MODEL TEST PAPER
ENTRANCE EXAMINATION FOR ADMISSION TO
B.Sc. (HONS.) CHEMISTRY, PHYSICS AND MATHEMATICS -2018

General Instructions for Students

1. Every candidate should carry his/her valid Roll No. cum Admit Card to the Entrance Test. No candidate without the valid Roll No. cum Admit Card will be allowed to enter the examination centre.

2. The question paper will be of **One & Half Hours** duration and will comprise of **Seventy Five** Multiple Choice Questions of **One** mark each.

3. There will be three sections, *viz: Physics, Chemistry, Biology* OR *Mathematics*.

4. The candidates with 10 + 2 (Medical) will opt the section of Biology while the candidates with 10+2 (Non-Medical) will opt the Mathematics Section.

5. The candidate has to mark the right option against the question number in the OMR sheet **with black pen.** The circles marked with pencil or blue pen will not be marked.

6. **There will be no negative marking.**

7. The OMR must be handed over to the Room Supervisor even if candidate has not filled any option.

8. No candidate will be allowed to leave the examination hall before two hours.

9. Don't write/make any identification marks(s)/religious symbols/slogan(s) on the answer books.

10. The candidate must ensure that his OMR has been duly **stamped**.

11. Please ensure that you have signed the **attendance** sheet.

12. Mobile Phones and other electronic gadgets such as Bluetooth etc. are strictly prohibited in the Examination Centre.

PHYSICS

1. While using an electric bulb the reflector for street lighting should be a
   A) Concave mirror
   B) Convex mirror
   C) Cylinderical mirror
   D) Plane mirror

2. Sunlight filtering through a tree often makes circular patches on the ground because :
   A) The space through which light penetrates is round
   B) The sun is round
   C) Light is transmitted through wave motion
   D) Due to diffraction of light

3. A ray of light passing through a prism having refractive index of 1.414 suffers minimum deviation. If the angle of incidence is double the angle of refraction within the prism, the angle of prism is :
   A) 30°
   B) 45°
   C) 60°
   D) 90°

4. A diode as rectifier converts :
   A) AC into DC
   B) DC into AC
   C) Varying DC into constant DC
   D) High voltage into low voltage

5. A metal surface ejects electrons when hit by green light but none when hit by yellow light. The electrons will also be ejected when the surface is hit by :
   A) Red light
   B) Blue light
   C) Heat rays
   D) Infrared light

6. In terms of magnetic properties, oxygen belongs to :
   A) Non Magnetic Materials
   B) Ferromagnetic Materials
   C) Paramagnetic Materials
   D) Diamagnetic Materials

7. A lens behaves as converging lens in air and diverging lens in water. The refractive index of the material is :
   A) Equal to unity
   B) Equal to 1.33
   C) Between unity and 1.33
   D) Greater than 1.33

8. The resolving power of the telescope depends upon :
   A) The focal length of the eye lens
   B) The focal length of the objective
   C) The length of the telescope tube
   D) Aperture of the objective length

9. Which of the following have maximum wavelength?
   A) X rays
   B) Radio waves
   C) UV rays
   D) IR rays

10. Two coherent sources of intensity I_1 and I_2 produce an interference pattern. The maximum intensity in the interference pattern is :
    A) $I_1 + I_2$
    B) $I_1^2 + I_2^2$
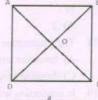   C) $(I_1 + I_2)^2$
    D) $(\sqrt{I_1} + \sqrt{I_2})^2$

11. The point charges $4q, -2q, +q, -3q$ are paced at the corners of square of side a as shown in figure the potential at the point O is :

A) Zero

B) $\dfrac{1}{4\pi\varepsilon_0}\left(\dfrac{10q}{a}\right)$

C) $\dfrac{1}{4\pi\varepsilon_0}\left(\dfrac{2\sqrt{2q}}{a}\right)$

D) $\dfrac{1}{4\pi\varepsilon_0}\left(\dfrac{2q}{a}\right)$

12. An electric dipole of moment p is placed normal to the lines of force of electric field E, then work done in deflecting it through $180°$ is

A) pE   B) +2pE   C) $-2pE$ D) Zero

13. There is a solid sphere of radius R of metal having uniformly distributed charge. What is relation between electric field E and distance r from centre (r>R)?

A) $E \propto r^{-2}$ B) $E \propto r^{-1}$ C) $E \propto r$ D) $E \propto r^2$

14. Which of the following is NOT the property of a metallic substance?
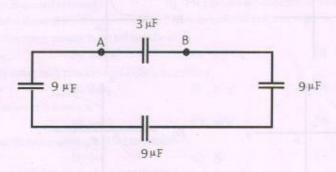
A) Good conductor

B) Opaque to light

C) Non crystalline

D) Involve non directional bonds

15. The equivalent capacitance between A and B in the following figure is :
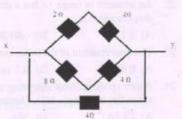

A) $51/30\ \mu F$ B) $6\ \mu F$

C) $30\ \mu F$ D) $12\ \mu F$

16. Find the equivalence resistance in the point x and y :

A) $2\ \Omega$

B) $8\ \Omega$

C) $6\ \Omega$

D) $4\ \Omega$

17. 100 cells each of emf 5V and internal resistance 1 ohm are to be arranged so as to produce maximum current in 25 ohm resistance. Each row is to contain equal number of cells. The number of rows should be :

A) 2   B) 4   C) 5   D) 10

18. The temperature at which thermoelectric power of thermocouple is zero is called :

A) Inversion temperature   B) Neutral temperature

C) Junction temperature   D) Null temperature

19. In connection with chemical effects of current, Faradays constant is equal to :

A) Electrochemical equivalent/chemical equivalent

B) Electrochemical equivalent/gram equivalent

C) Gram equivalent/Electrochemical equivalent

D) Chemical equivalent/Electrochemical equivalent

20. The relationship between $\vec{B}$, $\vec{I}$ and $\vec{H}$ is

A) $\vec{B} = \mu_0 (\vec{I} + \vec{H})$ B) $\vec{B} = \mu_0 \vec{H}$ C) $\vec{B} = \mu_0 \vec{I}$ D) $\vec{B} = \dfrac{(\vec{I} + \vec{H})}{\mu_0}$

21. Which of the following represent correctly the variation of the magnetic filed B at an axial point for circular coil with the distance from the centre of circular coil?

A)   B)

C)   D)

22. An ammeter of range 1A has a internal resistance of 0.9 Ω. To extend the range upto 10A, the necessary shunt required is

A) 0.1 Ω   B) 0.01Ω   C) 0.9 Ω   D) 1Ω

23. The time constant of the series combination of inductor 5 H and resistance 10 Ω is

A) 0.02 sec   B) 0.5 sec   C) 2 sec   D) 50 sec

24. A step up transformer operating on 230V line supplies current to the load 2A. The ratio of primary and secondary winding is 1:25. Determine the primary current :

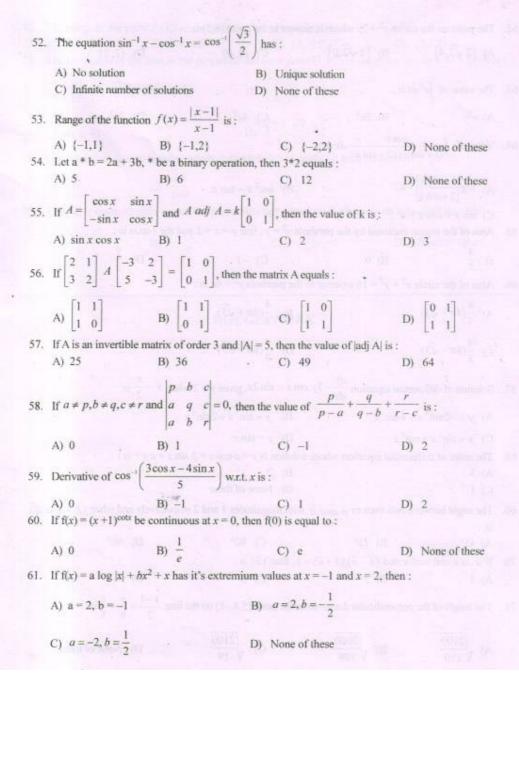A) 12.5A   B) 50A   C) 8.8A   D) 25A

25. The order of the size of the nucleus and Bohr radius of an atom respectively are

    A) 10^{-14}m, 10^{-10} m
    B) 10^{-14}m, 10^{-8} m
    C) 10^{-20}m, 10^{-10} m
    D) 10^{-11}m, 10^{-10} m

CHEMISTRY

26. Name of the phenomenon wherein mechanical stress causes the production of electricity is?

    A) Pyroelectric effect
    B) Photoelectric effect
    C) Piezoelectric effect
    D) Ferroelectric effect

27. For two solutions of same concentration, the osmotic pressure at 327°C is twice that at :

    A) 127°C
    B) 27°C
    C) 227°C
    D) 17°C

28. When lead storage battery is charged

    A) Lead dioxide dissolves

    B) Sulphuric acid is regenerated

    C) Lead electrode becomes coated with lead sulphate

    D) The concentration of H_2SO_4 decreases.

29. The rate constant for a chemical reaction $A \to B$ is 0.25 s^{-1}. What will be rate constant if concentration of A is reduced to half?

    A) 0.25 s^{-1}
    B) 0.30 s^{-1}
    C) 0.075 s^{-1}
    D) 2.25 s^{-1}

30. Butter is a colloid form in which :

    A) Fat is dispersed in casein
    B) Fat globules are dispersed in water
    C) Water is dispersed in fat
    D) Suspension of casein in water

31. The chief impurity present in the red bauxite ore is :

    A) SiO_2
    B) Fe_2O_3
    C) K_2SO_4
    D) NaF

32. HCOOH reacts with concentrated H_2SO_4 to produce

    A) CO
    B) CO_2
    C) SO_2
    D) SO_3

33. Hybridization of S in SO_3 is

    A) sp^2
    B) sp^3
    C) sp^3d
    D) sp^3d^2

34. The most abundant noble gas in the atmosphere is :

    A) He
    B) Ne
    C) Xe
    D) Ar

35. The shape of $XeOF_2$ on the basis of VSPER theory is

    A) Sea saw
    B) V-shaped
    C) Triagonal planar
    D) T-shaped

36. Which of the following transition metal shows only +3 oxidation state?

    A) Ce
    B) Pt
    C) Gd
    D) Ni

37. IUPAC name of $K_3[Fe(CN)_6]$ is :

    A) Potassium hexacyanoferrate (II)
    B) Potassium hexacyanoferrate (III)
    C) otassiumhexacyanoiron (II)
    D) Potassium hexacyanoiron (III)

38. Which is a naturally occurring polymer?

A) Nylon   B) Protein   C) Bakelite   D) Terylene

39. Which of the following does not give a silver mirror test with Tollen's reagent?

A) Lactose   B) Sucrose   C) Glucose   D) All of them

40. α and β Glucose differ with respect to position of OH group at :

A) Carbon α and β to aldehyde group   B) Carbon number 3

C) Carbon number 1   D) All the carbons

41. Denaturation of proteins effect its :

A) Tertiary structure   B) Secondary structure

C) Both secondary and tertiary structure   D) Only primary structure

42. o-Nitrophenol is steam volatile while p-nitrophenol is not. This is due to :

A) Intra-molecular H-bonding in p-nitrophenol.

B) Intra-molecular H-bonding in o-nitrophenol.

C) Inter-molecular H-bonding in o-nitrophenol.

D) Higher acidic nature of o-nitrophenol.

43. p-Bromophenol can be prepared from phenol by reaction with:

A) Aqueous Br_2 B) Br_2 in presence of sunlight

C) Br_2 in presence of $FeCl_3$ D) None of these

44. Reaction of ethylamine with chloroform in alcoholic KOH provides :

A) Methanol   B) CH_3NC C) C_2H_5NC D) C_2H_5CN

45. When aniline is treated with bromine water, it yields:

A) o-bromoaniline   B) p-bromoaniline

C) Both (A) and (B)   D) 2,4,6-tribromoaniline

46. When a mixture of benzaldehyde and formaldehyde is treated with concentrated NaOH solution, the product is :

A) Sodium benzoate and benzyl alcohol

B) Sodium benzoate and methyl alcohol

C) Sodium formate and benzyl alcohol

D) Sodium formate and methyl alcohol

47. Phenol is formed by decarboxylation of :

A) Benzoic acid   B) Salicyclic acid

C) Phthalic acid   D) All of these

48. Which of the following reagents can distinguish C_2H_5OH from CH_3OH?

A) H_2O B) NH_3 C) $I_2 + KOH$ D) HCl

49. Bakelite is obtained from phenol by condensation reaction with

A) Ethanal   B) Methanal

C) Vinyl chloride   D) Ethylene glycol

50. A compound 'X'on heating with soda lime gives ethane, X is :
    A) Ethanoic acid
    B) Propanoic acid
    C) Methanoic acid
    D) Ethyl acetate

BIOLOGY

51. The endosperm cells in angiosperms are :
    A) Haploid
    B) Diploid
    C) Triploid
    D) Tetraploid

52. The semi dwarf wheat which was instrumental in increasing wheat production was developed by :
    A) Paul Ehlrick
    B) Kurien
    C) Edward Jenner
    D) Norman E. Borlaugh

53. Anthesis is :
    A) Formation of Pollen
    B) Development of Anther
    C) Reception of Pollen by stigmas
    D) Opening of flower bud

54. An organic substance which cannot be degraded by any enzyme and extreme of environment :
    A) Sporopollenin
    B) Lignin
    C) Cuticle
    D) Cellulose

55. Enzyme required for polymerase chain reaction is :
    A) RNA polymerase
    B) Ribonuclease
    C) Taq polymerase
    D) Endonuclease

56. Who discovered jumping gene in Maize :
    A) Khorana
    B) Morgan
    C) Mc Clintock
    D) Beadle and Tatum

57. Nucleosome contains :
    A) Only histones
    B) Both DNA and histones
    C) Only DNA
    D) Both DNA and RNA

58. DNA synthesis during replication :
    A) Discontinuous
    B) Continuous
    C) Semi-discontinuous
    D) None of above

59. The term molecular scissors refers to :
    A) DNA polymerases
    B) RNA polymerases
    C) Restriction endonucleases
    D) DNA ligases

60. In tissue culture shoot system is induced by :
    A) IAA
    B) ABA
    C) Kinetin
    D) GA3

61. First transgenic plant released for commercial use was :
    A) Bt Cotton
    B) Tobacco
    C) Golden rice
    D) Solan gola

62. Restriction enzymes are used to cut :
    A) Single stranded RNA
    B) Double stranded DNA
    C) Single stranded DNA
    D) Double stranded RNA

63. DNA parts which can switch their positions are :

    A) Cistrons   B) Transposons   C) Introns   D) None of these

64. Which extra embryonic membrane in humans prevent desiccation of the embryo inside the uterus :

    A) Allantois   B) Yolk sac   C) Amnion   D) Chorion

65. Allopatric speciation is due to geographical separation of :

    A) Species   B) Population   C) Plants   D) Animals

66. Entire alimentary canal can be regenerated by :

    A) Amphibians   B) Birds   C) Fish   D) Sea cucumber

67. Effect of alcohol is :

    A) Liver Cirrhosis   B) Kidney Failure

    C) Insomnia   D) All of the above

68. The amount and distribution of yolk in egg affects :

    A) Number of blastomeres produced   B) Pattern of cleavage

    C) Fertilization   D) Formation of zygote

69. Lactation in sterile cows is induced by :

    A) Stilbesterol   B) Vitamin B12

    C) Gonadotropin   D) LH

70. A sex linked disorder is :

    A) Albinism   B) Phenylketonuria

    C) Haemophilia   D) Sickle cell anaemia

71. The name "honey stomach" in bees is applied for :

    A) Crop   B) Stomach   C) Pharynx   D) Abdomen

72. Mammals have originated from which of the following :

    A) Pisces   B) Amphibia   C) Reptilia   D) Aves

73. Widal test is for :

    A) Malaria   B) Typhoid   C) Pneumonia   D) Jaundice

74. Which immunoglobulin is present in mother's milk :

    A) IgA   B) IgD   C) IgG   D) IgE

75. Lake ecosystem is

    A) Artificial   B) Natural   C) Both (A) and (B)   D) None

OR
MATHEMATICS

51. If $f : R \rightarrow R$ is a function defined by $f(x) = 10\,x - 7$. If $g = f^{-1}$, then $g(x) =$

    A) $\dfrac{1}{10x - 7}$ B) $\dfrac{1}{10x + 7}$ C) $\dfrac{x + 7}{10}$ D) $\dfrac{x - 7}{10}$

52. The equation $\sin^{-1} x - \cos^{-1} x = \cos^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$ has :

    A) No solution
    B) Unique solution
    C) Infinite number of solutions
    D) None of these

53. Range of the function $f(x) = \dfrac{|x-1|}{x-1}$ is :

    A) $\{-1,1\}$
    B) $\{-1,2\}$
    C) $\{-2,2\}$
    D) None of these

54. Let $a * b = 2a + 3b$, $*$ be a binary operation, then $3*2$ equals :

    A) 5
    B) 6
    C) 12
    D) None of these

55. If $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$ and $A\, adj\, A = k\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the value of k is :

    A) $\sin x \cos x$
    B) 1
    C) 2
    D) 3

56. If $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the matrix A equals :

    A) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$
    B) $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$
    C) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$
    D) $\begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}$

57. If A is an invertible matrix of order 3 and $|A| = 5$, then the value of $|adj\, A|$ is :

    A) 25
    B) 36
    C) 49
    D) 64

58. If $a \neq p, b \neq q, c \neq r$ and $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$, then the value of $\dfrac{p}{p-a} + \dfrac{q}{q-b} + \dfrac{r}{r-c}$ is :

    A) 0
    B) 1
    C) -1
    D) 2

59. Derivative of $\cos^{-1}\left(\dfrac{3\cos x - 4\sin x}{5}\right)$ w.r.t. x is :

    A) 0
    B) -1
    C) 1
    D) 2

60. If $f(x) = (x+1)^{\cot x}$ be continuous at $x = 0$, then $f(0)$ is equal to :

    A) 0
    B) $\dfrac{1}{e}$
    C) e
    D) None of these

61. If $f(x) = a \log|x| + bx^2 + x$ has it's extremium values at $x = -1$ and $x = 2$, then :

    A) $a = 2, b = -1$
    B) $a = 2, b = -\dfrac{1}{2}$
    C) $a = -2, b = \dfrac{1}{2}$
    D) None of these

62. The point on the curve $x^2 = 2y$ which is nearest to the point $(0,5)$ is :

   A) $\left(2\sqrt{2}, 4\right)$ B) $\left(2\sqrt{2}, 0\right)$ C) $(0, 0)$ D) $(2, 2)$

63. The value of $\int_1^4 e^{\sqrt{x}} dx$ is :

   A) e^2 B) $2e^2$ C) $4e^2$ D) $3e^2$

64. Value of $\int \dfrac{\cos x}{(1+\sin x)(2+\sin x)} dx$ is :

   A) $\log\left|\dfrac{1+\sin x}{2+\sin x}\right| + c$ B) $\sec^2 x - \tan x$

   C) $\sin x + \cos x + c$ D) 0

65. Area of the region enclosed by the parabola $x^2 = y$, line $y = x + 2$ and the x-axis is :

   a) $\dfrac{4}{7}$ B) 0 C) -1 D) $\dfrac{9}{2}$

66. Area of the circle $x^2 + y^2 = 16$ exterior to the parabola $y^2 = 6x$ is :

   A) $\dfrac{4}{3}(4\pi - \sqrt{3})$ B) $\dfrac{4}{3}(4\pi + \sqrt{3})$

   C) $\dfrac{4}{3}(8\pi - \sqrt{3})$ D) $\dfrac{4}{3}(8\pi + \sqrt{3})$

67. Solution of differential equation $\dfrac{dy}{dx} - 3y \cot x = \sin 2x$, given $y = 2$ when $x = \dfrac{\pi}{2}$ is

   A) $y = -2\sin^2 x + 4\sin^3 x$ B) $y = \sin^3 x + 2\sin^2 x$

   C) $y = \sin^2 x + \cot^2 x$ D) $y = \tan x$

68. The order of differential equation whose solution is $y = a \cos x + b \sin x + c\, e^{-x}$ is :

   A) 3   B) 2

   C) 1   D) None of these

69. The angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes 1 and 2 respectively and when $|\vec{a} \times \vec{b}| = \sqrt{3}$ is :

   A) $45°$ B) $75°$ C) $90°$ D) $60°$

70. If $\vec{a}$ is a unit vector and $(\vec{x} - \vec{a}).(\vec{x} + \vec{a}) = 8$, then $|\vec{x}|$ is :

   A) 1   B) 2   C) 3   D) 4

71. The length of the perpendicular drawn from the point $(5,4,-1)$ on the line $\dfrac{x-1}{2} = \dfrac{y}{9} = \dfrac{z}{5}$ is :

   A) $\sqrt{\dfrac{2109}{110}}$ B) $\sqrt{\dfrac{2020}{109}}$ C) $\sqrt{\dfrac{2100}{19}}$ D) None of these

72. The image of the point P (1,3,4) in the plane $2x - y + z + 3 = 0$ is :

A) (3,5,-2)   B) (-3,5,2)   C) (3,-5,2)   D) (3,5,2)

73. The cordinates of the foot of the perpendicular from point (1,1,2) to the plane $2x - 2y + 4z + 5 = 0$ is :

A) $\left(\dfrac{-1}{12}, \dfrac{25}{12}, \dfrac{-1}{6}\right)$

B) $\left(\dfrac{1}{6}, \dfrac{25}{13}, -1\right)$

C) (0, 1, 4)

D) $\left(\dfrac{-1}{7}, \dfrac{29}{13}, 0\right)$

74. Eight coins are thrown simultaneously the probability of getting at least six heads is

A) $\dfrac{37}{256}$ B) $\dfrac{19}{208}$ C) $\dfrac{1}{3}$ D) $\dfrac{19}{29}$

75. A fair dice is tossed eight times. The probability that a third six is observed on the eighth throw is

A) $\dfrac{^7C_2 \times 5^5}{6^7}$ B) $\dfrac{^7C_2 \times 5^5}{6^8}$ C) $\dfrac{^7C_2 \times 5^5}{6^6}$ D) None of these