

University of Hyderabad
Integrated M.Sc.
Entrance Examination - 2007

Max. Marks: 75

Time: 2.00 hrs.

Hall Ticket No.							
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I. Please enter your Hall Ticket Number on this page and on the OMR answer sheet without fail.

II. Read carefully the following instructions:

1. This question paper has 100 questions. Questions 1 to 20 are in English Language Communication Skills (ELCOMS) (a special section) which is **compulsory** and the marks secured in this section will not be counted in drawing the merit list. These questions are meant to test the applicant's English language communication skills and will be used to design appropriate remedial course for the selected candidates who are deficient in English language communication..
2. Questions 21 to 40 are in biology, 41 to 60 are in chemistry, 61 to 80 are in mathematics and 81 to 100 are in physics.
3. Answer as many questions as you can. The maximum marks are 75. Wrong answers carry negative marks. Each correct answer carries 1 mark and each wrong answer carries $-1/4$ mark. **DO NOT GAMBLE.**
4. Hand over both the question booklet as well as the OMR answer sheet at the end of the examination.
5. Answers are to be marked on the OMR answer sheet following the instructions provided there upon.
6. Non-programmable calculators are allowed. Logarithmic tables and cell phones are not allowed.
7. The rough work can be done anywhere on the question paper but not on the OMR sheet.

This book contains 20 pages.

III. Values of physical constants:

$$c = 3 \times 10^8 \text{ m/s}; h = 6.63 \times 10^{-34} \text{ J.s}; k_B = 1.38 \times 10^{-23} \text{ J/K}$$

$$e = 1.6 \times 10^{-19} \text{ C}; \mu_0 = 4\pi \times 10^{-7} \text{ Henry/m}; \epsilon_0 = 8.85 \times 10^{-12} \text{ Farad/m}$$

English Language Communication Skills Question Paper

This section is compulsory for all. There are 20 questions in this section. Each question carries one mark. There will be negative marking of 1/4 mark for every wrong answer. Questions not attempted will not attract negative marking.

Choose the most appropriate answer and mark the relevant part of your OMR.

1. He joined the navy because he wanted to be a ____.
(A) florist (B) miner
(C) sailor (D) navyman
2. The people who load and unload ships are called ____.
(A) diplomats (B) trainees
(C) bankers (D) dockers
3. I borrowed ____ eraser from your pile of stationery.
(A) a (B) an
(C) the (D) None of the above
4. ____ apple a day keeps the doctor away.
(A) a (B) an
(C) the (D) None of the above
5. He always ____ his car on Sundays.
(A) washes (B) wash
(C) washing (D) was washed
6. The students ____ usually a disciplined lot.
(A) is (B) was
(C) are (D) have
7. We want to the party ____ ?
(A) didn't we (B) may we
(C) should we (D) shall we
8. I am going to ____ market. Do you want anything?
(A) on (B) neither
(C) the (D) an

9. I ____ to Delhi.
- (A) belongs (B) belong
(C) belonging (D) was belonged
10. Each one of these boxes ____ open.
- (A) was (B) were
(C) are (D) will have
11. The computer is to be placed ____ this room.
- (A) about (B) in
(C) for (D) onto
12. The meeting was supposed to happen at 2 pm today; it is put ____ till next Monday.
- (A) off (B) of
(C) out (D) in

Choose the word closest in meaning to the underlined word from the options given below.

13. The English teacher shall preside over the meetings from now on.
- (A) lead (B) lose control
(C) leave (D) loose control
14. The insect found in the Campus often mimic their surroundings.
- (A) hate (B) hide in
(C) look like (D) like
15. He wandered around the university asking everyone about the 'School of Humanities' and was glad to have found the building.
- (A) strolled (B) asked
(C) excepted (D) accepted
16. I had an old precious book with me, but, it is buried somewhere in this chaos.
- (A) smitten (B) hidden
(C) bruised (D) bettered
17. Which word denotes the opposite of laconic ?
- (A) concise (B) succinct
(C) garrulous (D) reticent

18. A story from the past is called a ____.

- (A) exciting
- (C) ancient

- (B) account
- (D) myth

19. Thaw is to ____.

- (A) melt
- (C) peace

- (B) freeze
- (D) straw

20. She was convinced that she would get admission into the course.

- (A) afraid
- (C) confident

- (B) unlikely
- (D) convoluted

J-26

Biology

21. Jurassic period is about
- A) 248-201 million years ago
 - B) 200-144 million years ago
 - C) 144-65 million years ago
 - D) 65-10 million years ago
22. Arctic fox is a good example to explain
- A) Evolution
 - B) Phenomenon of extinction
 - C) Animal Communication
 - D) Camouflage
23. In the colony of honey bees
- A) the number of chromosomes is uniform in all bees
 - B) queen bee carries double the number of chromosomes than drones and worker bees
 - C) queen and worker bees have similar number of chromosomes
 - D) queen bee and drones have similar number of chromosomes
24. Endoplasmic reticulum (ER) is rich in
- A) oxidative environment
 - B) Calcium
 - C) protein disulfide isomerase
 - D) All of them
25. In which cerebral lobes is the speech center located?
- A) Frontal
 - B) Parietal
 - C) Temporal
 - D) Occipital

26. *Taenia solium* is an example of

- A) permanent and obligate parasite
- B) facultative parasite
- C) obligate parasite
- D) permanent parasite

27. The major cell type involved in phagocytosis is

- A) B lymphocyte
- B) Neutrophils
- C) T lymphocytes
- D) Eosonophil

28. Ribothymidine is a nucleotide incorporated

- A) rarely in DNA
- B) rarely in mRNA
- C) rarely in ribosomal RNA
- D) generally in transfer RNA

29. The scientist(s) whose experiments are critical to suggest that DNA is the genetic material

- A) Watson and Crick
- B) Messelson and Stahl
- C) Oswald Avery and his colleagues
- D) Walter Sutton

30. Cellulose, a glucose polymer, contains one of the following linkages

- A) Glucose α (1 \rightarrow 4)
- B) Glucose α (1 \rightarrow 6)
- C) Glucose β (1 \rightarrow 4)
- D) Glucose β (1 \rightarrow 6)

31. Which of the following statements about reaction rate is not true?

- A) reaction rates are governed by energy barrier between reaction and products
- B) reaction rate is the speed at which reaction proceeds towards equilibrium
- C) reaction rates are not sensitive to temperature
- D) enzymes accelerate reaction rates

32. Which of the following is a neurotransmitter?

- A) Gamma-carboxy glutamic acid
- B) Glutaric acid
- C) Glutamic acid
- D) Gluconic acid

33. Botanical name of bengal gram is

- A) *Cicer arietinum*
- B) *Phaseolus mungo*
- C) *Phaseolus aureus*
- D) *Lathyrus sativus*

34. A plant that has pentarch condition i.e. five xylem bundles alternating with five phloem bundles

- A) *Pisum sativum*
- B) *Ricinus communis*
- C) *Nicotiana glauca*
- D) *Trapa natans*

35. Male Grass hopper contains

- A) 11 pairs of autosomes without sex chromosomes
- B) One X chromosome and 11 pairs of autosomes
- C) XY chromosomes and 11 pairs of autosomes
- D) Two XX chromosomes and 11 pairs of autosomes

36. Quincuncial aestivation in perianth lobes is seen in

- A) *Datura*
- B) *Ipomoea*
- C) *Brassica*
- D) *Hibiscus*

37. A vitamin important in blood coagulation

- A) Ascorbic acid
- B) Menaquinone
- C) Alpha-tocopherol
- D) Trans-retinol

38. Animals living in tropical regions have more pigmentation than those living in temperate and subtropic regions according to

A) Allen's rule

B) Gloger's rule

C) Bergman's rule

D) Jordan's rule

39. Dinoflagellates belong to

A) Protista

B) Animalia

C) Fungi

D) Monera

40. The major extra cellular matrix protein of animal tissues is

A) Collagen

B) Elastin

C) Fibrinogen

D) Fibrin

Chemistry

41. When hydrogen peroxide is added to an acidified solution of potassium iodide, iodine is liberated. In this reaction, hydrogen peroxide acts as

A) a reducing agent

B) an oxidizing agent

C) a strong acid

D) a weak acid

42. 20 ml of 0.1 M hydrochloric acid is added to 5 ml of 0.1 M sodium carbonate. The resultant solution is then titrated against 0.1 M sodium hydroxide. What will be the titre value?

A) 5 ml

B) 10 ml

C) 15 ml

D) 20 ml

43. Which is the substance whose content in air in considerable amounts is incompatible with the presence of ozone?

A) sulphur dioxide

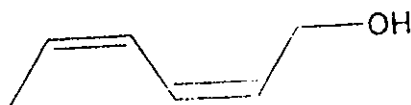
B) carbon dioxide

C) nitrogen

D) hydrogen fluoride

44. Which sulphide is not precipitated from acidified aqueous solutions by hydrogen sulphide?
- A) CuS B) PbS
C) ZnS D) HgS
45. Which among the following are non-planar molecules/ions : BF_3 , NO_3^- , NH_3 , CO_3^{2-} ?
- A) BF_3 and NH_3 B) NO_3^- and NH_3
C) NH_3 and CO_3^{2-} D) only NH_3
46. In an oxide of silver 50% of the silver is in +1 oxidation state and the remaining 50% in +3 oxidation state. What would be the empirical formula of this oxide?
- A) AgO B) Ag_2O
C) AgO_2 D) Ag_2O_3
47. Which element exists in the widest range of oxidation states in their common compounds?
- A) fluorine B) calcium
C) iron D) manganese
48. A piece of copper is dissolved in an acid. The acid is evaporated and the resulting solid is recrystallised from water. The crystals are then added to a solution of barium chloride. A white precipitate is obtained. From this observation, one may infer that the acid used for the dissolution of copper is,
- A) nitric acid B) hydrochloric acid
C) sulphuric acid D) carbonic acid
49. Conversion of allyl phenyl ether into *o*-allylphenol under thermal conditions is an example of
- A) Perkin reaction B) Fries rearrangement
C) Kolbe reaction D) Claisen rearrangement

50. Identify the most appropriate name of the following molecule



- A) (2E, 4Z)-hexa-2,4-dien-1-ol
- B) (2 Z, 4Z)-hexa-2,4-dien-1-ol
- C) (2 E, 4E)-hexa-2,4-dien-1-ol
- D) (2 Z, 4E)-hexa-2,4-dien-1-ol

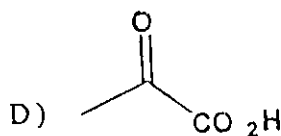
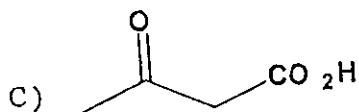
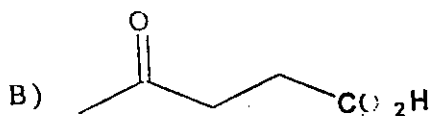
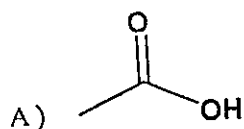
51. Identify the chiral compound from the following

- A) 2-bromopentane
- B) 3-bromopentane
- C) 1-bromopentane
- D) pentan-3-one

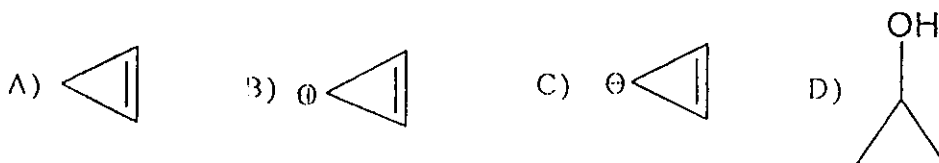
52. Wolff Kishner reduction involves

- A) reduction of alkene into alkane
- B) reduction of ketone into alkane
- C) reduction of ketone into alcohol
- D) reduction of alkyne into alkene

53. Identify the most appropriate compound that would undergo decarboxylation on heating



54. Identify the aromatic compound from the following



55. The experiment that established the concept of atomic number is

- A) Rutherford's alpha particle scattering experiment
- B) Photo-electric effect
- C) Mosley's experiments on X-ray emission
- D) Milliken's oil drop experiment

56. The solution with the lowest freezing point is

- A) 0.1 M glucose solution
- B) 0.2 M fructose solution
- C) 0.1 M NaCl solution
- D) 0.1 M Na₂SO₄ solution

57. Two gaseous elements A and B react in the volume ratio of 1:12 at STP to give the product AB₆. The molecular formula of B is B₂. The molecular formula of A would be

- A) A₂
- B) A₃
- C) A₄
- D) A₆

58. The molecule in which the hybridization on the central atom is different from the hybridization on the central atom of other molecules is

- A) BH₃
- B) CH₄
- C) NH₃
- D) H₂O

59. The number of nearest neighbors for an atom in a face centered crystal structure is

- A) 2
- B) 3
- C) 4
- D) 6

60. The variation of the first ionization potential among sodium, magnesium and aluminum is expected to be

- A) increase monotonically
- B) increase and then decrease
- C) decrease and then increase
- D) decrease monotonically

Mathematics

61. The coordinates of the middle points of the sides of a triangle are (1, 1), (2, -3) and (3, 4). Then the centroid of the triangle is given by

- A) (2, 2/3)
- B) (1, 2/3)
- C) (-2, -2/3)
- D) (0, 0)

62. For what values of λ are the following lines concurrent ?
 $X + Y = 1$, $\lambda X + 2Y = 3$, $\lambda^2 X + 4Y + 9 = 0$.

- A) (2, 15)
- B) (2, -15)
- C) (-2, -15)
- D) no value of λ

63. The function $f(x) = 3x^2 - 2x^3$ is

- A) increasing in $(0, \infty)$
- B) increasing in $(0, 1)$ only
- C) has no maxima or minima in $(0, 1)$
- D) has both maxima and minima in $(0, 1)$

64. The statement "In this class of 60 there are at most 5 bad students" is equivalent to

- A) there are at most 55 good students.
- B) there are only 5 bad students.
- C) there are at least 55 good students.
- D) there is at least one bad student.

65. The derivative of $\exp(x^2)$ with respect to x^4 is $[\exp(x) = e^x]$

- A) $\exp(x^2)/2x^2$
- B) $\exp(x^2)/2x^3$
- C) $\exp(x^2)/4x^2$
- D) $\exp(x^2)/4x^3$

66. $\lim_{x \rightarrow 1} [1 - \sin(\pi x/2)] [(1-x)^2(1+x)] =$

A) $\pi/4$

B) $\pi/16$

C) $\pi^2/4$

D) $\pi^2/16$

67. The greatest term in the expansion of $(1+x)^8$ when $x = 1/3$ is

A) the 6th term

B) the 5th term

C) the 4th term

D) the 3rd term

68. If α, β, γ are rational numbers, the roots of $(\alpha + \beta - \gamma)X^2 + 2\beta X + (\gamma + \beta - \alpha)$ are

A) complex but not necessarily real.

B) real but not necessarily rational.

C) rational but not necessarily integral.

D) integral.

69. From a class of 10 boys and 10 girls, a committee of 4 is to be selected consisting of at least one boy and one girl. This can be done in

A) $10^{10}C_3$ ways

B) $20^{10}C_3$ ways

C) $20^{10}C_3 + 2^{10}C_2$ ways

D) $20^{10}C_3 + ({}^{10}C_2)^2$ ways.

70. Consider the functions $f(x) = x \sin x$ and $g(x) = x \cos x^2$. Then

A) f and g are both odd functions.

B) f is an odd function and g is even.

C) f is an even function and g is odd.

D) f and g are both even functions.

71. Let $f(x, y)$ be a homogeneous function of degree 3. Then $f((x^2 + y^2)^2, x^2 y^2)$ is homogeneous of degree

A) 2

B) 3

C) 6

D) 12

72. Let $f(x) = \cos^{-1} x$. Then the domain and range are respectively given by

- A) $[-1, 1]$ and $(-\infty, \infty)$
C) $[-1, 1]$ and $[0, \pi/2]$

- B) $[-1, 1]$ and $[0, 2\pi]$
D) $[-1, 1]$ and $[0, \pi]$

73. If S_1, S_2, S_3 are respectively the sums of $n, 2n, 3n$ terms of an arithmetic progression, we have

A) $S_2 = S_1 + S_3$

B) $S_2 = (S_1 + S_3)/2$

C) $S_2 = (S_3 - S_1)/2$

D) $S_3 = 3(S_2 - S_1)$

74. $101!$ is a multiple of what power of 10?

A) 10

B) 20

C) 15

D) 24

75. If a_1, a_2, \dots, a_n are real numbers more than 1, then $\log_{a_1} a_2 \log_{a_2} a_3 \dots \log_{a_{n-1}} a_n \log_{a_n} a_1 =$

A) 0

B) 1

C) a_1

D) a_n

76. The number of positive integers less than 10,000 which can be formed with the digits 0, 1, 2, 3, 4, 5, 6, 7 is

A) 4095

B) 4097

C) $7.8^3 - 1$

D) $7.8^3 + 1$

77. The value of \sqrt{i} is

A) $1 - i$

B) $1 + i$

C) $\pm(1 - i)$

D) $\pm(1 + i)/\sqrt{2}$

78. If $\alpha = \theta_1 + \theta_2$ and $\beta = \theta_1 - \theta_2$ and $\tan \theta_1 = \lambda \tan \theta_2$ then $\sin \beta / \sin \alpha$ is equal to

A) $(\lambda + 1)/(\lambda - 1)$

B) $(\lambda - 1)/(\lambda + 1)$

C) $1/\lambda$

D) $\lambda/(1 + \lambda)$

79. The negation of the statement "Suresh likes Indian and Chinese food is

- A) Suresh likes only one of Indian and Chinese foods.
- B) Suresh likes only Indian food.
- C) Suresh likes neither Chinese nor Indian food.
- D) Suresh does not like either Indian or Chinese food.

80. Given three vectors A , B and C , $(A + B) \cdot (B + C) \times (C + A)$ is equal to

- A) $2A \cdot B \times C$
- B) $-2A \cdot B \times C$
- C) $A \cdot B \times C$
- D) 0

Physics

81. A particle is moving along the x -axis such that its position at time t is given by $x(t) = 8.4 + 10t + t^3$. The most appropriate statement about the motion of this particle is

- A) uniform motion
- B) uniformly accelerating motion
- C) non-uniformly accelerating motion
- D) none of the above

82. A stone is thrown with an initial velocity of 5m/s such that it covers maximum possible horizontal distance R_E on the surface of earth. The same stone is thrown with same initial velocity by a person standing on the moon, making an angle of 15° with the surface. The horizontal distance it covers on the moon is (given that $g_E = 9.8\text{m/s}^2$ and $g_m = 1.6\text{m/s}^2$)

- A) $0.326R_E$
- B) $0.326/R_E$
- C) $3.06R_E$
- D) $0.629R_E$

89. Two infinite conducting parallel plates carry equal and opposite charge densities $\pm\sigma$. The electric field at a point half way between the planes is

- A) $2\sigma/\epsilon_0$ B) σ/ϵ_0
C) $\sigma/2\epsilon_0$ D) 0

90. The average translational energy of an ideal gas will be doubled if its pressure is

- A) doubled at constant volume
B) halved at constant volume
C) doubled at constant temperature
D) halved at constant temperature

91. Water emerges with velocity of 10m/s from the nozzle of a hose pipe held horizontally 1.2m above the ground. How far away does the water reach?

- A) 15.6m B) 10m
C) 9.8m D) 4.9m

92. Two parallel wires 10cm apart carry equal currents of 8A in opposite directions. The magnetic field half way between them is

- A) 0 T B) 1.6×10^{-5} T
C) 6.4×10^{-7} T D) 6.4×10^{-5} T

93. The energy stored in a parallel plate capacitor, connected to an ideal battery which provides a fixed potential difference, is known to be U_0 . If the distance between the plates is doubled, the energy stored will be

- A) $4U_0$ B) $2U_0$
C) U_0 D) $U_0/2$

94. Two polarising sheets have their polarising directions parallel. Through what angle should one of the sheets be rotated if the intensity is to drop to half the original value?

- A) 30° B) 45°
C) 60° D) 75°

95. The flux of electric field through a plane surface of area A is maximum when the normal to the surface

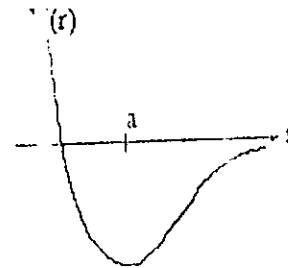
- A) is perpendicular to the electric field
- B) is parallel to the electric field
- C) is opposite to the electric field
- D) makes an angle of 45° with the electric field

96. If the wave length of yellow light in the air is 6×10^{-7} m, what is its wavelength in a glass plate of refractive index 1.5 ?

- A) 9.0×10^{-7} m
- B) 4.0×10^{-7} m
- C) 3.0×10^{-7} m
- D) 2.0×10^{-7} m

97. Figure below shows the potential energy $V(r)$ as a function of separation r of two atoms in a diatomic molecule. Which of the following is correct?

- A) The molecule will be in equilibrium at $r = 0$
- B) The molecule will be in equilibrium at $r = a$
- C) The force between the atoms is repulsive for $r > a$
- D) The force between the atoms is attractive for $r < a$



98. A beam of electrons moving with momentum p enters a uniform magnetic field of strength B which is perpendicular to the direction of the momentum and moves in a circular orbit. If e and m denote the charge and mass of the electron respectively, which of the following statements is correct?

- A) The energy gained in one revolution is $p^2/2m$.
- B) The centripetal force on the electron is Bem/p .
- C) The radius of the electron path is p/Be .
- D) None of the above is a correct statement.

99. The work function of three metals is in the ratio 1 : 2 : 3. The threshold wavelength for emission of photo electrons from the three metals will be in the ratio

A) 1:2:3

B) 1.73:1.41:1

C) 1:1.41:1.73

D) 3:2:1

100. A pendulum is attached to a point on a conducting charged sheet with positive surface charge density σ (see Figure). The mass of the bob is m and it carries positive charge q . If θ is the angle that the string makes with the vertical in equilibrium, which of the following statements is correct?

A) $\tan \theta = q\sigma/mg\epsilon_0$

B) $\tan \theta = q\sigma/2mg\epsilon_0$

C) $\tan \theta = mg\epsilon_0/q\sigma$

D) θ in equilibrium will be $\pi/2$

