1994270

M – 2023

Register Number : | | | | | | |

Subject Code : 36 (NS)

BIOLOGY

(Kannada and English Versions)

Time : 3 Hours 15 Minutes] [Total No. of questions : 47] [Max. Marks : 70

(Kannada Version)

ಸೂಚನೆಗಳು :

1. ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯು ನಾಲ್ಕು ಭಾಗಗಳನ್ನು ಒಳಗೊಂಡಿದೆ – ಎ, ಬಿ, ಸಿ, ಡಿ.
2. ಭಾಗ–ಎ, I ಮತ್ತು II, ಭಾಗ–ಡಿ, V ಮತ್ತು VI ಅನ್ನು ಒಳಗೊಂಡಿರುತ್ತದೆ.
3. ಎಲ್ಲಾ ಭಾಗಗಳು ಕಡ್ಡಾಯವಾಗಿದೆ.
4. ಅಗತ್ಯವಿದ್ದೆಡೆ ಭಾಗಗಳನ್ನು ಗುರುತಿಸಿದ ಚಿತ್ರಗಳನ್ನು ಬಿಡಿಸಿ. ಭಾಗಗಳನ್ನು ಗುರುತಿಸದ ಚಿತ್ರಗಳಿಗೆ ಅಂಕಗಳನ್ನು ನೀಡಲಾಗುವುದಿಲ್ಲ.

ಭಾಗ – ಎ

I. ಕೆಳಗೆ ನೀಡಲಾದ ಆಯ್ಕೆಗಳಿಂದ ಸರಿಯಾದ ಪರ್ಯಾಯವನ್ನು ಆಯ್ಕೆ ಮಾಡಿ : **(15 × 1 = 15)**

1) ಈ ಕೆಳಗಿನ ಯಾವುದು ನಿಷೇಚನೋತ್ತರ ನಂತರದ ಘಟನೆಯಲ್ಲ?

a) ಲಿಂಗಾಣು ಉತ್ಪತ್ತಿ
b) ಭ್ರೂಣೋತ್ಪತ್ತಿ
c) ಫಲ (ಹಣ್ಣು)ವಾಗಿ ಪರಿವರ್ಧನೆಯಾಗುತ್ತದೆ
d) ಬೀಜಗಳಾಗಿ ಪರಿವರ್ಧನೆಯಾಗುತ್ತದೆ

P.T.O.

(English Version)

Instructions :

1. *The question paper consists of four Parts A, B, C and D.*
2. *Part–A consists of I & II and Part–D consists of V & VI.*
3. *All the Parts are compulsory.*
4. *Draw diagrams wherever necessary, unlabelled diagrams or illustrations do not attract any marks.*

PART – A

I. Select the correct alternative from the choices given below : **(15 × 1 = 15)**

1) Which among these one is not a post-fertilization event?
   a) Gametogenesis b) Embryogenesis
   c) Fruit formation d) Seed formation

2) The most resistant organic material present on exine of pollen grains is
   a) Tapetum b) Germpore
   c) Sporopollenin d) Cellulose

3) The first movements of the foetus are observed during which month of the pregnancy?
   a) First trimester b) Second trimester
   c) Fifth month d) Sixth month

4) Tassels in Corncob represent
   a) Ovary b) Anther
   c) Filament d) Stigma and style

5) Which of the following sexually transmitted diseases is not completely curable?
   a) Gonorrhea b) Genital warts
   c) Genital herpes d) Chlamydiasis

6) An example for non-medicated IUD is

a) Cu-T b) Lippes Loop

c) LNG-20 d) Multiload 375

7) Who noted that the behaviour of Chromosomes was parallel to the behaviour of genes?

a) T.H. Morgan b) Gregor. J. Mendle

c) Alfred Sturtevent d) Walter Sutton & Theodore Boveri

8) The first genetic material could be

a) Protein b) Carbohydrates

c) DNA d) RNA

9) Which of the following is used as an Industrial pollution indicator?

a) Lepidoptera b) Lichens

c) Lycopersicon d) Lypopodium

10) The disease Chikunguniya is transmitted by

a) House flies b) Aedes Mosquitoes

c) Cockroach d) Female anopheles

11) Sonalika and Kalyan Sona are varieties of

a) wheat b) rice

c) millet d) tobacco

12) Which one of the following alcoholic drinks is produced without distillation?

a) Wine b) Whisky

c) Rum d) Brandy

13) Plant cells are bombarded with high velocity microparticles of gold or Tungsten coated with DNA in a method known as

a) Microinjection b) Biolistics

c) Heat shock d) Vector mediated

14) The commonly used vector for cloning genes in animals is

a) Retrovirus

b) Disarmed retrovirus

c) Disarmed Ti plasmid

d) Agrobacterium tumifaciens

15) According to Allen's rule the mammals from colder climates have

a) Shorter ears and longer limbs

b) Longer ears and shorter limbs

c) Longer ears and longer limbs

d) Shorter ears and shorter limbs

II. Fill in the blanks by choosing the appropriate word/words from those given below : **(5 × 1 = 5)**

(Food Web, Standing State, Gause's-Competitive exclusion principle, Atmosphere, Single base pair of DNA)

16) Point Mutation arises due to the change in ————————.

17) ———————— states that two closely related species competing for the same resources cannot co-exist indefinitely and competitively inferior one will be eliminated eventually.

18) The amount of nutrient, such as carbon, nitrogen, phosphorous and calcium present in the soil at any given time is called as ————————.

19) The reservoir of gaseous type of nutrient cycle exist in the ————————.

20) The natural interconnection of food chains make it a ————————.

PART – B

III. Answer **any five** of the following questions in **3 - 5** sentences **each,** wherever applicable : **(5 × 2 = 10)**

21) What are hermaphrodites? Mention one example.

22) Distinguish between Menstrual cycle and Oestrous cycle.

23) Mention the four symptoms of Down's syndrome.

24) Write the genotype of the parents when their children are with A, B, AB, O blood groups.

25) Write the two basic aminoacids residues which are rich in histones.

26) Differentiate between Geitonogamy and Xenogamy.

27) Mention any two examples of evolution by anthropogenic action.

28) The use of CNG is better than Petrol or Diesel. Give four reasons.

PART – C

IV. Answer **any five** of the following questions in about **40 - 80** words **each,** wherever applicable : **(5 × 3 = 15)**

29) a) Why is oxytocin necessary for Parturition? **(1)**

b) List any four hormones secreted by Placenta. **(2)**

30) What is Infertility? Give reasons for infertility in humans.

31) Mention any three applications of DNA finger printing technique.

32) Draw a neat labelled diagram of Miller's experiment.

33) a) Write the infectious forms of Plasmodium which enter human body through mosquito bite. **(1)**

b) Draw a neat labelled diagram of structure of an antibody molecule. **(2)**

34) What is Poultry? Mention two important components of poultry farm Management.

35) What is Ecological Succession? Distinguish between Primary succession and Secondary succession.

36) a) Mention four "Evil Quartet", which cause depletion of biodiversity. **(2)**

b) Among vertebrates which group of animals has the highest number in global biodiversity. **(1)**

PART – D

V. Answer **any three** of the following questions in about **200 - 250** words **each,** wherever applicable : **(3 × 5 = 15)**

37) What is double fertilization? Describe fertilized embryosac with a neat labelled diagram.

38) Draw a neat labelled diagram of human sperm.

39) What is incomplete dominance? Explain it with reference to flower colour in Snapdragon.

40) Explain five benefits of creating Transgenic animals.

41) Name the disease caused by following organisms :

a) Entamoeba histolytica (1)

b) Epidermophyton (1)

c) Salmonella typhi (1)

d) Wuchereria Malayi (1)

e) Plasmodium Vivax. (1)

42) Name the technology that can successfully increase the herd size of cattle in a short time and explain the steps involved in this technology.

VI. Answer **any two** of the following questions in about **200 - 250** words **each,** wherever applicable : **(2 × 5 = 10)**

43) Explain the role of microbes in Industrial products.

44) a) Write any four tools used in recombinant DNA technology. (2)

b) Mention any two methods of introducing alien DNA into host cells. (2)

c) Name the stain used to visualise DNA fragments in Gel electrophorosis. (1)

45) Describe Fredrick Griffith experiment to show transformation in Bacteria.

46) a) Mention any two mechanisms how human body compensates low oxygen availability at higher altitude. (2)

b) Write two suspended activities in animals against abiotic stresses with suitable examples. (2)

c) The Abington tortoise in Galapagous Islands become extinct after goats were introduced on the Island. Mention the type of interaction. (1)

47) Write a brief account of electrostatic precipitator with a neat labelled diagram.

0599290

M – 2023

Register Number :

Subject Code : 35 (NS)

MATHEMATICS

(Kannada and English Versions)

Time : 3 Hours 15 Minutes] [Total No. of questions : 60] [Max. Marks : 100

(Kannada Version)

ಸೂಚನೆಗಳು : 1. *ಈ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯಲ್ಲಿ A, B, C, D ಮತ್ತು E ಎಂಬ ಐದು ವಿಭಾಗಗಳಿವೆ.* ***ಎಲ್ಲಾ*** *ವಿಭಾಗಗಳಿಗೆ ಉತ್ತರಿಸಿ.*

2. *ವಿಭಾಗ– A ನಲ್ಲಿ* ***ಒಂದು*** *ಅಂಕದ ಪ್ರಶ್ನೆಗಳಾದ* ***10*** *ಬಹು ಆಯ್ಕೆಯ,* ***5*** *ಬಿಟ್ಟ ಸ್ಥಳವನ್ನು ತುಂಬುವ ಮತ್ತು* ***5*** *ಅತೀ ಲಘು ಉತ್ತರದ ಪ್ರಶ್ನೆಗಳಿರುತ್ತವೆ.*

3. *ವಿಭಾಗ–E ನಲ್ಲಿ ಬರುವ ರೇಖಾತ್ಮಕ ಕಾರ್ಯಕ್ರಮ ಪ್ರಶ್ನೆಗೆ ನಕ್ಷೆಯನ್ನು ಉಪಯೋಗಿಸಿ ಉತ್ತರಿಸಿ.*

ವಿಭಾಗ– A

I. ಈ ಕೆಳಗಿನ ಬಹು ಆಯ್ಕೆಯ ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿ : **(10 × 1 = 10)**

1) ಗಣ $\{1, 2, 3\}$ ನಲ್ಲಿ ಸಂಬಂಧ R ನ್ನು $R = \{(1, 2), (2, 1)\}$ ಎಂದು ಕೊಟ್ಟಾಗ ಅದು

a) ಪ್ರತಿಫಲನ ಸಂಬಂಧ
b) ಸಮಾಂಗತ ಸಂಬಂಧ
c) ವಾಹಕ ಸಂಬಂಧ
d) ಸಮತ್ವ ಸಂಬಂಧ

P.T.O.

(English Version)

Instructions : 1. *The question paper has five Parts namely A, B, C, D and E. Answer* ***all*** *the parts.*

2. *Part-A has* ***10*** *multiple choice questions,* ***5*** *fill in the blanks and* ***5*** *very short answer questions of* ***1*** *mark each.*

3. *Use the graph sheet for question on linear programming problem in Part E.*

PART – A

I. Answer **all** the multiple choice questions : **(10 × 1 = 10)**

1) The relation R in the set $\{1, 2, 3\}$ given by $R = \{(1, 2), (2, 1)\}$ is

a) Reflexive b) Symmetric

c) Transitive d) Equivalence relation

2) The principal value branch of $\tan^{-1} x$ is

a) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ b) $[0, \pi]$

c) $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ d) $(0, \pi)$

3) If a matrix has 18 elements, then the number of matrices having all possible orders is

a) 4 b) 6

c) 2 d) 8

4) If A is a square matrix of order n, then $|adj\ A|$ is

a) $|A|^{n-1}$ b) $|A|^{n}$

c) $|A|^{n^2}$ d) $n|A|$

5) The derivative of $\sin^{-1} x$ exists in the interval

a) $[-1, 1]$ b) $(-1, 1)$

c) R d) $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

6) $\int e^x \sec x (1+\tan x)\, dx$ equals

a) $e^x \cos x + c$ b) $e^x \tan x + c$

c) $e^x \sin x + c$ d) $e^x \sec x + c$

7) The unit vector in the direction of the vector $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$ is

a) $\frac{\hat{i}+\hat{j}+2\hat{k}}{\sqrt{6}}$ b) $\frac{\hat{i}+\hat{j}+2\hat{k}}{6}$

c) $\frac{\hat{i}+\hat{j}+2\hat{k}}{4}$ d) $\frac{\hat{i}+\hat{j}+2\hat{k}}{2}$

8) If a line makes angle 90°, 60° and 30° with the positive direction of X, Y and Z axis respectively, then its direction cosines are

a) $1, \frac{1}{2}, \frac{\sqrt{3}}{2}$ b) $0, \frac{\sqrt{3}}{2}, \frac{1}{2}$

c) $1, \frac{\sqrt{3}}{2}, \frac{1}{2}$ d) $0, \frac{1}{2}, \frac{\sqrt{3}}{2}$

9) The corner points of the feasible region determined by the system of linear constraints are (0, 0), (0, 50), (30, 0), (20, 30). The maximum value of the objective function $z = 4x + y$ is

a) 210 b) 150

c) 110 d) 120

10) Let E and F be events of a sample space S of an experiment, then $P(E/F) + P(E'/F)$ is

a) $P(E)$ b) $P(F)$

c) $P(S)$ d) $P(E/F)$

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket : **(5 × 1 = 5)**

(0, 2, 11, 3, 4)

11) The value of x in which $\begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix} = \begin{vmatrix} x & 3 \\ 2x & 5 \end{vmatrix}$ is _____.

12) The slope of the tangent to the curve $y = x^3 - x$ at $x = 2$ is _____.

13) $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \sin^7 x \, dx$ is _____.

14) The order of the differential equation $\frac{d^4y}{dx^4} + \sin(y''') = 0$ is _____.

15) The distance of the point $(2, 3, -5)$ from the plane $x + 2y - 2z = 9$ is _____.

III. Answer **all** the following questions : **(5 × 1 = 5)**

16) Let $*$ be the binary operation on N of natural numbers given by $a * b$ = LCM of a and b. Find $5 * 7$.

17) Find the derivative of the function $\sin(x^2 + 5)$ with respect to x.

18) Define coinitial vectors.

19) Define feasible region in a linear programming problem.

20) If A and B are two events such that $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{8}$, find P(not A and not B).

PART – B

Answer **any nine** questions : **(9 × 2 = 18)**

21) Find $g \circ f$ and $f \circ g$, if $f : R \to R$ and $g : R \to R$ are given by $f(x) = \cos x$ and $g(x) = 3x^2$.

22) Prove that $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$, $x \in [-1, 1]$.

23) Find the value of $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(\frac{-1}{2}\right)\right)$.

24) Find the area of the triangle whose vertices are (1, 0), (6, 0) and (4, 3) using determinants.

25) Find $\frac{dy}{dx}$, if $y + \sin y = \cos x$.

26) Find $\frac{dy}{dx}$, if $y = x^x$, $x > 0$.

27) Using differential, find the approximate value of $\sqrt{25.3}$.

28) Evaluate $\int \frac{2 - 3\sin x}{\cos^2 x} dx$.

29) Evaluate $\int_1^{\sqrt{3}} \frac{dx}{1 + x^2}$.

30) Form the differential equation representing the family of parabolas having vertex at origin and axis along positive direction of x-axis.

31) Find the projection of the vector $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ on the vector $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$.

32) Find the area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$.

33) Find the angle between the pair of lines given by $\vec{r} = (2\hat{i} - 5\hat{j} + \hat{k}) + \lambda(3\hat{i} + 2\hat{j} + 6\hat{k})$ and $\vec{r} = (7\hat{i} - 6\hat{k}) + \mu(\hat{i} + 2\hat{j} + 2\hat{k})$

34) Find the probability distribution of number of tails in the simultaneous tosses of three coins.

PART – C

Answer **any nine** questions : **(9 × 3 = 27)**

35) Let T be the set of all triangles in a plane with 'R' a relation in T given by $R = \{(T_1, T_2) : T_1$ is congruent to $T_2\}$. Show that R is an equivalence relation.

36) Prove that $2\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{7} = \tan^{-1}\frac{31}{17}$.

37) Express $\begin{bmatrix} 1 & 5 \\ -1 & 2 \end{bmatrix}$ as the sum of a symmetric and skew symmetric matrix.

38) Find $\frac{dy}{dx}$, if $x = a(\theta - \sin\theta)$ and $y = a(1 + \cos\theta)$.

39) Verify Rolle's theorem for the function $y = x^2 + 2$, $a = -2$ and $b = 2$.

40) Find the intervals in which the function f given by $f(x) = 2x^2 - 3x$ is

a) Increasing

b) Decreasing

41) Find $\int \frac{dx}{(x+1)(x+2)}$.

42) Evaluate $\int x \sin 3x \, dx$.

43) Find the area of the region bounded by $x^2 = 4y$, $y = 2$, $y = 4$ and the y-axis in the first quadrant.

44) Find the general solution of the differential equation $\frac{dy}{dx} = (1+x^2)(1+y^2)$.

45) Show that the position vector of the point P, which divides the line joining the points A and B having position vectors $\vec{a}$ and $\vec{b}$ internally in the ratio $m:n$ is $\frac{m\vec{b}+n\vec{a}}{m+n}$.

46) Prove that $[\vec{a}+\vec{b},\ \vec{b}+\vec{c},\ \vec{c}+\vec{a}] = 2[\vec{a},\ \vec{b},\ \vec{c}]$

47) Find the distance between the lines given by

$\vec{r} = (\hat{i}+2\hat{j}-4\hat{k}) + \lambda(2\hat{i}+3\hat{j}+6\hat{k})$ and $\vec{r} = (3\hat{i}+3\hat{j}-5\hat{k}) + \mu(2\hat{i}+3\hat{j}+6\hat{k})$.

48) Of the students in a college, it is known that 60% reside in hostel and 40% are day scholars (not residing in hostel). Previous year results report that 30% of all students who reside in hostel attain *A* grade and 20% of day scholars attain *A* grade in their annual examination. At the end of the year, one student is chosen at random from the college and he has an *A* grade, what is the probability that the student is a hostlier?

PART – D

Answer **any five** questions : **(5 × 5 = 25)**

49) Let $f : N \to Y$ be a function defined as $f(x) = 4x + 3$, where $Y = \{y \in N : y = 4x + 3, \text{ for some } x \in N\}$. Show that f is invertible. Find the inverse of f.

50) If $A = \begin{bmatrix} 0 & 6 & 7 \\ -6 & 0 & 8 \\ 7 & -8 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}$, $C = \begin{bmatrix} 2 \\ -2 \\ 3 \end{bmatrix}$

Calculate AC, BC and $(A+B)C$. Verify that $(A+B)C = AC + BC$.

51) Solve the following system of Linear equations by matrix method

$$3x - 2y + 3z = 8$$
$$2x + y - z = 1$$
$$4x - 3y + 2z = 4$$

52) If $y = 3e^{2x} + 2e^{3x}$, prove that $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$.

53) The length x of a rectangle is decreasing at the rate of 5 cm/min and the width y is increasing at the rate of 4 cm/min. When $x = 8$ cm and $y = 6$ cm, find the rates of change of

a) the perimeter, and

b) the area of the rectangle.

54) Find the integral of $\frac{1}{\sqrt{x^2 + a^2}}$ with respect to x and hence evaluate $\int \frac{dx}{\sqrt{x^2 + 2x + 2}}$.

55) Find the area enclosed by the circle $x^2 + y^2 = a^2$ by the method of integration.

56) Find the general solution of the differential equation

$$x\frac{dy}{dx} + 2y = x^2 (x \neq 0).$$

57) Derive the equation of a plane perpendicular to a given vector and passing through a given point both in vector and Cartesian form.

58) A die is thrown 6 times. If 'getting an odd number' is a success, what is the probability of

a) 5 successes?

b) at least 5 successes?

c) at most 5 successes?

PART – E

Answer the following questions.

59) a) Minimize $Z = -3x + 4y$

Subject to constraints

$$x + 2y \leq 8$$

$$3x + 2y \leq 12$$

$x \geq 0$ and $y \geq 0$

by graphical method.

OR

b) Prove that $\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$

and hence evaluate $\int_0^{\frac{\pi}{2}} \frac{\cos^5 x}{\sin^5 x + \cos^5 x}\,dx$. **(6)**

60) a) Find the value of K so that the function $f(x)$ given by

$$f(x) = \begin{cases} Kx^2, & \text{if } x \leq 2 \\ 3, & \text{if } x > 2 \end{cases}$$ is continuous at $x = 2$.

OR

b) Prove that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$. **(4)**

1356968

M – 2023

Register Number :

Subject Code : 34 (NS)

CHEMISTRY

(Kannada and English Versions)

Time : 3 Hours 15 Minutes] [Total No. of questions : 47] [Max. Marks : 70

(Kannada Version)

ಸೂಚನೆಗಳು : 1. *ಈ ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯಲ್ಲಿ ನಾಲ್ಕು ವಿಭಾಗಗಳಿವೆ. ಎಲ್ಲಾ ನಾಲ್ಕೂ ವಿಭಾಗಗಳನ್ನೂ ಉತ್ತರಿಸಬೇಕು.*

2. *ವಿಭಾಗ–Aಯ ಪ್ರಶ್ನೆಯೊಂದಕ್ಕೆ 1 ಅಂಕದಂತೆ 20 ಅಂಕಗಳು.*
ವಿಭಾಗ–Bಯ ಪ್ರಶ್ನೆಯೊಂದಕ್ಕೆ 2 ಅಂಕಗಳಂತೆ 8 ಅಂಕಗಳು.
ವಿಭಾಗ-Cಯ ಪ್ರಶ್ನೆಯೊಂದಕ್ಕೆ 3 ಅಂಕಗಳಂತೆ 12 ಅಂಕಗಳು.
ವಿಭಾಗ-Dಯ ಪ್ರಶ್ನೆಯೊಂದಕ್ಕೆ 5 ಅಂಕಗಳಂತೆ 30 ಅಂಕಗಳು.

3. *ಅಗತ್ಯವಿರುವಲ್ಲಿ ಅಂದವಾದ ಚಿತ್ರಗಳನ್ನು ಮತ್ತು ಸಮತೋಲಿತ ರಾಸಾಯನಿಕ ಸಮೀಕರಣಗಳನ್ನು ಬರೆಯಿರಿ.*

4. *ಅಗತ್ಯವಿದ್ದಲ್ಲಿ ಲಾಗ್ ಟೇಬಲ್ ಮತ್ತು ಸರಳ ಕ್ಯಾಲ್ಕ್ಯುಲೇಟರ್‌ನ್ನು ಬಳಸಿ. (ವೈಜ್ಞಾನಿಕ ಕ್ಯಾಲ್ಕ್ಯುಲೇಟರ್ ಬಳಕೆಗೆ ಅವಕಾಶವಿಲ್ಲ)*

ವಿಭಾಗ – A

I. ಕೊಟ್ಟಿರುವ ಆಯ್ಕೆಗಳಲ್ಲಿ ಸರಿಯಾದ ಉತ್ತರವನ್ನು ಆರಿಸಿ ಬರೆಯಿರಿ. **(15 × 1 = 15)**

1) ಆಂತರಿಕ ಅರೆವಾಹಕಗಳ ಡೋಪಿಂಗ್‌ನಿಂದ ಯಾವ ಪ್ರಕಾರದ ನ್ಯೂನತೆ ಉಂಟಾಗುತ್ತದೆ?

a) ಸ್ಥಳಾಂತರಿಸುವ ನ್ಯೂನತೆ
b) ವಿದ್ಯುನ್ಮಾನ ನ್ಯೂನತೆ
c) ತೆರಪಿನ ನ್ಯೂನತೆ
d) ಸ್ಕಾಟ್ಕಿ ನ್ಯೂನತೆ

P.T.O.

(English Version)

Instructions : 1. *The question paper has four parts. All the four parts are compulsory.*

2. *Part-A carries 20 marks. Each question carries 1 mark.*
   Part-B carries 8 marks. Each question carries 2 marks.
   Part-C carries 12 marks. Each question carries 3 marks.
   Part-D carries 30 marks. Each question carries 5 marks.

3. *Write balanced chemical equations and draw diagrams wherever necessary.*

4. *Use log table and simple calculators if necessary. (Use of scientific calculator is not allowed)*

PART – A

I. Select the correct option from the given choices : **(15 × 1 = 15)**

1) Which kind of defect is introduced by doping intrinsic semiconductors?

a) Dislocation defect b) Electronic defect
c) Interstitial defect d) Schottky defect

2) A binary liquid mixture that forms maximum boiling azeotrope at a specific composition is

a) Ethanol + Water b) n-Hexane + n-Heptane
c) Benzene + Toluene d) Nitric acid + Water

3) The value of Van't Hoff factor (i) for ethanoic acid in benzene is nearly

a) 2 b) 1
c) 0.5 d) 0

4) On charging the Lead storage battery, $PbSO_4(s)$ on cathode is converted into

a) PbO_2 b) Pb
c) PbO d) No change

5) In the Arrhenius equation the factor $e^{\frac{-Ea}{RT}}$ corresponds to

a) Collision frequency

b) Proper orientation

c) The fraction of molecules with kinetic energy > Ea

d) Threshold energy

6) Which one of the following is not applicable to the phenomenon of adsorption?

a) $\Delta G = -Ve$ b) $\Delta S = -Ve$

c) $\Delta H = -Ve$ d) $\Delta H = +Ve$

7) What is the role of NaCN in the separation of ZnS and PbS by froth floatation method?

a) depressant b) froth stabiliser

c) collector d) reductant

8) On complete hydrolysis of XeF_6 with water, the product formed is

a) XeF_4 b) XeO_3

c) XeO_2F_2 d) $XeOF_4$

9) Which of the following elements is not regarded as transition element?

a) Fe b) Mn

c) Sc d) Zn

10) M – C bond in metal carbonyls possesses _____.

a) Ionic character b) Both σ and π characters

c) π-character only d) Ion-dipole forces

11) Identify chiral molecule in the following compounds.

a) 2-Bromobutane b) 1-Bromobutane

c) 2-Bromopropane d) 2-Bromo-2-methyl-Propane

PART – B

III. Answer **any four** of the following. Each question carries **2** marks : **(4 × 2 = 8)**

21) Give any two differences between Frenkel defect and Schottky defect.

22) Λ°_m for NaCl, HCl and NaAc (Sodium acetate) are 126.4 Scm^2mol^{-1}, 425.9 Scm^2mol^{-1} and 91.0 Scm^2mol^{-1} respectively. Calculate Λ°_m for HAc (acetic acid).

23) What are the two criteria for the effective collisions between molecules in a chemical reaction?

24) Give reason :
   a) Actinoids exhibit a greater range of oxidation states
   b) Zr and Hf have the almost identical atomic radii.

25) What happens when Phenol is heated with Zinc dust? Write equation.

26) How is Benzoylchloride converted into Benzaldehyde? Name the reaction.

27) What is the role of following chemicals in food?
   a) Sodium benzoate
   b) Butylated Hydroxy Anisole (BHA).

28) Why do soaps not work in hard water?

PART – C

IV. Answer **any four** of the following. Each question carries **3** marks : **(4 × 3 = 12)**

29) Explain the extraction of 'blister copper' from copper matte. Write the balanced equations for the reactions taking place in the convertor. **(3)**

30) Write the balanced chemical equations with reaction conditions involved in the manufacture of nitric acid by Ostwald's process. **(3)**

31) Complete the following chemical equations :

a) $PbS + 4O_3 \longrightarrow$ ——— $+ 4O_2$

b) $5SO_2 + 2MnO_4^- + 2H_2O \longrightarrow 5SO_4^{2-} + 4H^+ +$ ———.

c) $C_{12}H_{22}O_{11} \xrightarrow{\text{Conc. } H_2SO_4}$ ——— $+ 11H_2O$. **(1 + 1 + 1)**

32) a) How is chlorine manufactured by Deacon's process? Give equation. **(2)**

b) Write the structure of Chlorous acid. **(1)**

33) a) The transition metals and their compounds are known for their catalytic activity. Give two reasons. **(2)**

b) What is Mischmetall? **(1)**

34) Explain the preparation of Potassium permanganate from MnO_2 with equations. **(3)**

35) Out of the following two coordination entities ; cis – $[PtCl_2(en)_2]^{2+}$ and trans – $[PtCl_2(en)_2]^{2+}$.

a) Which is Chiral (optically active)? **(1)**

b) Draw the structures of its enantiomers. **(2)**

36) According to Valence Bond Theory (VBT), explain hybridization, geometry and magnetic property of $[CoF_6]^{3-}$ ion.
(Atomic No. of Co = 27) **(3)**

PART – D

V. Answer **any three** of the following. Each question carries **5** marks : **(3 × 5 = 15)**

37) a) Calculate the packing efficiency in Face Centred Cubic (FCC) Lattice. **(3)**

b) Potassium metal crystallises in a bcc unit cell with edge length 542 pm. Calculate the density of potassium metal. **(2)**

[Atomic mass of K = 39 g mol^{-1}, $N_A = 6.022 \times 10^{23} mol^{-1}$]

38) a) 450 cm^3 of an aqueous solution of a protein contains 1.0 g of the protein. The osmotic pressure of such a solution at 310 K is found to be 3.1×10^{-4} bar. Calculate the molar mass of the protein. (R = 0.083 L bar mol^{-1} K^{-1}). **(3)**

b) State Raoult's law of relative lowering of vapour pressure. Write its mathematical form. **(2)**

39) a) Calculate the standard Gibb's energy (ΔrG°) for the reaction at 298 K :

$$Zn(s) + 2Ag^+_{(aq)} \rightarrow 2\,Ag(s) + Zn^{2+}_{(aq)}$$

[Given : $E^0_{Zn^{2+}/Zn} = -0.76$ V,

$E^0_{Ag^+/Ag} = +0.80$ V, F = 96,500 C mol^{-1}]. **(3)**

b) Write the balanced equations for the reactions taking place at anode and cathode during rusting of iron. **(2)**

40) a) Derive an integrated rate equation for the rate constant of a first order reaction. **(3)**

b) Draw a graph of potential energy V/s reaction coordinate showing the effect of catalyst on the rate of a reaction. **(2)**

41) a) Explain Bredig's Arc method for the preparation of metal sols. **(3)**

b) Write two steps involved in the mechanism of enzyme catalysed reaction. **(2)**

VI. Answer **any three** of the following. Each question carries **5** marks : **(3 × 5 = 15)**

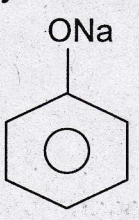
42) a) Explain S_N1 mechanism of conversion of tert-butyl bromide to tert-butyl alcohol. **(3)**

b) Give any two reasons for the less reactivity of arylhalides towards nucleophilic substitution reactions. **(2)**

43) a) Write the mechanism of the following reaction : **(3)**

$$C_2H_5OH \xrightarrow[443\ K]{\text{Conc. } H_2SO_4} CH_2 = CH_2 + H_2O$$

b) Identify 'A' and 'B' in the following equations : **(1+1)**

(i) 

$$\xrightarrow[(2)\ H^+]{(1)\ CO_2} A$$

(ii) $(CH_3)_3C - OC_2H_5 \xrightarrow{HI} C_2H_5OH + B$

44) a) How is ketone prepared from Grignard reagent and nitrile? Explain with an example. **(2)**

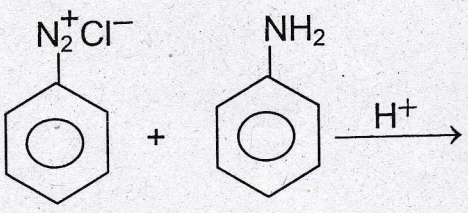
b) Explain Hell-Volhard-Zelinsky reaction. Give equation. **(2)**

c) What is the role of dry HCl gas in the addition of alcohols to aldehydes? **(1)**

45) a) Write the equations of reactions involved in the Gabriel Phthalimide synthesis of a primary amine. **(3)**

b) Complete the following reactions by giving major products.

i) $C_6H_5NH_2 \xrightarrow[273K-278K]{NaNO_2+2HCl}$

ii) 

(1 + 1)

46) a) Write the Haworth's structure of Lactose. **(2)**

b) What is denaturation of proteins? Which level of structure remains intact during denaturation of globular proteins? **(2)**

c) Name the sugar moiety present in DNA. **(1)**

47) a) How is Buna-N prepared? Give equation. **(2)**

b) Name the monomers of the biodegradable polymer Nylon-2-nylon-6. **(2)**

c) Write the partial structure of Dacron. **(1)**

2560353

M – 2023

Register Number : | | | | | | |

Subject Code : 33 (NS)

PHYSICS

(Kannada and English Versions)

Time : 3 Hours 15 Minutes] [Total No. of questions : 48] [Max. Marks : 70

(Kannada Version)

ಸೂಚನೆಗಳು: 1. *ಎಲ್ಲಾ ಭಾಗಗಳೂ ಕಡ್ಡಾಯವಾಗಿರುತ್ತವೆ.*

2. *ಅವಶ್ಯವಿರುವೆಡೆ ಉತ್ತರಗಳಲ್ಲಿ ಸಂಬಂಧಿತ ಚಿತ್ರ/ರೇಖಾಚಿತ್ರ/ಮಂಡಲ ಬರೆಯದಿದ್ದಲ್ಲಿ ಯಾವುದೇ ಅಂಕಗಳನ್ನು ನೀಡಲಾಗುವುದಿಲ್ಲ.*

3. *ಸಾಂಖ್ಯಿಕ ಲೆಕ್ಕಗಳಿಗೆ ವಿವರವಾದ ಪರಿಹಾರವಿಲ್ಲದೇ ನೇರವಾಗಿ ಉತ್ತರಗಳನ್ನು ಬರೆದರೆ ಅಂಕಗಳನ್ನು ನೀಡಲಾಗುವುದಿಲ್ಲ.*

ಭಾಗ - A

I. ಈ ಕೆಳಗಿನ **ಎಲ್ಲಾ** ಪ್ರಶ್ನೆಗಳಿಗೆ, ಕೊಟ್ಟಿರುವ ನಾಲ್ಕು ಆಯ್ಕೆಗಳಲ್ಲಿ ಸರಿಯಾದ ಉತ್ತರವನ್ನು ಆರಿಸಿ ಬರೆಯಿರಿ : **(15 × 1 = 15)**

1) ಭೌತ ಪರಿಮಾಣವನ್ನು "ಕೂಲಂಬ್" ಮಾನದಿಂದ ಅಳೆಯುವರು.

a) ವಿದ್ಯುದಾವೇಶ b) ವಿದ್ಯುತ್ ಪ್ರವಾಹ

c) ವಿದ್ಯುತ್ ಅಭಿವಾಹ d) ವಿದ್ಯುತ್ ಕ್ಷೇತ್ರ

(English Version)

Instructions :

1. *All Parts are compulsory.*
2. *Answers without relevant diagram/figure/circuit wherever necessary will not carry any marks.*
3. *Direct answers to the numerical problems without detailed solutions will not carry any marks.*

PART – A

I. Pick the correct option among the four given options for **all** of the following questions : **(15 × 1 = 15)**

1) Physical quantity measured in terms of "Coulomb" is

a) electric charge
b) electric current
c) electric flux
d) electric field

2) The electric field inside the cavity of a charged conductor is zero, this is known as

a) charging
b) grounding
c) electrostatic shielding
d) electrostatic induction

3) An example for polar molecule is

a) oxygen molecule
b) nitrogen molecule
c) water molecule
d) hydrogen molecule

4) The magnitude of the drift velocity per unit electric field is

a) mobility
b) drift velocity
c) relaxation time
d) resistivity

5) The device used to accelerate charged particle is

a) electroscope b) cyclotron

c) galvanometer d) ammeter

6) The net magnetic flux through any closed surface is zero is in accordance with

a) Gauss's law in magnetism

b) Gauss's law in electrostatics

c) Ampere's circuital law

d) Biot-Savart's law

7) S.I unit of mutual inductance of pair of coils is

a) Henry b) Ohm

c) Farad d) Ohm-metre

8) If the number of turns of a solenoid is doubled, the self inductance of the solenoid will

a) remains unchanged b) be doubled

c) be halved d) becomes four times

9) The relation between peak value of current (i_m) and rms value of current (I) is

a) $I = \frac{i_m}{\sqrt{2}}$ b) $I = i_m\sqrt{2}$

c) $I = 2i_m$ d) $I = \frac{i_m}{2}$

10) The ultraviolet region of the electromagnetic spectrum lies between
   a) X–ray region and visible region
   b) Microwave region and Radiowave region
   c) γ–rays region and X–rays region
   d) Visible region and microwave region

11) Snell's law of refraction invalid at an angle of incidence (i) is
   a) $i = 30^\circ$ b) $i = 60^\circ$
   c) $i = 0^\circ$ d) $i = 90^\circ$

12) When a point source of light is placed at the principal focus of a thin convex lens, the shape of the emergent wave front is
   a) Spherical convergent wave front
   b) Spherical divergent wave front
   c) Plane wave front
   d) Cylindrical wave front

13) C.J. Davison – L.H. Germer experiment proved
   a) Wave nature of electrons
   b) Particle nature of electrons
   c) Wave nature of light
   d) Particle nature of light

14) Function of moderator in a nuclear reactor is
   a) to slow down fast neutrons
   b) to absorb the neutrons
   c) to reduce heat energy
   d) to control the chain reaction

15) Energy gap (E_g) between the valence band and the conduction band for conductor is
   a) $E_g = 0$ b) $E_g < 3eV$
   c) $E_g > 3eV$ d) $E_g = 3eV$

II. Fill in the blanks by choosing appropriate answer given in the bracket for **all** the following questions : **(5 × 1 = 5)**

(curie temperature, electric dipole, transverse, isotopes, zener diode)

16) A pair of equal and opposite point charges q and $-q$ separated by a distance $2a$ is an ————

17) Temperature of transition from ferro magnetism to paramagnetism is called ————

18) Phenomenon of polarisation proves the ———— nature of light waves.

19) Nuclei having same atomic number and different mass number are called ————

20) ———— is used as voltage regulator.

PART – B

III. Answer **any five** of the following questions : **(5 × 2 = 10)**

21) On what factors does the capacitance of a parallel plate capacitor depends?

22) State and explain Ampere's Circuital Law.

23) Define magnetic dip and declination at a place.

24) What are eddy current? Mention any one use of it.

25) Write two sources of energy Loss in a transformer.

26) What is displacement current? Give the expression for it.

27) Mention the expression for limit of resolution of a telescope and explain the terms.

28) Name the spectral series of hydrogen atom lies in

a) ultraviolet region and

b) visible region of electromagnetic spectrum.

29) Give any two differences between nuclear fission and nuclear fusion.

PART – C

IV. Answer **any five** of the following questions : **(5 × 3 = 15)**

30) Write any three properties of electric field lines.

31) Draw a Labeled Wheatstone's bridge and hence write the balancing condition in terms of resistances.

32) How would you convert a galvanometer into an ammeter? Explain.

33) Write three differences between diamagnetic and paramagnetic materials.

34) Derive an expression for motional e.m.f induced in a conductor moving perpendicular to the uniform magnetic field.

35) Arrive the relation between focal length and radius of curvature of a spherical concave mirror.

36) Give the three postulates of Bohr's atomic model.

37) Calculate the mass defect and binding energy of helium nucleus $\left({}_2He^4\right)$ using the following data in MeV

Mass of proton = 1.00727 u

Mass of neutron = 1.00866 u

Mass of helium nucleus = 4.00260 u

38) Write the logical symbol and truth table of NAND gate.

PART – D

V. Answer **any three** of the following questions : **(3 × 5 = 15)**

39) State Gauss's law in electrostatics. Derive an expression for the electric field at a point due to an infinitely long thin charged straight wire using Gauss's law.

40) Derive the expression for conductivity of a material $\sigma = \frac{ne^2\tau}{m}$; where the terms have their usual meaning.

41) Obtain the expression for the force between two straight long parallel conductors carrying current. Hence define "ampere".

42) Arrive at the expression for refractive index of the material of the prism in terms of angle of prism and angle of minimum deviation.

43) a) What is meant by photo electric effect? (1)

b) Define work function. (1)

c) Write the three experimental observations of photo electric effect. (3)

44) a) What is rectification? (1)

b) Draw the circuit diagram and input-output waveforms of a full wave rectifier. (2)

c) Explain the working of a full wave rectifier. (2)

VI. Answer **any two** of the following questions : **(2 × 5 = 10)**

45) Charge $2\mu c$, $4\mu c$ and $6\mu c$ are placed at the three corners A, B and C respectively of a square ABCD of side X metre. Find the charge that must be placed at the fourth corner so that the total potential at the centre of the square is zero.

46) Three resistors $2\Omega, 3\Omega$ and 6Ω are combined in parallel. What is the total resistance of the combination? If this combination is connected to a battery of emf $2V$ and negligible internal resistance, determine the current through each resistor and the total current drawn from the battery.

47) A sinusoidal voltage of peak value 283V and frequency 50 Hz, is applied to a series LCR circuit in which $R = 3\Omega$, $L = 25.48\,mH$ and $C = 796\,\mu F$.

Calculate :

a) impedance of the circuit.

b) the phase difference between the voltage across the source and the current.

48) Two narrow slits in Young's double slit experiment are 0.18 mm apart. When they are illuminated by a monochromatic light, fringes of width 2.7 mm are obtained on a screen 0.8 m away. Find the wavelength of light used. If the source is replaced by another source of wavelength 450 nm, find the change in the fringe width.
