

M.H.G.

10P/288/5

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 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 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 *both the Question Booklet and the 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.

10P/288/5

**No. of Questions/प्रश्नों की संख्या : 150**

**Time/समय : 2 Hours/घण्टे**

**Full Marks/पूर्णांक : 450**

**Note/नोट :** (1) 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.

अधिकाधिक प्रश्नों को हल करने का प्रयत्न करें। प्रत्येक प्रश्न 3 अंक का है। प्रत्येक गलत उत्तर के लिए एक अंक काटा जाएगा। प्रत्येक अनुत्तरित प्रश्न का प्राप्तांक शून्य होगा।

(2) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

यदि एकाधिक वैकल्पिक उत्तर सही उत्तर के निकट प्रतीत हों, तो निकटतम सही उत्तर दें।

1. Consider the following two statements

(A) If heat is added to a system, its temperature must increase.

(B) If positive work is done by a system in a thermodynamic process, its volume must increase.

State which one of the following is correct

(1) Both A and B are correct

(2) A is correct and B is wrong

(3) B is correct and A is wrong

(4) Both A and B are wrong

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2. The internal energy of an ideal gas decreases by the same amount as the work done by the system
- (1) the process must be adiabatic            (2) the process must be isothermal  
(3) the process must be isobaric            (4) the temperature must increase
3. A Carnot engine takes in 3000 kcal. Of heat from a reservoir at 627 °C gives it to a tank at 27 °C. The work done by the engine is
- (1)  $4.2 \times 10^6$  J      (2)  $8.4 \times 10^6$  J      (3)  $16.8 \times 10^6$  J      (4) zero
4. All matter in motion has a wave-like nature was said by
- (1) Schrödinger      (2) de Broglie      (3) Planck      (4) Thomson
5. The Heisenberg uncertainty principle states that it is impossible to determine accurately what of fast moving particles simultaneously?
- (1) Position and Momentum  
(2) Electrostatic Attraction  
(3) Position and Quanta  
(4) Principal and Secondary quantum numbers
6. What orbital has the most (7) possible orientations in space?
- (1) S                      (2) f                      (3) p                      (4) d
7. All lasers must have which of the following?
- (1) A medium                                      (2) A light source  
(3) Both of the above                              (4) None of the above

8. Which part of the human body is most vulnerable to laser radiation?  
(1) Skin                      (2) Eye                      (3) Brain                      (4) Ears
9. Which of these materials are acceptable mediums?  
(1) Gases                      (2) Solids                      (3) Liquids                      (4) Gases and solids
10. Phosphorus-32 has a half-life of 14 days. How long will it take for the P-32 sample to decay to one-fourth of its original level?  
(1) 7 days                      (2) 14 days                      (3) 28 days                      (4) 42 days
11. When an alpha particle is released in nuclear decay, the mass number of the nucleus undergoing decay  
(1) stays the same                      (2) increases by 4  
(3) decreases by 4                      (4) decreases by 2
12. The radioisotopes used for diagnosis in nuclear medicine because  
(1) they have short half lives                      (2) they travel rapidly through tissue  
(3) they are usually gamma emitters                      (4) All of the above
13. A magnifying glass is an example of a  
(1) convex lens                      (2) concave lens                      (3) prism                      (4) biconcave
14. When light rays travel at a critical angle through an object such as optical fibre, they are  
(1) totally internally reflected                      (2) refracted out of the fibre  
(3) termed 'critically angled'                      (4) totally externally reflected

15. Light is composed of waves and particles called  
(1) electrons            (2) quarks            (3) photons            (4) neutrons
16. How many electrons are required in the outermost shell of an element for it to be stable?  
(1) 6                      (2) 2                      (3) 8                      (4) 4
17. Inert gases do not react with any other element because  
(1) their outermost electron level is filled with 8 electrons  
(2) the pressure is not high enough  
(3) the temperature is not high enough  
(4) their nucleus is very small
18. Addition polymerization is often catalyzed by a chemical free radical. What is a 'free radical' ?  
(1) It is a chemical species with one or more unpaired electrons  
(2) It is a chemical species with one or more double bonds  
(3) It is a chemical species with all electrons paired  
(4) It is a chemical species with all single bonds
19. For a reaction  $\text{Rate} = k[A][B]^2$ , what factor will not change  $k$  ?  
(1) Raising temperature                      (2) Adding inhibitor  
(3) Increasing  $[A]$                               (4) Adding catalyst
20. Which is the correct set of acid properties, as described by Boyle?  
(1) Sour taste, corrosive, change litmus from red to blue  
(2) Sour taste, corrosive, change litmus from blue to red  
(3) Sweet taste, slippery, change litmus from blue to red  
(4) Sour taste, slippery, change litmus from blue to red

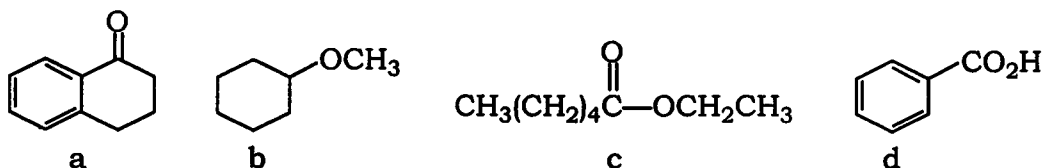
21. A 50.0 mL sample of a 6.0 M NaOH solution is diluted with 250 mL of water. What is the final concentration of the diluted NaOH solution?

- (1) 6 M                      (2) 3 M                      (3) 1.2 M                      (4) 1.0 M

22. Why are organic molecules usually not very polar?

- (1) They contain carbon, which is nonpolar  
 (2) They have a high degree of symmetry  
 (3) The electronegativities of carbon and hydrogen are similar  
 (4) More than one of the above

23. Of the following compounds, which will be eluting first and last from an alumina chromatography column?



- (1) a will elute first and b will elute last  
 (2) d will elute first and c will elute last  
 (3) b will elute first and a will elute last  
 (4) b will elute first and d will elute last

24. Why is the molecular weight obtained by size exclusion chromatography (SEC) for most polymers just an approximation?

- (1) It's not. The molecular weight you get is what it is  
 (2) Because it is only an estimation based upon polystyrene standards  
 (3) Accurate SEC calibration is difficult  
 (4) There is no procedure for obtaining accurate molecular weight data

25. Three proteins X, Y and Z having pI values 6, 8, 4.5 and 1.0. respectively are loaded onto a cation-exchange column. Under the increasing salt gradient in mobile phase, the order of elution of these proteins will be

- (1) X, Z, Y                      (2) Z, Y, X                      (3) X, Y, Z                      (4) Y, Z, X

26. A spectrophotometer measures

- (1) light given off by a substance  
(2) light that passes through a substance  
(3) light changed (change in wavelength) by a substance  
(4) light that is fluoresced by a substance

27. Beer's law states that the absorbance equals

- (1) extinction coefficient X light path X concentration  
(2) 2-log % transmission  
(3) natural log of the concentration times the light path length  
(4) extinction coefficient X light path X concentration and 2-log % transmission

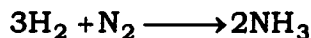
28. Ultraviolet light

- (1) has a short wavelength                      (2) is measured at 185 to 300 nm  
(3) is harmful to human eyes                      (4) All of the above

29. In photovoltaic cell based spectrophotometer, which metal produces electrons in response to the beam of light?

- (1) Silver                      (2) Silicon                      (3) Selenium                      (4) Iron

30. Hydrogen and nitrogen react to form ammonia according to the reaction



If 4.0 moles of  $\text{H}_2$  with 2.0 mol of  $\text{N}_2$  are reacted, how do you know this is a limiting reactant problem?

- (1) Mass is conserved in the problem
- (2) Moles are not conserved in the problem
- (3) The masses of two reactants are given
- (4) More than one of the above are correct

31. Which of the following is an alkane?

- |   |   |
|---|---|
| (1) $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—OH}$ | (2) $\text{CH}_3\text{—C} \begin{array}{l} \text{=O} \\ \text{—OH} \end{array}$ |
| (3) $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_3$           | (4) $\text{CH}_3\text{CH=CH}_2$   |

32. Which ionic equation is an 'acid-alkali neutralisation'?

- |   |  |
|---|--|
| (1) $\text{Zn}_{(s)} + \text{Cu}_{(aq)}^{2+} \longrightarrow \text{Zn}_{(aq)}^{2+} + \text{Cu}_{(s)}$ | (2) $\text{Ag}_{(aq)}^+ + \text{Cl}_{(aq)}^- \longrightarrow \text{AgCl}_{(s)}$                              |
| (3) $\text{H}_{(aq)}^+ + \text{OH}_{(aq)}^- \longrightarrow \text{H}_2\text{O}_{(l)}$                 | (4) $\text{MgO}_{(s)} + 2\text{H}_{(aq)}^+ \longrightarrow \text{Mg}_{(aq)}^{2+} + \text{H}_2\text{O}_{(l)}$ |

33. Which of these would be least soluble in water?

- (1) Butanol ( $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{—OH}$ )
- (2) Pentanol ( $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{—OH}$ )
- (3) Hexanol ( $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{—OH}$ )
- (4) Octanol ( $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{—OH}$ )



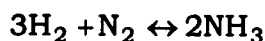
**34.** A solution having a pH of 5 would have this many times as much hydrogen ion concentration as a solution having a pH of 9

- (1) 100                      (2) 1000                      (3) 10000                      (4) 100000

**35.** In general, hydrogen bonds

- (1) are weaker than covalent bonds but stronger than ionic bonds  
(2) occur between polar molecules having hydrogen atoms attached to carbon atoms  
(3) are relatively unimportant, as few ions exist within cells  
(4) are weaker than covalent bonds but stronger than van der Waals' forces

**36.** Consider the equilibrium between ammonia, nitrogen and hydrogen



If extra hydrogen were added to this system at equilibrium

- (1) nothing would happen because the system is already at equilibrium  
(2) the concentration of nitrogen would decrease  
(3) the concentrations of ammonia, hydrogen and nitrogen would all increase  
(4) the concentration of ammonia would decrease

**37.** If two protons are removed from an oxygen nucleus, the result is

- (1) carbon                      (2) neon                      (3) nitrogen                      (4) helium

**38.** The bacterial cell wall is composed of

- (1) a phospholipid matrix                      (2) a lipoprotein  
(3) a polymer of sugars                      (4) chitin

39. A monophyletic group is
- (1) a group outside the groups in question which is used to define the polarity of character transformations (primitive to derived)
  - (2) a group containing an ancestor and all of its descendants defined by one or more synapomorphies
  - (3) a group consisting of an ancestor but not all of its descendants. It is defined by what it does not have
  - (4) a new band appearing at the mercury lounge
40. Which structure alone cannot be observed with light microscopy?
- (1) Plastid
  - (2) Microfilament
  - (3) Cell wall
  - (4) Vacuole
41. Algae is an informal term which refers to
- (1) heterotrophs in kingdom Monera
  - (2) autotrophs in kingdom Monera
  - (3) heterotrophs in kingdom Protista
  - (4) autotrophs in kingdom Protista
42. What do bryophytes and ferns require for successful reproduction that other more complex plants do not?
- (1) High summer temperatures
  - (2) A period of dormancy
  - (3) Free water in which sperm can swim to eggs
  - (4) Freezing temperatures to activate sperm cells
43. Angiosperms are the only plants that produce
- (1) pinnate leaves
  - (2) flowers
  - (3) sperm
  - (4) seeds
44. Flagellated sperms are replaced by ——— in the gymnosperm and angiosperm life cycles.
- (1) spores
  - (2) ovules
  - (3) pollen grains
  - (4) seeds

45. Which of the following is the proper summary equation for photosynthesis?
- (1)  $C_6H_{12}O_6 + CO_2$  in the presence of light and chlorophyll yields  $H_2O + O_2$
  - (2)  $H_2O + CO_2$  in the presence of light and chlorophyll yields  $C_6H_{12}O_6 + O_2 + H_2O$
  - (3)  $H_2O + CO_2$  yields  $C_6H_{12}O_6 + O_2 + H_2O$
  - (4)  $CO_2$  in the presence of light and chlorophyll yields  $C_6H_{12}O_6 + O_2$
46. If you wanted to retard the growth of a plant, then which color(s) of light would you most likely use?
- (1) Green only
  - (2) Purple and red
  - (3) Green and purple
  - (4) Yellow and green
47. In plant cells, the organelles that conduct photosynthesis and the organelles that conduct cellular respiration are the
- (1) leukoplasts and mitochondria
  - (2) chromoplasts and leucoplasts
  - (3) chloroplasts and mitochondria
  - (4) chloroplasts and chromoplasts
48. What is the role of tetrahydrofolate and S-adenosyl methione?
- (1) The transfer of electrons
  - (2) The transfer one-carbon units
  - (3) Both act as reductants
  - (4) Both act as oxidizers
49. The first step in the catabolism of most amino acids is
- (1) removal of carboxylate groups
  - (2) enzymatic hydrolysis of peptide bonds
  - (3) removal of the amino group
  - (4) catabolism of the carbon skeleton

50. Do ecosystems have a particular size?
- (1) 1 square mile
  - (2) 10 square miles
  - (3) 100 square miles
  - (4) None of the above, ecosystems do not have one size
51. Which of the following is a part of an ecosystem that can die without affecting the ecosystems functionality?
- (1) Plants
  - (2) Water
  - (3) Sunlight
  - (4) None of the above
52. Bacteria drives the ——— cycle
- (1) carbon
  - (2) oxygen
  - (3) nitrogen
  - (4) energy
53. *Nitrosomonas* and *Nitrobacter* interaction in the nitrogen cycle where *Nitrosomonas* oxidizes ammonium ions to nitrite and *Nitrobacter* oxidizes nitrite to nitrate is an example of
- (1) parasitism
  - (2) protocooperation
  - (3) commensalism
  - (4) syntrophism
54. Which of the following is not a semisynthetic chemotherapeutic agent?
- (1) Ampicillin
  - (2) Penicillin
  - (3) Sulfonamide
  - (4) Carbenicillin
55. The most selective antibiotics are those that interfere with the synthesis of
- (1) bacterial DNA
  - (2) bacterial RNA
  - (3) bacterial cell walls
  - (4) bacterial plasma membrane

56. Which class of coelenterates has the greatest number of species?
- (1) Class Anthozoa (2) Class Hydrozoa  
(3) Class Cubozoa (4) Class Scyphozoa
57. What type of natural selection is occurring when the average phenotype is selected for and the extreme phenotypes are selected against?
- (1) Disruptive (2) Stabilizing (3) Directional (4) Reductive
58. Which of the following is correct for a comparison of human and ape jaw?
- (1) Human-rounded, ape-box (2) Human-rounded, ape-rounded  
(3) Human-box, ape-rounded (4) Human-triangular, ape-box
59. The onset of menstruation is caused by decreasing levels of
- (1) LH (2) FSH (3) estrogen (4) progesterone
60. By the end of ———, distribution of cells into the three primary tissue types has been accomplished.
- (1) cleavage (2) gastrulation  
(3) the formation of the blastocyst (4) neurulation
61. Which one of the following is not an advantage of chemical messengers over electrical signals?
- (1) Chemical molecules initiate faster responses  
(2) Chemical molecules can spread to all tissues  
(3) Chemical signals can persist longer  
(4) Different chemicals can target different tissues

**62.** Chemical signals that are secreted into the environment and modify the behaviour and physiology of other individuals are called

- |                                |                |
|--------------------------------|----------------|
| (1) autocrine chemical signals | (2) pheromones |
| (3) paracrine chemical signals | (4) hormones   |

**63.** Which of these is an example of positive-feedback regulation in the endocrine system?

- (1) An increase in blood glucose causes an increase in insulin secretion, insulin moves glucose into cells
- (2) An increase in TSH causes an increase in thyroid hormone secretion, thyroid hormones inhibit TSH secretion
- (3) Before ovulation, an increase in LH causes an increase in estrogen, which causes an increase in LH
- (4) An increase in TRH causes an increase in TSH secretion; thyroid hormone inhibits TRH secretion

**64.** Given these events

- (a) acetylcholine is released
- (b) action potentials travel through parasympathetic neurons
- (c) insulin is secreted
- (d) pancreatic cells depolarize

what is correct order of events after parasympathetic neurons are stimulated?

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

**65.** Immediately following a break in the skin, phagocytes engulf bacteria within the wound. This is an example of an \_\_\_\_\_ immune response which is \_\_\_\_\_ against a pathogen.

- |                         |                           |
|-------------------------|---------------------------|
| (1) adaptive, specific  | (2) innate, specific      |
| (3) innate, nonspecific | (4) adaptive, nonspecific |

- 66.** Allergies result from the production of ——— directed against an antigen.  
(1) IgG                      (2) IgA                      (3) IgM                      (4) IgE
- 67.** Due to rise in the concentration of 2,3-bis-phosphoglycerate in RBC, the O<sub>2</sub>-Hb dissociation curve  
(1) shifts to left                      (2) shifts to right  
(3) remains unchanged                      (4) becomes straight
- 68.** Which of the following is not a part of the cell theory?  
(1) All cells come from preexisting cells  
(2) The chemical reactions which occur in an organism occur in its cells  
(3) All cells are structurally and functionally similar  
(4) All living things are composed of cells
- 69.** Which of these biologists suggested that all animal tissues are composed of cells?  
(1) Theodore Schwann                      (2) Rudolf Virchow  
(3) Matthias Schleiden                      (4) Robert Hooke
- 70.** The fluid-mosaic model of the plasma membrane suggests that  
(1) cholesterol are always bad in nature  
(2) some proteins are free to move laterally through the membrane  
(3) phospholipids form a single lipid layer in the center of the membrane  
(4) the membrane has rigidity and flexibility

- 71.** Cell Adhesion Molecules (CAM) are
- (1) extensions of the lysosomal membrane
  - (2) modified structure to function as sensory receptors
  - (3) proteins that help in the interaction between cells
  - (4) external projections supported by microtubules
- 72.** When molecules move from the area of lower concentration to the area of higher concentration and energy is used, it is called
- (1) filtration
  - (2) osmosis
  - (3) active transport
  - (4) passive transport
- 73.** What change(s) occur(s) when red blood cells are placed in a hypertonic solution?
- (1) Red blood cells gain water
  - (2) Red blood cells lose water and shrink
  - (3) Red blood cells neither gain nor lose water
  - (4) Concentration of sodium increases within the cells
- 74.** The sodium-potassium pump located in the plasma membrane
- (1) actively moves potassium into cells
  - (2) osmotically moves sodium into cells
  - (3) actively transports water out of cells
  - (4) moves chlorine out of cells

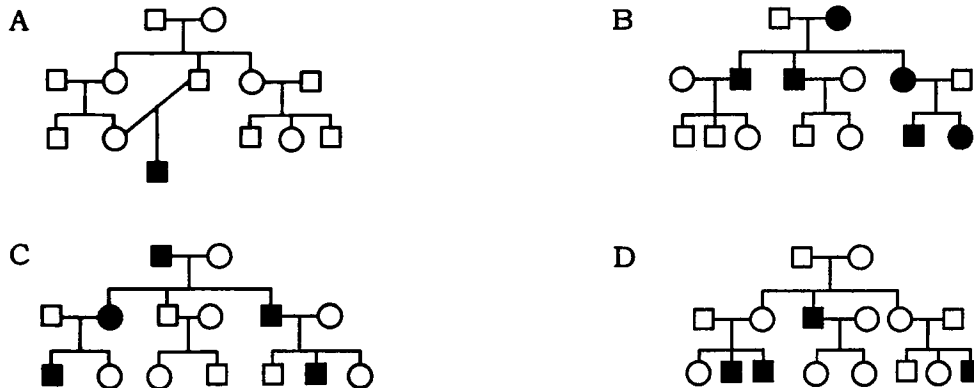


- 75.** What characteristic is shared by simple diffusion and facilitated diffusion?
- (1) Both require cellular energy for the transport of substances
  - (2) Both involve the movement of water across a semipermeable membrane
  - (3) Both require a special carrier molecule to move substances across the membrane
  - (4) Both involve the movement of a substance from regions of a higher concentration to lower concentration without cellular energy
- 76.** If a carrier protein were to move both hydrogen and chloride ions from the inside of a cell to the extracellular fluid, and consume ATP in the process, it would be considered a/an
- (1) symport system
  - (2) voltage-gated ion channel
  - (3) facilitated diffusion system
  - (4) antiport system
- 77.** What organelle is most active in causing programmed cell death?
- (1) The lysosomes
  - (2) The rough endoplasmic reticulum
  - (3) The centriole
  - (4) The nucleus
- 78.** The function of the Golgi apparatus is
- (1) packaging and distribution of proteins and lipids
  - (2) production of microtubules
  - (3) excretion of excess salt
  - (4) DNA replication

- 79.** Tay-Sachs disease involves a cellular defect in
- (1) membrane structure
  - (2) lysosomal enzymes
  - (3) ciliary activity
  - (4) mitotic spindles
- 80.** Cilia and flagella are distinguished from each other on the basis of
- (1) width and numbers
  - (2) depth and numbers
  - (3) length and numbers
  - (4) length and width
- 81.** Crossing-over
- (1) occurs during mitosis
  - (2) increases the amount of genetic diversity
  - (3) results in the formation of chromatids with the same DNA sequences
  - (4) forms tetrads
- 82.** How many divisional stages occur during meiosis?
- (1) 5
  - (2) 4
  - (3) 2
  - (4) 1
- 83.** Which is the longest and most complex phase during meiosis?
- (1) Prophase I
  - (2) Metaphase II
  - (3) Cytokinesis
  - (4) Telophase I
- 84.** Which of the following is characteristic of aging cells?
- (1) Golgi apparatus becomes fragmented
  - (2) Lipid inclusions accumulate
  - (3) Glycogen-containing structures decrease
  - (4) All of the above phenomenon occur

- 85.** An animal has 40 chromosomes in its gametes, how many chromosomes would you expect to find in this animal's brain cells?
- (1) 1                      (2) 20                      (3) 40                      (4) 80
- 86.** A picture of a person's chromosomes is called a
- (1) karyotype              (2) syndrome              (3) chromatin              (4) fingerprint
- 87.** Two alleles for pea plant height are designated T (tall) and t (dwarf). These alleles are found on
- (1) genes    (2) homologous chromosomes
- (3) sex chromosomes                              (4) ribosomes
- 88.** A person who receives an extra chromosome, could have
- (1) heightened intelligence                      (2) Down syndrome
- (3) red eyes    (4) polygenic traits
- 89.** During which phase of mitosis is DNA replicated?
- (1) Interphase              (2) Prophase              (3) Anaphase              (4) Telophase
- 90.** A man who is affected with phenylketonuria marries a woman who is heterozygous at that locus. What is the probability that their first child will have phenylketonuria?
- (1)  $\frac{1}{8}$                       (2)  $\frac{1}{4}$                       (3)  $\frac{1}{2}$                       (4)  $\frac{3}{4}$

91. A man is diagnosed with a glucose-6-phosphate deficiency subsequent to taking primaquine for malaria due to *Plasmodium vivax*. Which of the following pedigrees best illustrates the inheritance pattern of this trait?



- (1) Pedigree A      (2) Pedigree B      (3) Pedigree C      (4) Pedigree D

92. Given these molecules (i) fibrin, (ii) fibrinogen, (iii) prothrombin and (iv) thrombin. Choose the arrangement that lists the molecules in the order they are formed during clot formation

- (1) (i), (ii), (iii), (iv)      (2) (ii), (i), (iii), (iv)  
 (3) (iii), (iv), (ii), (i)      (4) (iii), (ii), (i), (iv)

93. Type A blood

- (1) has type A antibodies  
 (2) would cause a transfusion reaction if donated to someone with type B blood  
 (3) could be safely donated to someone with type O blood  
 (4) has only the B antigen

**94.** The neuroectoderms are cells of the —— and become the brain, spinal cord and parts of the peripheral nervous system in the developing embryo.

- (1) neural plate      (2) neural folds      (3) neural groove      (4) neural tube

**95.** The heart begins to beat around —— days after fertilization.

- (1) 11-15              (2) 21-25              (3) 31-35              (4) 41-45

**96.** Which of the following statements regarding epigenetic inheritance is false?

- (1) Epigenetic inheritance can be reset during gametogenesis  
(2) Epigenetic inheritance can temporarily affect an individual  
(3) Epigenetic inheritance does not involve a change in DNA sequence  
(4) (1) and (3)

**97.** A pattern of transmission where all offsprings have the same phenotype as their mother is consistent with which type of non-Mendelian inheritance?

- (1) Maternal effect                              (2) Genomic imprinting  
(3) Dosage compensation                      (4) Extranuclear inheritance

**98.** An organism that contains more than two sets of chromosomes is said to be

- (1) disomic              (2) amphidiploid      (3) polyploid              (4) tetraploid

- 99.** Human chromosome banding patterns match most closely those of  
(1) chimpanzees    (2) monkeys    (3) gorillas    (4) orangutans
- 100.** What genetic information can be used to trace maternal lineage?  
(1) X-chromosome    (2) Y-chromosome  
(3) Nuclear genes    (4) Mitochondrial genes
- 101.** Which of the following illustrates a frame shift mutation on a segment of DNA which reads TACACGCTG?  
(1) TACACGTGTG    (2) TACACGCTG    (3) GTGGCACAT    (4) TTCACGGAG
- 102.** A mutation is defined as  
(1) a change in an organism's DNA  
(2) the growth of an abnormal cell structure  
(3) the changing of a cell from one type to another  
(4) a way of changing mRNA to proteins
- 103.** Cytologists can use which of the following to describe locations of a gene at a specific place on the chromosome?  
(1) DNA sequence of a chromosomal region  
(2) Protein expression from a chromosomal region  
(3) Banding pattern of stained chromosomes  
(4) Comparison to markers located within a few thousand bp

- 104.** Identify the correct order of organization of genetic material, from largest to smallest
- (1) Genome, chromosome, gene, nucleotide
  - (2) Gene, chromosome, nucleotide, genome
  - (3) Chromosome, gene, genome, nucleotide
  - (4) Chromosome, genome, nucleotide, gene
- 105.** A karyotype reveals that a woman is carrying a fetus that has 47 chromosomes. The test reveals that the genotype of the fetus is XYY. Which of the following statements would be correct?
- (1) This is a monosomy; most likely the mother had a nondisjunction
  - (2) This is a trisomy, most likely the egg cell had a nondisjunction
  - (3) This is a trisomy; most likely the sperm cell had a nondisjunction
  - (4) Not enough information is given to determine a cause
- 106.** A karyotype you are viewing shows an extrapiece of chromosome #1 attached to chromosome #22. What type of abnormality is caused for this?
- (1) Inversion
  - (2) Nondisjunction
  - (3) Translocation
  - (4) Deletion
- 107.** A protein made up of two identical subunits having MW of 60 kDa, when resolved on SDS-polyacrylamide gel will show how many protein bands after proper staining and destaining?
- (1) Single band of 60 kDa
  - (2) Two bands of 30 kDa each
  - (3) Single band of 30 kDa
  - (4) Two bands of 60 kDa each

- 108.** Proline disrupts helical structure in proteins because it is
- (1) an acidic amino acid                      (2) an imino acid  
(3) an aromatic amino acid                      (4) a sulfur-containing amino acid
- 109.** An alpha-helical conformation of a globular protein in solution is best determined by which of the following?
- (1) Ultraviolet-visible absorbance spectroscopy  
(2) Circular dichroism  
(3) Analytical ultracentrifugation  
(4) Fluorescence spectroscopy
- 110.** Which of the following diseases is not caused by overexpression of a trinucleotide repeat?
- (1) Alzheimer's disease                      (2) Fragile-X-syndrome  
(3) Spinocerebellar ataxia                      (4) Huntington's disease
- 111.** The relationship between the ratio of acid to base in a solution and its pH is described by the Henderson-Hasselbalch equation
- $$\text{pH} = \text{pK} + \log \frac{[\text{base}]}{[\text{acid}]}$$
- The pK of acetic acid is 4.8. What is the approximate pH of an acetate solution containing 0.2 M acetic acid 2 M acetate ion?
- (1) 0.48                      (2) 4.8                      (3) 5.8                      (4) 6.8





**117.** The conversion of pyruvate to lactate by lactate dehydrogenase (LDH) is accompanied by the consumption of

- (1) ATP                      (2) ADP                      (3) NADH                      (4) NAD<sup>+</sup>

**118.** At high temperatures, the rate of enzyme action decreases because the increased heat

- (1) changes the pH of the system  
(2) alters the active site of the enzyme  
(3) neutralizes the acids and bases in the system  
(4) increases the concentration of the enzyme

**119.** The fact that amylase in the human small intestine works best at normal temperature (37 °C) suggests that

- (1) amylase is denatured at temperatures below 37 °C  
(2) amylase can function only in the small intestine  
(3) the lock-and-key model of enzyme action does not apply to amylase  
(4) the optimum temperature for amylase is 37 °C

**120.** Which compound bonds to acetyl coenzyme A to start the Krebs' cycle but is later regenerated?

- (1) Ribulose diphosphate                      (2) Oxaloacetic acid  
(3) Pyruvic acid                                      (4) Lactic acid

**121.** The energy released from the electron transport chain is used to

- (1) directly form ATP
- (2) break down glucose
- (3) power chemiosmosis
- (4) digest food particles

**122.** 2,4-Dinitrophenol and oligomycin inhibit oxidative phosphorylation. 2,4-dinitrophenol is an uncoupling agent, therefore, 2,4-dinitrophenol will

- (1) block electron transfer in the presence of oligomycin
- (2) allow electron transfer in the presence of oligomycin
- (3) block oxidative phosphorylation in the presence of oligomycin
- (4) allow oxidative phosphorylation in the presence of oligomycin

**123.** The DNA sequence that can be recognized by the restriction enzyme Eco RI is

- (1) C T G C A ^ G  
G ^ A C G T C
- (2) G ^ A A T T C  
C T T A A ^ G
- (3) G A G C T ^ C  
C ^ T C G A G
- (4) A ^ A G C T T  
T T C G A ^ A

**124.** The DNA sequence shown below is the sense strands from a coding region known to be a mutational hot spot for a gene. It encodes amino acids 21 to 25. Given the genetic and amino acid codes CCC = proline, GCC = alanine, TTC = phenylalanine and TAG = stop codon, which of the following sequence is a frame-shift mutation that causes termination of the encoded protein?

5'-CCC-CCT-AGG-TTC-AGG-3'

- (1) -CCA-CCT-AGG-TTC-AGG-
- (2) -GCC-CCT-AGG-TTC-AGG-
- (3) -CCA-CCC-TAG-GTT-CAG-
- (4) -CCC-CCT-AGG-AGG-

- 125.** If a section of DNA has 13% thymine, then there is \_\_\_\_\_ adenine.  
(1) 13%                      (2) 26%                      (3) 37%                      (4) 74%
- 126.** The 3' end of each Okazaki fragment is joined to the 5' end of the next fragment by  
(1) DNA repair enzymes                      (2) RNA polymerase  
(3) helicase                      (4) DNA ligase
- 127.** Which of the following does not happen during hnRNA processing?  
(1) Ribosomes bind and begin translation  
(2) A poly A tail is added  
(3) A 7-methylguanosine cap is added to the 5' end of the RNA  
(4) Introns are spliced out
- 128.** RNA polymerase specificity for specific genes is governed by  
(1) the delta subunit                      (2) the sigma subunit  
(3) the beta subunit                      (4) the gamma subunit
- 129.** The wobble hypothesis states that  
(1) there are too many tRNAs present to account for the number of amino acids  
(2) tRNAs wobble when attached to an mRNA  
(3) several mRNA codons may pair with a single transfer RNA  
(4) an mRNA codon may pair with more than one transfer RNA

- 130.** Once a strand of mRNA starts being translated
- (1) it is degraded so that only one polypeptide is made from this mRNA
  - (2) many proteins are made simultaneously by the ribosome
  - (3) only a single protein will be transcribed
  - (4) another mRNA is made simultaneously from the DNA
- 131.** Transcription in prokaryotes ends at
- (1) a gene's stop codon
  - (2) a region beyond the end of one or more tandem genes
  - (3) a region beyond the end of a single gene
  - (4) a region called the "TATA" box
- 132.** The first step in the polymerase chain reaction (PCR) is
- |                  |                      |
|------------------|----------------------|
| (1) denaturation | (2) primer extension |
| (3) annealing    | (4) cooling          |
- 133.** Bacteria protect themselves from viruses by fragmenting viral DNA upon entry with
- |             |                   |                |             |
|-------------|-------------------|----------------|-------------|
| (1) ligases | (2) endonucleases | (3) methylases | (4) vectors |
|-------------|-------------------|----------------|-------------|
- 134.** In preliminary screening of clones, it is common to use
- |                         |                       |
|-------------------------|-----------------------|
| (1) restriction enzymes | (2) dyes              |
| (3) antibiotics         | (4) millipore filters |

- 135.** To identify an individual by DNA analysis of their blood, investigators look for
- (1) primers
  - (2) DNA fingerprints
  - (3) nucleosomes
  - (4) transgenic fragments
- 136.** All fragments cut by most restriction endonucleases have
- (1) complementary double-stranded ends
  - (2) supplementary single-stranded ends
  - (3) double-stranded "sticky" ends
  - (4) complementary single-stranded ends
- 137.** In 1980, interferon was produced by splicing a human gene into the genome of
- (1) bacteria
  - (2) yeast
  - (3) viruses
  - (4) mice
- 138.** A successful vector in genetic engineering has been the
- (1) vaccinia virus
  - (2) TMV plasmid
  - (3) Ti plasmid
  - (4) retrovirus
- 139.** In the screening process, clones that metabolize X-gal turn
- (1) yellow
  - (2) orange
  - (3) red
  - (4) blue
- 140.** A powerful way to identify an individual using a particular gene as a marker is the analysis of
- (1) RFLP's
  - (2) X-gal reaction
  - (3) PCR's
  - (4) BST's

- 141.** A library of DNA fragments results from the use of
- (1) restriction endonucleases
  - (2) virus
  - (3) plasmids
  - (4) recombinant DNA
- 142.** One of the most useful methods for identifying a specific gene is
- (1) Thin layer chromatography
  - (2) The Eastern blot
  - (3) The Western blot
  - (4) The Southern blot
- 143.** Bacterial DNA is not cleaved by their own restriction enzymes because bacteria add \_\_\_\_\_ to their own DNA.
- (1) nucleotides
  - (2) peptides
  - (3) methyl groups
  - (4) somatotropin
- 144.** In genetic engineering, DNA ligase is used as a
- (1) probe
  - (2) sealing enzyme
  - (3) restriction enzyme
  - (4) mutagen
- 145.** Which of the following statements is true about developing cDNA?
- (1) Mature mRNA directs the formation of the DNA
  - (2) Mature mRNA does not contain introns
  - (3) DNA taken from the nucleus is used to produce the cDNA
  - (4) Both (1) and (2) are true

- 146.** Genetically identical organisms derived from a single genetic source are called
- (1) populations
  - (2) varieties
  - (3) sibling species
  - (4) clones
- 147.** Methylation of CpG islands
- (1) enhances binding of regulatory transcription factors
  - (2) prevents activation of enhancers
  - (3) prevents binding of chromatin remodelling proteins
  - (4) interferes directly with RNA polymerase binding
- 148.** In RNA editing, the guide RNA
- (1) must have the same sequence as the end result of the edited RNA
  - (2) can change a uracil to another base
  - (3) can control the insertion or deletion of uracils
  - (4) can interact with many different RNAs
- 149.** Which of these would be the best evidence for a functional role of RNA interference in resistance to viral infection?
- (1) Cells resistant to double stranded RNA viruses are also likely to be resistant to single stranded RNA viruses
  - (2) Cells resistant to DNA viruses tend not to also be resistant to RNA viruses
  - (3) Cells resistant to a single stranded RNA virus tend to be resistant to DNA viruses
  - (4) Cells resistant to one double stranded RNA virus tend to be resistant to all double stranded RNA viruses



10P/288/5

**150.** Photo Multiplier Tube (PMT) is a variation of the conventional

- (1) photovoltaic cell
- (2) phototube
- (3) silicon photodiode
- (4) combination of phototube and photovoltaic cell

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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 प्रश्न-पुस्तिका एवं 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।

KEY OF UET/PET-2010

- 03 (Three) marks to be awarded for each correct answer.
- 01 (one) mark to be deducted for each incorrect answer.
- 00 (zero) mark to be awarded for each unattempted question.

Q. 1	A. 3	Q. 21	A. 4	Q. 41	A. 4	Q. 61	A. 1	Q. 81	A. 2	Q. 101	A. 1	Q. 121	A. 3	Q. 141	A. 1	Q. 161	A.	Q. 181	A.
2	1	22	3	42	3	62	2	82	3	102	1	122	2	142	4	<del>162</del>		<del>182</del>	
3	2	23	4	43	2	63	3	83	1	103	3	123	2	143	3	<del>163</del>		<del>183</del>	
4	2	24	2	44	3	64	3	84	4	104	1	124	3	144	2	<del>164</del>		<del>184</del>	
5	1	<del>25</del>	<del>2</del>	45	2	65	3	85	4	105	3	125	1	145	4	<del>165</del>		<del>185</del>	
6	2	26	2	46	1	66	4	86	1	106	3	126	4	146	4	<del>166</del>		<del>186</del>	
7	7	27	1	47	3	67	2	87	2	107	3	127	1	147	2	<del>167</del>		<del>187</del>	
8	2	28	4	48	2	68	3	88	2	108	2	128	2	148	3	<del>168</del>		<del>188</del>	
9	1	29	3	49	3	69	1	89	1	109	2	129	3	149	4	<del>169</del>		<del>189</del>	
10	3	30	3	50	4	70	4	90	3	110	1	130	4	150	2	<del>170</del>		<del>190</del>	
11	3	31	3	51	4	71	2	91	4	111	3	131	2	151		<del>171</del>		<del>191</del>	
12	3	32	3	52	3	72	3	92	3	112	3	132	1	<del>152</del>		<del>172</del>		<del>192</del>	
13	1	33	4	53	3	73	2	93	2	113	1	133	2	153		<del>173</del>		<del>193</del>	
14	1	34	3	54	2	74	1	94	4	114	3	134	3	154		<del>174</del>		<del>194</del>	
15	3	35	4	55	3	75	4	95	2	115	1	135	2	155		<del>175</del>		<del>195</del>	
16	3	36	2	56	1	76	1	96	2	116	1	136	4	156		<del>176</del>		<del>196</del>	
17	1	37	1	57	2	77	1	97	4	117	3	137	1	157		<del>177</del>		<del>197</del>	
18	1	38	3	58	1	78	1	98	3	118	2	138	3	158		<del>178</del>		<del>198</del>	
19	3	39	2	59	4	79	2	99	1	119	4	139	4	159		<del>179</del>		<del>199</del>	
20	2	40	2	60	2	80	3	100	4	120	2	140	1	160		<del>180</del>		<del>200</del>	

Q no. 25 is cancelled.  
 3 (Three) marks be allotted to all.

*[Handwritten signature]*