BITSAT 2019 Question Paper with Answer Key

Birla Institute of Technology and Science Admission Test

BITSAT : SOLVED PAPER 2019

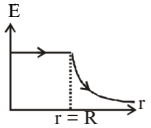
(memory based)

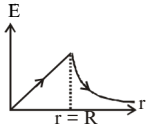
INSTRUCTIONS

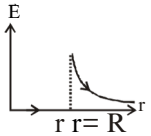
- This question paper contains total ۞ questions divided into four parts
  Part ۱ Physics Q No ۞ to
  Part ۱۱ Chemistry Q No ۞ to
  Part ۱۱۱ 꾀序 쟬nglish Proficiency Q No ۞ to 黨 ◆
  序 ogical Reasoning Q No 黨 to ۞ ◆
  Part ۱V Mathematics Q No ۞ to ۞◆
- 꾀ll questions are multiple choice questions with four options only one of them is correct
- 쟬ach correct answer awarded marks and – ۞ for each incorrect answer
- uration of paper嬰 ours

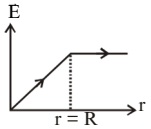
PART - I : PHYSICS

1. Which one of the following graphs represents the variation of electric field with distance r from the centre of a charged spherical conductor of radius R?

(a) 

(b) 

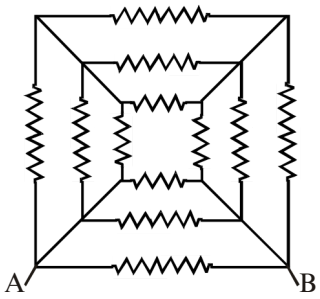
(c) 

(d) 

2. If E and B are the electric and magnetic field vectors of e.m. waves then the direction of propagation of e.m. wave is alonrg the direction of
(a) E r (b) B
(c) E´B (d) None of these

3. The young's modulus of a wire of length L and radius r is Y N/m2. If the length and radius are reduced to L/2 and r/2, then its young's modulus will be
(a) Y/2 (b) Y (c) 2Y (d) 4Y

4. Twelve resistors each of resistance 16W are connected in the circuit as shown. The net resistance between A and B is



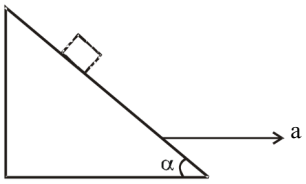
(a) 1W (b) 2W
(c) 3W (d) 4W

5. The time period of a satellite of earth is 5 hours. If the separation between the earth and the satellite is increased to 4 times the previous value, the new time period will become
(a) 10 hours (b) 80 hours
(c) 40 hours (d) 20 hours

6. Two trains are moving towards each other with speeds of 20 m/s and 15 m/s relative to the ground. The first train sounds a whistle of frequency 600 Hz. The frequency of the whistle heard by a passenger in the second train before the train meets, is (the speed of sound in air is 340 m/s)
(a) 600 Hz (b) 585 Hz
(c) 645 Hz (d) 666 Hz

7. You are asked to design a shaving mirror assuming that a person keeps it 10 cm from his face and views the magnified image of the face at the closest comfortable distance of 25 cm. The radius of curvature of the mirror would then be :
(a) 60 cm (b) –24 cm
(c) – 60 cm (d) 24 cm

8. A block is kept on a frictionless inclined surface with angle of inclination 'a' . The incline is given an acceleration 'a' to keep the block stationary. Then 'a' is equal to



(a) g cosec a
(b) g/tana
(c) g tana
(d) g

9. With the increase in temperature, the angle of contact
(a) decreases
(b) increases
(c) remains constant
(d) sometimes increases and sometimes decreases

10. Forward biasing is that in which applied voltage
(a) increases potential barrier
(b) cancels the potential barrier
(c) is equal to 1.5 volt
(d) None of these

11. Number of significant figures in expression $\frac{4.327\ g}{2.51\ cm^3}$ is
(a) 2 (b) 4 (c) 3 (d) 5

12. The ratio of the specific heats $\frac{C_p}{C_v} = g$ in terms of degrees of freedom (n) is given by
(a) $\left(1+\frac{n}{3}\right)$ (b) $\left(1+\frac{2}{n}\right)$
(c) $\left(1+\frac{n}{2}\right)$ (d) $\left(1+\frac{1}{n}\right)$

13. A stone is thrown with a velocity u making an angle q with the horizontal. The horizontal distance covered by its fall to ground is maximum when the angle q is equal to
(a) 0° (b) 30° (c) 45° (d) 90°

14. A ball of mass 150 g, moving with an acceleration 20 m/s2, is hit by a force, which acts on it for 0.1 sec. The impulsive force is
(a) 0.5 N (b)0.1 N (c) 0.3 N (d)1.2 N

15. A man drags a block through 10 m on rough surface ($\mu = 0.5$).√A force of 3 kN acting at 30° to the horizontal. The work done by applied force zero (b) 7.5 kJ (c) 5 kJ (d) 10 kJ is

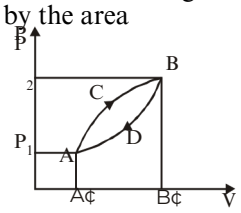
16. A force of $2\hat{i}+3\hat{j}+4\hat{k}$ N acts on a body for 4 second, produces a displacement of $(3\hat{i}+4\hat{j}+5\hat{k})$m. The power used is
(a) 9.5 W (b)7.5 W (c) 6.5 W (d)4.5 W

17. The Earth is assumed to be a sphere of radius R. A platform is arranged at a height R from the surface of the Earth. The escape velocity of a body from this platform is fv, where v is its escape velocity from the surface of the Earth. The value of f is (a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) $\sqrt{2}$ (d) $\frac{1}{\sqrt{2}}$

18. Kepler's second law regarding constancy of areal velocity of a planet is a consequence of the law of conservation of (a) (b) (c) (d)
Energy
Angular momentum
Linear momentum
None of these

19. Water is flowing through a horizontal tube having cross-sectional areas of its two ends being A and A¢ such that the ratio A/A¢ is 5. If the pressure difference of water between the two ends is 3 × 105 N m–2, the velocity of water with which it enters the tube will be (neglect gravity effects)
(a) 5 m s–1 (b) 10 m s–1
(c) 25 m s–1 (d) $\sqrt{5010}$ m s–1

20. A thermodynamic system is taken from state A to B along ACB and is brought back to A along BDA as shown in the PV diagram. The net work done during the complete cycle is given by the area



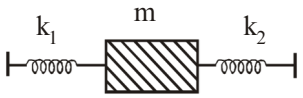
(a) P1ACBP2P1
(b) ACBB'A'A
(c) ACBDA
(d) ADBB'A'A

21. A boat crosses a river from port A to port B, which are just on the opposite side. The speed of the water is V_w and that of boat is V_B relative to water. Assume $V_B = 2V_w$. What is the time taken by the boat if it has to cross the river directly on the AB line [D = width of the river]

(a) $\frac{2D}{V_B\sqrt{3}}$ (b) $\frac{\sqrt{3}D}{2V_B}$

(c) $\frac{D}{V_B\sqrt{2}}$ (d) $\frac{D\sqrt{2}}{V_B}$

22. Two springs, of force constants k_1 and k_2 are connected to a mass m as shown. The frequency of oscillation of the mass is f. If both k_1 and k_2 are made four times their original values, the frequency of oscillation becomes



(a) 2 f (b) f /2 (c) f /4 (d) 4 f

23. When a potential difference V is applied across a conductor at a temperature T, the drift velocity of electrons is proportional to

(a) $\sqrt{V}$ (b) V (c) $\sqrt{T}$ (d) T

24. The amplitude of a damped oscillator becomes $\left(\frac{1}{e}\right)^{th}$ in 2 seconds. If its amplitude after 6 seconds is $\frac{1}{n}$ times the original amplitude, the value of n is

(a) 32 (b) 33 (c) $3\sqrt{3}$ (d) 23

25. The angular speed of the electron in the nth orbit of Bohr hydrogen atom is

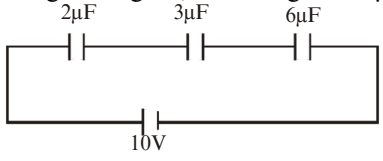
(a) directly proportional to n

(b) inversely proportional to $\sqrt{n}$

(c) inversely proportional to n2

(d) inversely proportional to n3

26. In the given figure, the charge on 3 μF capacitor is



(a) 10 μC (b) 15 μC (c) 30 μC (d)

27. Two bodies A and B are placed in an evacuated vessel maintained at a temperature of 27ºC. The temperature of A is 327ºC and that of B is 227ºC. The ratio of heat loss from A and B is about

(a) 2 : 1 (b) 1 : 2 (c) 4 : 1 (d) 1 : 4

28. If a rigid body is rotating about an axis with a constant velocity, then

(a) Velocity, Angular velocity of all particles will be same

(b) Velocity, Angular velocity of all particles will be different

(c) Velocity of all particles will be different but angular velocity will be same.

(d) Angular velocity of all particles will be different but velocity will be same.

29. The fundamental frequency of an open organ pipe is 300 Hz. The first overtone of this pipe has same frequency as first overtone of a closed organ pipe. If speed of sound is 330 m/s, then the length of closed organ pipe is

(a) 41 cm (b) 30 cm (c) 45 cm (d) 35 cm

30. In Young's experiment, the distance between the slits is reduced to half and the distance between the slit and screen is doubled, then the fringe width

(a) will not change
(b) will become half
(c) will be doubled
(d) will become four times

31. If a rolling body's angular momentum changes by 20 Sl units in 3 seconds, by a constant torque. Then find the torque on the body

(a) 20/3 Sl units (b) 100/3 Sl units
(c) 20 Sl units (d) 5 Sl units

32. Charge Q is distributed to two different metallic spheres having radii x and 2x such that both spheres have equal surface charge density, then charge on large sphere is

(a) $\frac{4Q}{5}$ (b) $\frac{Q}{5}$ (c) $\frac{3Q}{5}$ (d) $\frac{5Q}{4}$

33. In an LR circuit f = 50 Hz, L=2 H, E=5 volts, R=1 W then energy stored in inductor is

(a) 50 J (b) 25 J (c) 100 J (d) None of these

34. A straight wire of length 0.5 metre and carrying a current of 1.2 ampere is placed in uniform magnetic field of induction 2 tesla. The magnetic field is perpendicular to the length of the wire. The force on the wire is

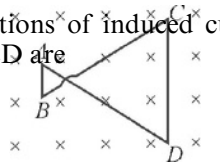
(a) 2.4 N (b) 1.2 N (c) 3.0 N (d) 2.0 N

35. A man drives a car from station B towards station A at speed 60 km/h. A car leaves station A for station B every 10 min. The distance between A and B is 60 km. The car travels at the speed of 60 km/h. A man drives a car from B towards A at speed of 60 km/h. If he starts at the moment when first car leaves the station B, then how many cars would be meet on the route?
(a) 4 (b) 7 (c) 9 (d) 12

36. In rotatory motion, linear velocities of all the particles of the body are
(a) same (b) different
(c) zero (d) cannot say

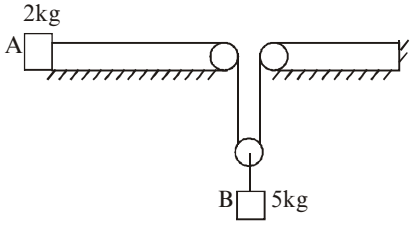
37. If x, v and a denote the displacement, the velocity and the acceleration of a particle executing simple harmonic motion of time period T, then, which of the following does not change with time?
(a) aT/x (b) aT + 2pv
(c) aT (d) a2T2 + 4p2v2

38. A conducting wire frame is placed in a magnetic field which is directed into the paper. The magnetic field is increasing at a constant rate.
The directions of induced current in wires AB and CD are



(a)B to A and D to C(b)A to B and C to D
(c)A to B and D to C(d)B to A and C to D

39. Find the acceleration of block A and B. Assume pulley is massless.

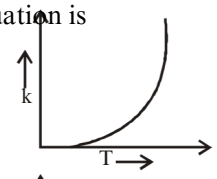


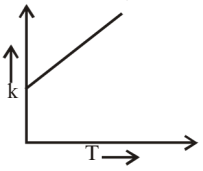
(a) $\frac{10}{13}$ g, $\frac{5}{13}$ g (b) $\frac{1}{13}$ g, $\frac{5}{13}$ g
(c) $\frac{9}{13}$ g, $\frac{11}{13}$ g (d) $\frac{13}{10}$ g, $\frac{13}{5}$ g

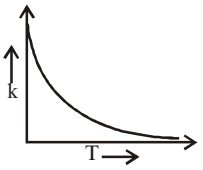
40. The nuclei of which one of the following pairs of nuclei are isotones?
(a) $_{34}Se74$, $_{31}Ga71$
(b) $_{38}Sr84$, $_{38}Sr86$
(c) $_{42}Mo92$, $_{40}Zr92$
(d) $_{20}Ca40$, $_{16}S32$

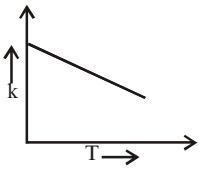
PART - II : CHEMISTRY

41. Plots showing the variation of the rate constant (k) with temperature (T) are given below. The plot that follows Arrhenius equation is

(a)


(b)


(c)


(d)


42. 3.6 g of oxygen is adsorbed on 1.2 g of metal powder. What volume of oxygen adsorbed per gram of the adsorbent at 1 atm and 273 K?
(a) 0.10 L (b) 2.0 L
(c) 1.0 L (d) None of these

43. In the purification of impure nickel by Mond's process, metal is purified by :
(a) Electrolytic reduction
(b) Vapour phase thermal decomposition
(c) Thermite reduction
(d) Carbon reduction

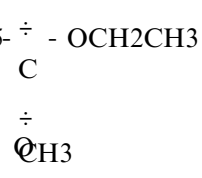
44. When chlorine water is added to an aqueous solution of sodium iodide in the presence of chloroform, a violet colouration is obtained. On adding more of chlorine water and vigorous shaking, the violet colour disappears. This shows the conversion of .....into HI.
(a) I_2, HIO_3 (b) I_2, HI
(c) HI, HIO_3 (d) I_2, HOI

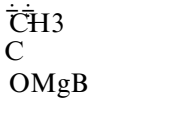
45. In the clathrates of xenon with water, the nature of bonding between xenon and water molecules is
(a) covalent (b) coordinate
(d) hydrogen bonding (Atomic
The electronic configurations of Eu(Atomic No. 63), Gd(Atomic No. 64) and Tb (Atomic
46. No. 65) are
(a) [Xe]4f76s2, [Xe]4f8 6s2 and [Xe]4f 85d16s2
(b) [Xe]4f75d16s2, [Xe]4f7 5d1 6s2 and [Xe]4f 96s2
(c) [Xe]4f65d16s2, [Xe]4f75d16s2 and [Xe]4f 85d16s2
(d) [Xe]4f 76s2, [Xe]4f 75d16s2 and [Xe]4f 96s2

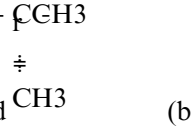
47. Which of the following carbonyls will have the strongest C – O bond ?
(a) $[Mn(CO)_6]^+$ (b) $[Cr(CO)_6]$
(c) $[V(CO)_6]^-$ (d) $[Fe(CO)_3]$

48. How many chiral compounds are possible on monochlorination of 2- methyl butane ?
(a) 8 (b) 2 (c) 4 (d) 6

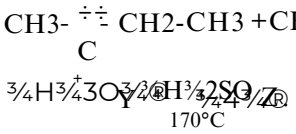
49. Which of the following are intermediates in the reaction of excess of CH_3MgBr with $C_6H_5COOCH_2CH_3$ to make 2-phenyl - 2-propanol ?

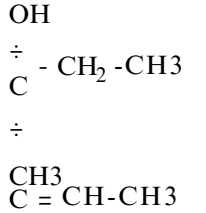
A. 

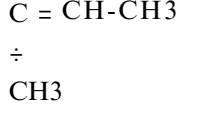
B. 

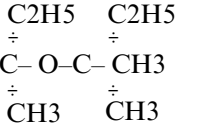
C. 

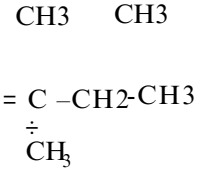
(a) A and B (b) A, B and C
(c) A and C (d) B and C

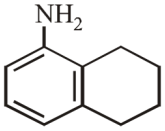
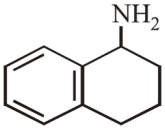
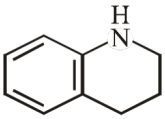
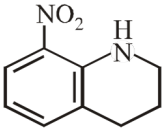
50. 
What is Z?

(a) 

(b) 

(c) 

(d) 

51. Which of the following is the strongest base ?
(a)  (b) 
(c)  (d) 

52. Which of the following does not reduce Benedict's solution?
(a) Glucose (b) Fructose
(c) Sucrose (d) Aldehyde

53. General formula of solid in zinc blende structure is:
(a) AB_2 (b) AB3 (c) AB (d) A2B

54. Glycine in alkaline solution exists as _____ and migrates to _____.
(a) Cation, cathode
(b) Neutral, anode
(c) Zwitter ion, cathode
(d) anion, anode

55. Product on reaction of ethanamide with phosphorus pentoxide is:
(a) ethanamine
(b) acetonitrile
(c) ethanol
(d) ethane isonitrile

56. K_a of HX is 10–5, then find concentration of HO^+_3 when equal volumes of 0.25M HX and 0.05 M NaOH are mixed.
(a) 4 ´ 10–5 M (b)6 ´ 10–5 M
(c) 8 ´ 10–3 M (d)2 ´ 10–5 M

57. Net cell reaction of Pt | H (640 mm) | HCl | H (510 mm) | Pt.
(a) 0.89 V (b) 0.93 V
(c) 2.91´ ´ 10–3 V (d) 2.5´ ´ 10–2 V

58. Which of the following has zero net dipole moment? (a) XeF4 (b) BrF3 (c) ClF3 (d) SF4

59. Which of the following element has the highest ionisation enthalpy?
(a) Boron (b) Aluminium
(c) Germanium (d) Thallium

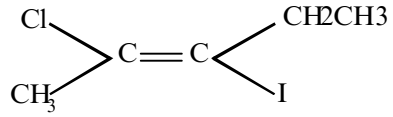
60. Out of the elements with atomic number 7, 8, 9, 13 which has the smallest size and highest ionization enthalpy?
(a) 7 (b) 8 (c) 9 (d) 13

61. Which one is classified as a condensation polymer?
(a) Dacron (b) Neoprene
(c) Teflon (d) Acrylonitrile

62. Which of the following compounds is not an antacid ?
(a) Phenelzine (b) Ranitidine
(c) Aluminium hydroxide (d) Cimetidine

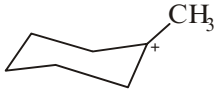
63. Mole fraction of the solute in a 1.00 molal aqueous solution is
(a) 0.1770 (b) 0.0177 (c) 0.0344 (d) 1.7700

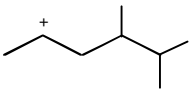
64. The IUPAC name of the following compound is

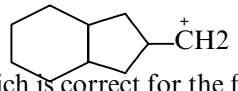


(a) trans-2-chloro-3-iodo-2-pentene
(b) cis-3-iodo-4-chloro-3-pentene
(c) trans-3-iodo-4-chloro-3-pentene
(d) cis-2-chloro-3-iodo-2-pentene

65. Most stable carbocation among the following is:

(a) 

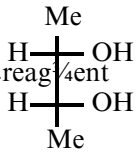
(b) 

(c) 

(d) 

66. Which is correct for the following changes ?

A ¾¾X® B ¾B¾ae¾yer¾'s¾reag¾ent



(a) X is Lindlar Catalyst, B is cis-2-butene
(b) A is 2-butyne, X is Na-liq. NH3
(b) B is trans-2-butene, X is Na-liq.NH3
(c) A is 2-butene, X is SeO2
(d)

67. The stability of +1 oxidation state among Al, Ga, In and Tl increases in the sequence :
(a) Ga < In < Al < Tl
(b) Al < Ga < In < Tl
(c) Tl < In < Ga < Al
(d) In < Tl < Ga < Al

68. Which of the following alkaline earth metal hydroxides is amphoteric in character?
(a) $Be(OH)_2$ (b) $Ca(OH)_2$
(c) $Sr(OH)_2$ (d) $Ba(OH)_2$

69. Which reaction shows oxidising nature of H_2O_2?
(a) $H_2O_2 + 2KI \rightarrow 2KOH + I_2$
(b) $Cl_2 + H_2O_2 \rightarrow 2HCl + O_2$
(c) $2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$
(d) $NaClO + H_2O_2 \rightarrow NaCl + H_2O + O_2$

70. $aK_2Cr_2O_7 + bKCl + cH_2SO_4 \rightarrow xCrO_2Cl_2 + yKHSO_4 + zH_2O$
The above equation balances when
(a) a = 2, b = 4, c = 6 and x = 2, y = 6,
(b) z = 3 a = 4, b = 2, c = 6 and x = 6, y
(c) = 2, z = 3 a = 6, b = 4, c = 2 and x =
(d) 6, y = 3, z = 2 a = 1, b = 4, c = 6 and x = 2, y = 6, z = 3

71. For the reactions

$A \rightleftharpoons B$; $K_c = 2$

$B \rightleftharpoons C$; $K_c = 4$

$C \rightleftharpoons D$; $K_c = 6$

K_c for the reaction $A \rightleftharpoons D$ is

(a) $2 \times 4 \times 6$ (b) $\frac{2 \cdot 4}{6}$

(c) $2 + 4 + 6$ (d) $\frac{4 \cdot 6}{2}$

72. Which of the following will always lead to a non-spontaneous change?

(a) DH and DS both +ve

(b) DH is –ve DS both +ve

(c) DH and DS both –ve

(d) DH is +ve DS both –ve

73. The densities of two gasses are in the ratio of 1: 16. The ratio of their rates of diffusion is

(a) 16:1 (b) 4:1 (c) 1:4 (d) 1:16

74. In the reaction $2PCl_5 \rightarrow PCl_4^+ + PCl_6^-$, the change in hybridisation is from

(a) sp3d to sp3 and sp3d2

(b) sp3d to sp2 and sp3

(c) sp3d to sp3d2 and sp3d3

(d) sp3d2 to sp3 and sp3d

75. The group having isoelectronic species is:

(a) O^{2-} , F^-, Na^+, Mg^{2+}

(b) O^- , F^-, Na, Mg^+

(c) O^{2-} , F^-, Na , Mg^{2+}

(d) O^- , F^-, Na^+ , Mg^{2+}

76. 100 mL O_2 and H_2 kept at same temperature and pressure. What is true about their number of molecules

(a) $N_{O_2} > N_{H_2}$

(b) $N_{O_2} < N_{H_2}$

(c) $N_{O_2} = N_{H_2}$

(d) $N_{O_2} + N_{H_2} = 1$ mole

77. If m_A gram of a metal A displaces m_B gram of another metal B from its salt solution and if the equivalent mass are E_A and E_B respectively then equivalent mass of A can be expressed as:

(a) $E_A = \frac{m_A}{m_B} \cdot E_B$

(b) $E_A = \frac{m_A \cdot m_B}{E_B}$

(c) $E_A = \frac{m_B}{m_A} \cdot E_B$

(d) $E_A = \sqrt{\frac{m_A}{m_B} \cdot E_B}$

78. Which one of the following set of quantum numbers is not possible for 4p electron?

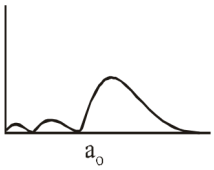
(a) $n = 4, l = 1, m = -1, m_s = +\frac{1}{2}$

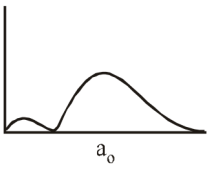
(b) $n = 4, l = 1, m = 0, m_s = \pm\frac{1}{2}$

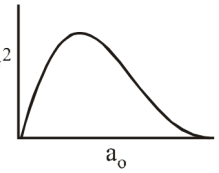
(c) $n = 4, l = 1, m = 2, m_s = \pm\frac{1}{2}$

(d) $n = 4, l = 1, m = -1, m_s = -\frac{1}{2}$

79. Which of the following radial distribution graphs correspond to l = 2 for the H atom ?

(a) 

(b) 

(c) 

(d) 

80. Which of the following is paramagnetic?

(a) B^2 (b) C2 (c) N2 (d) F2

PART - III (A): ENGLISH

DIRECTIONS (Qs. 81-83) : In the following questions below, out of the four alternatives, choose the one which best expresses the meaning of the given word.

81. Garrulous
(a) Talkative (b) Sedative
(c) Cocative (d) Positive

82. Tinsel
(a) Tinkle (b) Decoration
(c) Tin (d) Colourful

83. Labyrinth
(a) Meandering (b) Rotating
(c) Pacing (d) Wriggling

DIRECTIONS (Qs. 84-86) : In the following questions, choose the word opposite in meaning to the given word.

84. Knack :
(a) Talent (b) Dullness
(c) Dexterity (d) Balance

85. Pernicious :
(a) Prolonged (b) Ruinous
(c) Ruthless (d) Beneficial

86. Opulence :
(a) Luxury (b) Transparency
(c) Weath (d) Poverty

DIRECTIONS (Qs. 87-90) : Read the passage carefully and choose the best answer to each question out of the four alternatives and mark it by blackening the [a] appropriate circle ·

Like watering a plant, we grow our friendships [and all our relationships) by running them. Friendships need the same attention as other relationships. If they are to continue. These relationships can be delightfully non-judgemental, supportive, understanding and fun.

Sometimes a friendship can bring out the positive side that you never show in any other relationship. This may be because the pressure of playing a 'role' (daughter, partner or child) is removed. With a friend you are to be yourself and free to change. Of course, you are free to do this in all other relationships as well, but in friendships you get to have lats of rehearsals and discussion about changes as you experience them. It is an unconditional experience where you receive as much as you give. You can explain yourself to a friend openly without the fear of hurting a family member. How do friendships grow ? The answer is simple. By revealing yourself; being attentive: remembering what is most showing empathy; seeing the world through the eyes of your friend, you will understand the value of friendship. All this means learning to accept a person from a completely different family to your own or perhaps someone from a completely different cultural background. This is the way we learn tolerance. In turn we gain tolerance and acceptance for our own differences.

87. In good friendships we
(a) give and receive.
(b) neither give nor receive.
(c) only give.
(d) only receive.

88. Empathy means
(a) someone else's misfortunes
(b) the ability to share and understand another feelings.
(c) skill and efficiency
(d) ability to do something

89. Through strong friendships, we gain
(a) only acceptance.
(b) only attention.
(c) acceptance and tolerance.
(d) only tolerance.

90. Friendships and relationships grow when they are
(a) compared (b) divided
(c) favoured (d) nurtured

DIRECTIONS (Qs. 91-92) : In the following questions, sentences are given with blanks to be filled with an appropriate word(s). Four alternatives are suggested for each question. Choose the correct alternative out of the four as your answer.

91. There are not solitary, free-living creatures ; every form of life is _____ other forms.
(a) dependent on (b) parallel to
(c) overshadowed by (d) segregated from

92. I'll take _____now as I have another's appointment some where else.
(a) departure (b) your leave
(c) permission (d)leave from work

DIRECTIONS (Qs. 93-95) : In the following questions, some parts of the sentences have errors and some are correct. Find out which part of a sentence has an error. The number of that part is the answer. If a sentence is free from error, then your answer is (d). i.e., No error.

93. When one hears of the incident (a)/about the plane crash (b)/ he feels very sorry. (c)/ No error (d)

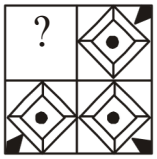
94. I went there (a)/ with a view to survey (b)/ the entire procedure. (c)/ No error (d)

95. It had laid (a)/ in the closet (b)/ for a week before we found it. (c)/ No error (d)

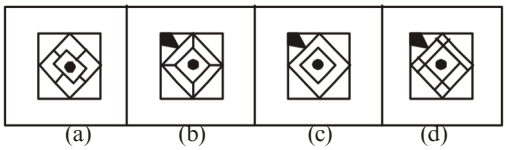
PART - III (B) : LOGICAL REASONIN

DIRECTIONS (Qs. 96 & 97) : In the following questions, which answer figure will complete the question figure?

96.Question Figures :

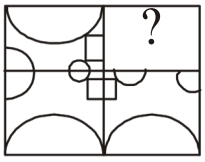


Answer figures :

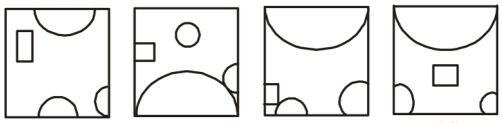


(a) (b) (c) (d)

97.Question Figure:



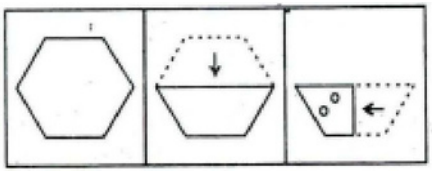
Answer Figure:



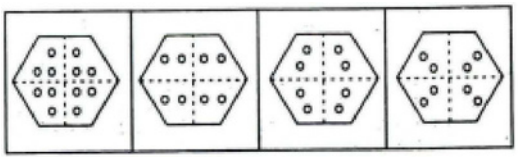
(a) (b) (c) (d)

98. A piece of paper is folded and cut/punched as shown below in the question figures. From the given answer figures, indicate how it will A appear when opened.

Question figures:



Answer figures:



(a) (b) (c) (d)

99. Select the related word from the given alternatives:

Medicine : Patient : : Education : ?

(a) Teache (b) School

(c) r (d) Tuition

Student

100. Choose the correct alternative from the given ones that will complete the series.

A3E, F5J, K7O, ____

(a) Q11T (b) Q9V

(c) P9T (d) P11T

101. Which one of the following numbers lacks the common property in the series? 81, 36, 25, 9, 5, 16 (a) (c)

5 (b) 9

36 (d) 25

102. In a certain code language, "TIRED" is written as "56" and "BRAIN" is written as "44". How is 'LAZY" written in that code language?

(a) 64 (b) 61

(c) 58 (d) 43

103. Select the missing number from the given response.

	7	6
	7	6
	77	?
	3773	3132

(a) 66 (b) 87 (c) 78 (d) 76

104. Which one of the following diagrams best depicts the relationship among Human Society - Youth Club, Political Party and Youths ?

(a)  (b) 

(c)  (d) 

105. Among her children, Ganga's favourites are Ram and Rekha. Rekha is the mother of Sharat, who is loved most by his uncle Mithun. The head of the family is Ram Lal, who is succeeded by his sons Gopal and Mohan. Gopal and Ganga have been married for 35 years and have 3 children. What is the relation between Mithun and Mohan?

(a) Uncle (b) Son
(c) Brother (d) No relation

PART - IV : MATHEMATICS

106. If x cos a + y sin a = P is a tangent to the ellipse $\frac{x2}{a2}+\frac{y2}{b2}=1$, then

(a) a cos a + b sin a = P2
(b) a sin a + b cos a = P2
(c) a2 cos2 a + b2 sin2 a = P2
(d) a2 sin2 a + b2 cos2 a = P2

107. If a1,a2,a3.....,anare in A.P. where $a_i > 0$ for all i, then

$$\frac{1}{\sqrt{a1}+\sqrt{a2}}+\frac{1}{\sqrt{a_2}+\sqrt{a_3}}+.....+\frac{1}{\sqrt{an-1}+\sqrt{a_n}}=$$

(a) $\frac{n+1}{\sqrt{a_1}+\sqrt{a_n}}$ (b) $\frac{n}{\sqrt{a_1}+\sqrt{a_n}}$

(c) $\frac{n-1}{\sqrt{a_1}+\sqrt{a_n}}$ (d) none of these

108. In order to solve the differential equation

$$x\cos x\frac{dy}{dx}+y(x\sin x+\cos x)=1$$

the integrating factor is:

(a) x cos x (b) x sec x
(c) x sin x (d) x cosec x

109. Equation of two straight lines are $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-4}{5}=\frac{y-1}{2}=z$.

Then

(a) The lines are non-coplanar
(b) The lines are parallel and distinct
(c) The lines intersect in unique point
(d) The lines are coincident

110. The equation of the curve passing through the point $\left(a,-\frac{1}{a}\right)$ and satisfying the differential equation $y-x\frac{dy}{dx}=a\left(y^2+\frac{d}{y}\right)$ is

(a) $(x+a)(1+ay)=-4a^2y\frac{d}{x}$

(b) $(x+a)(1-ay)=4a^{2y}$

(c) $(x+a)(1-ay)=-4a^{2}y$

(d) None of these

111. The locus of the mid-point of a chord of the circle $x^2+y^2=4$, which subtends a right angle at the origin is

(a) x + y = 2 (b) x2 + y2 = 1
(c) x2 + y2 = 2 (d) x + y = 1

112. With the usual notation $\int_1^2([x2]-[x]2)dx$ is equal to

(a) $4+\sqrt{2}-\sqrt{3}$ (b) $4-\sqrt{2}+\sqrt{3}$

(c) $4-\sqrt{2}-\sqrt{3}$ (d) none of these

113. $\frac{1+\sin A-\cos A}{1+\sin A+\cos A}=$

(a) $\sin\frac{A}{2}$ (b) $\cos\frac{A}{2}$

(c) $\tan\frac{A}{2}$ (d) $\cot\frac{A}{2}$

114. If $x\sqrt{1+y}+y\sqrt{1+x}=0$, then $\frac{d}{y}=$

(a) $\frac{x+1}{x}$ (b) $\frac{1}{1+x}\frac{d}{x}$

(c) $\frac{-1}{(1+x)^2}$ (d) $\frac{x}{1+x}$

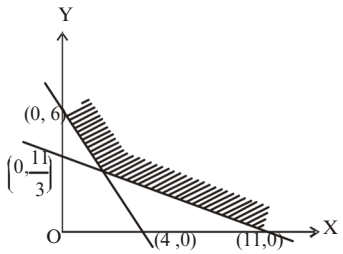
115. If f (x) = 3x4 + 4x3 – 12x2 + 12, then f (x) is
(a) increasing in (–¥, – 2) and in (0, 1)
(b) increasing in (– 2, 0) and in (1,¥)
(c) decreasing in (– 2, 0) and in (0,1)
(d) decreasing in (– ¥, – 2) and in (1,¥)

116. Consider $\frac{x}{2}+\frac{y}{4} \geq 1$ and $\frac{x}{3}+\frac{y}{2} \leq 1, x, y \geq 0$.
Then number of possible solutions are :
(a) Zero (b) Unique
(c) Infinite (d) None of these

117. The distance of a point (2, 5, –3) from the plane $\vec{r}\times(6\hat{i}-3\hat{j}+2\hat{k})=4$ is
(a) $\frac{13}{13}$ (b) $\frac{13}{7}$
(c) $\frac{5}{}$ (d) $\frac{37}{7}$

118. The value of definite integral $\int_0^{\frac{\pi}{2}} \log(\tan x)\,dx$ is
(a) 0 (b) $\frac{\pi}{4}$
(c) $\frac{\pi}{2}$ (d) p

119. For the following feasible region, the linear constraints are



(a) $x \geq 0, y \geq 0, 3x + 2y \geq 12, x + 3y \geq 1$
(b) $x \geq 0, y \geq 0, 3x + 2y \leq 12, x + 3y \geq 1$
(c) $x \geq 0, y \geq 0, 3x + 2y \leq 12, x + 3y \leq 1$
(d) None of these 1

120. The general solution of differential equation $(ex + 1)\,y\,dy = (y + 1)ex\,dx$ is 1
(a) $y + 1 = k(ex + 1)$
(b) $y + 1 = ex + 1 + k$
(c) $y = \log\{k(y + 1)(ex + 1)\}$
(d) $y = \log\left\{\frac{ex+1}{y+1}\right\} + k$

121. What is the slope of the normal at the point (at2, 2at) of the parabola y2 = 4ax ?
(a) $\frac{1}{t}$ (b) t
(c) – t (d) $-\frac{1}{t}$

122. $\int_0^{p/2} x\sin^2 x\cos^2 x\,dx$ is equal to
(a) $\frac{p}{32}$ (b) $\frac{p^2}{16}$
(c) $\frac{p}{32}$ (d) None of these

123. If $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix} = x + iy$, where $i = \sqrt{-1}$, then what is x equal to ?
(a) 3 (b) 2
(c) 1 (d) 0

124. The limit $\lim_{x\to 0}\left(\frac{\log_e(1+x)}{x^2}+\frac{x-1}{x}\right)$
(a) is equal to $\frac{1}{2}$ (b) is equal to $-\frac{1}{2}$
(c) is equal to 2 (d) does not exist

125. If $2\cos 2x + 3\sin x - 3 = 0$, $0 \leq x \leq 180°$, then x =
(a) 30°, 90°, 150° (b) 60°, 120°, 180°
(c) 0°, 30°, 150° (d) 45°, 90°, 135°

126. If the number of available constraints is 3 and the number of parameters to be optimized is 4, then
(a) The objective function can be optimized
(b) The constraint are short in number
(c) The solution is problem oriented
(d) None of these

127. If $y=\tan^{-1}\left(\frac{\sqrt{x}-x}{1+x^{3/2}}\right)$, then $y'(1)$ is equal to
(a) 0 (b) $\frac{1}{2}$ (c) – 1 (d) $-\frac{1}{4}$

128. The maximum area of rectangle inscribed in a circle of diameter R is
(a) R2 (b) $\frac{R^2}{2}$
(c) $\frac{R2}{4}$ (d) $\frac{R2}{8}$

129. If A and B are two events, such that

$P(A \cup B) = \frac{3}{4}, P(A \cap B) = \frac{1}{4}, P(Ac) = \frac{2}{3}$

where Ac stands for the complementary event of A, then P(B) is given by:

(a) $\frac{1}{3}$ (b) $\frac{2}{3}$

(c) $\frac{1}{9}$ (d) $\frac{2}{9}$

130. If $f(x) = \begin{cases} \frac{e^{e/} - e^{-e/x}}{e^{x} + e^{-1/x}}, & x \neq 0 \\ 1/ \quad k, & x = 0 \end{cases}$ then

(a) f is continuous at x, when k = 0

(b) f is not continuous at x = 0 for any real k.

(c) $\lim_{x \to 0} f(x)$ exist infinitely

None of these

131. $\int \cos\left(2\tan^{-1}\sqrt{\frac{1-x}{1+x}}\right)$

(a) $\frac{1}{8}(x2 - 1) + k$ (b) $\frac{1}{2}x2 + k$

(c) $\frac{1}{2}x + k$ (d) None of these

132. The equation of chord of the circle x2 + y2 = 8x bisected at the point (4, 3) is

(a) x = 3 (b) y = 3

(c) x = –3 (d) y = –3

133. x and y are positive number. Let g and a be G. M. and AM of these numbers. Also let G be G. M. of x + 1 and y + 1. If G and g are roots of equation x2 – 5x + 6 = 0, then

(a) $x = 2, y = \frac{3}{4}$ (b) $x = \frac{3}{4}, y = 12$

(c) $x = \frac{5}{2}, y = \frac{8}{5}$ (d) x = y = 2

134. The co-efficient of x^n in the expansion of $\frac{e^{7x} + ex}{e^{3x}}$ is

(a) $\frac{4n - 1 + (-2)n}{n!}$ (b) $\frac{4n - 1 + 2n}{n!}$

(c) $\frac{4n + (-2)n}{n!}$ (d) $\frac{4^{n-1} + (-2)^{n-1}}{n!}$

135. A pair of tangents are drawn from the origin to the circle x2 + y2+ 20 (x + y) + 20 = 0, then the equation of the pair of tangent are

(a) $x2 + y^2 - 5xy = 0$

(b) $x2 + y^2 + 2x + y = 0$ –

(c) $x2 + y\ xy + 7 = 0$

(d) $2x^2 + 2y^2 + 5xy = 0$

136. If the sum of a certain number of terms of the A.P. 25, 22, 19, ... is 116. then the last term is

(a) 0 (b) 2

(c) 4 (d) 6

137. If 1, a and P are in A. P. and 1, g and P are in G. P., then

(a) $1 + 2a + ^2 = 0$ (b) $1 + 2a^2 = 0$

(c) $^2 = 0$ (d) $^2 = 0$

138. If $y = \sin x + e^x$, then $\frac{d^2y}{dx^2}$ is equal to

(a) $\frac{\sin x - e^x}{(\cos x + e^x)^2}$ (b) $\frac{\sin x - e^x}{(\cos x + e^x)^3}$

(c) $\frac{\sin x + e^x}{(\cos x - e^x)^2}$ (d) $(-\sin x + e^x)^{-1}$

139. The foci of the hyperbola $4x2 - 9y2 - 1 = 0$ are

(a) $(\pm\sqrt{13}, 0)$ (b) $\left(\pm\frac{\sqrt{13}}{6}, 0\right)$

(c) $\left(0, \pm\frac{\sqrt{13}}{6}\right)$ (d) None of these

140. From the top of a cliff 50 m high, the angles of depression of the top and bottom of a tower are observed to be 30° and 45°. The height of tower is

(a) 50 m (b) $50\sqrt{3}$ m

(c) $50(\sqrt{3}-1)$ m (d) $50\left(1-\frac{\sqrt{3}}{3}\right)$ m

141. The coefficient of x^2 term in the binomial expansion of $\left(\frac{1}{3}x^{1/2}+x^{-1/4}\right)^{10}$ is :

(a) $\frac{70}{243}$ (b) $\frac{60}{423}$

(c) $\frac{50}{13}$ (d) none of these

142. The value of λ, for which the circle $x^2 + y^2 + 2\lambda x + 6y + 1 = 0$ intersects the circle $x^2 + y^2 + 4x + 2y = 0$ orthogonally, is

(a) 11/8 (b) –1

(c) –5/4 (d) 5/2

143. The value of $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{vmatrix}$ is

(a) $2abc$ (b) abc

(c) 1 (d) None of these

144. If $f(x)=(a-x)^{n}$, where $a > 0$ and $n \in N$, then $f'(x)$ is equal to :

(a) a (b) x

(c) x^n (d) a^n

145. Sum of n terms of the series $8 + 88 + 888 + \ldots$ equals

(a) $\frac{8}{81}[10n+1-9n-10]$

(b) $\frac{8}{81}[10n-9n-10]$

(c) $\frac{8}{81}[10n+1-9n+10]$

(d None of these

146. The modulus of the complex number z such that $|z + 3 - i| = 1$ and $\arg(z) = \pi$ is equal to

(a) 3 (b) 2

(c) 9 (d) 4

147. Bag P contains 6 red and 4 blue balls and bag Q contains 5 red and 6 blue balls. A ball is transferred from bag P to bag Q and then a ball is drawn from bag Q. What is the probability that the ball drawn is blue?

(a) $\frac{7}{15}$ (b) $\frac{8}{15}$

(c) $\frac{4}{19}$ (d) $\frac{8}{19}$

148. The number of 4-digit numbers that can be formed with the digits 1, 2, 3, 4 and 5 in which at least 2 digits are identical, is

(a) 50 (b) $45 - 5!$

(c) 5 (d) None of these

149. Consider the system of linear equations;

$x_1 + 2x_2 + x_3 = 3$

$2x_1 + 3x_2 + x_3 = 3$

$x_1 + 5x_2 + 2x_3 = 1$

The system has

(a) exactly 3 solutions

(b) a unique solution

(c) no solution

(d) infinite solutions

150. What is the value of y so that the line through (3, y) and (2, 7) is parallel to the line through (– 1, 4) and (0, 6)?

(a) 6 (b) 7

(c) 5 (d) 9

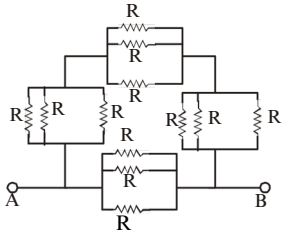
SOLUTIONS

PART - I : PHYSICS

1. (c) The charged sphere is a conductor. Therefore the field inside is zero and outside it is
2. (c) proportional to 1/r2. The direction of propagation of electromagnetic wave is perpendicular to the magnetic field B the variation of electric field E as well as to
3 (b .) Young's modulus of wire does not vary with dimention of wire. It is a constant quantity.

Redraw the given circuit,

4 (d .)



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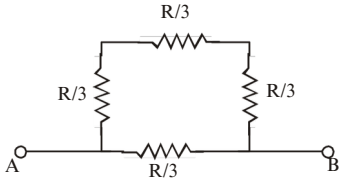


$R_{net\ between\ AB} = \frac{3R}{3} \times \frac{\frac{R}{3}}{3R + \frac{R}{3}} = \frac{R^2}{4R}$

where, R = 16W

Rnet = 4W

5. (c) According to Kepler's law of planetary motion, $T^2 \propto R^3$

$$\therefore \quad T_2 = T_1\left(\frac{R_2}{R_1}\right)^{3/2}$$

$$= 5\left(\frac{4R}{R}\right)^{3/2} = 40 \text{ hours}$$

6. (d) $= f\left(\frac{v + v_o}{v - v_s}\right)$

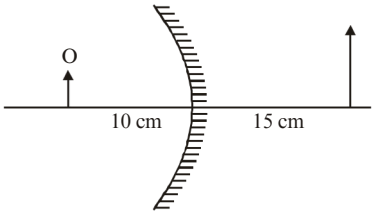
Here, f = 600 Hz, vo = 15 m/s

vs = 20 m/s, v = 340 m/s

$$f' = 600\left(\frac{340 + 15}{340 - 20}\right)$$

$$\therefore \quad f' = 600\left(\frac{355}{320}\right) \approx 666 \text{ Hz}$$

7. (c) Concave morror is used as a shaving mirror.



From question : v = 15 cm, u = – 10 cm

Radius of curvature, R = 2f = ?

Using mirror formula, $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$$\frac{1}{15} + \frac{1}{(-10)} = \frac{1}{f} \Rightarrow f = -30 \text{ cm}$$

Therefore radius of curvature,

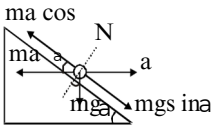
R = 2f = – 60 cm

8. (c) From free body diagram,

For block to remain stationary,

a

$mg \sin\alpha = ma \cos\alpha$



$\Rightarrow a = g\tan\alpha$

9. (a) On increasing the temperature, angle of contact decreases.

10.) Forward bias opposes the potential barrier and if the applied voltage is more than knee

(b voltage it cancels the potential barrier.

)

11. (c) ┣· §竈盐 ◆ ◆÷▯ ◆▯ §▯ § ◆ ◆瞟 ◆▯§ ▯§ ◆ ▯§▯瞟盐 瞟▯盐 §▯盐 §▯ 瞟§竈▯ 渺§瞟◆◆ ◆ ◆÷▯ § ◆◆盐▯ 瞟 ▯瞟§ ▯▯§▯▯§◆ § ▯§▯ ◆◆◆ ▯§盐 竈 ▯§犨◆ § ▯ ▯▯瞟 §瞟◆◆ ◆ ◆÷

12. (b) ▯ § ◆◆盐▯瞟ö ×▯盐 ◆ ◆§▯ §▯§ ▯▯§瞟◆◆ ◆ ◆÷ ▯Ū§ ◆◆◆ 瞟Y ▯§◆ §▯§ ▯§ ▯◆ ▯▯§§▯§ ▯▯▯ ▯竈 ▯瞟▯î§Ū§§Ū §©§ Ū §©§Ū §è§ Ū §©§ n + Ū §©§ n + Ū §©§ n +

瞧 = 弊 = Ć / n Þ q = ÐĀ ⊠Q Ť§©§n °₀§桌

龕⊠§⊠ ├⊠§⊠§÷ ⊠瞧瞧§ ⊠§ ⊠ö

= Ť Ű / Ť÷⊠瞧 = Ű / Ť÷瞧Ā⊠ = nŰ / Ť√Ð ö

22. (a) ⊠§ 弊⊠§瞧 ⊠ ⊠瞧§⊠⊠§⊠ §⊠⊠ ⊠ö

\§Ŷ ⊠÷ ⊠ ⊠§瞧 ⊠ ⊠§÷⊠瞧⊠ î

k§©§Ć§è§kn

⊠弊îş ⊠乙盐⊠ ÷泐§⊠ §⊠瞧÷⊠ ⊠⊠⊠§⊠瞧§⊠⊠⊠§泐⊠⊠⊠§⊠÷ ⊠瞧瞧§ÐŞ §÷⊠⊠÷⊠ ⊠§弊⊠ §⊠ ĆĀŞŰö

f © Ć / np √(k / m)

⊠ î §f§§©§ Ć / np √((kĆ èk_n) / m) öööö×⊠Ý

⊠⊠§⊠ §k Ć§⊠ §kn§⊠⊠§龕⊠⊠§⊠盐§⊠龕⊠瞧

⊠⊠ §⊠ ⊠⊠⊠ ⊠§⊠盐⊠瞧îş ⊠§⊠弊§ ⊠乙盐⊠ ÷泐§⊠瞧

⊠⊠⊠§ 泐

f Ñ © Ć / np √((ĖkĆèĖkn) / m)

§§§§§§§§§§ §Ñ = Ć / np √((Ė×kĆ+kn Ý) / m) æ Ć / ç np √((k_Ć+k_n) / m) ö / ÷ ø = n f

23. (b) Ű⊠ §⊠⊠÷⊠ 泐î

§©§ ⊠Ş = ⊠ = sŶ / ⊠ = Ŷ / r⊠rl⊠

瞧□§§§§§ ∨ μ ∨

24. (b) Ş龕 ⊠ 盐⊠§⊠§⊠龕⊠§⊠瞧÷⊠ ⊠⊠

Ş§©§Ş⊠ ún龕

Ű⊠瞧⊠§Ć§Íð

⊠ ⊠§ §©§ n§瞧 îş§©§ Ş Ā / Ð

\ §Ş Ā / Ð §©§Ş Ā ⊠ n ún龕Þ §©§⊠ Ć / Ð ú龕§嘴§×⊠Ý

Ū⊠瞧⊠§nŚÍð

⊠ ⊠§ §©§ Ģ§瞧 îş§©§ Ş Ā / Ð

\ § Ş Ā / Ð §©§Ş Ā ⊠ Ģ ún龕§ Ć / Ð §©§×⊠ ú龕ÝÐ§§嘴§×⊠⊠Ý

⊠龕§×⊠Ý§⊠ §×⊠⊠Ý

§ Ć / Ð §©§ æ Ć ö / ç Ð ø Þ \§ §§©§ÐÐ

25. (d) Ş ⊠ 盐 ⊠ § 瞧 ⊠⊠ §⊠ §⊠ ⊠ ÷ ⊠§⊠§ ⊠§ §⊠ ⊠ §Ť⊠ §ð⊠⊠龕§⊠ 瞧§⊠ ⊠瞧⊠ 泐§ ⊠⊠ ⊠⊠⊠§⊠§nÐ wnμ Ć / n Ð

26. (a) Ū ©§⊠乙盐⊠ ⊠⊠ §÷⊠⊠÷⊠ ⊠÷⊠

\ Ć / Ū = Ć / n + Ć / Ð + Ć / Ģ Þ Ū = Ćm

Ū ⊠ ⊠⊠§⊠§⊠⊠÷§÷⊠ ⊠÷⊠ ⊠§⊠ §瞧⊠ ⊠⊠瞧§÷⊠ ÷盐⊠ 弊⊠ §⊠§瞧⊠龕⊠ö

\§ 乙=Ū =×Ć′ĆĀ-Ģ Ý′ĆĀ=ĆĀmŪ

27. (a Ŷ Ć / n = s × Ė / Ć Ė Ý / Ā × Ģ Ā Ā Ý Ė - × Ð / Ā Ā Ý Ė §= Ā Ā Ý Ė - × Ð / Ā Ā Ý Ė

28.)

29. (c

⊠§⊠⊠§⊠ ⊠îş Ć= ⊠ / nl îş弊 ⊠⊠§ ⊠⊠瞧§ ⊠

盐 ⊠龕⊠ ⊠§ ⊠乙盐⊠ ÷泐§⊠ §⊠⊠§⊠⊠ö

⊠⊠ §⊠§⊠⊠§⊠瞧î

)

(a

\ §§l = ⊠ / n = ÐĐĀ / n′ĐĀĀ = ĆĆ / nĀ

¡·瞧 §⊠⊠ ⊠⊠§⊠ §⊠⊠§⊠ îş §©§n æ ö / ç n ø

¡·瞧 §⊠⊠ ⊠ ⊠§⊠§÷⊠瞧⊠§ ⊠î

Ð Ć §©§Ð Ć §©§ æ Ð ö / ç Ė l ø

弊 ⊠ ⊠îşl §©§⊠ ⊠ §⊠§÷⊠瞧⊠§ ⊠ ⊠

Ş瞧§ ⊠乙ö§⊠ §Ć瞧 §⊠⊠ ⊠⊠§⊠§⊠⊠§ ⊠§©§ ⊠乙ö

⊠§Ć瞧 §⊠⊠ ⊠ ⊠§⊠§÷⊠瞧⊠§ ⊠⊠

\ n ⊠ / nl = Ð Ė Ⅎ§Ñ ¬ Ðl / ⊠ = Ð / Ć Ć / ⊠

Dl §§ = ĖĆönĜ ÷龕

30. (d) Ь§© d ⊠ §⊠ §b¢§©§ ×nDÝl / ×dúnÝ = Ėb

盐瞧§ ⊠§ ⊠ ⊠⊠§弊⊠ §⊠÷⊠龕⊠瞧§⊠

31. (a) 盐§ ⊠龕⊠瞧ö Ş瞧§弊⊠§ ├⊠弊îşt§⊠瞧§

÷⊠⊠⊠§⊠ §⊠⊠盐⊠

龕⊠龕⊠ 盐龕ö

瞧⊠îşt§©§ nA / Ð 和¡·§盐 ⊠ 瞧

32. (a) ⊠§乙§⊠ §乙Ñ§⊠§ ⊠§§÷⊠⊠瞧§⊠§瞧 ⊠⊠瞧§⊠

⊠⊠⊠§x§⊠ §nx§⊠瞧⊠÷ ⊠⊠泐ö

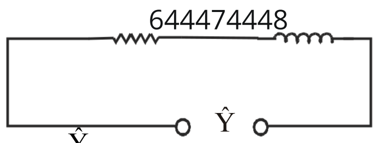
⊠⊠ îş乙§è§乙Ñ§©§ 嘴×⊠Ý

和盐 ⊠÷⊠§÷⊠⊠⊠§⊠瞧⊠ ⊠⊠瞧§⊠⊠

s = 乙 / Ėp^nx ⊠ §s = 乙Ñ / Ėp×nxŶ

[illegible]

33. (d) [illegible]



[illegible]

34. (b) [illegible]

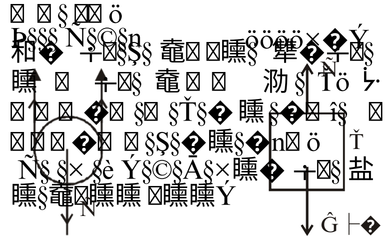
35. (b) [illegible]

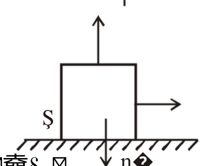
36. (b) [illegible]

37. (a) [illegible]

38. (a) [illegible]

39. (a) [illegible]





[illegible]

40. (a) [illegible]

PART - II : CHEMISTRY

41. (a)

42. (c)

43. (b)

44. (a)

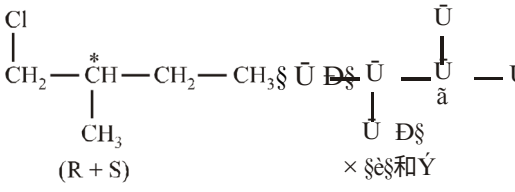
45. (d

46.)

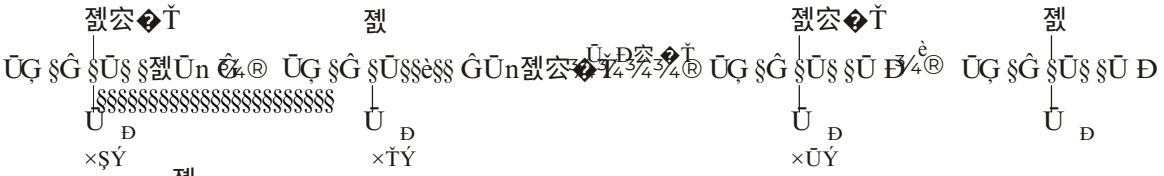
(d

47. (a)
)

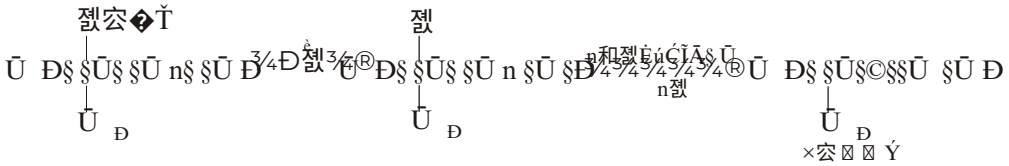
48. (c)



49. (b)



50. (b)



51. (b) [illegible]

52. (c) [illegible]

53. (c) [illegible]

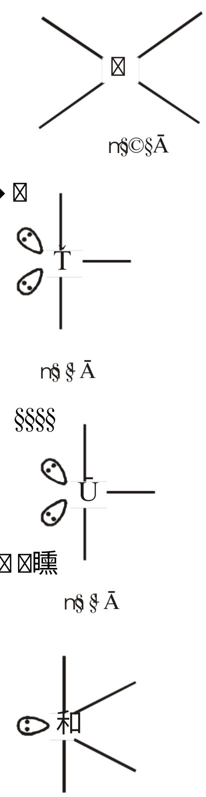
54. (d) [illegible]

55. (b) [illegible]

56. (a) [illegible]

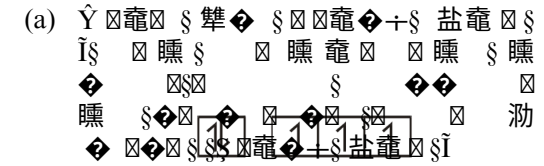
57. (c) [illegible]

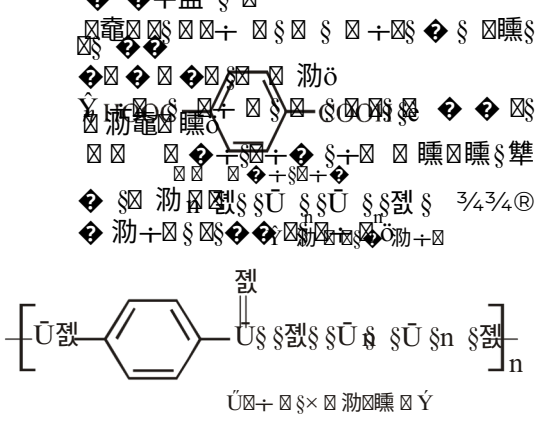
58. (a)

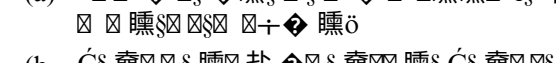


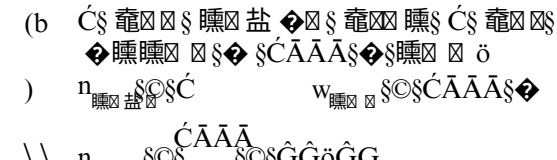
[illegible]

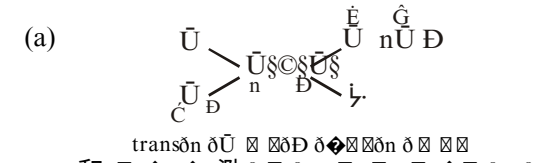
59. (a) [illegible]

60. (a) 

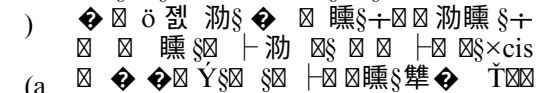
61. (a) 

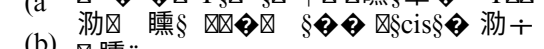
62. (a) 

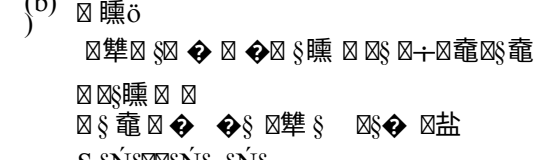
63. (b) 

64. (a) 

65. (a 

66.) 

(a 

67. (b) 

68. (a)

69. (a)

70. (d) 

71. (a) 

72. (d)

73. (b)

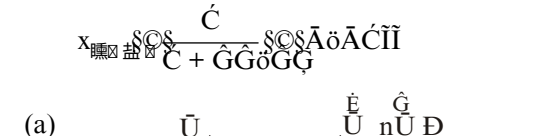
74. (a)

75. (a)

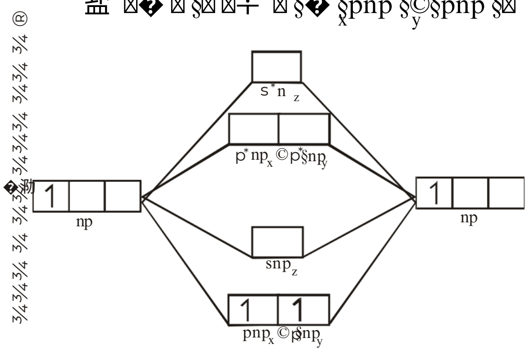
76. (c)

77. (a)

78. (c) 

79. (c) 

80. (a) pnp_x pnp_y



PART - III (A): ENGLISH PROFICIENCY

81. (a) Garrulous

82. (b) Tinsel (Noun/Adjective)

83. (a) Labyrinth (Noun)

84. (b)

85. (d)

86. (d)

87. (a)

88. (b)

89. (c)

90. (d)

91. (a)

92. (b) Dependent on

93. (d)

94. (b)

95. (a)

PART - III (B) : LOGICAL REASONING

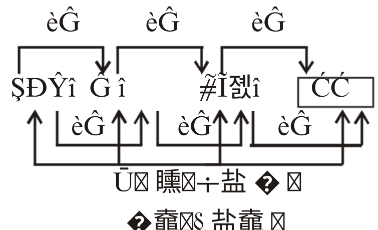
96. (b)

97. (c)

98. (d)

99. (c)

100. (d)

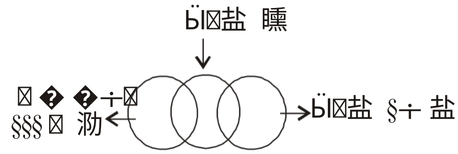


101. (a)

102. (a)

103. (b)

104. (b)



105. (d)

PART - IV : MATHEMATICS

106. (c)

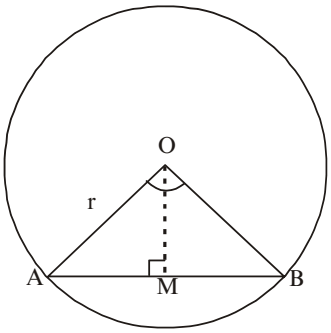
107. (c)

108. (b)

109. (c)

110.(c)

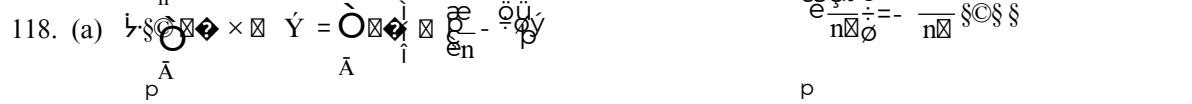
111. (c)

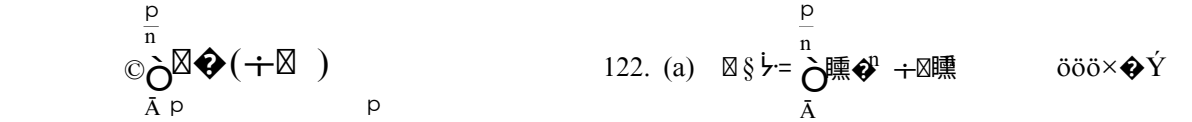


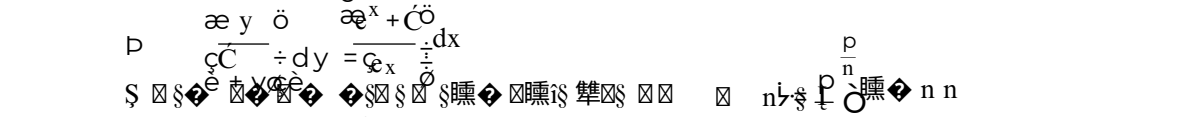
112. (c)

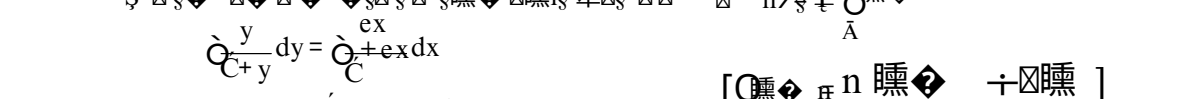
113. (c)

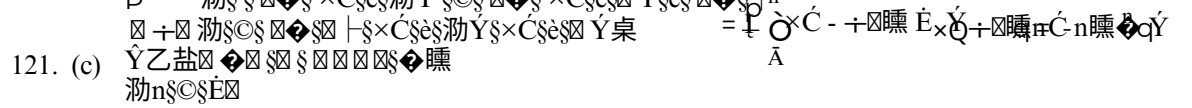
114. (c)











[illegible]

118. (a) [illegible]

119. (a)

120. (c) [illegible]

$$\frac{dy}{dx} = \frac{y}{1+y} + \frac{y}{(1+y)e^{x}}$$

$$\frac{dy}{dx} = \left(\frac{y}{1+y}\right)\left(\frac{e^{x}+1}{e^{x}}\right)$$

$$\left(\frac{1+y}{y}\right)dy = \left(\frac{e^{x}+1}{e^{x}}\right)dx$$

[illegible]

121. (c) [illegible]

122. (a) [illegible]

123. (d) $\begin{vmatrix} & & \\ & & \\ & & \end{vmatrix}$

124. (a) $= \frac{n}{n}$

125. (a)

126. (b)

127. (d)

128. (b)

129. (b)

130. (b) $= \frac{n}{n}$

131. (b)

132. (b)

133. (d)

134. (c)

135. (d) Ŷ乙盐□ ◆□§□§ □◆ §□§ □◆□ 瞶§ ◆瞶§ ◆◆ □§ 泐
SS§©§ n
□ 和§©§ n§è§泐n§è§nĀ§× §è§泐§Ý§è§nĀî§和
§©§ĆĀ§× §è§泐Ý§è§nĀ§©§Ā
\ 和和§©§ n
Þ nĀ§× n§è§泐n§è§nĀ§× §è§泐§Ý§è§nĀÝ
©§ĆĀn§× §è§泐§è§nÝn
Þ Ė n§è§Ė泐n§è§ĆĀ 泐
§©§Ā Þ n n§è§n 泐

136. (c) n§è§Ĝ 泐 §©§Ā
a§©§nĜî§d§©§nn§ §nĜ
§©§ Đö □§n§□§n □§
和盐竈§©§ĆĀ和盐竈© □n è×nðĆÝd桌
□o§□§□ 竈 瞶 n
ĆĆĢ□nĜĀè×n ĆÝ×ð ĐÝ桌

□§§ nĐn © n□ĜĀ Đn è Đ桌 © n□ĜĐ ð Đn桌 ĜĀ§竈
©§ Đnn§è§ĜĐn
Þ§Đnn§ §ĢĐ§è§nĐn©§Ā§§Þ§×n§ §ĮÝ§×Đn§ §nĴÝ§©§Ā

Þ§n§©§I§§□ §§n© nĴ îš§n漏 nĴ \§§n§©§Į
\§□雉î§Ť Đ Đ
Į§©§a§è§×Į§ §ĆÝd§©§nĜ§è§Ĩ§叹§× ĐÝ
©§nĜ§ §nĆ
\§□瞶 §□竈§©§Ė

137. (d) na§©§Ć§è§P§□ §gn§©§P
Þgn=na-ĆÞĆ-na+gn=Ā

138. (b) y§©§瞶◆ §x§©§ex

Þ $\frac{dy}{dx} = \div\square瞶 e^x$

Þ $\frac{dx}{dy} = \frac{Ć}{\div\square瞶 e^x}$ öööö×◆Ý

\ $\frac{d\ x}{dy^n} = \frac{Ć}{\times\div\square瞶 e^x Ý^n}\square\ 瞶◆+e^x$ 桌 dy

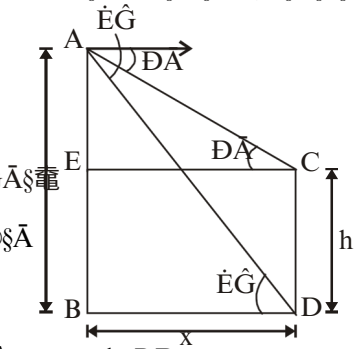
$= \frac{\times ex\ \ 瞶◆ Ý}{\times\div\square瞶 e^x Ý x} \cdot \frac{Ć}{\div\square瞶 e^x +}$

$= \frac{\times e^x\ \ 瞶◆\ xÝ瞶◆x}{\times\div\square瞶 x+ex Ý Đ} = \frac{e^x}{\times\div\square瞶 e^x Ý^Đ}$

139. (b) Ė n§ §Ĵ泐n§©§Ć

$\frac{n}{\ddot{o}} - \frac{泐^n}{Ć}$ ©§Ć

140. (d) □§□◆◆ §□§ □§□雉□§□§h§竈§□ §◆瞶□÷□
□雉□□§□雉□§□ §÷◆ §□§x§竈ö



\ CD = hî BD = x

ì· §Ş§ŤŰî§§□ ĖĜ = $\frac{A}{B}$ §§§§□§§§§ $\frac{ĜĀ}{x}$ =
x§©§ĜĀ B §§§§§§öööö§×◆Ý
ì· §Ş§ÝŪ D

□ ĐĀ = $\frac{A}{E} = \frac{AB - EB}{EC} = \frac{AB - DC}{BD}$

E ×Q EB = DCîEC = BDÝ

$\frac{Ć}{\sqrt{Đ}} = \frac{ĜĀ - h}{x}$ §§§□§ x=ĜĀ√Đ- h√Đ

□§§ĜĀ=ĜĀ√Đ-h √Đ □ □竈§×◆Ýî§ §©§ĜĀ桌
□§§h√Đ =ĜĀ√Đ-ĜĀ

□§§h= $\frac{ĜĀ√Đ - ĆÝ}{\sqrt{Đ}}$ = ĜĀ$\left(C - \frac{Ć}{\sqrt{Đ}}\right)$

\ h = ĜĀ$\left(C - \frac{\sqrt{Đ}}{Đ}\right)$

141. (a) □□□□§□竈§□§ □§◆◆ □§◆ □竈◆□§瞶□ ◆□瞶§◆瞶
◆◆ □§ 泐Í

r + Ć = $\frac{ĆĀ - \text{ìïX}^{Ć ú n ü}}{Ū\ r\ í\ ï\ î\ Đ\ ý\ ì}$ $^{ĆĀ_{\text{r}}}$ ö筏$^{Ć ú Ė}$唔

Þ

盐§§©§Ėî§鞣⊠§◆⊠

Ĝ= ĆĀ- Ůė Ć xĐ ox̄ Ć

= ĆĀ Ĵ ´Į ´Ĭ ö Ć xⁿ §= ĬĀ xⁿ
Ė´Đ´n´Ć ĐĢ nĖĐ
ĬĀ

盐瞟§÷⊠⊠ ◆÷◆⊠ §⊠§xn§©§
nĖĐ

142. (c) 鞣⊠§÷◆ ÷ ⊠瞟§xn§èŷn§è§nĝ Ćy§è§cĆ§©§Ā
⊠ §xn§è§yn§è§ng x§è§nfny§è§cn§©§Ā§§÷盐 瞟
⊠ ⊠◆⊠⊠ 泐§◆ §ng
⊠◆ ⊠§⊠乙盐⊠ ◆⊠ 瞟§⊠§ 鞣⊠§÷◆ ÷ ⊠瞟§⊠⊠
xn§è§yn§è§nlx è§Gy§è§Ć§©§Ā öööö§×◆Ý
n§è§泐n§èĖ §è§n泐§©§Ā öööö§×◆◆Ý
꼀§÷⊠龘⊠◆ ◆§×◆Ý§⊠ §×◆◆Ý§鞣◆ §⊠◆◆◆⊠§⊠乙盐⊠◆⊠î
鞣⊠§◆⊠
gĆ§©§lî§fĆ§©§Đî§cĆ§©§Ć§⊠ §gn§©§nî§fn§©§Ćî§cn§©§Ā
和⊠î§ ⊠龘§⊠ ⊠◆⊠⊠◆ 泐§÷⊠ ◆ ◆⊠ î§鞣⊠§ ⊠ĆĀ×ĆĀ-Ć Ý ù
Ėl+Ģ=Ć§Þ§Ėl=-Ĝ ê ĆĀ- Ć -nú úû

\ §§§§l= -Ĝ / Ė

143. (a) ⊠⊠§ ├⊠鞣îş瞟÷⊠⊠§ ◆ ⊠§ ⊠盐÷
⊠ab c桌= a ö × b Ý º x ´ c a ´ b Ý öc
Ū⊠ 瞟◆ ⊠⊠§+b b+c c+a桌
= ×a b Ý ö 絷 × c Ý ´ × c + a Ý 晤
= × b Ý ö 絷 × c Ý + × b ´ a Ý + × c ´ a Ý 晤
= × a + b Ý ö 絷 × c Ý + × b ´ a Ý + × c ´ a Ý 晤
× Q r = Ā Ý
= a ö × c ´ c Ý + a ö × b ´ a Ý + a ö × c ´ a Ý
+ b ö × c ´ c Ý + b ö × b á Ý b + ö × c ´ a Ý
= ⊠abc桌⊠aba桌+ ⊠aca桌 ⊠bbc桌
+⊠bba桌⊠bca桌
×Ť泐§⊠◆ ◆ ◆⊠§⊠§瞟÷⊠⊠§ ◆ ⊠§ ⊠盐÷ Ý

⊠a ab桌 Āi⊠ b a 桌 Ā§⊠ §⊠ b a a 桌 Ā
=⊠abc桌 + b⊠c a桌 = n⊠abc桌

144. (b) ⊠◆ ⊠§ ⊠× Ý= ×⊠ Ý Ć ú
\ ⊠× Ý =⊠⊠- 絷×⊠ Ý Ć ú 晤 Ć桌
§§§§§⊠⊠- ×⊠ Ý桌 Ć ú
§§§§§⊠ Ć桌 =

145. (a) 和盐龘§⊠§Ĵ§è§ĴĴ§è§ĴĴĴ§è§öööö§⊠龘瞟桌
Ĵ
©§ Ĵ §⊠×ĆĀ ĆÝ§è§×ĆĀĀ ĆÝ§è§×ĆĀĀĀ ĆÝ§è§öööö§n§⊠龘瞟桌
©§ Ĵ §⊠§×ĆĀ§è§ĆĀn§èĆĀĐ§è§ööööè§ĆĀ Ý§ §n桌
©§ Ĵ ê ĆĀ- Ć -nú úû ë
©§ Ĵ ⊠ĆĀnèĆ§ §Ĵn§ §ĆĀ桌

146. (a) ⊠§ §©§ §è§ ◆泐
\ §è§Đ§ §◆ §©§ × §è§ĐÝ §è§◆×泐§ §ĆÝ §©§Ć
Þ √×èĐÝ è×泐 Ć Ý ©§Ć öööö§×◆Ý
Q ⊠◆§ §©§§Þ§⊠ Ć 泐 §©§p
Þ 泐 §©§⊠§§©§Ā§§Þ 泐§©§Ā öööö§×◆◆Ý

⊠龘§⊠乙盐⊠◆⊠ 瞟§×◆Ý§⊠ §×◆◆Ýî 鞣⊠§ ◆⊠
§©§ Đî§泐§©§Ā§§©§ Đ
Þ §©§ Đ §©§Đ

147. (b) ⊠§ ŶĆî§Ŷn§⊠ §S§⊠§ ⊠§⊠⊠ 瞟§⊠◆⊠§⊠瞟
⊠ ⊠鞣瞟Í
ŶĆ§©§ ⊠§ ⊠ §◆ 瞟§ ⊠ 瞟⊠ ⊠§ ⊠龘§ ⊠◆§§⊠
⊠◆§ 豈
Ŷn§©§ 盐⊠§⊠ §◆瞟§ ⊠瞟⊠ ⊠§ ⊠龘§⊠◆§§⊠
⊠◆§ 豈
S§©§ ⊠§⊠ § ⊠鞣§ ⊠龘§⊠◆§豈§◆瞟§ 盐⊠

$$(\hat{Y}C) = \frac{G}{CA} = \frac{D}{C}$$ $$(\hat{Y}n) = \frac{\dot{E}}{CA} = \frac{n}{G}$$

$$\hat{Y} = \frac{G}{Cn}$$

149. (c)

$$\hat{Y} = \frac{\tilde{I}}{Cn}$$

150. (d)

$$\frac{D}{G} \cdot \frac{C}{n} + \frac{n}{G} \cdot \frac{\tilde{I}}{Cn} = \frac{I}{CG}$$

148. (a)

$$D = \begin{vmatrix} C & n & C \\ n & D & C \\ D & G & n \end{vmatrix} = A - DC = \begin{vmatrix} D & n & C \\ D & D & C \\ C & G & n \end{vmatrix} - A$$

$$\frac{\tilde{I}}{n} - \frac{\text{沏}}{D} = \times \text{沏} - \tilde{I}Y$$

$$\frac{G}{A} - \frac{\dot{E}}{CY}$$