
a) Both assertion and reason are true and reason is correct explanation of assertion
b) Both assertion and reason are true but reason is not correct explanation of assertion
c) Assertion is true reason is false
d) Both Assertion and reason are false

119) Maximum noise permissible during day time in residential areas is
a) 75db b) 55db
c) 65db d) 45db

120) Which of the following statement is regarding decomposition is false?
a) Warm and moist environment favours decomposition
b) Decomposition rate is slower if detritus is rich in chitin and lignin
c) Earthworm is a detritivore
d) Precipitation of soluble inorganic nutrients into the soil horizon as unavailable salts is called mineralization
e) Detritus is the raw material for decomposition

121) Mutualism is found in
a) hermit crab and sea anemone
b) butterfly and flower
c) Zoochlorellae and hydra
d) E.coli and man

122) Biological oxygen demand (BOD)is a measure of :
a) industrial wastes poured into water bodies
b) extent to which water is polluted with organic compounds
c) amount of carban monoxide inseparably combined with haemoglobin
d) amount of oxygen needed by green plants during night

123) The montreal protocol refers to
a) persistent organic pollutants
b) global warming and climate change
c) substances that deplete the ozone layer
d) biosafety of genetically modified organisms
c) remain unaffected d) burst

124) In a spadix inflorescence the spathe encloses
a) umbel b) biparous cyme
c) catkin d) spike

125) In a dicotyledonous stem, what is the sequence of tissues from the outside to the inside?
a) phellem- pericycle – endodermis- phloem
b) phellem-phloem-endodermis-pericycle
c) phellem-endodermis-pericycle-phloem
d) pericycle-phellem-endodermis-phloem

126) In CAM plants, CO_2 acceptor is
a) RuBP b) PEP
c) OAA d) PGA

127) Number of chromosomes in root cells of an angiospermic plant is 14, than the number of chromosomes in its synergid cells will be
a) 14 b) 7
c) 28 d) 21

128) Name the syndrome which is caused when there is trisomy of the sex chromosomes.
a) turner's syndrome
b) Down's syndrome
c) klinefelter's syndrome
d) Patau's syndrome

129) The 'gene-flow' terms refer to
a) exchange of genes over a chromosome
b) inversion of genes over a chromosome
c) passing on the genes from one generation to the other
d) genetic result of intergroup mating.

130) In assisted reproductive technology where gametes have been fertilized in vitro, which of the following is practicable for embryo transplantation in fallopian tube?
a) only embryo up to 8 blastomeres if zygote is not transplanted.
b) only zygote is transplanted not embryo
c) either embryo or zygote with 8 blastomere phase transplanted.
d) morulla with 8-24 celled stage is transplanted in fallopian tube

131) **Assertion :** in a regular medical examination of a small population , a 35 year old lady was found to have higher levels of oestrogens, progesterone in her blood.
Reason : The lady is 12 weeks pregnant.
a) Both assertion and reason are true and reason is correct explanation of assertion
b) Both assertion and reason are true but reason is not correct explanation of assertion
c) Assertion is true reason is false
d) Both Assertion and reason are false

132) The first heart sound is produced when
a) diastole begins
b) semilunar valve close quickly
c) interventricular pressure decreses
d) bicuspid and tricuspid valve close quickly

133) The low pressure below the arterial PO_2 results in
a) release of CO_{2v} from the cell
b) formation of haemoglobin
c) production of bicarbonate
d) reduction of blood volume

134) Intercellular communication in multicellular organism occurs through
a) digestive system only
b) respiratory system only
c) nervous system only
d) both nervous and endocrine system

135) Which is not a reflex action?
a) Salivation
b) Eye opening and closing
c) Response to pinching pin in a frog leg
d) Sweating

136) Heartwood differs from sapwood in
a) presence of rays and fibres
b) absence of vessels and parenchyma
c) having dead and non-conducting elements
d) being susceptible to pests and pathogens.

137) **Assertion :** Deforestation is one main factor

to contributing to global warming

Reason : Besides CO_2, two other gases methane and CFCs are also included under green house gases

a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion
c) Assertion is true but Reason is false
d) Both Assertion and Reason are false

138) Kyoto protocol is related with
a) ozone layer depletion
b) green house effect
c) water pollution
d) conservation of wildlife

139) Which plant species is on the verge of extinction due to over-exploitation ?
a) gloriosa b) podophyllum
c) ceritella d) all of these

140) The most important source of energy on earth is
a) ATP molecules b) chlorophyll
c) xanthophyll d) carotenoids

141) **Assertion** : In food chain members of successive higher levels are fewer in number.

Reason : Number of organisms at any trophic level depends upon the availability of organisms, which serve as food at the lower level.

a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion
c) Assertion is true but Reason is false
d) Both Assertion and Reason are false

142) Which of the following helps in the growth of terrestrial pteridophytes in tropical rain forest?
a) Microclimate
b) C_4-pathway
c) Eutrophication
d) Biological magnification

143) Which of the following enzymes digests protein in stomach?
a) Trypsin b) Pepsin
c) Erepsin d) None of these.

144) Which one of the following is reptilian ancestor of birds?
a) Hesperornis b) Ichthyornis
c) Archaeopteryx d) Lycaenops

145) In some organism, Karyokinesis is not followed by cytokinesis as a result of which, multinucleate condition arises leading to the formation syncytium. The perfect example for this is
a) appearance of a furrow in cell membrane
b) liquid endosperm in coconut
c) sexual reproduction
d) fertilization

146) Wind pollination is common in
a) lilies b) grasses
c) orchids d) legumes

147) Who postulated the mutation theory?
a) Mendel b) Darwin
c) Weismann d) Hugo de Vries

148) Identify the characteristics of gynoecium found in members of asteraceae, fabaceae, liliaceae and solanaceae, respectively
I. Tricarpellary syncarpous, ovary superior and trilocular.
II. Bicarpellary sycarpous , ovary superior and usually bilocular.
III. Bicarpellary sycarpous , ovary inferior and unilocular.
IV. Monocarpellary , ovary half- inferior and unilocular.
a) II, I, III, IV b) III, IV, I, II

c) IV, III, II, I d) I, II, IV, III

149) Nicotiana sylvestris flowers only during long days and N.tabacum flowers only during short days. If raised in the laboratory under different photoperiods. They can be induced to flower at the same time and can be cross-fertilized to produce self-fertile offspring. What is the best reason for considering N.sylvestris and N. tabacum to be separate species?
a) they cannot interbreed in nature
b) they are reproductively distinct
c) they are physiologically distinct
d) they are morphologically distinct

150) An example of gene therapy is
a) production of injectable hepatitis-B vaccine
b) production of vaccines in food crops like potatoes which can be eaten
c) introduction of gene for adenosine deaminase in persons suffering from Severe Combined Immuno Deficiency (SCID)
d) production of test tube babies by artificial insemination and implantation of fertilized eggs

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