

2022
BIOLOGY
(Theory)
Full Marks – 70
Time – 3 Hours

General Instructions :

- (i) All questions are compulsory.
- (ii) Please write down the serial number of the question before attempting it.
- (iii) Marks for each question are indicated against it.

SECTION – A

1. Choose the correct answer :

9×1=9

- (a) The protective and nutritive layer of the blastocyst is –
 - (i) trophoblast
 - (ii) embryonic disc
 - (iii) inner cell mass
 - (iv) mesoderm
- (b) When pollen grains of a flower are transferred to the stigma of another flower on the same plant, it is known as –
 - (i) autogamy
 - (ii) geitonogamy
 - (iii) allogamy
 - (iv) xenogamy
- (c) Which of these is not a secondary sex organ ?
 - (i) Oviduct
 - (ii) Ova
 - (iii) Vas deferens
 - (iv) Penis
- (d) If a double stranded DNA has 20 % cytosine, the percentage of adenine in DNA would be –
 - (i) 30 %
 - (ii) 20 %
 - (iii) 40 %
 - (iv) 60 %
- (e) If Tall (T) is dominant over dwarf (t) and round seed (R) is dominant over wrinkled seed (r), the genotype of a true breeding tall plant with wrinkled seed would be –
 - (i) TtRr
 - (ii) TIRR
 - (iii) TTrr
 - (iv) TIRr

P.T.O.

5. Differentiate between Humoral and Cell mediated immune response. 1+1=2
6. What are the effects of alcohol on the liver? 2
7. Define transgenic crops. Give *two* advantages of transgenic crops. 1+½+½=2
8. Explain Brood parasitism with example. 2
9. List *any four* important ecosystem services derived from biodiversity. 2

SECTION – C

10. What is population explosion? Write the causes and effects of population explosion. 1+2=3
11. (a) What is speciation? Explain the types of speciation. 1+2=3
- OR*
- (b) Explain Oparin Haldane theory. 3
12. Can a couple both having blood group 'A' have a child having blood group 'O'? Give reasons and make suitable crosses. 1+1+1=3
13. What is vaccination? Briefly explain what happens when vaccine is introduced into the body. 1+2=3
14. There is a need to develop food that have higher level of nutritive value. Why is it so? Explain the desired nutritional qualities in crops. 1+2=3
15. What is palindromic nucleotide sequence? Mention *two* important consequences that arise from palindromic nucleotide sequence. 1+2=3
16. What is a transgenic animal? Mention *four* applications of transgenic animals. 1+2=3
17. Write notes on micro-habitat, habitat and ecological niche. 1+1+1=3
18. Define water pollution? Explain the important resources of water pollutants. 1+2=3

SECTION – D

19. (a) Explain various stages of ovarian cycle or menstrual cycle with a well labelled diagram. 4+1=5
- OR*
- (b) Where does microsporogenesis occur? Explain microsporogenesis and draw the diagram of the development of a mature pollen grain. ½+3+1½=5

20. (a) How did Hershey and Chase prove that DNA is the genetic material? Explain their experiment with suitable diagrams. Write down the results and conclusion. 3+2=5

OR

- (b) With diagram, describe Meselson and Stahl's experiment to explain the semi-conservative mode of DNA replication. Write down the results and interpretation.

3+2=5

21. (a) What is recombinant DNA technology? Explain the various steps of recombinant DNA (rDNA) technique. 1+4=5

OR

- (b) What are bioreactors? What are the important aspects of a bioreactor? Name the commonly used types of bioreactors. Describe their common features. 1+1+1+2=5

2022
CHEMISTRY
(Theory)
Full Marks – 70
Time – 3 Hours

General Instructions :

- (i) All questions are compulsory.
- (ii) Marks for each question are indicated against it.
- (iii) Use log tables if necessary.
- (iv) Use of calculator is not allowed.

1. Normality of 0.3M phosphorus acid (H_3PO_3) is – 1
 - (a) 0.5 (b) 0.6
 - (c) 0.9 (d) 0.1
2. Constant boiling point mixtures are called – 1
 - (a) Ideal solution (b) Azeotropes
 - (c) Isotonic solution (d) Buffers
3. The units of cell constant are – 1
 - (a) $ohm^{-1}cm^{-1}$ (b) cm
 - (c) $ohm^{-1}cm$ (d) cm^{-1}
4. For a gaseous reaction, the units of rate of reaction are – 1
 - (a) $L atm s^{-1}$ (b) $atm s^{-1}$
 - (c) $atm mol^{-1} s^{-1}$ (d) $mol s^{-1}$
5. The number of reacting species which collide simultaneously to bring about a chemical reaction is – 1
 - (a) molecularity of a reaction (b) order of a reaction
 - (c) rate of reaction (d) unit of reaction

6. The process of separation of colloids by passing through semi-permeable membrane is called – 1
- (a) Filtration (b) Electrophoresis
(c) Dialysis (d) Ultrafiltration
7. Which of the following is the strongest acid? 1
- (a) H_2O (b) H_2S
(c) H_2Se (d) H_2Te
8. Largest number of oxidation states is shown by – 1
- (a) Mn (b) Fe
(c) Cr (d) Zn
9. Transition elements form alloys easily because they have – 1
- (a) nearly same atomic size (b) same electronic configuration
(c) same atomic number (d) same oxidation state
10. Which of the following gives positive Fehling's solution test? 1
- (a) Sucrose (b) Glucose
(c) Fats (d) Protein
11. Tollen's reagent is used to identify – 1
- (a) aldehydes (b) ketones
(c) carboxylic acids (d) alcohols
12. Ethylamine and anilines can be distinguished by – 1
- (a) Azo dye Test (b) Lucas Test
(c) Hinsberg's Test (d) Victor Meyer's Test
13. The IUPAC name of $CH_3 - \underset{\substack{| \\ NH_2}}{CH} - CH_2 - CHO$ is – 1
- (a) 3-Aminobutanal (b) 4-Oxobut-2-amine
(c) 2-Amino propanal (d) 4-Oxo but-3-amine

14. The IUPAC name of $\text{C}_2\text{H}_5-\text{N}(\text{C}_2\text{H}_5)-\text{CH}_2\text{CH}_2\text{CH}_3$ is - 1
- (a) N, N - Diethylpropanamine (b) N, N - Diethylheptan - 1 - amine
(c) N, N - Diethylpropan - 2 - amine (d) N, N - Diethylpropan - 3 - amine
15. Define F-Centre. Which property is influenced by the presence of it in a solid. 2
16. Explain that NF_3 does not have donor properties like ammonia. 2
17. (a) Write the reaction mechanism for the formation of diethyl ether from ethanol at 413K. 2

OR

- (b) Write the reaction mechanism for acid catalysed dehydration of ethanol to form alkene. 2
18. Why are phenols more acidic than alcohols? 2
19. Which is the stronger acid between acetic acid and chloroacetic acid and why? 1+1=2
20. Why are the boiling points of amines lower than alcohols and carboxylic acids? 2
21. Write the chemical reaction for the conversion of bromoethane to diethyl ether. 2
22. Write the chemical reaction for the conversion of benzaldehyde to benzalaniline. 2
23. Write a short note on Finkelstein reaction and give suitable chemical equation. 2
24. Write short notes on Friedal Crafts alkylation in phenol and give suitable chemical equation. 2
25. Write a short note on Rosenmund reaction and give suitable chemical equation. 2
26. An element with atomic mass 40 gmol^{-1} has fcc structure and its unit cell edge length is 400 pm. Calculate the density of the element. 3
27. Osmotic pressure of a solution containing 7g of a protein per 100cm^3 of solution is 3.3×10^{-2} bar at 37°C . Calculate the molar mass of protein. ($R=0.083 \text{ L Bar K}^{-1} \text{ mol}^{-1}$) 3
28. (a) The rate constant for a first order reaction is 80 s^{-1} . How much time will it take to reduce the concentration of the reactant to $\frac{1}{18}$ th of its initial value. 3

OR

- (b) A first order reaction is 15% complete in 20 minutes. How long will it take to complete 60 % of the reaction. 3

29. Explain Freundlich adsorption isotherm at – 3
- low pressure
 - high pressure
 - intermediate pressure
30. Why do transition metals act as a good catalyst for various reactions? 3
31. What is crystal field splitting? Draw and explain the splitting of d-orbitals in an octahedral complex. 3
32. Explain the following terms – 3
- Ambidentate ligand
 - Chelation
 - Coordination number
33. What are nucleic acids? Write two differences between RNA and DNA. 3
34. (a) (i) Why does the conductivity of an electrolytic solution decrease with dilution? 2
(ii) Zinc rod is dipped in 0.1 M solution of $ZnSO_4$. The salt is 95 % dissociated at this dilution at 298K. Calculate the electrode potential given that $E^\circ(Zn^{2+}/Zn) = -0.76V$. 3

OR

- (b) (i) Why on dilution the \wedge_m of CH_3COOH increases drastically while that of CH_3COONa increases gradually? 2
(ii) Represent the cell in which the following reaction takes place. 3

$$Mg_{(s)} + 2Ag^+(0.0001M) \rightarrow Mg^{2+}(0.130M) + 2Ag_{(s)}$$
Calculate its E if E° is 3.17 V.
35. (a) (i) Ammonia is a good complexing agent. Explain. 3
(ii) Write the molecular structure of $XeOF_4$ and XeO_3 . 2

OR

- (b) (i) Why are the melting and boiling points of noble gases very low? 2
(ii) What are interhalogen compounds? Why are they more reactive than halogens? 3

2022
COMPUTER SCIENCE
(Theory)
Full Marks – 70
Time : 3 hours

General instructions :

- (i) All questions are compulsory.
- (ii) Please write down the number of the question before attempting it.
- (iii) Figures in the margin indicate marks.
- (iv) Programming Language : Python

1. Choose the correct answer :

5×1=5

- (a) How would you write x^y in Python as an expression ?
 - (i) x^y
 - (ii) $x ** y$
 - (iii) $x \wedge y$
 - (iv) None of these
- (b) A Python module has _____ extension.
 - (i) .mod
 - (ii) .imp
 - (iii) .mpy
 - (iv) .py
- (c) Which transmission media is capable of having a much higher bandwidth (data capacity) ?
 - (i) coaxial
 - (ii) twisted pair cable
 - (iii) fibre optic
 - (iv) untwisted cable
- (d) Which command is used for removing a table and all its data from the database ?
 - (i) create table command
 - (ii) drop table command
 - (iii) alter table command
 - (iv) delete table command
- (e) A relational database consists of a collection of –
 - (i) Tables
 - (ii) Fields
 - (iii) Records
 - (iv) Keys

2. Fill in the blanks :

5×1=5

- (a) A _____ is a word having special meaning reserved by programming language. (token / keyword / identifiers)

P.T.O.

- (b) _____ is a variable defined outside all the functions. (A global variable / A static variable / A local variable)
- (c) To read all the file contents in the form of a list, _____ method is used. (readlines () / close () / flush ())
- (d) _____ network topology requires a central controller or hub. (Bus / Tree / Star)
- (e) By default, ORDER BY clause lists the results in _____ order. (descending / ascending / same)

3. State whether the following statements are *True* or *False* : 4×1=4

- (a) A Dictionary is an unordered set of key : value pairs.
- (b) A Python function may return multiple values.
- (c) A Router can be replaced with a bridge.
- (d) A Primary key can store empty values in it.

4. Answer the following questions : 13×2=26

- (a) What are data types ? What are Python's built-in core data types ?
- (b) (i) What is indexing in context to Python strings ? Why is it also called two way indexing ?

OR

- (ii) What is a string slice ? How is it useful ?
- (c) What are the different kinds of loops provided by Python ?
- (d) Write the output of the following Python code :

```
def update (x=10):
    x +=15
    print ('x =', x)
```

```
x =20
update ()
print ('x =', x)
```

- (e) (i) What is the difference between a text file and a binary file ?

OR

- (ii) What is the difference between 'w' and 'a' file mode ?

- (f) What is recursion ?
 (g) (i) Differentiate between LAN and PAN.

OR

- (ii) Differentiate between Hackers and Crackers.
 (h) What is a protocol ? Give *two* examples of protocol.
 (i) What is database system ? What is its need ?
 (j) (i) Differentiate between Primary key and Foreign key.

OR

- (ii) Define *any two* aggregate functions of SQL with example.
 (k) Define INSERT INTO command with an example.
 (l) Differentiate between CHAR and VARCHAR datatypes.
 (m) Write a SQL command to create a student table whose schema is as follows :

student (name, roll, age)

5. Answer the following questions :

10×3=30

- (a) Explain mutable and immutable types with examples.
 (b) What is a nested IF statement ? Rewrite the following code in Python after removing all syntax error (s). Underline each correction done in the code.

```

value = 30
for val in range (0, value)
    if val % 4 == 0 :
        print ( val *4)
    Elseif val % 5 == 0:
        print (val +3)
    else
        print (val + 10)
  
```

- (c) (i) What is meant by the term iteration ? Write a python program to print a multiplication table of a number using range () function.

OR

- (ii) What is the difference between the break statement and the continue statement.
 (d) Differentiate between an actual parameter and a formal parameter with a suitable example for each.

- (e) (i) What is a module, a package and a library ?

OR

- (ii) Write the procedure to create a library /package in Python.
- (f) Write a program to get the empid, name and salary of the employees of a department and store these details in a file called "salary.txt"
- (g) State the advantages and the disadvantages of using recursion over iteration.
- (h) (i) Explain the different types of network topologies.

OR

- (ii) What are the differences between Hub and switch.
- (i) Differentiate between the DROP TABLE and the ALTER TABLE command.
- (j) Write SQL commands for the following on the basis of the given table sports :

TABLE : SPORTS

Sl. No.	Class	Name	Game	Grade
101	7	John	Cricket	B
102	8	Robert	Tennis	A
103	7	William	Swimming	B
104	7	Grace	Tennis	C
105	9	Archana	Basketball	A
106	10	Andrew	Cricket	A

- (i) To display the name of the students who are getting grade 'C' in the table.
- (ii) To display the games taken up by the students whose name starts with 'A'.
- (iii) To display the table in the ascending order of name.

2022
ENGLISH
(CORE)
Full Marks – 80
Time – 3 Hours

General Instructions :

- (i) *The paper is divided into three sections:-A,B & C. All the sections are compulsory.*
- (ii) *Separate instructions are given with each section and question wherever necessary. Read these instructions very carefully and follow them.*
- (iii) *Do not exceed the prescribed word limit while answering the questions.*
- (iv) *Marks for each question are indicated against it.*

SECTION – A : Reading (15 marks)

1. Read the following passage carefully and answer the questions that follow :

Punctuality is a necessary habit in all public affairs of a civilised society. Without it, nothing could ever be brought to a conclusion, everything would be in a state of chaos. Only in a sparsely populated rural community, is it possible to disregard it. In ordinary living, there can be some tolerance of punctuality. The intellectual who is working on some abstruse problem has everything coordinated and organised for the matter in hand. He is therefore, forgiven, if late for the dinner party.

But people are often reproached for the unpunctuality when their only fault is cutting things fine. It is hard for energetic, quick - minded people to waste time, so they are often tempted to finish a job before sitting out to keep an appointment. If no accidents occur on the way, like punctured tyres, diversion of traffic, sudden descent of fog, they will be on time. They are often more industrious useful citizens than those who are always late. The over punctual can as much be a trial to others as the unpunctual. The guest who arrives half an hour too soon is the greatest nuisance. Some friends of my family had this irritating habit. The only thing to do was to ask them to come half an hour later than the other guests. Then they arrived just when we wanted them.

P.T.O.

If you are catching a train, it is always better to be comfortably early than even a fraction of a minute too late. Although being early may mean wasting a little time, this will be less than if you miss the train and have to wait an hour or so for the next one. Also, you avoid the frustration of arriving at the very moment when the train is drawing out of the station and being unable to get on it. An even harder situation is to be on the platform in good time for a train and to still see it go off without you. Such an experience befell a certain young girl the first time she was travelling alone.

She entered the station twenty minutes before the train was due, since her parents had impressed upon her that it would be unforgivable to miss and cause the friends with which she was going to stay to make two journeys to meet her. She gave her luggage to a porter and showed him her ticket. To her horror, he said that she was two hours too soon. She felt in the handbag for the piece of paper on which her father had written down the details of the journey and gave it to the porter. He agreed that a train did come into the station at the time on the paper and that it did stop, but only to take on water, not passengers. The girl asked to see a timetable, feeling sure that her father could not have made a mistake. The porter went to fetch one and arrived back with the station master, who produced it with a flourish and pointed out a microscopic '0' beside the time of the arrival of the train at his station. This little 0 indicated that the train only stopped for water. Just at that moment, the train came into the station. The girl with tears streaming down her face, begged to be allowed to slip into the guards van. But the station master was adamant: rules could not be broken. And she had to watch that train disappear towards her destination while she was left behind.

- A. Based on your understanding of the passage, answer the following questions briefly : $2 \times 2 = 4$
- (a) Why is punctuality necessary in a civilised society ?
 - (b) The over-punctual can be as much a trial to others as the un-punctual. Why ?
- B. Select the appropriate answer from the given options : $2 \times 1 = 2$
- (a) Reason why punctuality is necessary in a society –
 - (i) for emotional reasons
 - (ii) for environmental factors
 - (iii) to avoid chaos
 - (iv) to avoid suffocation

(b) Pick out the odd word from the following words :

- (i) energetic
- (ii) quick-minded
- (iii) irritating
- (iv) industrious

C. Choose the correct word from the given options which convey similar meaning to the following :

2×1=2

(a) thinly

- (i) comfortably
- (ii) horribly
- (iii) ordinarily
- (iv) sparsely

(b) hard working

- (i) frustrating
- (ii) unpunctuality
- (iii) chivalrous
- (iv) industrious

2. Read the following passage and answer the questions that follow :

Conversation is indeed the most easily teachable of all arts. All you need to do in order to become a good conversationalist is to find a subject that interests you and your listeners. There are, for example, numberless hobbies to talk about. But the important things are that you must talk about other fellow's hobbies rather than your own. Therein lies the secret of your popularity. Talk to your friends about the things than interest them, and you will get a reputation for good fellowship, charming wit and a brilliant mind. There is nothing that pleases people so much as your interest in their interests.

It is just as important to know what subjects to avoid as subject to select for good conversation. If you don't want to be set as a wet blanket or a bore, be careful to avoid certain unpleasant

topics. Avoid talking about yourself; unless you are asked to do so. People are interested in their own problems, and not in yours. Sickness or death bores everybody. The only one who willingly listens to such talk is the doctor, but he gets paid for it.

To be a good conversationalist, you must know not only what to say but how to say it. Be civil and modest. Don't overemphasize your own importance. Be mentally quick and witty, but don't hurt others with your wit. Finally try to avoid mannerism in your conversation.

- (a) On the basis of your reading of the passage make notes on it using recognisable abbreviations wherever necessary. Supply a suitable title to it. 4
- (b) Write a summary of the above passage in about 80 words. 3

SECTION – B : Writing (25 marks)

3. You are Zara of Ramhlun South, Aizawl. You want to rent out your newly constructed flat in the heart of the city. Prepare an advertisement in not more than 50 words for publication in a newspaper giving location of the building, nature of accomodation, rent expected, etc. 5
4. You are a student of Class XII, studying at St. Mary's H.S.S. You have lost your Titan wristwatch somewhere in the school premises. Draft a notice in not more than 50 words to be placed on your school notice board. 5
5. (a) You are Lali/Lala of A-17, Chaltlang Lily Veng, Aizawl. You are disturbed by the way people throw their garbage and rubbish in polythene bags by the roadside in your locality. Write a letter to the Editor of 'Mizoram Daily' to create awareness about the harmful effects of polythene bags and also suggest measures to clear garbage. 10

OR

- (b) You are James/ Mary. You have seen an advertisement for the post of Education teacher in ABC Public School, Mamit. Write a letter in response to the advertisement applying for the post. Give your detailed bio-data also. 10
6. (a) You are Lalrinmawia / Lalrinmawii of Aizawl Public School. You have witnessed a road accident near your school. Write a report in not more than 120 words to be published in your school news-letter. 5

OR

- (b) You are Lalthazuala/Lalthazuali of Aizawl Public School. As a representative of your school, you have attended a campaign on 'Say No to Polythene Bags'. Write a report in not more than 120 words. 5

SECTION – C : Literature (40 marks)

7: Read the following extract and answer the questions that follow :

4×1=4

I. And show the children to green fields, and make their world

Run azure on gold sands, and let their tongues

Run naked into books the white and green leaves open

History theirs whose language is the sun.

(a) * The title of the poem is –

- (i) A Roadside Stand
- (ii) A Thing of Beauty
- (iii) Keeping Quiet
- (iv) An Elementary School Classroom in a Slum

(b) The 'Children' here refers to –

- (i) The children who were running out of their homes joyously
- (ii) The children who had everything in their lives
- (iii) The children who go to school in a slum
- (iv) The children who are retarded

(c) The white leaves refer to –

- (i) the leaves of books
- (ii) the leaves of plants
- (iii) the tender leaves of trees
- (iv) the leaves of new season

(d) The poet wants to take the children to a place –

- (i) where they can play in a safe environment
- (ii) where they can enjoy a good meal
- (iii) where they can play in open fields and golden sands
- (iv) where they can play without worries

OR

II. A thing of beauty is a joy forever

Its loveliness increases, it will never

Pass into nothingness; but will keep

A bower quiet for us, and a sleep

Full of sweet dreams, and health and quiet breathing

4×1=4

- (a) The name of the poet is --
- (i) Pablo Neruda
 - (ii) Kamala Das
 - (iii) John Keats
 - (iv) Stephen Spender
- (b) A thing of beauty never passes into --
- (i) something
 - (ii) imagination
 - (iii) nothingness
 - (iv) dreams
- (c) A thing of beauty can be measured by --
- (i) its colour
 - (ii) its fragrance
 - (iii) its appearance
 - (iv) its performance
- (d) Pick out what is not true about 'a thing of beauty' --
- (i) its a joy forever
 - (ii) provides us peace of mind
 - (iii) increases its loneliness
 - (iv) it befools us

8. Answer the following questions in about 30 words : 3×2=6

- (a) Why has the poet brought in the image of merry children 'spilling out of their homes' in the poem 'My Mother at Sixty-Six'?
- (b) What idea does Pablo Neruda want to convey in his poem 'Keeping Quiet'?
- (c) How does the poet describe the faces of the children in the classroom?

9. Answer the following questions in about 30 words : 4×2=8

- (a) Why did the ironmaster speak kindly to the peddler and invite him home?
- (b) How did Franz's feeling about M. Hamel and school change?
- (c) Why did Gandhiji go to Lucknow in 1916? Who met him there and why?
- (d) How did Douglas' misadventure affect him?

10. Choose the correct answer from the given options :

- (a) Mukesh's father was born in a family of bangle makers, but his first profession was a –
 (i) carpenter (ii) teacher
 (iii) tailor (iv) plumber
- (b) The name of the ironmaster's daughter was –
 (i) Mary Jones (ii) Emily Dickinson
 (iii) Selma Lagerlof (iv) Edla Willmansson

11. Answer *any one* of the following questions in about 100 – 120 words each : 5

- (a) What forces conspire to keep the workers in the bangle industry of Firozabad in poverty?
 (b) Why do you think Gandhi considered the Champaran episode to be a turning point in his life?

12. Answer the following questions in about 30 words : 2×2=4

- (a) What does Zitkala Sa remember about her first day in the land of apples?
 (b) Who was Sam in the lesson, 'The Third Level'?

13. Choose the correct answer from the given options : 6×1=6

- (a) Why did Mother Skunk want her son to retain his identity?
 (i) She disliked the wizard
 (ii) She did not like roses
 (iii) She wanted her son to be accepted as he was
 (iv) All of these
- (b) What did Charley find in his stamp collection?
 (i) Old addresses (ii) Hairstyles
 (iii) Old letters (iv) First day cover
- (c) The chief concern for Sadao's father was –
 (i) Sadao's wedding (ii) Sadao's education
 (iii) Sadao's migration (iv) Sadao's treatment

- (d) Which words of Annan made a deep impression on Bama ?
- (i) To leave their house to have better education
 - (ii) They were not supposed to touch the upper caste people
 - (iii) She should never bow low before the upper caste
 - (iv) To study hard and progress, to rise above all shackles of indignity
- (e) Derry entered Mr. Lamb's garden by –
- (i) climbing over the wall
 - (ii) climbing through the window
 - (iii) walking in through the open gate
 - (iv) walking in stealthily
- (f) Jo wanted the _____ in the story the next day.
- (i) skunk to smell of roses (ii) skunk mommy to relent
 - (iii) wizard to hit mommy (iv) animals to love skunk

14. Answer *any one* of the following questions in about 100–120 words :

- (a) There are moments in life when we have to make hard choices between our roles as private individuals and as citizens with a sense of national loyalty. Discuss with reference to the story "The Enemy". 5

OR

- (b) Will Derry get back to his old seclusion or will Mr. Lamb's brief association affect a change in the kind of life he will lead in the future ? 5

2022
GEOLOGY
(Theory)

Full Marks – 70

Time – 3 Hours

General Instructions :

- (i) All questions are compulsory.
- (ii) Marks for each question are indicated against it.
- (iii) Please write down the question number before attempting it.

1. Choose the correct answer : 14×1=14

(a) A large anticline with secondary folds of smaller size developed in it is called –

- (i) Monocline
- (ii) Anticlinorium
- (iii) Synclinorium
- (iv) Homocline

(b) A series of parallel joints is termed as –

- (i) Joint set
- (ii) Master joint
- (iii) Joint system
- (iv) Dip set

(c) If you walk towards the direction of a dip, you will encounter –

- (i) Same rocks
- (ii) Younger rocks
- (iii) Folded rocks
- (iv) Older rocks

(d) The sum of angle of Hade and Dip is –

- (i) 180°
- (ii) 45°
- (iii) 90°
- (iv) 50°

(e) Pitch and Plunge coincide in case of –

- (i) Symmetrical fold
- (ii) Assymetrical fold
- (iii) Recumbent fold
- (iv) Overtuned fold

P.T.O.

- (f) The word 'fossil' is derived from –
- (i) Greek (ii) English
(iii) Latin (iv) French
- (g) In bivalves when two adductor impressions are present, it is called –
- (i) Monomyarian shell (ii) Isomyarian shell
(iii) Bimyarian shell (iv) Dimyarian shell
- (h) The formation temperature of different magmatic deposits varies from –
- (i) $1500^{\circ}\text{C} - 700^{\circ}\text{C}$ (ii) $1500^{\circ}\text{C} - 500^{\circ}\text{C}$
(iii) $1500^{\circ}\text{C} - 300^{\circ}\text{C}$ (iv) $1500^{\circ}\text{C} - 100^{\circ}\text{C}$
- (i) If the cavity filling deposits consist of only one mineral, it is called –
- (i) Massive (ii) Crustification
(iii) Horses (iv) Vugs
- (j) Earthquake is caused by –
- (i) Unconformity (ii) Faults
(iii) Sedimentation (iv) Metamorphism
- (k) Strength of rock to resist the movement of one part of rock with respect to the other is –
- (i) Crushing strength (ii) Tensional strength
(iii) Shearing strength (iv) Lithostatic strength
- (l) Artesian Well occurs in –
- (i) Confined aquifers (ii) Perched aquifers
(iii) Aquicludes (iv) Unconfined aquifers
- (m) Which dam requires strong abutment rocks?
- (i) Gravity Dam (ii) Arch Dam
(iii) Buttress Dam (iv) Earth Dam

(n) Very light rain smaller than 0.5mm in diameter is –

- (i) Freezing rain (ii) Sleet
(iii) Drizzle (iv) Sun shower

2. Answer the following questions :

7×2=14

- (a) What is a clinometer compass?
(b) What is spiral angle of gastropods?
(c) Define tenor.
(d) What is injection deposit?
(e) Write down the non-metallic minerals formed by metamorphic mineral deposits.
(f) What is global warming?
(g) (i) What is an earthquake?

OR

(ii) What is a Tsunami?

3. Explain with diagram the difference between thrust faults and strike slip faults. $1\frac{1}{2}+1\frac{1}{2}=3$
4. Describe the nature and mode of preservation of fossils. 3
5. What are the uses of fossils? 3
6. What is meant by residual concentration? What are the deposits formed by residual concentration? $2+1=3$
7. Differentiate between Immiscible liquid segregation and Immiscible liquid injection deposits. $1\frac{1}{2}+1\frac{1}{2}=3$
8. (a) What are the different types of Placer deposits? 3

OR

(b) What are the *four* essential factors which are important for the formation of placer deposits? 3

9. Differentiate between Primary and Secondary mineral deposits. 3

10. Why do greenhouse gas trap infrared radiation as compared to other gases in the atmosphere? 3
11. Describe the *three* zones of occurrence of groundwater. 3
12. (a) Explain with a diagram the different parts of a fold. 2+3=5

OR

- (b) Classify the types of fault on the basis of attitude of fault with a suitable diagram. 3+2=5
13. What are fossils? What are the *three* processes in which the altered hard parts are preserved? Write a neat diagram of gastropods fossils. 1+3+1=5
14. (a) What are the different types of landslides? What are the various ways in which we can prevent landslides? 3+2=5

OR

- (b) What is hydrological cycle? What are the *two* types of openings present in rocks? 3+2=5

2022

HINDI

Full Marks – 80

Time – 3 Hours

General Instructions :

- (i) All questions are compulsory.
- (ii) Figures in the margin indicate marks.
- (iii) Write your answers neatly and legibly.
- (iv) While attempting a question, write the question number as given in the question paper.

खण्ड – 'क'

1. निम्नलिखित काव्य-पंक्तियों को ध्यान से पढ़िए और पूछे गए प्रश्नों के उत्तर दीजिए :

हवा हूँ, हवा मैं बसती हवा हूँ ।

सुनो बात मेरी – अनोखी हवा हूँ ।

बड़ी बावली हूँ, बड़ी मस्तमौला ।

नहीं कुछ फिकर है, बड़ी ही निडर हूँ ।

जिधर चाहती हूँ उधर घुमती हूँ ।

मुसाफिर अजब हूँ । न घर-बार मेरा ।

न उद्देश्य मेरा, न इच्छा किसी की,

न आशा किसी की, न प्रेमी न दुश्मन,

जिधर चाहती हूँ, उधर घूमती हूँ ।

हवा हूँ, हवा मैं बसती हवा हूँ ।

P.T.O.

- (क) कवि ने अनोखी हवा किसे कहा है ? 1
- (ख) यह हवा अनोखी क्यों है ? 1
- (ग) 'बावली' और 'मस्तमौला' का अर्थ स्पष्ट कीजिए । 1
- (घ) 'मुसाफिर अजब हूँ' से क्या अभिप्राय है ? 1
- (ङ) हवा कहाँ घूमती है ? 1
- (च) इस कविता का शीर्षक लिखिए । 1

2. निम्नलिखित गद्यांश को ध्यानपूर्वक पढ़िए और पूछे गए प्रश्नों के उत्तर दीजिए :

मनोरंजन का जीवन में विशेष महत्व है । दिन भर की दिनचर्या से थकामांदा मनुष्य रात को आराम का साधन खोजता है । यह साधन है - मनोरंजन । मनोरंजन मानव-जीवन में संजीवनी-बूटी का काम करता है । यह मनुष्य के थके हारे शरीर को आराम की सुविधा प्रदान करता है । यदि आज के मानव के पास मनोरंजन के साधन न होते तो उसका जीवन नीरस बन कर रह जाता । यह नीरसता मानव-जीवन को चक्की की तरह पीस डालती और मानव संघर्ष तथा परिश्रम करने के योग्य भी न रह पाता ।

- (क) मनोरंजन क्या है ? 2
- (ख) यदि मनुष्य के पास मनोरंजन के साधन न होते तो उसका जीवन कैसा होता ? 2
- (ग) नीरस मानव जीवन का सबसे बड़ा नुकसान क्या होता है ? 2

खण्ड - 'ख'

3. निम्नलिखित विषयों में से किसी एक पर निबंध लिखिए : 8
- (क) जीवन में खेलों का महत्व
- (ख) कम्प्यूटर - आज की आवश्यकता
- (ग) मंहगाई समस्या
- (घ) ऑनलाइन क्लास के फायदे और नुकसान

4. सड़को पर दिन-प्रतिदिन होने वाली दुर्घटनाओं के कारणों पर एक रिपोर्ट तैयार कीजिए । 5
5. 'मेरे विद्यालय का पुस्तकालय' विषय पर एक प्रतिवेदन तैयार कीजिए । 5
6. 'भीड़ भरी बस के अनुभव' विषय पर एक फीचर तैयार कीजिए । 5

खण्ड - 'ग'

7. निम्नलिखित पद्यांश से संबंधित प्रश्नों के उत्तर दीजिए :

(अ) मैं जन-जीवन का भार लिए फिरता हूँ,

फिर भी जीवन में प्यार लिए फिरता हूँ,

कर दिया किसी ने झंकृत जिनको छूकर

मैं साँसों के दो तार लिए फिरता हूँ ।

(क) इस पद्यांश के कवि तथा कविता का नाम लिखिए । 1

(ख) जन-जीवन के भार से कवि का क्या आशय है ? 1

(ग) 'फिर भी' के द्वारा कवि क्या कहना चाहता है ? 1

(घ) कवि क्या चाहता है ? वह किसलिए अधीर है ? 2

(ङ) कवि की मनोदशा पर टिप्पणी कीजिए । 3

अथवा

(आ) 'पतंगों के साथ-साथ वे भी उड़ रहे हैं

अपने रंघों के सहारे

अगर वे कभी गिरते हैं छतों के खतरनाक किनारों से

और बच जाते हैं तब तो

और भी निडर होकर सुनहले सूरज के सामने आते हैं

पृथ्वी और भी तेज घूमती हुई आती है

उअन्के बेचैन पैरों के पास ।'

(क) इस पद्यांश के कवि तथा कविता का नाम लिखिए । 1

(ख) कौन है जो पतंगों के सहारे उड़ रहे हैं और कैसे उड़ रहे हैं ? 1

- (ग) गिरकर बचने पर बच्चों पर क्या प्रभाव पड़ता है ? 1
- (घ) सुनहले सूरज के सामने आने का आशय स्पष्ट कीजिए । 2
- (ङ) पृथ्वी बच्चों के बेचैन पैरों के पास किस प्रकार घूमती हुई आती है ? 3
8. निम्नलिखित पद्यांश से सौन्दर्यबोध संबंधित प्रश्नों के उत्तर दीजिए :
- (अ) जाने क्या रिश्ता है, जाने क्या नाता है
जितना भी उँड़ेलता हूँ भर-भर फिर आता है
दिल में क्या झरना है ?
मीठे पानी का सोता है
भीतर वह, ऊपर तुम
मुस्काता चाँद ज्यों धरती पर रात-भर
मुझ पर त्यों तुम्हारा ही खिलता वह चेहरा है ।
- (क) यह पद्यांश किस शैली में लिखि गई है ? 1
- (ख) भाषा की विशेषता लिखिए । 1
- (ग) 'भर-भर फिर' में कौन सा अलंकार है ? 1
- (घ) भाव-सौन्दर्य स्पष्ट कीजिए । 2

अथवा

- (आ) नभ में पाँती-बँधे बगुलों के पंख,
चुराए लिए जाती वे मेरी आँखें ।
कजरारे बादलों की छाई नभ छाया,
तैरती साँस की सतेज स्वेत काया ।
हौले हौले जाती मुझे बाँध निज माया से ।
उसे कोई तनिक रोक रखो ।
वह तो चुराए लिए जाती मेरी आँखें
नभ में पाँती-बँधी बगुलों की पाँखें ।

- (क) काव्यांश की भाषा पर टिप्पणी कीजिए । 1
- (ख) काव्यांश से मानवीकरण का एक उदाहरण छाँटकर लिखिए । 1
- (ग) काव्यांश में प्रयोग एक मुहावरा छाँटकर लिखिए । 1
- (घ) काव्यांश में चित्रित प्रकृति-सौंदर्य का चित्रण अपने शब्दों में कीजिए । 2
9. निम्नलिखित प्रश्नों में से किन्हीं दो के उत्तर दीजिए : 2×2=4
- (क) कविता और बच्चे को समानांतर रखने के क्या कारण हो सकते हैं ?
- (ख) कैमरे में बंद अपाहिज करुणा के मुखौटे में छिपी क्रूरता की कविता हैं - क्यों ?
- (ग) बादलों के आगमन से प्रकृति में होने वाले किन-किन परिवर्तनों को कविता रेखांकित करती है ?
10. निम्नलिखित गद्यांश को पढ़िए और पूछे गए प्रश्नों के उत्तर दीजिए :
- (अ) भक्तिन का दुर्भाग्य भी उससे कम हठी नहीं था, इसी से किशोरी से युवती होते ही बड़ी लड़की भी विधवा हो गई । भइयहू से पार ना पा सकने वाले जेठों और काकी को परास्त करने के लिए कटिबद्ध जिठौतों ने आशा की एक किरण देख पाई । विधवा बहिन के गठ-बंधन के लिए बड़ा जिठौत अपने तीतर लड़ाने वाले ससले को बुला लाया, क्योंकि उसका हो जाने पर सब कुछ उन्हीं के अधिकार में रहता । भक्तिन की लड़की भी माँ से कम समझदार नहीं थी, इसी से उसने वर को ना-पसंद कर दिया । बाहर के बहनोई का आना चचेरे भाइयों के लिए सुविधाजनक नहीं था, अतः यह प्रस्ताव जहाँ-का-तहाँ रह गया । तब वे दोनो माँ-बेटी खूब मन लगाकर अपनी संपत्ति की देख-भाल करने लगी और 'मान न मान में तेरा मेहमान' की कहावत चरितार्थ करने वाले वर के समर्थक उसे किसी-न किसी प्रकार पति की पदवी पर अभिषिक्त करने का उपाय सोचने लगे ।
- (क) भक्तिन का दुर्भाग्य किससे अधिक हठी था और क्यों ? 1
- (ख) जेठ भइयहू से पार क्यों नहीं पा रहे थी ? वे क्या चाहते थे ? 1
- (ग) भक्तिन के जिठौतों को आशा की कौन-सी किरण दिखाई दे रही थी ? 1
- (घ) बड़ा जिठौत अपने साले को अपने घर किसलिए बुला लाया ? 1
- (ङ) भक्तिन की लड़की ने क्या समझदारी दिखाई ? 2

अथवा

(आ) अपने जीवन के अधिकांश हिस्सों में हम चाली के टिली ही होते हैं जिसके रोमांस हमेशा पंचर होते रहते हैं। हमारे महानतम क्षणों में कोई भी हमें चिढ़ाकर या लात मारकर भाग सकता है। अपने चरमतम शूवीर क्षणों में हम क्लैव्य और पलायन के शिकार हो सकते हैं। कभी-कभार लाचार होते हुए जीत भी सकते हैं। मूलतः हम सब चाली हैं क्योंकि हम सुपरमैन नहीं हो सकते। सत्ता, शक्ति, बुद्धिमत्ता, प्रेम और पैसे के चरमोत्कर्षों में जब हम आईना देखते हैं तो चेहरा चाली-चाली हो जाता है।

- (क) चाली के टिली होने का क्या आशय है ? 1
- (ख) चाली के चरित्रों के साथ प्रायः कैसी घटनाएँ घटित होती हैं ? 1
- (ग) 'चेहरा चाली-चाली हो जाता है' का आशय स्पष्ट कीजिए। 1
- (घ) चाली अपने चरित्रों के माध्यम से क्या कहना चाहते हैं ? 1
- (ङ) सुपरमैन और चाली के व्यक्तित्व में क्या आंतर है ? 2

11. निम्नलिखित में से किन्हीं चार प्रश्नों के उत्तर दीजिए : 4×3=12

- (क) बाजार का जादू चढ़ने और उतरने पर मनुष्य पर क्या-क्या असर पड़ता है ?
- (ख) गाँव में महामारी फैलने और अपने बेटों के देहांत के बावजूद लुट्टन पहलवान ढोल क्यों बजाता रहा ?
- (ग) 'बाजारूपन' से क्या तात्पर्य है ?
- (घ) लेखक ने शिरिश को कालजयी अवधूत (संन्यासी) की तरह क्यों माना है ?
- (ङ) हृदय की कोमलता को बचाने के लिए व्यवहार की कठोरता भी कभी-कभी ज़रूरी हो जाती है - 'शिरिश के फूल' पाठ के आधार पर स्पष्ट करें।

12. निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर दीजिए :

(क) 'जूझ' कहानी में चित्रित ग्रामीण जीवन का संक्षिप्त वर्णन अपने शब्दों में लिखिए ।

(ख) मुअनजो-दड़ो के आदिम शहर की आज क्या दशा है ?

(ग) ऐन फ्रैंक कौन थी ? उसकी डायरी क्यों प्रसिद्ध है ?

13. (क) सिन्धु घाटी सभ्यता की कला का वर्णन कीजिए ।

4

अथवा

(ख) ऐन फ्रैंक ने अपनी डायरी 'किट्टी' को संबोधित चिट्ठी के रूप में क्यों लिखी होगी ?

4

2022

MATHEMATICS

Full Marks – 80

Time – 3 hours

General Instructions :

- (i) All questions are compulsory.
- (ii) Marks for each question are indicated against it.
- (iii) Use of calculator is not permitted; however, you may ask for logarithmic tables if required.
- (iv) Please write down the serial number of the questions before attempting it.

1. Choose the correct answer from the following :

16×1=16

- (a) If $f(x) = \frac{1}{1-x^2}$, then the domain of $f(x)$ is –
- (i) \mathbb{R}
 - (ii) $\mathbb{R} - \{-1, 1\}$
 - (iii) $\{-1, 1\}$
 - (iv) $\mathbb{R} - \{1\}$
- (b) Let R be the relation in the set \mathbb{N} given by $R = \{(a, b) : a = b - 2 > 6\}$. Choose the correct option –
- (i) $(2, 4) \in R$
 - (ii) $(3, 8) \in R$
 - (iii) $(6, 8) \in R$
 - (iv) $(8, 7) \in R$
- (c) If A is a singular matrix, then $A(\text{adj}A)$ is –
- (i) a unit matrix
 - (ii) a null matrix
 - (iii) a symmetric matrix
 - (iv) a scalar matrix
- (d) If $[2x \ 4] \begin{bmatrix} x \\ -8 \end{bmatrix} = 0$, then the positive value of x is –
- (i) 1
 - (ii) 2
 - (iii) 4
 - (iv) 6

P.T.O.

(e) If $y = \tan^{-1}(\log x)$, then $\frac{dy}{dx}$ is -

(i) $\frac{1}{1+(\log x)^2}$

(ii) $\frac{1}{x(1+\log x)^2}$

(iii) $\frac{1}{x\{1+(\log x)^2\}}$

(iv) None of these

(f) The function $f(x) = x^3 - 6x^2 + 15x - 12$ is -

(i) strictly decreasing on R

(ii) strictly increasing on R

(iii) increasing in $(-\infty, 2]$ and decreasing in $(2, \infty)$

(iv) decreasing in $(-\infty, 2]$ and increasing in $(2, \infty)$

(g) $\int \frac{1+2\sin x}{\cos^2 x} dx$ is -

(i) $\sec x + \tan x + C$

(ii) $\tan x + 2\sec x + C$

(iii) $\sec x + 2\tan x + C$

(iv) $\tan^2 x + 2\cot x + C$

(h) $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x dx$ is -

(i) -1

(ii) 0

(iii) 1

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

(i) The solution of the differential equation $\frac{dy}{dx} = e^{x+y}$ is -

(i) $e^x + e^y = C$

(ii) $e^x - e^{-y} = C$

(iii) $e^x + e^{-y} = C$

(iv) $e^x - e^y = C$

- (j) The value of k for which $f(x) = \begin{cases} \frac{\sin 2x}{5x}, & \text{when } x \neq 0 \\ k, & \text{when } x = 0 \end{cases}$

is continuous at $x = 0$, is –

- (i) $\frac{5}{2}$ (ii) $\frac{2}{5}$
 (iii) $\frac{4}{25}$ (iv) 5

- (k) If \vec{a} and \vec{b} are two vectors such that $|\vec{a}| = |\vec{b}| = \sqrt{2}$ and $\vec{a} \cdot \vec{b} = -1$, then the angle between \vec{a} and \vec{b} is –

- (i) $\frac{\pi}{6}$ (ii) $\frac{\pi}{4}$
 (iii) $\frac{\pi}{3}$ (iv) $\frac{2\pi}{3}$

- (l) The vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$ are orthogonal, if λ is equal to –

- (i) 0 (ii) $\frac{5}{2}$
 (iii) $-\frac{5}{2}$ (iv) $\frac{2}{5}$

- (m) The vector equation of the line passing through the points A (2, -1, 4) and B (1, 1, -2) is –

- (i) $\vec{r} = (2\hat{i} - \hat{j} + 4\hat{k}) + \lambda(\hat{i} + \hat{j} - 2\hat{k})$
 (ii) $\vec{r} = (2\hat{i} - \hat{j} + 4\hat{k}) + \lambda(-\hat{i} + 2\hat{j} - 6\hat{k})$
 (iii) $\vec{r} = (\hat{i} + \hat{j} - 2\hat{k}) + \lambda(2\hat{i} - \hat{j} + 4\hat{k})$
 (iv) $\vec{r} = (\hat{i} + \hat{j} - 2\hat{k}) + \lambda(3\hat{i} + 2\hat{k})$

- (n) The vector equation of the x-axis is given by –

- (i) $\vec{r} = \hat{i}$ (ii) $\vec{r} = \hat{j} + \hat{k}$
 (iii) $\vec{r} = \lambda\hat{i}$ (iv) $\vec{r} = \lambda(\hat{j} + \hat{k})$

(o) If $2P(A) = P(B) = \frac{6}{13}$ and $P(A/B) = \frac{1}{3}$, then, $P(A \cap B)$ is -

(i) $\frac{2}{13}$

(ii) $\frac{7}{13}$

(iii) $\frac{5}{13}$

(iv) $\frac{8}{39}$

(p) A coin is tossed and then a die is tossed. The probability of obtaining a 6 (six) given that a head came up is -

(i) $\frac{5}{6}$

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

(iii) $\frac{1}{12}$

(iv) $\frac{1}{6}$

2. Let $A = \mathbb{R} - \{3\}$ and $B = \mathbb{R} - \{1\}$. Let $f: A \rightarrow B: f(x) = \frac{x-2}{x-3}$ for all values of $x \in A$. Show that f is one-one and onto. 2

3. Let $y = e^x \log(\sin 2x)$, find $\frac{dy}{dx}$. 2

4. Evaluate: $\int \frac{dx}{x(x+2)}$. 2

5. A can solve 90% of the problems given in a book and B can solve 70%. What is the probability that at least one of them will solve a problem selected at random from the book? 2

6. Express the matrix $A = \begin{bmatrix} 3 & -1 & 0 \\ 2 & 0 & 3 \\ 1 & -1 & 2 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix. 4

7. Using matrix, solve the following system of linear equations :

$$2x + 3y + 3z = 5$$

$$x - 2y + z = -4$$

$$3x - y - 2z = 3$$

8. Let Z be the set of all integers and let R be a relation in Z defined by

$$R = \{(a, b) \mid a, b \in Z \text{ and } a - b \text{ is even}\}. \text{ Show that } R \text{ is an equivalence relation.}$$

9. (a) If $y = (\sin x)^{\cos x} + (\cos x)^{\sin x}$, find $\frac{dy}{dx}$.

OR

- (b) Find the equation of the tangent to the curve $x^2 + 3y = 3$, which is parallel to the line $y - 4x + 5 = 0$.

10. (a) Evaluate: $\int \frac{2x+1}{(x+2)(x-3)} dx$.

OR

- (b) Evaluate: $\int \frac{x^2}{x^4 - 1} dx$.

11. (a) Solve the differential equation: $3e^x \tan y dx + (1 - e^x) \sec^2 y dy = 0$

OR

- (b) Show that the differential equation $(x^2 + 3xy + y^2) dx - x^2 dy = 0$ is homogeneous and solve it.

12. Find the coordinates of the image of the point $P(1, 3, 4)$ in the plane $2x - y + z + 3 = 0$.

13. There are 3 bags, each containing 5 white and 3 black balls. Also, there are 2 bags each containing 2 white and 4 black balls. A white ball is drawn at random. Find the probability that this ball is from a bag of the second group.

14. (a) Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$. Find the volume of the largest cylinder inscribed in a sphere of radius R . 6

OR

- (b) Show that the perimeter of a right angled triangle of given hypotenuse is maximum when the triangle is isosceles. 6
15. (a) Find the area of the region bounded by the line $y = x$ and the curve $y = x^3$. 6

OR

- (b) Using integration, find the area of $\triangle ABC$, the equation of whose sides AB , BC and AC are given by $y = 4x + 5$, $x + y = 5$ and $4y = x + 5$ respectively. 6
16. Show that the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ intersect each other. Also, find the point of their intersection. 6
17. A firm manufactures two types of products A and B, and sell them at a profit of Rs. 5 per unit of type A and Rs. 3 per unit of type B. Each product is processed on two machines M_1 and M_2 . One unit of type A requires one minute of processing time on M_1 and two minutes of processing time on M_2 , whereas one unit of type B requires one minute of processing time on M_1 and one minute on M_2 . Machines M_1 and M_2 are respectively available for at most 5 hours and 6 hours in a day. Find out how many units of each type of product should the firm produce a day in order to maximise the profit. Solve the problem graphically. 6

2022

MIZO

Full Marks – 80

Time – 3 Hours

Hriat turte :

- (i) Zawhna zawng zawng hi chhan ngei ngei tur a ni.
- (ii) Zawhna tin mark put zat chu a zawnah tarlan zel a ni.
- (iii) Chhan dawnin zawhna nambar ziah zel tur a ni.

THEN KHATNA: HLA

1. Kualkhung chhunga thute hi a dik ber thlang chhuak la, a kar awlte hi dah khat rawh : $4 \times 1 = 4$
 - (a) Sem sem dam dam _____ hawihhâwm tlawmngaihna nê. (ei bil thi thi / lian tê thlei lo / aia upa zah)
 - (b) _____ lailen thuanglam zawhna. (Sirvate / Savate / Thuvate)
 - (c) An sulhnu lei _____ hian. (awmharah / khawharah / hrehawmah)
 - (d) Zan khua tlaia run sang _____. (belin / kaiin / mawiin)
2. Hausiampa Zai-a, “Duh leh mual lianpui chu tul rawh se” tih hi eng nge a awmzia? 2
3. Phungrual an tin ang a tih hla phuahtuin, ‘Lung kan ruat ngei ang a’ a tih kha tute nge ni sawi la. Engti turin nge an inlungrual ang sawi bawh rawh. 2
4. Phengphe nunnem tih hla phuahtu hian theih nise engtia awm nge a duh sawi la, eng vangin nge hringnun hi a tahpui thin sawi bawh rawh. $2+2=4$
5. I tan ka ding zel ang tih hla phuahtu T. Zorampela’n ‘Ka tan chunnu’ a tih hi eng nge sawi la. Mizorama chengte dinchhuah nana thil pawimawh a sawi hrang hrangte kha a hla thu tlawhchhanin han ziaak teh. $1+5=6$

P.T.O.

THEN HNIHNA : THU

6. A dik ber thlang chhuak rawh : 4×1=4
- (a) R.L. Thanmawia'n zirlai tam takin an tlakchham nia a sawi chu –
(Dawhtheihna / Hmangaihna / Ngilneihna)
- (b) British-in Mizoram a awp kum chu –
(1880 / 1890 / 1900)
- (c) Mizo Tawnga Bible bu kim kan neih kum chu –
(1957 / 1958 / 1959)
- (d) H. Lallungmuana'n khawhar aia tuar har a tih chu –
(sum tlakchham / riltam / khawsik)
7. I thinrim elo ? tih ziaktuin thinrimna hneh dan tha ber a tih kha eng nge ? Han sawi zau teh. 4
8. C. Lalsiamthanga'n literature tehfung dik tak a tih kha eng nge ni ? 2
9. Mizo AAWB kan neih tan kum sawi la, min siamsaktu Missionary-te hming kha sawi baww rawh. 1+1=2
10. 'Ka han chhut ka han chhut hian, pawl ber maia ka hriat tak chu kan nun khuarei an chang tur hi a ni'. C. Thumluaia'n kan nun khuarei an chang tur pawl a tih dan kim takin han sawi teh. 6

THEN THUMNA : LEMCHAN

11. A dik ber thlang chhuak rawh : 2×1=2
- (a) Thangzawra'n nang zawngin min lainat e', a tih kha tu nge?
(Lalhniangi / Khuaia / Anu)
- (b) Thangzawra'n 'phivaww rimchhe pahnih' a tihte kha tute nge ?
(Chawnghrima leh Kanglova / Thanghrima leh Kanglova / Khuaia leh Kanglova)
12. Kalkhama'n pui tham deuh hleka vai run a tum chhan kha eng nge ni ? 2
13. Lalhniangi pain a fanu man atana a ngen kha sawi la, a ngen chhan chiang takin han sawi baww teh. 1+3=4
14. Lalhniangi leh Thangzawra te inneih theih lohna tura Chawnghrima hma lak dante kha han sawi teh. 6

THEN LINA : GRAMMAR AND COMPOSITION

15. A hnuaia rinte hi eng adverb nge an nih ? 1+1=2
- (a) A zuang thoh thoh mai.
(Adjectival Adverb / Double Adverb / Emphatic Adverb)
- (b) Tlan vak vak suh.
(Adjectival Adverb / Double Adverb / Emphatic Adverb)
16. A hnuaia tawng upa hi hrilhfiash la, a tifiash turin thu phuah rawh : 1+1=2
Rotekawla se pa ang
17. A dik zawk thlang chhuak rawh : 2×1=2
- (a) Chhungkhat laina hnai nei lo hi (Zuntei nu siam ang / vanlaia tla ang) an ti.
- (b) Mumanga thil hmuh a taka lo thleng dik leh hi (kelchal mang man / zawng mang chhia ang) an ti.
18. Lalenga, Bawngkawn, Aizawl i ni a. In bialtu SDO, Power & Electricity Department, Bawngkawn hnenah in electric bill dik lo chungchang sawiselna (complaint) han ziaak teh. 4
19. A hnuaia thupui i duh ber hmang hian thumal 250 velin Essay ziaak rawh : 6
- (a) COVID-19 leh Mizote
- (b) Zirlaite leh Mobile Phone
- (c) Nungcha Humhalh

THEN NGANA : RAPID READER

20. A dik ber thlang chhuak rawh : 2×1=2
- (a) 'E Chawngpuii pa zah ngai, zah ngai, a tawk e, a tawk e' ti tu chu _____ a ni.
(Hrangmuana / Kapzawna / Aitama)
- (b) Zawlbuka riak tlangval mutthilh hnua Hrangchhuana tui petu chu _____ a ni.
(Kapphunga / Kapzawna / Hrangmuana)

21. "A hun thlen hma chuan kan sawi tak leh kan sawi zel turte pawh a hretu pathum chauh kan ni tlat reng tur a ni." He thu hi tu sawi nge? A hun lo thleng tur chu eng nge ni? 1+1=2
22. Tlangchhina'n Hrangtinluaia kha hmeifa a tih mai theihna chhan han sawi teh. 2
23. Khaw thenawm invelh tawn nan fei pawh a ban a la sei lutuk fih hi eng nge a awmzia? 2
24. Chawngmawii leh Hrangchhuana te inhmangaihna thuk takin a thlen leh a rahchhuah pahnih te kha han sawi teh. 2
25. Chawngmawii te khua leh Hrangchhuana te khua an tuathu chhiat chhan kha tawi fel takin han sawi teh. 4

2022
NEPALI
Full Marks – 80
Time – 3 Hours

General Instructions :

- (i) All questions are compulsory.
- (ii) Figures in the margin indicate marks.
- (iii) Write your answers neatly and legibly.
- (iv) While attempting a question, write the question number as given in the question paper.

खण्ड – 'क' (पठन : 10 अंक)

1. तलको दिइको गद्यांश पढेर सोधिएका प्रश्नहरूको उत्तर सरल भाषामा लेख :

भारतवर्षमा आज बोलिने, लेखिने नयाँ भारतीय आर्य भाषाहरू (हिन्दी, बांग्ला, असमी, पंजाबी, कश्मीरी आदि) को जन्म संस्कृत भाषाबाट भएको हो । नेपाली भाषाको जन्म पनि संस्कृत भाषाबाट नै भएको हो । तर भव्य भारतीय आर्य भाषाहरूको जन्म सोझै संस्कृतबाट भएको भने होइन । संस्कृतबाट पछि सात प्राकृत भाषा भए, शौरसेनी, मागधी आदि । सात प्राकृतबाट पछि उसरी नै सात अपभ्रंश भाषाहरू भए । प्राकृत र अपभ्रंश भाषाहरूलाई मध्य भारतीय भाषा भनिन्छ ।

प्राध्यापक टुच्चीको अनुसन्धान अनुसार बाह्रौँ शताब्दीसम्ममा खसहरूले पश्चिम नेपालमा आक्रमण गरी खसान राज्य बसाइसकेका थिए भनि सेन्जामा आफ्नो राजधानी स्थापित गरेका थिए । सेन्जाका एक खस राजा पुण्यमल्लको ताम्रपत्र सन् 1337 को पाइएको छ । नेपाली भाषाको अहिलेसम्म पाइएको सबभन्दा पुरानो लिखित प्रमाण यही हो । राजा पुण्यमल्लले आफ्नो छोरालाई पढाउने जयाकर पण्डितलाई पाँच गाउँ विर्तादिदा यो ताम्रपत्र गोल्लहण जोइसीलाई लेख्न लाएका थिए । यी खसहरूले खस प्राकृत भाषा बोल्थे भनेर ग्रीयसन र मुनीति कुमार चटर्जीले अनुमान गरे अनि नेपाली भाषाको जन्म खस प्राकृतबाट भएको हुनुपर्छ भन्ने उनीहरूको भनाई छ ।

- | | |
|--|---|
| (क) भारतवर्षमा बोलिने भाषाहरूको मूल श्रोत कुन भाषा हो ? | 1 |
| (ख) नव्य (नया) भारतीय भाषाहरू के के हुन ? | 1 |
| (ग) संस्कृतका प्राकृत र अपभ्रंश भाषाहरूको अर्को नाउँ के हो ? | 1 |

- (घ) खसहरूको राज्यको राजधानीको नाउं के थियो ? 1
- (ङ) नेपाली भाषामा लेखिएको सबैभन्दा पुरानो ताम्रपत्र कुन हो ? 1
- (च) खसहरूले कहिले नेपालमा राज्य बसाएका थिए ? 1
- (छ) के नव्य भारतीय आर्य भाषाहरूको जन्म सोझै संस्कृतबाट भएको हो ? यदि होइन भने यी भाषाहरूको जन्म कसरी भयो ? 1+1=2
- (ज) खस भाषाको ताम्रपत्र कहिले, किन लेखिएको थियो ? 2

खण्ड - 'ख' (व्याकरण और रचना : 25 अंक)

2. (क) छात्रावासमा बस्ने आफ्नो भाईलाई दशैको बिदामा घर नआएको कारण सोध्दैउटा व्यक्तिगत पत्र लेख । 5
अथवा
- (ख) मान कि तिमी कम्प्यूटर नेटवर्क, आइजोलको मालिक मदन हो । तलका चिजहरु क्यापिटल कागो द्वारा झट्टै पठाइदिने आग्रह गर्दै अनि सो चिजहरूको लागि रु 5,00,000.00 उनीहरूको बैंक खातामा हालिदिएको जनाउँदै विक्रय प्रबन्धक कम्प्यूटर हाउस, चांदनीचोक, दिल्लीलाई व्यापारीक पत्र लेख । 5
3. कुनै एक विषयमा लगभग 250 शब्दको निबन्ध रचना गर : 8
- (क) कोविट-19 महामारी
- (ख) मोबाइल फोन - लाभ र हानी
- (ग) टोकियो ओलम्पिक -2020
4. खाली ठाँउ भरेर उखान पूरा गर : (कुनै दुई) 1+1=2
- (क) आफ्नो _____ जगन्नाथ ।
- (ख) तै रानी मै रानी कसले _____ कुवाको पानी ।
- (ग) कि रोइस _____ आफ्नै ढगले ।
5. कुनै दुई शब्दहरूले दुई-दुईवटा पर्यायवाची शब्द लेख : 1+1=2
- (क) फूल
- (ख) पानी
- (ग) घर

6. कुनै दुई शब्द-समूहको सार शब्द लेख : 1+1=2
- (क) जो मासु खान्छ
(ख) जो कहिल्यै मर्दैन
(ग) जसले ईश्वर मान्छ
7. तलका कुनै दुई अनेकार्थक शब्दहरूको बेग्ला-बेग्लै अर्थ निस्कने गरी तिनीहरूलाई चलाएर दुई-दुईवटा वाक्य रचना गर : 1+1=2
- (क) हार
(ख) तान
(ग) वर
8. कुनै दुई भिन्नार्थक शब्दहरूका बेग्ला-बेग्लै अर्थ बुझाउन तिनीहरूको प्रयोगद्वारा वाक्य रचना गर : 1+1=2
- (क) दियो, दीयो
(ख) चिन, चीन
(ग) फुल, फूल
9. कुनै दुई वाग्धाराको अर्थ खोल्न तिनीहरूलाई चलाएर वाक्य रचना गर : 1+1=2
- (क) मुख लाग्नु
(ख) नाक राख्नु
(ग) मन मार्नु

खण्ड - 'ग' (साहित्य : 45 अंक)

10. बहादुर हिजो-आज के गर्न बाध्य छन् ? 1
11. सुगा के मा थुनिएको छ ? 1
12. उकन गरी-पत्थर जालमाहाँ फसाई
अब तिमि नसताऊ दुखिनी पन्छिलाई
गरुँ कति भन तिप्रो जाबिमा अश्रुपात
गरदछु शत बिन्ती छाडिघौ हे निषाद ।
उक्त पद्यांश कुन कविताबाट लिइएको हो ? 1
13. भिखारी कविता का कवि को हुन ? 1
14. 'हामी बहादुर' कवितामा युवाहरूलाई कस्ता चुनौती दिएका छन् ? 2

15. जाबीको चराले शिकारीसित कस्ता बिन्तीहरु पोखेका छन् ? 2
16. कविले भिखारीबारे कस्ता कल्पना गरेका छन् ? 2
17. कुनै एक प्रश्नको उत्तर देऊ : 5
- (क) पिंजराको सुगाले कस्ता दुःख भोगि रहेको छ ?
- (ख) हामी बहादुर कवितामा कवि ले बहादुर गौर्खाली को कस्तो अवस्था दर्शाउनु भएको छ ?
18. संक्षेपमा उत्तर देउ : 6×1=6
- (क) चामे गुन्द्री ओछ्याएर कता सुत्यो ?
- (ख) स्वाध्याय निबन्धको लेखक को हुन ?
- (ग) ऐटन साहेबका नेपाली गुरु को थिए ?
- (घ) नौमती बाजा निबन्ध अनुसार प्रत्येक नेपाली को कर्तव्य र दायित्व के हो ?
- (ङ) हाम्रो मातृभाषा के हो ?
- (च) मानिसको जीवनलाई रसीलो बनाउने के हो ?
19. सन 1828 तिर नेपाल राज्यभित्र कति थरीका के के बोली बोलीनथे ? 2
20. "तपाईं लाई कसैमाथि शङ्का हुन्छ ?" 1+1=2
- यो कसले, कसलाई भनेको हो ?
21. स्वाध्याय भनेको के हो ? 2
22. इयाउरे छन्दबारे लेख । 3
23. कसरी खस भाषा नेपालको राजभाषा बन्यो ? 4
24. 'बादल जतिसुकै कालो होस् त्यसको भित्री चाँदी जस्तो सेतो हुन्छ ।' यो कथनको भाव स्पष्ट गर । 4
25. कृष्णरायको चरित्र चित्रण गर । 7

2022
PHYSICS
(Theory)
Full Marks – 70
Time – 3 Hours

General Instructions :

- (i) All questions are compulsory.
- (ii) Marks for each question are indicated against it.
- (iii) Use log table, if necessary.
- (iv) Use of calculator is not allowed.

1. An uncharged insulated conductor A is brought near a charged insulated conductor B. Which one is the correct statement for the conductor B ? 1
 - (a) Charge remains same but potential decreases
 - (b) Both charge and potential decrease
 - (c) Charge decreases but potential remains same
 - (d) Both charge and potential increase

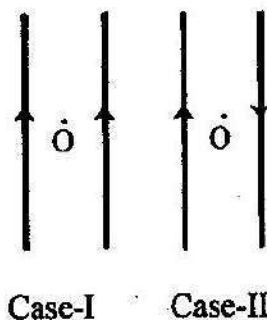
2. If the electric field is given by $6\hat{i} + 3\hat{j} + 4\hat{k}$, what is the electric flux through a surface of area 20 units lying in YZ plane – 1
 - (a) 120 units (b) 60 units
 - (c) 80 units (d) 260 units

3. Of the two bulbs in a house, one glows brighter than the other. Which of the two has a larger resistance ? 1
 - (a) The brighter bulb
 - (b) The dim bulb
 - (c) Both have same resistance
 - (d) The brightness does not depend upon the resistance

P.T.O.

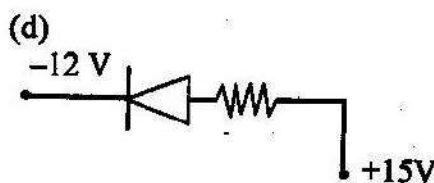
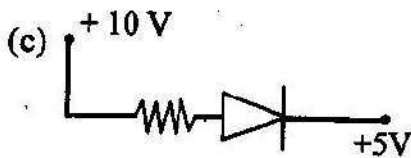
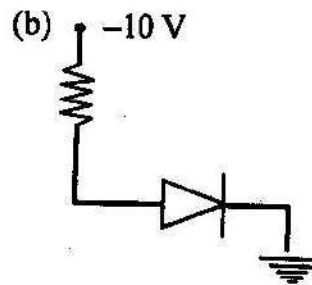
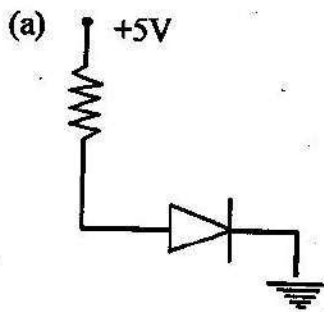
4. In the figure given below, if B is the magnetic field produced by individual wire, current in each wire being the same, then the resultant magnetic field at O in the two cases will be – 1

- (a) zero in both cases
 (b) 2B in both cases
 (c) zero in case-I and 2B in case-II
 (d) zero in case-II and 2B in case-I



5. A charged particle is moving through magnetic field. Then the magnetic field – 1
- (a) always exerts a force on the particle
 (b) never exerts a force on the particle
 (c) exerts a force, if the particle is moving at right angle to the field
 (d) exerts a force, if the particle is moving along the field
6. Identify the correct statement – 1
- (a) α -rays have highest penetrating power
 (b) β -rays have highest penetrating power
 (c) γ -rays have highest penetrating power
 (d) All three are equally penetrating
7. The electromagnetic waves used in telecommunications are – 1
- (a) ultraviolet (b) infrared
 (c) visible (d) microwaves
8. The power of a lens of focal length 50 cm is – 1
- (a) +5D (b) +2D
 (c) -5D (d) -2D
9. Which of the following equations is true for de-Broglie wavelength ' λ ' of a particle of mass 'm' moving with velocity 'v'? 1
- (a) $\lambda \propto mv$ (b) $\lambda \propto \frac{1}{mv}$
 (c) $\lambda \propto \frac{v}{m}$ (d) $\lambda \propto \frac{m}{v^2}$

10. Light of wavelength 5000 \AA falls on a photo-sensitive plate with photoelectric work function of 1.9 eV . The kinetic energy of the photoelectrons emitted will be - 1
- (a) 0.58 eV (b) 2.48 eV
 (c) 1.24 eV (d) 1.16 eV
11. The nuclear force between the two nucleons is the result of the exchange of - 1
- (a) neutrino (b) π -meson
 (c) photon (d) μ -meson
12. When the hydrogen atom is in first excited level, its radius is - 1
- (a) four times its ground state radius (b) twice as its ground state radius
 (c) same as its ground state radius (d) half of its ground state radius
13. Number of holes are equal to number of electrons in - 1
- (a) p-type semiconductor (b) n-type semiconductor
 (c) intrinsic semiconductor (d) All of these
14. In the following figures, which one of the diodes is reverse biased? 1



15. State Ohm's law. Write the SI unit of conductance.

1+1=2

16. Define the following terms :

(a) Magnetic declination

(b) Magnetic inclination

17. Why does a capacitor block DC whereas an inductor allows easy path to it ? 2

18. Write two properties of electromagnetic waves. 2

19. (a) Calculate the refractive index of the material of equilateral prism for which the angle of minimum deviation is 60° . 2

OR

(b) In Young's double slit experiment, interference fringes were produced on a screen placed at 1.5 m from the two slits 0.3 mm apart and illuminated by light of 6400 \AA . Find the width of the fringe. 2

20. A ray of light of frequency $5 \times 10^{14} \text{ Hz}$ is passed through a liquid. The wavelength of light measured inside the liquid is found to be $450 \times 10^{-9} \text{ m}$. Calculate the refractive index of the liquid. 2

21. (a) What is Light Emitting Diode (LED) ? State the factor which controls the wavelength of light emitted by a LED and how ? $1+\frac{1}{2}+\frac{1}{2}=2$

OR

(b) What is donor energy level ? Explain. 2

22. Two point charges equal to $+10 \mu\text{C}$ and $+20 \mu\text{C}$ are 1m apart. What is the amount of work done to bring them closer by 50 cm ? 3

23. The electrical resistance of a 5 m long wire is 3Ω . Calculate the electrical resistivity and conductivity, if its cross-sectional area is 0.03 mm^2 . 3

24. With the help of a circuit diagram, explain how a potentiometer can be used to compare emfs of two cells. 3

25. (a) Using Ampere's circuital law, derive the expression for magnetic field at a point due to an infinitely long wire carrying current I . 3

OR

- (b) What is a galvanometer? With the help of a schematic diagram, explain how it can be converted into a voltmeter. 3
26. (a) The magnetic flux through a coil perpendicular to its plane is varying according to the relation $\phi = (4t^3 + 5t^2 + 8t + 5)$ Weber. Calculate the induced current through the coil at $t=2s$, if the resistance of the coil is 3.1Ω . 3

OR

- (b) Find the virtual value of current through a capacitor of capacitance $10 \mu F$, when connected to a source of 110 volt at 50 cycles supply. What is its reactance? 3
27. The focal length of a glass convex lens in air is 15 cm. Calculate its focal length, when it is completely immersed in water. Given: ${}^a\mu_w = \frac{4}{3}$ and ${}^s\mu_g = 1.5$. 3
28. Derive the relation $\delta = A(\mu - 1)$, for a small angled prism, where the symbols have their usual meanings. 3
29. Distinguish between nuclear fission and nuclear fusion. 3
30. What is photoelectric effect? Write the laws of photoelectric effect. 3
31. (a) Define capacitance. Write its S.I Unit. Derive an expression for the electrostatic energy stored in a charged capacitor. 1+1+3=5

OR

- (b) Is electric field intensity a scalar or vector quantity? Give its SI Unit. Derive the expression for electric field intensity at any far point due to an electric dipole. 1+1+3=5
32. (a) Define instantaneous power of an a.c. circuit. Derive an expression between true power and virtual power of an a.c. circuit. 1+4=5

OR

- (b) What is meant by self-induction and co-efficient of self induction ? Derive an expression for the co-efficient of self-induction for a long air-cored solenoid.

1+1+3=5

33. (a) Define magnifying power of an astronomical telescope. With the help of a ray diagram, derive the expression for the magnifying power of a telescope for its normal adjustment.

1+1+3=5

OR

- (b) State Huygen's principle and prove the laws of refraction on the basis of wave theory.

2+3=5

Physical constants :

$\frac{1}{4\pi\epsilon_0}$	=	$9 \times 10^9 \text{ Nm}^2\text{C}^{-2}$
ϵ_0	=	$8.854 \times 10^{-12} \text{ C}^2 \text{ N}^{-1}\text{m}^{-2}$
c	=	$3 \times 10^8 \text{ ms}^{-1}$
e	=	$1.6 \times 10^{-19} \text{ C}$
m_e	=	$9.1 \times 10^{-31} \text{ Kg}$
m_p	=	$1.67 \times 10^{-27} \text{ Kg}$
h	=	$6.6 \times 10^{-34} \text{ Js}$
G	=	$6.67 \times 10^{-11} \text{ Nm}^2 \text{ Kg}^{-2}$
g	=	9.8 ms^{-2}
1 \AA	=	10^{-10} m
1 amu	=	931 MeV
μ_0	=	$4\pi \times 10^{-7} \text{ TA}^{-1}\text{m}$