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MD

PHYSICS

1) The vector sum of two force is perpendicular to their vector differences. In that case, the forces:-

- (1) Cannot be predicted
- (2) Are perpendicular to each other
- (3) Are equal to each other in magnitude
- (4) Are not equal to each other in magnitude

2) A force $\vec{F} = (6\hat{i} + 2\hat{j} - 3\hat{k})\text{N}$ acts on particle and produces a displacement of $\vec{S} = (2\hat{i} - 3\hat{j} - x\hat{k})\text{m}$. If work done is zero, then value of x is :-

- (1) -2
- (2) 1/2
- (3) 6
- (4) 5

3) If $\vec{A} = \vec{B} + \vec{C}$ and the magnitudes of \vec{A} , \vec{B} and \vec{C} are 5, 4 and 3 units respectively, the angle between \vec{A} and \vec{C} is :-

- (1) $\cos^{-1} \left(\frac{3}{5} \right)$
- (2) $\cos^{-1} \left(\frac{4}{5} \right)$
- (3) $\frac{\pi}{2}$
- (4) $\sin^{-1} \left(\frac{3}{4} \right)$

4) Given $\vec{A} = 2\hat{i} + p\hat{j} + q\hat{k}$ and $\vec{B} = 5\hat{i} + 7\hat{j} + 3\hat{k}$. If $\vec{A} \parallel \vec{B}$, then the values of p and q are, respectively:-

- (1) $\frac{14}{5}$ and $\frac{6}{5}$
- (2) $\frac{14}{3}$ and $\frac{6}{5}$
- (3) $\frac{6}{5}$ and $\frac{1}{3}$
- (4) $\frac{3}{4}$ and $\frac{1}{4}$

5) If \vec{A} & \vec{B} are two vectors then which of the following are correct ?

- (a) $(\vec{A} \times \vec{B}) \perp \vec{A}$

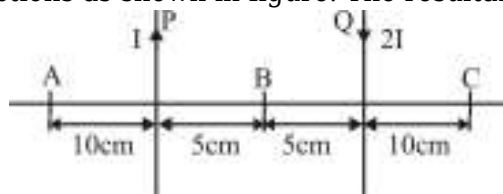
- (b) $(\vec{A} \times \vec{B}) \perp \vec{B}$
 (c) $(\vec{A} \times \vec{B}) \perp (\vec{A} + \vec{B})$
 (d) $(\vec{A} \times \vec{B}) \perp (\vec{A} - \vec{B})$
 (e) $(\vec{A} \times \vec{B}) \perp (\vec{A} \cdot \vec{B})$

- (1) (a), (b), (c), (d), (e)
 (2) (a), (b) only
 (3) (a), (b), (c) only
 (4) (a), (b), (c), (d) only

6) If $\vec{A} = 3\hat{i} + 4\hat{j}$ and $\vec{B} = \hat{i} + \hat{j}$, then the component of \vec{B} along \vec{A} will be :-

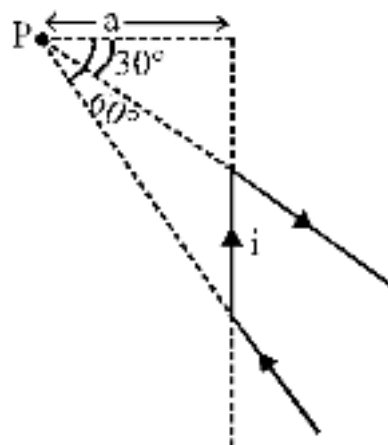
- (1) $\frac{7}{25} (3\hat{i} + 4\hat{j})$
 (2) $\frac{7}{5} (3\hat{i} + \hat{j})$
 (3) $\frac{7}{2} (\hat{i} + \hat{j})$
 (4) $\frac{7}{\sqrt{2}} (\hat{i} + \hat{j})$

7) Two infinitely long wires P and Q separated by a distance of 10 cm in air, carry currents I and 2I in opposite directions as shown in figure. The resultant magnetic field due to currents in these wires



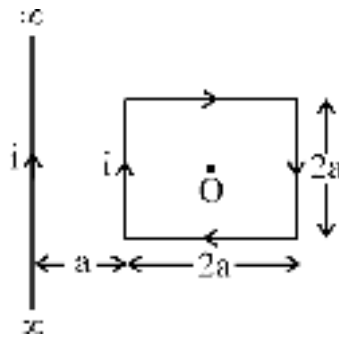
will be zero at :-

- (1) Point A
 (2) Point B
 (3) Point C
 (4) None of the points A, B, C



8) Find magnetic field at point P in given figure :-

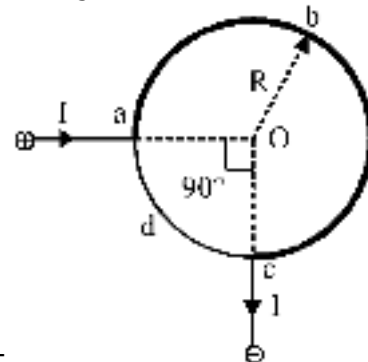
- (1) $\frac{\mu_0 i}{4\pi a} (\sqrt{3} - 1)$
- (2) $\frac{\mu_0 i}{8\pi a} (1 - \sqrt{3})$
- (3) $\frac{\mu_0 i}{8\pi a} (\sqrt{3} - 1)$
- (4) $\frac{\mu_0 i}{4\pi a} (1 - \sqrt{3})$



9) Find net magnetic field at centre of square.

- (1) $\frac{\mu_0 i}{2\pi a} \left[\frac{1}{2} + 2\sqrt{2} \right]$
- (2) $\frac{\mu_0 i}{2\pi a} \left[\frac{1}{2} + 4\sqrt{2} \right]$
- (3) $\frac{\mu_0 i}{2\pi a} \left[1 + 2\sqrt{2} \right]$
- (4) $\frac{\mu_0 i}{2\pi a} \left[1 - 2\sqrt{2} \right]$

10) A conducting circular loop of copper is placed as shown in figure. Cross section area of part abc

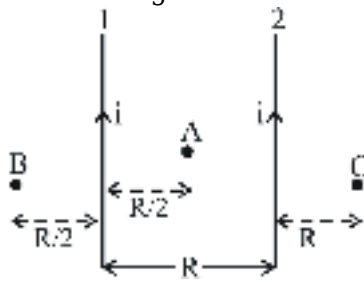


is A and part adc is A/3 then magnetic field at point 'O' is :-

- (1) $\frac{\mu_0 I}{8R} \otimes$
- (2) $\frac{3\mu_0 I}{11R} \otimes$
- (3) $\frac{\mu_0 I}{16R} \odot$
- (4) Zero

11) Two long parallel wires are at a distance R apart. They carry steady equal currents in the same

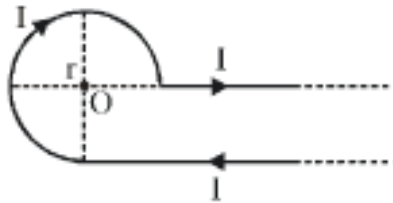
directions as shown in the figure. The ratio of magnitude of magnetic fields at A, B and C



respectively, is :-

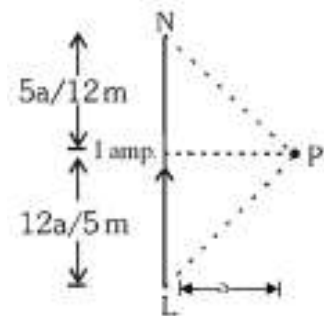
- (1) 0 : 1 : 1
- (2) 0 : 16 : 9
- (3) 0 : 1 : 0
- (4) 0 : 9 : 16

12) Current 'I' is flowing in a conductor shaped as shown in the figure. The radius of the curves part is r and the length of straight portion is very large. The value of the magnetic field at the centre O



will be :-

- (1) $\frac{\mu_0 I}{4\pi r} \left(\frac{\pi}{2} + 1 \right)$
- (2) $\frac{\mu_0 I}{4\pi r} \left(\frac{\pi}{2} - 1 \right)$
- (3) $\frac{\mu_0 I}{4\pi r} \left(\frac{3\pi}{2} + 1 \right)$
- (4) $\frac{\mu_0 I}{4\pi r} \left(\frac{3\pi}{2} + 2 \right)$



13) Magnetic field at point 'P' due to finite length wire in S.I. units :-

- (1) $\frac{7I}{50a} \left(\frac{\mu_0}{4\pi} \right)$
- (2) $\frac{5I}{136a} \left(\frac{\mu_0}{4\pi} \right)$

$$(3) \frac{17I}{13a} \left(\frac{\mu_0}{4\pi} \right)$$

$$(4) \frac{17I}{130a} \left(\frac{\mu_0}{4\pi} \right)$$

14) When a certain length of wire is turned into one circular loop, the magnetic induction at the centre of coil due to some current flowing is B_0 . If the same wire is turned into three loops to make a circular coil, the magnetic induction at the center of this coil for the same current will be :-

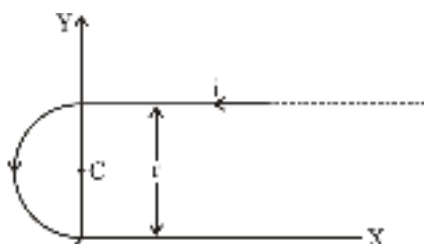
- (1) B_0
- (2) $9B_0$
- (3) $3B_0$
- (4) $27B_0$

15) Two identical coils of radius R and number of turns N are placed perpendicular to each others in such a way that they have common centre. The current through them are I and $I\sqrt{3}$. The resultant intensity of magnetic field at the centre of the coil will be: (in weber/m²).

- (1) $\frac{\mu_0 NI}{2R}$
- (2) $\sqrt{5} \frac{\mu_0 NI}{2R}$
- (3) $\sqrt{3} \frac{\mu_0 NI}{2R}$
- (4) $\frac{\mu_0 NI}{R}$

16) A coil having N turns is wound tightly in the form of a spiral with inner and outer radii a and b respectively. When a current I passes through the coil, the magnetic field at the centre is:

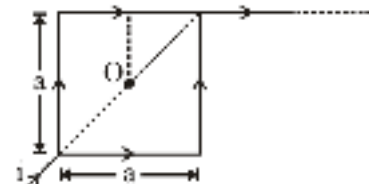
- (1) $\mu_0 NI/b$
- (2) $2\mu_0 NI/a$
- (3) $\frac{\mu_0 NI}{2(b-a)} \ln \frac{b}{a}$
- (4) $\frac{\mu_0 NI}{(b-a)} \ln \frac{b}{a}$



17)

In the above figure magnetic field at point C will be :-

- (1) $\frac{\mu_0 i}{2\pi r} [(1 + \pi) \hat{k} + \hat{i}]$
- (2) $\frac{\mu_0 i}{4\pi r} [(1 + \pi) \hat{k} - \hat{i}]$
- (3) $\frac{\mu_0 i}{2\pi r} [(1 + \pi) \hat{k} - \hat{i}]$
- (4) $\frac{\mu_0 i}{4\pi r} [(1 - \pi) \hat{k} + \hat{i}]$



18) Magnetic field at centre 'O' due to given current distribution.

- (1) $\frac{\mu_0 i}{2\sqrt{2}\pi a} (\sqrt{2} - 1) \otimes$
- (2) $\frac{\mu_0 i}{2\sqrt{2}\pi a} (\sqrt{2} - 1) \odot$
- (3) $\frac{2\sqrt{2}\mu_0 i}{\pi a} \left(1 - \frac{1}{\sqrt{2}}\right) \otimes$
- (4) Zero

19) A proton beam is coming towards observer in horizontal plane then pattern of magnetic field lines will be :-

- (1) ACW in horizontal plane
- (2) ACW in vertical plane
- (3) CW in horizontal plane
- (4) CW in vertical plane

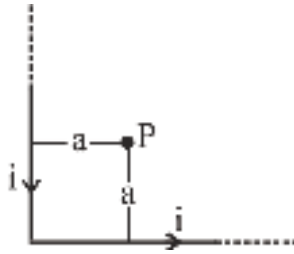
20) Two very long wire's are kept perpendicular to plane of paper at points P & Q respectively as shown in fig. decide the correct direction of currents in wires & relation between I_1 & I_2 from the



given options :-

- (1) $I_1 \rightarrow \odot, I_2 \rightarrow \odot, I_1 > I_2$
- (2) $I_1 \rightarrow \otimes, I_2 \rightarrow \otimes, I_1 > I_2$
- (3) $I_1 \rightarrow \otimes, I_2 \rightarrow \otimes, I_2 > I_1$
- (4) $I_1 \rightarrow \odot, I_2 \rightarrow \otimes, I_1 > I_2$

21) A large straight current carrying conductor is bent in the form of L shape. Find \vec{B} at P :-



- (1) Zero
- (2) $(2 + \sqrt{2}) \frac{\mu_0 i}{4\pi a} \hat{k}$
- (3) $\frac{\mu_0 i}{4\pi a}$
- (4) $\frac{2\mu_0 i}{\pi a}$

22) At very close point on the axis of a current carrying circular coil ($x \ll R$) of radius 'R' the value of magnetic field decrease by a fraction of 5% with respect to centre value. The position 'x' of the point from the centre of the coil is :-

- (1) $\frac{R}{\sqrt{10}}$
- (2) $\frac{R}{\sqrt{30}}$
- (3) $\frac{R}{\sqrt{50}}$
- (4) $\frac{R}{\sqrt{150}}$

23) A circular current carrying coil has a radius R. The distance from the centre of the coil on the axis where the magnetic induction will be $\frac{1}{8}$ th of its value at the centre of the coil, is

- (1) $\frac{R}{\sqrt{3}}$
- (2) $R\sqrt{3}$
- (3) $2\sqrt{3}R$
- (4) $\frac{2}{\sqrt{3}}R$

24) Find sum of given arithmetic progression :
 {4 + 7 + 10 + + 94}

- (1) 314
- (2) 30
- (3) 1519
- (4) 1470

25) The sum of the series $\frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \dots \infty$ is :-

- (1) $\frac{4}{3}$
- (2) $\frac{1}{3}$
- (3) $\frac{3}{4}$
- (4) $\frac{1}{4}$

26) $\cos(-120^\circ) = \dots\dots\dots$

- (1) $-\frac{1}{2}$
- (2) $\frac{1}{2}$
- (3) $-\frac{\sqrt{3}}{2}$
- (4) $\frac{\sqrt{3}}{2}$

27)

Find value of $\cos 106^\circ$ -

- (1) $\frac{7}{25}$
- (2) $-\frac{7}{25}$
- (3) $\frac{2}{25}$
- (4) $\frac{5}{25}$

28)

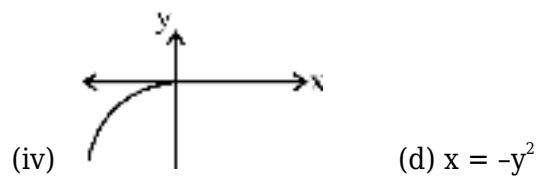
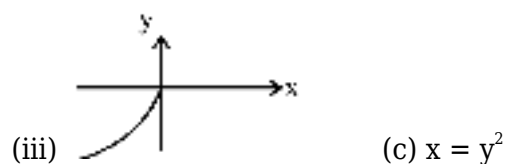
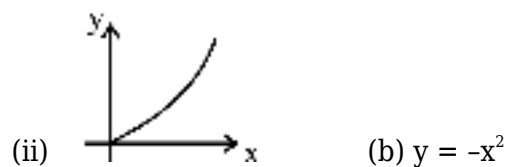
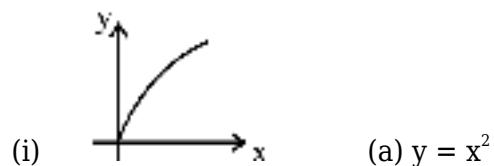
Find the value of $\cos(165^\circ)$:-

- (1) $\frac{1 - \sqrt{3}}{2\sqrt{2}}$
- (2) $\frac{\sqrt{3} - 1}{2\sqrt{2}}$
- (3) $\frac{-(\sqrt{3} + 1)}{2\sqrt{2}}$

(4) None of these

29)

Which of the following match is correct ?



	(i)	(ii)	(iii)	(iv)
(1)	a	b	c	d
(2)	a	c	b	d
(3)	d	c	b	a
(4)	c	a	d	b

(1) 1

(2) 2

(3) 3

(4) 4

30) If $y = 2x^2 - 12x$ then minimum value of y is :-

(1) 13

(2) 12

(3) -18

(4) 23

31) What is the minimum value of $\frac{2}{4 + \sin \theta + \sqrt{3} \cos \theta}$

(1) 0

(2) 1

(3) $\frac{1}{3}$

(4) $\frac{1}{2}$

32) Distance from earth to moon is D. If angle of moon at the eye of observer at the earth is 3° , then diameter of moon :-

(1) $\frac{\pi}{180}D$

(2) $\frac{\pi D}{60}$

(3) $\frac{\pi D}{30}$

(4) $\frac{\pi D}{90}$

33) For a spherical balloon, the rate of change of radius with respect to time is $2/\pi$ cm/s. Find the rate of change of volume, when radius is $\frac{1}{2}$ cm.

(1) $1 \text{ cm}^3/\text{s}$

(2) $2 \text{ cm}^3/\text{s}$

(3) $3 \text{ cm}^3/\text{s}$

(4) $4 \text{ cm}^3/\text{s}$

34) Divide a number 100 into two parts such that their product is maximum.

(1) 75, 25

(2) 40, 60

(3) 50, 50

(4) 70, 30

35) The velocity v of a particle is given by the equation $v = 6t^2 - 6t^3$, where v is in m/sec and t is time in seconds, then :

(1) at $t = 0$, velocity is maximum

(2) at $t = \frac{2}{3}$, velocity is minimum

(3) minimum velocity is zero

(4) minimum velocity is -2 m/sec

36) The value of $\frac{d}{dx} \left(\frac{x}{\sin x} \right)$ will be :-

(1) $\frac{\sin x - x \cos x}{\sin^2 x}$

(2) $\frac{\cos x - x \sin x}{\sin^2 x}$

(3) $\frac{x \cos x - \sin x}{\cos^2 x}$

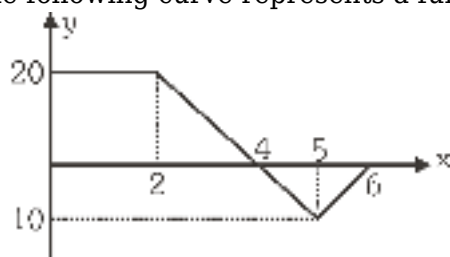
(4) $\frac{x \sin x - \cos x}{\cos^2 x}$

37)

Ice at -20°C mixed with 200 gm water at 25°C . If temperature of mixture is 10°C , then mass of ice is :

- (1) 30 gm
- (2) 15 gm
- (3) 40 gm
- (4) 20 gm

38) The following curve represents a function $y = f(x)$. Find average value of y when x changes from



0 to 6.

- (1) $\frac{20}{3}$
- (2) $\frac{25}{3}$
- (3) $\frac{35}{3}$
- (4) $\frac{40}{3}$

39) On an X temperature scale, water freezes at -125.0°X and boils at 375.0°X . On another Y temperature scale, water freezes at -70.0°Y and boils at -30.0°Y . The value of temperature on X-scale equal to the temperature of 50.0°Y on Y-scale is :

- (1) 455.0°X
- (2) -125.0°X
- (3) 1375.0°X
- (4) 1500.0°X

40)

A liquid of mass m and specific heat ' C ' is heated to a temperature $2T$. Another liquid of mass $\frac{m}{2}$ and specific heat $2C$ is heated to a temperature T . If these two liquids are mixed, the resulting temperature of mixture is :

(1) $\frac{2T}{3}$

(2) $\frac{8}{5}T$

(3) $\frac{3}{5}T$

(4) $\frac{3}{2}T$

41) Two temperature scales A and B are related by $\frac{A - 42}{110} = \frac{B - 72}{220}$. At which temperature two scales have the same reading?

(1) -42°

(2) -72°

(3) $+12^\circ$

(4) -40°

42) The lengths of two metallic rods at temperatures θ are L_A and L_B and their linear coefficient of expansion are α_A and α_B respectively. If the difference in their lengths is to remain constant at any temperature, then

(1) $L_A/L_B = \alpha_A/\alpha_B$

(2) $L_A/L_B = \alpha_B/\alpha_A$

(3) $\alpha_A = \alpha_B$

(4) $\alpha_A\alpha_B = 1$

43) A thin rod of negligible mass and area of cross section $4 \times 10^{-6} \text{ m}^2$ suspended vertically from one end has a length 0.5 m at 100°C . The rod is cooled to 0°C , but is prevented from contracting by attaching a mass at the lower end. Find this mass :

(Given young's modulus of rod = 10^{11} N/m^2 , coefficient of linear expansion of rod = 10^{-5} K^{-1})

(1) 10 kg

(2) 20 kg

(3) 30 kg

(4) 40 kg

44)

Calculate the time required to heat 20 kg of water from 10°C to 70°C using heater rated 1000 watt. Assume that 80% of power input is used to heat the water. Specific heat of water = 4200 J/kg-K .

(1) 110 min

(2) 105 min

(3) 100 min

(4) 115 min

45) The value of coefficient of volume expansion of glycerin is $5 \times 10^{-4} \text{ K}^{-1}$. The fractional change in

the density of glycerin for a rise of 40°C in its temperature, is :-

- (1) 0.010
- (2) 0.015
- (3) 0.020
- (4) 0.025

CHEMISTRY

1) For a reaction $K_1 = Ae^{-\frac{1000}{T}}$, $K_2 = Ae^{-\frac{3000}{T}}$,

$K_3 = Ae^{-\frac{4000}{T}}$. What will activation energy for a reaction if $K = \frac{K_2 K_3}{K_1}$

- (1) 6000 R
- (2) -6000 R
- (3) 2000 R
- (4) -1000 R

2) For an elementary reaction, $X(g) \rightarrow Y(g) + Z(g)$, the half life period is 10 min. In what approximate period of time would concentration of X be reduced to 10% of original concentration ?

- (1) 20 min.
- (2) 33 min.
- (3) 15 min.
- (4) 25 min.

3) For the reaction $A + B \rightarrow C$; starting with different initial concentration of A and B, initial rate of reaction were determined graphically in three experiments.

S.No.	[A] ₀ /M (Initial conc.)	[B] ₀ /M (Initial conc.)	rate/ (M s ⁻¹)
1	1.6×10^{-3}	5×10^{-2}	10^{-3}
2	3.2×10^{-3}	5×10^{-2}	4×10^{-3}
3	1.6×10^{-3}	10^{-1}	2×10^{-3}

Rate law for reaction from above data is:-

- (1) $r = k[A]^2 [B]^2$
- (2) $r = k[A]^2 [B]$
- (3) $r = k[A] [B]^2$
- (4) $r = k[A] [B]$

4) For a reaction the initial rate is given as : $R_0 = k[A]_0^2 [B]_0^1$ by what factor, the initial rate of reaction will increase if initial concentration of A is taken 1.5 times and of B is tripled ?

- (1) 4.5

- (2) 2.25
- (3) 6.75
- (4) 3

5)

The rate constant of a zero order reaction is $0.2 \text{ mol L}^{-1} \text{ h}^{-1}$. If the concentration of reactant after 30 minutes is 0.05 mol L^{-1} , then its initial concentration would be :-

- (1) 0.15 mol L^{-1}
- (2) 1.05 mol L^{-1}
- (3) 0.25 mol L^{-1}
- (4) 4.00 mol L^{-1}

6) For a reaction : $A \rightarrow \text{Product}$

Rate law is - $\frac{d[A]}{dt} = K[A]$

The concentration of A left after time t when $t = 1/K$ is :-

- (1) $\frac{[A]_0}{e}$
- (2) $[A]_0 e$
- (3) $\frac{[A]_0}{e^2}$
- (4) $\frac{1}{[A]_0}$

7) Half lives and initial concentration of a first order and zero order reactions are same. Then the ratio of the initial rates of the first order reaction to that of zero order reaction is :-

- (1) $1/0.693$
- (2) 2×0.693
- (3) $2/0.693$
- (4) 6.93

8) For the first order reaction $A \rightarrow B + C$, carried out at 27°C if $4 \times 10^{-16} \%$ of the reactant molecules exists in the activated state, the activation energy of the reaction is:

- (1) 1000 kJ/mol
- (2) 88.57 kJ/mol
- (3) 100 kJ/mol
- (4) 831.4 kJ/mol

9) The rate constant of which of the following reactions is independent of concentration of the reactants ?

- (1) First order reactions

- (2) Zero order reactions
- (3) Second order reactions
- (4) All of these

10) In a reaction $A_2B_3(g) \rightarrow A_2(g) + \frac{3}{2}B_2(g)$, the pressure increases from 60 torr to 75 torr in 2.5 minutes. The rate of disappearance of A_2B_3 is -

- (1) 8 torr min^{-1}
- (2) 18 torr min^{-1}
- (3) 4 torr min^{-1}
- (4) 10 torr min^{-1}

11) For the reaction $A \rightarrow B$, data of initial concentration and corresponding half life period are given in the tabular form :

[A]	1M	2M	4M
$T_{0.5}$	300s	600s	1200s

The order of the reaction is :-

- (1) 0
- (2) 1
- (3) 2
- (4) 3

12) For a given reaction of first order, it takes 20 minutes for the reactant concentration to drop from 1.0 M to 0.4 M. The time required for the concentration to drop from 0.4 M to 0.16 M will be :-

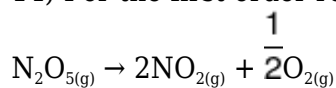
- (1) More than 20 minutes
- (2) Less than 20 minutes
- (3) Equal to 20 minutes
- (4) Infinity

13) **Statement-I** : A fractional order reaction must be a complex reaction.

Statement-II : Fractional order of RDS equals to overall order of a complex reaction.

- (1) Both **Statement I** and **Statement II** are correct.
- (2) Both **Statement I** and **Statement II** are incorrect.
- (3) **Statement I** is correct but **Statement II** is incorrect.
- (4) **Statement I** is incorrect but **Statement II** is correct.

14) For the first order reaction,



total pressure is 350 mm after 30 min and 500 mm after complete reaction. Thus rate constant is :-

- (1) $2.31 \times 10^{-2} \text{ min}^{-1}$
- (2) $2.31 \times 10^{-3} \text{ min}^{-1}$

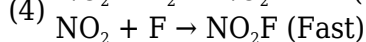
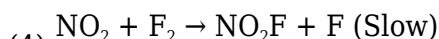
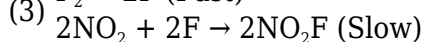
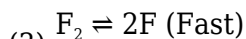
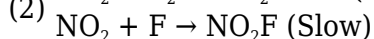
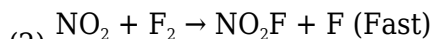
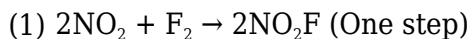


(3) $4.62 \times 10^{-2} \text{ min}^{-1}$

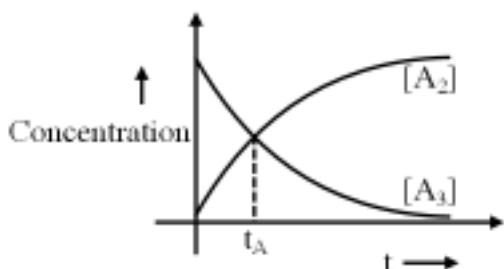
(4) $1.31 \times 10^{-2} \text{ min}^{-1}$

15) The following reaction and rate law have been experimentally determined :- $2\text{NO}_{2(g)} + \text{F}_{2(g)} \rightarrow 2\text{NO}_2\text{F}_{(g)}$

Rate = $k[\text{NO}_2][\text{F}_2]$ Which of the following mechanism provides the best explanation of the experimental rate law ?



16) Consider a first order decomposition process :- $\text{A}_3 \rightarrow \frac{3}{2} \text{A}_2$ A plot of concentration of A_3 and A_2 versus time is shown below. At time t_A , percentage of reactant decomposed is :-



(1) 75%

(2) 50%

(3) 40%

(4) 30%

17) The order of a reaction $\text{A} \rightarrow \text{product}$ in which half of the reactant is reacted in half an hour, three fourth ($3/4^{\text{th}}$) in one hour and seven-eighth ($7/8^{\text{th}}$) in one and half hours is :

(1) 2

(2) 1

(3) Zero

(4) -1

18)

The rate constant for a reaction at 200 K and 300 K are 0.03 min^{-1} and 0.05 min^{-1} respectively. the activation energy for the reaction will be :-

(1) 5 kJ

(2) 10 kJ

(3) 2.5 kJ

(4) 3 kJ

19) Two reactions R_1 and R_2 have identical pre-exponential factors. Activation energy of R_1 exceeds that of R_2 by 10 kJ mol^{-1} . If k_1 and k_2 are rate constants for reactions R_1 and R_2 respectively at 300 K, then $\ln(k_2/k_1)$ is equal to : ($R = 8.314 \text{ J mol}^{-1}\text{K}^{-1}$)

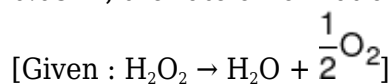
(1) 8

(2) 12

(3) 6

(4) 4

20) Decomposition of H_2O_2 follows a first order reaction. In fifty minutes the concentration of H_2O_2 decreases from 0.5 to 0.125 M in one such decomposition. When the concentration of H_2O_2 reaches 0.05 M, the rate of formation of O_2 will be :-



(1) $1.34 \times 10^{-2} \text{ mol min}^{-1}$

(2) $6.93 \times 10^{-2} \text{ mol min}^{-1}$

(3) $6.93 \times 10^{-4} \text{ mol min}^{-1}$

(4) $1.34 \times 10^{-4} \text{ mol min}^{-1}$

21) For the equilibrium,

$\text{A(g)} \rightleftharpoons \text{B(g)}$, ΔH is -40 kJ/mol . If the ratio of the activation energies of the forward (E_f) and reverse (E_b) reactions is $\frac{2}{3}$ then :-

(1) $E_f = 60 \text{ kJ/mol}$; $E_b = 100 \text{ kJ/mol}$

(2) $E_f = 30 \text{ kJ/mol}$; $E_b = 70 \text{ kJ/mol}$

(3) $E_f = 80 \text{ kJ/mol}$; $E_b = 120 \text{ kJ/mol}$

(4) $E_f = 70 \text{ kJ/mol}$; $E_b = 30 \text{ kJ/mol}$

22) Higher order (>3) reactions are rare due to :-

(1) shifting of equilibrium towards reactants due to elastic collision

(2) loss of active species on collision

(3) low probability of simultaneous collision of all the reacting species

(4) increase in entropy and activation energy as more molecules are involved.

23) Maximum number of electrons in outermost shell of s, p, d and f block elements are respectively.

(1) 2, 8, 2, 2

(2) 2, 6, 10, 14

(3) 2, 8, 18, 32

(4) 2, 8, 10, 8

24) Which of the following is not correct match ?

- (1) Next inert gas = Uuo
- (2) Next Pnicogen = Uup
- (3) Next alkaline earth metal = Ubn
- (4) Last d-block metal = Uut

25) Minimum atomic number that can change the model of modern periodic table : (follow $n + \square$ rule)

- (1) 119
- (2) 121
- (3) 132
- (4) 150

26) Number of electrons in penultimate shell of d-block elements and f-block elements are respectively :

- (1) 1-10 and 1-14
- (2) 9-18 and 19-32
- (3) 1-18 and 9-32
- (4) 9-18 and 8-9

27) Incorrect match is :

- (1) Natural transuranic element \Rightarrow Np, Pu
- (2) Rare earth metals \Rightarrow Am, Cm
- (3) Diagonally related elements \Rightarrow Be, Al
- (4) Typical elements \Rightarrow Mg, Al

28) The effective nuclear charge at the periphery of chromium atom [$Z = 24$] :

- (1) 4.25
- (2) 2.60
- (3) 3.60
- (4) 2.95

29) The difference between atomic radii is maximum in which one of the following pairs ?

- (1) Rb, Cs
- (2) K, Rb
- (3) Cs, Fr
- (4) Na, K

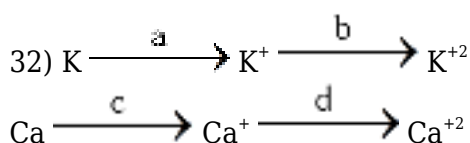
30) If the ionic radii of K^+ and F^- are nearly the same (i.e., 1.34 Å) then the atomic radii of K and F respectively are :

- (1) 1.34 Å, 1.34 Å
- (2) 0.72 Å, 1.96 Å
- (3) 1.96 Å, 0.72 Å
- (4) 1.96 Å, 1.34 Å

31) IP of Be is higher than :

- (a) B (b) Mg (c) Li
- (d) Al (e) K

- (1) a & b
- (2) a, b & d
- (3) a, b, d & e
- (4) a, b, c, d & e



If a, b, c, d are ionisation energies, the which of the following order is not correct ?

- (1) $c > a$
- (2) $b > a$
- (3) $d > c$
- (4) $b < d$

33) An ion X^{\ominus} has configuration $2s^2 2p^6$, which is same for other ion Y^{\oplus} . Then :

- (1) IP of X = IP of Y
- (2) EA of X = EA of Y
- (3) $\text{IP of X} > \text{EA of } \text{Y}^{\oplus}$
- (4) $\text{IP of } \text{X}^{\ominus} > \text{IP of } \text{Y}^{\oplus}$

34) The increasing order of electron affinity of the electronic configuration of element is :

- (I) $1s^2 2s^2 2p^6 3s^2 3p^5$ (II) $1s^2 2s^2 2p^3$
- (III) $1s^2 2s^2 2p^5$ (IV) $1s^2 2p^2 2p^6 3s^1$

- (1) $\text{II} < \text{IV} < \text{III} < \text{I}$
- (2) $\text{I} < \text{II} < \text{III} < \text{IV}$
- (3) $\text{I} < \text{III} < \text{II} < \text{IV}$
- (4) $\text{IV} < \text{III} < \text{II} < \text{I}$

35) Which of the following property decreases on moving down a group ?

- (1) Acidic nature of H—X (X-halogen)
- (2) Basic nature of M_2O_3 (M = IIIA element)

(3) Acidic nature of H-O-X (H-Halogen)

(4) Basic nature of MH (M-IA metal)

36) An element X occurs in short period having configuration ns^2np^1 . The formula and nature of its oxide is :

(1) XO_3 , basic

(2) XO_3 , acidic

(3) X_2O_3 , amphoteric

(4) X_2O_3 , basic

37) Read the following statements :

(I) Atomic size of following pair are almost same

Fe, CO ; Al, Ga ; Zr, Hf

(II) E.A. order of Li, Be, B, C, N, O is

$Be < N < B < Li < C < O$

(III) Ionisation energy of

$Al < Ga \text{ \& } Zr < Hf$

(IV) Ionic radius

$O^{2-} < F^- < Na^+ < Mg^{+2}$

Select the correct statement(s)

(1) I, III, IV

(2) I, II, III

(3) II, III, IV

(4) All the four

38) Which one of the following order of given properties is correct ?

(1) Atomic radius - $Li < Be < B$

(2) Ionisation potential - $Li < Be < B$

(3) Electron affinity - $Li < Be < B$

(4) Electronegativity - $Li < Be < B$

39) $A < B < C$ are the values of a periodic property of N, C, O respectively. The periodic property is :

(1) Z_{eff}

(2) I.E.

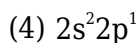
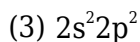
(3) E.A.

(4) E.N

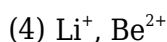
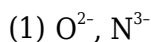
40) An element X belongs to short period, having Maximum unpaired electron in the excited state in the period. Its EA is greater than nitrogen but less than oxygen. The valence electronic configuration of the element X is :

(1) $3s^23p^2$

(2) $2s^22p^4$



41) In which one of the following pairs the radius of the second species is greater than that of the first ?



42) **Assertion** : There are 14 Lanthanoids and 14 actinoids in periodic table.

Reason : f-orbital can hold maximum $14e^-$ s.

(1) Assertion and reason are correct and reason is correct explanation for assertion.

(2) Assertion and reason are correct and reason is incorrect explanation of assertion.

(3) Assertion is correct but reason is incorrect.

(4) Assertion is incorrect but reason is correct.

43) **Assertion** : Vanderwall radius of Ne is more than that of F.

Reason : Ne has more Z_{eff} than F.

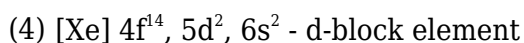
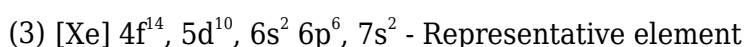
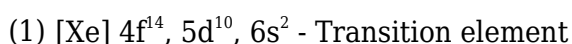
(1) Assertion and reason are correct and reason is correct explanation for assertion.

(2) Assertion and reason are correct and reason is incorrect explanation of assertion.

(3) Assertion is correct but reason is incorrect.

(4) Assertion is incorrect but reason is correct.

44) Which of the following is not correctly matched ?



45) Total number of p-block elements among given atomic number : 83, 79, 42, 64, 37, 54, 34

(1) 3

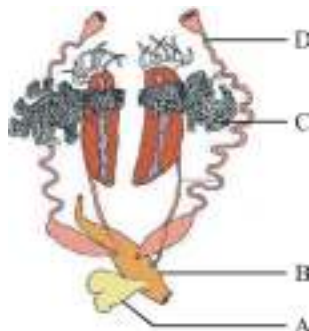
(2) 4

(3) 5

(4) 6

BIOLOGY

1) Given below is a diagrammatic representation of female reproductive system of frog labelled A, B, C



and D : Find out **incorrect** one :-

- (1) There is functional connection between C and kidney.
- (2) B is small, median chamber that is used to pass faecal matter, urine and ova to the exterior.
- (3) D is one pair arising from the ovaries opens into the cloaca separately.
- (4) A is thin walled urinary bladder is present ventral to rectum which also opens in cloaea.

2) How many pairs of cranial nerves arise from the brain of frog ?

- (1) 12 pairs
- (2) 10 pairs
- (3) 8 pairs
- (4) 9 pairs

3) Match the column-I with column-II

Column-I		Column-II	
(A)	Hibernation	(i)	Winter sleep
(B)	Camouflage	(ii)	The ability to change the colour to hide them from their enemies
(C)	Poikilotherm	(iii)	Cold blooded
(D)	Aestivation	(iv)	Summer sleep

(1)	A-iv	B-ii	C-iii	D-i
(2)	A-i	B-ii	C-iv	D-iii
(3)	A-i	B-ii	C-iii	D-iv
(4)	A-i	B-iii	C-iv	D-ii

- (1) 1
- (2) 2
- (3) 3
- (4) 4

4) Which one of the following is common in both male and female frog ?

- (1) Urogenital duct
- (2) Vocal sac
- (3) Cloaca
- (4) Copulatory pad

5) Which of the following feature is not found in Indian bull frog ?

- (1) External fertilisation
- (2) Indirect development
- (3) Metamorphosis
- (4) Internal fertilisation

6) Male frog can be distinguished from female frog due to the presence of :-

- (1) Presence of vocal sacs and copulatory pad on the first digit of the forelimb.
- (2) A neck and tail is absent.
- (3) Five digits in hind limbs
- (4) Eyes are bulged and covered by the nictitating membrane.

7) The frog is :-

- (1) Ureotelic animal
- (2) Ammonotellic animal
- (3) Urecotelic animal
- (4) Amminotellic animal

8) Bidder's canal is present in :-

- (1) Testes of frog
- (2) Kidney of male frog
- (3) Kidney of female frog
- (4) Ovary of female frog

9) In frog, the colour of ventral side of body is generally

- (1) Olive green
- (2) Uniform pale yellow
- (3) Dark red
- (4) Spotted pale yellow

10) **Assertion** : Frog show sexual dimorphism

Reason : Only male frog have well-developed vocal sac and copulatory pad

- (1) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion
- (2) Both Assertion & Reason are true and the reason is the correct explanation of the assertion
- (3) Assertion is true but Reason is false

(4) Both Assertion and Reason are false

11) In frog, the medulla oblongata passes out through the.....(a).... and continues into(b)... (a) and (b) are respectively-

- (1) Spinal cord, foramen magnum
- (2) Spinal cord, vertebral column
- (3) Foramen magnum, Spinal cord
- (4) Vertebral column, spinal cord

12) Which Statement is true (about frogs) :

- (1) Kidney is compact, light red and bean shape structures situated a little posteriorly in the body cavity on only one sides of vertebral column
- (2) Food is captured by the trilobed tongue. Digestion of food takes place by the action of HCl and gastric juices secreted from the walls of the stomach
- (3) Male frogs can be distinguished by the presence of sound producing vocal sacs and also a copulatory pad on the second digit of the fore limbs which are absent in female frogs
- (4) They have the ability of change the colour to hide them from their enemies. This protective coloration is called mimicry.

13) Match the column-I and column-II and select the correct option.

	Column-I		Column-II
(a)	Sensory Papillae	(p)	Hearing
(b)	Nasal epithelium	(q)	Touch
(c)	Test Buds	(r)	Smell
(d)	Tympanum	(s)	Taste

- (1) (a)-q, (b)-r, (c)-s, (d)-p
- (2) (a)-q, (b)-r, (c)-p, (d)-s
- (3) (a)-r, (b)-q, (c)-s, (d)-p
- (4) (a)-q, (b)-s, (c)-q, (d)-p

14) Which of the following statement is correct in reference to frog?

- (I) Eyes are bulged and covered by nictitating membrane
- (II) Membranous tympanum receives the sound signals
- (III) The frog never drinks water
- (IV) A pair of nostrils is present above the mouth

- (1) I and II
- (2) III and IV
- (3) I and IV
- (4) All of these



15) How many statements are **true** in the following?

- (i) Simple epithelium forms lining for body cavities, ducts and tubes.
- (ii) In epithelial tissue, cells are loosely packed with little intercellular matrix.
- (iii) Simple epithelium provide protection against chemical and mechanical stresses.
- (iv) Gap junction perform cementing to keep neighbouring cells together.

- (1) Two
- (2) Three
- (3) Four
- (4) One

16) In the given four statements, select the options which includes all the correct ones :-

- (a) Secretory duct is present in endocrine glands and secretes hormones
- (b) Mammary glands are exocrine glands
- (c) Sweat gland is exocrine gland
- (d) Bone has no collagen fibres

Option :-

- (1) a, b, c
- (2) b, c
- (3) a, c, d
- (4) b, d

17) Match the column I, II and III :-

	Column-I		Column-II		Column-III
(i)	Fibroblast	(a)	Serotonin	(1)	Scavanger cells
(ii)	Plasma cell	(b)	Largest cell	(2)	Clone of lymphocyte
(iii)	Mast cell	(c)	Cart wheel cell	(3)	Vaso constrictor
(iv)	Macrophages	(d)	Kidney shaped nucleus	(4)	Matrix producing cells

- (1) (i)-b-4, (ii)-c-2, (iii)-a-3, (iv)-d-1
- (2) (i)-b-4, (ii)-a-3, (iii)-c-2, (iv)-d-1
- (3) (i)-a-2, (ii)-b-1, (iii)-d-4, (iv)-c-3
- (4) (i)-a-2, (ii)-c-3, (iii)-d-4, (iv)-b-1

18) Read the following (A-D) statements :-

- (A) Connective tissue are most abundant and widely distributed in the body of complex organism.
- (B) Connective tissue helps in linking and supporting other tissue or organs in the body.
- (C) Adipose tissue is a type of dense connective tissue.
- (D) Connective tissue does not secrete its matrix.

Choose the incorrect statements :


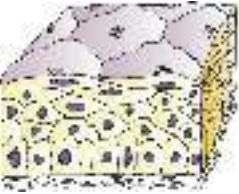
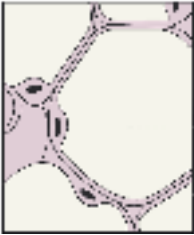

- (1) A, C & D
- (2) B and D
- (3) C and D

(4) Only D

19) Ciliated epithelium present in :-

- (1) Fallopian tube
- (2) Pharynx
- (3) Stomach
- (4) Urinary bladder

20) Choose the correct match :-

(1)		Squamous epithelium
(2)		Simple epithelium
(3)		Adipose tissue
(4)		Areolar tissue

- (1) 1
- (2) 2
- (3) 3
- (4) 4

21) Cells of tubular part of nephrons are?

- (1) Columnar
- (2) Cuboidal
- (3) Flat
- (4) Squamous

22) Histamine is meant for :

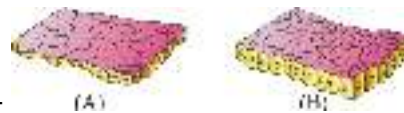
- (1) Vasodilation
- (2) Lowering B.P.
- (3) Regulation of B.P.
- (4) All of these

23) Which is not made up of elastic cartilage :

- (1) Epiglottis
- (2) Ear pinna
- (3) Larynx
- (4) Eustachian tube

24) PCT of nephron is lined by :-

- (1) Pseudostratified epithelium
- (2) Stratified cuboidal epithelium
- (3) Brush border cuboidal epithelium
- (4) Non ciliated stratified columnar epithelium



25) Select the correct option about given diagram:-

- (1) B = columnar epithelium - for protection and cover the dry surface of the skin
- (2) B = squamous epithelium - found in tubular part of nephron
- (3) A = squamous epithelium - found in wall of blood vessels
- (4) A = cuboidal epithelium - found in air sac of lungs

26) How many of the following has compound epithelium-stomach, Alveoli, Bowman's capsule, inner lining of buccal cavity, secretory duct of sweat gland.

- (1) one
- (2) two
- (3) three
- (4) four

27) Which one is the wrong statement about the "bones" ?

- (1) The bone-marrow in some bones is the site of production of blood-cells.
- (2) Bones have solid and pliable ground substance.
- (3) Matrix of bones is rich in Ca^{+2} salts and collagen fibres.
- (4) Bone cells are present in the spaces called lacunae.

28) Tissue present beneath the skin is/are ?

- (1) Dense regular connective tissue

- (2) Areolar tissue
- (3) Adipose tissue
- (4) Both (2) and (3)

29) Tendon is made up of

- (1) yellow fibrous connective tissue
- (2) modified white fibrous connective tissue
- (3) areolar tissue
- (4) adipose tissue

30) The epithelium found in walls of blood vessels and air sacs is :-

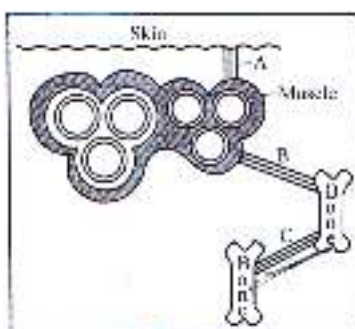
- (1) Columnar epithelium
- (2) Squamous epithelium
- (3) Ciliated squamous epithelium
- (4) Ciliated cuboidal epithelium

31) If the inner lining of cheeks are scratched with forcep, then which type of cells are visible in microscope ?

- (1) Cuboidal
- (2) Columnar
- (3) Squamous
- (4) Ciliated squamous

32)

Identify the tissues A, B and C :



	A	B	C
(1)	Areolar connective tissue	Ligament	Tendon
(2)	Areolar connective tissue	Tendon	Tendon



(3)	Adipose connective tissue	Tendon	Ligament
(4)	Areolar connective tissue	Tendon	Ligament

(1) 1

(2) 2

(3) 3

(4) 4

33) In which of the following simple epithelium is present :-

(A) Lining of body cavities

(B) PCT

(C) Lining of blood vessels

(D) Walls of alveoli of lungs

(E) Pancreatic duct

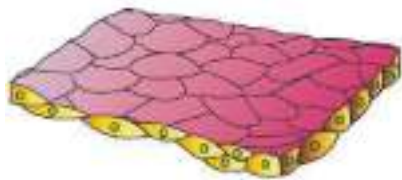
(1) B, C and D

(2) A, B, C and D

(3) A, B and D

(4) A, B, D and E

34) Identify the type of epithelial tissue shown below as well as the related right place of its occurrence in our body along with its correct function and select the correct option for the two



together ?

	Type of epithelial Tissue	Occurance & its function
(1)	Simple squamous Epithelium	- Found in wall of blood vessels and air sacs of lungs. - Function-forming a diffusion boundary
(2)	Simple cuboidal epithelium	- Found in wall of ducts of gland - Function-diffusion and excretion
(3)	Simple columnar epithelium	- Found in wall of nephrones and wall of ducts of glands - Function-secretion and Absorption



(4)	Simple squamous epithelium	<ul style="list-style-type: none">- Found in wall of stomach and intestine- Function-absorption and secretion
-----	----------------------------	--

(1) 1

(2) 2

(3) 3

(4) 4

35) In cockroach a ring of 6-8 blind tubules called hepatic or gastric caeca is present at the junction of :-

(1) Foregut and Hindgut

(2) Hindgut and midgut

(3) Midgut and foregut

(4) All of the above

36) Which of following is not a part of male cockroach ?

(1) Titillator

(2) Phallomeres

(3) Collateral glands

(4) Pseudopenis

37) In cockroach, the ootheca is formed by the secretion of :-

(1) Phallic gland

(2) Uricose gland

(3) Collateral gland

(4) Mushroom gland

38) Choose the statement which is not correct for cockroach?

(1) Blood vascular system of cockroach is a closed type.

(2) The abdomen in both males and females consists of 10 segments.

(3) On an average female produce 9-10 oothecae.

(4) Malpighian tubules help in excretion.

39) Arthrodial membrane in cockroach is associated with :

(1) Sclerites

(2) wall of gizzard

(3) ventral septum and connect the septum with heart and legs.

(4) tracheal chamber

40) Spiracles found in cockroach are :-

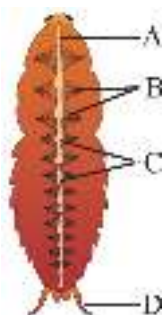
- (1) 2 pairs in thorax and 8 pairs in abdomen
- (2) 2 pairs in thorax and 10 pairs in abdomen
- (3) 8 pairs in thorax and 2 pairs in abdomen
- (4) 2 pairs in thorax and 4 pairs in abdomen

- 41) How many are **correct** statements about cockroach?
- (A) The abdomen in both males and females consists of 10 segments
 - (B) Cockroach is nocturnal and omnivorous animal
 - (C) Anal cerci present in both males and females
 - (D) Hepatic caecae are the excretory organs of cockroach
 - (E) Anal styles are present in both males and females

- (1) A, B, C and D
- (2) B, C, D and E
- (3) A, B and C
- (4) A, B and D

42)

In the diagram given below, identify the parts labelled as A, B, C & D and select the right option about them.



	Part-A	Part-B	Part-C	Part-D
(1)	Anterior aorta	Heart chambers	Alary muscles	Anal cerci
(2)	Anal cerci	Alary muscles	Heart chambers	Anterior aorta
(3)	Anterior aorta	Alary muscles	Heart chambers	Anal cerci
(4)	Heart chambers	Anal cerci	Anterior aorta	Alary muscles

- (1) 1
- (2) 2
- (3) 3
- (4) 4

43) **Statement-I :-** In frog, eyes and internal ears are well organised structures.

Statement-II :- Sensory papillae, taste buds and nasal epithelium are cellular aggregation around

nerve endings.

- (1) Both statement I and statement II are incorrect
- (2) Statement I is correct but statement II is incorrect
- (3) Statement I is incorrect but statement II is correct
- (4) Both statement I and statement II are correct

44) **Statement - I** : Cockroach eyes consist of several ommatidia. So they receive several images of an object.

Statement - II : Mosaic vision is present in cockroach with more sensitivity but less resolution.

- (1) Both statement I and statement - II are incorrect.
- (2) Statement - I is correct but statement - II is incorrect.
- (3) Statement - I is incorrect but statement - II is correct.
- (4) Both statement - I and statement - II are correct.

45) **Statement-I** : Connective tissue which is found in tendon have fibroblasts present in rows between many parallel bundles of fibers

Statement-II : In dense regular connect tissue fibers and fibroblasts are oriented differently
Select the correct option -

- (1) Statement-I is correct and statement-II is incorrect
- (2) Statement-II is correct and statement-I is incorrect
- (3) Both statement-I and statement-II are correct
- (4) Both statement-I and statement-II are incorrect

46)

Multicellular chlorophyll bearing, autotrophic, simple thalloid mostly aquatic organism are placed in :

- (1) Algae
- (2) Bryophyta
- (3) Pteridophyta
- (4) Angiosperm

47) Isogamy with non-flagellated gametes is observed in:

- (1) *Ectocarpus*
- (2) *Porphyra*
- (3) *Spirogyra*
- (4) *Ulothrix*

48) Which of the following is not correctly matched?

- (1) *Ectocarpus*: Simple branched filamentous brown algae
- (2) *Fucus*: Multicellular brown algae in which fertilization occurs inside oogonium

(3) *Chlorella*: Unicellular algae classified in Kingdom Protista by Linnaeus

(4) *Volvox*: Colonial green algae



49) Which of the following is true regarding the given figure?

- (1) It shows oogamy with flagellated male gametes
- (2) It produces zoospore during sexual reproduction
- (3) Due to pre dominance of r- phycoerythrin its thallus is red in colour
- (4) 1 and 2 both

50) Chlorophyll a, chlorophyll c and fucoxanthin is commonly present in :

- (1) Green algae
- (2) Brown Algae
- (3) Red algae
- (4) Blue green algae

51) **Assertion (A)** : Bryophytes are of great ecological importance

Reason (R) : Mosses along with the lichens are the first organism to colonise rocks and decompose rocks making substrate suitable for the growth of higher plants

- (1) A and R both are true and R explain A
- (2) A is true but R is false
- (3) A and R both are true and R does not explain A
- (4) A and R both are false

52) Archegonium and antheridium in Pteridophyta are:

- (1) Multicellular and jacketless
- (2) Unicellular and jacketed
- (3) Multicellular and Jacketed
- (4) Unicellular and jacketless

53) The second stage of gametophyte in *Sphagnum* is :

- (1) Primary protonema

- (2) Leafy gametophyte
- (3) Dorsiventral thalloid
- (4) Underground rhizome

54) Which of the following is true regarding gemma?

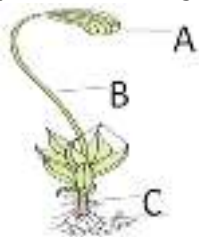
- (1) Unicellular
- (2) Green non photosynthetic
- (3) Observed in *Marchantia*
- (4) Sexual bud

55) **Statement A:** Spore producing gametophyte is the main plant body of bryophytes

Statement B: Main plant body of Bryophyta produces spore by the mitosis

- (1) Statement A and B both are false
- (2) Only statement A is true
- (3) Only Statement B is true
- (4) Statement A and B both are true

56) Study the following diagram carefully and identify the structure which produces spores by



meiosis:

- (1) A: Capsule
- (2) B: Seta
- (3) C: Stem
- (4) B: capsule

57) Which of the following is heterosporous fern?

- (1) *Selaginella*
- (2) *Salvia*
- (3) *Salvinia*
- (4) *Adiantum*

58) The leaves of Pteridophyta are microphylls as in ...a...or macrophylls as inb..

- (1) A: *Selaginella*; B *Lycopodium*
- (2) A: *Selaginella*; B *Salvia*
- (3) A: *Selaginella*; B Ferns
- (4) A: Ferns; B *Selaginella*

59) Which of the following do not require water for fertilization?

A.



B.



C.



D.



(1) A and B only

(2) B and C only

(3) A and D only

(4) A, B and C

60) Following fertilization, the zygote produce embryo in :

(1) *Polysiphonia*

(2) *Chara*

(3) *Porphyra*

(4) *Marchantia*

61) The highly reduced male gametophyte in Gymnosperm is known as :

(1) Pollen grain

(2) Male gamete

(3) Antherozoid

(4) Ovule

62) Few stages of life cycle of moss is given below. Arrange these events in correct order starting from sex organ bearing structure and select the correct option from option given below

A: Protonema B: Leafy gametophyte

C: Spore formation D: Spore germination

E: Fertilization F: Sporophyte

(1) B → A → C → D → E → F

(2) B → E → D → C → A → F

(3) A → B → E → F → C → D

(4) B → E → F → C → D → A

63) Match the Column I with Column II



Column I		Column II	
A.	<i>Cedrus</i>	P.	Gymnosperm
B.	<i>Polytrichum</i>	Q.	Bryophyta
C.	<i>Psilotum</i>	R.	Pteridophyta
D.	<i>Chara</i>	S.	Algae

- (1) A: P; B: Q; C: R; D: S
(2) A: S; B: P; C: R; D: Q
(3) A: Q; B: S; C: R; D: P
(4) A: R; B: Q; C: P; D: S

64) Prothallus is
a. Multicellular
b. Gametophyte
c. Usually heterotrophic
d. Usually dioecious

- (1) a and c
(2) a and b
(3) a and d
(4) b and c

65) Male and female gametophyte do not have independent existence in :

- (1) *Ginkgo*
(2) *Funaria*
(3) *Pteris*
(4) *Polytrichum*

66) Male gametes in typical gymnosperms are released at mouth of archegonia by :

- (1) Water
(2) Air
(3) Pollen tube
(4) All of the above

67) Precursor events to seed habit is observed in :

- (1) *Salvinia*
(2) *Selaginella*
(3) *Marchantia*
(4) 1 and 2 both

68) Which of the following is not associated with naked seed plant?

- (1) fruit formation
- (2) Heterospory
- (3) Seed formation
- (4) Archegonia

69) Archegonia and antheridium both are present in:

- (1) Algae and Bryophyta
- (2) Bryophyta and Pteridophyta
- (3) Bryophyta, Pteridophyta and Gymnosperm
- (4) Algae, Bryophyta and Pteridophyta

70) Which of the following is a dioecious Bryophyta?

- (1) *Marchantia*
- (2) *Funaria*
- (3) *Sphagnum*
- (4) *Pteris*

71) **Assertion (A)** : *Cycas* is a dioecious plant while *Pinus* is a monoecious plant

Reason (R) : Male cone and female cone are present on same tree in *Pinus* while male cone and female cone is present on different tree in *Cycas*

- (1) A and R both are true and R explain A
- (2) A is true but R is false
- (3) A and R both are true and R does not explain A
- (4) A and R both are false

72) Study the following table carefully and identify the correct match and select the correct option from options given below :

	Plant group	Life cycle	Meiosis
A	Bryophyta	Haplodiplontic	Sporic
B	Gymnosperm	Diplontic	Gametic
C	Algae	Haplontic	Gametic
D	Gymnosperm	diplontic	Sporic

- (1) A, B and C
- (2) A, B and D
- (3) A and D only
- (4) A, C and D

73) Which of the following statement is true regarding gymnosperm?

- (1) Gymnosperms are usually herb and medium to large sized tree

- (2) One cell of nucellus modifies in megaspore mother cell and produce megaspore tetrad after mitosis
- (3) Two or more archegonia is present in female gametophyte present inside the ovule
- (4) Male and female gametophyte have their independent existence

74) Match the column I with column II and select the correct option from options given below :

Column I		Column II	
A.	<i>Sphagnum</i>	P.	Agar-agar
B.	<i>Gracillaria</i>	Q.	Food
C.	<i>Chlorella</i>	R.	Used by Space travellers
D.	<i>Sargassum</i>	S.	Trans-shipment of living specimen

- (1) A: P; B: Q; C: R; D: S
- (2) A: S; B: P; C: R; D: Q
- (3) A:Q; B: S; C: R; D: P
- (4) A: R; B: Q; C: P; D: S

75) **Two statements 1 and 2 are given below :**

Statement 1 : Fungi, and members of the Monera and Protista having cell walls have now been excluded from Plantae, though earlier classification given by Whittaker placed them in the same kingdom

Statement 2 : The earliest systems of scientific classification were based mainly on vegetative characters or on the androecium structure. Such systems were artificial and separated the closely related species.

- (1) Statement 1 and 2 both are false
- (2) Only statement 1 is true
- (3) Only Statement 2 is true
- (4) Statement 1 and 2 both are true

76) Rhizoids of *Funaria* are :

- (1) Unicellular and unbranched
- (2) Multicellular and branched
- (3) Multicellular and unbranched
- (4) Unicellular and branched

77) Which of the following is not a moss?

- (1) *Funaria*
- (2) *Polytrichum*
- (3) *Marchantia*
- (4) *Sphagnum*

78) Pinnately compound leaf containing unbranched stem is observed in :

- (1) *Cycas*
- (2) *Cedrus*
- (3) *Ginkgo*
- (4) 1 and 3 both

79) All of the following have motile male gametes except :

- (1) *Adiantum*
- (2) *Funaria*
- (3) *Fucus*
- (4) *Gracillaria*

80) Ovule of gymnosperm is equivalent to:

- (1) Archegonia
- (2) Endosperm
- (3) Microsporangia
- (4) Megasporangia

81) Cilia and flagella are completely absent in life cycle of :

- (1) Red algae
- (2) Bryophyta
- (3) Pteridophyta
- (4) Red algae and Pteridophyta

82) Most common type of asexual spore in algae is

- (1) Zoospore
- (2) Aplanospore
- (3) Zygote
- (4) Antherozoid

83) Pyrenoids in algae contains:

- (1) proteins besides fats
- (2) Proteins besides starch
- (3) Lipids besides starch
- (4) Lipid, proteins and starch

84) Dominant diploid generation is common feature of:

- (1) Bryophyta
- (2) Bryophyta and Pteridophyta
- (3) Bryophyta, Pteridophyta and Gymnosperm
- (4) Pteridophyta, Gymnosperm and Angiosperm

85) Which of the following is not associated with brown algae :

- (1) Presence of two lateral flagella in male gametes
- (2) Fusion of gametes occur in water or inside archegonium
- (3) Some of the members form massive plant body
- (4) Some members are used as food

86) Evolutionary first plants to have vascular tissues are:

- (1) Bryophyta
- (2) Pteridophyta
- (3) Gymnosperm
- (4) Algae

87) Antheridium and archegonium in Bryophyta and Pteridophyta are present on:

- (1) Gametophyte and sporophyte respectively
- (2) Sporophyte and sporophyte respectively
- (3) Gametophyte and gametophyte respectively
- (4) Sporophyte and gametophyte respectively

88) How many of the following plants show oogamy?

Volvox, Ulothrix, Pteris, Pinus, Fucus, Chara, Ectocarpus, Funaria, Cedrus, Eudorina, Sargassum

- (1) Eight
- (2) Seven
- (3) Nine
- (4) Four

89) The female gametophytes are retained on parental sporophyte for variable time period in :

- (1) *Equisetum*
- (2) *Marchantia*
- (3) *Selaginella*
- (4) *Chara*

90) Coralloid roots with nitrogen fixing cyanobacteria are present in :

- (1) *Cycas*
- (2) *Pinus*
- (3) *Cedrus*
- (4) *Ginkgo*

ANSWER KEYS

SOLUTIONS

PHYSICS

$$1) \vec{S} = \vec{F}_1 + \vec{F}_2 \text{ and } \vec{D} = \vec{F}_1 - \vec{F}_2$$

As two vectors are perpendicular to each other, hence $\vec{S} \cdot \vec{D} = 0$.

$$\text{or } (\vec{F}_1 + \vec{F}_2) \cdot (\vec{F}_1 - \vec{F}_2) = 0$$

$$\text{or } (\vec{F}_1)^2 - (\vec{F}_2)^2 = 0$$

$$\text{or } |\vec{F}_1|^2 - |\vec{F}_2|^2 = 0$$

$$\text{or } |\vec{F}_1|^2 = |\vec{F}_2|^2$$

$$\text{or } |\vec{F}_1| = |\vec{F}_2|$$

$$2) \vec{W} = \vec{F} \cdot \vec{S} = 0$$

$$3) \text{ given : } |\vec{A}| = 5$$

$$|\vec{B}| = 4$$

$$|\vec{C}| = 3$$

$$\vec{A} = \vec{B} + \vec{C}$$

$$|\vec{A} - \vec{C}| = |\vec{B}|$$

$$A^2 + C^2 - 2AC \cos \theta = B^2$$

$$25 + 9 - 2(5)(3) \cos \theta = 16$$

$$34 - 30 \cos \theta = 16$$

$$30 \cos \theta = 34 - 16$$

$$\cos \theta = \frac{18}{30} ; \cos \theta = \frac{3}{5}$$

$$\theta = \cos^{-1} \left(\frac{3}{5} \right)$$

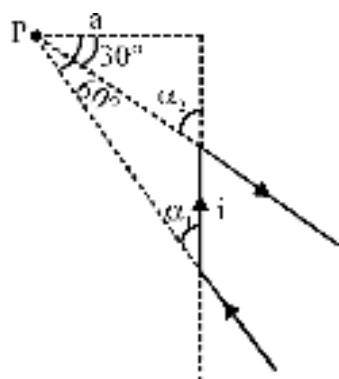
$$4) \frac{2}{5} = \frac{p}{7} = \frac{q}{3}$$

$$p = \frac{14}{5} \quad q = \frac{6}{5}$$

5) $\vec{A} \times \vec{B}$ is a vector perpendicular to $\vec{A}, \vec{B}, \vec{A} + \vec{B}, \vec{A} - \vec{B}$ But $\vec{A} \cdot \vec{B}$ is a scalar quantity

$$6) (\vec{B} \cdot \hat{A}) \hat{A}$$

7) Conceptual.



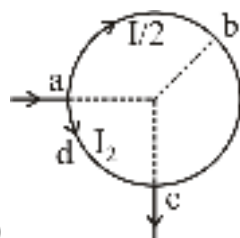
8)

$$B_p = \frac{\mu_0 i}{4\pi a} (\sin 60^\circ - \sin 30^\circ)$$

$$= \frac{\mu_0 i}{8\pi a} (\sqrt{3} - 1) \odot$$

$$9) B_0 = \frac{\mu_0 i}{2\pi(2a)} + \frac{2\sqrt{2}\mu_0 i}{\pi(2a)}$$

$$= \frac{\mu_0 i}{2\pi a} \left[\frac{1}{2} + 2\sqrt{2} \right] \otimes$$



10)

$$\text{for loop abc } R_{abc} = \frac{\rho \ell}{A} = \frac{\rho \left(\frac{3\pi R}{2} \right)}{A}$$

$$R_{abc} = \frac{\rho \frac{\pi R}{2}}{\frac{A}{3}} = \frac{3\pi \rho R}{2A}$$

$R_{abc} = R_{adc}$ so current will divide equally

$$B_{abc} = \frac{\mu_0 I/2}{4\pi R} \left(\frac{3\pi}{2} \right) = \frac{3}{16} \frac{\mu_0 I}{R} \otimes$$

$$B_{adc} = \frac{\mu_0 I/2}{4\pi R} \left(\frac{\pi}{2} \right) = \frac{\mu_0 I}{16R} \odot$$

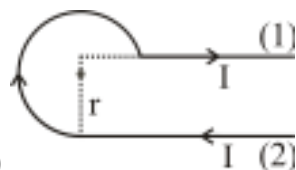
$$B_{net} = B_{abc} - B_{adc} = \frac{2\mu_0 I}{16R} = \frac{\mu_0 I}{8R} \otimes$$

$$11) B_A = \frac{\mu_0 I}{2\pi \frac{R}{2}} - \frac{\mu_0 I}{2\pi \frac{R}{2}} = 0$$

$$B_B = \frac{\mu_0 I}{2\pi \frac{R}{2}} + \frac{\mu_0 I}{2\pi \frac{3R}{2}} = \frac{4\mu_0 I}{3\pi R}$$

$$B_C = \frac{\mu_0 I}{2\pi R} + \frac{\mu_0 I}{2\pi(2R)} = \frac{3\mu_0 I}{4\pi R}$$

0 : 16 : 9



12)

B due to Arc

$$B_1 = \frac{\mu_0 I \theta}{4\pi r} = \frac{\mu_0 I}{4\pi r} \times \frac{3\pi}{2}$$

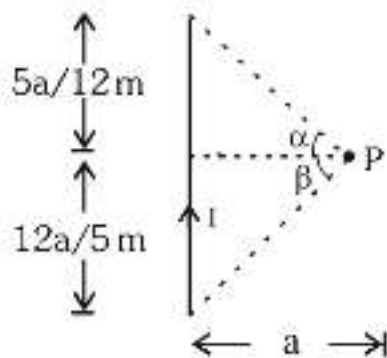
$$= \frac{3\mu_0 I}{8r} \otimes$$

$$B_2 = B \text{ due to wire (1)} = 0$$

$$B_3 = B \text{ due to wire (2)} = \frac{\mu_0 I}{4\pi r} \otimes$$

$$B_{\text{net}} = B_1 + B_2 + B_3$$

$$= \frac{\mu_0 I}{4\pi r} \left(\frac{3\pi}{2} + 1 \right)$$



13)

$$B_P = \frac{\mu_0 I}{4\pi a} (\sin \alpha + \sin \beta)$$

$$\sin \alpha = \frac{\frac{5a}{12}}{\left(\left(\frac{5a}{12} \right)^2 + a^2 \right)^{1/2}}$$

Here

$$\sin \alpha = \frac{5}{13}$$

$$\sin \beta = \frac{\frac{12a}{5}}{\left(\left(\frac{12a}{5} \right)^2 + a^2 \right)^{1/2}}$$

$$\sin \beta = \frac{12}{13}$$

$$\text{So, } B_P = \frac{\mu_0 I}{4\pi a} \left(\frac{5}{13} + \frac{12}{13} \right)$$

$$B_P = \left(\frac{\mu_0}{4\pi} \right) \left(\frac{17I}{13a} \right)$$

$$14) \quad B = \frac{\mu_0 n I}{2r}$$

here $\square = 2\pi r n = \text{constant}$

$$\Rightarrow r = \frac{\ell}{2\pi n} \Rightarrow B = \frac{\pi \mu_0 n^2 I}{\ell}$$

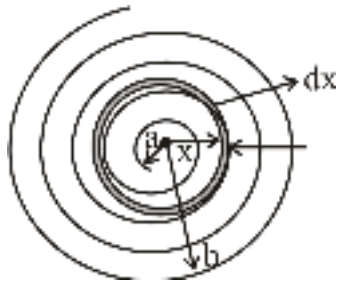
$$\Rightarrow B \propto n^2$$

15)

$$B = \sqrt{B_1^2 + B_2^2}$$

$$B_1 = \frac{\mu_0 N I}{2R}$$

$$B_2 = \frac{\mu_0 N I \sqrt{3}}{2R}$$



16)

$$\text{No. of turns per unit width} = \frac{N}{b-a}$$

No. of turns of elementary ring of radius x and thickness dx

$$dN = \frac{N dx}{(b-a)}$$

$$\therefore \int dB = \frac{\mu_0 (dN) I}{2x} = \frac{\mu_0 I N}{2(b-a)} \int_a^b \frac{dx}{x}$$

$$B = \frac{\mu_0 N I}{2(b-a)} \ln \left(\frac{b}{a} \right)$$

$$17) \quad \vec{B}_1 = \frac{\mu_0 I}{4\pi \frac{r}{2}} (-\hat{i}) \quad \text{semi-infinite}$$

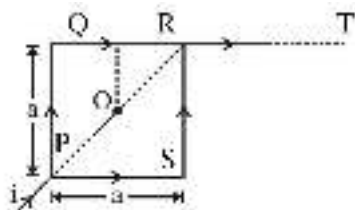
$$\vec{B}_2 = \frac{\mu_0 I}{4\pi \frac{r}{2}} \pi \hat{k} \quad \text{semi-circle}$$

$$\vec{B}_3 = \frac{\mu_0 I}{4\pi \frac{r}{2}} (+\hat{k}) \quad \text{semi-infinite}$$

$$\vec{B} = \vec{B}_1 + \vec{B}_2 + \vec{B}_3$$

$$\vec{B} = \frac{\mu_0 I}{2\pi r} (-\hat{i} + \pi \hat{k} + \hat{k})$$

$$\vec{B} = \frac{\mu_0 I}{2\pi r} [(\pi + 1)\hat{k} - \hat{i}]$$



18)

Net magnetic field at 'O' will be only due to section R-T

$$B = \frac{\mu_0 i}{4\pi \left(\frac{a}{2}\right)} (\sin 90^\circ - \sin 45^\circ)$$

$$= \frac{\mu_0 i}{2\pi a} \left(1 - \frac{1}{\sqrt{2}}\right) = \frac{\mu_0 i}{2\sqrt{2}\pi a} (\sqrt{2} - 1)$$



19)

20)

$I_1 \rightarrow \otimes$

$I_2 \rightarrow \otimes$

Neutral point is towards I_2 So, I_2 is small.

$$21) B_1 = \frac{\mu_0 i}{4\pi a} (\sin 45^\circ + \sin 90^\circ)$$

$$= \frac{\mu_0 i}{4\pi a} \left(\frac{1}{\sqrt{2}} + 1\right)$$

$$\vec{B}_{\text{net}} = 2B_{\odot}$$

$$= 2 \left(\frac{\mu_0 i}{4\pi a} \left(\frac{1}{\sqrt{2}} + 1\right) \right) \odot$$

$$= \frac{\mu_0 i}{4\pi a} (\sqrt{2} + 2) \hat{k}$$

$$22) \frac{B_{\text{centre}}}{B_{\text{axial}}} = \left(1 + \frac{x^2}{R^2}\right)^{3/2}$$

$$\Rightarrow 1 - \frac{3x^2}{2R^2} = \frac{B_{\text{axial}}}{B_{\text{centre}}}$$

$$\frac{3x^2}{2R^2} = 1 - \frac{B_{\text{axial}}}{B_{\text{centre}}}$$

$$\frac{3x^2}{2R^2} = \frac{5}{100}$$

$$x = \frac{R}{\sqrt{30}}$$



23)

$$B = B_0 \sin^3 \theta$$

$$\sin^3 \theta = \frac{B}{B_0} = \frac{B_0}{8B_0} = \frac{1}{8}$$

$$\sin \theta = \frac{1}{2}$$

$$x = \sqrt{3}R$$

24)

$$4 + (n - 1) 3 = 94$$

$$n = 31$$

$$S = \frac{n}{2} [2a + (n - 1) d]$$

$$= \frac{31}{2} [2 \times 4 + 30 \times 3]$$

$$= 1519$$

$$25) S_{\infty} = \frac{a}{1-r}$$

26)

$$\cos (- \theta) = \cos \theta$$

27)

$$\cos(2\theta) = \cos^2 \theta - \sin^2 \theta$$

$$\cos(2 \times 53^\circ) = \cos^2 53^\circ - \sin^2 53^\circ$$

28)

$$\cos(165^\circ) = \cos(180^\circ - 15^\circ)$$

$$= -\cos 15^\circ = -\cos(45^\circ - 30^\circ)$$

$$= \frac{-\left(\sqrt{3}+1\right)}{2\sqrt{2}}$$

29)

$y = x^2$: Parabola opening upward → (ii) Match with (a).

$y = -x^2$: Parabola opening downward → (iv) Match with (b).

$x = y^2$: Parabola opening rightward → (i) Match with (c).

$x = -y^2$: Parabola opening leftward → (iii) Match with (d).

Correct Answer: Option (4)

30)

$$y = 2x^2 - 12x$$

$$\frac{dy}{dx}$$

$$= 4x - 12 = 0 \Rightarrow x = 3$$

$$\frac{d^2y}{dx^2} = 4 > 0$$

so, at $x = 3$, y will be minimum

$$\begin{aligned} \text{Now, } y_{\min} &= 2(3)^2 - 12(3) \\ &= 18 - 36 = -18 \end{aligned}$$

31)

$$y = \left[\frac{2}{4 + \sin \theta + \sqrt{3} \cos \theta} \right]$$

y_{\min} when denominator or is maximum.

maximum value of denominator

$$= 4 + \sqrt{1^2 + (\sqrt{3})^2} = 6$$

$$y_{\min} = \frac{2}{6} = \frac{1}{3}$$

$$32) \text{ Angle} = \frac{\text{Arc}}{\text{Radius}}$$

$$3^\circ = \frac{\pi}{180} \times 3 = \frac{\pi^C}{60}$$

$$\text{so, Arc} = \frac{\pi}{60} \times \text{Radius} = \frac{\pi}{60} \times D$$

$$33) V = \frac{4}{3} \pi r^3$$

$$\Rightarrow \frac{dV}{dt} = \frac{4}{3} \pi \times 3r^2 \frac{dr}{dt} = 4\pi r^2 \frac{dr}{dt} = 4\pi \left(\frac{1}{4} \right) \left(\frac{2}{\pi} \right) = 2$$

34)

$$P = (C - x)(x)$$

$$\frac{dP}{dx} = C - 2x = 0$$

$$x = \frac{C}{2} = \frac{100}{2} = 50$$

$$\text{Thus, } n_1 = C - x = 50$$

$$n_2 = x = 50$$

So, both numbers should be equal

$$35) v = 6t^2 - 6t^3 \Rightarrow \frac{dv}{dt} = 12t - 18t^2$$

$$\text{For max. and min.}, \frac{dv}{dt} = 0$$

$$\Rightarrow 12t - 18t^2 = 0$$

$$6t(2 - 3t) = 0$$

$$t = 0, t = 2/3$$

$$\frac{d^2v}{dt^2} = 12 - 3t$$

$$\text{at } t = 0, \frac{d^2v}{dt^2} = 12$$

$$\text{and } t = \frac{2}{3}, \frac{d^2v}{dt^2} = -12$$

thus v is max at $t = \frac{2}{3}$ and min. at $t = 0$

$$36) \frac{d}{dx} \left(\frac{U}{V} \right) = \frac{V \frac{d}{dx}(U) - U \frac{d}{dx}(V)}{V^2}$$

37)

Heat gain = Heat loss

$$m \left(\frac{1}{2} \right) (20) + m 80 + m \times 1 \times 10 = 200 \times 1 \times 15$$

$$100 m = 200 \times 15$$

$$m = 30 \text{ gm}$$

$$38) \bar{y} = \int_0^6 \frac{y dx}{6} = \frac{25}{3}$$

$$39) \frac{X - (-125)}{500} = \frac{Y - (-70)}{40}$$

For $Y = 50$

$$X = 1375.0^\circ\text{X}$$

40)

Heat gain = Heat loss

$$\frac{m}{2} (2C) (T_f - T) = m C (2T - T_f)$$

$$T_f = \frac{3}{2} T$$

$$41) \frac{A-42}{110} = \frac{B-72}{220}$$

$$A = B = X$$

$$2(x - 42) = x - 72$$

$$2x = x + 12$$

$$x = 12$$

$$42) \text{Change in } L_A = \text{Change in } L_B$$

$$\text{i.e., } \Delta L_A = \Delta L_B$$

$$\Rightarrow \alpha_A \Delta T L_A = \alpha_B \Delta T L_B$$

$$\text{or } \alpha_A L_A = \alpha_B L_B$$

$$43) \text{NCERT-XI, Part-II, Pg. \# 283}$$

Tension generated in rod due to tendency of thermal contraction, $T = YA\alpha \Delta\theta$

By FBD of block

$$T = mg$$

$$YA\alpha \Delta\theta = mg$$

$$m = \frac{YA\alpha \Delta\theta}{g}$$

$$= \frac{10^{11} \times 4 \times 10^{-6} \times 10^{-5} \times (100 - 0)}{10} = 40 \text{ kg}$$



$$44)$$

$$P \times t = mS \Delta T$$

$$\frac{80}{100} \times 1000 \times t = 20 \times 4200 \times 60$$

$$t = 105 \text{ min}$$

$$45) \frac{\Delta \rho}{\rho} = \gamma \Delta T$$

$$= 5 \times 10^{-4} \times 40$$

$$= 200 \times 10^{-4}$$

$$= 0.02$$

CHEMISTRY

$$46)$$

Generated by Allie

Problem Statement: The question asks to find the activation energy of a new reaction whose rate constant K is given by the expression $K = (K_2 * K_3) / K_1$. Each rate constant K_1 , K_2 , and K_3 follows the Arrhenius equation, and you need to combine them to find the activation energy of the resulting overall rate constant K .

Underlying Concept: This problem involves the Arrhenius equation, which relates the rate constant of a reaction to its activation energy and temperature. The core concept is that rate constants can be multiplied or divided to find composite rate constants, and their exponential terms combine algebraically to derive the net activation energy.

Relevant Formulas: Arrhenius equation for rate constant: $K = Ae^{-E_a/RT}$ where: - K = rate constant - A = pre-exponential factor (frequency factor) - E_a = activation energy - R = universal gas constant - T = temperature (K)

Given: $K_1 = Ae^{-1000/T}$, $K_2 = Ae^{-3000/T}$, $K_3 = Ae^{-4000/T}$

$$K = \frac{K_2 K_3}{K_1}$$

Find activation energy for

$$K = \frac{K_2 K_3}{K_1} = \frac{Ae^{-3000/T} \times Ae^{-4000/T}}{Ae^{-1000/T}}$$

Step-by-Step Calculation: Start with the expression:
Simplify the numerator and denominator:

$$K = Ae^{\left(-\frac{3000}{T} - \frac{4000}{T}\right)} \times \frac{1}{Ae^{-\frac{1000}{T}}} = Ae^{\left(-\frac{3000}{T} - \frac{4000}{T} + \frac{1000}{T}\right)} = Ae^{-\frac{6000}{T}}$$

Comparing with Arrhenius

$$\frac{E_a}{R} = 6000 \Rightarrow E_a = 6000R$$

from $K = Ae^{-E_a/RT}$, we identify:

Tips and Tricks: Always express all rate constants with similar pre-exponential factors for easier cancellation. Focus on combining the exponential parts to find the net activation energy.

Common Mistakes: Forgetting to add or subtract the exponents properly during multiplication or division of exponential terms. Ignoring the cancellation of the pre-exponential factors 'A' if they are the same.

Why Other Options Are Incorrect?: Answers like '-6000 R' or negative activation energy are incorrect because activation energy is always positive in typical chemical kinetics. Also, '2000 R' doesn't result from the sum and subtraction of the given exponents.

47)

For first order reaction $t_{1/2} = \frac{1}{3.33} t_{90\%}$

48)

$$49) R_0 = K [A_0]^2 [B_0]$$

$$R_2 = K [1.5 A_0]^2 [3B_0]$$

$$R_2 = (1.5)^2 \times 3 [A_0]^2 [B_0]$$

From eq. (i) and (ii)

$$R_2 = 6.75 R_0$$

50)

conceptual

$$51) [A]_t = A_0 e^{-kt}$$

$$[A]_t = A^0 e^{-1} = \frac{[A]_0}{e}$$

$$52) r_1 = K_1 C_{A0} \quad \text{For first order}$$

$$r_0 = k_0 \quad \text{For zero order}$$

$$\frac{r_1}{r_0} = \frac{K_1 C_{A0}}{k_0}$$

$$\frac{0.693}{K_1} = \frac{C_{A0}}{2K_0} \quad t_{1/2,1} = t_{1/2, \text{Zero}}$$

$$\frac{r_1}{r_0} = 2 \times 0.693$$

53)

Generated by Allie

Problem Statement: The question asks us to find the activation energy (E_a) for a first-order chemical reaction A converting to products B and C. We are given the temperature and the fraction of reactant molecules that have enough energy to react (activated state). Using this information, we must calculate E_a .

Underlying Concept: The core concept here is the Arrhenius equation and the Boltzmann distribution. According to these, the fraction of molecules with energy greater than or equal to the activation energy is related exponentially to E_a , temperature (T), and the gas constant (R). This fraction determines the reaction rate.

Relevant Formulas: The key formula used is the Boltzmann factor to express the fraction of activated molecules:

$$f = e^{-\frac{E_a}{RT}}$$

Where: - f = fraction of molecules in the activated state - E_a = activation energy (J/mol) - R = universal gas constant = $8.314 \text{ J/mol}\cdot\text{K}$ - T = absolute temperature in Kelvin

Step-by-Step Calculation: 1. Given activated percentage = $4 \times 10^{-16}\% = 4 \times 10^{-18}$ as a

fraction. 2. Use the formula $f = e^{-E_a/(RT)}$, so: $E_a = -RT \ln f$ 3. Calculate
 $\ln(4 \times 10^{-18}) = \ln 4 + \ln 10^{-18} \approx 1.386 - 41.54 = -40.07$ 4. Calculate E_a :

$$E_a = (8.314)(300)(40.07) = 1.00 \times 10^5 \text{ J/mol} = 100 \text{ kJ/mol}$$

Therefore, the activation energy is approximately 100 kJ/mol.

Tips and Tricks: Use natural logarithm properties to break down the log of a product or a power to simplify calculations. Also, remember that $\ln(10^{-x}) = -x \ln 10$ where $\ln 10 \approx 2.303$.

Common Mistakes: Forgetting to convert the percentage to a fraction (e.g., using 4×10^{-16} instead of 4×10^{-18}) or neglecting to convert Celsius to Kelvin for temperature can lead to large errors. Miscalculating logarithms or confusing the sign in the formula may also occur.

Why Other Options Are Incorrect?: Choices like 12 kJ/mol or 831.4 kJ/mol are far off because they do not match the exponential relationship between activation energy and fraction of activated molecules at the given temperature. 88.57 kJ/mol is close but results from miscalculations in logarithms or temperature conversion.

54)

For all reactions,
 $K = \text{independent of conc.}$

(Only depends on temperature, catalyst)

$$\begin{array}{rclcl}
 55) & & A_2B_3 & \rightarrow & A_2 & + & \frac{3}{2} B_2 \\
 & t = 0 & P_0 & & 0 & & 0 \\
 & & & & & & \frac{3x}{2} \\
 \text{eq.} & & P^0 - x & & x & & \\
 & & \frac{3}{2} & & \frac{3x}{2} & & \\
 75 = P^0 + \frac{3}{2} x = 60 + \frac{3x}{2} \\
 x = 10 \\
 \text{Rate} = \left| \frac{\Delta p}{\Delta t} \right| = \left| \frac{50 - 60}{2.5} \right| \\
 = 4 \text{ torr min}^{-1}
 \end{array}$$

$$\begin{array}{l}
 56) \frac{(t_{1/2})_I}{(t_{1/2})_{II}} = \left(\frac{a_1}{a_2} \right)^{1-n} \\
 \frac{300}{600} = \left(\frac{1}{2} \right)^{1-n} \Rightarrow 1 - n = 1 \\
 = n = 0
 \end{array}$$

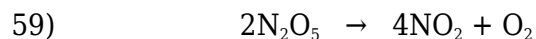
57)

$$k = \frac{2.303}{t} \times \log \left(\frac{a}{a-x} \right)$$

□ if $\left(\frac{a}{a-x} \right) = \text{same}$, $t = \text{same}$

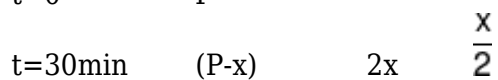
58)

conceptual



$t=0$

P



$$P-x+2x+\frac{x}{2}=350$$

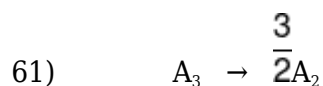
At complete reaction $2P - \frac{P}{2} \Rightarrow 2P + \frac{P}{2} = 500$

$$P=200 \quad x=100$$

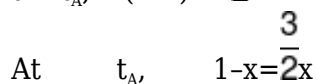
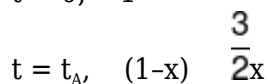
$$k = \frac{1}{t} \cdot \ln \frac{P}{P-x} = \frac{1}{30} \ln \frac{200}{200-100}$$

$$k = 2.31 \times 10^{-2} \text{ min}^{-1}$$

60) Slowest step here gives directly the experimentally determined rate law.

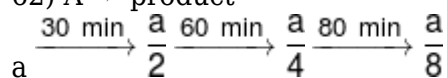


$t = 0, \quad 1$



$$\Rightarrow x = \frac{2}{5} \text{ or } 40\%$$

62) $\text{A} \rightarrow \text{product}$



So, order is 1.

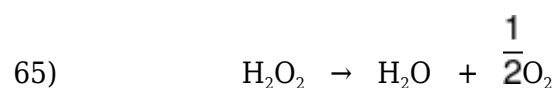
63)

conceptual

$$64) k_1 = A \cdot e^{-E_1/RT}$$

$$k_2 = A \cdot e^{-E_2/RT}$$

$$\ln \frac{k_2}{k_1} = \frac{E_1 - E_2}{RT} = \frac{10 \times 1000}{8 \cdot 314 \times 300} = 4.$$



$t = 0.$ 0.5 M

$t = 50 \text{ min.}$ 0.125 M

$t_{1/2} = 25 \text{ min}$

$$k = \frac{\ln 2}{25}$$

$$\text{ROD}|_{\text{H}_2\text{O}_2} = \frac{\text{ROA}|_{\text{O}_2}}{1/2}$$

$$\text{ROA}|_{\text{O}_2} = \frac{1}{2} \times k \times [\text{H}_2\text{O}_2]$$

$$= \frac{1}{2} \times \frac{\ln 2}{25} \times 0.05$$

$$= 6.93 \times 10^{-4} \text{ mol min}^{-1}$$

66) $\Delta H = -40$

$$\Delta H = E_f - E_b$$

$$\frac{E_f}{E_b} = \frac{2}{3} \Rightarrow 3E_f = 2E_b$$

$$E_f = \frac{2}{3}E_b$$

$$\Rightarrow \Delta H = \frac{2}{3}E_b - E_b$$

$$\Rightarrow \Delta H = -\frac{1}{3}E_b$$

$$\Rightarrow -40 = -\frac{1}{3}E_b$$

$$\Rightarrow 120 = E_b$$

$$\Rightarrow -40 = E_f - 120$$

$$\Rightarrow E_f = 80$$

67) Based on fact

68)

Configuration

69)

IUPAC

70)

$n+l$ rule

71)

Configuration

72)

NCERT

73)

Z_{eff}

74)

S-block size order

75)

Ionic radius

76)

IP

77)

IP

78)

relation between IP & EA

79)

EA

80)

Acidic & Basic size

81)

$\text{Al}_2\text{O}_3 \rightarrow$ Amphoteric

82)

Radius, IP & EA

83)

EN

84)

EA

85)

$C \rightarrow 1s^2 2p^2 2s^2$

86)

Ionic Radius

87) $\boxed{1f} 2e^-$ only

88)

vwR F > Ne

89)

Identification

90)

Identification

BIOLOGY

91) Pg. No. 119 NCERT 2022 - 2023 Edition

92) **10 pairs of cranial nerves** emerge, each serving specific sensory and motor functions. These nerves are responsible for various activities like vision, hearing, taste, smell, and muscle control.ans-2

93)

NCERT Pg#80,81

94) **Cloaca:** The cloaca is a single opening used for excretion, reproduction, and elimination of waste in both males and females.ans-3

95) **Internal Fertilization:** Frogs do not have internal fertilization.ans-4

96)

NCERT Pg. No. # 81

97)

NCERT Pg. No. # 83

98)

NCERT Pg. No. # 83

99)

NCERT Pg. No. # 80

100)

NCERT Pg. No. # 81

101)

NCERT Pg. No. # 83

102)

NCERT Pg. No. # 80

103)

NCERT Pg. No. # 82

104)

NCERT Pg. No. # 80, 81

105) **Question Explanation:** True statement about epithelial tissue ?

Concept : Epithelial tissue

Solution : Let's analyse each statement

(i) Simple epithelium forms lining for body cavities, ducts and tubes. - true

- (ii) In epithelial tissue, cells are loosely packed with little intercellular matrix. – False, because cells are tightly packed.
- (iii) Simple epithelium provide protection against chemical and mechanical stresses. – false because. It is function of compound epithelium.
- (iv) Gap junction perform cementing to keep neighbouring cells together. – false, because cementing is function of Adhering junction.

Final Answer : option (4). One

106) Module-5, Page#95,99

107) Module, Pg. # 98,99,100

108) NCERT (XI) Pg. # 102, 103

109)

NCERT Pg. No. # 101

110) NCERT (XIth) Pg.#102,103-Fig.-7.2(a), 7.3, 7.4(b), 7.5(a)

111)

NCERT Pg. No. # 101

112)

Histamine cause vasodilation, lowering B.P. and regulate B.P.

113)

Larynx is made up of hyaline cartilage.

114) NCERT Pg. # 101, para 2

115)

NCERT Page # 101

116) NCERT Pg. # 102

117) NCERT XI (E), Page No. 104

118)

NCERT XI, Pg. # 103

119) The correct answer is **2. modified white fibrous connective tissue.** • **Tendons:** These are tough, rope-like structures that connect muscles to bones. • **Composition:** Tendons are primarily composed of dense regular connective tissue, which is a type of white fibrous connective tissue. This tissue is characterized by a high density of collagen fibers arranged in parallel bundles, providing great tensile strength in the direction of the fibers.

120)

NCERT Pg. No. # 101

121)

NCERT Pg. No. # 102

122) • **Tissue A:** This tissue is located beneath the skin and appears to be areolar connective tissue.

• **Tissue B:** This tissue connects muscle to bone. This is a defining characteristic of a **tendon**.

• **Tissue C:** This tissue connects bone to bone. This is a defining characteristic of a **ligament**.

Therefore, the correct answer is Option 4

123)

NCERT Pg. # 101

124)

NCERT Pg. No. # 101

125)

Midgut and foregut

126) Collateral glands

127) NCERT (XI) Pg. # 114

128)

NCERT (XIth) Pg. # 113

129) NCERT XI, Page # 111

130) NCERT XIth P.No. 113

131)

NCERT Pg. No. # 112

132) NCERT Pg#113, Para-7.4.2

133) NCERT Pg.# 83

134) NCERT-XI Pg. # 112

135)

NCERT Pg # 103

136) NCERT XI PAGE 24

137) NCERT XI PAGE 26

138) NCERT XI 13, 24, 26, 27

139) NCERT XI PAGE 27

140) NCERT XI PAGE 26

141) NCERT XI 29

142) NCERT XI PAGE 29

143) NCERT XI PAGE 30

144) NCERT XI page 29

145) NCERT XI PAGE 29

146) NCERT XI 28

147) NCERT XI 32

148) NCERT XI PAGE 32

149) NCERT-XI, Pg # 34,37,39

150) NCERT XI 29

151) NCERT XI page 33

152) NCERT XI Pg 30

153) NCERT XI pg.26, 30, 32

154) NCERT XI PAGE 32

155) NCERT XI 33

156) NCERT XI 33

157) NCERT XI page 32

158) NCERTXI 33

159) NCERT XI 28,30

160) NCERT XI page 29

161) NCERT-XI, Pg # 33

162) NCERT XI Old 42 and 43

163) NCERT XI 32,33

164) NCERT XI pg. 27,29

165) NCERT XI 23

166) NCERT XI 30

167) NCERT XI 29,30

168) NCERT XI 32

169) NCERT XI 28

170) NCERT XI 33

171) NCERT XI 28,29 32

172) NCERT XI 34 summary

173) NCERT XI 26

174) NCERT XI 31,33,34

175) NCERT XI 26,27

176) NCERT XI 32

177) NCERT XI 29,32

178) *Volvox, Pteris, Pinus, Fucus, Chara , Funaria, Cedrus, Sargassum*

179) NCERT XI 32

180) NCERT XI 32