BITSAT 2014 Question Paper with Answer Key

Birla Institute of Technology and Science Admission Test

BITSAT : SOLVED PAPER 2014

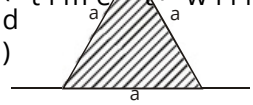
(memory based)

INSTRUCTIONS

- *This question paper contains total ☐☐ questions divided into four parts*
  Part ·ì· Physics Q No ☐☐ to
  Part ·ì·ì· Chemistry Q No ☐☐ to
  Part ·ì·ì·ì· Mathematics Q No ☐☐ to ☐☐
  Part ·ì·V 꾀序 졜nglish Proficiency Q No ☐☐ to ☐☐
  序 ogical Reasoning Q No ☐☐ ☐☐ to ☐☐
- *꾀ll questions are multiple choice questions with four options only one of them is*
- *졜ach correct answer awarded ☐ marks and –☐ for each incorrect answer*
- *u ration of paper ☐ ours*

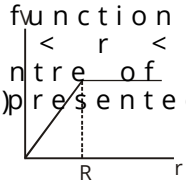
PART - I : PHYSICS

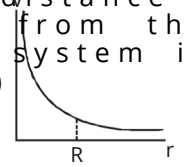
1. A rifle man, who together with his rifle has a mass of 100 kg, stands on a smooth surface and fires 10 shots horizontally. Each bullet has a mass 10 g and a muzzle velocity of 800 ms–1. The velocity which the rifle man attains after firing 10 shots is
   (a) 8 ms–1 (b) 0.8 ms–1
   (c) 0.08 ms–1 (d) – 0.8 ms–1
2. A train accelerating uniformly from rest attains a maximum speed of 40 ms–1 in 20 s. It travels at the speed for 20 s and is brought to rest with uniform retardation in further 40 s. What is the average velocity during the period of motion?
   (a) 80 m/s (b) 25 m/s
3. A projectile is fired with a velocity u making an angle q with the horizontal. What is the magnitude of change in velocity when it is at the highest point?
   (a) u sin q (b) u
   (c) u cos q (d) – u
4. For the equation F = Aavbdc, where F is the force, A is the area, v is the velocity and d is the density, the values of a, b and c are respectively
   (a) 1, 2, 1 (b) 2, 1, 1 (c) 1, 1, 2 (d) 1, 1, 1
5. A person with his hand in his pocket is skating on ice at the rate of 10 m/s and describes a circle of radius 50 m. What is his inclination (g = 10 m/sec2)
   (a) tan–1(½) (b) tan–1 (1/5)
   (c) tan–1 (3/5) (d) tan–1(1/10)
6. A small block of mass m is kept on a rough inclined surface of inclination q fixed in a elevator. The elevator goes up with a uniform velocity v and the block does not slide on the wedge. The work done by the force of friction on the block in time t will be
   (a) zero (b) mgvt sin2q
   (c) mgvt cos2q (d) $\frac{1}{2}$ mgvt sin 2q
7. A prism of mass m rests on a rough horizontal surface with coefficient of friction $\frac{1}{\sqrt{3}}$. A horizontal force F is applied on the prism as shown in the figure. If the coefficient of friction is sufficient so that the prism does not slide before it topples, then the minimum force required to topple the prism is –

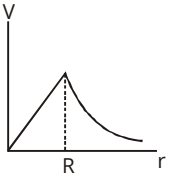


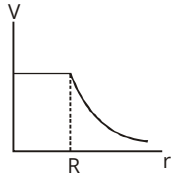
   (a) mg (b) $\frac{mg}{\sqrt{3}}$ (c) $\frac{mg}{2}$ (d) $\frac{mg}{4}$
8. A spherically symmetric gravitational particles has a mass density r = $\begin{cases} r_0 & \text{for } r \le R \\ 0 & \text{for } r > R \end{cases}$
   where r_0 is a constant. A test mass can u

circular motion under the influence of the gravitational field of particles. Its speed V as a function of distance r (0 < r < ¥) from the centre of the system is represented by

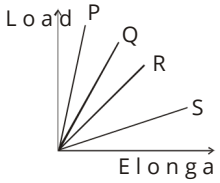
(a) 

(b) 

(c) 

(d) 

9. The load versus elongation graphs for four wires is shown. The thinnest wire is



(a) *P* (b) *Q* (c) *R* (d) *S*

10. The work done in blowing a soap bubble of surface tension 0.06 × Nm–1 from 2 cm radius to 5 cm radius is
(a)0.004168 J(b)0.003168 J
(c)0.003158 J(d)0.004568 J

11. The wavelength of radiation emitted by a body depends upon
(a)the nature of its surface
(b)the area of its surface
(c)the temperature of its surface
(d)All of the above

12. One mole of O2 gas having a volume equal to 22.4 Litres at 0°C and 1 atmospheric pressure in compressed isothermally so that its volume reduces to 11.2 litres. The work done is this process is-
(a) –1728 J (b) 1728 J
(c) –1672.5 J (d) –1572.5 J

13. In a thermodynamic process, the pressure of a fixed mass of a gas is changed in such a manner that the gas releases 20 J of heat and 8 J of work is done on the gas. If the initial internal energy of the gas was 30 J, then the final internal energy will be
(a) 18 J (b) 42 J
(c) 2 J (d) 58 J

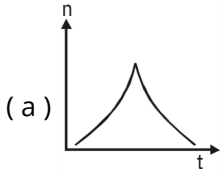
14. In the kinetic theory of gases, which statements is/are true ?
(i) The pressure of a gas is proportion
(ii)mean speed of the molecules.
(iii) The root mean square speed of the molecules is proportional to the pr The rate of diffusion is proportiona mean speed of the molecules.
(iv)The mean translational kinetic ene gas is proportional to its kelvin temp
(a) (ii) and (iii) only (b) (i) and (iv) only
(c) (i) and (iii) only (d) (iii) and (iv) only

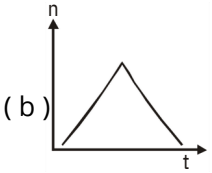
15. Two balloons are filled one with pure he gas and other with air respectively. If the pressure and temperature of these balloons are same then the number of molecules per unit volume is
(a) more in he gas filled balloon
(b) more in air filled balloon
(c) in the ratio 1 : 4
(d) same in both balloons

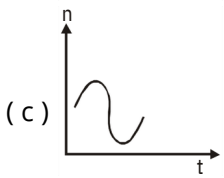
16. Two particles P and Q describe S.H.M. of same amplitude a, same frequency $\sqrt{2}$ f along the same straight line. The maximum distance between the
(a) zero (b) p/2 (c) p/6 (d) p/3

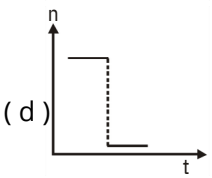
17. A tunnel is dug through the cen earth and a ball is released in it. It ex the centre. The time between the ball reaches the centre is
(a) 42 minutes (b) 1 day
(c) 1 hour (d) 84.6 minutes

18. A sound source, emitting sound of co frequency, moves with a constant spee crosses a stationary observer. The fre of sound heard by the observer is plot time (t). Which of the following graphs the correct variation ?

(a) 

(b) 

(c) 

(d) 

19. When a string is divided into three segments of lengths l_1, l_2 and l_3 the fundamental frequencies of these three segments are v_1, v_2 and v_3 respectively. The original fundamental frequency (v) of the string is

(a) $\sqrt{v} = \sqrt{v_1} + \sqrt{v_2} + \sqrt{v_3}$

(b) $v = v_1 + v_2 + v_3$

(c) $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2} + \frac{1}{v_3}$

(d) $\frac{1}{\sqrt{v}} = \frac{1}{\sqrt{v_1}} + \frac{1}{\sqrt{v_2}} + \frac{1}{\sqrt{v_3}}$

20. Two point dipoles $\vec{p}_1 = p\hat{k}$ and $\vec{p}_2 = \frac{p}{2}\hat{k}$ are located at (0, 0, 0) and (1m, 0, 2m) respectively. The resultant electric field due to the two dipoles at the point (1m, 0, 2m) is

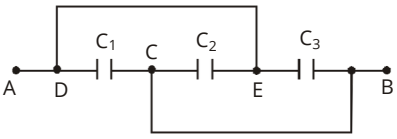
(a) $-\frac{3}{32\pi}\frac{p}{\varepsilon_0}\hat{k}$ (b) $-\frac{7}{32\pi}\frac{p}{\varepsilon_0}\hat{k}$

(c) $\frac{7p}{32\pi\varepsilon_0}\hat{k}$ (d) None of these

21. Electric field in the region is given by $\vec{E} = \frac{M}{x^2}\hat{i}$ then the correct expression for the potential in the region is [assume potential at infinity is zero]

(a) $\frac{M}{2x^2}$ (b) $\frac{M}{x^2}$ (c) $\frac{M}{3x^4}$ (d) $\frac{M}{x^2}$

22. Three capacitors $C_1 = 1\,\mu F$, $C_2 = 2\,\mu F$ and $C_3 = 3\,\mu F$ are connected as shown in figure, then the equivalent capacitance between points A and B is



(a) 3 μF (b) 4 μF (c) 5 μF (d) 6 μF

23. Two long coaxial and conducting cylinders of radius a and b are separated by a material of conductivity s and a constant potential difference V is maintained between them, then the current, per unit length of the cylinder, flowing from one cylinder to the other is

(a) $\frac{4\pi\sigma}{\ln(b/a)}V$ (b) $\frac{4\pi\sigma}{(b+a)}V$

(c) $\frac{2\pi\sigma}{\ln(b/a)}V$ (d) $\frac{2\pi\sigma}{(b+a)}V$

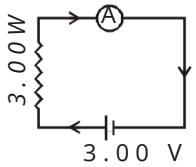
24. A wire X is of half the diameter and half the length of a wire Y of similar material. The ratio of resistance of X to that of Y is

(a) 8 : 1 (b) 4 : 1 (c) 2 : 1 (d) 1 : 1

25. A narrow beam of protons and deuterons, each having the same momentum, enters a region of uniform magnetic field directed perpendicular to their direction of motion. The ratio of the radii of the circular paths described by them is

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

26. If the circuit (figure), the current measured by the ammeter is a



(a) 0.7 A (b) 0.29 A (c) 9 A (d) 0.8 A

27. The susceptibility of a magnetism at 300 K is 1.2 × 10–5. The temperature at which the susceptibility increases to 1.8 × 10–5 is

(a) 150 K (b) 200 K (c) 250 K (d) 100 K

28. A coil of 10 turns and a resistance of 20W is connected in series with a B.G. of resistance 30W. The coil is placed with its plane perpendicular to the direction of a uniform magnetic field of induction 10^{-2} T. If it is flipped through an angle of 60° about an axis in its plane, find the charge that flows through the coil. (Area of coil = 2×10^{-3} m²)

(a) 2×10^{-5} C (b) 3.2×10^{-5} C (c) 1×10^{-5} C (d) 5.5×10^{-5} C

29. Voltage V and current i in AC circuit are given by $V = 50\sin\omega t$ volt and $i = 50\sin(\omega t + 60°)$ mA. The power dissipated in the circuit is

(a) 2.5 W (b) 1.25 W (c) 0 W (d) zero

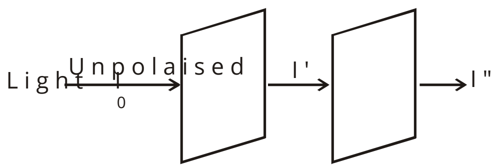
30. Resolving power of the telescope will the diameter of the objective is

(a) larger
(b) smaller
(c) it does not depends on diameter
(d) None of these

31. The magnifying power of a telescope is 9. When it is adjusted for parallel rays, the distance between the objective and the eye piece is found to be 20 cm. The focal length of lenses are
(a) 18 cm, 2 cm (b) 11 cm, 9 cm (c) 10 cm, 10 cm (d) 15 cm, 5 cm

32. The angular size of the central maxima due to a single slit diffraction is (a ® slit width)
(a) $\frac{\lambda}{a}$ (b) $\frac{2\lambda}{a}$ (c) $\frac{3\lambda}{2a}$ (d) $\frac{\lambda}{2a}$

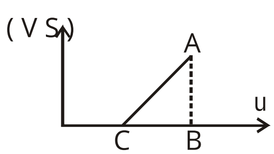
33. Find the final intensity of light (I"), if the angle between the axes of two polaroids is 60°.



(a) $\frac{3I_0}{2}$ (b) $\frac{I_0}{2}$ (c) $\frac{I_0}{4}$ (d) $\frac{I_0}{8}$

34. The threshold wavelength of the tungsten is 2300 Å. If ultraviolet light of wavelength 1800 Å is incident on it, then the maximum kinetic energy of photoelectrons would be about –
(a) 1.49 eV (b) 2.3 eV (c) 3.0 eV (d) 5.0 eV

35. Graph betwen stopping potential for most energetic emitted photoelectrons (V_S) with frequency (u) of incident radiation on metal is given below. Value of AB/BC, in graph is [where h = plank's constant, e = electronic cha r ge]



(a) h (b) e (c) h/e (d) e/h

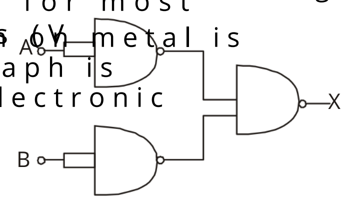
36. If hydrogen atom, an electron jumps from bigger orbit to smaller orbit so that radius of smaller orbit is one-fourth of radius of bigger orbit. If speed of electron in bigger orbit was v, then speed in smaller orbit is
(a) $\frac{v}{4}$ (b) $\frac{v}{2}$ (c) v (d) 2v

37. A nucleus of uranium decays at rest into nuclei of thorium and helium. Then :
(a) the helium nucleus has less momentum than the thorium nucleus
(b) the helium nucleus has more momen
than the thorium nucleus
(c) the helium nucleus has less kinetic
than the thorium nucleus
(d) the helium nucleus has more kineti
than the thorium nucleus

38. Let binding energy per nucleon of nu denoted by E_{bn} and radius of nucleus is denoted as r. If mass number of nuclei A, B an respectively then
(a) $r_A < r_B$, $E_{bnA} < E_{bnB}$
(b) $r_A > r_B$, $E_{bnA} > E_{bnB}$
(c) $r_A = \frac{4}{5} r_B$, $E_{bnA} < E_{bnB}$
(d) $r_A < r_B$, $E_{bnA} > E_{bnB}$

39. For a CE transistor amplifier, the aud voltage across the collector resistanc is 2.0 V. Suppose the current amplific of the transistor is 100. What should R_B in series with V_{BB} supply of 2.0V if base current has to be 10 times the si
(a) 14 kW (b) 18 kW (c) 10 kW (d) 5 kW

40. The combination of gates shown below



(a) OR gate (b) NOT gate
(c) XOR gate (d) NAND gate

PART - II : CHEMISTRY

41. The formation of CO and CO_2 illustrates the law of
(a) reciprocal proportion
(b) conservation of mass
(c) multiple proportion
(d) constant composition

42. The wave number of the limiting line i series of hydrogen is 109678 cm–1. Th number of the limiting line in Balmer would be :
(a) 54839 cm–1 (b) 109678 cm–1
(c) 219356 cm–1 (d) 438712 cm–1

43. The valency shell of element A contains 3 electrons while the valency shell of element B contains 6 electrons. If A combines with B, the probable formula of the compound formed will be

(a) AB_2 (b) A_2B

(c) A_2B_3 (d) A_3B_2

44. The enthalpy of sublimation of aluminium is 330 kJ/mol. Its Ist, IInd and IIIrd ionization enthalpies are 580, 1820 and 2740 kJ respectively. How much heat has too be supplied (in kJ) to convert 13.5 g of aluminium into Al^{3+} ions and electrons at 298 k

(a) 5470 (b) 2735

(c) 4105 (d) 3765

45. Which one of the following pairs is isostructural (i.e., having the same shape and hybridization)?

(a) $[BCl_3$ and $BrCl_3]$

(b) $[NH_3$ and $NO_3^-]$

(c) $[NF_3$ and $BF_3]$

(d) $[BF_4^-$ and $NH_4^+]$

46. N_2 and O_2 are converted into mono anions N_2^- and O_2^- respectively. Which of the following statements is wrong ?

(a) In N_2^-, the N—N bond weakens

(b) In O_2^-, the O—O bond order increases

(c) O_2^-; bond length decreases

(d) In N_2^-, O_2^- becomes diamagnetic

47. If the enthalpy of vaporization of water is 186.5 $kJmol^{-1}$, the entropy if its vaporization will be :

(a) 0.5 $kJK^{-1}mol^{-1}$ (b) 1.0 $kJK^{-1}mol^{-1}$

(c) 1.5 $kJK^{-1}mol^{-1}$ (d) 2.0 $kJK^{-1}mol^{-1}$

48. The heats of neutralisation of CH_3COOH, HCOOH, HCN and H_2S are –13.2, –13.4, –2.9 and –3.8 kCal per equivalent respectively. Arrange the acids in increasing order of acidic strength.

(a) HCOOH > CH_3COOH > H_2S > HCN

(b) CH_3COOH > HCOOH > H_2S > HCN

(c) H_2S > HCOOH > CH_3COOH > HCN

(d) HCOOH > H_2S > CH_3COOH > HCN

49. K_c for the the reaction, $[Ag(CN)_2]^- \rightleftharpoons Ag^+ + 2CN^-$ the equillibrium constant at 25°C is 4.0×10^{-19}, then the silver ion concentration in a solution which was originally 0.1 molar in KCN and 0.03 molar in $AgNO_3$:

(a) 7.5×10^{18} (b) 7.5×10^{-19}

(c) 7.5×10^{19} (d) 7.5×10^{-18}

50. The ratio of oxidation states of Cl in potassium chloride to that in potassium chlorate is

(a) $\frac{+1}{5}$ (b) $\frac{-1}{5}$

(c) $\frac{-2}{5}$ (d) $\frac{+3}{5}$

51. Which of the following among alkali metals is most reactive ?

(a) Na (b) K

(c) Rb (d) Cs

52. Which of the following compounds has wrong IUPAC name?

(a) $CH_3 - CH_2 - CH_2 - COO - CH_2CH_3$ ® Ethyl butanoate

(b) $CH_3 - CH(CH_3) - CH_2 - CHO$ ® 3-Methyl-butanal

(c) $CH_3 - CH(OH) - CH(CH_3) - CH_3$ ® 2-Methyl-3-butanol

(d) $CH_3 - CH(CH_3) - C(=O) - CH_2 - CH_3$ ® 2-Methyl-3-pentanone

53. The compound which gives the most stable carbonium ion on dehydration is

(a) $CH_3CH(CH_3)CH_2OH$

(b) $(CH_3)_3COH$

(c) $CH_2 = CHCH_2CH_2OH$

(d) $CH_3CHOHCH_2CH_3$

54. The correct order of increasing C - O bond length of CO, CO_3^{2-}, CO_2 is:

(a) $CO < CO_2 < CO_3^{2-}$

(b) $CO_2 < CO_3^{2-} < CO$

(c) $CO < CO_3^{2-} < CO_2$

(d) $CO_3^{2-} < CO_2 < CO$

55. An organic compound A (C_4H_9Cl) on reaction with Na/diethyl ether gives a hydrocarbon which on monochlorination gives only one chloro derivative, then A is
(a) tert-butyl chloride
(b) sec-butyl chloride
(c) isobutyl chloride
(d) n-butyl chloride

56. When rain is accompanied by a thunderstorm, the collected rain water will have a pH value:
(a) Slightly lower than that of rain without thunderstorm.
(b) Slightly higher than that when the thunderstorm is not there.
(c) Uninfluenced by occurrence of thunderstorm.
(d) Which depends upon the amount of dust in air.

57. An elemental crystal has a density of 8570 kg/m3. The packing efficiency is 0.68. The closest distance of approach between neighbouring atoms of the atom, is 2.86 Å. What is the mass of one atom approximately?
(a) 93 amu (b) 39 amu
(c) 63 amu (d) 29 amu

58. Identify the correct order of solubility of Na2S, CuS and ZnS in aqueous medium
(a) CuS > ZnS > Na2S
(b) ZnS > Na2S > CuS
(c) Na2S > CuS > ZnS
(d) Na2S > ZnS > CuS

59. In the cell reaction
$Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$
$E^0_{cell} = 0.46$ V. By doubling the concentration of Cu^{2+}, E^0_{cell} is
(a) doubled
(b) halved
(c) increases but less than double
(d) decreases by a small fraction

60. Cu^+ is unstable in solution and undergoes simultaneous oxidation and reduction according to the reaction
$2Cu^+(aq) \rightarrow Cu^{2+}(aq) + Cu(s)$
choose correct E° for above reaction if
$E^\circ_{Cu^{2+}} = 0.34$ V and $E^\circ_{Cu^{2+}} = 0.15$ V
(a) −0.38 V (b) +0.49 V
(c) +0.19 V (d) +0.83 V

61. The reduction of peroxydisulphate ion is expressed by $S_2O_8^{2-} + 3I^- \rightarrow 2SO_4^{2-} + I_3^-$. If rate of disappearance of I^- is $9/2 \times 10^{-4}$ mol Lit^{-1} s^{-1}, what is the rate of formation of SO_4^{2-} during same time?
(a) 3×10^{-3} mol Lit^{-1} s^{-1}
(b) 2×10^{-3} mol Lit^{-1} s^{-1}
(c) 1×10^{-3} mol Lit^{-1} s^{-1}
(d) 4×10^{-3} mol Lit^{-1} s^{-1}

62. A gaseous reaction $X_2(g) \rightarrow 2Y(g) + \frac{1}{2}Z(g)$. There is increase in pressure from 100 mm in 5 minutes. The rate of disappearance of X_2
(a) 8 mm min^{-1} (b) 2 mm min^{-1}
(c) 16 mm min^{-1} (d) 4 mm min^{-1}

63. Two substances R and S decompose independently, both following first order. The rate constant of R is twice that of S. In an experiment, the solution initially contains millimoles of R and 0.25 of S. The moles of R and S will be equal just at the end of
(a) twice the half life of R
(b) twice the half life of S
(c) the half life of S
(d) the half life of R

64. The isoelectric-point of a colloidially material is the pH value at which
(a) the dispersed phase migrate in an electric field.
(b) the dispersed phase does not migrate in electric field.
(c) the dispersed phase has pH equal to
(d) the dispersed phase has pH equal to

65. Which of the following halogens exhibits one oxidation state in its compounds?
(a) Bromine (b) Chlorine
(c) Fluorine (d) Iodine

66. Starch can be used as an indicator for detection of traces of
(a) glucose in aqueous solution
(b) proteins in blood
(c) iodine in aqueous solution
(d) urea in blood

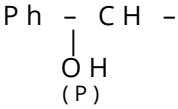
67. Which one of the following arrangements represents the correct order of electron gain enthalpy (with negative sign) of the given atomic species?
(a) S < O < Cl < F
(b) F < Cl < O < S
(c) O < S < F < Cl
(d) Cl < F < O < S

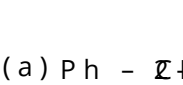
68. Which form coloured salts :
(a) Non-metals
(b) Metals
(c) p-block elements
(d) Transitional elements

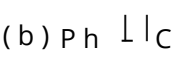
69. The correct order of magnetic moments (spin only values in B.M.) is:
(a) $[Fe(CN)_6]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$
(b) $[MnCl_4]^{2-} > [Fe(CN)_6]^{4-} > [CoCl_4]^{2-}$
(c) $[MnCl_4]^{2-} > [CoCl_4]^{2-} > [Fe(CN)_6]^{4-}$
(d) $[Fe(CN)_6]^{4-} > [CoCl_4]^{2-} > [MnCl_4]^{2-}$
(Atomic nos. : Mn = 25, Fe = 26, Co = 27)

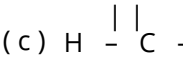
70. The number of double bonds in

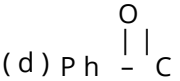
(a) 0 (b) 1 (c) 2 (d) 3

71. 
(P)
P and Q are isomers. Identify Q.

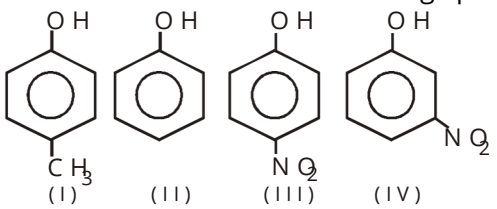
(a) 

(b) 

(c) 

(d) 

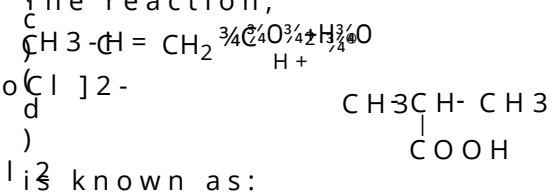
72. Consider the following phenols :



The decreasing order of acidity of the phenols is
(a) III > IV > II > I
(b) IV > III > II > I
(c) II > IV > III > I
(d) I > II > III > IV

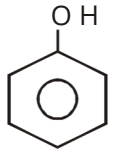
73. The ionization constant of phenol is h that of ethanol because :
(a) Phenoxide ion is bulkier than ethox
(b) Phenoxide ion is stronger base than ethoxide
(c) Phenoxide ion is stabilized through delocalization
(d) Phenoxide ion is less stable than et

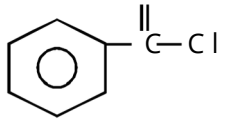
74. The reaction,

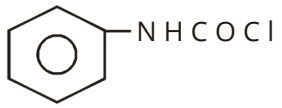


is known as:
(a) Wurtz reaction
(b) Kharasch reaction
(c) Clemmensen reduction
(d) Kolbe's reaction

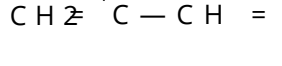
75. Aniline reacts with phosgene and KOH

(a) 

(b) 

(c) 

(d) 

76. Which one of the following monomers polymer neoprene on polymerization ?
(a) $CF_2 = CF_2$
(b) $CH \equiv CCl_2$
(c) 
(d) 

77. Which of the following can possibly be used as analgesic without causing addiction and modification? (a) morphine (b) N-acetyl-para-aminophenol (c) codeine (d) None of these

78. Which among the following is not a bactericidal? (a) Penicillin (b) Oxytocin (c) Ofloxacin (d) Tetracycline

79. Which of the following ions can be separated by aq. NH4OH in presence of NH4Cl? (a) Al3+ and Fe3+ (b) Cr3+ and Al3+ (c) Cu2+ and Al3+ (d) None of these

80. 3.92 g of ferrous ammonium sulphate reacts completely with 50 ml 0.1 M KMnO4 solution. The percentage purity of the sample is- (a) 50 (b) 78.4 (c) 80 (d) 39.2

PART - III : MATHEMATICS

81. The set $(A \cup (B \setminus A)) \cap [B \setminus (A \cap B)]$ is equal to
(a) $[A \setminus (A \cap B)] \cup [B \setminus (A \cap B)]$
(b) $(A \cup B) \setminus (A \cap B)$
(c) $A \setminus (A \cap B)$
(d) $\overline{A \cap B} \setminus A \cup B$

82. The domain of the function $f(x) = \log_{1/2}\left(\log_2\left(1 - \frac{1}{x}\right)\right)$ is
(a) $(0, 1)$ (b) $(0, 1]$ (c) $[1, \infty)$ (d) $(1, \infty)$

83. $\cos\left(\frac{\pi}{6} + \theta\right) - \sin\left(\frac{\pi}{6} - \theta\right) =$
(a) $\frac{1}{2}\cos\theta$ (b) 0
(c) $-\frac{1}{2}\cos\theta$ (d) $\frac{1}{2}$

84. The solution of $(2\cos x - 1)(3 + 2\cos x) = 0$ in the interval $0 \le x \le 2\pi$ is
(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{3}, \frac{5\pi}{3}$
(c) $\frac{\pi}{3}, \frac{5\pi}{3}, \cos^{-1}\left(-\frac{3}{2}\right)$ (d) None of these

85. $2^{3n} - 7n - 1$ is divisible by
(a) 64 (b) 36
(c) 49 (d) 25

86. The greatest positive integer, which $n(n+1)(n+2)(n+3)$ for all n is
(a) 2 (b) 6 (c) 24 (d) 120

87. If $z = x + iy$, $z^{1/3} = a - ib$, where k is equal to
(a) 1 (b) 2 (c) 3 (d) 4

88. $i^{57 + \frac{1}{2}}$ when simplified has the value
(a) 0 (b) $2i$ (c) $-2i$ (d) 2

89. The complex number $z = x + iy$ which satisfies the equation $\left|\frac{z-3i}{z+3i}\right| = 1$, lies on
(a) the X-axis
(b) the straight line $y = 3$
(c) a circle passing through origin
(d) None of the above

90. The number of all three elements subset $\{a_1, a_2, a_3 \ldots a_n\}$ which contain a_3
(a) n_{C_3} (b) $^{n-1}C_3$
(c) $^{n-1}C_2$ (d) None of these

91. In how many ways can a committee of out 6 men and 4 women containing at woman?
(a) 246 (b) 222
(c) 186 (d) None of these

92. The coefficient of x^4 in the expansion $(1 + x + x^2 + x^3)^{11}$, is
(a) 440 (b) 770 (c) 990 (d) 1001

93. If $T_0, T_1, T_2 \ldots . T_n$ represent the terms expansion of $(x + a)^n$, then $(T_0 - T_2 + T_4 - \ldots\ldots) + (T_1 - T_3 + T_5 - \ldots\ldots)^2 =$
(a) $(x^2 + a^2)$ (b) $(x^2 + a^2)^n$
(c) $(x^2 + a^2)^{n/2}$ (d) $(x^2 + a^2)^{1/n}$

94. If the $(2p)$th term of a H.P. is q and th is p, then the $2(p + q)$th term is-
(a) $\frac{pq}{2(p+q)}$ (b) $\frac{2pq}{p+q}$
(c) $\frac{pq}{p+q}$ (d) $\frac{p+q}{pq}$

95. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A. P. then $\left(\frac{1}{a}+\frac{1}{b}-\frac{1}{c}\right)\left(\frac{1}{b}+\frac{1}{c}-\frac{1}{a}\right)$ is equal to

(a) $\frac{4}{ac}-\frac{3}{b^2}$ (b) $\frac{b^2-ac}{a^2b^2c^2}$

(c) $\frac{4}{ac}-\frac{1}{b^2}$ (d) None of these

96. The product of n positive numbers is unity, then their sum is :

(a) a positive integer (b) divisible by n

(c) equal to $n+\frac{1}{n}$ (d) never less than n

97. If P_1 and P_2 be the length of perpendiculars from the origin upon the straight lines $x \sec\theta + y \operatorname{cosec}\theta = a$ and $x \cos\theta - y \sin\theta = a \cos 2\theta$ respectively, then the value of $4P_2^2 + P_1^2$ is

(a) a^2 (b) $2a^2$ (c) $a^2/2$ (d) $3a^2$

98. The angle of intersection of the two circles $x^2 + y^2 - 2x - 2y = 0$ and $x^2 + y^2 = 4$ is

(a) 30° (b) 60° (c) 90° (d) 45°

99. An arch of a bridge is semi-elliptical with major axis horizontal. If the length the base is 9 meter and the highest part of the bridge is 3 meter from the horizontal; the best approximation of the height of the arch. 2 meter from the centre of the base is

(a) 11/4 m (b) 3 m (c) 7/2 m (d) 2 m

100. $\lim_{x \to 0} (\operatorname{cosec} x)^{1/\log x}$ is equal to :

(a) 0 (b) 1

(c) $\frac{1}{e}$ (d) None of these

101. If M. D. is 12, the value of S.D. will be

(a) 15 (b) 12

(c) 24 (d) None of these

102. A bag contains 5 brown and 4 white socks. A man pulls out 2 socks. Find the probability that they are of the same colour.

(a) $\frac{4}{9}$ (b) $\frac{2}{9}$

(c) $\frac{5}{9}$ (d) $\frac{7}{9}$

103. Let R = {(3, 3), (6, 6), (9, 9), (12, 12), (3, 9), (3, 12), (3, 6)} be a relation on A = {3, 6, 9, 12}. Then, the relation is

(a) an equivalence relation
(b) reflexive and symmetric
(c) reflexive and transitive
(d) only reflexive

104. Let $f : R \to R$ be a function defined by $f(x) = \frac{x-m}{x-n}$, where $m \neq n$, then

(a) f is one one (b) f is one-one into
(c) f is many-one (d) f is many-one into

105. Find the value of $\tan\left[\frac{1}{2}\tan^{-1}\left(\frac{2\tan\theta}{5-4\sec^2\theta}\right)\right]$

(a) $-1/3$ (b) $-7/17$ (c) $-1/2$ (d) $-1/4$

106. If x is a square root of identity matrix of order 2 then

(a) $1 + a^2 + bg = 0$ (b) $1 + a^2 - bg = 0$
(c) $1 + a^2 + bg = 0$ (d) $1 + a^2 + bg = 1$

107. The value of l for which the lines $3x - 4y = 13, 8x - 11y = 33$ and $2x - 3y + l = 0$ are concurrent is

(a) -1 (b) -7 (c) $\frac{1}{7}$ (d) 9

108. Let $f(x) = \begin{cases} \frac{1}{x}\sin(x-1) & \text{if } x \neq 1 \\ 0 & \text{if } x = 1 \end{cases}$

Then which one of the following is true

(a) f is differentiable at $x = 1$
(b) f is not differentiable at $x = 0$ and $x = 1$
(c) f is differentiable at $x = 0$ but not at $x = 1$
(d) f is neither differentiable at $x = 0$ nor at $x = 1$

109. The interval in which the function $f(x) = x^3 - 6x^2 + 9x + 15$ increases is less than or equal to

(a) $(-\infty, 1]$ (b) $[1, 3]$
(c) $[3, \infty)$ (d) None of these

110. The cost of running a train is proportional to the square of the speed generated in miles per hour and costs ` 48 per hour at 16 miles per hour. The most economical speed if the fixed charges i.e. salaries etc. amount to ` 300 per hour is

(a) 10 (b) 20 (c) 30 (d) 40

111. Evaluate: $\int \frac{1}{1+3\sin^2 x+8\cos^2 x}\,dx$

(a) $\frac{1}{6}\tan^{-1}(\frac{1}{2}\tan x)+C$
(b) $6\tan^{-1}(2\tan x)+C$
(c) $\frac{1}{6}\tan^{-1}\left(\frac{2\tan x}{3}\right)+C$
(d) None of these

112. $\int_0^{10}(10-x)10^x dx$ is equal to

(a) 10 (b) 5 (c) 2 (d) $\frac{1}{2}$

113. The area bounded by the x-axis, the curve $y=f(x)$ and the lines $x=1, x=b$ is equal to $\sqrt{b^2+1}-\sqrt{2}$ for all $b>1$, then $f(x)$ is

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

114. Solution of differential equation $x^2\left(1+\left(\frac{x}{y}\right)^{-1}\right)\frac{dy}{dx}+\frac{\left(\frac{x}{y}\right)^{-2}}{2!}\frac{d}{x}+\frac{\left(\frac{x}{y}\right)^{-3}}{3!}\frac{d}{x}+\ldots$ is

(a) $y^2=x^2(\ln x^2-1)+C$ (b) $y=x^2(\ln x^2-1)+C$
(c) $y^2=x(\ln x-1)+C$ (d) $y=xe^{2x^2}+C$

115. If the middle points of sides BC, CA & AB of triangle ABC are respectively D, E, F then position vector of centre of triangle DEF when position vector of A, B, C are respectively $i^+j^,j^+k^,k^+i^$ is

(a) $\frac{1}{3}(i^+j^+k^)$ (b) $2(i^+j^+k^)$
(c) $\frac{2}{3}(i^+j^+k^)$ (d) $\frac{2}{3}(i^+j^+k^)$

116. The angle between any two diagonal of a cube is

(a) 45° (b) 60° (c) 30° (d) $\tan^{-1}(2\sqrt{2})$

117. Find the angle between the line $\frac{x+1}{2}=\frac{y-2}{3}=\frac{z-3}{6}$ and the plane $10x+2y-11z=3$.

(a) $\sin^{-1}\left(\frac{8}{21}\right)$ (b) $\sin^{-1}\left(\frac{5}{21}\right)$
(c) $\sin^{-1}\left(\frac{7}{12}\right)$ (d) $\sin^{-1}\left(\frac{1}{12}\right)$

118. The equation of the right bisector pla segment joining (2, 3, 4) and (6, 7, 8)
(a) $x+y+z+15=0$ (b) $x+y+z-15=0$
(c) $x-y+z-15=0$ (d) None of these

119. A bag contains $n+1$ coins. It is known of these coins shows heads on both si whereas the other coins are fair. One selected at random and tossed. If the that toss results in heads is $\frac{7}{12}$ then the value of n is.

(a) $\frac{3}{5}$ (b) 4
(c) $\frac{1}{2}$ (d) None of these

120. A coin is tossed 7 times. Each time a n head. Find the probability that he win on more occasions.

(a) $\frac{2}{3}$ (b) $\frac{1}{2}$ (c) $\frac{3}{4}$ (d) $\frac{1}{3}$

121. Consider $\frac{x}{2}+\frac{y}{4}\le 1$ and $\frac{x}{3}+\frac{y}{2}\le 1$, $x, y \ge 0$. Then number of possible solutions are :

(a) Zero (b) Unique
(c) Infinite (d) None of these

122. If $A=\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}$ then A^{100}

(a) $\begin{bmatrix}1 & 100\\ 0 & 1\end{bmatrix}$ (b) $\begin{bmatrix}1 & 299\\ 0 & 1\end{bmatrix}A$
(c) $\begin{bmatrix}2 & 101\\ 0 & 1\end{bmatrix}A$ (d) None of the above

123. If $\begin{vmatrix} p & q-y & r-z\\ p-x & q & r-z\\ p-x & q-y & r\end{vmatrix}=0$, then the value of $\begin{vmatrix} p & q & r\\ x & y & z\end{vmatrix}$ is

(a) 0 (b) 1 (c) 2 (d) 4pqr

124. Through the vertex O of a parabola y^2 OP and OQ are drawn at right angles another. The locus of the middle point
(a) $y^2=2x+8$ (b) $y^2=x+8$
(c) $y^2=2x-8$ (d) $y^2=x-8$

125. Let $f(x) = \begin{cases} \frac{1-\sin^3 x}{3\cos^2 x}, & x < \frac{\pi}{2} \\ p, & x = \frac{\pi}{2} \\ \frac{q(1-\sin x)}{(\pi - 2x)^2}, & x > \frac{\pi}{2} \end{cases}$

If $f(x)$ is continuous at $x = \frac{\pi}{2}$, then

(a) (1, 4) (b) $\left(\frac{1}{2}, 2\right)$

(c) $\left(\frac{1}{2}, 4\right)$ (d) None of these

PART - IV : ENGLISH

DIRECTIONS (Qs. 126 - 128): Out of the four alternatives, choose the one which express the correct meaning of the word.

126. AUGMENT

(a) Increase (b) Decrease

(c) Save (d) Mention

127. CONSOLATION

(a) Comfort (d) Problem

(c) Sadness (d) Solution

128. AUXILIARY

(a) Chief (d) Supplemental

(c) Negligible (d) Separate

DIRECTIONS (Qs. 129 - 131): Choose the word opposite is meaning to the given word.

129. AUSPICIOUS

(a) Prosperous (b) Unfavourable

(c) Improper (d) New

130. RECOMPENSE

(a) Emolument (d) Reward

(c) Payment (d) Penalty

131. IMPEDE

(a) Block (b) Delay

(c) Push (d) Freeze

DIRECTIONS (Qs. 132 - 134): A part of sentence is underlined. Belence are given alternatives to the underlined part a, b, c and d which may improve the sentence. Choose the correct alternative.

132. They requested me to follow them.

(a) ordered (b) urged

(c) asked (d) No improvement

133. She did not believed me.

(a) believing (b) believe to

(c) believe (d) No improvement

134. I am fine, what about you?

(a) your (b) your's

(c) yours (d) No improvement

DIRECTIONS (Qs. 135 - 137): Fill in the blanks.

135. They were afraid ..... the lion, so the idea of hunting in jungle.

(a) in (b) to

(c) from (d) of

136. Our company signed a profitable .....

(a) issue (d) agenda

(c) deal (d) paper

137. What is your ..... for tonight?

(a) Principle (b) Motto

(c) Plan (d) Objective

DIRECTIONS (Qs. 138 - 140): Arrange the following sentences in correct pattern and mark at combination.

138. 1. Today we live in modern technology

P. We have a log of problems now.

Q. We want to get everything in one da

R. Ancient time was quite pleasant.

S. We has no problems then.

6. Perhaps greed is the main cause for

(a) PQRS (b) PRSQ

(c) SRQP (d) RPQS

139. 1. He is a common man.

P. Yesterday our city saw a brutal crim

Q. Police is trying to arrest innocent p

R. The criminals are well known.

S. Police as well as whole system in co

6. Police will arrest him as he is an ea target because of being a common man

(a) PRSQ (b) PQSR

(c) PQRS (d) PSQR

140. 1. I want to change the room.

P. Last month I got a job.

Q. I had been living there for six mont

R. The office is far from the room.

S. I want to cut the expenses of travelling

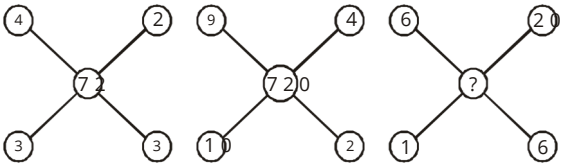
6. Hopefully I will do this next week.

(a) PQRS (b) PRSQ

(c) QPRS (d) PQSR

141. In a certain code language, 'SAFER' is written as '5@3#2' and 'RIDE' is written as '2#©%', how would 'FEDS' be written in that code?
(a) 3#©5 (b) 3@%5 (c) 3#%5 (d) 3#%2

142. Find the missing number from the given response.

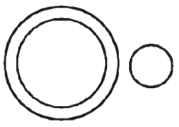
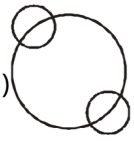
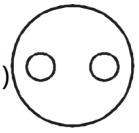


(a)72 (b)720 (c) 7200 (d) 38

143. If the first and second letters in the word DEPRESSION were interchanged, also the third and fourth letters, the fifth and the sixth letters and so on, then which of the following would be seventh letter from the right?
(a) O (b) P (c) R (d) S

144. Today is Thursday. The day after 59 days will be
(a) Sunday (b) Monday
(c) Tuesday (d) Wednesday

145. Which of the following represents coal mines, factories and fields?

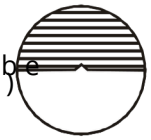
(a) 
(b) 
(c) 
(d) 

146. Find out the missing term in the series.
1, 8, –27, ?, 125, 216
(a)52 (b)58 (c) 64 (d) 65

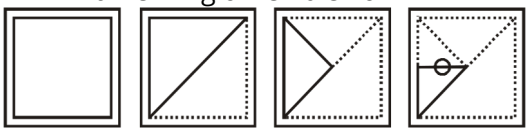
147. If '+' means '×', '–' means '+', '×' means '÷' and '÷' means '–', then 6 – 9 + 8 × 3 ÷ 20 = ?
(a)– 2 (b)6 (c)10 (d)12

148. Here are some words translated from a la n guage.
mallon piml means blue light
mallon tifl means blue berry
arpan tifl means rasp berry
Which word could means 'light house'?
(a) tiflmallon (b) pimlarpan
(c) mallonarpan (d) pimldoken

149. What is the water image of below figu

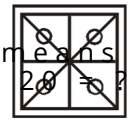
(a) 
(b) 
(c) 
(d) 

150. A piece of paper is folded and penche in the figure below



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

How will it appear when unfolded?

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

SOLUTIONS

PART - I : PHYSICS

1. (b)

2. (b)

3. (c)

4. (a)

5. (b)

6. (c)

7. (a)

8. (c)

9. (d)

10. (b)

11. (d)

12. (d)

13. (c)

14. (d)

15. (b)

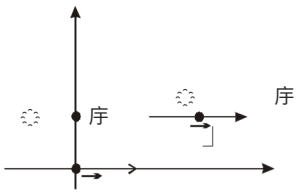
16. (b)

17. (d)

18. (d)

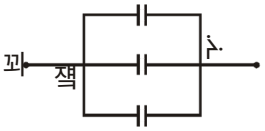
19. (c)

20. (b)



21. (a)

22. (d)



23. (c)

24. (c)

25. (b)

26. (c)

27. (b)

28. (c)

29. (c)

30. (a)

32. (b)

33. (d)

34. (a)

35. (c)

36. (d)

37. (d)

38. (d)

39. (a)

40. (a)

$$X = (A \quad B)$$

PART - II : CHEMISTRY

41. (c)

42. (b)

43. (c)

44. (b)

45. (d)

46. (b)

47. (a)

48. (a)

49. (d)

50. (b)

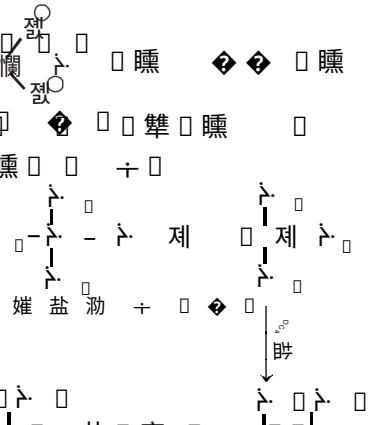
51. (d)

52. (c)

53. (b)

54. (a)

55. (a)



56. (a)

57. (a)

58. (d)

59. (d)

60. (c)

61. (a) $\frac{d}{dt}$

$\frac{d}{dt}$

$\frac{d}{dt}$

62. (a)

63. (a)

64. (b)

65. (c)

66. (c)

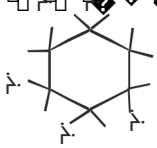
67. (d)

68. (d)

69. (c)

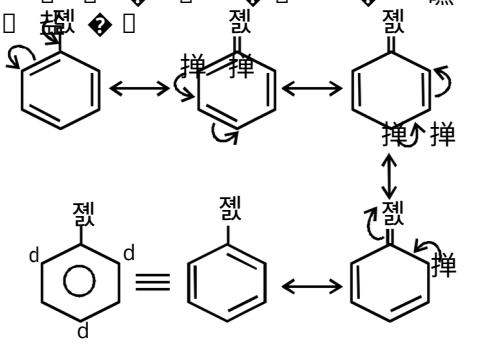
70. (d)

71. (d)



72. (a)

73. (c)



74. (b)

75. (d)

76. (d)

77. (b)

78. (b)

79. (c)

80. (a)

81. (b)

82. (a)

83. (a)

84. (b)

85. (c)

86. (c)

PART - III : MATHEMATICS

87. (d) $z = (a - ib) \Rightarrow z = a - ib$

$\therefore x + iy = a^3 + ib^3 - 3iab - 3ab$

$\Rightarrow x = a^3 - 3ab \Rightarrow \frac{x}{a} = a - 3b$

$y = b \Rightarrow \frac{y}{b} = b - 3a$

88. (a)

89. (a) $\left|\frac{z_1 - i}{z_1 + i}\right| < 1 \Rightarrow |z_1 - i| < |z_1 + i|$

90. (c)

91. (a)

92. (c)

93. (b)

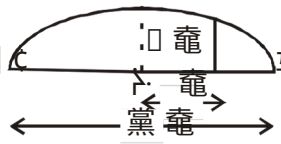
94. (d)

95. (a)

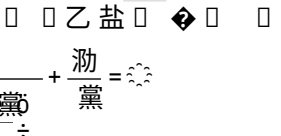
96. (d)

97. (a)

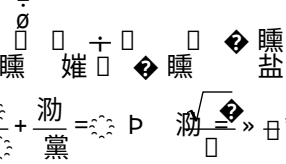
98. (d)



99. (b)

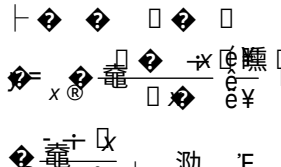


100. (c)



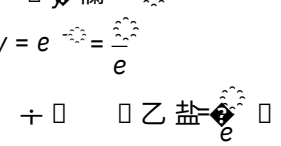
101. (a)

102. (a)

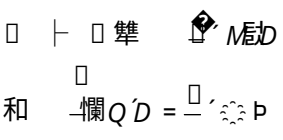


103. (c)

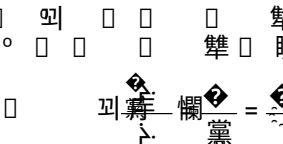
104. (b)



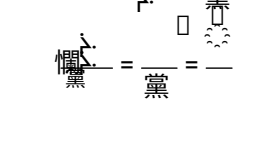
105. (b)



106. (d)



107. (b)



108. (b)

109. (b)

110. (d)

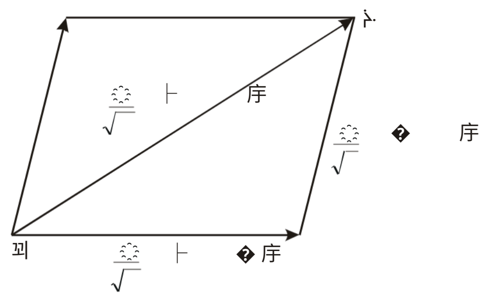
111. (c)

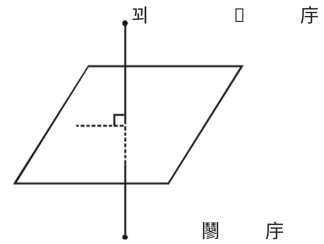
112. (b)

113. (d)

114. (a)

115. (d)



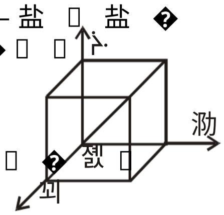


[illegible]

$\left[\frac{i + j}{\ } + k + i \quad \frac{k + j}{\ } + \frac{i + k}{\ } \right]$ [illegible]

$\left[i + j + k \right]$ [illegible]

116. (d) [illegible]



[illegible]

117. (a) [illegible] $q =$ [illegible]

[illegible]

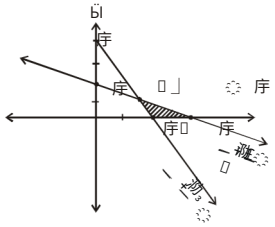
118. (b) [illegible]

119. (c) [illegible]

$\frac{n}{n+1}$ [illegible]

120. (b) [illegible]

121. (c) [illegible]



122. (b)

123. (c)

124. (c)

125. (c)

126. (a)

127. (a)

128. (b)

129. (b)

130. (d)

131. (c)

132. (b)

133. (c)

134. (d)

135. (d)

136. (c)

PART - IV : ENGLISH

137. (c)

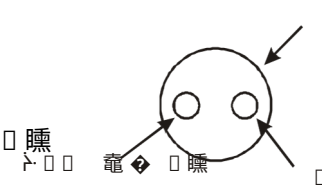
138. (b) 139. (a) 140. (d) 141. (c)

142. (b)

143. (b)

144. (a)

145. (b)



146. (c)

147. (c)

148. (d) 149. (b) 150. (b)