

12P/290/5

Question Booklet No. ....

(To be filled up by the candidate by **blue/black ball-point pen**)

Roll No. 

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Roll No.

(Write the digits in words) .....

Serial No. of Answer Sheet .....

Day and Date .....

.....  
(Signature of Invigilator)

### INSTRUCTIONS TO CANDIDATES

(Use only **blue/black ball-point pen** in the space above and on both sides of the Answer Sheet)

1. Within 10 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.
2. Do not bring any loose paper, written or blank, inside the Examination Hall *except the Admit Card without its envelope*.
3. A separate Answer Sheet is given. *It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.*
4. Write your **Roll Number and Serial Number of the Answer Sheet by pen** in the space provided above.
5. *On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top, and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.*
6. No overwriting is allowed in the entries of Roll No., Question Booklet No. and Set No. (if any) on OMR sheet and Roll No. and OMR sheet No. on the Question Booklet.
7. Any changes in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfair means.
8. Each question in this Booklet is followed by four alternative answers. *For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by pen as mentioned in the guidelines given on the first page of the Answer Sheet.*
9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.
10. *Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).*
11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.
12. Deposit *only the OMR Answer Sheet* at the end of the Test.
13. You are not permitted to leave the Examination Hall until the end of the Test.
14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

[ उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण-पृष्ठ पर दिये गये हैं । ]

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**No. of Questions : 180**

**Time : 2 Hours ]**

**[ Full Marks : 360**

**Note :**

- (i) Attempt as many questions as you can. Each question carries 3 (**three**) marks. *One mark will be deducted for each incorrect answer. Zero mark will be awarded for each unattempted question.*
- (ii) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

(iii) This Question Booklet comprises two Sections viz., **Section-A** and **Section-B** :

**Section-A** : This is *compulsory*.

**Section-B** : This contains *three* Sub-sections having questions of *three* disciplines viz.,

**Life Science** (Sub-section B-1)

**Physics** (Sub-section B-2)

**Geology** (Sub-section B-3)

A candidate is required to attempt *only one* from these *three* Sub-sections.

**SECTION – A**

**BASIC ENVIRONMENTAL SCIENCES**

**(Compulsory for all)**

1. "Law of Minimum" was given by :  
(1) Shelford            (2) Clemant            (3) Liebig            (4) Blackman
2. Cup anemometer is used for measuring :  
(1) Water evaporation            (2) Wind speed  
(3) Wind direction            (4) Rainfall

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3. Which region of the seas and oceans are the most polluted ?  
(1) Estuarine      (2) Sea depths      (3) Sea surface      (4) Coastal
4. Largest salt water lake in India is :  
(1) Chilka      (2) Lonar      (3) Wullar      (4) Sambhar
5. In which of the following, inverted pyramid of biomass is found ?  
(1) Grassland ecosystem      (2) Pond ecosystem  
(3) Desert ecosystem      (4) Forest ecosystem
6. The important GHG mainly released from marshy lands is :  
(1)  $CO_2$       (2)  $N_2O$       (3)  $CH_4$       (4) CFCs
7. How many agro-climatic zones are found in India ?  
(1) 15      (2) 16      (3) 17      (4) 10
8. Atmospheric humidity is measured by :  
(1) Radiometer      (2) Hygrometer      (3) Hydrometer      (4) Micrometer
9. The  $CO_2$  concentration in the atmosphere is increasing at the rate of about :  
(1) 0.3%      (2) 0.2%      (3) 0.4%      (4) 0.5%
10. The concentration of ozone is found maximum in :  
(1) Troposphere      (2) Upper stratosphere  
(3) Lower stratosphere      (4) Mesosphere
11. The National Institute of Oceanography is presently situated at :  
(1) Kerala      (2) Calicut      (3) Cochin      (4) Goa
12. Which elemental cycle has no atmospheric reservoir ?  
(1) Oxygen      (2) Carbon      (3) Phosphorus      (4) Nitrogen
13. Concept of ecological pyramid was given by :  
(1) A. G. Tansley      (2) E. P. Odum      (3) R. Mishra      (4) C. Elton
14. The Ministry of Environment and Forests was set up in :  
(1) 1970      (2) 1980      (3) 1985      (4) 1975

15. The target organ of Cadmium toxicity is :  
 (1) Lung (2) Liver (3) Kidney (4) Bones
16. The normal lapse rate of temperature per kilometer altitude is :  
 (1) 6.4°C (2) 4.6°C (3) 10 (4) 9.8°C
17. Gregarious flowering is observed in :  
 (1) Bamboo (2) Forbs (3) Legues (4) Lantana
18. In primary succession, the pioneer organism on a Xerosere is :  
 (1) Pteridophytes (2) Mosses (3) Green algae (4) Lichens
19. Ecological or physiological races are also known as :  
 (1) Ecads (2) Ecotypes (3) Ecophens (4) Ectogens
20. The biggest hindrance in using biomass as a energy source is :  
 (1) Lack of proven technology for commercialization  
 (2) Energy yield is low  
 (3) Large amount of land is required to grow energy crops  
 (4) Air pollution due to combustion
21. Among the following, which one is *not* a criteria pollutant ?  
 (1) NO<sub>x</sub> (2) SO<sub>2</sub> (3) PAH (4) PM<sub>2.5</sub>
22. Water potential in soil and plants is always :  
 (1) zero (2) more than zero  
 (3) less than zero (4) more than one
23. Apparent photosynthesis is also termed as :  
 (1) Total assimilation (2) Net assimilation  
 (3) Net productivity (4) Secondary productivity
24. Which of the following pair is not correctly matched regarding National Parks and their locations ?  
 (1) Nilgiri - Tamil Nadu (2) Sunderbans - West Bengal  
 (3) Nanda Devi - Uttarakhand (4) Kanha - Rajasthan

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25. Redox titration is used in determination of :
- (1) Dissolved Oxygen (2) Total hardness  
(3) Chemical Oxygen demand (4) Biochemical Oxygen demand
26. The dominance of a new genetic form as a result of environmental change is called :
- (1) Adaptation (2) Natural selection  
(3) Succession (4) Synergism
27. Demography is the statistical study of :
- (1) Human society (2) Human population  
(3) Human settlement (4) Human life
28. The wave length of the atmospheric window is :
- (1) 4.0 – 6.0  $\mu$  (2) 2.0 – 5.0  $\mu$  (3) 8.0 – 13.0  $\mu$  (4) 7.0 – 10.0  $\mu$
29. Dobson unit is a measure of :
- (1) PAN concentration (2) CFC concentration  
(3) Ozone concentration (4) CO<sub>2</sub> concentration
30. The rate of photosynthesis is greater in :
- (1) IR region (2) In intermittent light  
(3) In continuous light (4) UV region

### CHEMISTRY

(Compulsory for all)

31. The energy of a magnetic moment in Z direction of a magnetic field of magnitude  $H$ , is expressed as :
- (1)  $E = hv$  (2)  $E = -\mu_z H$  (3)  $E = -\mu H$  (4)  $E = \mu H$
32. The equation,  $H_2 + Br_2 \rightarrow HBr + Br$  is :
- (1) Elementary equation (2) Unimolecular reaction  
(3) Bimolecular reaction (4) Complex reaction

33. The unit of the specific reaction rate of a second order reaction is :  
 (1)  $S^{-1}$                       (2)  $M.S^{-1}$                       (3)  $M^{-1}.S^{-1}$                       (4)  $M^{-1}$
34. The molecular mass of  $CO_2$  is  $44.01 \text{ g mol}^{-1}$ , the root mean square speed of the molecules in the gas at 298 K is [ $R = 8.3145 \text{ JK}^{-1}\text{mol}^{-1}$ ]:  
 (1)  $400 \text{ ms}^{-1}$                       (2)  $409 \text{ ms}^{-1}$                       (3)  $411 \text{ ms}^{-1}$                       (4)  $\sqrt{894} \text{ ms}^{-1}$
35. The  $PK_a$  of  $HCN$  (aq.) is 9.3, the pH of 0.01 M  $HCN$  (aq.) is :  
 (1) 5.01                      (2) 4.65                      (3) 5.65                      (4) 3.65
36. The concept of temperature and the use of thermometer is justified by :  
 (1) Dalton's law                      (2) Boyle's law  
 (3) Zeroth law of thermodynamics                      (4) Second law of thermodynamics
37. Supercritical  $CO_2$  is applied in the :  
 (1) NMR machine                      (2) separation of 3 He from 4 He  
 (3) decaffeination of coffee                      (4) separation of lanthanides
38. The metal transparent to X-rays is :  
 (1) Zn                      (2) Be                      (3) B                      (4) Mg
39. The term  $\lambda$ -transition applied to phase transition is :  
 (1) The fluid superfluid transition of liq. helium  
 (2) Second order phase transition  
 (3) First order phase transition  
 (4) The system in which heat capacity begins to decrease before the transition
40. Electrolysis of dil. aq.  $NaCl$  solution was carried by passing 100 milliamperere current, the time required to liberate 0.1 mol of  $H_2$  gas at Cathode is :  
 [ 1 Faraday =  $96500 \text{ c mol}^{-1}$  ]  
 (1)  $9.65 \times 10^4$  second                      (2)  $24.95 \times 10^4$  second  
 (3)  $19.3 \times 10^4$  second                      (4)  $38.6 \times 10^5$  second



47. Dimethyl ether is an isomer of :  
 (1) methanol      (2) ethanol      (3) acetone      (4) acetaldehyde
48. 1, 2-dimethylcyclopentane exists in :  
 (1) two stereoisomers      (2) four stereoisomers  
 (3) three stereoisomers      (4) nine stereoisomers
49. The reaction  $\begin{array}{c} H \\ | \\ -C-\overset{\alpha}{C}- \\ | \end{array} + :B(\text{base}) \rightarrow \begin{array}{c} \diagup \\ C \\ \diagdown \end{array} = \begin{array}{c} \diagdown \\ C \\ \diagup \end{array} + H : B + :X^-$ , is an example of :  
 (1) dehydrogenation      (2) dehydration  
 (3) dehydrohalogenation      (4) dehalogenation
50. Cellulose is a polymer of :  
 (1)  $\alpha(-D)$  glucose    (2)  $\beta(D)$  glucose    (3) fructose      (4) sucrose
51. The least stable carbanion is :  
 (1)  $(CH_3)_3C^-$       (2)  $\bar{C}Cl_3$       (3)  $\bar{C}H_3$       (4)  $C_6H_5\bar{C}H_2$
52. The correct molecular formula of 2, 2, 4-trimethyl hexane is :  
 (1)  $C_9H_{18}$       (2)  $C_8H_{16}$       (3)  $C_9H_{20}$       (4)  $C_9H_{22}$
53. Lindlar's catalyst is :  
 (1)  $Pd / BaSO_4$  in Quinoline      (2)  $SOCl_2$   
 (3)  $Pd / Cu$       (4)  $ZnCl_2 / HCl$
54. The correct acidity order is :  
 (1) Formic acid > acetic acid > propionic acid > fluoroacetic acid  
 (2) Fluoroacetic acid > acetic acid > formic acid > propionic acid  
 (3) Propionic acid > acetic acid > formic acid > fluoroacetic acid  
 (4) Acetic acid > propionic acid > fluoroacetic acid > formic acid

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55. Chloroform exposed to light and air provides :  
(1)  $CCl_4$                       (2)  $COCl_2$                       (3)  $Cl_2$                       (4)  $CO$
56. n-butane is converted into isobutane :  
(1) heating n-butane at  $300^\circ C$   
(2) n-butane treated with  $HCl$   
(3) n-butane treated with  $AlCl_3$  and  $HCl$  at  $25^\circ C$   
(4) cooling n-butane at  $-5^\circ C$
57. Thiamine is called :  
(1) Vitamin A                      (2) Vitamin  $B_6$                       (3) Vitamin C                      (4) Vitamin  $B_1$
58. Which one of the following is used for the preparation of alizarin ?  
(1) Catechol    (2) Phthalic anhydride  
(3) Phenol    (4) Toluene
59. The oxidation of catechol with silver oxide gives :  
(1) Silver catecholate    (2) 1, 4-naphthoquinone  
(3) o-benzoquinone    (4) hydroquinone
60. Glycerol is :  
(1) Soap    (2) Fat    (3) Alcohol    (4) Acid
61. Chloral upon reduction with  $Al(OC_2H_5)_3$  gives :  
(1)  $CHCl_3$     (2)  $Al(OH)_3$   
(3) Chloralhydrate    (4) Trichloroacetic acid
62. Benzene upon reaction with propene in presence of anhydrous  $AlCl_3$  provides :  
(1) Cumene    (2) Cumene hydroperoxide  
(3) Acetone    (4) Phenol
63. Which one of the following is used as insecticide ?  
(1)  $C_2H_5NO_2$                       (2)  $CCl_3NO_2$                       (3)  $CH_2Cl_2$                       (4)  $Cl_2C=O$

64. The metal used for removal of traces of  $N_2$  from  $Ar$  is :  
(1)  $Ti$  (2)  $Zr$  (3)  $Cu$  (4)  $Ca$
65. White asbestos is :  
(1)  $Mg_3(OH)_4 \cdot Si_2O_5$  (2)  $Zn_2(SiO_4)$   
(3)  $Al_2(OH)_2(Si_2O_5)_2$  (4)  $(Mg, Fe, Mn)_2(SiO_4)$
66. Which one of the following gases burns in air with a blue flame and is also highly water soluble ?  
(1)  $CO_2$  (2)  $SO_2$  (3)  $H_2S$  (4)  $NH_3$
67. Which is powerful electrophilic reducing agent for functional  $R-NO_2$  group ?  
(1)  $Na_2SO_3$  (2)  $NaBH_4$  (3)  $B_2H_6$  (4)  $H_2O_2$
68. Which one of the following forms compound that bring out other elements in higher oxidation state ?  
(1)  $Cl_2$  (2)  $F_2$  (3)  $Br_2$  (4)  $N_2$
69. In Wacker process, for the preparation acetaldehyde from ethylene, the catalyst used is :  
(1)  $PdCl_2, CuCl_2$  (2)  $Pd, CuCl_2$  (3)  $PdCl_2$  (4)  $Pt$
70. The geometry of Wilkinson catalyst is :  
(1) Tetrahedral (2) Square planar  
(3) Trigonal bipyramidal (4) Linear
71. Molecular orbital for which wave function ( $\Psi$ ) is zero along the internuclear line, is  
(1)  $\sigma^b$  (2)  $\pi$  (3)  $\sigma^*$  (4)  $\delta$
72. In Stoichiometric ionic crystals, Schottky defect is caused by the vacancy of :  
(1) anion  
(2) cation  
(3) equal number of cation and anion  
(4) unequal number of cation and anion

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73. Number of microstates for  $d^2$  electronic configuration is :
- (1) 10                      (2) 20                      (3) 120                      (4) 45
74. If  $SO_2$  is passed over  $PCl_5$ , it gives :
- (1)  $SOCl_2$                       (2)  $SO_2Cl_2$                       (3)  $PCl_5 \cdot SO_2$                       (4)  $SO_3$
75. Calomel is :
- (1)  $HgCl_2$                       (2)  $Hg_2Cl_2$                       (3)  $Hgl_2$                       (4)  $Cdl_2$
76. The colour of oxyhemoglobin is :
- (1) blue                      (2) violet                      (3) red                      (4) browr
77. Which one of the following is *not* diamagnetic ?
- (1) Oxyhemoglobin                      (2)  $O_2$   
(3)  $N_2$                       (4)  $Ni(CO)_4$
78. Nessler's reagent is a solution of :
- (1)  $HgI_2$  in  $KI$                       (2)  $HgI_2$  in  $KBr$   
(3)  $HgCl_2$  in  $KI$                       (4)  $HgBr_2$  in  $KBr$
79. The coloured compound is :
- (1)  $CuF_2$                       (2)  $[Cu(CH_3CN)_4]BF_4$   
(3)  $CuCl$                       (4)  $K_3[Cu(CN)_4]$
80. The IUPAC name of  $[Pt(Py)_4] [PtCl_4]$  is :
- (1) Tetrapyridine Platinum (II) tetrachloroplatinate (II)  
(2) Tetrachloroplatinate (II) tetrapyridine platinate (II)  
(3) Tetrapyridine platinate (II) tetrachloroplatinate (II)  
(4) Tetrapyridine tetrachloro Pt (II)

81. What changes will increase the equilibrium concentration of product C in the system,  $A(g) + B(g) \rightleftharpoons C(g)$ , if the  $\Delta H^\circ$  of the reaction is negative ?

Choose from the following conditions :

- (i) the addition of a catalyst
- (ii) the addition of an extra amount of substance B,
- (iii) raising of the temperature
- (iv) lowering of the temperature

(1) (i) and (iv)      (2) (i) and (iii)      (3) (iii)      (4) (ii) and (iv)

82. Some changes in reaction conditions are given below. Which of these changes will lead to a change in the rate constant of the reaction ?

- (i) change in the pressure
- (ii) change in the temperature
- (iii) introduction of a catalyst
- (iv) change in the concentration of the reactants and products

(1) (ii) and (iv)      (2) (ii)      (3) (ii) and (iii)      (4) all four

83. What is the pH of a  $10^{-3}$  M solution of sodium hydroxide ?

(1) -3      (2) 3      (3) 11      (4) 7

84. What happens to the pH when a small amount of  $NH_4Cl$  is added to a 1 M solution of  $NH_4Cl$  ?

- (1) pH decreases
- (2) pH remains at 7
- (3) pH increases
- (4) pH does not change

85. How many degrees of freedom are there at the triple point of carbon dioxide ?

(1) zero      (2) one      (3) two      (4) three

86. If A and B are the molar concentration in the two half cells of an electrochemical concentration cell, the potential of the concentration cell will be zero when :

(1)  $A - B = 1$       (2)  $A = B$       (3)  $\log (A/B) = 1$       (4)  $A + B = 1$  M





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- 101.** Steroid hormones are derived from :  
(1) Cholesterol      (2) Ergosterol      (3) Triglycerol      (4) Tocopherol
- 102.** Antidiuretic hormone is otherwise known as :  
(1) Oxytocin      (2) Prolactin      (3) Somatotropin      (4) Vasopressin
- 103.** The synthesis of yolk is known as :  
(1) Epigenesis      (2) Spermatogenesis  
(3) Transgenesis      (4) Vitellogenesis
- 104.** The simplest type of excretory system consisting of flame cells is :  
(1) Amoeba      (2) Cockroach      (3) Earthworm      (4) Planaria
- 105.** Which one of the following acids accumulates during muscle fatigue ?  
(1) Lactic acid      (2) Pyruvic acid  
(3) Oxaloacetic acid      (4) Succinic acid
- 106.** The inactive form of enzyme is known as :  
(1) Agglutinogen      (2) Collagen      (3) Fibrinogen      (4) Zymogen
- 107.** In an ecosystem bacteria perform the role as :  
(1) Micro consumers      (2) Macro consumers  
(3) Primary consumers      (4) Secondary consumers
- 108.** Out of 64 codons, how many are nonsense codons ?  
(1) 2      (2) 3      (3) 4      (4) 5
- 109.** The functional unit of gene which specifies synthesis of one polypeptide chain is :  
(1) Cistron      (2) Codon      (3) Recon      (4) Muton
- 110.** The specific scientific term for the processing of m-RNA synthesis on a DNA template is :  
(1) Elongation      (2) Replication      (3) Transcription      (4) Translation

111. Name the scientist who had synthesized the first artificial gene without a primer :
- (1) Barbara McClintock                      (2) Har Govind Khurana  
(3) Linus Pauling                              (4) Severo Ochoa
112. Which one of the following is a sex linked disease ?
- (1) Colourblindness                              (2) Amoebic dysentery  
(3) Tetanus    (4) Typhoid
113. There is no crossing over during spermatogenesis in :
- (1) Dragon fly      (2) Damsel fly      (3) Fruit fly      (4) House fly
114. Reproduction by larval forms is known as :
- (1) Metagenesis                                      (2) Orthogenesis  
(3) Paedogenesis                                      (4) Spermatogenesis
115. In the nucleus, the proteins associated with DNA are mostly :
- (1) Bradykinins      (2) Collagens      (3) Histones      (4) Myosins
116. Which one of the following proteins exhibit Quarternary structure of protein ?
- (1) Actin                      (2) Haemoglobin      (3) Oxytocin      (4) Pepsin
117. Myoglobin is present in :
- (1) Brain                      (2) Kidney                      (3) Liver                      (4) Muscle
118. The study of animal behaviour is :
- (1) Ecology                      (2) Ethology                      (3) Gerontology      (4) Malacology
119. In eukaryotic cells, microsomes are derived from :
- (1) Endoplasmic reticulum                      (2) Golgi body  
(3) Lysosome    (4) Mitochondria
120. Which one of the following enzymes can cause break and reseal of one strand of DNA ?
- (1) Aminotransferase                              (2) Helicase  
(3) Ligase    (4) Topoisomerase

**PHYSICS (Sub-section B-2)****(Optional)**

- 121.** In Young's double slit experiment the separation between the slits is 1 cm wavelength of the light used is 600 nm and the interference pattern is observed on a screen 1.0 m away. The separation between the successive bright fringes will be :
- (1) 6.0 mm                      (2) 3 mm                      (3) 12 mm                      (4) 1.5 mm
- 122.** A parallel beam of green light of wavelength 546 nm passes through a slit of width 0.40 mm. The transmitted light is collected on a screen 40 cm away. The distance between the two first order minima is :
- (1) 0.55 mm                      (2) 2.2 mm                      (3) 0.275 mm                      (4) 1.1 mm
- 123.** If the light is incident on the plane surface of a material at an angle of incidence  $i = \tan^{-1} \mu$  where  $\mu$  is the refractive index of the material then :
- (1) the reflected light is completely polarized  
(2) the refracted light is completely polarized  
(3) the reflected light is partially polarized  
(4) the refracted light is partially polarized
- 124.** Optical fiber communication is based on the principle of :
- (1) interference in thin films                      (2) total internal reflection  
(3) reflection and refraction                      (4) diffraction at the edges
- 125.** Indicate the false statement about the properties of LASER light given below :
- (1) It is monochromatic                      (2) It is coherent  
(3) Its frequency is very high                      (4) It is easily absorbed by water
- 126.** Two thin convex lenses of focal lengths  $f_1$  and  $f_2$  are placed coaxially separated by a distance  $d$  such that  $d < (f_1 + f_2)$  the combination of lenses acts as :
- (1) convergent lens                      (2) divergent lens  
(3) telescopic lens                      (4) microscopic lens



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132. "If A is in thermal equilibrium with B and B is in equilibrium with C, then A and C will also be in equilibrium". This statement is known as :
- (1) Zeroth law of thermodynamics      (2) First law of thermodynamics  
(3) Second law of thermodynamics      (4) Third law of thermodynamics
133. If for any thermodynamics system  $\oint dx \neq 0$  for all cyclic irreversible processes then the variable  $x$  is :
- (1) internal energy  $\mu$       (2) pressure  $P$   
(3) temperature  $T$       (4) entropy  $S$
134. 10 gm water at  $^{\circ}\text{C}$  is heated and transformed to 10 gm steam at  $100^{\circ}\text{C}$ . If the latent heat of evaporation at  $100^{\circ}\text{C}$  is  $538 \text{ cal/gm}$ , then the change in entropy is :
- (1)  $14.44 \text{ cal/}^{\circ}\text{k}$       (2)  $17.54 \text{ cal/}^{\circ}\text{k}$       (3)  $4.56 \text{ cal/}^{\circ}\text{k}$       (4)  $14.72 \text{ cal/}^{\circ}\text{k}$
135. "The ratio of the emissive power to the absorptive power for radiation of a given wavelength is the same for all bodies at the same temperature". This statement is known as :
- (1) Stefan's law      (2) Newton's law  
(3) Kirchhoff's law      (4) Wien's law
136. A 50 gm bullet moving with velocity 10 m/sec strikes a block of 950 gm at rest and gets embedded in it. The loss in the kinetic energy will be :
- (1) 100 %      (2) 95 %      (3) 5 %      (4) 0 %
137. A space craft of length 100 meter is moving with a velocity  $0.6 c$  in a direction along its length. The apparent length of the space craft to the observer at earth surface will be :
- (1) 80 meter      (2) 125 meter      (3) 120 meter      (4) 60 meter
138. The average kinetic energy of a particle executing simple harmonic motion with amplitude  $a$  and angular frequency  $\omega$  is :
- (1)  $\frac{1}{2} m\omega^2 a^2$       (2)  $\frac{1}{3} m\omega^2 a^2$       (3)  $\frac{1}{4} m\omega^2 a^2$       (4)  $ma^2\omega^2$

139. The theoretical limiting values of Poisson's ratio  $\sigma$  lies in the range :  
(1)  $-0.5 < \sigma < 0.5$  (2)  $0.2 < \sigma < 0.5$  (3)  $-1 < \sigma < 0.5$  (4)  $-0.5 < \sigma < 1$
140. A water drop of radius 0.001 cm is falling through air. Find its terminal velocity if it is given that the coefficient of viscosity for water is  $1.8 \times 10^{-4}$  CGS units and density of air is negligible :  
(1) 1.5 cm/sec (2) 2.4 cm/sec (3) 4.2 cm/sec (4) 1.2 cm/sec
141. A big drop is formed by coalescing 1000 small droplets. What will be change in surface energy ?  
(1) 90% decrease (2) 10% decrease (3) 10% increase (4) 60% increase
142. In a triode the plate current increases by 1 mA when plate voltage is increased by 20 volt keeping grid voltage constant. Negative bias on the gate voltage has to be increased by 1 volt to bring the current to its initial value maintaining the increased plate voltage constant. Find the amplification factor of triod :  
(1) 10 (2) 40 (3) 30 (4) 20
143. A solenoid has an inductance of 50 henry and a resistance of  $30 \Omega$ . It is connected to a 100 V battery. How long will it take to reach one half of the final value ?  
(1) 1.67 sec (2) 1.5 sec (3) 1.2 sec (4) 1.42 sec
144. Indicate the false statement about the N type semiconductor :  
(1) Its resistance decreases with slight increase in temperature  
(2) Its resistance increases with slight increase in temperature  
(3) It is obtained by adding impurities of 5th group of periodic table in Ge or Si  
(4) In these semiconductors number of electrons is much greater than the number of holes
145. In P-N junction diode reverse bias current :  
(1) decrease with increase in bias voltage  
(2) increase with increase in bias voltage  
(3) increase with increase in temperature  
(4) decrease with increase in temperature

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146. For a transistor the common base current gain is 0.98 then the common emitter current gain for this transistor is :
- (1) 100                      (2) 50                      (3) 49                      (4) 51
147. The half life of a radio isotope is 5 years. The fraction of atoms decayed in this resistance in a period of 15 years will be :
- (1)  $\frac{1}{8}$                       (2)  $\frac{3}{8}$                       (3)  $\frac{5}{8}$                       (4)  $\frac{7}{8}$
148. Assuming that 2 deuterium nuclei after nuclear fusion form a single helium nucleus. If the mass of deuteron is 2.01471 amu and mass of  $\alpha$ -particle is 4.00388 amu, then find the energy liberated in this process is about (1 amu = 931 MeV) :
- (1) 24 MeV                      (2) 12 MeV                      (3) 6 MeV                      (4) 30 MeV
149. Indicate the false statement about the binding energy per nucleon for nuclei of different mass number :
- (1) It is constant for most of the nuclei  
(2) Its average value is about 5 MeV  
(3) It is maximum for iron  
(4) It increases sharply for low values of mass number A
150. A water main of 20 cm diameter has a pilot tube fixed into it and the pressure difference indicated by the gauge is 5 cm of water column, calculate the rate of flow of water the main ( $g = 980 \text{ cm/sec}^2$  and density of water  $1 \text{ gm/cm}^3$ ) :
- (1) 62.2 liters/sec                      (2) 39.2 liters/sec  
(3) 31.1 liters/sec                      (4) 20.2 liters/sec

**GEOLOGY (Sub-section B-3)**  
**(Optional)**

151. Certain structure of sedimentary or tectonic origin which resemble fossilized organic remains is :
- (1) Facies fossil      (2) Derived fossil      (3) Pseudo fossil      (4) Remain fossil

152. The shell spindle in shape, in which the body whorl is thick in middle and tapering near the bottom and the top is :  
 (1) Fusiform (2) Conical (3) Trochiform (4) Globular
153. The maximum diameter of the test in Echinoderm is called :  
 (1) Anus (2) Ambitus (3) Peripocet (4) Madreporite
154. The unit of permeability is :  
 (1)  $m^2$  (2)  $m/sec$  (3)  $Sec^{-1}$  (4)  $gm . m/ sec^2$
155. "Harpoon structure" is associated with :  
 (1) Transform fault boundaries (2) Rift system  
 (3) Inversion system (4) Mid-Oceanic ridges
156. When the principal stress is vertical, the resultant fault is a :  
 (1) Thrust (2) Normal fault  
 (3) Dip slip fault (4) Strike slip fault
157. The explored part of the Moon consists dominantly of :  
 (1) Basalts and anorthosite (2) Basalts  
 (3) Basalts and granites (4) Basalts and andesites
158. What type of lithology is responsible for formation of "Turtle Structure" ?  
 (1) Shale (2) Rock Salt (3) Limestone (4) Clay Stone
159. Vertebrate fossils are most important for the study of the :  
 (1) Intratrappean beds (2) Siwalik rocks  
 (3) Gondwana rocks (4) Vindhayan rocks
160. A river that maintains its course by valley deepening during uplift is termed as :  
 (1) Insequent (2) Antecedent (3) Subsequent (4) Consequent
161. Among the following the glacial landform is :  
 (1) Monadnock (2) Bajada (3) Hanging valley (4) Alluvial cone

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162. Transgression is responsible for :
- (1) Lowering of sea level
  - (2) Change in atmospheric  $CO_2$
  - (3) Rise in sea level
  - (4) Change in sedimentation rate
163. What scientific avenue of investigation gave scientists the best estimate of the age of the Earth ?
- (1) Dating fossils
  - (2) Archaeological Dating
  - (3) Radiometric Dating
  - (4) Carbon Dating
164. In India, Kyanite deposits are found in the area of :
- (1) Lapsa Buru
  - (2) Agnigundala
  - (3) Bailadila Hills
  - (4) Nilgiri Hills
165. Which one of the following is known as lowest rank of Coal ?
- (1) Semi bituminous
  - (2) Lignite
  - (3) Bituminous
  - (4) Anthracite
166. The fuel ratio is determined by :
- (1) Fixed carbon/Ash content
  - (2) Fixed carbon \* volatile matter
  - (3) Fixed carbon/ volatile matter
  - (4) Volatile matter + fixed carbon/Ash content
167. In Bowen's reaction series, from Quartz to Olivine, the temperature :
- (1) Increases
  - (2) Decreases
  - (3) First increases then decreases
  - (4) First decreases then increases
168. The Concave shaped bodies of igneous rock strata is known as :
- (1) Phacolith
  - (2) Lopolith
  - (3) Laccolith
  - (4) Batholith
169. .... is the high temperature-high pressure polymorph of Alumino Silicates ( $Al_2SiO_5$ ) :
- (1) Kyanite
  - (2) Andalusite
  - (3) Sillimanite
  - (4) Chlorite

170. Vitrification is the process in which :
- (1) Glassy material converts into crystallized state
  - (2) Glass forms directly from the magma
  - (3) Crystallized material converts into glassy material
  - (4) None of the above
171. Which of the following forms at the low grade of regional metamorphism ?
- (1) Gneiss
  - (2) Schist
  - (3) Slate
  - (4) Phyllite
172. In contact metamorphism there is a ..... :
- (1) Local heat source
  - (2) Frictional heat source
  - (3) Regional heat source
  - (4) Local heat transfer
173. For a given mineral, the physical property which displays the directional variation is :
- (1) Color
  - (2) Hardness
  - (3) Streak
  - (4) Lustre
174. Which of the following mineral has a high solubility and therefore is most susceptible to chemical weathering at the Earth's surface ?
- (1) Calcite
  - (2) Plagioclase
  - (3) Olivine
  - (4) Quartz
175. Which system has minimum number of classes ?
- (1) Tetragonal
  - (2) Hexagonal
  - (3) Isometric
  - (4) Triclinic
176. Which one of the following is true for "Cubic form" ?
- (1)  $a \neq b \neq c, a \wedge b \wedge c = 90^\circ$
  - (2)  $a \neq b \neq c, a \wedge b \neq 90^\circ, b \wedge c = 90^\circ$
  - (3)  $a = b = c, a \wedge b = 90^\circ$
  - (4)  $a \neq b \neq c, a \wedge b \wedge c \neq 90^\circ$
177. Cassiterite is an ore of :
- (1) Zinc
  - (2) Lead
  - (3) Copper
  - (4) Tin

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178. Which one of the following is part of process of formation of sedimentary rocks ?

- (1) Weathering and erosion
- (2) Sedimentation
- (3) Lithification and diagenesis
- (4) All of the above

179. Flint, chert are microcrystalline forms of :

- (1) Quartz; ( $SiO_2$ )
- (2) Hematite ( $Fe_2O_3$ )
- (3) Halite ( $NaCl$ )
- (4) Calcite ( $CaCO_3$ )

180. The fault between Vindhyan and Aravalli System is :

- (1) Main Central thrust
- (2) Main Boundary thrust
- (3) Great Boundary fault
- (4) Tsangpo Suture zone

## अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली/काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 10 मिनट के अन्दर ही देख ले कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।
2. परीक्षा भवन में लिफाफा रहित प्रवेश-पत्र के अतिरिक्त, लिखा या सादा कोई भी खुला कागज साथ में न लायें।
3. उत्तर-पत्र अलग से दिया गया है। इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा। केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।
4. अपना अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से निर्धारित स्थान पर लिखें।
5. उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।
6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न-पुस्तिका पर अनुक्रमांक संख्या और ओ० एम० आर० पत्र संख्या की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।
7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।
8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिये आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।
9. प्रत्येक प्रश्न के उत्तर के लिये केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।
10. ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का उत्तर नहीं देना चाहते हैं, तो सम्बन्धित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।
11. रफ कार्य के लिये इस पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा अंतिम खाली पृष्ठ का प्रयोग करें।
12. परीक्षा के उपरान्त केवल ओ० एम० आर० उत्तर-पत्र ही परीक्षा भवन में जमा करें।
13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।
14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की भागी होगा/होगी।