

Set No. : 1

2016.

Question Booklet No.

M.Phil/16/TEST-B

997

Life Sciences

(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 OMR 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 30 minutes of the issue of the Question Booklet, Please ensure that you have got the correct booklet and it contains all the pages in correct sequence and 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.*
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 change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfair means.*
8. *This Booklet contains 40 multiple choice questions followed by 10 short answer questions. For each MCQ, 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. For answering any five short Answer Questions use five Blank pages attached at the end of this Question Booklet.*
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 pages of the title cover and the blank page at the end of this Booklet.
12. **Deposit both OMR Answer Sheet and Question Booklet 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.

Total No. of Printed Pages : 20

33.

**M.Phil./16/TEST-B**

**997/Life Sciences**

**ROUGH WORK**

रफ़ कार्य

## **M.Phil. Entrance Test-2016**

**No. of Questions : 50**

**Time : 2 Hours**

**Full Marks : 200**

- Note: (1)** This Question Booklet contains **40** Multiple Choice Questions followed by **10** Short Answer Questions.
- (2)** Attempt as many MCQs as you can. Each MCQ carries **3 (Three)** marks. **1 (One)** mark will be deducted for each incorrect answer. **Zero** mark will be awarded for each unattempted question. If more than one alternative answers of MCQs seem to be approximate to the correct answer, choose the closest one.
- (3)** Answer only **5** Short Answer Questions. Each question carries **16 (Sixteen)** marks and should be answered in **150-200** words. Blank **5 (Five)** pages attached with this booklet shall only be used for the purpose. Answer each question on separate page, after writing Question No.

1. In quick setting cement, the compound added is :  
(1) Aluminium sulphate (2) Aluminium silicate  
(3) Calcium sulphate (4) Gypsum (1)
2. If 1 man or 2 women or 3 boys can do a piece of work in 44 days, then the same piece of work will be done by 1 man, 1 woman and 1 boy in :  
(1) 21 days (2) 24 days (2)  
(3) 26 days (4) 33 days
3. The Earth's core is mainly composed of :  
(1) Silicon & Chromium (2) Silicon & Magnesium  
(3) Nickel & Iron (3) (4) Nickel & Chromium
4. An ingredient of anticoagulant solution used for storage of whole blood :  
(1) Anhydrous benzoic acid (2) Anhydrous citric acid (2)  
(3) Anhydrous Tartaric acid (4) Ascorbic acid
5. Potassium permanganate is an example for :  
(1) Acidifying agent (2) Alkalising agent  
(3) Reducing agent (4) Oxidising agent (4)
6. The motion of rocket is according to which law ?  
(1) Newton first law (2) Newton second law  
(3) Newton third law (3) (4) Joule-Thomson law

7. The function of heavy water in a nuclear reactor is to :  
(1) Slow down the speed of neutrons  
(2) Increase the speed of neutrons (1)  
(3) Cool down the reactor  
(4) Stop the nuclear reaction
8. What is the value of 'u' in the sequence 2, 7, 14, 23, 34, u ?  
(1) 45 (2) 46 (3) 47 (4) 53
9. The bases and heights of a cylinder and a cone are the same. The volume of the cylinder is  $V \text{ cm}^3$ . What is the volume of the cone in  $\text{cm}^3$ ?  
(1)  $1/4 V$  (2)  $1/3 V$  (2) (3)  $1/2 V$  (4)  $V$
10. The perimeter of a rectangle is 26 cm. The rectangle is converted to a square by tripling the width and taking a quarter of the length. What is the perimeter of the resulting square? (2)  
(1) 9 cm (2) 12 cm (3) 20 cm (4) 26 cm
11. The brain area affected in Parkinson's disease is :  
(1) pars compacta of the substantia nigra  
(2) pars reticulata of the substantia nigra  
(3) locus ceruleus raphe nuclei  
(4) Nucleus accumbens
12. Functional MRI produces :  
(1) 3D computer generated image of the brain reflecting blood and oxygen flow produced during cerebral activity  
(2) Computational image of the magnetic field surrounding the brain  
(3) 2D image produced through radio-frequent waves in the magnetic field  
(4) Detailed case study of cognitive impairment based on computational models

13. What is the precursor of dopamine ?
- |                   |                    |
|-------------------|--------------------|
| (1) Tryptophan    | (2) Tyrosine       |
| (3) Acetylcholine | (4) Norepinephrine |
14. Semi-conservative replication of DNA was first demonstrated in :
- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| (1) <i>Escherichia coli</i>       | (2) <i>Streptococcus pneumoniae</i> |
| (3) <i>Salmonella typhimurium</i> | (4) <i>Drosophila melanogaster</i>  |
15. In eukaryotes, the transcriptional regulatory proteins usually have :
- |   |
|---|
| (1) at least two distinct domains of protein structure, a DNA binding domain and an activation domain |
| (2) at least two distinct domains of protein structure and a DNA binding domain                       |
| (3) at least one distinct domain of protein structure, a DNA binding domain and an activation domain  |
| (4) at least one domain of protein structure and an activation domain                                 |
16. A 40-year-old alcoholic man has severe pain in his big toe. He is administered Allopurinol to inhibit :
- |                                       |
|---------------------------------------|
| (1) Xanthine oxidase                  |
| (2) Thymidine kinase                  |
| (3) Adenosine deaminase               |
| (4) Adenine phosphoribosyltransferase |
17. Antibiotics such as Ciprofloxacin and Flouoroquinolones act by inhibiting a specific enzyme. This enzyme is normally necessary to relieve torsional strain that is caused by unwinding of the helix. What is the name of this enzyme ?
- |                                |
|--------------------------------|
| (1) DNA ligase                 |
| (2) Topoisomerase (DNA Gyrase) |
| (3) DNA polymerase             |
| (4) Primase                    |

- 18.** Alzheimer's disease is associated with the deficiency of :
- (1) dopamine
  - (2) glutamic acid
  - (3) acetylcholine
  - (4) gamma aminobutyric acid
- 19.** Which of the following characterizes parthenogenesis ?
- (1) An individual may change its sex during its lifetime
  - (2) Specialized groups of cells grow into new individuals
  - (3) An egg develops without being fertilized
  - (4) Both mates have male and female reproductive organs
- 20.** In male mammals, excretory and reproductive systems share :
- (1) testes
  - (2) vas deferens
  - (3) urethra
  - (4) prostate
- 21.** Which of the following is the most likely explanation for hypothyroidism in a patient whose iodine level is normal ?
- (1) a disproportionate production of T3 to T4
  - (2) hyposecretion of TSH
  - (3) hypersecretion of TSH
  - (4) a decrease in the thyroid secretion of calcitonin
- 22.** Which hormone is incorrectly paired with its action ?
- (1) oxytocin - stimulation of uterine contractions during childbirth
  - (2) thyroxine - stimulation of metabolic processes
  - (3) insulin - stimulation of glycogen breakdown in the liver
  - (4) ACTH - stimulation of release of glucocorticoids by the adrenal cortex

23. What happens when a neuron's membrane depolarizes ?

- (1) There is a net diffusion of  $\text{Na}^+$  out of the cell
- (2) The equilibrium potential for  $\text{K}^+$  ( $E_K$ ) becomes more positive.
- (3) The neuron's membrane voltage becomes more positive.
- (4) The neuron becomes less likely to generate an action potential

24. An epitope associates with which part of an antibody ?

- (1) antibody-binding site
- (2) heavy-chain constant region only
- (3) variable regions of a heavy chain and light chain combined
- (4) light-chain constant region only

25. Which of the following reactions prevails in red blood cells traveling through alveolar capillaries ? (Hb = hemoglobin)

- (1)  $\text{Hb} + 4 \text{O}_2 \rightleftharpoons \text{Hb}(\text{O}_2)_4$
- (2)  $\text{Hb}(\text{O}_2)_4 \rightleftharpoons \text{Hb} + 4 \text{O}_2$
- (3)  $\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3$
- (4)  $\text{Hb} + 4 \text{CO}_2 \rightleftharpoons \text{Hb}(\text{CO}_2)_4$

26. The smallest human chromosome on the basis of genomic size (in base pairs) is :

- (1) Chromosome 20
- (2) Chromosome 21
- (3) Chromosome 22
- (4) Y chromosome

**27.** Pleiotropy means :

- (1) one gene can affect more than one trait
- (2) one trait can be affected by more than one gene
- (3) one trait can only be affected by one gene
- (4) two closely linked genes affect one trait

**28.** None sense mutation results in :

- (1) codon change that does not alter the amino acid
- (2) a changed amino acid
- (3) truncated protein
- (4) gain of function of a protein

**29.** Micro-RNA is :

- (1) fragmented mRNA that codes for incomplete protein
- (2) mRNA of microorganisms
- (3) non-coding RNA that binds to tRNA
- (4) non-coding RNA that binds to complementary mRNA

**30.** An individual with 47, XXY karyotype is :

- (1) Phenotypic male with one Barr body
- (2) Phenotypic female with one Barr body
- (3) Phenotypic male with two Barr bodies
- (4) Phenotypic female with two Barr bodies

**31.** The fraction of human genome derived from transposable elements is :

- (1) at least 45%
- (2) 15-25 %
- (3) less than 5%
- (4) more than 75%

32. Pseudogenes are :

- (1) the genes having gain of function mutation
- (2) duplicated genes that are translocated but have retained its original function
- (3) non-functional duplicated genes
- (4) duplicated genes that transcribe from anti-sense strand

33. Huntington's disease is the consequence of :

- (1) expansion of trinucleotide repeats
- (2) deletion of trinucleotide repeats
- (3) mis-sense mutation
- (4) chromosomal translocation

34. Cytosine differs from thymine by :

- (1) one  $\text{NH}_2$
- (2) one  $\text{-COOH}$
- (3) one  $\text{-OH}$
- (4) one  $\text{-CH}_3$

35. Which RNA molecules have a cloverleaf structure ?

- (1) eukaryotic mRNAs
- (2) prokaryotic mRNAs
- (3) transfer RNAs
- (4) ribosomal RNAs

36. Interphase is a period corresponding to the cell cycle phases of :

- (1) S
- (2)  $G_1 + S$
- (3)  $G_1 + S + G_2$
- (4)  $G_1 + S + G_2 + M$

37. A man of which blood group could not be the father of a child of blood group AB ?

- (1) A
- (2) B
- (3) O
- (4) AB

**38.** Plasmids are :

- (1) small circular DNA molecules that are free in the cytosol
- (2) small linear DNA molecules that are free in the cytosol
- (3) small circular DNA molecules that remain incorporated in the genomic DNA
- (4) large linear RNA molecules that are free in the cytosol

**39.** Operon occurs in :

- (1) only prokaryotes
- (2) primarily in prokaryotes and in some eukaryotes including nematodes
- (3) all prokaryotes and all eukaryotes
- (4) primarily in eukaryotes and also in many prokaryotes

**40.** In Bioinformatics, Basic Local Alignment Search Tool is used to :

- (1) compare amino acid sequence of proteins
- (2) analyze the conformations of proteins
- (3) check the activity of proteins
- (4) determine protein-protein interactions

***Short Answer Questions***

**Note:** Attempt any **five** questions. Write answer in **150-200** words. Each question carries **16** marks. Answer each question on separate page after writing Question Number.

- 01.** How glycogen metabolism will be affected by an increase in intracellular cAMP concentration ?
- 02.** What do you understand by Pharmacogenetics ?
- 03.** What are the various mechanisms of inactivation of tumour suppressor genes ?
- 04.** Briefly explain DNA fingerprinting.
- 05.** How does telomerase contribute to tumorigenesis ?
- 06.** Briefly describe the pre-replication licensing factor in eukaryotes.
- 07.** Outline the hormonal regulation of eukaryotic gene regulation.
- 08.** How will you determine the subunit composition of a purified protein using polyacrylamide gel electrophoresis ?
- 09.** Explain energy flow in an ecosystem considering the laws of thermodynamics.
- 10.** Describe and differentiate between competitive, non-competitive and un-competitive enzymatic inhibition.

**Question No.**

**Page for Short Answer**

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**Question No.**

**Page for Short Answer**

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**Question No.**

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**Question No.**

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**Question No.**

**Page for Short Answer**

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**ROUGH WORK**

रफ़ कार्य

**ROUGH WORK**

रफ़ कार्य

## 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 30 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, प्रश्नपुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्नपुस्तिका पर अनुक्रमांक 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 लिए 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 लिए 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 संबंधित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।
11. रफ कार्य के लिए प्रश्न-पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा उत्तर-पुस्तिका के अंतिम पृष्ठ का प्रयोग करें।
12. परीक्षा के उपरान्त केवल ओ एम आर 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।