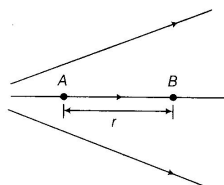## PHYSICS

01. Figure shows the electric lines of force emerging from a charged body. If the electric field at A and B are E_A and E_B respectively and if the distance between A and B is r, then


(a) $E_A > E_B$

(b) $E_A < E_B$

(c) $E_A = \dfrac{E_B}{r}$

(d) $E_A = \dfrac{E_B}{r^2}$

02. A charge q is lying at mid-point of the line joining the two similar charges Q. The system will be in equilibrium, if the value of q is

(a) Q/2

(b) – Q/2

(c) Q/4

(d) – Q/4

03. Electric field intensity at a point in between two parallel sheets with like charges of same surface charge densities (σ) is

(a) $\dfrac{\sigma}{2\varepsilon_0}$

(b) $\dfrac{\sigma}{\varepsilon_0}$

(c) zero

(d) $\dfrac{2\sigma}{\varepsilon_0}$

04. A charge Q is placed at the origin. The electric potential due to this charge at a given point in space is V. The work done by an external force in bringing another charge q from infinity up to the point is

(a) $\dfrac{V}{q}$

(b) Vq

(c) V + q

(d) V

05. Two condensers of capacity $0.3\,\mu F$ and $0.6\,\mu F$ respectively are connected in series. The combination is connected across a potential of 6 V. The ratio of energies stored by the condensers will be

(a) $\dfrac{1}{2}$

(b) 2

(c) $\dfrac{1}{4}$

(d) 4

06. In a parallel plate capacitor the separation between the plates is 3 mm with air between them. Now a 1 mm thick layer of a material of dielectric constant 2 is introduced between the plates due to which the capacity increases. In order to bring its capacity to the original value the separation between the plates must be made
(a) 1.5 mm   (b) 2.5 mm
(c) 3.5 mm   (d) 4.5 mm

07. Consider the following two statements.
A. Kirchhoff's junction law follows from the conservation of charge.
B. Kirchhoff's loop law follows from the conservation of energy.
Which of the following is correct?
(a) Both A and B are wrong
(b) A is correct but B is wrong
(c) A is wrong but B is correct
(d) Both A and B are correct

08. Two cells with the same emf E and different internal resistances r_1 and r_2 are connected in series to an external resistance R. The value of R, so that the potential difference across the first cell be zero, is

(a) $\sqrt{r_1 r_2}$

(b) $r_1 + r_2$

(c) $r_1 - r_2$

(d) $\dfrac{r_1 + r_2}{2}$

ROUGH WORK

09. The current in resistance R_3 in the given circuit is

(a) 1 A   (b) 2/3 A
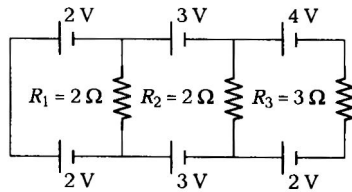
(c) 0.25 A   (d) 0.50 a

10. A current i ampere flows in a circular arc of wire whose radius is R, which subtends an angle $3\pi/2$ radian at its centre. The magnetic induction B at the centre is
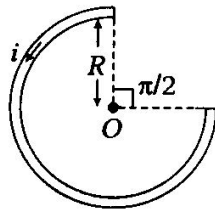
(a) $\dfrac{\mu_0 i}{R}$ (b) $\dfrac{\mu_0 i}{2R}$ (c) $\dfrac{2\mu_0 i}{R}$ (d) $\dfrac{3\mu_0 i}{8R}$

11. A beam of protons with a velocity of 4×10^5 ms^{-1} enters a uniform magnetic field of 0.3 T at an angle of 60° to the magnetic field. The radius of helical path taken by proton beam is

(a) 0.036 m   (b) 0.012 m

(c) 0.024 m   (d) 0.048 m

12. The force between two long parallel wires A and B carrying current is 0.004 Nm^{-1}. The conductors are 0.01 m apart. If the current in conductor A is twice that of conductor B, them the current in the conductor B would be

(a) 5 A   (b) 50 A   (c) 10 A   (d) 100 A

13. In a circuit with a coil of resistance $2\,\Omega$, the magnetic flux changes from 2.0 Wb to 10.0 Wb in 0.2 s. The charge that flows in the coil during this time is

(a) 5.0 C   (b) 4.0 C

(c) 1.0 C   (d) 0.8 C

14. Two pure inductors each of self-inductance L are connected in parallel but are well separated from each other. The total inductance is

(a) 2 L   (b) L   (c) $\dfrac{L}{2}$ (d) $\dfrac{L}{4}$

15. Two coils of self-inductances L_1 and L_2 are placed closer to each other, so that total flux in one coil is completely linked with other. If M is mutual inductance between them, then

(a) $M = L_1 L_2$ (b) $M = L_1/L_2$

(c) $M = \sqrt{L_1 L_2}$ (d) $M = (L_1 L_2)^2$

16. The instantaneous current in an AC circuit is $I = \sqrt{2}\sin(50t + \pi/4)$. The rms value of current is

(a) $\sqrt{2}$ A   (b) 50 A

(c) 90 A   (d) 1 A

17. The value of current at resonance in a series L-C-R circuit is affected by the value of

(a) R only   (b) C only

(c) L only   (d) L, C and R

18. The average power dissipated in a pure capacitance AC circuit is

(a) CV   (b) zero

(c) $\dfrac{1}{CV^2}$ (d) $\dfrac{1}{4}CV^2$

19. Which of the following is correct for the image formed by a plane mirror?

(a) Always real

(b) Always virtual

(c) Virtual and laterally inverted

(d) Real and laterally inverted

20. In Young's double slit experiment, the fringe width will remain same, if (D = distance between screen and plane of slits, d = separation between two slits and λ = wavelength of light used)

(a) Both λ and D are doubled

(b) Both d and D are doubled

(c) D is doubled but d is halved

(d) λ is doubled but d is halved

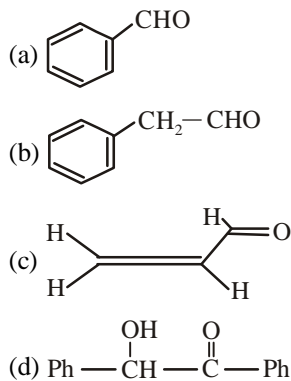## ROUGH WORK

CHEMISTRY

21. Match the drug with its use

List-I		List-II
(A)	Bithional	(p) Used in the prevention of tuberculosis
(B)	Chloramphenical	(q) Used to relieve pain due to arthritis
(C)	Streptomycin	(r) Used in treatment of typhoid, dysentery etc
(D)	Paracetamol	(s) Used to impart antiseptic properties to soap

(a) A - r   B - p   C - q   D - s
(b) A - q   B - s   C - p   D - r
(c) A - s   B - r   C - q   D - p
(d) A - s   B - r   C - p   D - q

22. The correct Haworth structure of Lactose is -
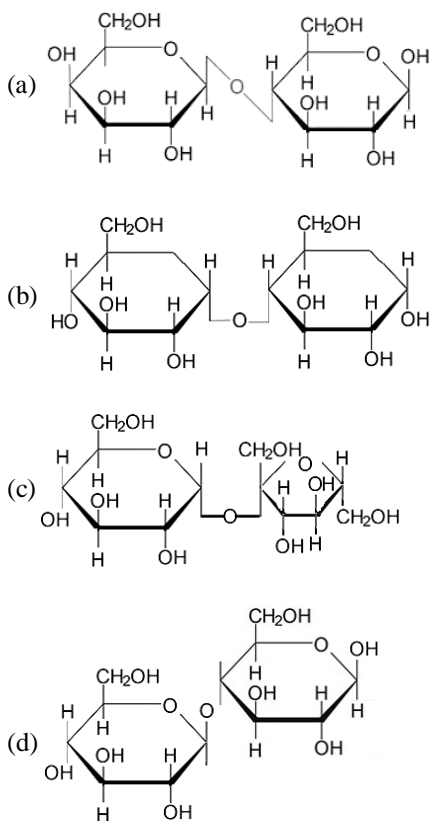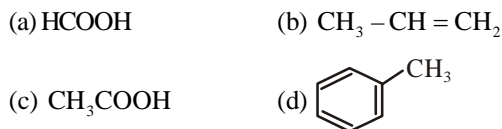

23. Globular proteins are not present in -

(i) Blood   (ii) Keratin
(iii) Egg   (iv) Muscle
(a) ii, iv   (b) i, ii
(c) iii, iv   (d) i, iv

24. Tollens test is not observed for

(d) $Ph-\underset{\underset{OH}{|}}{CH}-\underset{\underset{O}{\|}}{C}-Ph$

25. The compound which does not decolourise Baeyer's reagent.

(a) HCOOH   (b) $CH_3-CH=CH_2$

(c) CH_3COOH (d)

26. Iodoform can be prepared all except

(a) CH_3-CH_2OH

(b) $CH_3-\underset{\underset{}{\overset{O}{\|}}}{C}-CH_2-$

(c) $CH_3-\underset{\underset{OH}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3$

(d) $CH_3-CH_2-\underset{\underset{}{\overset{O}{\|}}}{C}-CH_3$
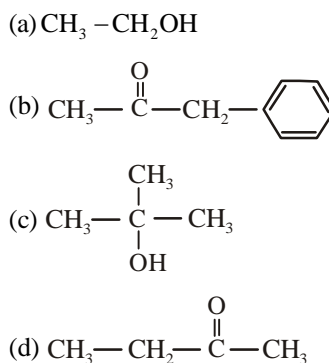
27. Identify Z in the following set of reaction.

$$C_2H_5OH \xrightarrow{PBr_3} X \xrightarrow{CH_3CH_2 ONa} Y \xrightarrow{HOH} Z$$

(a) C_2H_5OH (b) CH_3CHO

(c) CH_3COOH (d) C_2H_5Br
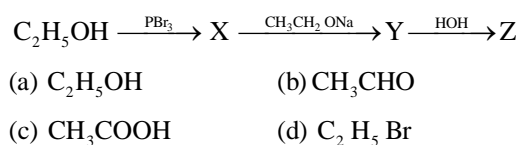
ROUGH WORK

28. A compound X having molecular formula C_6H_6O have characteristic smell, give violet colour with neutral $FeCl_3$ also give white ppt with Br_2 water. The compound X is -
(a) Anilene
(b) Phenol
(c) Salicyldehyde
(d) Anisol

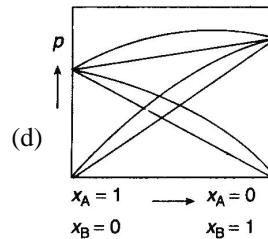29. A solid is formed with three types of atoms A, B and C. A forms fcc lattice, while B atoms occupy all tetrahedral voids and C atoms occupy half of the octahedral voids. The formula of the solid is
(a) A_2B_4C
(b) A_2B_2C
(c) AB_2C_2
(d) AB_2C

30. For trigonal crystal system, the relationship between parameters is -
(a) $a = b \neq c; \alpha = \beta = 90°; \gamma = 120°$
(b) $a = b \neq c; \alpha = \beta = \gamma = 90°$
(c) $a = b = c; \alpha = \beta = \gamma \neq 90°$
(d) $a \neq b \neq c; \alpha = \beta = \gamma = 90°$

31. Which of the following aqueous solutions will have the lowest freezing point?
(a) 0.10 M KCl
(b) 0.10 M $Al_2(SO_4)_3$
(c) 0.10 M $C_6H_{12}O_6$
(d) 0.10 M $C_{12}H_{22}O_{11}$

32. Which of the following graphs represent the positive deviation from Raoult's law?

(a)

$x_A = 1 \longrightarrow x_A = 0$
$x_B = 0 \qquad x_B = 1$

(b)

$x_A = 1 \longrightarrow x_A = 0$
$x_B = 0 \qquad x_B = 1$

(c)

$x_A = 1 \longrightarrow x_A = 0$
$x_B = 0 \qquad x_B = 1$

(d)

$x_A = 1 \longrightarrow x_A = 0$
$x_B = 0 \qquad x_B = 1$
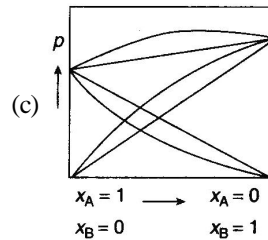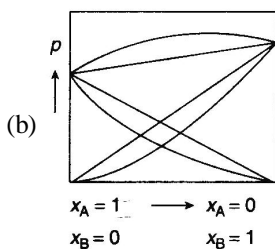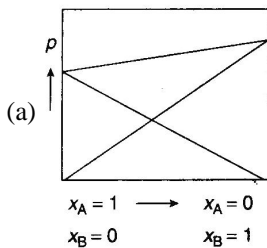
33. Aluminium oxide may be electrolyzed at 1000°C to furnish aluminium metal (atomic mass = 27 u; 1 F = 96500 C). The cathode reaction is $Al^{3+} + 3e^- \rightarrow Al$. To prepare 5.12 kg of aluminium metal by this method would require
(a) 5.49×10^7 C of electricity
(b) 1.83×10^7 C of electricity
(c) 5.49×10^4 C of electricity
(d) 5.49×10^1 C of electricity.

34. The limiting molar conductivities $\Lambda°$ for NaCl, KBr and KCl are 126, 152 and 150 S cm² mol⁻¹, respectively. The $\Lambda°$ for NaBr is
(a) 128 S cm² mol⁻¹
(b) 302 S cm² mol⁻¹
(c) 278 S cm² mol⁻¹
(d) 176 S cm² mol⁻¹

35. Given $E°_{Cr^{3+}/Cr} = -0.72 V$, $E°_{Fe^{2+}/Fe} = -0.42 V$. The potential for the cell Cr |Cr³⁺ (0.1 M)||Fe²⁺ (0.01 M)| Fe is
(a) 0.26 V
(b) 0.399 V
(c) – 0.339 V
(d) – 0.26 V

36. Calculate the order of the reaction in A and B.

[A] (mol L⁻¹)	0.05	0.10	0.05
[B] (mol L⁻¹)	0.01	0.05	0.10
Rate (mol L⁻¹ s⁻¹)	1.2×10^{-3}	2.4×10^{-3}	1.2×10^{-3}

(a) 1 and 0
(b) 1 and 1
(c) 0 and 1
(d) 1 and 2

ROUGH WORK

37. The half-life of a substance in a first-order reaction is 15 min. The rate constant is
(a) 2.46×10^2 min^{-1} (b) 4.62×10^{-2} min^{-1}
(c) 6.74×10^{-2} min^{-1} (d) 7.18×10^2 min^{-1}

38. The activation energy E_a of a reaction can be calculated by plotting:
(a) k against T   (b) k against 1/log T
(c) log k against 1/T   (d) log k against 1/log T

39. Which of the following is fully fluorinated polymer?
(a) Neoprene   (b) Teflon
(c) Thiokol   (d) PVC

40. Which of statement does not explain fibers?
(a) Fibers are made of linear long chains which permit side-by-side alignment.
(b) Structures of fibers are controlled by enthalpy instead of entropy.
(c) There exist strong intermolecular forces to prevent slipping between chains.
(d) Nylon and rubbers are typical examples of fibers.

BIOLOGY

41. What is the correct surgical method for preventing pregnancy in which the vas deferens is cut?
(a) Ovariectomy   (b) Hysterectomy
(c) Vasectomy   (d) Castration

42. Sertoli cells are found ....
(a) Between the seminiferous tubules
(b) In the germinal epithelium of ovary
(c) In the uppermost part of fallopian tube
(d) In the germinal epithelium of seminiferous tubules

43. The highly sophisticated procedure of directly injecting a sperm into an egg is called
(a) ICSI   (b) ZIFT
(c) GIFT   (d) AID

44. Phase of menstrual cycle when ovulation occurs is ...
(a) Luteal   (b) Menstrual
(c) Ovulatory   (d) Secretory

45. Medical Termination of Pregnancy (MTP) is considered safe up to how many weeks of pregnancy?
(a) Six weeks   (b) Eight weeks
(c) Twelve weeks   (d) Eighteen weeks

46. Process of formation of gamete is called
(a) Ovulation   (b) Amphimixis
(c) Arrhenotoky   (d) Gametogenesis

47. Given below are four methods (A - D) and their modes of action (a - d) in achieving contraception. Select their correct matching from the four options that follow:

Method		Mode of Action
A.	The pill	a. Prevents sperms reaching cervix
B.	Condom	b. Prevents implantation
C.	Vasectomy	c. Prevents ovulation
D.	Copper T	d. Semen contains no sperms

(a) A-(b), B-(c), C-(a), D-(d)
(b) A-(c), B-(a), C-(d), D-(b)
(c) A-(d), B-(a), C-(b), D-(c)
(d) A-(c), B-(d), C-(a), D-(b)

48. Immune system is made up of ...
(a) Humoral system
(b) Humoral and fibrous systems
(c) Humoral and cell mediated system
(d) Antigen induced antibodies

49. Blood cancer is ....
(a) Melanoma   (b) Sarcoma
(c) Carcinoma   (d) Leukemia

50. Which of the following is a bacterial disease ...
(a) Leprosy   (b) Measles
(c) Diabetes   (d) Scurvy

51. Which of the following pollination types is caused by birds?
(a) Entomophily   (b) Ornithophily
(c) Malacophily   (d) Chiropterophily

ROUGH WORK

52. Sporopollenin, a chemical substance is found in
_____ .
(a) Intine of pollen grain
(b) Exine of pollen grain
(c) Endothecium of anther
(d) Tapetum of anther

53. The role of double fertilisation in angiosperms is to produce
(a) Cotyledons   (b) Endocarp
(c) Endosperm   (d) Hormones

54. Who among the following was proposed chromosomal theory of inheritance?
(a) T.H. Morgan   (b) Johannsen
(c) Sutton and Boveri   (d) Beadle and Tatum

55. Monosomy and trisomy are respectively
(a) n -1, n + 2   (b) 2n + 2, 2n + 1
(c) 2n - 1, 2n + 1   (d) n - 2, 2n + 1

56. IR-8 is a variety of
(a) Cajanus   (b) Rice
(c) Ground nut   (d) Maize

57. Which of the following is best fertiliser for paddy?
(a) Azolla pinnata   (b) Bacillus polymyxa
(c) Anthoceros   (d) Rhizobium

58. Match the following and choose the correct combination from the options given below.

Column I	Column II
(Population interaction)	(Examples)
A. Mutualism	1. Ticks on dogs
B. Commensalism	2. *Balanus* and *Chathamalus*
C. Parasitism	3. Sparrow and any seed
D. Competition	4. Epiphyte on a mango branch
E. Predation	5. Orchid Ophrys and bee

(a) A - 1, B - 5, C - 4, D - 3, E - 2
(b) A - 2, B - 1, C - 5, D - 4, E - 3
(c) A - 3, B - 2, C - 1, D - 5, E - 4
(d) A - 5, B - 4, C - 1, D - 2, E - 3

59. The logistic population growth is expressed by the equation
(a) $\dfrac{dt}{dN} = Nr\dfrac{(K-N)}{K}$ (b) $\dfrac{dN}{dt} = rN\dfrac{(K-N)}{K}$

(c) $\dfrac{dN}{dt} = rN$ (d) $\dfrac{dN}{dt} = rN\dfrac{(N-K)}{N}$

60. Which of the following is a test cross
(a) TT × TT   (b) Tt × tt
(c) tt × tt   (d) Tt × TT

G.K.

61. World Health day is observed on?
(a) 3rd April   (b) 4th April
(c) 5th April   (d) 7th April

62. Which among the following bodies estimates the national income of India?
(a) Office of the Economic Advisor
(b) Ministry of Statistics
(c) Central Statistical Office
(d) Ministry of Finance

63. The right to constitutional remedies allows Indian citizens to stand up for their rights against anybody even the government of India. Which article says this?
(a) Article 31   (b) Article 32
(c) Article 33   (d) Article 34

64. What was the original name of Mirabehn, an associate and disciple of Mahatma Gandhi?
(a) Oliver Schriener   (b) Millie Graham Polock
(c) Madeline Slade   (d) Margarate Cousins

65. For his major role in the development of computer chip 'Pentium', which Indian IT expert is called the `Father of Pentium'?
(a) Ajay Bhatt   (b) AnandChandrasekher
(c) VinodDham   (d) BiswamohanPani

ROUGH WORK

66. GolGhar, a beehive shaped structure built in 1786 to store grains for the British Army, is located in which city?
(a) Bhopal   (b) Patna
(c) Varnas   (d) Lucknow

67. What is the name of India's first nuclear reactor?
(a) Cirius   (b) Apsara
(c) Dhruva   (d) Kamini

68. Mahatama Gandhi had launched his first Satyagraha in India from which among the following places?
(a) Kheda   (b) Bardoli
(c) Champaran   (d) Sabarmati

69. Which among the following Indian classical dance form was developed by Siddhendra Yogi from Bhamakalapam dance drama ?
(a) Kuchipudi   (b) Odissi
(c) Yakshagana   (d) Kathkali

70. Which of the following European countries is known as the 'Land of a thousand lakes'?
(a) Norway   (b) Sweden
(c) Finland   (d) Estonia

71. Stilwell Road" connects India with which among the following neighbors?
(a) China   (b) Bhutan
(c) Bangladesh   (d) Pakistan

72. Major Dhyanchand's birthday is celebrated as National Sports Day in India, on which among the following dates?
(a) July 29th   (b) August 29th
(c) March 29th   (d) April 29th

73. The Commonwealth Games started from which among the following countries?
(a) England   (b) Australia
(c) Canada   (d) India

74. Who among the following had written Bangladesh's national anthem" Amar Sonar Bangla"?
(a) Nazrul Islam
(b) Rabindranath Tagore
(c) AnisurRahman
(d) SantidevGhosh

75. Which among the following types of glasses contains Cerium and other rare earths and has a high absorption of ultraviolet rays?
(a) Crookes Glass   (b) Pyrex Glass
(c) Flint Glass   (d) Crown Glass

76. Where are the headquarters of NATO?
(a) New York   (b) Brussels
(c) Paris   (d) Vienna

77. National Housing Bank is the wholly subsidiary of RBI. In which year, NHB was established?
(a) 1985   (b) 1986
(c) 1987   (d) 1988

78. The Mandal Commission was constituted during the tenure of which among the following prime ministers?
(a) Indira Gandhi   (b) Morarji Desai
(c) Rajiv Gandhi   (d) V P Singh

79. "The Analects" is a sacred text of which philosopher?
(a) Confucius   (b) Hippocrates
(c) Socrates   (d) Herodotus

80. Maximum number of animals species belong to which among the following groups?
(a) Mammalia   (b) Ayes
(c) Pisces   (d) Arthropoda

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ROUGH WORK