JIPMER Medical Entrance Exam Previous Year Question Paper 2015
With Answer Key

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Medical Entrance Exam Previous Year – 2015

Physics

1. The angle between two linear trans-membrane domains is defined by following vectors
   (a) $\cos^{-1}(\frac{1}{3})$
   (b) $\cos^{-1}(\frac{-1}{3})$
   (c) $\sin^{-1}(\frac{-1}{3})$
   (d) $\sin^{-1}(\frac{1}{3})$

   Ans: (b)

2. The distance $x$ (in μm) covered by a molecule starting from point A at time $t = 0$ and stopping at another point B in given by the equation $x = t^2 \left( 2 \frac{t}{3} \right)$

   The distance between A and B (in μm) is closed to
   (a) 10.7
   (b) 20.7
   (c) 40.7
   (d) 50.7

   Ans: (a)

3. A tangential force acting on the top of sphere of mass $m$ kept on a rough horizontal place as shown in figure.
If the sphere rolls without slipping, then the acceleration with which the centre of sphere moves, is

(a) \( \frac{10F}{10m} \)

(b) \( \frac{F}{2m} \)

(c) \( \frac{3F}{7m} \)

(d) \( \frac{7F}{2m} \)

Ans: (a)

4. The density of a rod having length \( l \) varies as \( \rho = c + dx \), where \( x \) is the distance from the left end. The centre of mass is

\[
\text{Ans: (a)}
\]

5. One end of a massless spring of constant 100 N/m and natural length 0.5 m is fixed and the other end is connected to a particle of mass 0.5 kg lying on a frictionless horizontal table. The spring remains horizontal. If the mass is made to rotate at angular velocity of 2 rad/s, then elongation of spring is

(a) 0.1 m

(b) 10 cm
(c) 1 cm
(d) 0.01 cm
**Ans: (c)**

6. A block slides down an incline of angle 30° with an acceleration $g/4$. Find the kinetic friction coefficient.

(a) $\frac{1}{2\sqrt{2}}$
(b) 0.6
(c) $\frac{1}{2\sqrt{3}}$
(d) $\frac{1}{\sqrt{2}}$

**Ans: (c)**

7. Two long straight wires, each carrying an electric current of 5 A, are kept parallel to each other at a separation of 2.5 cm. Find the magnitude of the magnetic force exerted by 10 cm of a wire.

(a) $4.0 \times 10^{-4}$ N
(b) $3.5 \times 10^{-6}$ N
(c) $2.0 \times 10^{-5}$ N
(d) $2.0 \times 10^{-9}$ N

**Ans: (c)**

8. A wire of resistance 10 Ω is bent to form a complete circle. Find its resistance between two diametrically opposite points.

(a) 5 Ω
(b) 2.5 Ω
Find the resistance of a hollow cylindrical conductor of length 1.0 mm and 2.0 mm respectively. The resistivity of the material is $2.0 \times 10^{-8} \, \Omega \text{m}$.

(a) $2.1 \times 10^{-3} \, \Omega$
(b) $1.3 \times 10^{-4} \, \Omega$
(c) $3.2 \times 10^{-4} \, \Omega$
(d) $4.6 \times 10^{-2} \, \Omega$

Ans: (a)

9. Three equal charges, each having a magnitude of $2.0 \times 10^{-6} \, \text{C}$, are placed at the three corners of a right angled triangle of sides 3 cm 4 cm and 5 cm. The force (in magnitude) on the charge at the right

(a) 50 N
(b) 26 N
(c) 29 N
(d) 45.9 N

Ans: (d)

10. A diatomic gas ($\gamma = 1.4$) does 200 J of work when it is expanded isobarically. Find the heat given to the gas in the process.

(a) 500 J
(b) 700 J
(c) 600 J
(d) 900 J

Ans: (b)

11. A uniform ring of mass $m$ and radius $a$ is placed directly above a uniform sphere of mass $m$ and of equal to radius. The centre of the ring is at a distance $\sqrt{3}a$ from the centre of the sphere. The gravitational force ($F$) exerted by the sphere on the ring is

(a) $\frac{3GmM}{8a^2}$
13. A projectile is fired with a velocity $u$ at angle $\theta$ with the ground surface. During the motion at any time it is making an angle $\alpha$ with the ground surface. The speed of particle at this time will be

(a) $u \cos \theta \sec \alpha$
(b) $u \cos \theta \tan \alpha$
(c) $u^2 \cos^2 \alpha \sin^2 \alpha$
(d) $u \sin \theta \sin \alpha$

Ans: (a)

14. The earth receives solar radiation at a rate of $8.2 \text{ J cm}^{-2} \text{ min}^{-1}$. If the sun radiates as the black bodies, the temperature at the surface of the sun will be (the angle subtended by sun on the earth in suppose 0.53° and Stefan constant is $\sigma = 5.67 \times 10^{-8} \text{Wm}^{-2} \text{K}^4$)

(a) 5800 K
(b) 6700 K
(c) 8000 K
(d) 7800 K

Ans: (a)

15. The rms speed (in m/s) of oxygen molecules of the gas at temperature 300 K, is

(a) 483
(b) 504
(c) 377
(d) 346

Ans: (a)

16. A horizontal tube of length $l$ closed at both ends, contains an ideal gas of molecular weight $M$. The tube is
rotated at a constant angular velocity \( \omega \) about a vertical axis passing through an end. Assuming the temperature to be uniform and constant. If \( p_1 \) and \( p_2 \) denote the pressure at free and the fixed end respectively, then choose the correct relation.

\[
\begin{align*}
\text{(a)} & \quad p_1 = e^{\frac{M_0 \omega l^2}{RT}} \\
\text{(b)} & \quad \frac{p_1}{p_2} = e^{\omega l M} \\
\text{(c)} & \quad \frac{p_1}{p_2} = e^{\frac{\omega l M}{3RT}} \\
\text{(d)} & \quad \frac{p_2}{p_1} = e^{\frac{M^2 \omega^2 l^2}{3RT}}
\end{align*}
\]

Ans: (a)

17. The parts of two concentric circular arcs joined by two radial lines and carries current \( i \). The arcs subtend an angle \( \theta \) at the centre of the circle. The magnetic field at the centre \( O \), is

\[
\begin{align*}
\text{(a)} & \quad \frac{\mu_0 i (b - a) \theta}{4 \pi ab} \\
\text{(b)} & \quad \frac{\mu_0 i (b - a)}{(\pi - \theta)} \\
\text{(c)} & \quad \frac{\mu_0 i (b - a) \theta}{\pi ab}
\end{align*}
\]
18. 1 kg of water is converted into steam at the same temperature and at 1 atm (100 kPa). The density of water and steam are 1000 kgm$^{-3}$ and 0.6 kgm$^{-3}$ The latent heat of vaporization of water is $2.25 \times 10^{-6}$ J kg$^{-1}$, What will be increase in energy?

(a) $3 \times 10^5$ J
(b) $4 \times 10^6$ J
(c) $2.08 \times 10^6$ J
(d) None of these

Ans: (c)

19. The ammeter shown in figure consists of a 480 Ω coil connected in parallel to a 20Ω shunt. The reading of ammeter is

![Ammeter Diagram](image)

(a) 0.125 A
(b) 1.67 A
(c) 0.13 A
(d) 0.67 A

Ans: (a)

20. A lead ball at 30°C is dropped from a height of 6.2 km. The ball is heated due to the air resistance and it completely melts just before reaching the ground. The molten substance falls slowly on the ground. If the specific heat of lead = 126 Jkg$^{-1}$°C$^{-1}$ and melting point of lead = 130°C and suppose that any mechanical energy lost is used to heat the ball, then the latent heat of fusion of lead is
(a) $2.4 \times 10^4 \text{J kg}^{-1}$
(b) $3.6 \times 10^4 \text{J kg}^{-1}$
(c) $7.6 \times 10^2 \text{J kg}^{-1}$
(d) $4.2 \times 10^3 \text{J kg}^{-1}$

Ans: (a)

21. A inductor ($L = 20 \text{H}$), a resistor ($R = 100 \Omega$) and a battery ($E = 10 \text{V}$) are connected in series. After a long time, the circuit is short-circuited and then the battery is disconnected. Find the current in the circuit at 1 ms after short circuiting.

(a) $4.5 \times 10^5 \text{A}$
(b) $3.2 \times 10^{-5} \text{A}$
(c) $9.8 \times 10^{-5} \text{A}$
(d) $6.7 \times 10^{-4} \text{A}$

Ans: (d)

22. Two charges of $+10 \mu \text{C}$ and $+20 \mu \text{C}$ are separated by a distance 2 cm. The net potential (electric) due to the pair at the middle point of the line joining the two changes, is

(a) 27 MV
(b) 18 MV
(c) 20 MV
(d) 23 MV

Ans: (a)

23. A copper rod of length 20 cm and cross-sectional area 2 mm$^2$ is joined with a similar aluminium rod as shown below

![Diagram of two Rods](image)

The resistance of pair of rods is

($\rho_{\text{Al}} = 2.6 \times 10^{-8} \text{Ω-m and } \rho_{\text{Cu}} = 1.7 \times 10^{-8} \text{Ω-m}$)
24. A particle is subjected to two simple harmonic motions along X–axis while other is along a line making angle 45° with the X–axis. The two motions are given by \( x = x_0 \sin \omega t \) and \( s = s_0 \sin \omega t \).

The amplitude of resultant motion is

(a) \( x_0 + s_0 + 2x_0s_0 \)

(b) \( \sqrt{x_0^2 + s_0^2} \)

(c) \( \sqrt{x_0^2 - s_0^2 + 2x_0s_0} \)

(d) \( [x_0^2 + s_0^2 + \sqrt{2x_0s_0}]^{1/2} \)

Ans: (d)

25. What is the change in the volume of 1.0 L kerosene, when it is subjected to an extra pressure of \( 2.0 \times 10^5 \text{ Nm}^{-2} \) from the following data? Density of kerosene = 800 kg m\(^{-3}\) and speed of sound in kerosene = 1330 ms\(^{-1}\).

(a) 0.97 cm\(^{-3}\)

(b) 0.66 cm\(^{-3}\)

(c) 0.15 cm\(^{-3}\)

(d) 0.59 cm\(^{-3}\)

Ans: (c)

26. A 4 kg block is suspended from the ceiling of an elevator through a spring having a linear mass density of \( 19.2 \times 10^{-3} \text{ kg m}^{-1} \). Find the speed with respect to spring with which a wave pulse can proceed on the spring if the elevator accelerates up at the rate of 2.0 ms\(^{-2}\). Take \( g = 10 \text{ ms}^{-2} \).

(a) 30 m/s
(b) 42 m/s
(c) 46 m/s
(d) 50 m/s
Ans: (d)

27. The lower end of capillary tube is immersed in mercury. The level of mercury in the tube is found to be 2 cm below the outer level. If the same tube is immersed in water, up to what height will the water rise in the capillary?

(a) 5.9
(b) 4.9
(c) 2.9
(d) 1.9
Ans: (c)

28. Find the increase in pressure required to decrease the volume of water sample by 0.01% Bulk modulus of water = \(2.1 \times 10^9\) Nm\(^{-2}\).

(a) \(4.3 \times 10^4\) N/m\(^2\)
(b) \(1.8 \times 10^7\) N/m\(^2\)
(c) \(2.1 \times 10^5\) N/m\(^2\)
(d) \(3.7 \times 10^4\) N/m\(^2\)
Ans: (c)

29. Water level is maintained in a cylindrical vessel upto a fixed height H. The vessel is kept on a horizontal plane. At what weight above the bottom should a hole be made in the vessel, so that the water stream coming out of the hole strikes the horizontal plane of the greatest distance from the vessel.
(a) $h = \frac{H}{2}$

(b) $h = \frac{3H}{2}$

(c) $h = \frac{2H}{3}$

(d) $h = \frac{3H}{4}$

Ans: (a)

30. Figure shows spring + block + pulley system which are light. The time period of mass would be

![Pendulum Diagram]

(a) $2\pi \sqrt{\frac{k}{m}}$

(b) $\frac{1}{2\pi} \sqrt{\frac{k}{m}}$

(c) $2\pi \sqrt{\frac{m}{k}}$

(d) $\frac{1}{2\pi} \sqrt{\frac{m}{k}}$

Ans: (c)

31. A pendulum having a bob of mass $m$ is hanging in a ship sailing along the equator from east to west. When the strip is stationary with respect to water, the tension in the string is $T_0$. The difference between $T_0$ and earth attraction on the bob, is

(a) $\frac{mg + m\omega^2R}{2}$
(b) \( \frac{m\omega^2 R}{3} \)
(c) \( \frac{m\omega^2 R}{2} \)
(d) \( m\omega^2 R \)

Ans: (d)

32. A solid sphere is set into motion on a rough horizontal surface with a linear speed \( v \) in the forward direction and an angular speed \( \frac{v}{R} \) in the anticlockwise direction as shown in figure. Find the linear speed of the sphere when it stops rotating and \( \omega = \frac{v}{R} \).

\[
\omega = \frac{v}{R}
\]

(a) \( 3v/5 \)
(b) \( 2v/5 \)
(c) \( 4v/3 \)
(d) \( 7v/3 \)

Ans: (a)

33. Two blocks of mass \( m_1 \) and \( m_2 \) are connected by a spring of spring constant \( k \). The block of mass \( m_2 \) is given a sharp impulse so that it acquires a velocity \( v_0 \) towards right. Find the maximum elongation that the spring will suffer.

![Diagram of two blocks connected by a spring with an impulse to block \( m_2 \)]
34. A ball of mass $m$ hits the floor with a speed $v$ making an angle of incidence $\theta$ with the normal. The coefficient of restitution is $e$.

The speed of reflected ball and the angle of reflection of the ball will be

(a) $v' = V, \theta = \theta'$
(b) $v' = \frac{v}{2}, \theta = 2\theta'$
(c) $v' = 2v, \theta = 2\theta'$
(d) $v' = \frac{3v}{2}, \theta = \frac{2\theta'}{3}$

Ans: (a)

35. A particle slides on surface of a fixed smooth sphere starting from topmost point. The angle rotated by the radius through the particle, when it leaves contact with the sphere, is

(a) $\theta = \cos^{-1}\left(\frac{1}{3}\right)$
(b) \( \theta = \cos^{-1} \left( \frac{2}{3} \right) \)

(c) \( \theta = \tan^{-1} \left( \frac{1}{3} \right) \)

(d) \( \theta = \sin^{-1} \left( \frac{4}{3} \right) \)

**Ans:** (b)

36. What is the radius of curvature of the parabola traced out by the projectile in the previous problem at a point where the particle velocity makes an angle \( \theta / 2 \) with the horizontal?

(a) \( f = \frac{v^2 \cos^2 \theta}{g \cos^2 \frac{\theta}{2}} \)

(b) \( f = \frac{2v \sin \theta}{g \tan \theta} \)

(c) \( r = \frac{v \cos \theta}{g \sin^2 \frac{\theta}{2}} \)

(d) \( r = \frac{3v \cos \theta}{g \cot \theta} \)

**Ans:** (a)

37. A block of mass 2 kg is pushed against a rough vertical wall with a force of 40 N, coefficient of static friction being 0.5. Another horizontal force of 15 N, is applied on the block in a direction parallel to the wall. If the block will move, then its direction would be

(a) 15° with 15 N force

(b) 53° with 15 N force

(c) 45° with 15 N force

(d) 75° with 15 N force

**Ans:** (b)

38. A block is kept on the floor of an elevator at rest. The elevator starts descending with an acceleration of 12 m/s\(^2\). Find the displacement of the block during the first 0.2 s after the start. (Take, \( g = 10 \text{ m/s}^2 \))

(a) 30 cm
39. A monkey of mass 15 kg is climbing on a rope with one end fixed to the ceiling. If it wishes to go up with an acceleration $1 \, \text{m/s}^2$, how much force should it apply to the rope if rope is 5 m long and the monkey starts from rest?

(a) 150 N
(b) $> 160 \, \text{N}$
(c) 165 N
(d) $150 < T \leq 160 \, \text{N}$

**Ans:** (c)

40. A square loop is made by a uniform conductor wire as shown in figure?

![Diagram of a square loop](image)

The net magnetic field at the centre of the loop if side length of the square is $a$

(a) $\frac{\mu_0 i}{2a}$
(b) zero
(c) $\frac{\mu_0 i^2}{a^2}$
(d) None of these
41. The electron of an H-atom is revolving around the nucleus in circular orbit having radius \( \frac{h^2}{4\pi mc^2} \) with \( \left( \frac{2\pi e^2}{h} \right) \).

The current produced due to the motion of electron is

(a) \( \frac{2\pi m^2 e^2}{3h^2} \)

(b) zero

(c) \( \frac{2\pi^2 me}{h^2} \)

(d) \( \frac{4\pi^2 mc^5}{h^3} \)

Ans: (d)

42. Two small balls, each carrying a charge q are suspended by equal insulator strings of length l m form the hook of a stand. This arrangement is carried in a satellite in space. The tension in each string will be

(a) \( \frac{1}{4\pi \varepsilon_0} \frac{q}{l^2} \)

(b) \( \frac{1}{4\pi \varepsilon_0} \frac{q^2}{4l^2} \)

(c) \( \frac{1}{4\pi \varepsilon_0} \frac{q^2}{l^2} \)

(d) \( \frac{1}{(4\pi \varepsilon_0)} \frac{q}{1} \)

Ans: (b)

43. A vessel of depth t is half filled with a liquid having refractive index \( n_1 \) and the other half is filled with water of having refractive index \( n_2 \). The apparent depth of the vessel as viewed from top is

(a) \( \frac{2t(n_1 + n_2)}{n_1 n_2} \)

(b) \( \frac{tn_1 n_2}{(n_1 + n_2)} \)
44. In photoelectric effect, the number of photo-electrons emitted is proportional to
(a) velocity of incident beam
(b) frequency of incident beam
(c) intensity of incident beam
(d) work function for cathode material
Ans: (c)

45. A change of 8.0 mA in the emitter current brings a change of 7.9 mA in the collector current. The value of $\alpha$ will be
(a) 0.96
(b) 0.93
(c) 0.90
(d) 0.99
Ans: (d)

46. The half-life of $^{198}\text{Au}$ is 2.7 days. The average life is
(a) 4 days
(b) 3.4 days
(c) 3.9 days
(d) None of the above
Ans: (c)

47. The de-Broglie wavelength of electron falling on the target in an X-ray tube is $\lambda$. The cut-off wavelength of the emitted X-ray is
(a) $\lambda_0 = \frac{(mc\lambda)^2}{h}$
(b) \( \lambda_0 = \frac{m^2 c \lambda}{h^2} \)

(c) \( \lambda_0 = \frac{2mc \lambda^2}{h} \)

(d) \( \lambda_0 = \frac{mc \lambda^2}{h^2} \)

Ans: (c)

48. If \( M_O \) is the mass of an oxygen isotope \( _8^17O \), \( M_P \) and \( M_N \) are the masses of a proton and a neutron, respectively, the nuclear binding energy of the isotope is

(a) \( M_O c^2 \)

(b) \( (M_O - 17M_n) c^2 \)

(c) \( (M_O - 8M_p)c^2 \)

(d) \( (8M_p + 9M_n - M_O) \)

Ans: (d)

49. A nucleus disintegrates into two nuclear parts which have their velocities in the ratio 2 : 1. The ratio of their nuclear size will be

(a) \( 2^{1/3} : 1 \)

(b) \( 1 : 3^{1/2} \)

(c) \( 3^{1/2} : 1 \)

(d) \( 1 : 2^{1/3} \)

Ans: (d)

50. The given p–V diagram shows gases during adiabatic process. Plots 1 and 2 should correspond respectively to
51. For an adiabatic expansion of a mono atomic perfect gas, the volume increases by 24%. What is the percentage decrease in pressure?

(a) 24%
(b) 40%
(c) 48%
(d) 71%

**Ans:** (b)

52. A body weighing 8 g when placed in one pan and 18 g when placed on the other pan of a false balance. If the beam is horizontal when both the pans are empty, then the true weight of the body is

(a) 13 g
(b) 9 g
(c) 22 g
(d) 12 g

**Ans:** (d)

53. A rod PQ of length l is moving with ends remaining in contact with frictionless wall and floor. If at the instant, shown the velocity of end Q is 2 m/s towards negative direction of x. The speed of end P will be
54. Universal time is based on
(a) rotational effect of the earth about its axis
(b) vibrations of cesium atom
(c) orbital motion of the earth around the sun
(d) oscillation of quartz crystal
**Ans: (a)**

55. A slab consists of portions of different materials of same thickness and having the conductivities $K_1$ and $K_2$. The equivalent thermal conductivity of the slab is
(a) $K_1 + K_2$
(b) $\sqrt{K_1 + K_2}$
(c) $\frac{2K_1 K_2}{K_1 + K_2}$
(d) $\frac{K_1 K_2}{\sqrt{K_1 + K_2}}$
**Ans: (c)**

56. Two rigid boxes containing different ideal gases are placed on table. Box A contains one mole of nitrogen at

(a) $\sqrt{3}$ m$^{-1}$
(b) $\frac{2}{3}$ m$^{-1}$
(c) $\sqrt{2}$ m$^{-1}$
(d) $\frac{\sqrt{5}}{2}$ m$^{-1}$
**Ans: (b)**
temperature $T_0$, while box B contains 1 mole of helium at temperature $7/3 T_0$. The boxes are then put into thermal contact with each other and heat flows between them until the gases reach a common final temperature (ignore the heat capacity of boxes) then the final temperature of gases, $T_f$ in terms of $T_0$ is

(a) $\frac{2T_0}{5}$

(b) $\frac{3T_0}{7}$

(c) $\frac{5T_0}{3}$

(d) $\frac{9T_0}{7}$

Ans: (c)

57. The temperature of the cold junction of thermocouple is 0°C and the temperature of hot junction is $T^\circ C$. The emf is $E = 16T - 0.04 T^2 \mu$ The inversion temperature $T_i$ is

(a) 300°C

(b) 200°C

(c) 500°C

(d) 400°C

Ans: (d)

58. The galvanometer resistance is 30Ω and it is connected to 2 V battery along with a resistance 2000 Ω in series. A full scale deflection of 25 divisions is obtained. In order to reduce this deflection to 20 divisions, the resistance in series should be

(a) 2470 Ω

(b) 2320 Ω

(c) 2180 Ω

(d) 2210 Ω

Ans: (a)

59. A thin bar magnet of length 2L is bent at the mid-point so that the angle between them is 60°. The new length of the magnet is
60. The magnetic flux through each turn of a coil having 200 turns is given as \((t^2 - 2t) \times 10^{-3}\) Wb, where \(t\) is in second. The emf induced in the coil at \(t = 3\) s is

(a) 0.7 V
(b) 1.2 V
(c) 0.8 V
(d) 0.9 V

Ans: (c)

Chemistry

1. Given that the reduced temperature, \(\theta = \frac{T}{T_C}\)
   
   the reduced pressure, \(\pi = \frac{F}{F_C}\)
   
   the reduced volume, \(\phi = \frac{V}{V_{\infty}}\)

   Thus, it can be said that the reduced equation of state may be given as

   (a) \(\left(\frac{\pi}{3} + \frac{1}{\phi}\right)(3\phi - 1) = \frac{8}{3}\theta\)
   
   (b) \(\left(\frac{\pi}{4} + \frac{1}{\phi}\right)(3\phi - 1) = \frac{3}{8}\phi\)
   
   (c) \(\left(\frac{\pi}{3} + \frac{1}{\phi}\right)(\phi - 1) = \frac{3}{8}\theta\)
   
   (d) \(\left(\frac{\pi}{3} + \frac{1}{\phi^2}\right)(3\phi - 1) = \frac{8}{3}\theta\)
Ans: (d)

2. The suitable reaction steps to carry out the following transformation is

\[
\begin{align*}
\text{CH}_2=\text{CH}_2 & \xrightarrow{?} \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_{2}\text{CH}_3 \\
(a) & \xrightarrow{(i) \text{BH}_3, \text{THF}} \text{HIO}_4 \\
& \xrightarrow{(ii) \text{H}_2\text{O}_2, \text{NaOH}} \\
(b) & \xrightarrow{\text{OsO}_4, (\text{CH}_3)_3\text{C\text{COOH, OH}^+}} \text{K}_3\text{Cr}_2\text{O}_7, \text{H}_2\text{SO}_4, \text{H}_2\text{O} \\
(c) & \xrightarrow{(i) \text{BH}_3, \text{THF}} \text{PCC} \\
& \xrightarrow{(ii) \text{H}_2\text{O}_2, \text{NaOH}} \text{CH}_2\text{Cl}_2 \\
(d) & \xrightarrow{\text{H}_2\text{O}, \text{H}_2\text{SO}_4(\text{dil.})} \text{PCC} \\
& \xrightarrow{\text{CH}_2\text{Cl}_2} 
\end{align*}
\]

Ans: (c)

3.

\[
\text{SF}_4 \xrightarrow{\text{Hydrolysis}} \text{X} + \text{Y} + \text{X} + \text{H}_2\text{S} \rightarrow \text{Z}
\]

Here, Z is

(a) $\text{SO}_3$

(b) colloidal sulphur

(c) gaseous sulphur

(d) solid sulphur

Ans: (b)

4. For preparing 3.00 L of 1 M NaOH by mixing portions of two stock solutions (A and B) of 2.50 M NaOH and 0.40 M NaOH respectively. Find out the amount of B stock solution (in L) added.

(a) 8.57 L

(b) 2.14 L

(c) 1.28 L

(d) 7.51 L

Ans: (b)
5. Sodium sulphite is used in preserving squashes and other mildly acidic foods due to

(a) potassium salt has preservative action
(b) potassium metabisulphite prevents oxidation
(c) potassium metabisulphite is not influenced by acid
(d) sulphur dioxide and sulphurous acid formed kill bacteria and germs

**Ans:** (d)

6. The Vividh Bharti Station of All India Radio, Delhi, broadcasts on a frequency of 1,368 kHz (Kilohertz). Calculate the wavelength (\(\lambda\)) of the electromagnetic radiation emitted by transmitter. Which part of the electromagnetic spectrum does it belong to

(a) 319.4 m and X-rays
(b) 319.4 m and raywave
(c) 219.3 m and microwave
(d) 219.3 m and radiowave

**Ans:** (d)

7. Which of the following soap/detergent is least, reduce space biodegradable?

(a) \(\text{CH}_3-(\text{CH}_2)_{11}-\text{OSO}_2\text{Na}\)
(b) \(\text{C}_{17}\text{H}_{35}-\text{COONa}\)
(c) \(\text{CH}_3-\text{CH}-(\text{CH}_2\text{CH}_2)_2-\text{CH}_2-\text{CH}-\text{CH}\)
(d) \(\text{CH}_3-(\text{CH}_2)_9\text{CH}_2-\text{SO}_3\text{Na}\)

**Ans:** (c)

8. In an atom, an electron is moving with a speed of 600 m/s with an accuracy of 0.005%. Certainty with which the position of the electron can be located is
(Given, \( h = 6.6 \times 10^{-34} \text{ kg m}^2 \text{ s}^{-1} \), mass of electron \( e_m = 9.1 \times 10^{-31} \text{ kg} \))

(a) \( 2.15 \times 10^{-3} \text{ m} \)
(b) \( 2.78 \times 10^{-3} \text{ m} \)
(c) \( 1.92 \times 10^{-3} \text{ m} \)
(d) \( 3.24 \times 10^{-3} \text{ m} \)

Ans: (c)

9. Buna–N, a synthetic rubber is copolymer of
(a) \( \text{H}_2\text{C} = \text{CH} - \text{CH} = \text{CH}_2 \) and \( \text{H}_5\text{C}_6 - \text{CH} = \text{CH}_2 \)
(b) \( \text{H}_2\text{C} = \text{CH} - \text{CN} \) and \( \text{H}_2\text{C} = \text{CH} - \text{CH} = \text{CH}_2 \)
(c) \( \text{H}_2\text{C} = \text{CH} - \text{C} = \text{CH}_2 \) and \( \text{H}_2\text{C} = \text{CH} - \text{CH} = \text{CH}_2 \)
(d) \( \text{H}_2\text{C} = \text{CN} - \text{CN} \) and \( \text{H}_2\text{C} = \text{CH} - \text{C} = \text{CH}_2 \)

Ans: (b)

10. What would be the heat released when an aqueous solution containing 0.5 mole of HNO\(_3\) is mixed with 0.3 mole of OH\(^-\)?

(enthalpy of neutralization is \(-57.1 \text{ kJ}\) )

(a) \( 28.5 \text{ kJ} \)
(b) \( 17.1 \text{ kJ} \)
(c) \( 45.7 \text{ kJ} \)
(d) \( 1.7 \text{ kJ} \)

Ans: (b)

11. The number average molar mass and mass average molar mass of a polymer are respectively 30,000 and 40,000. The polydispersity index (PDI) of the polymer is

(a) \( -1 \)
(b) \( 0 \)
(c) \( >1 \)
(d) \( <1 \)
12. The charge/size ratio of a cation determines its polarizing power. Which one of the following sequences represents the increasing order of the polarizing power of the cationic species, $K^+$, $Ca^{2+}$, $Mg^{2+}$, $Be^{2+}$?

(a) $K^+ < Ca^{2+} < Mg^{2+} < Be^{2+}$
(b) $Be^{2+} < K^{2+} < Ca^{2+} < Mg^{2+}$
(c) $Mg^{2+} < Be^{2+} < K^+ < Ca^{2+}$
(d) $Ca^{2+} < Mg^{2+} < Be^+ < K^+$

**Ans:** (a)

13. In an amino acids, the carboxyl group ionizes at and ammonium ion at The isoelectric point of the amino acid is at pH

(a) 4.32
(b) 3.34
(c) 9.46
(d) 5.97

**Ans:** (d)

14. 40 g of helium in a bulb at a temperature of T K had a pressure of $p$ atm. When the bulb was immersed in water bath at temperature 50 K more than the first one, 0.08 g of gas had to be removed to restore the original pressure.

(a) 500 K
(b) 400 K
(c) 600 K
(d) 200 K

**Ans:** (d)

15. What percentage of $\beta$-D(+)–glucopyranose is found at equilibrium in the aqueous solution?

(a) 64%
(b) 36%
(c) $\approx$100%
(d) $\approx$50%

**Ans:** (c)
Ans: (a)

16. Which of the following is correctly arranged in order of increasing weight?

(a) $0.0105$ equivalent of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O} < 0.006 \text{ g atom of } \text{Ag} < 6.0 \times 10^{21} \text{ atoms of } \text{Zn}$

(b) $0.625 \text{ g of Fe} < 0.0105$ equivalent of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O} < 6.0 \times 10^{21} \text{ atoms of Zn} < 0.006 \text{g atom of Ag}$

(c) $0.625 \text{ g of Fe} < 6.0 \times 10^{21} \text{ atoms of Zn} < 0.006 \text{ g atom of Ag} < 0.0105$ equivalent of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$

(d) $0.0105$ equivalent of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O} < 0.006 \text{g atom of Ag} < 6.0 \times 10^{21} \text{ atoms of Zn} < 0.625 \text{ g of Fe}$

Ans: (c)

17. The correct order of basic strength of the following are

![Chemical structures](chemical_structures.png)

(a) I > II > IV > III

(b) IV > III > II > I

(c) II > III > IV > I

(d) III > IV > II > I

Ans: (d)

18. If for a given substance, melting point is $T_B$ and freezing points is $T_A$ then correct variation of entropy by graph between entropy change and temperature is

![Graph](entropy_graph.png)
19. When a mixture of 1-hexanol and hexanoic acid in diethyl ether is shaken with an aqueous NaHCO₃ solution, then which of the following is right distribution?

<table>
<thead>
<tr>
<th>In ether</th>
<th>In sodium bicarbonate solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Sodium hexanoate</td>
<td>1-hexanol</td>
</tr>
<tr>
<td>(b) 1-hexanol</td>
<td>Hexanoic acid</td>
</tr>
<tr>
<td>(c) 1-hexanol</td>
<td>Sodium hexanoate</td>
</tr>
<tr>
<td>(d) Hexanoic acid</td>
<td>1-hexanol</td>
</tr>
</tbody>
</table>

(a) In ether—Sodium hexanoate, In sodium bicarbonate solution—1-hexanol  
(b) In ether—1-hexanol, In sodium bicarbonate solution—Hexanoic acid  
(c) In ether—1-hexanol, In sodium bicarbonate solution—Sodium hexanoate  
(d) In ether—Sodium hexanoate, In sodium bicarbonate solution—1-hexanol  

 Ans: (c)

20. ΔH and ΔS for the reaction,
\[ \text{Ag}_2\text{O(s)} \rightarrow 2\text{Ag(s)} + \frac{1}{2}\text{O}_2\text{(g)} \] are 30.56 kJ mol⁻¹ and
66.00 JK\(^{-1}\) mol\(^{-1}\) respectively. The temperature at which the free energy change for the reaction will be zero, is

(a) 3528 K  
(b) 463 K  
(c) 73 K  
(d) 144 K  
**Ans: (b)**

21. The major product P will be

(a)  

(b)  

(c)  

(d)  

**Ans: (c)**

22. If \(\text{Ag}^+ + 2\text{NH}_3 = \text{Ag(NH}_3)_2^+\); \(K_1 = 1.7 \times 10^7\)
Ag⁺ + Cl⁻ ⇌ AgCl; K₂ = 5.4 × 10⁹

Then, for AgCl + 2NH₃ → [Ag(NH₃)₂]⁺ + Cl⁻ equilibrium constant will be
(a) 4.68 × 10⁻³
(b) 5.2 × 10⁻¹⁷
(c) 0.31 × 10⁻²
(d) 3.1 × 10⁻²
**Ans:** (c)

23. What is product of the following sequence of reactions?

![Chemical reaction diagram](image)

(a) [Structure A]
(b) [Structure B]
(c) [Structure C]
(d) [Structure D]

**Ans:** (d)

24. For the following equilibrium (omitting charges)

I. M + Cl → MCl, K_{eq} = β₁
II. MCl + Cl → MCl₂, K_{eq} = β₂
III. MCl₂ + Cl → MCl₃, K_{eq} = β₃
IV. \( M + 3\text{Cl} \rightarrow M\text{Cl}_3, K_{eq} = K \)

then relationship between \( K, \beta_1, \beta_2 \) and \( \beta_3 \) is

(a) \( K = \beta_1 \beta_2 \beta_3 \)
(b) \( \log K = \log \beta_1 + \log \beta_2 + \log \beta_3 \)
(c) \( p_K = p_{\beta_1} + p_{\beta_2} + p_{\beta_3} \)
(d) All of the above

**Ans:** (d)

25. \( \text{R–CH}_2\text{–CH}_2\text{–OH} \) can be converted into \( \text{RCH}_2\text{CH}_2\text{COOH} \) by the following sequence of steps.

(a) \( \text{PBr}_3, \text{KCN, H}_2 / \text{Pt} \)
(b) \( \text{PBr}_3, \text{KCN, H}_3\text{O}^+ \)
(c) \( \text{HCN, PBr}_3, \text{H}_3\text{O}^+ \)
(d) \( \text{KCN, H}_3\text{O}^+ \)

**Ans:** (b)

26. When \( \text{KMnO}_4 \) acts as an oxidizing agent and ultimately forms \( \text{MnO}_4^{2–}, \text{MnO}_2, \text{Mn}_2\text{O}_3 \) and \( \text{Mn}^{2+} \), then the number of electrons transferred in each case respectively are

(a) 1, 3, 4, 5
(b) 3, 2, 1, 4
(c) 1, 5, 3, 7
(d) 4, 3, 2, 1

**Ans:** (a)

27. The product \( P \) of the given reaction is

\[
\begin{align*}
\text{CH}_3 & \quad \text{CH} \\
\text{CH}_3 & \quad \text{CH} \\
\text{CH}_3 & \quad \text{CH}_2 \\
\text{CH}_3 & \\
\text{CH}_3 & \\
\text{Hg (OAc)}_2, \text{H}_2\text{O} & \\
\text{NaBH}_4 & \\
\end{align*}
\]

(i) \( \text{Hg (OAc)}_2, \text{H}_2\text{O} \)
(ii) \( \text{NaBH}_4 \)
28. In acidic medium, dichromate ion oxidizes ferrous ion to ferric ion. If the gram molecular weight of potassium dichromate is 294 g, its gram equivalent weight (in grams) is
(a) 24.5
(b) 49
(c) 125
(d) 250
Ans: (b)

29. Find out the correct stereoisomeric product for the following reaction,

(a) d–form
(b) l–form
(c) meso–form
(d) racemic mixture
Ans: (d)
30. Ferrous oxide has a cubic structure. The length of edge of the unit cell is 5 Å and the density of the oxide is 4.0 g cm\(^{-3}\). Then the number of Fe\(^{2+}\) and O\(^{2-}\) ions present in each unit cell will be

(a) four Fe\(^{2+}\) and two O\(^{2-}\)
(b) four Fe\(^{2+}\) and four O\(^{2-}\)
(c) two Fe\(^{2+}\) and four O\(^{2-}\)
(d) two Fe\(^{2+}\) and two O\(^{2-}\)

Ans: (b)

31. In the reaction

\[ \text{C}_7\text{H}_8 \xrightarrow{3\text{Cl}_2/\Delta} \text{X} \xrightarrow{\text{Br}_2/\text{Fe}} \text{Y} \xrightarrow{\text{Zn}/\text{HCl}} \text{Z} \]

(a) o–bromotoluene
(b) m–bromotoluene
(c) p–bromotoluene
(d) 3–bromo–2, 2, 6–trichlorotoluene

Ans: (b)

32. Which of the following arrangements correctly represents hexagonal and cubic close packed structure respectively?

(a) ABAB ............ and ACBACB ............
(b) ABCABC ............ and ABAB ........
(c) Both have ABCABC ...... arrangement
(d) Both have ABAB ........ arrangement

Ans: (a)

33. 0.001 mole of [Co(NH\(_3\))\(_5\)(NO\(_3\))(SO\(_4\))] was passed through a cation exchanger and the acid coming out of it required 20 mL of 0.1 M NaOH for neutralization. Thus, the complex is

(a) [Co(NH\(_3\))\(_5\)(NO\(_3\))]SO\(_4\)
(b) [Co(NH\(_3\))\(_5\)(SO\(_4\))]NO\(_3\)
(c) [Co(NH\(_3\))\(_5\)]NO\(_3\) \cdot SO\(_4\)

...
34. The molal freezing point depression constant for benzene \((C_6H_6)\) is \(4.90 \text{ K kg mol}^{-1}\). Selenium exists as a polymer of the type \(\text{Se}_x\). When \(3.26\) g of selenium is dissolved in \(226\) g of benzene, the observed freezing point is \(0.112\) °C lower than that of pure benzene. The molecular formula of selenium is

(at atomic mass of Se = 78.8 g mol\(^{-1}\))

(a) \(\text{Se}_8\)

(b) \(\text{Se}_6\)

(c) \(\text{Se}_4\)

(d) \(\text{Se}_2\)

*Ans: (a)*

35. In the complexes \([\text{Fe(H}_2\text{O})_6]^{3+}\), \([\text{Fe(CN)}_6]^{3-}\), \([\text{Fe(C}_2\text{O}_4)_3]^{3-}\) and \([\text{FeCl}_6]^{3-}\), more stability is shown by

(a) \([\text{FeCl}_6]^{3-}\)

(b) \([\text{Fe(C}_2\text{O}_4)_3]^{3-}\)

(c) \([\text{Fe(H}_2\text{O})_6]^{3+}\)

(d) \([\text{Fe(CN)}_6]^{3-}\)

*Ans: (b)*

36. For an ideal binary liquid solution with \(p_x^0 > p_y^0\) in which relation between \(X_x\) (mole fraction of \(X\) in liquid phase) and \(Y_x\) (mole fraction of \(X\) in vapour phase) is correct, \(X_y\) and \(Y_y\) are mole fraction of \(Y\) in liquid and vapour phase respectively

(a) \(X_x > Y_x\)

(b) \(X_x = Y_x\)

(c) \(\frac{X_x}{X_y} < \frac{Y_x}{Y_y}\)

(d) \(X_x, Y_x, X_y\) and \(Y_y\) cannot be correlated
37. Point out the incorrect reaction from the following.

(a) $2\text{Na}_2\text{CrO}_4 + \text{H}^+ \rightarrow \text{Na}_2\text{Cr}_2\text{O}_7 + 2\text{Na}^+ + \text{H}_2\text{O}$

(b) $4\text{MnO}_2 + 4\text{KOH} + \text{O}_2 \rightarrow 4\text{KMnO}_4 + 2\text{H}_2\text{O}$

(c) $2\text{MnO}_4^- + 5\text{C}_2\text{O}_4^{2-} + 16\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 10\text{CO}_2 + 8\text{H}_2\text{O}$

(d) $\text{MnO}_4^- + 8\text{H}^+ + 5\text{Fe}^{2+} \rightarrow 5\text{Fe}^{3+} + \text{Mn}^{2+} + 4\text{H}_2\text{O}$

Ans: (b)

38.

\[ \text{C} = \text{CH} \xrightarrow{\text{NgSO}_4/\text{H}_2\text{SO}_4\cdot\text{D}_2\text{O}} X \]
\[ \text{NgSO}_4/\text{H}_2\text{SO}_4\cdot\text{H}_2\text{O} \xrightarrow{\text{BH}_3/\text{THF}} Y \]
\[ \text{H}_2\text{O}_2 \xrightarrow{\text{OH}} Z \]

X, Y and Z respectively are

(a) [Diagram of X]

(b) [Diagram of Y] CH$_3$CHO in all cases

(c) [Diagram of Z] COCH$_3$ in all cases

(d) [Diagram of X] OCH$_3$

[Diagram of Y] CH$_3$CHO
Ans: (a)

39. A student made the following observation in the laboratory.

I. Clean copper metal did not react with 1 molar Pb(NO₃)₂ solution

II. Clean lead metal dissolved in a 1 molar AgNO₃ solution and crystals of Ag metal appeared

III. Clean silver metal did not react with 1 molar Cu(NO₃)₂ solution

The order of decrease in reducing character of three metals is

(a) Pb, Cu, Ag
(b) Pb, Ag, Cu
(c) Cu, Ag, Pb
(d) Cu, Pb, Ag

Ans: (a)

40. Choose the correct alkyne and reagents for the preparation of

(a) \[
\begin{align*}
\text{O} & \\
\text{HgSO₄, H₂SO₄, H₂O} & \\
\end{align*}
\]

(b) \[
\begin{align*}
\text{HgSO₄, H₂SO₄, H₂O} & \\
\end{align*}
\]

(c) \[
\begin{align*}
\text{BH₃, H₂O₂, NaOH} & \\
\end{align*}
\]

(d) \[
\begin{align*}
\text{BH₃, H₂O₂, NaOH} & \\
\end{align*}
\]

Ans: (a)

41. The conductivity of 0.001028 mol L⁻¹ acetic acid is 4.95 × 10⁻⁵ S cm⁻¹. Find out its dissociation constant if \( k_m \) for acetic acid is 390.5 S cm⁻¹ mol⁻¹.
42. In order to prepare one litre 1 N solution of KMnO₄, how many grams of KMnO₄ are required, if the solution to be used in acid medium for oxidation?

(a) 128 g
(b) 41.75 g
(c) 31.60 g
(d) 62.34 g

**Ans:** (c)

43. Which of the following represents the correct order of decreasing number of S = O bonds?

(a) H₂SO₄ > H₂SO₃ > H₂S₂O₈
(b) H₂S₂O₈ > H₂SO₃ > H₂SO₄
(c) H₂S₂O₈ > H₂SO₄ > H₂SO₃
(d) H₂SO₃ > H₂S₂O₈ > H₂SO₄

**Ans:** (c)

44. A hypothetical reaction, X₂ + Y₂ → 2 XY follows the following mechanism

X₂ = X + X ...... fast
X + Y₂ → XY + Y ...... slow
X+ Y → XY ......fast

The order of the overall reaction is

(a) 2
(b) 3/2
(c) 1
(d) 0
45. The major role of fluorspar (CaF$_2$) which is added in small quantity in the electrolytic reduction of alumina dissolved in fused cryolite (Na$_3$AlF$_6$) is

I. as a catalyst.
II. to make the fused mixture very conducting.
III. to lower the temperature of melting.
IV. to decrease the rate of oxidation of carbon at the anode.

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

Ans: (b)

46. The variation of concentration of the product P with time in the reaction, A → P is shown in following graph.

The graph between $\frac{-d[A]}{dt}$ and time will be of the type

(a) [Diagram]
(b) [Diagram]
(c) [Diagram]
47. Point out the correct statement.
(a) Below 710°C, C is better reducing agent than CO
(b) Below 710°C, CO is better reducing agent than C
(c) Below 710°C, CO is an oxidizing agent
(d) Below 710°C, CO₂ is a reducing agent
**Ans:** (b)

48. Which of the following represents physical adsorption?

**Ans:** (d)

49. KMnO₄ reacts with ferrous sulphate according to the following equation,

\[
\text{MnO}_4^- + 5\text{Fe}^{2+} + 8\text{H}^- \rightarrow \text{Mn}^{2+} + 2\text{Fe}^{3+} + 4\text{H}_2\text{O}
\]

Here, 10 mL of 0.1 M KMnO₄ is equivalent to
(a) 50 mL of 0.1 M FeSO₄
(b) 20 mL of 0.1 M FeSO₄
(c) 40 mL of 0.1 M FeSO₄
(d) 30 mL of 0.1 M FeSO₄

Ans: (a)

50. In an experiment, addition of 4.0 mL of 0.005 M BaCl₂ to 16.0 mL of arsenious sulphide sol just causes complete coagulation in 2 h. The flocculating value of the effective ion is

(a) Ba²⁺, 1.0
(b) Ba²⁺, 2.0
(c) Cl⁻, 1.0
(d) Cl⁻, 2.0

Ans: (a)

51. Which of the following atomic and physical properties of hydrogen is false?

(a) Hydrogen > Deuterium > Tritium; (melting point/K)
(b) Hydrogen < Deuterium < Tritium; (boiling point/K)
(c) Hydrogen < Deuterium < Tritium; (density/gL⁻¹)
(d) Hydrogen > Deuterium > Tritium; (% relative abundance)

Ans: (a)

52. Eutrophication of a lake means, it

(a) is low in nutrients
(b) is high in nutrients
(c) has a high temperature
(d) has excess amount of organic matter

Ans: (b)

53. When H₂O₂ is added to ice cold solution of acidified potassium dichromate in ether and the contents are shaken and allowed to stand
(a) a blue colour is obtained in ether because of formation of $\text{CrO}_5$

(b) a blue colour is obtained in ether because of formation of $\text{CrO}_3$

(c) a blue colour is obtained in ether because of formation of $\text{Cr}_2(\text{SO}_4)_3$

(d) chromyl chloride is formed

**Ans:** (a)

54. 500 mL of a sample of water required 19.6 mg of $\text{K}_2\text{Cr}_2\text{O}_7$ for the oxidation of dissolved organic matter in it in the presence of $\text{H}_2\text{SO}_4$. The COD of water sample is

(a) 3.2 ppm

(b) 7.2 ppm

(c) 6.4 ppm

(d) 4.6 ppm

**Ans:** (c)

55. $\text{X} + \text{Na}_2\text{CO}_3 \rightarrow \text{Y} + \text{Z}$  

CO$_2$  

$\rightarrow \text{Z}$ (milky cloud)

The chemical formulae of $\text{X}$, $\text{Y}$ and $\text{Z}$ are

<table>
<thead>
<tr>
<th></th>
<th>$\text{X}$</th>
<th>$\text{Y}$</th>
<th>$\text{Z}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>$\text{CaO}$</td>
<td>$\text{Ca(OH)}_2$</td>
<td>$\text{NaOH}$</td>
</tr>
<tr>
<td>(b)</td>
<td>$\text{NaOH}$</td>
<td>$\text{CaO}$</td>
<td>$\text{CaCO}_3$</td>
</tr>
<tr>
<td>(c)</td>
<td>$\text{NaOH}$</td>
<td>$\text{Ca(OH)}_2$</td>
<td>$\text{CaCO}_3$</td>
</tr>
<tr>
<td>(d)</td>
<td>$\text{Ca(OH)}_2$</td>
<td>$\text{NaOH}$</td>
<td>$\text{CaCO}_3$</td>
</tr>
</tbody>
</table>

**Ans:** (d)

56. For carbanion
Stability order will be
(a)  \( P > Q > S > R \)
(b)  \( P > R > Q > S \)
(c)  \( Q > R > S > R \)
(d)  \( S > R > Q > P \)
**Ans:** (b)

57. The aqueous solution of an unknown sodium salt gives the following reactions.

I. It decolourises a solution of iodine in potassium iodide.
II. It gives white turbidity with dil. HCl solution.
III. It gives a white precipitate with AgNO\(_3\) solution which changes colours and finally becomes black on standing.

The unknown sodium salt is
(a) sodium thiosulphate
(b) sodium bisulphite
(c) sodium sulphite
(d) sodium sulphide
**Ans:** (a)

58. The catenation tendency of C, Si and Ge is in the order
Ge < Si < C. The bond energies (in \( \text{kJ mol}^{-1} \)) of C—C, Si—Si and Ge—Ge bonds, respectively are
(a) 348, 167, 180
(b) 348, 180, 167
(c) 167, 180, 348
(d) 180, 167, 348
**Ans:** (b)
59. What is correct about the following structure?

(a) Total stereoisomers = 4
(b) Number of chiral carbons = 1
(c) Number of optical isomers = 2
(d) Number of meso compounds = 2

Ans: (c)

60. Number of oxygen atoms shared per SiO$_4$ tetrahedron in
I. two dimensional sheet structured silicates
II. cyclic silicates and
III. single strand chain silicates respectively are
(a) 3, 3, 2
(b) 3, 2, 2
(c) 4, 3, 1
(d) 4, 3, 2

Ans: (b)

Biology

1. Which of the following is the most primitive ancestor of man?

(a) Ramapithecus
(b) Homo habilis
(c) Australopithecus
(d) Homo sapiens neanderthalensis

Ans: (a)
2. Vitamin–B\textsubscript{12} is absorbed primarily in the
(a) stomach
(b) duodenum
(c) jejunum
(d) ileum
\textbf{Ans: (d)}

3. The faster breathing in high fever is due to the
(a) additional requirement of O\textsubscript{2} for the invader germs
(b) high temperature of the body
(c) mental worry of a patient
(d) loss of appetite
\textbf{Ans: (b)}

4. Which of the following animals possess non–elastic lungs with elastic air sacs connected to them?
(a) Reptiles
(b) Birds
(c) Amphibians
(d) Mammals
\textbf{Ans: (b)}

5. Which of the following is not correctly matched?
(a) \textit{Trichomonas vaginalis} – Leishmaniasis
(b) \textit{Glossina palpalis} – Sleeping sickness
(c) \textit{Aedes aegypti} – Yellow fever
(d) \textit{Culex pipiens} – Filariasis
\textbf{Ans: (a)}

6. Carotid labyrinth contains
(a) olfactory receptors
(b) baroreceptors
(c) chemoreceptors
(d) phonoreceptors
\textbf{Ans: (b)}
7. Occupational lung disease that occurs in humans, among those given below is
   (a) dyspnea
   (b) anthracosis
   (c) atelectasis
   (d) cyanosis
   **Ans: (b)**

8. Epiphyseal plates at the extremities of long bones help in
   (a) bone moulding
   (b) elongation of bone
   (c) bone formation
   (d) formation of Haversian canal
   **Ans: (b)**

9. The strongest muscle in the human is
   (a) biceps
   (b) gluteus maximus
   (c) stapedius
   (d) masseter
   **Ans: (d)**

10. Parkinsonism is related with
    (a) brain
    (b) spinal nerve
    (c) cranial nerves
    (d) All of these
    **Ans: (a)**

11. Meniere’s disease is associated with
    (a) ear
    (b) eye
    (c) nose
    (d) throat
Ans: (a)

12. If the threshold for hearing increasing 1000 times, the hearing loss is
(a) 40 decibels
(b) 50 decibels
(c) 60 decibels
(d) None of these
Ans: (d)

13. Gonads are derived from
(a) ectoderm
(b) mesoderm
(c) endoderm
(d) None of the above
Ans: (b)

14. The number of chromosomes in a primary spermatocyte is
(a) same as in spermatid
(b) same as in spermatogonium
(c) help of that in spermatogonium
(d) same as in secondary spermatocyte
Ans: (b)

15. The portion of the endometrium that covers the embryo and is located between the embryo and the uterine cavity is the
(a) decidua basalis
(b) desidua umbilicus
(c) desidua capsularis
(d) deciduals functionalis
Ans: (c)

16. Depo-provera refers to
(a) injectible contraceptive
(b) intra uterine device
(c) implant
(d) oral contraceptive

Ans: (a)

17. What base is responsible for hot spots for spontaneous point mutations?
(a) Adenine
(b) Guanine
(c) 5-bromouracil
(d) 5-methyl cytosine

Ans: (c)

18. During which geological period of evolution did the greatest diversification of life occurred on the earth?
(a) Permian
(b) Jurassic
(c) Cambrian
(d) Ordovician

Ans: (c)

19. Specific radioactive identification of ribosomal RNA can be achieved by using C\(^{14}\) labelled
(a) guanine
(b) uracil
(c) thymine
(d) cytocine

Ans: (b)

20. Which of the following is the Pribnow box?
(a) 5′-TATAAT-3′
(b) 5′-TAATAT-3′
(c) 5′-AATAAT-3′
(d) 5′-ATATTA-3′

Ans: (a)

21. The genome of *Caenorhabditis elegans* consists of
(a) 3 billion base pairs and 30,000 genes
(b) 12 million base pairs and 6000 genes
(c) 4.7 million base pairs and 4000 genes
(d) 97 million base pairs and 18,000 genes

Ans: (b)

22. About how long ago was the earth formed?
(a) 3 billion years ago
(b) 10 billion years ago
(c) 4.6 billion years ago
(d) 20 billion years ago

Ans: (c)

23. Gas gangrene is caused by
   (a) Clostridium botulinum
   (b) Xanthomonas campestris
   (c) Pseudomonas
   (d) Clostridium perfringens

Ans: (d)

24. Who received Nobel Prize in 1951 for the development of vaccine for yellow fever?
   (a) Max Theiler
   (b) Ronald Ross
   (c) Max Delbruck
   (d) Francis Peyton Rous

Ans: (a)

25. Continuous exposure to vinyl chloride may cause cancer of the
   (a) liver
   (b) spleen
   (c) vagina
   (d) prostate gland

Ans: (a)
26. Which of the following T–cells and destroyed by HIV?
(a) Cytotoxic T–cells
(b) Killer T–cells
(c) Suppressor T–cells
(d) Helper T–cells
Ans: (d)

27. An autoimmune disease is
(a) AIDS
(b) haemophilia
(c) allergy
(d) myasthenia gravis
Ans: (d)

28. Which hormone produces calorigenic effect?
(a) Thyroxine
(b) FSH
(c) Insulin
(d) All of these
Ans: (a)

29. Which of the following act as an antigen, but do not induce antibody production?
(a) Haustra
(b) Histones
(c) Haptens
(d) None of these
Ans: (c)

30. Haldane effect refers to
(a) more acidity in the blood
(b) less acidity in the blood
(c) more basicity in the blood
(d) less basicity in the blood
Ans: (a)
31. The plant whose seeds are known to leave the longest viability period is
(a) *Carica papaya*
(b) *Triticum aestivum*
(c) *Zizyphus mauritiana*
(d) *Nelumbo nucifera*
*Ans: (d)*

32. Jut is a
(a) bast fibre from secondary xylem
(b) bast fibre from primary xylem
(c) bast fibre from secondary phloem
(d) bast firbe from primary phloem
*Ans: (c)*

33. Chlorosis is produced in the leaves due to the deficiency of Fe, Mg, Mn, S or N of these essential elements, those that are exclusive constituents of chlorophyll molecule are
(a) Fe, S
(b) N, S
(c) Mg, S
(d) Mg, N
*Ans: (d)*

34. Read the following statements and choose the correct option.
I. Leptosporangiate development of sporangium is found in all members *Pteropsida*.
II. Seed habit is shown by *Sellaginella*.
III. *Gnetum* leaves are monomorphic and pinnately compound.
IV. Sporic meiosis is found in *Volvox, Chalmydomonas* and *Ulothrix*.

Choose the correct option.
(a) I and IV
(b) I and II
(c) I, II and IV
(d) All of these

**Ans: (c)**

35. Which of the following characteristics out of I, II and III are exhibited by C₄ plants?

I. Kranz anatomy.

II. The product of photosynthesis is oxalo acetic acid.

III. Both PEP carboxylase and ribulose–bis phosphate carboxylase act as carboxylating enzyme.

Choose the correct option.

(a) I and II, but not III
(b) II and III, but not I
(c) I and III, but not II
(d) All of these

**Ans: (d)**

36. Match the following column I and II for organismic respiration.

<table>
<thead>
<tr>
<th>Column i</th>
<th>Column ii</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Respiration in bacteria</strong></td>
<td><strong>1. Mitochondria</strong></td>
</tr>
<tr>
<td><strong>B. Respiration in cyanobacteria</strong></td>
<td><strong>2. Cytoplasmic membrane</strong></td>
</tr>
<tr>
<td><strong>C. Respiration in eukaryotic cell</strong></td>
<td><strong>3. Mesosomes</strong></td>
</tr>
</tbody>
</table>

(a) A–2, B–3, C–1
(b) A–3, B–2, C–1
(c) A–1, B–3, C–2
(d) A–3, B–1, C–2

**Ans: (b)**

37. Compare the statements I and II and choose correct option.

**Statement (I)** Auxin promote apical dominance by suppressing the activity of lateral buds.
Statement (II) In moriculture, periodic pruning of shoot tips is done to make mulberry plants bushy.

Choose the correct options
(a) I is false, but II is true
(b) II is false, but I is true
(c) Both I and II are true
(d) Both I and II are false
Ans: (c)

38. The one advantage of cleistogamy is
(a) it leads to greater genetic diversity
(b) seed dispersal is more efficient and widespread
(c) seed set is not dependent on pollinators
(d) each visit of a pollinator results in transfer of hundreds of pollen grains
Ans: (c)

39. In coconut, the liquid endosperm is formed because
(a) karyokinesis is not followed by cytokinesis
(b) karyokinesis is followed by cytokinesis
(c) formation of liquid endosperm is not dependent upon karyokinesis and cytokinesis
(d) None of the above
Ans: (c)

40. Keeping in view the structure of cell membrane, which one of the following statements is correct with respect to the movements of liquid and proteins from one liquid monolayer to the other (flip flop movement).
(a) While proteins can flip flop, liquids can not
(b) Neither lipids, nor proteins can flip flop
(c) Both lipids and proteins can flip flop
(d) While lipids can rarely flip flop, proteins can not
Ans: (d)

41. Ribosomes are particles about 200 Å units in diameter consisting of protein and RNA. The percentage of protein
and RNA is respectively
(a) 80% and 20%
(b) 60% and 40%
(c) 50% and 50%
(d) 40% and 60%
Ans: (b)

42. Match the biological molecule listed under column I with their biological function listed under column II. Choose the answer which gives correct combination of alphabet of the two columns.

<table>
<thead>
<tr>
<th>Column I (Biological Molecule)</th>
<th>Column ii (Function)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Glycogen</td>
<td>1. Hormone</td>
</tr>
<tr>
<td>B. Globulin</td>
<td>2. Biocatalyst</td>
</tr>
<tr>
<td>C. Steroid</td>
<td>3. Antibody</td>
</tr>
<tr>
<td>D. Thrombin</td>
<td>4. Storage product</td>
</tr>
</tbody>
</table>

(a) A-3, B-2, C-4, D-1
(b) A-4, B-2, C-1, D-3
(c) A-2, B-4, C-3, D-1
(d) A-4, B-3, C-1, D-2
Ans: (d)

43. In peal plants, yellow seeds are dominant to green. If a heterozygous yellow seeded plant is crossed with a green seeded plant, what ratio of yellow and green seeded plants could you expect in F1-generation.

(a) 9 : 1
(b) 1 : 3
(c) 3 : 1
(d) 50 : 50
Ans: (d)

44. In a mutational event, when adenine is replaced by guanine, it is a case of

(a) frame shift mutation
45. Independent assortment of gene occurs due to the orientation of chromosomes at
(a) metaphase–I of mitosis
(b) metaphase–I of meiosis
(c) metaphase–II of meiosis
(d) any phase of the cell division
Ans: (b)

46. The non–disjunction, in meiosis may result is extra copy of a chromosome in a sperm cell. During which phase the above phenomenon may occur?
(a) Prophase–I, prophase–II
(b) Metaphase–I, anaphase–II
(c) Anaphase–I, anaphase–II
(d) Anaphase–I, telophase–II
Ans: (c)

47. Which of the following is true regarding the phase lambda, a virus which infects bacteria?
(a) In the lytic cycle, the bacterial host replicates viral DNA, passing it on to daughter cells during binary fission
(b) In the lysogenic cycle, the bacteria host replicates viral DNA, passing it onto daughter cells during binary fission
(c) In the lytic cycle, viral DNA is integrated into the host genome
(d) In the lysogenic cycle, the host bacterial cell burst, releasing phases
Ans: (b)

48. The part of the bacterial chromosomes sharing homology with genome fragment transferred from the recipients to cell during emrozygote formation is known as
(a) eugenic
49. In 1944, Avery, McCarty and MacLeod isolated substance from heat killed virulent form of bacteria and added to non-virulent form of bacteria which changed the non-virulent to virulent from this substance can be destroyed by

(a) DNase
(b) protease
(c) lipase
(d) amylase

Ans: (a)

50. Thermococcus, Methanococcus and Methanobacterium are groups of

(a) bacteria containing a cytoskeleton and all membrane bound organelles
(b) archaebacteria with peptidoglycan in their cell wall
(c) archaebacteria that consists of protein homologous to eukaryotic core histones
(d) most advanced type of bacteria

Ans: (c)

51. Match the following Column I with Column II.

<table>
<thead>
<tr>
<th>Column i</th>
<th>Column ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Complementary ratio</td>
<td>1. 9 : 7</td>
</tr>
<tr>
<td>B. Supplementary ratio</td>
<td>2. 9 : 3 : 4</td>
</tr>
<tr>
<td>C. Epistatic ratio</td>
<td>3. 12 : 3 : 1</td>
</tr>
<tr>
<td>D. Inhibitory ratio</td>
<td>4. 13 : 3</td>
</tr>
</tbody>
</table>

(a) A-4,B-1,C-3,D-2
(b) A-1, B-2, C-3, D-4
(c) A-4,B-1,C-2,D-3
52. Which of the following sequences represent a possible pathway in the production of a secretory protein?

(a) Rough ER → Secretory vesicle → Ribosome → Golgi apparatus

(b) Ribosome → Rough ER → Golgi apparatus → Secretory vesicle

(c) Secretory vesicle → Golgi apparatus → Ribosomes → Rough ER

(d) Rough ER → Ribosomes → Secretory vesicles → Golgi apparatus

**Ans: (d)**

53. A connecting link between plant and animal kingdom is

(a) *Paramecium*

(b) *Chlamydomonas*

(c) *Chlorella*

(d) *Euglena*

**Ans: (d)**

54. Which of the following statements is false regarding SDS–polyacrylamide gel electrophoresis?

(a) Proteins are separated by molecular weight

(b) SDS is a detergent which gives charge to protein

(c) Large protein move more slowly through gel

(d) SDS is used to maintain the 3–dimensional structure of protein

**Ans: (d)**

55. If the free energy change of a reaction is greater than zero, then the reaction is

(a) spontaneous

(b) non–spontaneous

(c) at equilibrium

(d) endothermic
Ans: (b)

56. Organisms who are able to freely interbreed producing fertile off-springs and having similar blue print for making these organisms are referred to as

(a) species
(b) tribe
(c) genus
(d) sub-genus

Ans: (a)

57. The enzyme hexokinase which catalyzes glucose to a glucose-6-phosphate in glycolysis is inhibited by glucose-6-phosphate. This is an example of

I. Competitive inhibition
II. non-competitive inhibition
III. feedback allosteric inhibition

Which of the above statements is/are correct?

(a) I and II
(b) I and III
(c) Only III
(d) All of these

Ans: (c)

58. The protein products of tumour suppressor gene may

(a) be present in non-cancerous cells
(b) cause signal cell death
(c) regulate the cell cycle
(d) All of the above

Ans: (a)

59. The mitotic cell cycle is divided typically into four phases; G1, S, G2 and M. Considering a mitotic cycle time of 18 hrs; the distribution of period of time (in hrs) for each of these phases will be

\[ \begin{array}{c|c|c|c}
\text{G}_1 & \text{S} & \text{G}_2 & \text{M} \\
1 & 3 & 5 & 9 \\
\end{array} \]

(a) 1 3 5 9
60. Match the following column I with column II.

<table>
<thead>
<tr>
<th>Column i</th>
<th>Column ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Carcinogen</td>
<td>1. Cancerous tumour</td>
</tr>
<tr>
<td>B. Anaphase-l</td>
<td>2. Disjunction</td>
</tr>
<tr>
<td>C. Mitosis</td>
<td>3. Synapse</td>
</tr>
<tr>
<td>D. Zygotene</td>
<td>4. Pletonemic coiling</td>
</tr>
</tbody>
</table>

(a) A–1, B–2, C–4, D–3  
(b) A–3, B–1, C–4, D–2  
(c) A–2, B–3, C–1, D–4  
(d) A–4, B–1, C–3, D–2

Ans: (a)

Quantitative Aptitude & English

1. When the bus reaches Shivani’s house, it faces South. After starting from Shivani’s house to the school, it turns twice to its left and once to its right. In which direction it is running now?

(a) North  
(b) West  
(c) East  
(d) South

Ans: (c)

2. A men travels 12 km West, then 3 km towards South and then 8 km towards East. How far is he form the start?

(a) 23 km  
(b) 20 km  
(c) 15 km  
(d) 5 km
Ans: (d)

3. From the given alternative words, select the one which can be formed using the letters of the given word EXAMINATION.
   (a) ANIMAL
   (b) EXAMINER
   (c) NATIONAL
   (d) ANIMATION
   Ans: (d)

4. If ANCE can be coded as 3, 7, 29, 11, then BOIL will be coded as
   (a) 5, 29, 19, 27
   (b) 5, 29, 19, 25
   (c) 5, 31, 21, 25
   (d) 5, 31, 19, 25
   Ans: (d)

5. QPRS : TUVW : JIKL : ?
   (a) NMOP
   (b) NMPO
   (c) MNPO
   (d) MNOP
   Ans: (c)

Directions (Q. No. 6-7) Find the odd letter pair from

6. (a) Wool (b) Feather
    (c) Hair    (d) Grass
   (a) a
   (b) b
   (c) c
   (d) d
   Ans: (d)

7. (a) Sport : Ground (b) Cinema : Screen
(b) Drama : Stage (d) Rubber : Erase

(a) a
(b) b
(c) c
(d) d

Ans: (d)

8. If + means −, − means ×, × means ÷ and ÷ means +, then
48 × 4 ÷ 7 + 8 − 2 = ?

(a) 3
(b) −5
(c) 35
(d) 16

Ans: (a)

9. If February 1, 2004 is Wednesday, what day is March 3, 2004?

(a) Monday
(b) Sunday
(c) Saturday
(d) Friday

Ans: (c)

10. How many triangles are there in the given figure?

(a) 5
(b) 4
(c) 3
(d) 8

Ans: (d)

Directions (Q. Nos. 11-12) Out of the four alternatives choose the one which best expresses the meaning of the given word.

11. Instigate

(a) Initiate
(b) Incite
(c) Force
(d) Cause
**Ans: (b)**

12. Voracious
(a) Quick
(b) Angry
(c) Hungry
(d) Wild
**Ans: (c)**

**Directions (Q. No. 13-14)** Choose the word opposite in meaning to the given word.

13. Epilogue
(a) Dialogue
(b) Prelude
(c) Post script
(d) Epigram
**Ans: (b)**

14. Indiscreet
(a) Reliable
(b) Honest
(c) Prudent
(d) Stupid
**Ans: (c)**

**Directions (Q. No. 15)** Out of the alternatives choose the one which can be substituted for the given words/sentence.

15. The absence of law and order
(a) Rebellion
(b) Anarchy
(c) Mutiny
(d) Revolt
Directions (Q. Nos 16-18) In the following question, a sentence has divided into four parts. Arrange these parts to make the sentence meaningful.

16. In favour of English,
P: has chances of securing employment
Q: we may say that
R: in all parts of India and in foreign countries
S: an English knowing Indian
(a) QSPR
(b) SPQR
(c) SRQP
(d) QRPS
Ans: (a)

17. The hungry man
P: and said
Q: replied in the negative
R: that he only wanted a meal
S: to his question
(a) SQPR
(b) QSPR
(c) SPRQ
(d) QPRS
Ans: (b)

18. It is
P: that people read fewer books today
Q: then they did
R: even about a decade ago
S: a matter of grave concern
(a) PSRQ
(b) SPRQ
Directions (Q. Nos. 19-20) Groups of four words are given. In each group, one word is correctly spelt. Find the correctly spelt word.

19. (a) Paraphernalia (b) Parsimonious (c) Peccadilo (d) Peadialriis

(a) a
(b) b
(c) c
(d) d

Ans: (b)

20. (a) Tussel (b) Tunnle (c) Tumble (d) Trable

(a) a
(b) b
(c) c
(d) d

Ans: (c)