

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

T.B.C. : SDGH-U-GKS

Test Booklet Series

Serial No.

1022205

TEST BOOKLET

PAPER—I

(General Studies)

Time Allowed : Two Hours

Maximum Marks : 100

A

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the Answer Sheet liable for rejection.
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. *DO NOT* write anything else on the Test Booklet.
4. This Test Booklet contains **120** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
5. You have to mark all your responses **ONLY** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong answers :**
THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.
 - (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to that question will be deducted as penalty.
 - (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
 - (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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1. Deserts are generally located at

 - (a) Equatorial region
 - (b) Polar region
 - (c) about 30° latitude
 - (d) about 65° latitude
2. Which one of the following has the adaptation 'echolocation' to detect the prey?

 - (a) Rattlesnake
 - (b) Barn owl
 - (c) Grasshopper
 - (d) Bat
3. Which one of the following is the most important stage in the process of ecological succession?

 - (a) Claim
 - (b) Acceptance by community members
 - (c) Reaction
 - (d) Settlement
4. In which one of the following trophic structures of ecosystems, both fungi and bacteria occur?

 - (a) Decomposer
 - (b) Autotroph
 - (c) Heterotroph
 - (d) Food web
5. The uplift mechanism that takes place when lighter warm moist air mass rises after encountering a colder and denser air mass causes

 - (a) conventional precipitation
 - (b) frontal precipitation
 - (c) cyclonic precipitation
 - (d) orogenic precipitation
6. Which one of the following managed ecosystems has the highest amount of standing crop?

 - (a) Agricultural land
 - (b) Grazing land
 - (c) Human habitation
 - (d) Forest plantation
7. Who among the following was the Viceroy of India in 1905, when the Partition of Bengal was announced?

 - (a) Lord Ripon
 - (b) Lord Canning
 - (c) Lord Curzon
 - (d) Lord Minto
8. *Nil Darpan*, which deals with the condition of indigo planters, was written by

 - (a) Michael Madhusudan Dutta
 - (b) Bankim Chandra Chatterjee
 - (c) Lal Behari Dey
 - (d) Dinabandhu Mitra

9. Who among the following revolutionaries founded the Hindustan Socialist Republican Army?

- (a) Ashfaqullah
- (b) Batukeshwar Dutta
- (c) Ram Prasad Bismil
- (d) Chandra Shekhar Azad

10. Chronologically arrange the following events :

1. Invasion of Alexander
2. Indo-Greek Rule in the North-West
3. Accession of Kanishka
4. Accession of Chandragupta Maurya

Select the correct answer using the code given below.

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

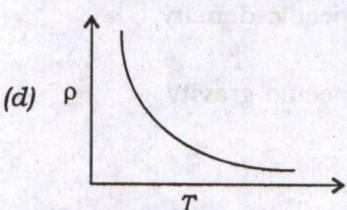
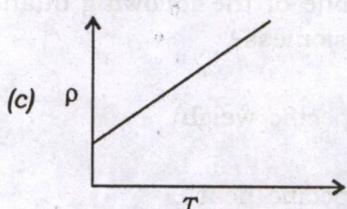
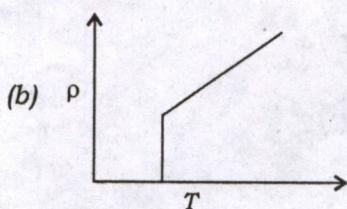
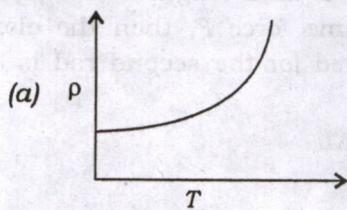
11. Consider the following statements :

1. Ajanta paintings depict stories from the *Jatakas*.
2. Ajanta paintings depict scenes of court-life, processions, men and women at work, festivals, etc.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

12. Which one of the following schematic graphs correctly represents qualitatively the variation of resistivity ρ with respect to temperature T for a semiconductor?



13. Which one of the following semiconductors possesses the highest value of band gap E_g ?

- (a) Si
- (b) Ge
- (c) GaAs
- (d) PbS

14. A steel rod having radius r and length L gets stretched along its length by ΔL , when a force F is applied to it. If another rod made of the same material having radius $2r$ and length L is subjected to the same force F , then the elongation observed for the second rod is

(a) $4\Delta L$

(b) $2\Delta L$

(c) $\Delta L / 4$

(d) $\Delta L / 2$

15. Which one of the following quantities is dimensionless?

(a) Specific weight

(b) Specific heat

(c) Specific density

(d) Specific gravity

16. Which one of the following is the correct order of increase of the atomic radius of the elements?

(a) C < B < Si < Al

(b) C < B < Al < Si

(c) C < Si < B < Al

(d) Si < Al < C < B

17. The oxidation state and covalency of Al in $[AlCl(H_2O)_5]^{2+}$ are

(a) +3 and 3

(b) +3 and 6

(c) +2 and 6

(d) +2 and 1

18. What is the total number of orbitals associated with the principal quantum number 3?

(a) 3

(b) 6

(c) 9

(d) 12

19. The phenomenon of radioactivity was first discovered by

(a) Marie Curie

(b) Henri Becquerel

(c) Frederick Soddy

(d) Ernest Rutherford

20. Which one of the following is the correct electronic configuration of copper?

(a) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$

(b) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9 4s^2$

(c) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2$

(d) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$

21. Which one of the following is the shape of BrF_5 ?

- (a) Octahedral
- (b) Square planar
- (c) Square pyramidal
- (d) Trigonal bipyramidal

22. Which of the following statements regarding the Panchayat system is/are correct?

1. The Constitution of India envisages a three-tier system of Panchayat.
2. Intermediate Panchayat stands between the village and district Panchayats in the State where the population is above 20 lakhs.
3. All the seats in a Panchayat shall be filled by direct election from territorial constituencies in the Panchayat area.

Select the correct answer using the code given below.

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

23. Which one of the following is *not* a Fundamental Duty enshrined in the Constitution of India?

- (a) To abide by the Constitution and respect its ideals and institutions
- (b) To protect the national animal and national bird
- (c) To value and preserve the rich heritage of India's composite culture
- (d) To safeguard public property and abjure violence

24. Which of the following statements regarding the President of India is/are correct?

1. The President of India is elected by an electoral college in accordance with the system of proportional representation by means of the single transferable vote.
2. The elected members of the Legislative Assemblies of Union Territories of Delhi and Puducherry take part in the election of the President of India.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

- 25.** Which one of the following is **not** an objective of One Stop Centre scheme?
- (a) To stop gender-based violence
 - (b) To support women affected by violence
 - (c) To provide cheaper credit to self-help groups
 - (d) To provide specialized services to aggrieved women including victims of acid attack
- 26.** The movement of a substance against a diffusion gradient with the use of energy is known as
- (a) active transport
 - (b) passive transport
 - (c) water potential gradient
 - (d) solute loss
- 27.** Which one of the following has non-nucleated cells at maturity?
- (a) Xylem parenchyma
 - (b) Xylem fibre
 - (c) Palisade parenchyma
 - (d) Companion cell
- 28.** Microscopic, branched and thread-like structures, which can grow and absorb nutrition from organic matter, are found in
- (a) bacteria
 - (b) viruses
 - (c) fungi
 - (d) algae
- 29.** What is the number of chromosomes found in human somatic cell?
- (a) 48
 - (b) 56
 - (c) 46
 - (d) 42
- 30.** Which one of the following animals lays eggs to reproduce?
- (a) Dolphin
 - (b) Seal
 - (c) Platypus
 - (d) Whale
- 31.** Bt Cotton is a genetically modified crop with a foreign gene from
- (a) *Bacillus thermolactis*
 - (b) *Bacillus thuringiensis*
 - (c) *Bacillus thermophilus*
 - (d) *Bacillus tequilensis*

32. In deep ponds and lakes, which one of the following vertical zones receives least light penetration?

- (a) Surface
- (b) Littoral zone
- (c) Limnetic zone
- (d) Profundal zone

33. What is ecological amplitude?

- (a) The range of demands and consequent range of tolerance of a species to the fluctuations in environmental conditions
- (b) The range of tolerance of a species in constant environmental conditions
- (c) The range of demands of a species in constant environmental conditions
- (d) The range of ecological conditions found in a biome

34. Which one of the following organisms can live both in air (outside water) and in water?

- (a) Xerocole
- (b) Mesocole
- (c) Secondary hydrocole
- (d) Mesophyte

35. What is 'duff'?

- (a) Partially decomposed litter
- (b) Weathered rock
- (c) Muddy puddle
- (d) Carcass of a dead animal

36. Which one of the following is a gravity transported soil?

- (a) Alluvial
- (b) Eolian
- (c) Colluvial
- (d) Glacial

37. What is 'pyrophilous organism'?

- (a) Fresh grass growing after ground fire
- (b) Fungi growing in soils of burnt terrains
- (c) Seeds germinating after clear felling of forest
- (d) Organisms with capacity to regenerate the tail after it was lost due to damage

38. Which one among the following States of India experienced the highest fall in population growth rate during 2001–2011 in relation to the previous decade?

- (a) Andhra Pradesh
- (b) Maharashtra
- (c) Tamil Nadu
- (d) Madhya Pradesh

39. Which one of the following statements about the Austric family of languages spoken in India is **not** correct?

- (a) The Austro-Asiatic sub-family of Austric family of languages has Mon-Khmer and Munda as its two main branches.
- (b) The Munda group of languages is spoken only by the Munda tribes living in Chota Nagpur.
- (c) The Mon-Khmer language speakers are found in two non-contiguous areas of Meghalaya Plateau and Nicobar Islands.
- (d) The Khasi language of Meghalaya belongs to the Mon-Khmer branch of Austric family.

40. Which of the following statements about farming in India is/are correct?

- 1. Dryland farming is confined to the regions having annual rainfall less than 100 cm.
- 2. Wetland farming regions are often susceptible to flood and soil erosion hazards.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

41. Which one of the following is a lagoon?

- (a) Pulicat
- (b) Deepor Beel
- (c) Kolleru
- (d) Gohna

42. Which one of the following is **not** observed by the stations operated by the Central Water Commission?

- (a) Water level
- (b) Silt
- (c) Water conservation
- (d) Water discharge

43. In a beta decay process, a nucleus spontaneously emits an electron (or positron) accompanied by the emission of antineutrino (or neutrino). Which one of the following statements is **not** true about neutrinos/antineutrinos?

- (a) They are uncharged particles.
- (b) Their masses are very small in comparison to that of an electron.
- (c) They possess charge of magnitude equal to electric charge.
- (d) They interact with other particles through weak force only.

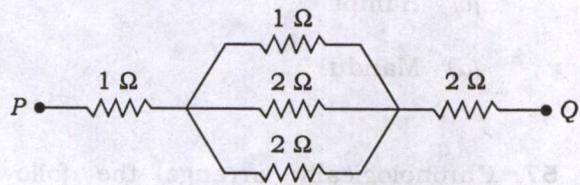
44. The radius of the first orbit ($n = 1$) of a hydrogen atom is 0.529 \AA . Then the radius of the second orbit ($n = 2$) of He^+ ion will be

- (a) 1.058 \AA
- (b) 2.116 \AA
- (c) 4.232 \AA
- (d) 0.529 \AA

45. Which one of the following statements for the emission spectrum of hydrogen is true?

- (a) The Lyman series lies in the visible region and the Paschen series lies in the infrared region.
- (b) The Lyman series lies in the ultraviolet region and the Paschen series lies in the visible region.
- (c) Both the Lyman and the Paschen series lie in the visible region.
- (d) The Lyman series lies in the ultraviolet region and the Paschen series lies in the infrared region.

46. Consider the following combination of resistors :



The equivalent resistance of the combination of resistors between P and Q is

- (a) 2 Ω
- (b) 3 Ω
- (c) 3.5 Ω
- (d) 2.5 Ω

47. Which one of the following zones of atmosphere is the farthest from the earth surface?

- (a) Stratosphere
- (b) Mesosphere
- (c) Ionosphere
- (d) Troposphere

48. Which one of the following ecological adaptations is **not** 'dormancy'?

- (a) Hibernation
- (b) Aestivation
- (c) Diapause
- (d) Cyclomorphosis

49. What are 'circadian rhythms'?

- (a) Daily responses of animals to light conditions
- (b) Growth of plant tip with changing light direction
- (c) Annual responses of living organisms to light conditions
- (d) Daily responses of animals to water availability

50. What is 'bioenergetic approach' in modern ecology?

- (a) Study of similarities and differences in food relationships among living organisms and various forms of energy supporting their life
- (b) Study of energy retention by ecosystems under threat
- (c) Study of energy loss by ecosystems under threat
- (d) Study of energy in deep oceans during cyclone buildup

- 51.** Which one of the following is defined as a natural biological unit tied together by the sharing of a common gene pool?
- (a) Vegetation
 - (b) Flora
 - (c) Fauna
 - (d) Species
- 52.** Which one of the following is *not* a non-renewable energy source?
- (a) Coal
 - (b) Oil
 - (c) Sunlight
 - (d) Nuclear fuel
- 53.** The typical Nagara style Shikhara is visible in which one of the following temples?
- (a) Brihadeshwara Temple, Thanjavur
 - (b) Dashavatara Temple, Deogarh
 - (c) Kailasanatha Temple, Ellora
 - (d) Meenakshi Temple, Madurai
- 54.** Which one of the following Harappan centres specialized in making shell objects?
- (a) Balakot
 - (b) Kalibangan
 - (c) Mohenjo-daro
 - (d) Banawali
- 55.** Who among the following was the first to decipher the Ashokan inscriptions?
- (a) William Jones
 - (b) John Marshall
 - (c) James Prinsep
 - (d) Alexander Cunningham
- 56.** The structure of Mahanavami Dibba is situated in which one of the following places?
- (a) Ujjain
 - (b) Gaur
 - (c) Hampi
 - (d) Mandu
- 57.** Chronologically arrange the following events :
1. Third Battle of Panipat
 2. Invasion of Nadir Shah
 3. Impeachment of Warren Hastings
 4. The Diwani of Bengal transferred to the East India Company
- Select the correct answer using the code given below.
- (a) 2-1-4-3
 - (b) 3-4-2-1
 - (c) 1-3-4-2
 - (d) 4-3-2-1

58. Lassaigne's test is used for the detection of which of the following elements?

- (a) N, S, P, Cl
- (b) C, N, P, Br
- (c) C, N, S, I
- (d) C, N, S, Br

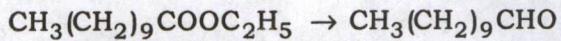
59. What is the use of heavy water?

- (a) It is used in nuclear reactors as a moderator
- (b) It is used in nuclear reactors as fuel
- (c) It is used in radiation therapy for cancer
- (d) It is used in water softening plants

60. Which one of the following statements about Fehling's test is **not** correct?

- (a) Fehling's A solution is aqueous copper sulphate.
- (b) Fructose gives a positive Fehling's test.
- (c) Red-brown ppt of CuO is obtained in the reaction.
- (d) Aromatic aldehydes do not respond to this test.

61. Which one of the following reagents is used to carry out the transformation given below?



- (a) DIBAL-H/H₂O
- (b) H₂/Pd-BaSO₄
- (c) SnCl₂/HCl
- (d) LiAlH₄

62. The electrophile generated in sulphonation of benzene from fuming sulphuric acid is

- (a) SO₃⁺
- (b) SO₃H
- (c) SO₃
- (d) SO₂H

63. The reaction of 1,2-dibromoethane with alcoholic KOH yields

- (a) ethene
- (b) ethyne
- (c) 1-bromo-2-hydroxyethane
- (d) 1-bromoethene

64. Consider the following statements regarding Janani Suraksha Yojana (JSY) :

1. JSY is a safe motherhood intervention under the National Health Mission.
2. The objective of JSY is to reduce maternal and neonatal mortality.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

65. Which one of the following statements regarding Jan Shikshan Sansthan (JSS) is **not** correct?

- (a) JSS aims to provide vocational skills to non-literate, neo-literate and person with rudimentary level of education.
- (b) JSS is meant for vocational education of women only.
- (c) JSS works at the doorstep of the beneficiaries.
- (d) JSS receives grants from the government for skill development.

66. According to the National Multi-dimensional Poverty Index (MPI) constructed by the NITI Aayog, the education dimension is represented by parameters pertaining to

1. school attendance
2. years of schooling
3. literacy rate in the region

Select the correct answer using the code given below.

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

67. What is Academic Bank of Credit (ABC) as per the National Education Policy (NEP), 2020?

- (a) ABC enables credits awarded to students for one programme from a recognized higher education institution to be transferred or redeemed by another higher education institution
- (b) ABC is the bank account of the students for direct transfer of scholarship
- (c) ABC is the newly created institution for providing credits to academic institutions for building infrastructure
- (d) ABC is an autonomous banking system dealing with the financial management of higher education institutions under NEP, 2020

68. Which one of the following expressions has dimensions of energy (here V is the voltage across a resistor of resistance R and I is the current through the resistor, and t is the time)?

- (a) $\frac{V^2}{I} t$
- (b) $\frac{V^2}{R} t$
- (c) $\frac{I^2}{R} t$
- (d) $\frac{I^2}{V} t$

69. The angular acceleration of a simple pendulum at an angle α from the vertical is proportional to

- (a) $\tan \alpha$
- (b) $\sin^2 \alpha$
- (c) $\sin \alpha$
- (d) $\sin 2\alpha$

70. Which one of the following statements about X-rays is **not** correct?

- (a) X-rays are longitudinal waves.
- (b) X-rays are transverse waves.
- (c) X-rays are electromagnetic waves.
- (d) X-rays do not require a medium to propagate.

71. The magnitude of work done in moving an electron across two points having a potential difference 6 V is (electronic charge = 1.6×10^{-19} C)

- (a) 1.2×10^{-19} J
- (b) 9.6×10^{-19} J
- (c) 4.8×10^{-19} J
- (d) 1.6×10^{-19} J

72. Reverberation of sound ensures

- (a) a single refraction
- (b) a single reflection
- (c) multiple reflections
- (d) multiple refractions

73. Which one of the following would be a suitable plant to test that chlorophyll is necessary for photosynthesis?

- (a) Lady Plymouth
- (b) Cactus
- (c) Cuscuta
- (d) Oleander

74. Quadrat is generally used to enumerate the number of

- (a) animals breeding in a pond
- (b) burrows present in an anthill
- (c) plants present in a unit area
- (d) epiphytes on a tree

75. "Athlete's foot" is a skin disease caused by

- (a) virus
- (b) fungus
- (c) alga
- (d) bacterium

76. Which one of the following is a 'false fruit'?

- (a) Peach
- (b) Banana
- (c) Apple
- (d) Apricot

77. Which one among the following States is the largest producer of natural gas in India?

- (a) Madhya Pradesh
- (b) Jharkhand
- (c) Bihar
- (d) Rajasthan

78. Which of the following statements about river valleys is/are correct?

- 1. Kullu Valley is an example of strike valley.
- 2. Kangra Valley is a transverse valley.
- 3. Narmada flows in a rift valley.

Select the correct answer using the code given below.

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

79. The Kumaon Himalayas lie between

- (a) Indus River and Satluj River
- (b) Satluj River and Kali River
- (c) Chenab River and Satluj River
- (d) Bhagirathi River and Alaknanda River

80. Which one of the following glaciers is *not* part of Pir Panjal Range?

- (a) Urdok
- (b) Sonapani
- (c) Bara Shigri
- (d) Gangri

81. Little Andaman is separated from Great Andaman by

- (a) Ten Degree Channel
- (b) Homfray's Strait
- (c) Duncan Passage
- (d) Austen Strait

82. Which one of the following is the international convention/agreement specifying the commitments of different countries to mitigate climate change?

- (a) Montreal Protocol
- (b) Kyoto Protocol
- (c) Paris Agreement
- (d) Bali Agreement

83. Which one of the following is a known metallophyte for Fe?

- (a) *Eichhornia crassipes*
- (b) *Miconia lutescens*
- (c) *Astragalus acemosus*
- (d) *Mentha arvensis*

84. Which one of the following is a 'drupe'?

- (a) Orange
- (b) Brinjal
- (c) Coconut
- (d) Tomato

- 85.** Duckweed or Azolla is used as a/an
- pesticide
 - biofertilizer
 - arsenic indicator
 - antiseptic
- 86.** Which one of the following 'algae' is **not** known identified partner to form 'lichen'?
- Nostoc*
 - Stigonema*
 - Trentepohlia*
 - Vaucheria*
- 87.** Which one of the following is a secondary metabolite produced by some plants?
- Starch
 - Terpenoids
 - Malate
 - Sugar
- 88.** What is 'phenology'?
- Study of phenol production in plants
 - Study of periodical phenomena of plants, such as the time of flowering in relation to climate
 - Study of excretory pathway of phenols by herbivores
 - Study of phenotypic variation in newborn individuals of cats
- 89.** The ozonolysis of which one of the following alkenes yields a mixture of propan-2-one and formaldehyde?
- Propene
 - Butene
 - 2-Methylpropene
 - 2-Methylbutene
- 90.** Which one of the following compounds is used for the synthesis of silicones?
- SiCl_4
 - $(\text{CH}_3)_2\text{Si}(\text{OH})_2$
 - SiO_2
 - Na_4SiO_4
- 91.** Which one of the following products is formed by the oxidation of phenol with chromic acid?
- -
 -
 -

92. Which of the following statements relating to SWIFT is/are correct?

1. It is a messaging network used by banks and financial institutions globally for quick and faultless exchange of information pertaining to financial transactions.
2. It stands for Society for Worldwide Interbank Financial Telecommunications.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

93. Which of the following statements relating to the State Election Commissioner is/are correct?

1. The State Election Commissioner is appointed by the Election Commission of India.
2. The State Election Commissioner can be removed only in the same manner as a Judge of a High Court.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

94. Which one of the following statements relating to the duration of Panchayat is **not** correct?

- (a) Every Panchayat shall continue for six years from the date of its first meeting.
 - (b) A Panchayat can be dissolved before the expiry of its term in accordance with the procedure prescribed by State Law.
 - (c) Election to Panchayat must take place within six months of its dissolution.
 - (d) A Panchayat reconstituted after premature dissolution shall continue only for a remainder of the period.
- 95.** Which of the following words/phrases was **not** incorporated into the Preamble to the Constitution of India by the Forty-second Amendment?
- (a) Socialist
 - (b) Secular
 - (c) Unity and integrity of the nation
 - (d) Dignity of the individual

96. Which one of the following statements with regard to the Attorney-General of India as per Article 76 of the Constitution of India is **not** correct?

- (a) The Attorney-General of India is appointed by the Chief Justice of India.
- (b) A person who is qualified to be appointed a Judge of the Supreme Court of India is appointed as the Attorney-General of India.
- (c) In the performance of his/her duties, the Attorney-General shall have right of audience in all courts in the territory of India.
- (d) The Attorney-General shall hold office during the pleasure of the President of India.

97. Which part of independent India had held the first election based on universal adult franchise?

- (a) Hyderabad
- (b) Manipur
- (c) West Bengal
- (d) Nagaland

98. According to the NITI Aayog SDG India Index, 2020–21, which one among the following States is a Front Runner in its performance on SDG-14?

- (a) Tripura
- (b) Maharashtra
- (c) Punjab
- (d) Odisha

99. The force of buoyancy on an object floating on water is F , while it is S on an object that sinks in water. The weight of both the objects is W . Which one of the following is always true?

- (a) $F = W$ and $S = 0$
- (b) Both F and S have upward direction
- (c) F has upward direction and S has downward direction
- (d) $F = W$ and $S > W$

100. Infrasonic sounds have frequencies

- (a) above 25 kHz
- (b) between 20 kHz and 25 kHz
- (c) below 20 Hz
- (d) between 20 Hz and 20 kHz

101. When the temperature of a gas increases, the average speed of its molecules

- (a) remains the same
- (b) decreases
- (c) increases
- (d) either increases or decreases depending on the gas

102. Which one of the following is the quantity of transfer of linear momentum to the floor, when a dumbbell of mass 500 g falls from a height of 5 m and stops after hitting the floor (take $g = 10 \text{ m/s}^2$)?

- (a) 0.5 kg-m/s
- (b) 5.0 kg-m/s
- (c) 10.0 kg-m/s
- (d) 1.0 kg-m/s

103. The gravitational force (\mathbf{F}) on mass M due to another mass m at a distance x is given by (vector \mathbf{x} is from mass M to mass m and unit vector $\hat{\mathbf{x}}$ is the corresponding unit vector)

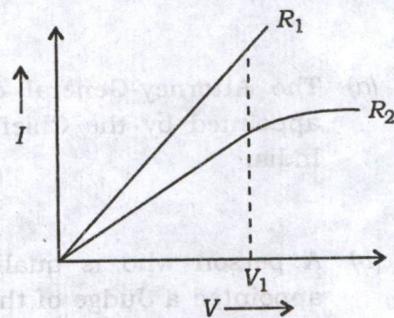
$$(a) \mathbf{F} = G \frac{Mm}{x^3} \mathbf{x}$$

$$(b) \mathbf{F} = -G \frac{Mm}{x^3} \mathbf{x}$$

$$(c) \mathbf{F} = -G \frac{Mm}{x^3} \hat{\mathbf{x}}$$

$$(d) \mathbf{F} = G \frac{Mm}{x^3} \hat{\mathbf{x}}$$

104. The $I-V$ graph for two resistors, resistor 1 (R_1) and resistor 2 (R_2), are shown below :



Which one of the following statements about these resistors is *not* correct?

- (a) R_1 follows Ohm's law.
- (b) R_2 does not follow Ohm's law after voltage V_1 .
- (c) Up to V_1 , the resistance of R_1 is smaller than that of R_2 .
- (d) Up to V_1 , the resistance of R_1 is larger than that of R_2 .

105. In which of the following situations will an applied force do negative work on a body?

- (a) The applied force and displacement of the body are at 135° to each other
- (b) The applied force and displacement of the body are parallel to each other
- (c) The applied force and displacement of the body are perpendicular to each other
- (d) The applied force and displacement of the body are at 45° to each other

106. Which one of the following is a tributary of Krishna River?

- (a) Harangi
- (b) Hiran
- (c) Purna
- (d) Munneru

107. Which of the following statements about breaks in the South-West Monsoon is/are correct?

1. In Northern India, rains are likely to fail if the rain-bearing storms are not very frequent along the monsoon trough.
2. In the West Coast, the dry spells occur when winds blow parallel to the coast.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

108. According to the Solid Waste Management Rules, 2016, the responsibility of waste generators has been fixed for segregation of waste in which of the following streams?

- (a) Biodegradable and non-biodegradable wastes
- (b) Metallic and non-metallic wastes
- (c) Wet, dry and domestic hazardous wastes
- (d) Recyclable and non-recyclable wastes

109. Which one of the following countries is landlocked?

- (a) Paraguay
- (b) Uruguay
- (c) Suriname
- (d) Colombia

110. Which one of the following States of India has the largest area under ravines?

- (a) Uttar Pradesh
- (b) Himachal Pradesh
- (c) Punjab
- (d) Gujarat

111. According to the Climate Change Performance Index (CCPI), 2023, India climbed two spots to rank

- (a) seventh
- (b) eighth
- (c) ninth
- (d) tenth

112. Freddie, Elton, Oban, Siaya, Aasha, Tbilisi, Sasha and Savannah are names of

- (a) nuclear reactors of Ukraine
- (b) cheetahs brought to India from Namibia
- (c) National Parks of Tanzania
- (d) tropical and sub-tropical grasslands

113. Who among the following players won the Golden Boot Award in FIFA World Cup, 2022?

- (a) Lionel Messi
- (b) Kylian Mbappe
- (c) Angel Di Maria
- (d) Thomas Muller

114. Thundi Beach and Kadmat Beach, which recently entered the coveted list of Blue Beaches, an eco-label given to the cleanest beaches in the world, are located in

- (a) Puducherry
- (b) Lakshadweep
- (c) Kerala
- (d) Andaman and Nicobar Islands

115. The recent outbreak of extremely contagious lumpy skin disease affects mostly which one of the following animals?

- (a) Cow
- (b) Dog
- (c) Pig
- (d) Horse

116. According to the United Nations Environment Programme (UNEP), one of the recent large-scale accidental releases of methane gas into the ocean occurred in

- (a) Exxon Valdez
- (b) Nord Stream
- (c) Deepwater Horizon
- (d) Atlantic Empress

117. The area under millets cultivation is the highest in

- (a) Asia
- (b) Africa
- (c) America
- (d) Europe

118. Who among the following is credited with pioneering the oral rehydration therapy?

- (a) Anandi Joshi
- (b) Bidhan Chandra Roy
- (c) Dilip Mahalanabis
- (d) Siddhartha Mukherjee

119. According to scientists, which one of the following is the only known animal, except for humans, capable of telling the difference between odd and even numbers?

- (a) Butterfly
- (b) Honeybee
- (c) Dragonfly
- (d) Cricket

120. Who among the following is the recipient of Nobel Prize in Medicine in 2022?

- (a) David Julius
- (b) Svante Paabo
- (c) Charles M. Rice
- (d) Ardem Patapoutian

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

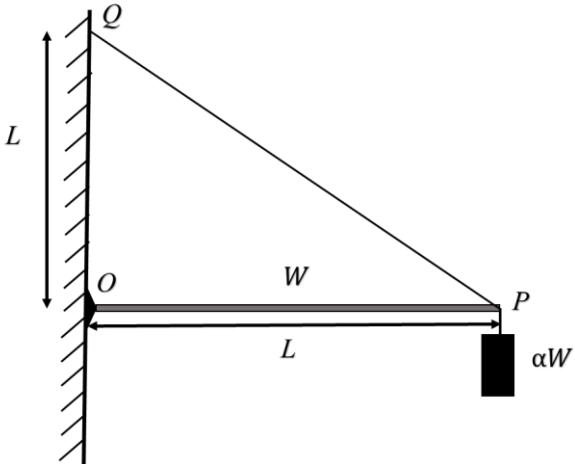
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SECTION 1

- This section contains **SIX (06)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +4 If only (all) the correct option(s) is(are) chosen;
Partial Marks : +3 If all the four options are correct but ONLY three options are chosen;
Partial Marks : +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;
Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks : 0 If unanswered;
Negative Marks : -2 In all other cases.
- For example, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then
choosing ONLY (A), (B) and (D) will get +4 marks;
choosing ONLY (A) and (B) will get +2 marks;
choosing ONLY (A) and (D) will get +2 marks;
choosing ONLY (B) and (D) will get +2 marks;
choosing ONLY (A) will get +1 mark;
choosing ONLY (B) will get +1 mark;
choosing ONLY (D) will get +1 mark;
choosing no option(s) (i.e. the question is unanswered) will get 0 marks and
choosing any other option(s) will get -2 marks.

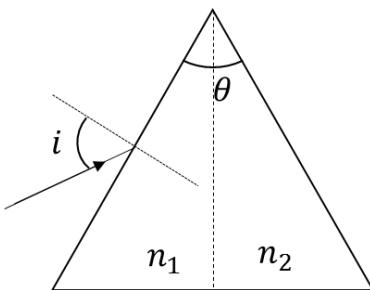
- Q.1 One end of a horizontal uniform beam of weight W and length L is hinged on a vertical wall at point O and its other end is supported by a light inextensible rope. The other end of the rope is fixed at point Q , at a height L above the hinge at point O . A block of weight αW is attached at the point P of the beam, as shown in the figure (not to scale). The rope can sustain a maximum tension of $(2\sqrt{2})W$. Which of the following statement(s) is(are) correct?



- (A) The vertical component of reaction force at O does **not** depend on α
- (B) The horizontal component of reaction force at O is equal to W for $\alpha = 0.5$
- (C) The tension in the rope is $2W$ for $\alpha = 0.5$
- (D) The rope breaks if $\alpha > 1.5$
- Q.2 A source, approaching with speed u towards the open end of a stationary pipe of length L , is emitting a sound of frequency f_s . The farther end of the pipe is closed. The speed of sound in air is v and f_0 is the fundamental frequency of the pipe. For which of the following combination(s) of u and f_s , will the sound reaching the pipe lead to a resonance?

- (A) $u = 0.8v$ and $f_s = f_0$
- (B) $u = 0.8v$ and $f_s = 2f_0$
- (C) $u = 0.8v$ and $f_s = 0.5f_0$
- (D) $u = 0.5v$ and $f_s = 1.5f_0$

- Q.3** For a prism of prism angle $\theta = 60^\circ$, the refractive indices of the left half and the right half are, respectively, n_1 and n_2 ($n_2 \geq n_1$) as shown in the figure. The angle of incidence i is chosen such that the incident light rays will have minimum deviation if $n_1 = n_2 = n = 1.5$. For the case of unequal refractive indices, $n_1 = n$ and $n_2 = n + \Delta n$ (where $\Delta n \ll n$), the angle of emergence $e = i + \Delta e$. Which of the following statement(s) is(are) correct?



- (A) The value of Δe (in radians) is greater than that of Δn
- (B) Δe is proportional to Δn
- (C) Δe lies between 2.0 and 3.0 milliradians, if $\Delta n = 2.8 \times 10^{-3}$
- (D) Δe lies between 1.0 and 1.6 milliradians, if $\Delta n = 2.8 \times 10^{-3}$
- Q.4** A physical quantity \vec{S} is defined as $\vec{S} = (\vec{E} \times \vec{B})/\mu_0$, where \vec{E} is electric field, \vec{B} is magnetic field and μ_0 is the permeability of free space. The dimensions of \vec{S} are the same as the dimensions of which of the following quantity(ies) ?
- (A) $\frac{\text{Energy}}{\text{Charge} \times \text{Current}}$
- (B) $\frac{\text{Force}}{\text{Length} \times \text{Time}}$
- (C) $\frac{\text{Energy}}{\text{Volume}}$
- (D) $\frac{\text{Power}}{\text{Area}}$
- Q.5** A heavy nucleus N , at rest, undergoes fission $N \rightarrow P + Q$, where P and Q are two lighter nuclei. Let $\delta = M_N - M_P - M_Q$, where M_P , M_Q and M_N are the masses of P , Q and N , respectively. E_P and E_Q are the kinetic energies of P and Q , respectively. The speeds of P and Q are v_P and v_Q , respectively. If c is the speed of light, which of the following statement(s) is(are) correct?

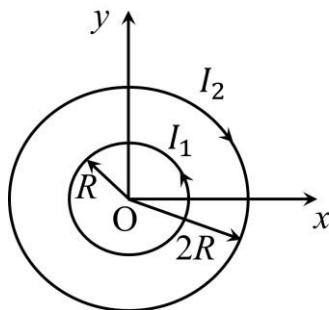
(A) $E_P + E_Q = c^2 \delta$

(B) $E_P = \left(\frac{M_P}{M_P + M_Q} \right) c^2 \delta$

(C) $\frac{v_P}{v_Q} = \frac{M_Q}{M_P}$

(D) The magnitude of momentum for P as well as Q is $c\sqrt{2\mu\delta}$, where $\mu = \frac{M_P M_Q}{(M_P + M_Q)}$

- Q.6** Two concentric circular loops, one of radius R and the other of radius $2R$, lie in the xy -plane with the origin as their common center, as shown in the figure. The smaller loop carries current I_1 in the anti-clockwise direction and the larger loop carries current I_2 in the clockwise direction, with $I_2 > 2I_1$. $\vec{B}(x, y)$ denotes the magnetic field at a point (x, y) in the xy -plane. Which of the following statement(s) is(are) correct?

(A) $\vec{B}(x, y)$ is perpendicular to the xy -plane at any point in the plane(B) $|\vec{B}(x, y)|$ depends on x and y only through the radial distance $r = \sqrt{x^2 + y^2}$ (C) $|\vec{B}(x, y)|$ is non-zero at all points for $r < R$ (D) $\vec{B}(x, y)$ points normally outward from the xy -plane for all the points between the two loops

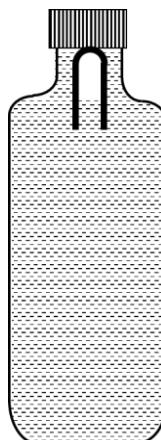
SECTION 2

- This section contains **THREE (03)** question stems.
- There are **TWO (02)** questions corresponding to each question stem.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value corresponding to the answer in the designated place using the mouse and the on-screen virtual numeric keypad.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme:
 Full Marks : +2 If ONLY the correct numerical value is entered at the designated place;
 Zero Marks : 0 In all other cases.

Question Stem for Question Nos. 7 and 8

Question Stem

A soft plastic bottle, filled with water of density 1 gm/cc, carries an inverted glass test-tube with some air (ideal gas) trapped as shown in the figure. The test-tube has a mass of 5 gm, and it is made of a thick glass of density 2.5 gm/cc. Initially the bottle is sealed at atmospheric pressure $p_0 = 10^5$ Pa so that the volume of the trapped air is $v_0 = 3.3$ cc. When the bottle is squeezed from outside at constant temperature, the pressure inside rises and the volume of the trapped air reduces. It is found that the test tube begins to sink at pressure $p_0 + \Delta p$ without changing its orientation. At this pressure, the volume of the trapped air is $v_0 - \Delta v$. Let $\Delta v = X$ cc and $\Delta p = Y \times 10^3$ Pa.



Q.7 The value of X is ____.

Q.8 The value of Y is ____.

Question Stem for Question Nos. 9 and 10

Question Stem

A pendulum consists of a bob of mass $m = 0.1$ kg and a massless inextensible string of length $L = 1.0$ m. It is suspended from a fixed point at height $H = 0.9$ m above a frictionless horizontal floor. Initially, the bob of the pendulum is lying on the floor at rest vertically below the point of suspension. A horizontal impulse $P = 0.2$ kg-m/s is imparted to the bob at some instant. After the bob slides for some distance, the string becomes taut and the bob lifts off the floor. The magnitude of the angular momentum of the pendulum about the point of suspension just before the bob lifts off is J kg-m²/s. The kinetic energy of the pendulum just after the lift-off is K Joules.

Q.9 The value of J is ____.

Q.10 The value of K is ____.

Question Stem for Question Nos. 11 and 12

Question Stem

In a circuit, a metal filament lamp is connected in series with a capacitor of capacitance $C \mu F$ across a 200 V, 50 Hz supply. The power consumed by the lamp is 500 W while the voltage drop across it is 100 V. Assume that there is no inductive load in the circuit. Take *rms* values of the voltages. The magnitude of the phase-angle (in degrees) between the current and the supply voltage is φ . Assume, $\pi\sqrt{3} \approx 5$.

Q.11 The value of C is ____.

Q.12 The value of φ is ____.

SECTION 3

- This section contains **TWO (02) paragraphs**. Based on each paragraph, there are **TWO (02)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +3 If ONLY the correct option is chosen;

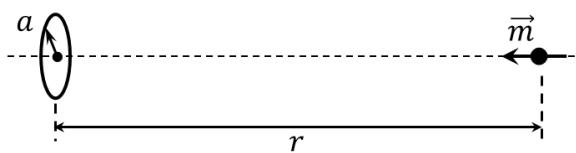
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases.

Paragraph

A special metal S conducts electricity without any resistance. A closed wire loop, made of S , does not allow any change in flux through itself by inducing a suitable current to generate a compensating flux. The induced current in the loop cannot decay due to its zero resistance. This current gives rise to a magnetic moment which in turn repels the source of magnetic field or flux. Consider such a loop, of radius a , with its center at the origin. A magnetic dipole of moment m is brought along the axis of this loop from infinity to a point at distance r ($\gg a$) from the center of the loop with its north pole always facing the loop, as shown in the figure below.

The magnitude of magnetic field of a dipole m , at a point on its axis at distance r , is $\frac{\mu_0 m}{2\pi r^3}$, where μ_0 is the permeability of free space. The magnitude of the force between two magnetic dipoles with moments, m_1 and m_2 , separated by a distance r on the common axis, with their north poles facing each other, is $\frac{k m_1 m_2}{r^4}$, where k is a constant of appropriate dimensions. The direction of this force is along the line joining the two dipoles.



Q.13 When the dipole m is placed at a distance r from the center of the loop (as shown in the figure), the current induced in the loop will be proportional to

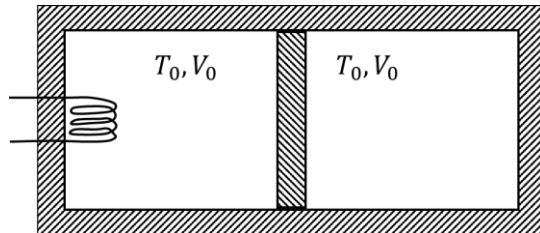
- (A) m/r^3 (B) m^2/r^2 (C) m/r^2 (D) m^2/r

Q.14 The work done in bringing the dipole from infinity to a distance r from the center of the loop by the given process is proportional to

- (A) m/r^5 (B) m^2/r^5 (C) m^2/r^6 (D) m^2/r^7

Paragraph

A thermally insulating cylinder has a thermally insulating and frictionless movable partition in the middle, as shown in the figure below. On each side of the partition, there is one mole of an ideal gas, with specific heat at constant volume, $C_V = 2R$. Here, R is the gas constant. Initially, each side has a volume V_0 and temperature T_0 . The left side has an electric heater, which is turned on at very low power to transfer heat Q to the gas on the left side. As a result the partition moves slowly towards the right reducing the right side volume to $V_0/2$. Consequently, the gas temperatures on the left and the right sides become T_L and T_R , respectively. Ignore the changes in the temperatures of the cylinder, heater and the partition.



Q.15 The value of $\frac{T_R}{T_0}$ is

- (A) $\sqrt{2}$ (B) $\sqrt{3}$ (C) 2 (D) 3

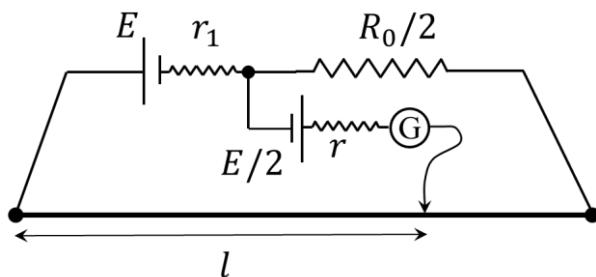
Q.16 The value of $\frac{Q}{RT_0}$ is

- (A) $4(2\sqrt{2} + 1)$ (B) $4(2\sqrt{2} - 1)$ (C) $(5\sqrt{2} + 1)$ (D) $(5\sqrt{2} - 1)$

SECTION 4

- This section contains **THREE (03)** questions.
 - The answer to each question is a **NON-NEGATIVE INTEGER**.
 - For each question, enter the correct integer corresponding to the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
 - Answer to each question will be evaluated according to the following marking scheme:
- Full Marks* : +4 If ONLY the correct integer is entered;
Zero Marks : 0 In all other cases.

- Q.17 In order to measure the internal resistance r_1 of a cell of emf E , a meter bridge of wire resistance $R_0 = 50 \Omega$, a resistance $R_0/2$, another cell of emf $E/2$ (internal resistance r) and a galvanometer G are used in a circuit, as shown in the figure. If the null point is found at $l = 72$ cm, then the value of $r_1 = \underline{\hspace{2cm}}$ Ω .



- Q.18 The distance between two stars of masses $3M_S$ and $6M_S$ is $9R$. Here R is the mean distance between the centers of the Earth and the Sun, and M_S is the mass of the Sun. The two stars orbit around their common center of mass in circular orbits with period nT , where T is the period of Earth's revolution around the Sun. The value of n is $\underline{\hspace{2cm}}$.

- Q.19 In a photoemission experiment, the maximum kinetic energies of photoelectrons from metals P , Q and R are E_P , E_Q and E_R , respectively, and they are related by $E_P = 2E_Q = 2E_R$. In this experiment, the same source of monochromatic light is used for metals P and Q while a different source of monochromatic light is used for the metal R . The work functions for metals P , Q and R are 4.0 eV, 4.5 eV and 5.5 eV, respectively. The energy of the incident photon used for metal R , in eV, is $\underline{\hspace{2cm}}$.

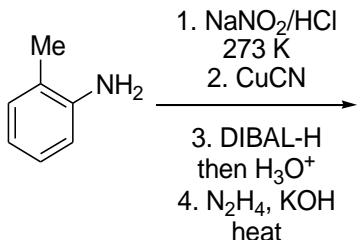
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SECTION 1

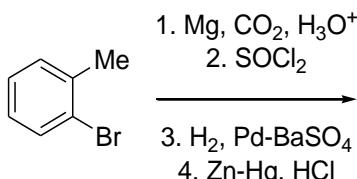
- This section contains **SIX (06)** questions.
 - Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).
 - For each question, choose the option(s) corresponding to (all) the correct answer(s).
 - Answer to each question will be evaluated according to the following marking scheme:
- Full Marks* : +4 If only (all) the correct option(s) is(are) chosen;
Partial Marks : +3 If all the four options are correct but ONLY three options are chosen;
Partial Marks : +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;
Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks : 0 If unanswered;
Negative Marks : -2 In all other cases.
- For example, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then
 choosing ONLY (A), (B) and (D) will get +4 marks;
 choosing ONLY (A) and (B) will get +2 marks;
 choosing ONLY (A) and (D) will get +2 marks;
 choosing ONLY (B) and (D) will get +2 marks;
 choosing ONLY (A) will get +1 mark;
 choosing ONLY (B) will get +1 mark;
 choosing ONLY (D) will get +1 mark;
 choosing no option(s) (i.e. the question is unanswered) will get 0 marks and
 choosing any other option(s) will get -2 marks.

Q.1 The reaction sequence(s) that would lead to *o*-xylene as the major product is(are)

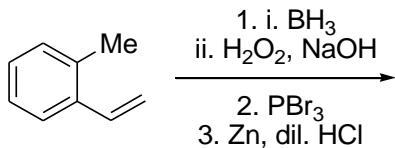
(A)



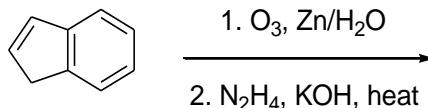
(B)



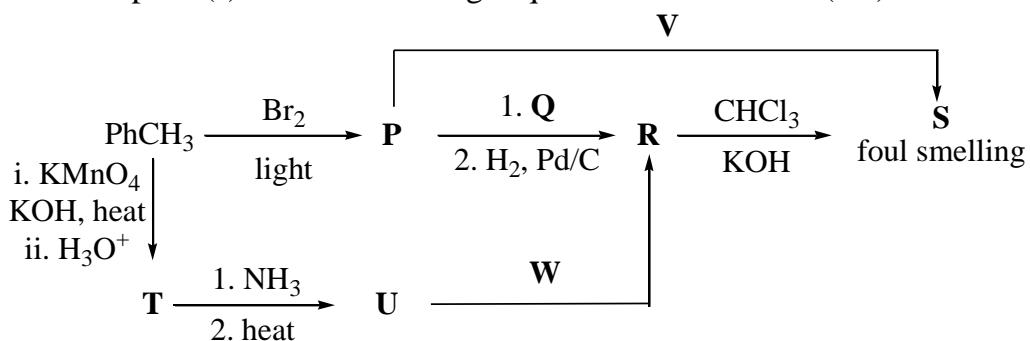
(C)



(D)



Q.2 Correct option(s) for the following sequence of reactions is(are)



- (A) $\mathbf{Q} = \text{KNO}_2$, $\mathbf{W} = \text{LiAlH}_4$ (B) $\mathbf{R} = \text{benzenamine}$, $\mathbf{V} = \text{KCN}$
 (C) $\mathbf{Q} = \text{AgNO}_2$, $\mathbf{R} = \text{phenylmethanamine}$ (D) $\mathbf{W} = \text{LiAlH}_4$, $\mathbf{V} = \text{AgCN}$

Q.3 For the following reaction



the rate of reaction is $\frac{d[\mathbf{P}]}{dt} = k[\mathbf{X}]$. Two moles of \mathbf{X} are mixed with one mole of \mathbf{Y} to make 1.0 L of solution. At 50 s, 0.5 mole of \mathbf{Y} is left in the reaction mixture. The correct statement(s) about the reaction is(are)

(Use: $\ln 2 = 0.693$)

- (A) The rate constant, k , of the reaction is $13.86 \times 10^{-4} \text{ s}^{-1}$.
 (B) Half-life of \mathbf{X} is 50 s.
 (C) At 50 s, $-\frac{d[\mathbf{X}]}{dt} = 13.86 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$.
 (D) At 100 s, $-\frac{d[\mathbf{Y}]}{dt} = 3.46 \times 10^{-3} \text{ mol L}^{-1} \text{ s}^{-1}$.

Q.4 Some standard electrode potentials at 298 K are given below:

Pb ²⁺ /Pb	-0.13 V
Ni ²⁺ /Ni	-0.24 V
Cd ²⁺ /Cd	-0.40 V
Fe ²⁺ /Fe	-0.44 V

To a solution containing 0.001 M of \mathbf{X}^{2+} and 0.1 M of \mathbf{Y}^{2+} , the metal rods \mathbf{X} and \mathbf{Y} are inserted (at 298 K) and connected by a conducting wire. This resulted in dissolution of \mathbf{X} . The correct combination(s) of \mathbf{X} and \mathbf{Y} , respectively, is(are)

(Given: Gas constant, $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$,
Faraday constant, $F = 96500 \text{ C mol}^{-1}$)

- (A) Cd and Ni
- (B) Cd and Fe
- (C) Ni and Pb
- (D) Ni and Fe

Q.5 The pair(s) of complexes wherein both exhibit tetrahedral geometry is(are)

(Note: py = pyridine

Given: Atomic numbers of Fe, Co, Ni and Cu are 26, 27, 28 and 29, respectively)

- (A) $[\text{FeCl}_4]^-$ and $[\text{Fe}(\text{CO})_4]^{2-}$
- (B) $[\text{Co}(\text{CO})_4]^-$ and $[\text{CoCl}_4]^{2-}$
- (C) $[\text{Ni}(\text{CO})_4]$ and $[\text{Ni}(\text{CN})_4]^{2-}$
- (D) $[\text{Cu}(\text{py})_4]^+$ and $[\text{Cu}(\text{CN})_4]^{3-}$

Q.6 The correct statement(s) related to oxoacids of phosphorous is(are)

- (A) Upon heating, H_3PO_3 undergoes disproportionation reaction to produce H_3PO_4 and PH_3 .
- (B) While H_3PO_3 can act as reducing agent, H_3PO_4 cannot.
- (C) H_3PO_3 is a monobasic acid.
- (D) The H atom of P–H bond in H_3PO_3 is not ionizable in water.

SECTION 2

- This section contains **THREE (03)** question stems.
- There are **TWO (02)** questions corresponding to each question stem.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value corresponding to the answer in the designated place using the mouse and the on-screen virtual numeric keypad.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +2 If ONLY the correct numerical value is entered at the designated place;
Zero Marks : 0 In all other cases.

Question Stem for Question Nos. 7 and 8**Question Stem**

At 298 K, the limiting molar conductivity of a weak monobasic acid is $4 \times 10^2 \text{ S cm}^2 \text{ mol}^{-1}$. At 298 K, for an aqueous solution of the acid the degree of dissociation is α and the molar conductivity is $y \times 10^2 \text{ S cm}^2 \text{ mol}^{-1}$. At 298 K, upon 20 times dilution with water, the molar conductivity of the solution becomes $3y \times 10^2 \text{ S cm}^2 \text{ mol}^{-1}$.

Q.7 The value of α is ____.

Q.8 The value of y is ____.

Question Stem for Question Nos. 9 and 10**Question Stem**

Reaction of x g of Sn with HCl quantitatively produced a salt. Entire amount of the salt reacted with y g of nitrobenzene in the presence of required amount of HCl to produce 1.29 g of an organic salt (quantitatively).

(Use Molar masses (in g mol^{-1}) of H, C, N, O, Cl and Sn as 1, 12, 14, 16, 35 and 119, respectively).

Q.9 The value of x is ____.

Q.10 The value of y is ____.

Question Stem for Question Nos. 11 and 12

Question Stem

A sample (5.6 g) containing iron is completely dissolved in cold dilute HCl to prepare a 250 mL of solution. Titration of 25.0 mL of this solution requires 12.5 mL of 0.03 M KMnO₄ solution to reach the end point. Number of moles of Fe²⁺ present in 250 mL solution is $x \times 10^{-2}$ (consider complete dissolution of FeCl₂). The amount of iron present in the sample is $y\%$ by weight.

(Assume: KMnO₄ reacts only with Fe²⁺ in the solution

Use: Molar mass of iron as 56 g mol⁻¹)

Q.11 The value of x is ____.

Q.12 The value of y is ____.

SECTION 3

- This section contains **TWO (02) paragraphs**. Based on each paragraph, there are **TWO (02)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:

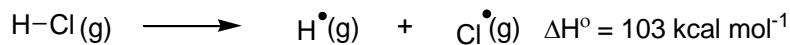
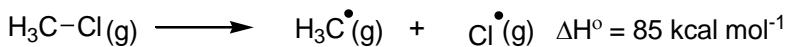
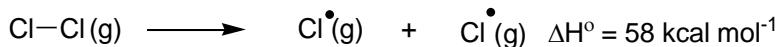
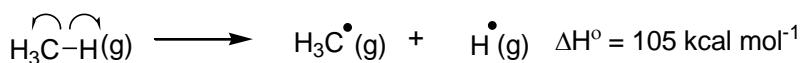
Full Marks : +3 If ONLY the correct option is chosen;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases.

Paragraph

The amount of energy required to break a bond is same as the amount of energy released when the same bond is formed. In gaseous state, the energy required for *homolytic cleavage* of a bond is called Bond Dissociation Energy (BDE) or Bond Strength. BDE is affected by *s*-character of the bond and the stability of the radicals formed. Shorter bonds are typically stronger bonds. BDEs for some bonds are given below:



Q.13 Correct match of the **C–H** bonds (shown in bold) in Column **J** with their BDE in Column **K** is

Column J Molecule	Column K BDE (kcal mol ⁻¹)
(P) H-CH(CH ₃) ₂	(i) 132
(Q) H-CH ₂ Ph	(ii) 110
(R) H-CH=CH ₂	(iii) 95
(S) H-C≡CH	(iv) 88

Q.14 For the following reaction



the correct statement is

- (A) Initiation step is exothermic with $\Delta H^\circ = -58 \text{ kcal mol}^{-1}$.

(B) Propagation step involving $\cdot\text{CH}_3$ formation is exothermic with $\Delta H^\circ = -2 \text{ kcal mol}^{-1}$.

(C) Propagation step involving CH_3Cl formation is endothermic with $\Delta H^\circ = +27 \text{ kcal mol}^{-1}$.

(D) The reaction is exothermic with $\Delta H^\circ = -25 \text{ kcal mol}^{-1}$.

Paragraph

The reaction of $K_3[Fe(CN)_6]$ with freshly prepared $FeSO_4$ solution produces a dark blue precipitate called Turnbull's blue. Reaction of $K_4[Fe(CN)_6]$ with the $FeSO_4$ solution in complete absence of air produces a white precipitate **X**, which turns blue in air. Mixing the $FeSO_4$ solution with $NaNO_3$, followed by a slow addition of concentrated H_2SO_4 through the side of the test tube produces a brown ring.

Q.15 Precipitate X is



Q.16 Among the following, the brown ring is due to the formation of



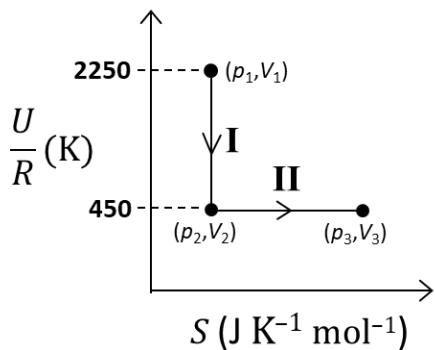
SECTION 4

- This section contains **THREE (03)** questions.
- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If ONLY the correct integer is entered;

Zero Marks : 0 In all other cases.

- Q.17 One mole of an ideal gas at 900 K, undergoes two reversible processes, **I** followed by **II**, as shown below. If the work done by the gas in the two processes are same, the value of $\ln \frac{V_3}{V_2}$ is ____.



(U : internal energy, S : entropy, p : pressure, V : volume, R : gas constant)

(Given: molar heat capacity at constant volume, $C_{V,m}$ of the gas is $\frac{5}{2}R$)

- Q.18 Consider a helium (He) atom that absorbs a photon of wavelength 330 nm. The change in the velocity (in cm s^{-1}) of He atom after the photon absorption is ____.

(Assume: Momentum is conserved when photon is absorbed.)

Use: Planck constant = $6.6 \times 10^{-34} \text{ J s}$, Avogadro number = $6 \times 10^{23} \text{ mol}^{-1}$, Molar mass of He = 4 g mol^{-1})

- Q.19 Ozonolysis of ClO_2 produces an oxide of chlorine. The average oxidation state of chlorine in this oxide is ____.

END OF THE QUESTION PAPER

SECTION 1

- This section contains **SIX (06)** questions.
 - Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).
 - For each question, choose the option(s) corresponding to (all) the correct answer(s).
 - Answer to each question will be evaluated according to the following marking scheme:
- Full Marks : +4 If only (all) the correct option(s) is(are) chosen;*
Partial Marks : +3 If all the four options are correct but ONLY three options are chosen;
Partial Marks : +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;
Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks : 0 If unanswered;
Negative Marks : -2 In all other cases.
- For example, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then
 choosing ONLY (A), (B) and (D) will get +4 marks;
 choosing ONLY (A) and (B) will get +2 marks;
 choosing ONLY (A) and (D) will get +2 marks;
 choosing ONLY (B) and (D) will get +2 marks;
 choosing ONLY (A) will get +1 mark;
 choosing ONLY (B) will get +1 mark;
 choosing ONLY (D) will get +1 mark;
 choosing no option(s) (i.e. the question is unanswered) will get 0 marks and
 choosing any other option(s) will get -2 marks.

Q.1 Let

$$\begin{aligned} S_1 &= \{(i, j, k) : i, j, k \in \{1, 2, \dots, 10\}\}, \\ S_2 &= \{(i, j) : 1 \leq i < j + 2 \leq 10, i, j \in \{1, 2, \dots, 10\}\}, \\ S_3 &= \{(i, j, k, l) : 1 \leq i < j < k < l, i, j, k, l \in \{1, 2, \dots, 10\}\} \end{aligned}$$

and

$$S_4 = \{(i, j, k, l) : i, j, k \text{ and } l \text{ are distinct elements in } \{1, 2, \dots, 10\}\}.$$

If the total number of elements in the set S_r is n_r , $r = 1, 2, 3, 4$, then which of the following statements is (are) **TRUE** ?

- (A) $n_1 = 1000$ (B) $n_2 = 44$ (C) $n_3 = 220$ (D) $\frac{n_4}{12} = 420$

Q.2 Consider a triangle PQR having sides of lengths p, q and r opposite to the angles P, Q and R , respectively. Then which of the following statements is (are) **TRUE** ?

(A) $\cos P \geq 1 - \frac{p^2}{2qr}$

(B) $\cos R \geq \left(\frac{q-r}{p+q}\right) \cos P + \left(\frac{p-r}{p+q}\right) \cos Q$

(C) $\frac{q+r}{p} < 2 \frac{\sqrt{\sin Q \sin R}}{\sin P}$

(D) If $p < q$ and $p < r$, then $\cos Q > \frac{p}{r}$ and $\cos R > \frac{p}{q}$

Q.3 Let $f: \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \rightarrow \mathbb{R}$ be a continuous function such that

$$f(0) = 1 \text{ and } \int_0^{\frac{\pi}{3}} f(t) dt = 0$$

Then which of the following statements is (are) **TRUE** ?

(A) The equation $f(x) - 3 \cos 3x = 0$ has at least one solution in $\left(0, \frac{\pi}{3}\right)$

(B) The equation $f(x) - 3 \sin 3x = -\frac{6}{\pi}$ has at least one solution in $\left(0, \frac{\pi}{3}\right)$

(C) $\lim_{x \rightarrow 0} \frac{x \int_0^x f(t) dt}{1 - e^{x^2}} = -1$

(D) $\lim_{x \rightarrow 0} \frac{\sin x \int_0^x f(t) dt}{x^2} = -1$

Q.4 For any real numbers α and β , let $y_{\alpha,\beta}(x)$, $x \in \mathbb{R}$, be the solution of the differential equation

$$\frac{dy}{dx} + \alpha y = xe^{\beta x}, \quad y(1) = 1.$$

Let $S = \{y_{\alpha,\beta}(x) : \alpha, \beta \in \mathbb{R}\}$. Then which of the following functions belong(s) to the set S ?

(A) $f(x) = \frac{x^2}{2}e^{-x} + \left(e - \frac{1}{2}\right)e^{-x}$

(B) $f(x) = -\frac{x^2}{2}e^{-x} + \left(e + \frac{1}{2}\right)e^{-x}$

(C) $f(x) = \frac{e^x}{2} \left(x - \frac{1}{2}\right) + \left(e - \frac{e^2}{4}\right)e^{-x}$

(D) $f(x) = \frac{e^x}{2} \left(\frac{1}{2} - x\right) + \left(e + \frac{e^2}{4}\right)e^{-x}$

Q.5 Let O be the origin and $\overrightarrow{OA} = 2\hat{i} + 2\hat{j} + \hat{k}$, $\overrightarrow{OB} = \hat{i} - 2\hat{j} + 2\hat{k}$ and $\overrightarrow{OC} = \frac{1}{2}(\overrightarrow{OB} - \lambda \overrightarrow{OA})$ for some $\lambda > 0$. If $|\overrightarrow{OB} \times \overrightarrow{OC}| = \frac{9}{2}$, then which of the following statements is (are) **TRUE**?

(A) Projection of \overrightarrow{OC} on \overrightarrow{OA} is $-\frac{3}{2}$

(B) Area of the triangle OAB is $\frac{9}{2}$

(C) Area of the triangle ABC is $\frac{9}{2}$

(D) The acute angle between the diagonals of the parallelogram with adjacent sides \overrightarrow{OA} and \overrightarrow{OC} is $\frac{\pi}{3}$

Q.6 Let E denote the parabola $y^2 = 8x$. Let $P = (-2, 4)$, and let Q and Q' be two distinct points on E such that the lines PQ and PQ' are tangents to E . Let F be the focus of E . Then which of the following statements is (are) **TRUE** ?

- (A) The triangle PFQ is a right-angled triangle
- (B) The triangle QPQ' is a right-angled triangle
- (C) The distance between P and F is $5\sqrt{2}$
- (D) F lies on the line joining Q and Q'

SECTION 2

- This section contains **THREE (03)** question stems.
- There are **TWO (02)** questions corresponding to each question stem.
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Question Stem for Question Nos. 7 and 8**Question Stem**

Consider the region $R = \{(x, y) \in \mathbb{R} \times \mathbb{R} : x \geq 0 \text{ and } y^2 \leq 4 - x\}$. Let \mathcal{F} be the family of all circles that are contained in R and have centers on the x -axis. Let C be the circle that has largest radius among the circles in \mathcal{F} . Let (α, β) be a point where the circle C meets the curve $y^2 = 4 - x$.

Q.7 The radius of the circle C is ____ .

Q.8 The value of α is ____ .

Question Stem for Question Nos. 9 and 10

Question Stem

Let $f_1: (0, \infty) \rightarrow \mathbb{R}$ and $f_2: (0, \infty) \rightarrow \mathbb{R}$ be defined by

$$f_1(x) = \int_0^x \prod_{j=1}^{21} (t-j)^j dt, \quad x > 0$$

and

$$f_2(x) = 98(x-1)^{50} - 600(x-1)^{49} + 2450, \quad x > 0,$$

where, for any positive integer n and real numbers a_1, a_2, \dots, a_n , $\prod_{i=1}^n a_i$ denotes the product of a_1, a_2, \dots, a_n . Let m_i and n_i , respectively, denote the number of points of local minima and the number of points of local maxima of function f_i , $i = 1, 2$, in the interval $(0, \infty)$.

Q.9 The value of $2m_1 + 3n_1 + m_1 n_1$ is ____.

Q.10 The value of $6m_2 + 4n_2 + 8m_2 n_2$ is ____.

Question Stem for Question Nos. 11 and 12

Question Stem

Let $g_i: \left[\frac{\pi}{8}, \frac{3\pi}{8}\right] \rightarrow \mathbb{R}$, $i = 1, 2$, and $f: \left[\frac{\pi}{8}, \frac{3\pi}{8}\right] \rightarrow \mathbb{R}$ be functions such that

$$g_1(x) = 1, \quad g_2(x) = |4x - \pi| \text{ and } f(x) = \sin^2 x, \text{ for all } x \in \left[\frac{\pi}{8}, \frac{3\pi}{8}\right]$$

Define

$$S_i = \int_{\frac{\pi}{8}}^{\frac{3\pi}{8}} f(x) \cdot g_i(x) dx, \quad i = 1, 2$$

Q.11 The value of $\frac{16S_1}{\pi}$ is ____.

Q.12 The value of $\frac{48S_2}{\pi^2}$ is ____.

SECTION 3

- This section contains **TWO (02) paragraphs**. Based on each paragraph, there are **TWO (02)** questions.
 - Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
 - For each question, choose the option corresponding to the correct answer.
 - Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +3 If ONLY the correct option is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : -1 In all other cases

Paragraph

Let

$$M = \{(x, y) \in \mathbb{R} \times \mathbb{R} : x^2 + y^2 \leq r^2\},$$

where $r > 0$. Consider the geometric progression $a_n = \frac{1}{2^{n-1}}$, $n = 1, 2, 3, \dots$. Let $S_0 = 0$ and, for $n \geq 1$, let S_n denote the sum of the first n terms of this progression. For $n \geq 1$, let C_n denote the circle with center $(S_{n-1}, 0)$ and radius a_n , and D_n denote the circle with center (S_{n-1}, S_{n-1}) and radius a_n .

Q.13 Consider M with $r = \frac{1025}{513}$. Let k be the number of all those circles C_n that are inside M . Let l be the maximum possible number of circles among these k circles such that no two circles intersect. Then

- (A) $k + 2l = 22$ (B) $2k + l = 26$ (C) $2k + 3l = 34$ (D) $3k + 2l = 40$

Q.14 Consider M with $r = \frac{(2^{199}-1)\sqrt{2}}{2^{198}}$. The number of all those circles D_n that are inside M is

- (A) 198 (B) 199 (C) 200 (D) 201

Paragraph

Let $\psi_1: [0, \infty) \rightarrow \mathbb{R}$, $\psi_2: [0, \infty) \rightarrow \mathbb{R}$, $f: [0, \infty) \rightarrow \mathbb{R}$ and $g: [0, \infty) \rightarrow \mathbb{R}$ be functions such that $f(0) = g(0) = 0$,

$$\psi_1(x) = e^{-x} + x, \quad x \geq 0,$$

$$\psi_2(x) = x^2 - 2x - 2e^{-x} + 2, \quad x \geq 0,$$

$$f(x) = \int_{-x}^x (|t| - t^2)e^{-t^2} dt, \quad x > 0$$

and

$$g(x) = \int_0^{x^2} \sqrt{t} e^{-t} dt, \quad x > 0.$$

Q.15 Which of the following statements is **TRUE** ?

- (A) $f(\sqrt{\ln 3}) + g(\sqrt{\ln 3}) = \frac{1}{3}$
- (B) For every $x > 1$, there exists an $\alpha \in (1, x)$ such that $\psi_1(x) = 1 + \alpha x$
- (C) For every $x > 0$, there exists a $\beta \in (0, x)$ such that $\psi_2(x) = 2x(\psi_1(\beta) - 1)$
- (D) f is an increasing function on the interval $\left[0, \frac{3}{2}\right]$

Q.16 Which of the following statements is **TRUE** ?

- (A) $\psi_1(x) \leq 1$, for all $x > 0$
- (B) $\psi_2(x) \leq 0$, for all $x > 0$
- (C) $f(x) \geq 1 - e^{-x^2} - \frac{2}{3}x^3 + \frac{2}{5}x^5$, for all $x \in \left(0, \frac{1}{2}\right)$
- (D) $g(x) \leq \frac{2}{3}x^3 - \frac{2}{5}x^5 + \frac{1}{7}x^7$, for all $x \in \left(0, \frac{1}{2}\right)$

SECTION 4

- This section contains **THREE (03)** questions.
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 - For each question, enter the correct integer corresponding to the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
 - Answer to each question will be evaluated according to the following marking scheme:
- Full Marks* : +4 If ONLY the correct integer is entered;
Zero Marks : 0 In all other cases.

Q.17 A number is chosen at random from the set $\{1, 2, 3, \dots, 2000\}$. Let p be the probability that the chosen number is a multiple of 3 or a multiple of 7. Then the value of $500p$ is ____.

Q.18 Let E be the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$. For any three distinct points P, Q and Q' on E , let $M(P, Q)$ be the mid-point of the line segment joining P and Q , and $M(P, Q')$ be the mid-point of the line segment joining P and Q' . Then the maximum possible value of the distance between $M(P, Q)$ and $M(P, Q')$, as P, Q and Q' vary on E , is ____.

Q.19 For any real number x , let $[x]$ denote the largest integer less than or equal to x . If

$$I = \int_0^{10} \left[\sqrt{\frac{10x}{x+1}} \right] dx ,$$

then the value of $9I$ is ____.

END OF THE QUESTION PAPER

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

T.B.C. : SDGH-U-GKS

Test Booklet Series

Serial No.

1022205

TEST BOOKLET

PAPER—I

(General Studies)

Time Allowed : Two Hours

Maximum Marks : 100



INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the Answer Sheet liable for rejection.
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. *DO NOT* write anything else on the Test Booklet.
4. This Test Booklet contains **120** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
5. You have to mark all your responses **ONLY** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong answers :**
THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.
 - (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to that question will be deducted as penalty.
 - (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
 - (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

1. Deserts are generally located at

 - (a) Equatorial region
 - (b) Polar region
 - (c) about 30° latitude
 - (d) about 65° latitude
2. Which one of the following has the adaptation 'echolocation' to detect the prey?

 - (a) Rattlesnake
 - (b) Barn owl
 - (c) Grasshopper
 - (d) Bat
3. Which one of the following is the most important stage in the process of ecological succession?

 - (a) Claim
 - (b) Acceptance by community members
 - (c) Reaction
 - (d) Settlement
4. In which one of the following trophic structures of ecosystems, both fungi and bacteria occur?

 - (a) Decomposer
 - (b) Autotroph
 - (c) Heterotroph
 - (d) Food web
5. The uplift mechanism that takes place when lighter warm moist air mass rises after encountering a colder and denser air mass causes

 - (a) conventional precipitation
 - (b) frontal precipitation
 - (c) cyclonic precipitation
 - (d) orogenic precipitation
6. Which one of the following managed ecosystems has the highest amount of standing crop?

 - (a) Agricultural land
 - (b) Grazing land
 - (c) Human habitation
 - (d) Forest plantation
7. Who among the following was the Viceroy of India in 1905, when the Partition of Bengal was announced?

 - (a) Lord Ripon
 - (b) Lord Canning
 - (c) Lord Curzon
 - (d) Lord Minto
8. *Nil Darpan*, which deals with the condition of indigo planters, was written by

 - (a) Michael Madhusudan Dutta
 - (b) Bankim Chandra Chatterjee
 - (c) Lal Behari Dey
 - (d) Dinabandhu Mitra

9. Who among the following revolutionaries founded the Hindustan Socialist Republican Army?

- (a) Ashfaqullah
- (b) Batukeshwar Dutta
- (c) Ram Prasad Bismil
- (d) Chandra Shekhar Azad

10. Chronologically arrange the following events :

1. Invasion of Alexander
2. Indo-Greek Rule in the North-West
3. Accession of Kanishka
4. Accession of Chandragupta Maurya

Select the correct answer using the code given below.

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

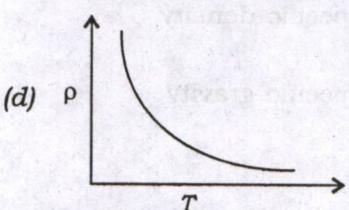
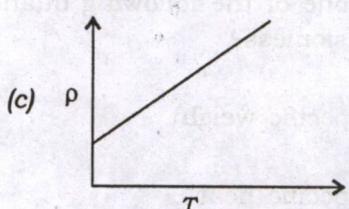
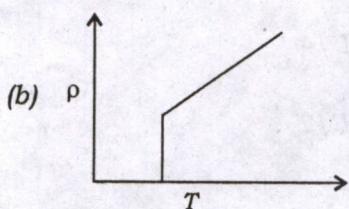
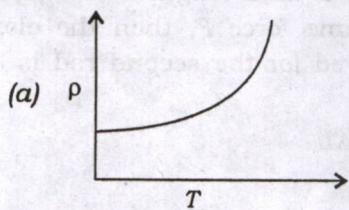
11. Consider the following statements :

1. Ajanta paintings depict stories from the *Jatakas*.
2. Ajanta paintings depict scenes of court-life, processions, men and women at work, festivals, etc.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

12. Which one of the following schematic graphs correctly represents qualitatively the variation of resistivity ρ with respect to temperature T for a semiconductor?



13. Which one of the following semiconductors possesses the highest value of band gap E_g ?

- (a) Si
- (b) Ge
- (c) GaAs
- (d) PbS

14. A steel rod having radius r and length L gets stretched along its length by ΔL , when a force F is applied to it. If another rod made of the same material having radius $2r$ and length L is subjected to the same force F , then the elongation observed for the second rod is

(a) $4\Delta L$

(b) $2\Delta L$

(c) $\Delta L / 4$

(d) $\Delta L / 2$

15. Which one of the following quantities is dimensionless?

(a) Specific weight

(b) Specific heat

(c) Specific density

(d) Specific gravity

16. Which one of the following is the correct order of increase of the atomic radius of the elements?

(a) C < B < Si < Al

(b) C < B < Al < Si

(c) C < Si < B < Al

(d) Si < Al < C < B

17. The oxidation state and covalency of Al in $[AlCl(H_2O)_5]^{2+}$ are

(a) +3 and 3

(b) +3 and 6

(c) +2 and 6

(d) +2 and 1

18. What is the total number of orbitals associated with the principal quantum number 3?

(a) 3

(b) 6

(c) 9

(d) 12

19. The phenomenon of radioactivity was first discovered by

(a) Marie Curie

(b) Henri Becquerel

(c) Frederick Soddy

(d) Ernest Rutherford

20. Which one of the following is the correct electronic configuration of copper?

(a) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$

(b) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9 4s^2$

(c) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2$

(d) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$

21. Which one of the following is the shape of BrF_5 ?

- (a) Octahedral
- (b) Square planar
- (c) Square pyramidal
- (d) Trigonal bipyramidal

22. Which of the following statements regarding the Panchayat system is/are correct?

1. The Constitution of India envisages a three-tier system of Panchayat.
2. Intermediate Panchayat stands between the village and district Panchayats in the State where the population is above 20 lakhs.
3. All the seats in a Panchayat shall be filled by direct election from territorial constituencies in the Panchayat area.

Select the correct answer using the code given below.

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

23. Which one of the following is *not* a Fundamental Duty enshrined in the Constitution of India?

- (a) To abide by the Constitution and respect its ideals and institutions
- (b) To protect the national animal and national bird
- (c) To value and preserve the rich heritage of India's composite culture
- (d) To safeguard public property and abjure violence

24. Which of the following statements regarding the President of India is/are correct?

1. The President of India is elected by an electoral college in accordance with the system of proportional representation by means of the single transferable vote.
2. The elected members of the Legislative Assemblies of Union Territories of Delhi and Puducherry take part in the election of the President of India.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

- 25.** Which one of the following is **not** an objective of One Stop Centre scheme?
- (a) To stop gender-based violence
 - (b) To support women affected by violence
 - (c) To provide cheaper credit to self-help groups
 - (d) To provide specialized services to aggrieved women including victims of acid attack
- 26.** The movement of a substance against a diffusion gradient with the use of energy is known as
- (a) active transport
 - (b) passive transport
 - (c) water potential gradient
 - (d) solute loss
- 27.** Which one of the following has non-nucleated cells at maturity?
- (a) Xylem parenchyma
 - (b) Xylem fibre
 - (c) Palisade parenchyma
 - (d) Companion cell
- 28.** Microscopic, branched and thread-like structures, which can grow and absorb nutrition from organic matter, are found in
- (a) bacteria
 - (b) viruses
 - (c) fungi
 - (d) algae
- 29.** What is the number of chromosomes found in human somatic cell?
- (a) 48
 - (b) 56
 - (c) 46
 - (d) 42
- 30.** Which one of the following animals lays eggs to reproduce?
- (a) Dolphin
 - (b) Seal
 - (c) Platypus
 - (d) Whale
- 31.** Bt Cotton is a genetically modified crop with a foreign gene from
- (a) *Bacillus thermolactis*
 - (b) *Bacillus thuringiensis*
 - (c) *Bacillus thermophilus*
 - (d) *Bacillus tequilensis*

32. In deep ponds and lakes, which one of the following vertical zones receives least light penetration?

- (a) Surface
- (b) Littoral zone
- (c) Limnetic zone
- (d) Profundal zone

33. What is ecological amplitude?

- (a) The range of demands and consequent range of tolerance of a species to the fluctuations in environmental conditions
- (b) The range of tolerance of a species in constant environmental conditions
- (c) The range of demands of a species in constant environmental conditions
- (d) The range of ecological conditions found in a biome

34. Which one of the following organisms can live both in air (outside water) and in water?

- (a) Xerocole
- (b) Mesocole
- (c) Secondary hydrocole
- (d) Mesophyte

35. What is 'duff'?

- (a) Partially decomposed litter
- (b) Weathered rock
- (c) Muddy puddle
- (d) Carcass of a dead animal

36. Which one of the following is a gravity transported soil?

- (a) Alluvial
- (b) Eolian
- (c) Colluvial
- (d) Glacial

37. What is 'pyrophilous organism'?

- (a) Fresh grass growing after ground fire
- (b) Fungi growing in soils of burnt terrains
- (c) Seeds germinating after clear felling of forest
- (d) Organisms with capacity to regenerate the tail after it was lost due to damage

38. Which one among the following States of India experienced the highest fall in population growth rate during 2001–2011 in relation to the previous decade?

- (a) Andhra Pradesh
- (b) Maharashtra
- (c) Tamil Nadu
- (d) Madhya Pradesh

39. Which one of the following statements about the Austric family of languages spoken in India is **not** correct?

- (a) The Austro-Asiatic sub-family of Austric family of languages has Mon-Khmer and Munda as its two main branches.
- (b) The Munda group of languages is spoken only by the Munda tribes living in Chota Nagpur.
- (c) The Mon-Khmer language speakers are found in two non-contiguous areas of Meghalaya Plateau and Nicobar Islands.
- (d) The Khasi language of Meghalaya belongs to the Mon-Khmer branch of Austric family.

40. Which of the following statements about farming in India is/are correct?

- 1. Dryland farming is confined to the regions having annual rainfall less than 100 cm.
- 2. Wetland farming regions are often susceptible to flood and soil erosion hazards.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

41. Which one of the following is a lagoon?

- (a) Pulicat
- (b) Deepor Beel
- (c) Kolleru
- (d) Gohna

42. Which one of the following is **not** observed by the stations operated by the Central Water Commission?

- (a) Water level
- (b) Silt
- (c) Water conservation
- (d) Water discharge

43. In a beta decay process, a nucleus spontaneously emits an electron (or positron) accompanied by the emission of antineutrino (or neutrino). Which one of the following statements is **not** true about neutrinos/antineutrinos?

- (a) They are uncharged particles.
- (b) Their masses are very small in comparison to that of an electron.
- (c) They possess charge of magnitude equal to electric charge.
- (d) They interact with other particles through weak force only.

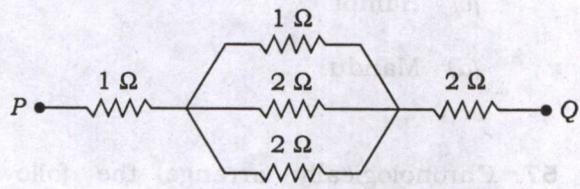
44. The radius of the first orbit ($n = 1$) of a hydrogen atom is 0.529 \AA . Then the radius of the second orbit ($n = 2$) of He^+ ion will be

- (a) 1.058 \AA
- (b) 2.116 \AA
- (c) 4.232 \AA
- (d) 0.529 \AA

45. Which one of the following statements for the emission spectrum of hydrogen is true?

- (a) The Lyman series lies in the visible region and the Paschen series lies in the infrared region.
- (b) The Lyman series lies in the ultraviolet region and the Paschen series lies in the visible region.
- (c) Both the Lyman and the Paschen series lie in the visible region.
- (d) The Lyman series lies in the ultraviolet region and the Paschen series lies in the infrared region.

46. Consider the following combination of resistors :



The equivalent resistance of the combination of resistors between P and Q is

- (a) 2Ω
- (b) 3Ω
- (c) 3.5Ω
- (d) 2.5Ω

47. Which one of the following zones of atmosphere is the farthest from the earth surface?

- (a) Stratosphere
- (b) Mesosphere
- (c) Ionosphere
- (d) Troposphere

48. Which one of the following ecological adaptations is *not* 'dormancy'?

- (a) Hibernation
- (b) Aestivation
- (c) Diapause
- (d) Cyclomorphosis

49. What are 'circadian rhythms'?

- (a) Daily responses of animals to light conditions
- (b) Growth of plant tip with changing light direction
- (c) Annual responses of living organisms to light conditions
- (d) Daily responses of animals to water availability

50. What is 'bioenergetic approach' in modern ecology?

- (a) Study of similarities and differences in food relationships among living organisms and various forms of energy supporting their life
- (b) Study of energy retention by ecosystems under threat
- (c) Study of energy loss by ecosystems under threat
- (d) Study of energy in deep oceans during cyclone buildup

- 51.** Which one of the following is defined as a natural biological unit tied together by the sharing of a common gene pool?
- (a) Vegetation
 - (b) Flora
 - (c) Fauna
 - (d) Species
- 52.** Which one of the following is *not* a non-renewable energy source?
- (a) Coal
 - (b) Oil
 - (c) Sunlight
 - (d) Nuclear fuel
- 53.** The typical Nagara style Shikhara is visible in which one of the following temples?
- (a) Brihadeshwara Temple, Thanjavur
 - (b) Dashavatara Temple, Deogarh
 - (c) Kailasanatha Temple, Ellora
 - (d) Meenakshi Temple, Madurai
- 54.** Which one of the following Harappan centres specialized in making shell objects?
- (a) Balakot
 - (b) Kalibangan
 - (c) Mohenjo-daro
 - (d) Banawali
- 55.** Who among the following was the first to decipher the Ashokan inscriptions?
- (a) William Jones
 - (b) John Marshall
 - (c) James Prinsep
 - (d) Alexander Cunningham
- 56.** The structure of Mahanavami Dibba is situated in which one of the following places?
- (a) Ujjain
 - (b) Gaur
 - (c) Hampi
 - (d) Mandu
- 57.** Chronologically arrange the following events :
1. Third Battle of Panipat
 2. Invasion of Nadir Shah
 3. Impeachment of Warren Hastings
 4. The Diwani of Bengal transferred to the East India Company
- Select the correct answer using the code given below.
- (a) 2-1-4-3
 - (b) 3-4-2-1
 - (c) 1-3-4-2
 - (d) 4-3-2-1

58. Lassaigne's test is used for the detection of which of the following elements?

- (a) N, S, P, Cl
- (b) C, N, P, Br
- (c) C, N, S, I
- (d) C, N, S, Br

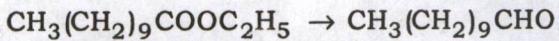
59. What is the use of heavy water?

- (a) It is used in nuclear reactors as a moderator
- (b) It is used in nuclear reactors as fuel
- (c) It is used in radiation therapy for cancer
- (d) It is used in water softening plants

60. Which one of the following statements about Fehling's test is **not** correct?

- (a) Fehling's A solution is aqueous copper sulphate.
- (b) Fructose gives a positive Fehling's test.
- (c) Red-brown ppt of CuO is obtained in the reaction.
- (d) Aromatic aldehydes do not respond to this test.

61. Which one of the following reagents is used to carry out the transformation given below?



- (a) DIBAL-H/H₂O
- (b) H₂/Pd-BaSO₄
- (c) SnCl₂/HCl
- (d) LiAlH₄

62. The electrophile generated in sulphonation of benzene from fuming sulphuric acid is

- (a) SO₃⁺
- (b) SO₃H
- (c) SO₃
- (d) SO₂H

63. The reaction of 1,2-dibromoethane with alcoholic KOH yields

- (a) ethene
- (b) ethyne
- (c) 1-bromo-2-hydroxyethane
- (d) 1-bromoethene

64. Consider the following statements regarding Janani Suraksha Yojana (JSY) :

1. JSY is a safe motherhood intervention under the National Health Mission.
2. The objective of JSY is to reduce maternal and neonatal mortality.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

65. Which one of the following statements regarding Jan Shikshan Sansthan (JSS) is **not** correct?

- (a) JSS aims to provide vocational skills to non-literate, neo-literate and person with rudimentary level of education.
- (b) JSS is meant for vocational education of women only.
- (c) JSS works at the doorstep of the beneficiaries.
- (d) JSS receives grants from the government for skill development.

66. According to the National Multi-dimensional Poverty Index (MPI) constructed by the NITI Aayog, the education dimension is represented by parameters pertaining to

1. school attendance
2. years of schooling
3. literacy rate in the region

Select the correct answer using the code given below.

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

67. What is Academic Bank of Credit (ABC) as per the National Education Policy (NEP), 2020?

- (a) ABC enables credits awarded to students for one programme from a recognized higher education institution to be transferred or redeemed by another higher education institution
- (b) ABC is the bank account of the students for direct transfer of scholarship
- (c) ABC is the newly created institution for providing credits to academic institutions for building infrastructure
- (d) ABC is an autonomous banking system dealing with the financial management of higher education institutions under NEP, 2020

68. Which one of the following expressions has dimensions of energy (here V is the voltage across a resistor of resistance R and I is the current through the resistor, and t is the time)?

- (a) $\frac{V^2}{I} t$
- (b) $\frac{V^2}{R} t$
- (c) $\frac{I^2}{R} t$
- (d) $\frac{I^2}{V} t$

69. The angular acceleration of a simple pendulum at an angle α from the vertical is proportional to

- (a) $\tan \alpha$
- (b) $\sin^2 \alpha$
- (c) $\sin \alpha$
- (d) $\sin 2\alpha$

70. Which one of the following statements about X-rays is **not** correct?

- (a) X-rays are longitudinal waves.
- (b) X-rays are transverse waves.
- (c) X-rays are electromagnetic waves.
- (d) X-rays do not require a medium to propagate.

71. The magnitude of work done in moving an electron across two points having a potential difference 6 V is (electronic charge = 1.6×10^{-19} C)

- (a) 1.2×10^{-19} J
- (b) 9.6×10^{-19} J
- (c) 4.8×10^{-19} J
- (d) 1.6×10^{-19} J

72. Reverberation of sound ensures

- (a) a single refraction
- (b) a single reflection
- (c) multiple reflections
- (d) multiple refractions

73. Which one of the following would be a suitable plant to test that chlorophyll is necessary for photosynthesis?

- (a) Lady Plymouth
- (b) Cactus
- (c) Cuscuta
- (d) Oleander

74. Quadrat is generally used to enumerate the number of

- (a) animals breeding in a pond
- (b) burrows present in an anthill
- (c) plants present in a unit area
- (d) epiphytes on a tree

75. "Athlete's foot" is a skin disease caused by

- (a) virus
- (b) fungus
- (c) alga
- (d) bacterium

76. Which one of the following is a 'false fruit'?

- (a) Peach
- (b) Banana
- (c) Apple
- (d) Apricot

77. Which one among the following States is the largest producer of natural gas in India?

- (a) Madhya Pradesh
- (b) Jharkhand
- (c) Bihar
- (d) Rajasthan

78. Which of the following statements about river valleys is/are correct?

- 1. Kullu Valley is an example of strike valley.
- 2. Kangra Valley is a transverse valley.
- 3. Narmada flows in a rift valley.

Select the correct answer using the code given below.

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

79. The Kumaon Himalayas lie between

- (a) Indus River and Satluj River
- (b) Satluj River and Kali River
- (c) Chenab River and Satluj River
- (d) Bhagirathi River and Alaknanda River

80. Which one of the following glaciers is *not* part of Pir Panjal Range?

- (a) Urdok
- (b) Sonapani
- (c) Bara Shigri
- (d) Gangri

81. Little Andaman is separated from Great Andaman by

- (a) Ten Degree Channel
- (b) Homfray's Strait
- (c) Duncan Passage
- (d) Austen Strait

82. Which one of the following is the international convention/agreement specifying the commitments of different countries to mitigate climate change?

- (a) Montreal Protocol
- (b) Kyoto Protocol
- (c) Paris Agreement
- (d) Bali Agreement

83. Which one of the following is a known metallophyte for Fe?

- (a) *Eichhornia crassipes*
- (b) *Miconia lutescens*
- (c) *Astragalus acemosus*
- (d) *Mentha arvensis*

84. Which one of the following is a 'drupe'?

- (a) Orange
- (b) Brinjal
- (c) Coconut
- (d) Tomato

- 85.** Duckweed or Azolla is used as a/an
- pesticide
 - biofertilizer
 - arsenic indicator
 - antiseptic
- 86.** Which one of the following 'algae' is **not** known identified partner to form 'lichen'?
- Nostoc*
 - Stigonema*
 - Trentepohlia*
 - Vaucheria*
- 87.** Which one of the following is a secondary metabolite produced by some plants?
- Starch
 - Terpenoids
 - Malate
 - Sugar
- 88.** What is 'phenology'?
- Study of phenol production in plants
 - Study of periodical phenomena of plants, such as the time of flowering in relation to climate
 - Study of excretory pathway of phenols by herbivores
 - Study of phenotypic variation in newborn individuals of cats
- 89.** The ozonolysis of which one of the following alkenes yields a mixture of propan-2-one and formaldehyde?
- Propene
 - Butene
 - 2-Methylpropene
 - 2-Methylbutene
- 90.** Which one of the following compounds is used for the synthesis of silicones?
- SiCl_4
 - $(\text{CH}_3)_2\text{Si}(\text{OH})_2$
 - SiO_2
 - Na_4SiO_4
- 91.** Which one of the following products is formed by the oxidation of phenol with chromic acid?
- -
 -
 -

92. Which of the following statements relating to SWIFT is/are correct?

1. It is a messaging network used by banks and financial institutions globally for quick and faultless exchange of information pertaining to financial transactions.
2. It stands for Society for Worldwide Interbank Financial Telecommunications.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

93. Which of the following statements relating to the State Election Commissioner is/are correct?

1. The State Election Commissioner is appointed by the Election Commission of India.
2. The State Election Commissioner can be removed only in the same manner as a Judge of a High Court.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

94. Which one of the following statements relating to the duration of Panchayat is **not** correct?

- (a) Every Panchayat shall continue for six years from the date of its first meeting.
 - (b) A Panchayat can be dissolved before the expiry of its term in accordance with the procedure prescribed by State Law.
 - (c) Election to Panchayat must take place within six months of its dissolution.
 - (d) A Panchayat reconstituted after premature dissolution shall continue only for a remainder of the period.
- 95.** Which of the following words/phrases was **not** incorporated into the Preamble to the Constitution of India by the Forty-second Amendment?
- (a) Socialist
 - (b) Secular
 - (c) Unity and integrity of the nation
 - (d) Dignity of the individual

96. Which one of the following statements with regard to the Attorney-General of India as per Article 76 of the Constitution of India is **not** correct?

- (a) The Attorney-General of India is appointed by the Chief Justice of India.
- (b) A person who is qualified to be appointed a Judge of the Supreme Court of India is appointed as the Attorney-General of India.
- (c) In the performance of his/her duties, the Attorney-General shall have right of audience in all courts in the territory of India.
- (d) The Attorney-General shall hold office during the pleasure of the President of India.

97. Which part of independent India had held the first election based on universal adult franchise?

- (a) Hyderabad
- (b) Manipur
- (c) West Bengal
- (d) Nagaland

98. According to the NITI Aayog SDG India Index, 2020–21, which one among the following States is a Front Runner in its performance on SDG-14?

- (a) Tripura
- (b) Maharashtra
- (c) Punjab
- (d) Odisha

99. The force of buoyancy on an object floating on water is F , while it is S on an object that sinks in water. The weight of both the objects is W . Which one of the following is always true?

- (a) $F = W$ and $S = 0$
- (b) Both F and S have upward direction
- (c) F has upward direction and S has downward direction
- (d) $F = W$ and $S > W$

100. Infrasonic sounds have frequencies

- (a) above 25 kHz
- (b) between 20 kHz and 25 kHz
- (c) below 20 Hz
- (d) between 20 Hz and 20 kHz

101. When the temperature of a gas increases, the average speed of its molecules

- (a) remains the same
- (b) decreases
- (c) increases
- (d) either increases or decreases depending on the gas

102. Which one of the following is the quantity of transfer of linear momentum to the floor, when a dumbbell of mass 500 g falls from a height of 5 m and stops after hitting the floor (take $g = 10 \text{ m/s}^2$)?

- (a) 0.5 kg-m/s
- (b) 5.0 kg-m/s
- (c) 10.0 kg-m/s
- (d) 1.0 kg-m/s

103. The gravitational force (\mathbf{F}) on mass M due to another mass m at a distance x is given by (vector \mathbf{x} is from mass M to mass m and unit vector $\hat{\mathbf{x}}$ is the corresponding unit vector)

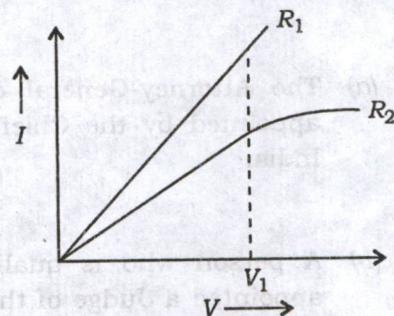
$$(a) \mathbf{F} = G \frac{Mm}{x^3} \mathbf{x}$$

$$(b) \mathbf{F} = -G \frac{Mm}{x^3} \mathbf{x}$$

$$(c) \mathbf{F} = -G \frac{Mm}{x^3} \hat{\mathbf{x}}$$

$$(d) \mathbf{F} = G \frac{Mm}{x^3} \hat{\mathbf{x}}$$

104. The $I-V$ graph for two resistors, resistor 1 (R_1) and resistor 2 (R_2), are shown below :



Which one of the following statements about these resistors is *not* correct?

- (a) R_1 follows Ohm's law.
- (b) R_2 does not follow Ohm's law after voltage V_1 .
- (c) Up to V_1 , the resistance of R_1 is smaller than that of R_2 .
- (d) Up to V_1 , the resistance of R_1 is larger than that of R_2 .

105. In which of the following situations will an applied force do negative work on a body?

- (a) The applied force and displacement of the body are at 135° to each other
- (b) The applied force and displacement of the body are parallel to each other
- (c) The applied force and displacement of the body are perpendicular to each other
- (d) The applied force and displacement of the body are at 45° to each other

106. Which one of the following is a tributary of Krishna River?

- (a) Harangi
- (b) Hiran
- (c) Purna
- (d) Munneru

107. Which of the following statements about breaks in the South-West Monsoon is/are correct?

1. In Northern India, rains are likely to fail if the rain-bearing storms are not very frequent along the monsoon trough.
2. In the West Coast, the dry spells occur when winds blow parallel to the coast.

Select the correct answer using the code given below.

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

108. According to the Solid Waste Management Rules, 2016, the responsibility of waste generators has been fixed for segregation of waste in which of the following streams?

- (a) Biodegradable and non-biodegradable wastes
- (b) Metallic and non-metallic wastes
- (c) Wet, dry and domestic hazardous wastes
- (d) Recyclable and non-recyclable wastes

109. Which one of the following countries is landlocked?

- (a) Paraguay
- (b) Uruguay
- (c) Suriname
- (d) Colombia

110. Which one of the following States of India has the largest area under ravines?

- (a) Uttar Pradesh
- (b) Himachal Pradesh
- (c) Punjab
- (d) Gujarat

111. According to the Climate Change Performance Index (CCPI), 2023, India climbed two spots to rank

- (a) seventh
- (b) eighth
- (c) ninth
- (d) tenth

112. Freddie, Elton, Oban, Siaya, Aasha, Tbilisi, Sasha and Savannah are names of

- (a) nuclear reactors of Ukraine
- (b) cheetahs brought to India from Namibia
- (c) National Parks of Tanzania
- (d) tropical and sub-tropical grasslands

113. Who among the following players won the Golden Boot Award in FIFA World Cup, 2022?

- (a) Lionel Messi
- (b) Kylian Mbappe
- (c) Angel Di Maria
- (d) Thomas Muller

114. Thundi Beach and Kadmat Beach, which recently entered the coveted list of Blue Beaches, an eco-label given to the cleanest beaches in the world, are located in

- (a) Puducherry
- (b) Lakshadweep
- (c) Kerala
- (d) Andaman and Nicobar Islands

115. The recent outbreak of extremely contagious lumpy skin disease affects mostly which one of the following animals?

- (a) Cow
- (b) Dog
- (c) Pig
- (d) Horse

116. According to the United Nations Environment Programme (UNEP), one of the recent large-scale accidental releases of methane gas into the ocean occurred in

- (a) Exxon Valdez
- (b) Nord Stream
- (c) Deepwater Horizon
- (d) Atlantic Empress

117. The area under millets cultivation is the highest in

- (a) Asia
- (b) Africa
- (c) America
- (d) Europe

118. Who among the following is credited with pioneering the oral rehydration therapy?

- (a) Anandi Joshi
- (b) Bidhan Chandra Roy
- (c) Dilip Mahalanabis
- (d) Siddhartha Mukherjee

119. According to scientists, which one of the following is the only known animal, except for humans, capable of telling the difference between odd and even numbers?

- (a) Butterfly
- (b) Honeybee
- (c) Dragonfly
- (d) Cricket

120. Who among the following is the recipient of Nobel Prize in Medicine in 2022?

- (a) David Julius
- (b) Svante Paabo
- (c) Charles M. Rice
- (d) Ardem Patapoutian

SPACE FOR ROUGH WORK

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SDGH-U-GKS/54A

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सामान्य अध्ययन (प्रश्न-पत्र I)

GENERAL STUDIES (Paper I)

निर्धारित समय : तीन घण्टे
Time Allowed : Three Hours

अधिकतम अंक : 250
Maximum Marks : 250

प्रश्न-पत्र सम्बन्धी विशेष अनुदेश

कृपया प्रश्नों के उत्तर देने से पूर्व निम्नलिखित प्रत्येक अनुदेश को ध्यानपूर्वक पढ़ें :

कुल बीस प्रश्न दिए गए हैं जो हिन्दी और अंग्रेजी दोनों में छपे हैं।

सभी प्रश्न अनिवार्य हैं।

प्रत्येक प्रश्न/भाग के लिए नियत अंक उसके सामने दिए गए हैं।

प्रश्नों के उत्तर उसी माध्यम में लिखे जाने चाहिए, जिसका उल्लेख आपके प्रवेश-पत्र में किया गया है, और इस माध्यम का स्पष्ट उल्लेख प्रश्न-सह-उत्तर (क्यू.सी.ए.) पुस्तिका के मुख-पृष्ठ पर निर्दिष्ट स्थान पर किया जाना चाहिए। उल्लिखित माध्यम के अतिरिक्त अन्य किसी माध्यम में लिखे गए उत्तर पर कोई अंक नहीं मिलेंगे।

प्रश्न संख्या 1 से 10 तक का उत्तर 150 शब्दों में तथा प्रश्न संख्या 11 से 20 तक का उत्तर 250 शब्दों में दीजिए।

प्रश्नों में इंगित शब्द सीमा को ध्यान में रखिए।

प्रश्न-सह-उत्तर पुस्तिका में खाली छोड़े गए कोई पृष्ठ अथवा पृष्ठ के भाग को पूर्णतः काट दीजिए।

QUESTION PAPER SPECIFIC INSTRUCTIONS

Please read each of the following instructions carefully before attempting questions.

There are TWENTY questions printed both in HINDI and in ENGLISH.

All questions are compulsory.

The number of marks carried by a question/part is indicated against it.

Answers must be written in the medium authorized in the Admission Certificate which must be stated clearly on the cover of this Question-cum-Answer (QCA) Booklet in the space provided. No marks will be given for answers written in a medium other than the authorized one.

Answers to Questions No. 1 to 10 should be in 150 words, whereas answers to Questions No. 11 to 20 should be in 250 words.

Keep the word limit indicated in the questions in mind.

Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

1. स्पष्ट करें कि मध्यकालीन भारतीय मंदिरों की मूर्तिकला उस दौर के सामाजिक जीवन का प्रतिनिधित्व करती है। (150 शब्दों में उत्तर दें) How will you explain that medieval Indian temple sculptures represent the social life of those days ? (Answer in 150 words) 10
2. अधिकांश भारतीय सिपाहियों वाली ईस्ट इंडिया की सेना क्यों तत्कालीन भारतीय शासकों की संख्याबल में अधिक और बेहतर सुसज्जित सेना से लगातार जीतती रही ? कारण बताएँ। (150 शब्दों में उत्तर दें) Why did the armies of the British East India Company – mostly comprising of Indian soldiers – win consistently against the more numerous and better equipped armies of the then Indian rulers ? Give reasons. (Answer in 150 words) 10
3. औपनिवेशिक भारत की अठारहवीं शताब्दी के मध्य से क्यों अकाल पड़ने में अचानक वृद्धि देखने को मिलती है ? कारण बताएँ। (150 शब्दों में उत्तर दें) Why was there a sudden spurt in famines in colonial India since the mid-eighteenth century ? Give reasons. (Answer in 150 words) 10
4. प्राथमिक चट्टानों की विशेषताओं एवं प्रकारों का वर्णन कीजिए। (150 शब्दों में उत्तर दें) Describe the characteristics and types of primary rocks. (Answer in 150 words) 10
5. भारतीय मौसम विज्ञान विभाग द्वारा चक्रवात प्रवण क्षेत्रों के लिए मौसम-सम्बन्धी चेतावनियों के लिए निर्धारित रंग-संकेत के अर्थ की चर्चा करें। (150 शब्दों में उत्तर दें) Discuss the meaning of colour-coded weather warnings for cyclone prone areas given by India Meteorological Department. (Answer in 150 words) 10
6. ‘दक्कन ट्रैप’ की प्राकृतिक संसाधन-सम्भावनाओं की चर्चा कीजिए। (150 शब्दों में उत्तर दें) Discuss the natural resource potentials of ‘Deccan Trap’. (Answer in 150 words) 10
7. भारत में पवन ऊर्जा की संभावना का परीक्षण कीजिए एवं उनके सीमित क्षेत्रीय विस्तार के कारणों को समझाइए। (150 शब्दों में उत्तर दें) Examine the potential of wind energy in India and explain the reasons for their limited spatial spread. (Answer in 150 words) 10

8. पारिवारिक सम्बन्धों पर 'वर्क फ्रॉम होम' के असर की छानबीन तथा मूल्यांकन करें।
(150 शब्दों में उत्तर दें) Explore and evaluate the impact of 'Work From Home' on family relationships.
(Answer in 150 words) 10
9. उपभोक्ता संस्कृति के विशेष परिप्रेक्ष्य में नव मध्यवर्ग के उभार से टीयर 2 शहरों का विकास किस तरह सम्बन्धित है ? (150 शब्दों में उत्तर दें)
How is the growth of Tier 2 cities related to the rise of a new middle class with an emphasis on the culture of consumption ? (Answer in 150 words) 10
10. भारत के जनजातीय समुदायों की विविधताओं को देखते हुए किस विशिष्ट सन्दर्भ के अन्तर्गत उन्हें किसी एकल श्रेणी में माना जाना चाहिए ? (150 शब्दों में उत्तर दें)
Given the diversities among tribal communities in India, in which specific contexts should they be considered as a single category ? (Answer in 150 words) 10
11. राज्यों एवं प्रदेशों का राजनीतिक और प्रशासनिक पुनर्गठन उन्नीसवीं शताब्दी के मध्य से निरंतर चल रही एक प्रक्रिया है। उदाहरण सहित विचार करें। (250 शब्दों में उत्तर दें)
The political and administrative reorganization of states and territories has been a continuous ongoing process since the mid-nineteenth century. Discuss with examples. (Answer in 250 words) 15
12. भारतीय परम्परा और संस्कृति में गुप्त-काल और चोल-काल के योगदान पर चर्चा करें।
(250 शब्दों में उत्तर दें)
Discuss the main contributions of Gupta period and Chola period to Indian heritage and culture. (Answer in 250 words) 15
13. भारतीय मिथक, कला और वास्तुकला में सिंह एवं वृषभ की आकृतियों के महत्व पर विचार करें।
(250 शब्दों में उत्तर दें)
Discuss the significance of the lion and bull figures in Indian mythology, art and architecture. (Answer in 250 words) 15
14. समुद्री धाराओं को प्रभावित करने वाली शक्तियाँ कौन सी हैं ? विश्व के मत्स्य-उद्योग में इनके योगदान का वर्णन करें। (250 शब्दों में उत्तर दें)
What are the forces that influence ocean currents ? Describe their role in fishing industry of the world. (Answer in 250 words) 15

15. रबर उत्पादक देशों के वितरण का वर्णन करते हुए उनके द्वारा सामना किए जाने वाले प्रमुख पर्यावरणीय मुद्दों को इंगित कीजिए। (250 शब्दों में उत्तर दें) 15

Describing the distribution of rubber producing countries, indicate the major environmental issues faced by them. (Answer in 250 words)

16. अंतर्राष्ट्रीय व्यापार में जलसंधि व स्थलसंधि के महत्व का उल्लेख कीजिए। (250 शब्दों में उत्तर दें)

Mention the significance of straits and isthmus in international trade. (Answer in 250 words)

15

17. क्षेत्रमंडल वायुमंडल का एक महत्वपूर्ण परत है जो मौसम प्रक्रियाओं को निर्धारित करता है। कैसे? (250 शब्दों में उत्तर दें)

Troposphere is a very significant atmospheric layer that determines weather processes. How? (Answer in 250 words)

15

18. भारतीय समाज में जाति, क्षेत्र तथा धर्म के समानांतर 'पंथ' की विशेषता की विवेचना कीजिए। (250 शब्दों में उत्तर दें)

Analyse the salience of 'sect' in Indian society vis-a-vis caste, region and religion. (Answer in 250 words)

15

19. क्या सहिष्णुता, सम्मिलन एवं बहुलता मुख्य तत्त्व हैं जो धर्मनिरपेक्षता के भारतीय रूप का निर्माण करते हैं? तर्कसंगत उत्तर दें। (250 शब्दों में उत्तर दें)

Are tolerance, assimilation and pluralism the key elements in the making of an Indian form of secularism? Justify your answer. (Answer in 250 words)

15

20. अपर्याप्त संसाधनों की दुनिया में भूमंडलीकरण एवं नए तकनीक के रिश्ते को भारत के विशेष सन्दर्भ में स्पष्ट करें। (250 शब्दों में उत्तर दें)

Elucidate the relationship between globalization and new technology in a world of scarce resources, with special reference to India. (Answer in 250 words)

15