BITSAT 2011 Question Paper with Solution

Birla Institute of Technology and Science Admission Test (BITSAT)

BITSAT : SOLVED PAPER 2011

(memory based)

INSTRUCTIONS

- This question paper contains total questions divided into four parts
  Part I: Physics Q. No. to
  Part II: Chemistry Q. No. to
  Part III: Mathematics Q. No. to
  Part IV: English Proficiency Q. No. to
  Logical Reasoning Q. No. to
- All questions are multiple choice questions with four options, only one of them is
- Each correct answer awarded marks and – for each incorrect answer
- Duration of paper hours

PART - I : PHYSICS

1. A passenger in a open car travelling at 30 m/s throws a ball out over the bonnet. Relative to the car the initial velocity of the ball is 20 m/s at 60° to the horizontal. The angle of projection of the ball with respect to the horizontal road will be
   (a) $\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$ (b) $\tan^{-1}\left(\frac{\sqrt{3}}{4}\right)$
   (c) $\tan^{-1}\left(\frac{4}{\sqrt{3}}\right)$ (d) $\tan^{-1}\left(\frac{3}{4}\right)$

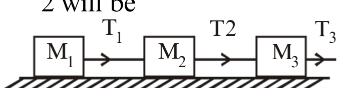
2. A particle is moving in a straight line with initial velocity and uniform acceleration a. If the sum of the distance travelled in tth and (t + 1)th seconds is 100 cm, then its velocity after t seconds in cm/s is
   (a) 80 (b) 50 (c) 20 (d) 30

3. The two vectors $\vec{A}$ and $\vec{B}$ are drawn from a common point and $\vec{C}=\vec{A}+\vec{B}$ then angle between $\vec{A}$ and $\vec{B}$ is –
   (1) 90° if $C^2 = A^2 + B^2$
   (2) greater than 90° if $C^2 < A^2 + B^2$
   (3) greater than 90° if $C^2 > A^2 + B^2$
   (4) less than 90° if $C^2 > A^2 + B^2$
   Correct options are –
   (a) 1, 2 (b) 1, 2, 3, 4
   (c) 2, 3, 4 (d) 1, 2, 4

4. If $T = 2\pi\sqrt{\frac{ML^3}{3Yq}}$ then find the dimensions of q.
   Where T is the time period of bar of mass M, length L and Young modulus Y.
   (a) [L] (b) [L2] (c) [L4] (d) [L3]

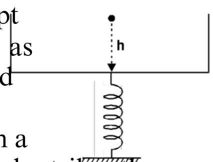
5. An object experiences a net force and accelerates from rest to its final position in 16s. How long would the object take to reach the same final position from rest if the object's mass was four times larger ?
   (a) 64 s (b) 32 s (c) 16 s (d) 8s

6. Three blocks of masses m1, m2 and m3 are connected by massless strings as shown on a frictionless table. They are pulled with a force T_3 = 40 N. If m1 = 10 kg, m2 = 6 kg and m3 = 4kg, the tension T_2 will be



   (a) 20 N (b) 40 N (c) 10 N (d) 32 N

7. A massless platform is kept on a light elastic spring as shown in fig. When a sand particle of mass 0.1 kg is dropped on the pan from a height of 0.24 m, the particle strikes the pan and spring is compressed by 0.01 m. From what height should the particle be dropped to cause a compression of 0.04 m.



   (a) 3.96 m (b) 0.396 m (c) 4 m (d) 0.4 m

8. A constant torque of 31.4 N-m is exerted on a pivoted wheel. If angular acceleration of wheel is 4π rad/s², then the moment of inertia of the wheel is
(a) 2.5 kg m^2 (b) 3.5 kg m^2 (c) 4.5 kg m^2 (d) 5.5 kg m^2

9. A man of mass m starts falling towards a planet of mass M and radius R. As he reaches near to the surface, he realizes that he will pass through a small hole in the planet. As he enters the hole, he sees that the planet is really made of two pieces a spherical shell of negligible thickness of mass 2M/3 and a point mass M/3 at the centre. Change in the force of gravity experienced by the man is:
(a) $\frac{2}{3}\frac{GMm}{R^2}$ (b) 0
(c) $\frac{1}{3}\frac{GMm}{R^2}$ (d) $\frac{4}{3}\frac{GMm}{R^2}$

10. Geo-stationary satellite is one which
(a) remains stationary at a fixed height from the earth's surface
(b) revolves like other satellites but in the opposite direction of earth's rotation
(c) revolves round the earth at a suitable height with same angular velocity and in the same direction as earth does about its own axis
(d) None of these

11. Two wires are made of the same material and have the same volume. However wire 1 has cross-sectional area A and wire 2 has cross-sectional area 3A. If the length of wire 1 increases by Δx on applying force F, how much force is needed to stretch wire 2 by the same amount?
(a) 4 F (b) 6 F (c) 9 F (d) F

12. An iron rod of length 2m and cross-sectional area of 50 mm^2 stretched by 0.5 mm, when a mass of 250 kg is hung from its lower end. Young's modulus of iron rod is
(a) 19.6×10^{20} N/m^2 (b) 19.6×10^{18} N/m^2
(c) 19.6×10^{10} N/m^2 (d) 19.6×10^{15} N/m^2

13. Viscosity is the property of a liquid due to which it :
(a) occupies minimum surface area
(b) opposes relative motion between its adjacent layers
(c) becomes spherical in shape
(d) tends to regain its deformed position

14. The radiation emitted by a perfectly black body is proportional to
(a) temperature on ideal gas scale
(b) fourth root of temperature on ideal gas scale
(c) fourth power of temperature on ideal gas scale
(d) square of temperature on ideal gas scale

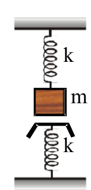
15. A copper sphere cools from 62°C to 50°C in 10 minutes and to 42°C in the next 10 minutes. Calculate the temperature of the surroundings.
(a) 18.01°C (b) 26°C (c) 6.8°C (d) 10.20°C

16. An air bubble of volume v_0 is released by a fish at a depth h in a lake. The bubble rises to the surface. Assume constant temperature and standard atmospheric pressure above the lake. The volume of the bubble just before touching the surface will be (density of water is ρ)
(a) v_0 (b) $v_0(\rho g h / p)$
(c) $\frac{v_0}{\left(1+\frac{\rho g h}{p}\right)}$ (d) $v_0\left(1+\frac{\rho g h}{p}\right)$

17. The molecules of a given mass of gas have a root mean square velocity of 200m s^{-1} at 27°C and 1.0×10^5 N m^{-2} pressure. When the temperature is 127°C and the pressure 0.5×10^5 Nm^{-2}, the root mean square velocity in ms^{-1} is
(a) $\frac{400}{\sqrt{3}}$ (b) $100\sqrt{2}$
(c) $\frac{100\sqrt{2}}{3}$ (d) $\frac{100}{3}$

18. Which of the following expressions corresponds to simple harmonic motion along a straight line, where x is the displacement and a, b, c are positive constants?
(a) $a + bx - cx^2$ (b) bx^2
(c) $a - bx + cx^2$ (d) $-bx$

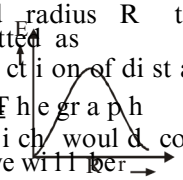
19. A mass m is suspended from a spring of force constant k and just touches another identical spring fixed to the floor as shown in the figure. The time period of small oscillations is

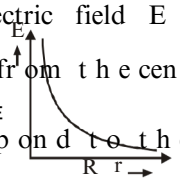


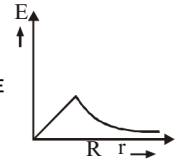
(a) $2\pi\sqrt{\frac{m}{k}}$ (b) $\pi\sqrt{\frac{m}{k}} + \pi\sqrt{\frac{m}{k/2}}$
(c) $\pi\sqrt{\frac{m}{3k/2}}$ (d) $\pi\sqrt{\frac{m}{k}} + \pi\sqrt{\frac{m}{2k}}$

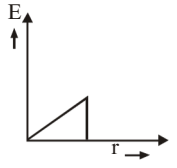
20. The fundamental frequency of an open organ pipe is 300 Hz. The first overtone of this pipe has same frequency as first overtone of a closed organ pipe. If speed of sound is 330 m/s, then the length of closed organ pipe is
a) 41 cm b) 37 cm c) 31 cm d) 80 cm

21. In a uniformly charged sphere of total charge Q and radius R, the electric field E is plotted as function of distance from the centre. The graph which would correspond to the above will be

a) 

b) 

c) 

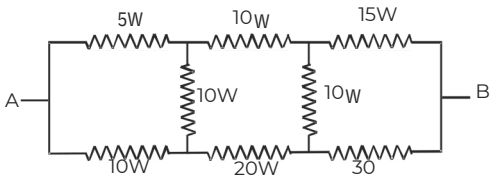
d) 

22. A charge Q1 exerts some force on a second charge Q2. If the charge Q2 is displaced to twice the distance from Q1, the force exerted on Q2 –
a) will increase
b) will decrease
c) will remain unchanged
d) will increase if Q2 is of the same sign as Q1 and will decrease if Q2 is of opposite sign

23. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. The potential at a distance of 2 cm from the centre of the sphere is
a) zero b) 10 V c) 4 V d) 10/3 V

24. If the potential of a capacitor having capacity 6 mF is increased from 10 V to 20 V, then increase in its energy will be
a) 4 × 10–4 J b) 4 × 10–6 J c) 12 × 10–6 J d) 12 × 10–4 J

25. Calculate the effective resistance between A and B in following network



a) 5 W b) 10 W c) 20 W d) 30 W

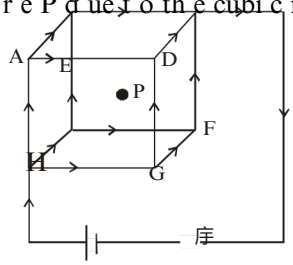
26. A steady current is set up in a cubic network composed of wires of equal resistance and length as shown in figure. What is the magnetic field at the centre P due to the cubic network?

a) $\frac{\mu_0}{4\pi}\frac{2I}{d}$

b) $\frac{\mu_0}{4\pi}\frac{2I}{\sqrt{2}d}$

c) 0

d) $\frac{\mu_0}{4\pi}\frac{qpI}{d}$

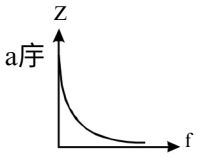


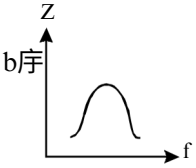
27. If M is magnetic moment and B is the magnetic field, then the torque is given by

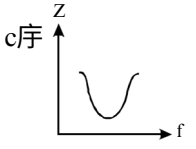
a) $\vec{M}\times\vec{B}$ b) $\frac{|\vec{M}|}{|\vec{B}|}$ c) $\vec{M}\cdot\vec{B}$ d) $|\vec{M}||\vec{B}|$

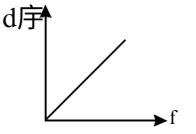
28. A metal rod of length 1 m is rotated about one of its ends in a plane right angles to a field of induction 2 × 10–3 Wb/m². If it makes 1800 revolutions/min. Calculate induced e.m.f. between its ends
a) 2.471 V b) 3.171 V
c) 0.471 V d) 1.771 V

29. Which one of the following curves represents the variation of impedance Z with frequency f in series LCR circuit?

a) 

b) 

c) 

d) 

30. An electromagnetic wave passes through space and its equation is given by $E = E_0 \sin(\omega t - kx)$, where E is electric field. Energy density of electromagnetic wave in space is

a) $\frac{1}{2}\varepsilon_0 E^2$ b) $\frac{1}{4}\varepsilon_0 E^2$

c) $\frac{1}{2}\varepsilon_0 E_0^2$ d) $\frac{1}{4}\varepsilon_0 E_0^2$

31. A thin convergent glass lens (μ_g = 1.5) has a power of +5.0 D. When this lens is immersed in a liquid of refractive index μ it acts as a divergent lens of focal length 100 cm. The value of μ must be
(a) 4/3 (b) 5/3 (c) 5/4 (d) 6/5

32. A vessel of depth 2d cm is half filled with a liquid of refractive index μ_1 and the upper half with a liquid of refractive index μ_2. The apparent depth of the vessel seen perpendicularly is –
(a) $d\left(\frac{\mu_1\mu_2}{\mu_1+\mu_2}\right)$ (b) $d\left(\frac{1}{\mu_1}+\frac{1}{\mu_2}\right)$
(c) $2d\left(\frac{1}{\mu_1}+\frac{1}{\mu_2}\right)$ (d) $2d\left(\frac{1}{\mu_1\mu_2}\right)$

33. If the distance between the first maxima and fifth minima of a double slit pattern is 7mm and the slits are separated by 0.15 mm with the screen 50 cm from the slits then the wavelength of the light used is :
(a) 200 nm (b) 100 nm
(c) 800 nm (d) 600 nm

34. If the energy of a photon is 10 eV then its momentum is
(a) 5.33×10^{-23} kg m/s
(b) 5.33×10^{-25} kg m/s
(c) 5.33×10^{-29} kg m/s
(d) 5.33×10^{-27} kg m/s

35. The energies of energy levels A, B and C for a given atom are in the sequence $E_A < E_B < E_C$. If the radiations of wavelengths λ_1, λ_2 and λ_3 are emitted due to the atomic transitions C to B, B to A and C to A respectively then which of the following relations is correct ?
(a) $\lambda_3 = \lambda_1 + \lambda_2$ (b) $\lambda_3 = \lambda_1 - \lambda_2$
(c) $\frac{1}{\lambda_3} = \frac{1}{\lambda_1} + \frac{1}{\lambda_2}$ (d) $\lambda_3 = \frac{\lambda_1\lambda_2}{\lambda_1+\lambda_2}$

36. Which one is correct about fission ?
(a) Approx 0.1% mass converts into energy
(b) Most of energy of fission is in the form of heat
(c) In a fission of U235 about 200 eV energy is released
(d) On an average one neutron is released per fission of U235

37. The output of an OR gate is connected to both the inputs of a NAND gate. The combination will work as a :
(a) NOT gate (b) NOR gate
(c) AND gate (d) OR gate

38. In a semiconductor diode the barrier potential offers opposition to
(a) holes in P-region only
(b) free electrons in N-region only
(c) majority carriers in both regions
(d) majority as well as minority carriers in both regions

39. An electron in a hydrogen-like atom is in an excited state. It has a total energy of –3.4 eV. The kinetic energy and the de-Broglie wavelength of the electron are respectively
(a) +3.4 eV, 0.66×10^{-9} m
(b) –3.4 eV, 1.99×10^{-9} m
(c) 2.8 eV, 2.38×10^{-10} m
(d) 1.1 eV, 1.28×10^{-9} m

40. Light of wavelength 180 nm ejects photoelectron from a plate of a metal whose work function is 2 eV. If a uniform magnetic field of 5×10^{-5} T is applied parallel to plate, what would be the radius of the path followed by electrons ejected normally from the plate with maximum energy ?
(a) 1.239 m (b) 0.149 m
(c) 3.182 (d) 2.33 m

PART - II : CHEMISTRY

41. The product of atomic weight and specific heat of any element is a constant approximately 6.4. This is known as
(a) Avogadro's law (b) Dalton's law
(c) Newton's law (d) Dulong Pettit law

42. 1.520 g of hydroxide of a metal on ignition gave 0.995g of oxide. The equivalent weight of metal is :
(a) 1.52 (b) 0.995 (c) 1.90 (d) 9

43. The correct order of radii is
(a) N < Be < B (b) $F^- < O^{2-} < N^{3-}$
(c) Na < Li < K (d) $Fe^{3+} < Fe^{2+} < Fe^{4+}$

44. Beryllium and aluminium exhibit many properties which are similar. But the two elements differ in
(a) forming covalent halides
(b) forming polymeric hydrides
(c) exhibiting maximum covalency in compounds
(d) exhibiting amphoteric nature in their oxides

45. Among Al_2O_3 SiO_2 P_2O_3 and SO_2 the correct order of acid strength is:
a序 $Al_2O_3 < SiO_2 < SO_2 < P_2O_3$
b序 $SiO_2 < SO_2 < Al_2O_3 < P_2O_3$
c序 $SO_2 < P_2O_3 < SiO_2 < Al_2O_3$
d序 $Al_2O_3 < SiO_2 < P_2O_3 < SO_2$

46. As bonded molecule MX_3 is T嫺shaped The number of non bonded pair of electrons is
a序 0 b序 2
c序 1
d序 can be predicted only if atomic number is known

47. The correct bond order in the following species is:
a序 $O_2^+ < O_2^- < O_2^{2+}$ b序 $O_2^{2+} < O_2^- < O_2^+$
c序 $O_2^{2-} < O_2^+ < O_2^{2+}$ d序 $O_2^{2+} < O_2^+ < O_2^-$

48. What is the free energy change DG when 1 0 mole of water at 100º C and 1 atm pressure is converted into steam at 100°C and 1 atm pressure?
a序 540 cal b序 –9800 cal
c序 9800 cal d序 0 cal

49. H_2S gas when passed through a solution of cations containing HCl precipitates the cations of second group of qualitative analysis but not those belonging to the fourth group It is because
a序 presence of HCl decreases the sulphide ion concentration
b序 solubility product of group II sulphides is more than that of group IV sulphides
c序 presence of HCl increases the sulphide ion concentration
d序 sulphides of group IV cations are unstable in HCl

50. The pH of a solution is increased from 3 to 6; its H제 ion concentration will be
a序 reduced to half
b序 doubled
c序 reduced by 1000 times
d序 increased by 1000 times

51. A gas X at 1 atm is bubbled through a solution containing a mixture of 1 M Y– and 1 M Z– at 25°C If the reduction potential is Z > Y > X then
a序 Y will oxidise X and not Z
b序 Y will oxidise Z and not X
c序 Y will oxidise both X and Z
d序 Y will reduce both X and Z

52. When a crystal of caustic soda is exposed to air a liquid layer is deposited because :
a序 Crystal loses water
b序 Crystal absorbs moisture and CO_2
c序 Crystal melts
d序 Crystal sublimes

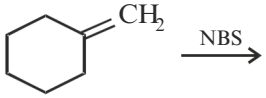
53. Which of the following compound is not chiral?
a序 $DCH_2CH_2CH_2Cl$ b序 CH_3CHDCH_2Cl
c序 $CH_3CHClCH_2D$ d序 CH_3CH_2CHDCl

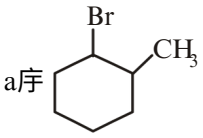
54. $C_6H_5C^{\circ}N$ and $C_6H_5N^{\circledR}=C$ exhibit which type of isomerism?
a序 Position b序 Functional
c序 Demotropism d序 Position isomerism

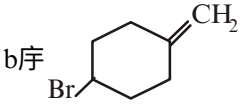
55. The correct nucleophilicity order is
a序 $C_3 < NH_2 < HO^- < F^-$
b序 $H_3 \sim NH_2 > HO^- \sim F^-$
c序 $C_3 > NH_2 > HO^- > F^-$
d序 $CH_2 > F^- > HO^- > CH_3$

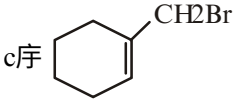
56. In the anion HCOO– the two carbon嫺oxygen bonds are found to be of equal length What is the reason for it ?
a序 The C = O bond is weaker than the C — O bond
b序 The anion HCOO– has two resonating structures
c序 The anion is obtained by removal of a proton from the acid molecule
d序 Electronic orbitals of carbon atom are hybridised

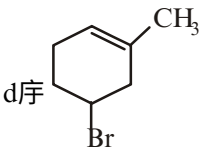
57. What will be the product in the following reaction?



a序 

b序 

c序 

d序 

58. The fraction of total volume occupied by the atoms present in a simple cube is

a序 $\frac{p}{3\sqrt{2}}$ b序 $\frac{p}{4\sqrt{2}}$ c序 $\frac{p}{4}$ d序 $\frac{p}{6}$

59. 1 00 g of a non嵴electrolyte solute molar mass 250 g mol–1序 was dissolved in 51 2 g of benzene If the freezing point depression constant K_f of benzene is 5 12 K kg mol–1 the freezing point of ben z en e wil l be l ower ed by
a序 0 3 K b序 0 5 K c序 0 4 K d序 0 2

60. The number of coulombs required for the deposition of 108 g of silver is
a序 96500 b序 48250
c序 193000 d序 10000

61. During the kinetic study of the reaction 2A 栽 B ® C 栽 D following results were obtained:

Run	[A]/mol L^{-1}	[B]/mol L^{-1}	Initial rate of formation of D/mol L^{-1} min^{-1}
I	0 1	0 1	$6 0 \times 10^{-1}$
II	0 3	0 2	$7 2 \times 10^{-1}$
III	0 3	0 4	$28 8 \times 10^{-1}$
IV	0 4	0 1	$24 0 \times 10^{-1}$

Based on the above data which one of the fol l owi n g i s cor r ect ?
a序 rate = k [A]2[B] b序 rate = k[A] [B]
c序 rate = k[A]2[B]2 d序 rate = k[A][B]2

62. Position of non嵴polar and polar part in micelle is
a序 polar at outer surface and non嵴polar at inner surface
b序 polar at inner surface and non嵴polar at outer surface
c序 distributed all over the surface
d序 present in the surface only

63. For adsorption of a gas on a solid the plot of log x/m vs log P is linear with slope equal to n being whole number序

a序 k b序 log k c序 n d序 $\frac{1}{n}$

64. Calcination is used in metallurgy for removal of?
a序 Water and sulphide
b序 Water and CO_2
c序 CO_2 and HS_2
d序 HO_2 and HS_2

65. Phosphine is not obtained by the reaction
a序 White P is heated with NaOH
b序 Red P is heated with NaOH
c序 Ca_3P_2 reacts with water
d序 Phosphorus trioxide is boiled with water

66. Which of the following halides is not oxidized by MnO_2
a序 F– b序 Cl– c序 Br– d序 I–

67. Which of the following exhibit only 栽 3 oxidation state?
a序 U b序 Th c序 Ac d序 Pa

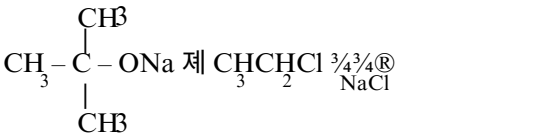
68. Which of the following pairs has the same size?
a序 $Fe^{2栽}$ Ni2栽 b序 $Zr^{4栽}$ Ti4栽
c序 $Zr^{4栽}$ Hf4栽 d序 Zn2栽 $Hf^{4栽}$

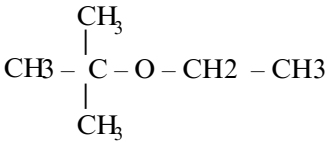
69. Which of the following is not considered as an or ga n omet a l li c com p oun d ?
a序 cis嵴platin b序 Ferrocene
c序 Zeise'Es salt d序 Grignard reagent

70. The most stable ion is
a序 $[Fe(OH)_3序]^{3-}$ b序 $[FeCl_6]^{3-}$
c序 $[Fe(CN)_6序]^{3-}$ d序 $[Fe(HO)_2{}_6序]^{3栽}$

71. A is an optically inactive alkyl chloride which on reaction with aqueous KOH gives B B on heating with Cu at 300°C gives an alkene C what are A and C
a序 CH3CH2Cl CH2 =CH2
b序 Me3CCl MeCH = CH Me
c序 Me3CCl Me2C =CH2
d序 Me2CH CH2Cl Me2C =CH2

72. The reaction





is called :
a序 Williamson continuous etherification process
b序 Etard reaction
c序 Gatterman 嵴 Koch reaction
d序 Williamson Synthesis

73. Which of the following esters cannot undergo Claisen self condensation ?

a序 $CH_3CH_2CH_2CH_2COOC_2H_5$

b序 $C_6H_5COOC_2H_5$

c序 $C_6H_{11}CH_2COOC_2H_5$

d序 $C_6H_5CH_2COOC_2H_5$

74. Schotten媄Baumann reaction is a reaction of phenols with

a序 benzoyl chloride and sodium hydroxide

b序 acetyl chloride and sodium hydroxide

c序 salicylic acid and conc H_2SO_4

d序 acetyl chloride and conc H_2SO_4

75. Identify X

H_3C \ C = O ¾C¾H¾3M¾gI® (dryether)
H_3C /

Intermediate¾H¾2O¾®X

a序 CH3OH b序 Ethyl alcohol

c序 Methyl cyanide d序 tert媄Butyl alcohol

76. The reagent s序 which can be used to distinguish acetophenone from benzophenone is are序

a序 2 4媄 dinitrophenylhydrazine

b序 aqueous solution of $NaHSO_3$

c序 benedict reagent

d序 I_2 and NaOH

77. Aniline reacts with nitrous acid to produce

a序 phenol

b序 nitrobenzene

c序 chlorobenzene

d序 benzene diazonium chloride

78. The structural feature which distinguishes proline from natural a媄amino acids?

a序Proline is optically inactive

b序 Proline contains aromatic group

c序 Proline is a dicarboxylic acid

d序 Proline is a secondary amine

79. Which of the following can not give iodometric titration ?

a序 Fe3제 b序 Cu2제 c序 Pb2제 d序 Ag2제

80. Acetaldehyde and acetone can be distinguished by :

a序 Iodoform test

b序 Nitroprusside test

c序 Fehlings solution test

d序 C P test

PART - III : MATHEMATICS

81. If f x序 is a function that is odd and even simultaneously then f 3序 – f 2序 is equal to

a 1 b序–1

c序 0 d序None of these

82. If tan A = $\frac{1}{2}$ and tan B = $\frac{1}{3}$ then find the value of A 제 B

a序 p b序 $\frac{p}{2}$ c序 $\frac{p}{4}$ d序 $\frac{4p}{}$

83. If sin q = – $\frac{1}{}$ and tan q = $1/\sqrt{3}$ then q =

a序 2np 제 p/6 b序2np 제11p/6

c序 2np 제7p/6 d序2np 제 p/4

84. $\frac{\cos q}{1-\tan q}+\frac{\sin q}{1-\cot q}$ is equal to

a序 sinq – cos q b序 sinq 제 cos q

c序 tanq 제 cot q d序 tanq – cot q

85. For n Î N xn제1 제 x 제 1序2n–1 is divisible by

a序 x b序x 제 1

c序 x2 제 x 제 1 d序x2 – x 제 1

86. If a b are the roots of the equation ax2 제 bx 제 c = 0 then the roots of the equation ax2 제 bx x 제 1序 제 c x 제 1序2 = 0 are

a序 a – 1 b – 1 b序 a 제 1 b 제 1

c序 $\frac{a}{a-1}$ $\frac{b}{b-1}$ d序 $\frac{a}{1-a}$ $\frac{b}{1-b}$

87. If a > 0 a Î R z = a 제 2i and z | z | – az 제 1 = 0 then

a序 z is always a positive real number

b序 z is always a negative real number

c序 z is purely imaginary number

d序 such a complex z does not exist

88. Which of the following is not a vertex of the positive region bounded by the inqualities 2x 제 3y £ 6 5x 제 3y £ 15 and x y ³ 0

a序 0 2序 b序0 0序

c序 3 0序 d序None of these

89. If $^{20}C_r = {}^{20}C_{r-10}$ then $^{18}C_r$ is equal to

a序 4896 b序816

c序 1632 d序None of these

90. The term independent of x in the expansion of

$\left(9x-\frac{1}{3\sqrt{x}}\right)^{18}$ x >0 is a times the corresponding binomial coefficient Then a is

a序 3 b序1/3

c序 –1/3 d序None of these

91. In the binomial 21/3 – 3-1/3 n if the ratio of the seventh term from the beginning of the expansion to the seventh term from its end is 1/6 then n equal to
a) 6 b) 9 c) 12 d) 15

92. If pth qth and rth terms of H P are u v w respectively then find the value of the expression
q – r)vw + r – p)wu + p – q)uv
a) 2 b) 0 c) 4 d) 8

93. If the sum of the first 2n terms of 2 5 8 is equal to the sum of the first n terms of 57 59 61 then n is equal to
a) 10 b) 12 c) 11 d) 13

94. The distance of the point –1 1) from the line 12 x + 6) = 5 y – 2) is
a) 2 b) 3 c) 4 d) 5

95. The family of straight lines
2a + 3b)x + a – b)y + 2a – 4b = 0 is concurrent at the point
a) $\left(\frac{2}{5}, \frac{-14}{5}\right)$ b) $\left(\frac{-2}{5}, \frac{-14}{5}\right)$
c) $\left(\frac{-2}{5}, \frac{14}{5}\right)$ d) $\left(\frac{2}{5}, \frac{14}{5}\right)$

96. The length of the latus rectum of the parabola whose focus is $\left(\frac{u^2}{2g}\sin 2\alpha, -\frac{u^2}{2g}\cos 2\alpha\right)$ and directrix is $y = \frac{u^2}{2g}$ is
a) $\frac{u^2}{g}\cos^2\alpha$ b) $\frac{u^2}{g}\cos 2\alpha$
c) $\frac{2u^2}{g}\cos^2 2\alpha$ d) $\frac{2u^2}{g}\cos^2\alpha$

97. The equation of the ellipse with focus at ±5 0) and $x = \frac{36}{5}$ as one directrix is
a) $\frac{x^2}{36} + \frac{y^2}{25} = 1$ b) $\frac{x^2}{36} + \frac{y^2}{11} = 1$
c) $\frac{x^2}{25} + \frac{y^2}{11} = 1$ d) None of these

98. For what value of k the circles x2 + y2 + 5x + 3y + 7 = 0 and x2 + y2 – 8x + 6y + k = 0 cuts orthogonally
a) 16 b) –18 c) – 13 d) – 10

99. If the lines 3x – 4y + 4 = 0 and 6x – 8y – 7 = 0 are tangents to a circle then the radius of the circle is
a) 3/2 b) 3/4 c) 1/10 d) 1/20

100. Evaluate $\lim_{x \to \infty} \frac{\sqrt{1+\sin 3x} - 1}{\ln 1 + \tan 2x}$
a) 1/2 b) 3/2 c) $3^{/4}$ d) 1/4

101. Negation of "Paris in France and London in England" is
a) Paris is in England and London is in France
b) Paris is not in France or London is not in England
c) Paris is in England or London is in France
d) None of these

102. Find the A M of the first ten odd numbers
a) 10 b) 20 c) 15 d) 25

103. If A and B are mutually exclusive events and if P B) = $\frac{1}{3}$ P A∪B) = $\frac{13}{21}$ then P A) is equal to
a) 1/7 b) 4/7 c) 2/7 d) 5/7

104. A die is loaded such that the probability of throwing the number i is proportional to its reciprocal The probability that 3 appears in a single throw is
a) 3/22 b) 3/11
c) 9/22 d) None of these

105. If $f(x) = \begin{cases} x; & \text{when } x \text{ is rational} \\ 1-x; & \text{when } x \text{ is irrational} \end{cases}$ then fof x) is given as
a) 1 b) x
c) 1 + x d) None of these

106. If $f(x) = \frac{1-x}{1+x}$ the domain of f–1 x) is
a) R b) R – {– 1}
c) – ∞ – 1) d) –1 ∞)

107. The value of $\sin\left(4\tan^{-1}\frac{1}{3}\right) - \cos\left(2\tan^{-1}\frac{1}{7}\right)$ is
a) b)
c) 3/7 d) 7/8
8/21 None of these

108. The matrix A2 + 4A – 5I where I is identity matrix and $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$ equals :
a) $4\begin{bmatrix} 2 & 1 \\ 2 & 0 \end{bmatrix}$ b) $4\begin{bmatrix} 0 & -1 \\ 2 & 2 \end{bmatrix}$
c) $32\begin{bmatrix} 2 & 1 \\ 2 & 0 \end{bmatrix}$ d) $32\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$

109. If $A = \begin{bmatrix} 2 & 0 & 0 \\ 2 & 2 & 0 \\ 2 & 2 & 2 \end{bmatrix}$ then adj adj A is equal to

a) $8\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ b) $16\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$

c) $64\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ d) None of these

110. If $y = x^{x^2}$ then $\frac{d}{y}$ is equal to

a) $2 \ln x$ b) $2 \ln x - 1$

c) $\ln \ln x + 1$ d) None of these

111. The function $f(x) = |x - 1| \ln x|$ is at $x = 1$

a) discontinuous

b) continuous but not differentiable

c) differentiable with $f'(1) = 0$

d) differentiable with $f(1) \neq 0$

112. The function $f(x) = \sin x - kx - c$ where k and c are constants decreases always when

a) $k > 1$ b) $k \geq 1$ c) $k < 1$ d) $k \leq 1$

113. The minimum value of $f(x) = \sin^4 x + \cos^4 x$ in the interval $\left[0, \frac{\pi}{2}\right]$ is

a) $\frac{1}{2}$ b) 2 c) $\sqrt{2}$ d) 1

114. The curve $y - e^{xy} + x = 0$ has a vertical tangent at

a) (1, 1) b) (0, 1)

c) (1, 0) d) no point

115. The function $f(x) = 2x^3 - 3x^2 - 12x + 4$ has

a) two points of local maximum

b) two points of local minimum

c) one maxima and one minima

d) no maxima or minima

116. Evaluate $\int_{x}^{x^2} dx$

a) $x - \frac{1}{2}\log\left|\frac{x-1}{x+1}\right| + c$ b) $x + \frac{1}{2}\log\left|\frac{x+1}{x-1}\right| + c$

c) $x + \frac{1}{2}\log\left|\frac{x-1}{x+1}\right| + c$ d) None of these

117. Find the value of $\int_{0}^{4\pi} |\sin x| dx$

a) 8 b) 6 c) 4 d) 2

118. Let $I_1 = \int_{1}^{2} \frac{1}{\sqrt{1+x^2}} dx$ and $I_2 = \int_{1}^{2} \frac{1}{x} dx$ then

a) $I_1 \geq I_2$ b) $I_2 > I_1$

c) $I_1 = I_2$ d) None of these

119. What is the area bounded by $y = \tan x$, $y = 0$ and $x = \frac{\pi}{4}$?

a) $\ln 2$ sq units b) $\frac{\ln 2}{2}$ sq units

c) $2 \ln 2$ sq units d) None of these

120. The degree of the differential equation $\left(\frac{d^3y}{dx^3}\right)^{2/3} + 4\frac{d^2y}{dx^2} + 5\frac{dy}{dx} = 0$ is

a) 1 b) 2 c) 3 d) None of these

121. Two vectors $\vec{A}$ and $\vec{B}$ are such that $|\vec{A}+\vec{B}| = |\vec{A}-\vec{B}|$. The angle between the two vectors will be–

a) 60° b) 90° c) 180° d) 0°

122. Gives the line $L : \frac{x-1}{3} = \frac{y+1}{2} = \frac{z-3}{-1}$ and the plane $p : x - 2y - z = 0$. Of the following assertions the only one that is always true is

a) L is $\perp$ to p b) L lies in p

c) L is not parallel to p d) None of these

123. A ladder rests against a wall so that its top touches the roof of the house. If the ladder makes an angle of 60° with the horizontal and height of the house be $6\sqrt{3}$ meters then the length of the ladder in meters is

a) $12\sqrt{3}$ b) 12

c) $12/\sqrt{3}$ d) None of these

124. In an equilateral triangle the in radius, circumradius and one of the ex-radii are in the ratio

a) 2 : 3 : 5 b) 2 : 3 : 2 c) 3 : 7 : 9 d) 3 : 7 : 9

125. For the constraints of a L P Problem given by $x_1 + 2x_2 \leq 2000$, $x_1 + x_2 \leq 1500$ and $x_2 \leq 600$ and $x_1, x_2 \geq 0$ which one of the following points does not lie in the positive bounded region

a) (1000, 0) b) (0, 500)

c) (2, 0) d) (2000, 0)

PART - IV : ENGLISH

DIRECTIONS (126 & 127): In the following que st i on s t wo s en t en ces a r e g i ven T h e r e m ay be an e r r or i n t h e s en t en ce s序 M a r k a s your cor r ect a n swer

126. I Although he was innocent baseless accusations were leveled at him

II Despite of repeated representations from the people the authorities have failed to take any action

a序 if there is an error only in the first sentence;
b序 if there is an error only in the second sen ten ce;
c序 if there are errors in both sentences; and
d序 if there is no error in either of the sentences

127. I I deem it as a privilege to address the gathering

II Perfection can be achieved with practice

a序 if there is an error only in the first sentence;
b序 if there is an error only in the second sen ten ce;
c序 if there are errors in both sentences; and
d序 if there is no error in either of the sentences

DIRECTIONS (Qs. 128 - 130): For each of the following questions select the option which is CLOSEST in meaning to the capitalized word

128. TURBULENCE

a序 Treachery b序 Triumph
c序 Commotion d序 Overflow

129. DEFER

a序 Discourage b序 Minimize
c序 Postpone d序 Estimate

130. ADAGE

a序 Proverb b序 Youth
c序 Supplement d序 Hardness

DIRECTIONS (Qs. 131 - 133): Choose the word which is most OPPOSITE in meaning as the word given in bol d.

131. FRAGRANCE

a序 Aroma b序 Perfume
c序 Smell d序 Stink

132. PECULIAR

a序 Characteristic b序 Special
c序 Specific d序 Universal

133. ETERNAL

a序 Momentary b序 Continual
c序 Everlasting d序 Endless

DIRECTIONS (Qs. 134 & 135): Pick out the most effect ive wor d fr om th e gi ven wor ds t o fil l in th e bl an ks to make the sentence meanin gfully complete in the con text of the senten ce

134. ____________to popular belief that red meat makes human aggressive scientist have found that it actually has a calming effect

a序 Sticking b序 Similarly
c序 Opposite d序 Contrary

135. From its____________opening sequence it is clear that we are in the grip of a delicious new voice a voice of breathtaking

a序 Imagination b序 Evocative
c序 Mesmerizing d序 Resonance

DIRECTIONS (Qs. 136-140): In the following passages th e fir st an d th e last part s of th e sen ten ce a r e n u m ber ed 1 a n d 6 T h e r est of t h e sen t en ce i s sp l i t i n t o fou r pa r t s a n d n a m ed P Q R a n d S T h e se f our parts are not given in their proper order Read the parts and find out which of the four combinations is correct Th en fin d th e cor r ect an swer

136. 1 making ourselves
P our language
Q part of growing into
R Masters of
S is an important
6 full manhood or womanhood

a序 PSRQ b序SQPR c序 RPSQ d序PRSQ

137. 1 The very first battle they fought
P and they had to fall back
Q cross the border
R was lost
S letting the enemy
6 an enter the country

a序 RQSP b序RPSQ c序 QRPS d序QPRS

138. 1 A nation
P the material assets it possesses
Q is not made by
R and collective determination
S but by the will
6 of the people

a序 PQRS b序QPSR c序 RSPQ d序SRPQ

139. 1 When the Governor
P the bell had rung
Q justice should be immediately
R he ordered that
S found out why
6 done to the horse

a序 RSPQ b序PQSR c序 SPRQ d序SQRP

140. 1 When you ponder over
P that the only hope
Q you will realize
R of world peace lies
S the question deeply
6 in the United Nations
a序 QRSP b序SPQR c序 SQPR d序 RSPQ

DIRECTION (Q. 141 & 142): In the following question a series is given with one term missing Choose the correct alternative from the given ones that will complete the series:

141. One of the numbers does not fit into the series
Fin d th e wr ong number
15 20 45 145 565 2830
a序 20 b序45 c序 145 d序565

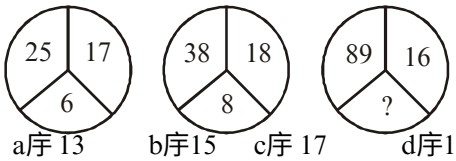
142. VWX BCD HIJ ?
a序 NOQ b序NOP c序 MNO d序OPQ

143. In a code language if TARGET is coded as 201187520 then the word WILLIUM will be coded as
a序 239121292113 b序 239121291213
c序 239122191213 d序 239121292213

144. Sanjay is taller than Suresh but shorter than Rakesh Rakesh is taller than Harish but shorter than Binit Who among is the tallest?
a序 Suresh b序 Sanjay
c序 Binit d序 Rakesh

145. In a row of 62 persons Rahul is 36th from left side of the row and Nitesh is 29th form the right si de of t h e r ow Fi n d out t h e n um ber of per son s sittin g between th em?
a序 1 b序2 c序 3 d序4

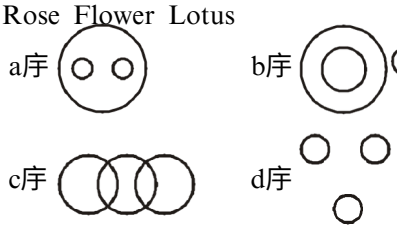
146. The missing number in the given figure is



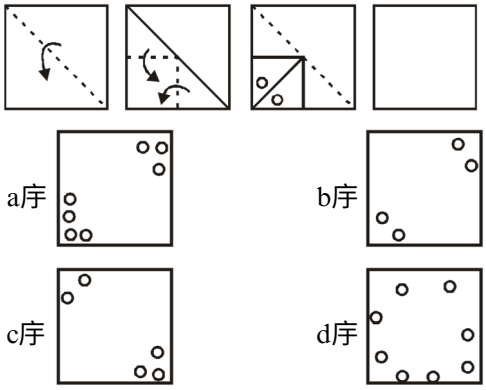
a序 13 b序15 c序 17 d序19

147. Select the combination of number so that the lett er s ar r a n g ed wil l from a mean in gful wor d
H N R C A B
1 2 3 4 5 6
a 2 5 3 4 1 b序 3 5 6 4 1
序 6 d序 2
c 4 1 5 6 2 6 3 5 2 4
序 3 1

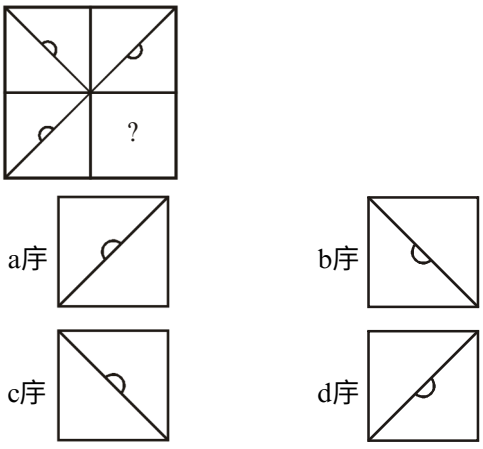
148. Which of the given Venn diagrams out of a 序 b序 c序 or d序 correctly represents the relationship among the following classes?
Rose Flower Lotus



149. A piece of paper is folded and a cut is made as shown below From the given responses indicate how it will appear when opened?



150. Which answer figure will complete the question figure?
Question figure



SOLUTIONS

PART - I : PHYSICS

1. (b)

2. (b) 3. (d)

4. (c)

5. (b)

6. (d)

7 (b
.)

8 (a
.)

9. (a)

10. (c)

12. (c)

13. (b) 14. (c)

15. (b)

16. (d)

17. (a)

18. (d)

19. (d)

20. (a)

22. (c)

23. (b)

24. (c)

25. (c)

27. (c)

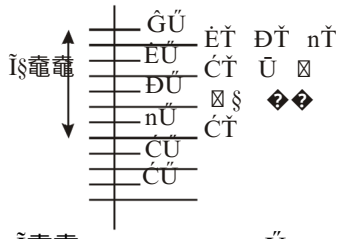
29. (c)

30. (a)

31. (b)

32. (b)

33. (d)



34. (d)

35. (d)

36. (a)

37. (b)

38. (c)

39. (a)

40. (b)

41. (d)

42. (d)

43. (b)

44. (c)

45. (d)

46. (b)

47. (c)

PART - II : CHEMISTRY

Ŷ öŪö§Í

σ1s σ*1s σ2s σ*2s σ2p

π2px = π2py π*2px = π*2py

Ť § § = × - Ý / n = ĆĀ-Ĩ / n = Đ / n = Ć / n

©§×ĆĢ§ §nÝ§©§ĆĖ

Ŷ öŪö§Í

σ1s σ*1s σ2s σ*2s σ2p π2px = π2py σ2p

Ť § §©§ × Ý / n = ĆĀ Ė / n = Ģ / n = Đ

48. (d) Ū § §§Đ§©§Āö

49. (a) ...

50. (c) §©§Đö§\§ è§©§ĆĀ Đ §©§Ģî \§ è§ ©§ ĆĀ Ģö§ ĆĀ Đ§ ö

51. (a) ...

52. (b) ... Ū ... n ... §è§Ū ... §è§

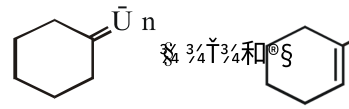
53. (a) ... ŰŪ Ū Ū Ū § ... ×... Ýö

54. (b) ...

55. (c) ... §Ō§ §Ō§ §Ō§ Ū § ... öî

Ū Đ > n -> -> -

56. (b) Ū ⟷ Ū ©

57. (c) 

58. (d) ... §©§Ć ... ö ... × ... Ý

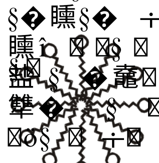
Ė p 3 / Đ × n Ý = Ģ p

59. (c) Đ = # = Ĝ ö Ć n Ć / n Ĝ Ā ĆĀĀĀ / ĜĆ ö n = Ā ö Ė #

60. (a) ö § §©§ Ŷ ö ĴĢĜĀĀ

ĆĀĨ ö ĮĨĀ / ĴĢĜĀĀ \ = ĴĢĜĀĀŪ

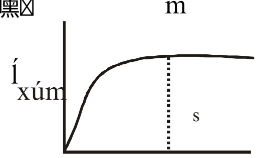
61. (d) ... × Ý § ... Ý § # ... î § ... Ť ... î § ... ö § ... Ť ö § ... Ë § # ... Ť ... î ...

62. (a) 

... ō ö ... §©§ k ... Ť n

63. (d) ... î § ...

$\frac{x}{m} = k\,C^{1/n}$ ... $\frac{x}{m}$ = k + $\frac{C}{n}$



... $\frac{x}{m}$ § ... §

©§ $\frac{C}{n}$

64. (b)

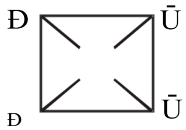
65. (b)

66. (a)

67. (c)

68. (c)

69. (a)



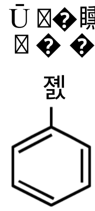
70. (b)

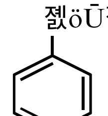
71. (c)

72. (d)

73. (b)

74. (a)

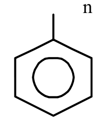




75. (d)

76. (d)

77. (d)



78. (d)

79. (a)

80. (c)

PART - III : MATHEMATICS

81. (c)

82. (c)

83. (c)

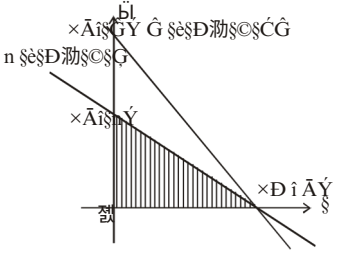
84. (b)

85. (c)

86. (d)

87. (d)

88. (d)



90. (d)

91. (b)

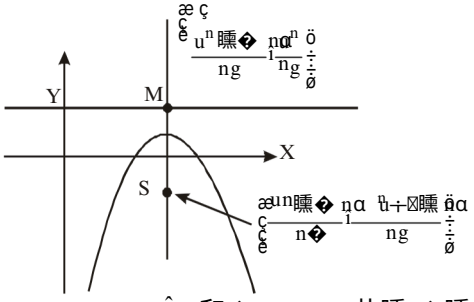
92. (b)

93. (c)

94. (d)

95. (a)

96. (d)



97. (b)

98. (b)

99. (b)

100. (c)

101. (b)

102. (a)

103. (c)

104. (d)

105. (b)

106. (b)

107. (d)

108. (a)

109. (b)

110. (d)

111. (c)

112. (b)

113. (a)

114. (c)

115. (c)

116. (c)

117. (a)

PART - IV : ENGLISH

118. (b)

119. (b)

120. (b)

121. (b)

122. (b)

123. (b)

124. (b)

125. (d)

126. (c)

127. (c)

128. (c)

129. (c)

130. (a)

131. (b)

134. (a)

135. (c)

136. (c) 137. (b) 138. (b) 139. (c)

140. (c)

141. (c)

143. (a)

144. (c)

145. (a)

146. (a)

147. (d) 148. (b)

150. (c)