

(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)

code No (493)

Serial No. of OMR Answer Sheet

(2016)

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 also Roll No. and OMR Sheet No. on the Question Booklet.
7. Any change 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 ball-point 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 mark).
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 गए हैं]

[No. of Printed Pages : 32+2]

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**No. of Questions : 150**

**Time : 2½ Hours**

**Full Marks : 450**

- Note :**
- (1) This paper comprises of Two Sections, viz., Section—A and Section—B having 30 Multiple Choice Questions in Section—A, and 120 Multiple Choice Questions in Section—B comprising 40 questions of Biology, 40 questions of Chemistry and 40 questions of Physics. A candidate has to attempt all **150** questions.
  - (2) Attempt as many questions as you can. Each question carries **3** marks. **One** mark will be deducted for each incorrect answer. Zero mark will be awarded for each unattempted question.
  - (3) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

**Section—A**

1. The slope of tangent to the curve represented by  $x = t^2 + 3t - 8$  and  $y = 2t^2 - 2t - 5$  at the point  $M(2, -1)$  is

(1)  $\frac{7}{6}$

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

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

(4)  $\frac{6}{7}$

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(P.T.O.)

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2. If  $f(x) = \frac{x^2 - 1}{x^2 + 1}$  for every real number, then minimum value of  $f$
- (1) is equal to  $-1$   
(2) is equal to  $1$   
(3) does not exist  
(4) is not attained even though  $f$  is bounded
3. If  $y = \log \tan \left( \frac{\pi}{4} + \frac{\pi}{2} \right)$ , then  $\frac{dy}{dx}$  is
- (1)  $0$                       (2)  $\cos x$                       (3)  $\sec x$                       (4)  $-\sec x$
4. The slope of tangent is zero at  $(x_1, y_1)$  then the equation of tangent at  $(x_1, y_1)$  is
- (1)  $y_1 = mx_1 + c$       (2)  $y_1 = mx_1$                       (3)  $y = y_1$                       (4)  $y = 0$
5. The value of  $\int \frac{dx}{x + \sqrt{x}}$  is
- (1)  $\log(+\sqrt{x})$                       (2)  $\frac{1}{2} \log(1 + \sqrt{x})$   
(3)  $\log(x + \sqrt{x})$                       (4)  $2 \log(1 + \sqrt{x})$
6. A coin is tossed three times, what is the probability that it lands on heads exactly one time?
- (1)  $0.125$                       (2)  $0.250$                       (3)  $0.375$                       (4)  $0.333$
7. The area included between the parabolas  $y^2 = 4ax$  and  $x^2 = 4ay$  is
- (1)  $16 \frac{a^3}{3}$                       (2)  $\frac{9}{2} a^2$                       (3)  $14 \frac{a^3}{2}$                       (4)  $\frac{a^2}{4}$



8. The difference between the greatest and least values of the function  $f(x) = \cos x + \frac{1}{2} \cos 2x - \frac{1}{3} \cos 3x$  is

(1)  $\frac{2}{3}$  (2)  $\frac{8}{7}$  (3)  $\frac{9}{4}$  (4)  $\frac{3}{8}$

9. The value of

$$\lim_{\alpha \rightarrow \frac{\pi}{4}} \frac{\sin \alpha - \cos \alpha}{\alpha - \frac{\pi}{4}}$$

is

(1)  $\sqrt{2}$  (2) 2 (3) 1 (4) 0

10. If  $\vec{a}, \vec{b}, \vec{c}$  are three vectors, such that  $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ ,  $|\vec{a}| = 1$ ,  $|\vec{b}| = 2$ ,  $|\vec{c}| = 3$ , then  $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$  is equal to

(1) 0 (2) -7 (3) 7 (4) 1

11. If the difference between mean and mode is 63, then the difference between mean and median will be

(1) 21 (2) 31.5 (3) 48.5 (4) 189

12. The mean of 100 observations is 40. If one of observations 50 is replaced by 60, the resulting mean will be

(1) 50 (2) 30 (3) 60 (4) 40.10

13. The probability that a leap year selected at random contains 53 Sundays is

(1)  $\frac{1}{7}$  (2)  $\frac{7}{366}$  (3)  $\frac{26}{183}$  (4)  $\frac{2}{7}$

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- 14.** The empirical relationship among mean, median and mode is  
(1) Mode = 3 Median - 2 Mean      (2) Mean = 3 Mode - 2 Median  
(3) Median = 3 Mode - 2 Mean      (4) Mean = 2 Mode - 3 Mean
- 15.** The mode of the individual series 8, 9, 11, 12, 12, 10, 15, 16, 12, 17, 9, 12, 10 is  
(1) 10      (2) 12      (3) 16      (4) 17
- 16.** If 50% of the observations in a series are less than 60, then the median of the series of observations is  
(1) 30      (2) 45      (3) 60      (4) 120
- 17.** The product  $32 (32)^{\frac{1}{6}} (32)^{\frac{1}{36}} \dots$  up to infinity is equal to  
(1) 0      (2) 32      (3) 64      (4)  $\infty$
- 18.** A sample consists of four observations {1, 3, 5, 7}. What is the standard deviation?  
(1) 2      (2) 0.258      (3) 6      (4) 6.67
- 19.** The sum of all two-digit odd natural numbers is  
(1) 2475      (2) 2530      (3) 4905      (4) 5049
- 20.** The sum of series

$$1 + \frac{1}{5} + \frac{1.3}{5.10} + \frac{1.3.5}{5.10.15} + \dots$$

is

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

- 21.** A CPU generally contains
- (1) registers and ALU
  - (2) a control and timing section
  - (3) instruction decoding circuit
  - (4) All of the above
- 22.** When the decimal number 9 is converted to the binary number, the number of binary digits needed is
- (1) 3
  - (2) 4
  - (3) 5
  - (4) 6
- 23.** Which memory is volatile?
- (1) RAM
  - (2) ROM
  - (3) EPROM
  - (4) PROM
- 24.** The heart of any computer is the
- (1) CPU
  - (2) memory
  - (3) I/O unit
  - (4) disks
- 25.** Which of the following computers is the least powerful?
- (1) Minicomputer
  - (2) Microcomputer
  - (3) Mainframe computer
  - (4) Supercomputer
- 26.** World Wide Web is
- (1) another name for Internet
  - (2) world wide connection for computers
  - (3) a collection of linked information residing on computers connected by the Internet
  - (4) a collection of world wide information

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Section—B

**BIOLOGY**

- 31.** The principal eukaryotic DNA replicating enzyme is
- |                             |                             |
|-----------------------------|-----------------------------|
| (1) DNA polymerase $\alpha$ | (2) DNA polymerase $\beta$  |
| (3) DNA polymerase $\gamma$ | (4) DNA polymerase $\delta$ |
- 32.** Corticotropin is produced by
- |                    |                     |
|--------------------|---------------------|
| (1) adrenal cortex | (2) adrenal medulla |
| (3) uterus         | (4) pituitary gland |
- 33.** Which one of the following organelles is essential for life on earth?
- |                  |                  |
|------------------|------------------|
| (1) Mitochondria | (2) Golgi bodies |
| (3) Ribosome     | (4) Plastids     |
- 34.** The largest living invertebrate is
- |             |            |              |            |
|-------------|------------|--------------|------------|
| (1) octopus | (2) loligo | (3) starfish | (4) mussel |
|-------------|------------|--------------|------------|
- 35.** Split genes were independently discovered by
- |                         |                         |
|-------------------------|-------------------------|
| (1) Watson and Crick    | (2) Roberts and Sharp   |
| (3) Ochoa and Nirenberg | (4) Balimore and Temmin |

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**36.** Which amino acid is twenty first amino acid found in any protein?

- |                    |                |
|--------------------|----------------|
| (1) Tryptophan     | (2) Methionine |
| (3) Solenocysteine | (4) Proline    |

**37.** The first amino acid discovered is

- |                |              |            |             |
|----------------|--------------|------------|-------------|
| (1) asparagine | (2) cysteine | (3) valine | (4) glycine |
|----------------|--------------|------------|-------------|

**38.** Which one of the following RNA has cap at its 5' end?

- |                       |                      |
|-----------------------|----------------------|
| (1) Prokaryotic m-RNA | (2) Eukaryotic m-RNA |
| (3) Prokaryotic t-RNA | (4) Eukaryotic t-RNA |

**39.** In humans malaria is caused by biting of

- |                    |                      |
|--------------------|----------------------|
| (1) Culex male     | (2) Culex female     |
| (3) Anopheles male | (4) Anopheles female |

**40.** Which one of the following arteries carries deoxygenated blood?

- |                    |                      |
|--------------------|----------------------|
| (1) Aorta          | (2) Pulmonary artery |
| (3) Lingual artery | (4) Carotid artery   |

**41.** Total number of spinal nerves in humans is

- |              |              |              |              |
|--------------|--------------|--------------|--------------|
| (1) 12 pairs | (2) 31 pairs | (3) 10 pairs | (4) 43 pairs |
|--------------|--------------|--------------|--------------|

42. The sequence (according to merit) of human five vital organs is
- (1) heart, brain, lungs, kidney, liver
  - (2) brain, heart, lungs, liver, kidney
  - (3) heart, kidney, liver, brain, lungs
  - (4) brain, lungs, liver, heart, lungs
43. Which one of the following hormones is required for every minute survival of human?
- (1) Growth hormone
  - (2) Corticosteroid
  - (3) Antidiuretic hormone
  - (4) Corticotropin
44. ATP was first discovered by
- (1) H. Krebs
  - (2) Karl Lohmann
  - (3) Mitchell
  - (4) Lehninger
45. Biosynthesis of glucose from non-carbohydrate sources is called
- (1) glycogenesis
  - (2) glycogenolysis
  - (3) glycolysis
  - (4) None of these
46. Deficiency of vitamin B<sub>12</sub> causes
- (1) beri-beri
  - (2) rickets
  - (3) pernicious anaemia
  - (4) scurvy

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- 47.** The largest energy reserve (in terms of kilocalories) in humans is  
(1) blood glucose (2) liver glycogen  
(3) muscle glycogen (4) adipose triglycerol
- 48.** Bacteriophage is a/an  
(1) virus (2) bacterium (3) protozoon (4) insect
- 49.** The most heterogenous (in size) RNA is  
(1) t-RNA (2) m-RNA (3) r-RNA (4) s-RNA
- 50.** Which one of the following is an insect?  
(1) Silverfish (2) dogfish (3) Starfish (4) devilfish
- 51.** Which one of the following is a photosynthetic bacterium?  
(1) Blue green (2) Rhodospirillum  
(3) Azospirillum (4) Methanogen
- 52.** Which one of the following microbes is used by astronaut?  
(1) Yeast (2) Bacteria (3) Chlorella (4) Diatoms
- 53.** Which one of the following is known as living fossil?  
(1) Taxus (2) Cephalotaxus  
(3) Pinus (4) Gingo



54. Which one of the following is known as false fruit?  
(1) Litchi                      (2) Apple                      (3) Castor                      (4) Cashew nut
55. Sugarcane is  
(1)  $C_2$  plant                      (2)  $C_3$  plant                      (3)  $C_4$  plant                      (4) None of these
56. In  $C_3$  plants, the first stable product is  
(1) PGA                      (2) DHAP                      (3) RUDP                      (4) PEPA
57. Sucrose is  
(1) monosaccharide                      (2) oligosaccharide  
(3) polysaccharide                      (4) disaccharide
58. Late blight of potato is caused by  
(1) *Pythium debaryanum*                      (2) *Phytophthora infestans*  
(3) *Peronospora destructor*                      (4) *Synchytrium endobioticum*
59. Which system of classification is proposed by Benthum and Hooker?  
(1) Natural                      (2) Artificial                      (3) Numerical                      (4) Phylogenetic
60. *Raphano brassica* is a classical example of  
(1) autopolyploidy                      (2) allopolyploidy  
(3) segmental polyploidy                      (4) aneuploidy

**61.** Which one of the following is beverage?

- (1) Flax                      (2) Cotton                      (3) Tea                      (4) Coir

**62.** Orientation of Z DNA is

- (1) left handed                      (2) right handed  
(3) both left and right handed                      (4) c DNA

**63.** In artificial seeds, the somatic embryoids are encapsulated by

- (1) wax                      (2) fibre paper  
(3) cellophane paper                      (4) Ca-algenate

**64.** NBRI is situated at

- (1) Howrah                      (2) Darjeeling                      (3) Lucknow                      (4) Delhi

**65.** Staminal tube is formed in the flower of

- (1) China rose                      (2) Datura                      (3) Marigold                      (4) Gladiolus

**66.** Ribosome is the site for the synthesis of

- (1) carbohydrates                      (2) proteins  
(3) steroids                      (4) lipids

**67.** The drug chloramphenicol blocks

- (1) cell-wall synthesis                      (2) translation-termination  
(3) polypeptide chain elongation                      (4) polypeptide chain initiation



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## CHEMISTRY

71. Which of the following will act as an acid in liquid  $\text{SO}_2$ ?

- (1)  $\text{Na}_2\text{SO}_3$       (2)  $\text{HCl}$       (3)  $\text{SOCl}_2$       (4)  $\text{K}_2\text{SO}_3$

72. Which of the following is lux-flood base?

- (1)  $\text{NaOH}$       (2)  $\text{SiO}_2$       (3)  $\text{CO}_2$       (4)  $\text{Na}_2\text{O}$

73. Relative order of Lewis acid strength is

- (1)  $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3 > \text{BI}_3$       (2)  $\text{BF}_3 < \text{BCl}_3 < \text{BBr}_3 < \text{BI}_3$   
(3)  $\text{BCl}_3 > \text{BF}_3 > \text{BBr}_3 > \text{BI}_3$       (4)  $\text{BCl}_3 < \text{BF}_3 < \text{BBr}_3 < \text{BI}_3$

74. The metallic character of beryllium is due to

- (1) partially filled 2s band      (2) completely filled 2s band  
(3) overlap of 2s and 2p bands      (4) empty 2s band

75. Which of the following has the highest lattice energy?

- (1)  $\text{NaF}$       (2)  $\text{KF}$       (3)  $\text{CsF}$       (4)  $\text{RbF}$

76. Which oxide of chlorine is a mixed anhydride?

- (1)  $\text{Cl}_2\text{O}$       (2)  $\text{ClO}_2$       (3)  $\text{Cl}_2\text{O}_3$       (4)  $\text{Cl}_2\text{O}_7$

77. The chemical formula of hypophosphoric acid is

- (1)  $\text{H}_3\text{PO}_4$       (2)  $\text{H}_4\text{P}_2\text{O}_5$       (3)  $\text{H}_4\text{P}_2\text{O}_6$       (4)  $\text{H}_4\text{P}_2\text{O}_7$



78. Which of the following species possesses the highest bond order?  
(1)  $O_2$  (2)  $O_2^+$  (3)  $O_2^-$  (4)  $O_2^{2-}$
79. Which of the following is an explosive?  
(1)  $PCl_3$  (2)  $SbCl_3$  (3)  $NCl_3$  (4)  $BiCl_3$
80. S—S bond is present in  
(1)  $S_2O_6^{2-}$  (2)  $S_2O_7^{2-}$  (3)  $S_2O_5^{2-}$  (4)  $S_2O_8^{2-}$
81. The formula of pyrosilicate ion is  
(1)  $SiO_4^{4-}$  (2)  $Si_2O_6^{6-}$  (3)  $Si_3O_9^{6-}$  (4)  $Si_6O_{18}^{12-}$
82. The crystal field stabilization energy (CFSE) value for  $[Ti(H_2O)_6]^{3+}$  that has an absorption maximum at 492 nm is  
(1)  $20325\text{ cm}^{-1}$  (2)  $12195\text{ cm}^{-1}$  (3)  $10162\text{ cm}^{-1}$  (4)  $8130\text{ cm}^{-1}$
83. The reaction between  $NH_4Br$  and Na metal in liquid ammonia (solvent) results in the products  
(1)  $NaBr, HBr$  (2)  $NaBr, H_2$  (3)  $H_2, HBr$  (4)  $NaBr_3, H_2$
84. Among the following pairs of ions/molecules, the one having the similar shape is  
(1)  $CO_2$  and  $H_2O$  (2)  $BF_3$  and  $H_3C^+$   
(3)  $CCl_4$  and  $PtCl_4$  (4)  $NH_3$  and  $BF_3$

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**85.** A triple point is

- |                 |                |
|-----------------|----------------|
| (1) monovariant | (2) bivariant  |
| (3) invariant   | (4) trivariant |

**86.** In electron capture

- |                            |                                  |
|----------------------------|----------------------------------|
| (1) gamma rays are emitted | (2) a neutron is formed          |
| (3) a positron is formed   | (4) an alpha particle is emitted |

**87.** The number of molecules reacted or formed per photon of light absorbed is called

- |                           |                          |
|---------------------------|--------------------------|
| (1) yield of the reaction | (2) quantum yield        |
| (3) quantum efficiency    | (4) quantum productivity |

**88.** Potassium crystallizes in b.c.c. structure. The coordination number of potassium in potassium metal is

- |       |       |       |       |
|-------|-------|-------|-------|
| (1) 2 | (2) 4 | (3) 6 | (4) 8 |
|-------|-------|-------|-------|

**89.** A reaction proceeds with increase in both the enthalpy and entropy. The reaction will be spontaneous if

- |                             |                             |
|-----------------------------|-----------------------------|
| (1) $\Delta H = T \Delta S$ | (2) $\Delta H > T \Delta S$ |
| (3) $\Delta H < T \Delta S$ | (4) None of the above       |

90. The high electronic mobility of  $H^+$  ions is due to
- (1) the small size of the  $H^+$  ions
  - (2) the small charge of the  $H^+$  ions
  - (3) the high velocity of  $H^+$  ions
  - (4) the effective transfer of proton along a series of hydrogen bonded water molecules by arrangement of hydrogen bonds
91. Which compound has bond angles nearest to  $120^\circ$ ?
- (1)  $O=C=S$
  - (2)  $CHI_3$
  - (3)  $H_2C=O$
  - (4)  $H-C\equiv C-H$
92. An increasing order of acidity of the following compounds
- |                            |                                |
|----------------------------|--------------------------------|
| (a) 3-Chloropropanoic acid | (b) 2,2-Dichloropropanoic acid |
| (c) 2-Chloropropanoic acid | (d) Propanoic acid             |
- is
- (1) (a) < (b) < (c) < (d)
  - (2) (b) < (c) < (d) < (a)
  - (3) (d) < (b) < (c) < (a)
  - (4) (d) < (a) < (c) < (b)
93. When acetaldehyde is heated with Fehling solution, it gives a red precipitate of
- |        |             |         |               |
|--------|-------------|---------|---------------|
| (1) Cu | (2) $Cu_2O$ | (3) CuO | (4) $Cu_3O_2$ |
|--------|-------------|---------|---------------|
94. Which reaction intermediate is involved in the following reaction?
- 2-Methylbutane  $\xrightarrow{Br_2, h\nu}$  2-bromo-3-methylbutane (minor product)
- (1) A secondary radical
  - (2) A tertiary radical
  - (3) A secondary carbocation
  - (4) A tertiary carbocation

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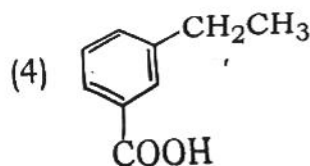
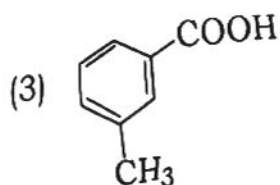
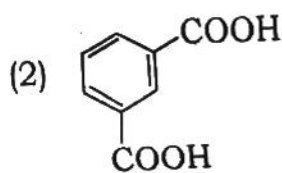
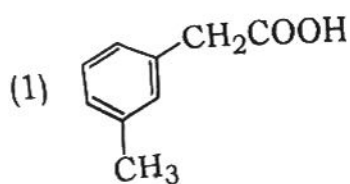
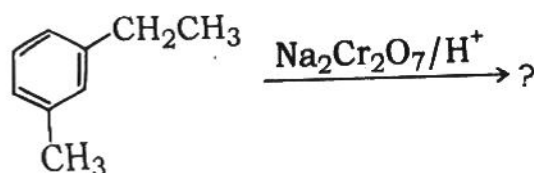
95. Which of the following compounds would give negative iodoform test with  $I_2$  and aqueous  $NaOH$ ?

- (1) Ethanol      (2) 2-Propanol      (3) 2-Pentanone      (4) 3-Pentanone

96. For a species to be aromatic, it should satisfy certain criteria. Identify them from the following

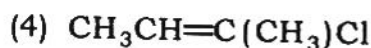
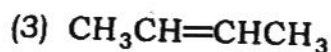
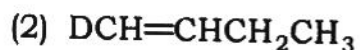
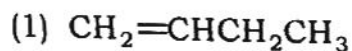
- (1) The species should be planar  
(2) It should be a cyclic conjugated system  
(3) It must contain  $(4n + 2)\pi$  electrons  
(4) All the above three

97. Give the product of the following reaction

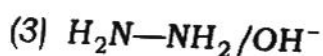
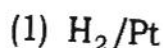




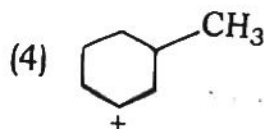
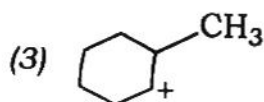
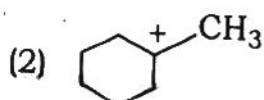
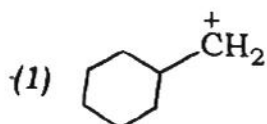
98. Which of the following alkenes cannot exhibit geometrical isomerism?



99. The reagent commonly used to reduce carbonyl  $>\text{C}=\text{O}$  functional group to methylene  $>\text{CH}_2$  is



100. Which of the following isomeric carbocations is the most stable?



101. An oxygen containing compound shows an absorption band at  $\sim 1700\text{ cm}^{-1}$  and no absorption band around  $3300\text{ cm}^{-1}$ ,  $2700\text{ cm}^{-1}$  or  $1100\text{ cm}^{-1}$ . What class of compound is it?

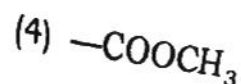
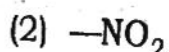
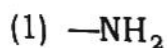
(1) Aldehyde

(2) Carboxylic acid

(3) Ketone

(4) Ester

102. Among the following choices, the group that activates the benzene ring toward electrophilic aromatic substitution is



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- 103.** It is possible to distinguish between optical isomers by
- |                     |                     |
|---------------------|---------------------|
| (1) IR spectroscopy | (2) UV spectroscopy |
| (3) chemical tests  | (4) polarimetry     |
- 104.** Which of the following best represents the strength of a hydrogen bond?
- |                 |                  |
|-----------------|------------------|
| (1) 5-10 kcal   | (2) 60-80 kcal   |
| (3) 80-100 kcal | (4) 100-120 kcal |
- 105.** On reduction with  $\text{LiAlH}_4$ , which of the following compounds would give an optically active product?
- |             |               |              |                    |
|-------------|---------------|--------------|--------------------|
| (1) Butanal | (2) Propanone | (3) Butanone | (4) 2-Nitropropane |
|-------------|---------------|--------------|--------------------|
- 106.** Phenol on treatment with bromine in  $\text{CS}_2$  at  $0^\circ\text{C}$  gives
- |                           |  |
|---------------------------|--|
| (1) <i>m</i> -bromophenol | (2) <i>o</i> - and <i>p</i> -bromophenol |
| (3) 2,3,4-tribromophenol  | (4) 2,4,6-tribromophenol                 |
- 107.** The numbers of  $^1\text{H}$ -NMR signals or peaks given by two isomeric carbonyl compounds propanone and propanal, respectively, are
- |                   |                   |
|-------------------|-------------------|
| (1) one and three | (2) two and two   |
| (3) one and two   | (4) two and three |
- 108.** Among the following, a natural polymer is
- |         |               |           |            |
|---------|---------------|-----------|------------|
| (1) PVC | (2) Cellulose | (3) Nylon | (4) Teflon |
|---------|---------------|-----------|------------|

**109.** The reaction of benzene with chlorine in the presence of iron gives

- |                     |                      |
|---------------------|----------------------|
| (1) benzyl chloride | (2) benzoyl chloride |
| (3) BHC             | (4) chlorobenzene    |

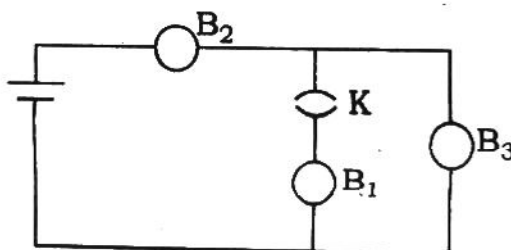
**110.** Glucose is converted into ethanol by the enzyme

- |            |               |            |              |
|------------|---------------|------------|--------------|
| (1) pepsin | (2) invertase | (3) zymase | (4) diastase |
|------------|---------------|------------|--------------|

**PHYSICS**

111. On the mast of a ship there is a source of green light of wavelength 500 nm. If the refractive index of water is  $\frac{4}{3}$  the colour and wavelength measured by a diver submerged in water by the side of the ship would be
- (1) blue of wavelength 376 nm
  - (2) green of wavelength 376 nm
  - (3) red of wavelength 600 nm
  - (4) green of wavelength 500 nm
112. An inductance coil and a capacitor are connected to identical bulbs in two separate AC circuits. The bulb glows more brightly if
- (1) the number of turns in the inductance coil is increased
  - (2) the separation between the plates of the capacitor is increased
  - (3) an iron rod is introduced into the inductance coil
  - (4) a dielectric is introduced in the gap between the plates of the capacitor
113. A 5 kg stone is thrown vertically up with a kinetic energy of 490 J. The height at which the kinetic energy of the stone becomes half of the original value is
- (1) 5 m
  - (2) 10 m
  - (3) 2.5 m
  - (4) 12.5 m

114. The identical bulbs are connected to a battery of steady e.m.f. as shown in the figure below with key  $K$  closed. What will happen to the brightness of bulbs  $B_2$  and  $B_3$  when the key is opened?

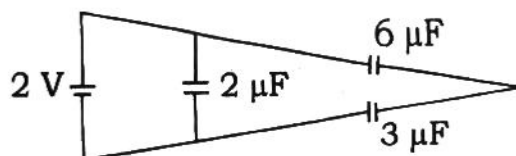


- (1) Brightness of the bulbs  $B_2$  and  $B_3$  decreases  
(2) Brightness of the bulbs  $B_2$  and  $B_3$  increases  
(3) Brightness of bulb  $B_2$  decreases and that of  $B_3$  increases  
(4) Brightness of bulb  $B_2$  increases and that of  $B_3$  decreases
115. A logical circuit can be constructed by using only  
(1) OR gates      (2) NOR gates      (3) AND gates      (4) NOT gates
116. If an object weighing 15 Newtons is lifted from ground to a height of 0.22 metre, the increase in its gravitational energy is approximately  
(1) 0.33 J      (2) 3.1 J      (3) 3.2 J      (4) 3.3 J
117. The moment of inertia of a circular disc of radius 2 m and mass 1 kg about an axis through its centre of mass and perpendicular to its plane is  $2 \text{ kg m}^2$ . Its moment of inertia about an axis parallel to this axis but passing through the edge of the disc will be  
(1)  $6 \text{ kg m}^2$       (2)  $10 \text{ kg m}^2$       (3)  $4 \text{ kg m}^2$       (4)  $8 \text{ kg m}^2$



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- 118.** Using a battery of 2 V the total energy stored in the capacitors shown in the figure below is



- (1)  $4\ \mu\text{J}$                       (2)  $6\ \mu\text{J}$                       (3)  $8\ \mu\text{J}$                       (4)  $12\ \mu\text{J}$
- 119.** During an ice age, the polar ice caps grow in size and the water level drops in oceans all around the earth. This causes the earth's day to be
- (1) stay the same                      (2) shorter  
(3) longer                      (4) infinite
- 120.** If the electrical potential of a single electron is 1 volt in an electrical field, what would be the electric potential of 10 electrons at the same position in the field?
- (1) 1 volt                      (2) 0.1 volt                      (3) 10 volts                      (4) 100 volts
- 121.** An infrared laser beam and an ultraviolet laser beam both have the same number of photons. Which of the following is true?
- (1) Both laser beams have same energy  
(2) Ultraviolet laser beam has less energy  
(3) Infrared laser beam has more energy  
(4) Infrared laser beam has less energy

- 122.** If the objects listed below are all moving with the same speed, then on the basis of quantum mechanics which one of them will have the shortest wavelength?
- (1) An electron    (2) A proton    (3) The earth    (4) A space-ship
- 123.** When an impurity is doped into a semiconductor its conductivity
- (1) remains the same    (2) increases  
(3) decreases    (4) becomes zero
- 124.** If a sample of radioactive isotope has a half life of one day, how much of the original sample will remain at the end of third day?
- (1)  $\frac{1}{8}$  of original    (2)  $\frac{1}{4}$  of original  
(3)  $\frac{1}{12}$  of original    (4)  $\frac{1}{6}$  of original
- 125.** Which layer of the atmosphere reflects radio waves?
- (1) Stratosphere    (2) Troposphere    (3) Ionosphere    (4) Mesosphere
- 126.** Which of the following has no melting point?
- (1) Mercury    (2) Glass  
(3) Carbon dioxide    (4) Copper
- 127.** An intrinsic semiconductor at absolute zero temperature would become
- (1) an extrinsic conductor    (2) a perfect insulator  
(3) a perfect conductor    (4) a super conductor

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**128.** A rotating frame of reference is

- (1) pseudo inertial
- (2) inertial
- (3) non-inertial
- (4) pseudo non-inertial

**129.** If a particle moves in a circle under the action of a central force inversely proportional to distance  $r$ , then its speed is

- (1) proportional to  $r$
- (2) independent of  $r$
- (3) proportional to  $\frac{1}{r}$
- (4) proportional to  $r^2$

**130.** The Franck-Hertz experiment proved that

- (1) electron orbits in atom are circular
- (2) electron has spin
- (3) nucleus is positively charged
- (4) internal energy of atom is quantized

**131.** If earth's atmosphere had no gases the length of day would

- (1) increase
- (2) be the same as at present
- (3) increase in winter and decrease in summer
- (4) decrease

(161)

- 132.** The atmosphere of planet Mars is characterized by the following feature
- (1) Surface atmospheric pressure same as earth's atmospheric pressure at sea level with equal proportion of  $\text{CO}_2$  and  $\text{CH}_4$
  - (2) Surface atmospheric pressure approximately 1% of the earth's atmospheric pressure at sea level consisting mainly  $\text{CH}_4$
  - (3) Surface atmospheric pressure approximately 1% of earth's atmospheric pressure at sea level with equal proportion of  $\text{CO}_2$  and  $\text{CH}_4$
  - (4) Surface atmospheric pressure approximately 1% of earth's atmospheric pressure at sea level consisting mainly  $\text{CO}_2$
- 133.** Two identical counter propagating Laser beams are linearly polarized in mutually perpendicular directions. The region of their overlap would exhibit light with
- (1) uniform linear polarization
  - (2) periodic change in both linear and circular polarizations
  - (3) periodic change in linear polarization
  - (4) periodic change in circular polarization
- 134.** For which of the following materials the magnetic susceptibility is independent of temperature?
- |                  |                   |
|------------------|-------------------|
| (1) Paramagnetic | (2) Ferromagnetic |
| (3) Ferrite      | (4) Diamagnetic   |



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**135.** Which of the following forces is the weakest?

- (1) Magnetic      (2) Electrostatic      (3) Nuclear      (4) Gravitational

**136.** Given that Planck constant is  $6.6 \times 10^{-34}$  J-second the momentum of a photon of wavelength 660 nm in units of kg-m/s would be

- (1)  $10^{-27}$       (2)  $2 \times 10^{-27}$       (3)  $10^{-30}$       (4)  $2 \times 10^{-30}$

**137.** Assuming the mass of a hydrogen atom to be  $1.67 \times 10^{-27}$  kg and force constant of hydrogen molecule to be  $4.8 \times 10^2$  N/m the vibrational frequency of  $H_2$  would be

- (1)  $1.4 \times 10^{12}$  Hz      (2)  $1.2 \times 10^{13}$  Hz  
(3)  $1.2 \times 10^{14}$  Hz      (4)  $1.4 \times 10^{16}$  Hz

**138.** When Zeeman splitting of an atomic line resulting from  $^1D_2 \rightarrow ^1P_1$  transition is observed in a direction perpendicular to the magnetic field, then the number of components is

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

**139.** The electronic configuration of carbon atom leads to three energy states  $^1D$ ,  $^1S$  and  $^3P$  in accordance with Pauli exclusion principle. The ground state of carbon atom is  $3P$  in view of the following

- (1) Lande interval rule  
(2) Hund's rule  
(3) Bohr's correspondence principle  
(4) Sommerfeld rule



**140.** Abnormally large isotope shifts are observed in spectral lines of heavy elements with mass number greater than 50. This has been explained in terms of

- (1) mass effect of the nucleus
- (2) charge distribution on the nucleus as a function of neutron number
- (3) nuclear magnetic moment and orbital motion of electron
- (4) nuclear magnetic moment and electron spin

**141.** The lightning discharge between a cloud and flat country originates due to

- (1) a positively charged cloud with its potential positive than earth underneath
- (2) a cloud with electron accumulation at the top and positive charges at the bottom
- (3) an electrically homogeneous cloud
- (4) a cloud with negative bottom with its potential more negative than the earth underneath

**142.** If  $\alpha$  is the atomic polarizability,  $N$  the number of atoms per unit volume and  $K$  is the dielectric constant, then Clausius-Mossotti equation for liquids is given by

$$(1) \quad K - 1 = \frac{N\alpha}{1 - \frac{N\alpha}{3}}$$

$$(2) \quad K + 1 = \frac{N\alpha}{1 - \frac{N\alpha}{3}}$$

$$(3) \quad K + 1 = \frac{N\alpha}{1 + \frac{N\alpha}{3}}$$

$$(4) \quad K - 1 = \frac{N\alpha}{1 + \frac{N\alpha}{3}}$$

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- 143.** When electric current flows in a loop it gives rise to magnetic field. The magnetic moment ( $\mu$ ) is normal to the plane of the loop and is related to the area ( $A$ ) of the loop and the current ( $I$ ) in the following manner

(1)  $\mu = \frac{I}{A}$                       (2)  $\mu = \frac{I^2}{A}$                       (3)  $\mu = IA$                       (4)  $\mu = I^2 A$

- 144.** A changing magnetic flux through a coil gives rise to an induced e.m.f. in the coil that tends to oppose the change in the magnetic flux through it. This method of finding the direction of the induced e.m.f. is known as

- (1) Fleming's right-hand rule                      (2) Fleming's left-hand rule  
(3) Faraday's rule                      (4) Lenz's rule

- 145.** When there is an alternating current through an inductance, energy flows back and forth between it and the rest of the circuit but the average rate at which energy is delivered to the circuit is zero. The inductance is therefore known as

- (1) a dissipative element                      (2) an inactive element  
(3) a nondissipative element                      (4) a magnetic element

- 146.** For frequencies from a few kilo cycles to some hundreds of megacycles, electromagnetic signals and power are transmitted via coaxial lines consisting of a central wire and an outer conductor. What would happen if the central wire is removed from the coaxial line?

- (1) The electromagnetic power will stop  
(2) It can still carry electromagnetic power  
(3) It will result in minor oscillations  
(4) There will be violent oscillators

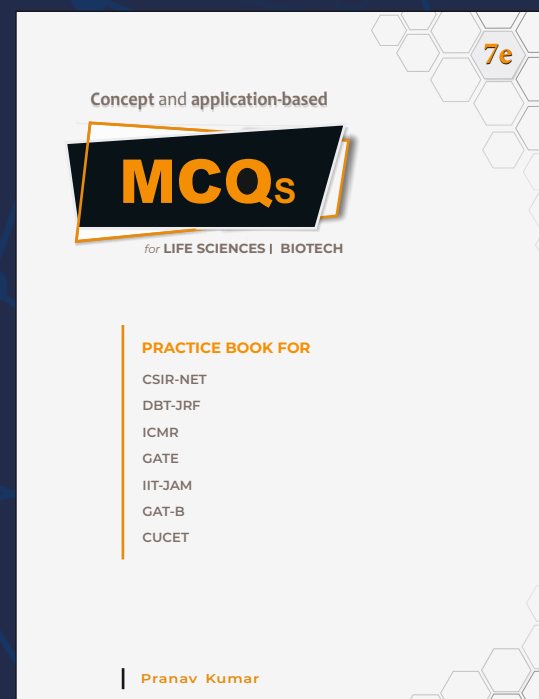
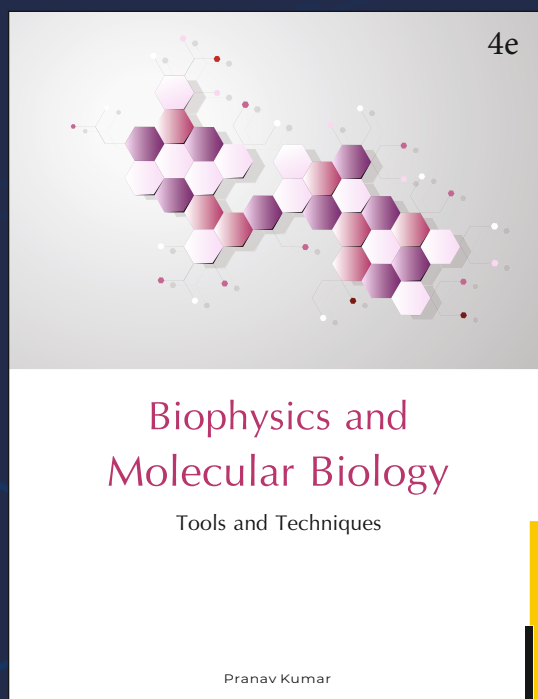
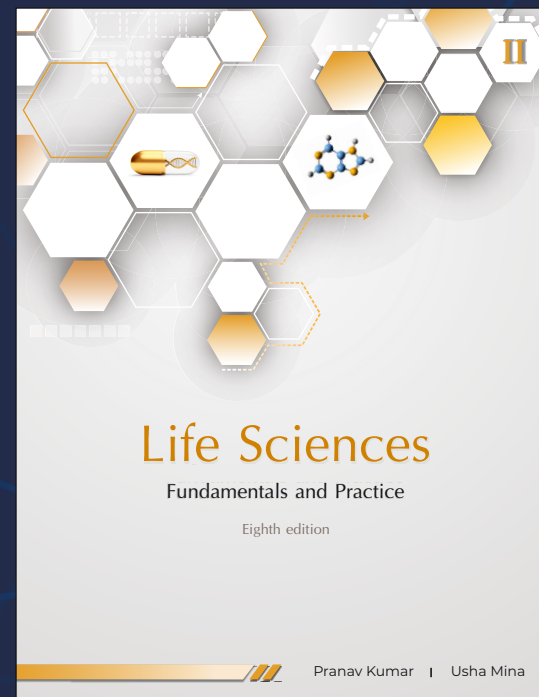
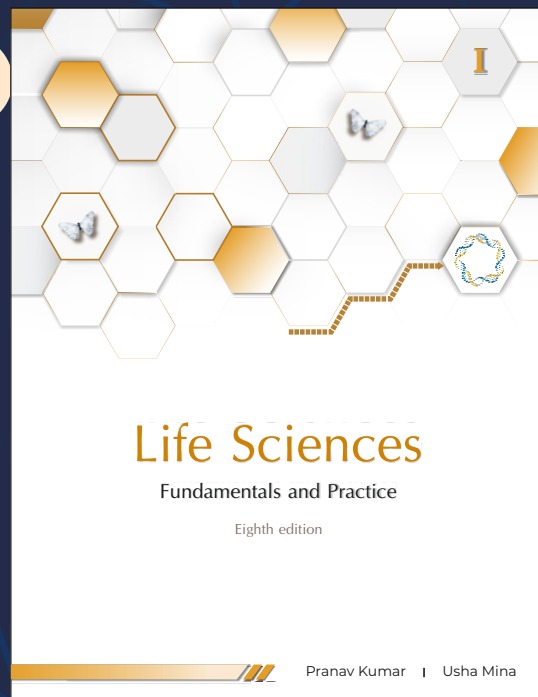
- 147.** Many metals reflect visible light very well at the surface and very little goes inside to be absorbed. This happens because
- (1) imaginary part of their refractive index is very small
  - (2) real part of their refractive index is very large
  - (3) real part of their refractive index is very small
  - (4) imaginary part of their refractive index is very large
- 148.** In a metallic beam there is a surface passing through the middle of its thickness that is known as the neutral surface to make the beam stiff against bending
- (1) as much material as possible should be put far from the neutral surface
  - (2) most of the material should be put near the neutral surface
  - (3) material should be uniformly distributed in the thickness of the beam
  - (4) beam should have a circular cross-section
- 149.** In the Ramsden eyepiece the cross-wire is placed
- (1) between the field lens and the eye lens
  - (2) behind the eye lens
  - (3) in front of the field lens
  - (4) just in front of the eye lens

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**150.** Michelson-Morley experiment is famous because it led to the conclusion that

- (1) light travels in straight line
- (2) light waves require a medium called ether
- (3) there is no ether in space
- (4) light travels as particles

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# MSc

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## अभ्यर्थियों के लिए निर्देश

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

1. प्रश्न पुस्तिका मिलने के 10 मिनट के अन्दर ही देख लें 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 सं० और ओ० एम० आर० पत्र सं० 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. रफ़ कार्य के लिये प्रश्न-पुस्तिका के मुखपृष्ठ के अन्दर वाले पृष्ठ तथा अंतिम पृष्ठ का प्रयोग करें।
12. परीक्षा के उपरान्त केवल ओ०एम०आर० उत्तर-पत्र परीक्षा भवन में जमा कर दें।
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।