BITSAT 2015 PAPER

(memory based)

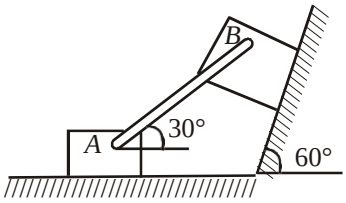
PHYSICS

1. An artificial satellite is moving in a circular orbit around the earth with a speed equal to half the magnitude of the escape velocity from the earth. The height (h) of the satellite above the earth's surface is (Take radius of earth as R_e)

(a) $h = R_e^2$ *(b)* $h = R_e$

(c) $h = 2R_e$ (d) $h = 4R_e$

2. In figure, two blocks are separated by a uniform strut attached to each block with frictionless pins. Block A weighs 400N, block B weighs 300N, and the strut AB weigh 200N. If $\mu = 0.25$ under B, determine the minimum coefficient of friction under A to prevent motion.



(a) 0.4 (b) 0.2 (c) 0.8 (d) 0.1

3. Two tuning forks with natural frequencies 340 Hz each move relative to a stationary observer. One fork moves away from the observer, while the other moves towards the observer at the same speed. The observer hears beats of frequency 3 Hz. Find the speed of the tuning forks.

(a) 1.5 m/s (b) 2 m/s (c) 1 m/s (d) 2.5 m/s

4. The displacement of a particle is given at time t, by:

$x = A\sin(-2\omega t) + B\sin^2 \omega t$ Then,

(a) the motion of the particle is SHM with an amplitude of $\sqrt{A^2 + \frac{B^2}{4}}$

(b) the motion of the particle is not SHM, but oscillatory with a time period of $T = \pi/\omega$

(c) the motion of the particle is oscillatory with a time period of $T = \pi/2\omega$

(d) the motion of the particle is a periodic.

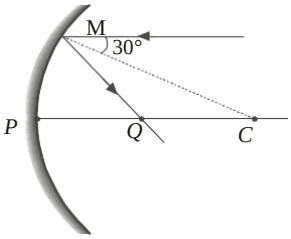
5. A ray parallel to principal axis is incident at 30° from normal on concave mirror having radius of curvature R. The point on principal axis where rays are focussed is Q such that PQ is

(b) $\frac{R}{2}$

(c) $\frac{R}{\sqrt{3}}$

(d) $\frac{2\sqrt{R} - R}{\sqrt{2}}$

(e) $R\left(1 - \frac{1}{\sqrt{3}}\right)$



6. A solid sphere of radius R has a charge Q distributed in its volume with a charge density $\rho = kr^a$, where k and a are constants and r is the distance from its centre. If the electric field at $r = \frac{R}{2}$ is $\frac{1}{8}$ times that at $r = R$, the value of a is

(a) 3 (b) 5 (c) 2 (d) 7

7. A charged particle moving in a uniform magnetic field and losses 4% of its kinetic energy. The radius of curvature of its path changes by

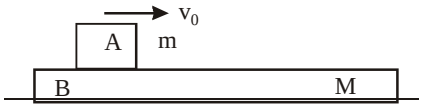
(a) 2% (b) 4% (c) 10% (d) 12%

8. Calculate the wavelength of light used in an interference experiment from the following data : Fringe width = 0.03 cm. Distance between the slits and eyepiece through which the interference pattern is observed is 1m. Distance between the images of the virtual source when a convex lens of focal length 16 cm is used at a distance of 80 cm from the eyepiece is 0.8 cm.

(a) 0.0006 Å (b) 0.0006m

(c) 600 cm (d) 6000 Å

9. The masses of blocks A and B are m and M respectively. Between A and B, there is a constant frictional force F and B can slide on a smooth horizontal surface. A is set in motion with velocity while B is at rest. What is the distance moved by A relative to B before they move with the same velocity?



(a) $\frac{mMv_0^2}{F(m-M)}$ (b) $\frac{mMv_0^2}{2F(m-M)}$

(c) $\frac{mMv_0^2}{F(m+M)}$ (d) $\frac{mMv_0^2}{2F(M+m)}$

10. An elastic string of unstretched length L and force constant k is stretched by a small length x. It is further stretched by another small length y. The work done in the second stretching is

(a) $1/2\ Ky^2$ (b) $1/2\ Ky(2x + y)$

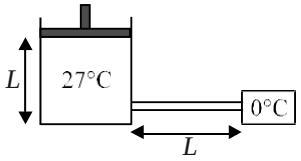
(c) $1/2\ K(x^2 + y^2)$ (d) $1/2\ k\,(x + y)^2$

11. A body is thrown vertically upwards from A, the top of the tower, reaches the ground in time t_1. If it is thrown vertically downwards from A with the same speed, it reaches the ground in time t_2. If it is allowed to fall freely from A, then the time it takes to reach the ground is given by

(a) $t = \frac{t_1 + t_2}{2}$ (b) $t = \frac{t_1 - t_2}{2}$

(c) $t = \sqrt{t_1 t_2}$ (d) $t = \sqrt{\frac{t_1}{t_2}}$

12. 0.5 mole of an ideal gas at constant temperature 27°C kept inside a cylinder of length L and cross-section area A closed by a massless piston.



The cylinder is attached with a conducting rod of length L , cross-section area (1/9) m^2 and thermal conductivity k, whose other end is maintained at 0°C. If piston is moved such that rate of heat flow through the conducing rod is constant then velocity of piston when it is at height $L/2$ from the bottom of cylinder is : [Neglect any kind of heat loss from system]

(a) $\left(\sqrt{\frac{k}{R}}\right)$ m/sec (b) $\left(\sqrt{\frac{k}{10R}}\right)$ m/sec

(c) $\left(\sqrt{\frac{k}{100R}}\right)$ m/sec (d) $\left(\sqrt{\frac{k}{1000R}}\right)$ m/ sec

13. A conducting square loop is placed in a magnetic field B with its plane perpendicular to the field. The sides of the loop start shrinking at a constant rate α. The induced emf in the loop at an instant when its side is 'a' is

(a) $2a\alpha B$ (b) $a^2\alpha B$ (c) $2a^2\alpha B$ (d) $a\alpha B$

14. The beam of light has three wavelengths 4144Å,4972Å and 6216 Å with a total intensity of 3.6×10^{-3} Wm^2 equally distributed amongst the three wavelengths. The beam falls normally on the area 1 cm^2 of a clean metallic surface of work function 2.3 eV. Assume that there is no loss of light by reflection and that each energetically capable photon ejects one electron. Calculate the number of photoelectrons liberated in 2s.

(a) 2×10^9 (b) 1.075×10^{12}

(c) 9×10^8 (d) 3.75×10^6

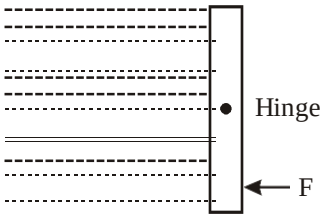
15. A square gate of size 1 m × 1m is hinged at its mid-point. A fluid of density ρ fills the space to the left of the gate. The force F required to hold the gate stationary is

(a) $\frac{\rho g}{3}$

(b) $\frac{\rho g}{2}$

(c) $\frac{\rho g}{6}$

(d) $\frac{\rho g}{8}$



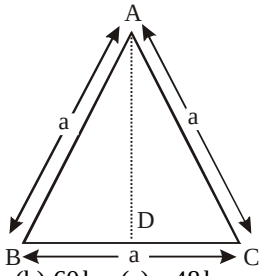
16. When 0.50 Å X-rays strike a material, the photoelectrons from the k shell are observed to move in a circle of radius 23 mm in a magnetic field of 2×10^{-2} tesla acting perpendicularly to the direction of emission of photoelectrons. What is the binding energy of k-shell electrons?

(a) 3.5 keV (b) 6.2 keV
(c) 2.9 keV (d) 5.5 keV

17. In CE transistor amplifier, the audio signal voltage across the collector resistance of 2 kΩ is 2 V. If the base resistance is 1kΩ and the current amplification of the transistor is 100, the input signal voltage is

(a) 2mV (b) 3mV (c) 10mV (d) 0.1mV

18. At the corners of an equilateral triangle of side a (1 metre), three point charges are placed (each of 0.1 C). If this system is supplied energy at the rate of 1 kw, then calculate the time required to move one of the mid-point of the line joining the other two.



(a) 50 h (b) 60 h (c) 48 h (d) 54 h

19. A vessel of volume 20L contains a mixture of hydrogen and helium at temperature of 27°C and pressure 2 atm. The mass of mixture is 5g. Assuming the gases to be ideal, the ratio of mass of hydrogen to that of helium in the given mixture will be

(a) 1 : 2 (b) 2 : 3 (c) 2 : 1 (d) 2 : 5

20. The resistance of a wire is *R*. It is bent at the middle by 180° and both the ends are twisted together to make a shorter wire. The resistance of the new wire is

(a) 2*R* (b) *R*/2 (c) *R*/4 (d) *R*/8

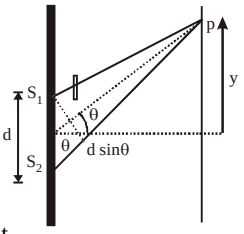
21. In a YDSE, the light of wavelength λ = 5000 Å is used, which emerges in phase from two slits a distance $d = 3 \times 10^{-7}$m apart. A transparent sheet of thickness $t = 1.5 \times 10^{-7}$m refractive index μ = 1.17 is placed over one of the slits. what is the new angular position of the central maxima of the interference pattern, from the centre of the screen? Find the value of y.

(a) 4.9°and $\frac{D(\mu-1)t}{2d}$

(b) 4.9°and $\frac{D(\mu-1)t}{d}$

(c) 3.9°and $\frac{D(\mu+1)t}{d}$

(d) 2.9°and $\frac{2D(\mu+1)t}{d}$



22. The position of a projectile launched from the origin at $t = 0$ is given by $\vec{r} = \left(40\hat{i} + 50\hat{j}\right)$m at $t =$ 2s. If the projectile was launched at an angle θ from the horizontal, then θ is
(take $g = 10\ ms^{-2}$)

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

(c) $\tan^{-1}\frac{7}{4}$ (d) $\tan^{-1}\frac{4}{5}$

23. Water is flowing on a horizontal fixed surface, such that its flow velocity varies with *y* (vertical direction) as

$v = k\left(\frac{2y^2}{a^2} - \frac{y^3}{a^3}\right)$. If coefficient of viscosity for water is η, what will be shear stress between layers of water at $y = a$.

(a) $\frac{\eta k}{a}$ (b) $\frac{\eta}{ka}$

(c) $\frac{\eta a}{k}$ (d) None of these

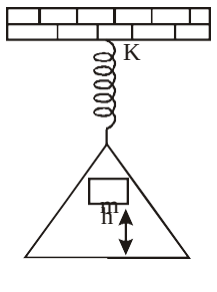
24. A load of mass m falls from a height h on to the scale pan hung from the spring as shown in the figure. If the spring constant is k and mass of the scale pan is zero and the mass m does not bounce relative to the pan, then the amplitude of vibration is

(a) mg/d

(b) $\frac{mg}{k}\sqrt{\left(1+\frac{2hk}{mg}\right)}$

(c) $\frac{mg}{k} + \frac{mg}{k}\sqrt{\left(1+\frac{2hk}{mg}\right)}$

(d) $\frac{mg}{k}\sqrt{\left(1+\frac{2hk}{mg}-\frac{mg}{k}\right)}$



25. In an ore containing uranium, the ratio of U^{238} to Pb^{206} is 3. Calculate the age of the ore, assuming that all the lead present in the ore is the final stable product of U^{238}. Take the half-life of U^{238} to be 4.5×10^9 yr.

(a) 1.6×19^3 yr (b) 1.5×10^4 yr

(c) 1.867×10^9 yr (d) 2×10^5 yr

26. A direct current of 5A is superposed on an alternating current $I = 10 \sin \omega t$ flowing through the wire. The effective value of the resulting current will be

(a) (15/2)A (b) $5\sqrt{3}$A

(c) $5\sqrt{5}$A (d) 15 A

27. A planoconvex lens fits exactly into a planoconcave lens. Their plane surface are parallel to each other. If the lenses are made of different materials of refractive indices μ_1 & μ_2 and R is the radius of curvature of the curved surface of the lenses, then focal length of combination is

(a) $\frac{R}{\mu_1 - \mu_2}$ (b) $\frac{2R}{\mu_1 - \mu_2}$

(c) $\frac{R}{2(\mu_1 - \mu_2)}$ (d) $\frac{R}{2-(\mu_1 + \mu_2)}$

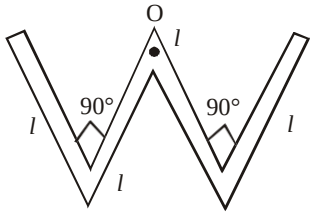
28. A thin rod of length 4l and mass 4m is bent at the points as shown in figure. What is the moment of inertia of the rod about the axis passes through point O and perpendicular to the plane of paper?

(a) $\frac{Ml^2}{3}$

(b) $\frac{10Ml^2}{3}$

(c) $\frac{Ml^2}{12}$

(d) $\frac{Ml^2}{24}$



29. One of the lines in the emission spectrum of Li^{2+} has the same wavelength as that of the 2nd line of Balmer series in hydrogen spectrum. The electronic transition corresponding to this line is $n = 12 \rightarrow n = x$. Find the value of x.

(a) 8 (b) 6 (c) 7 (d) 5

30. Two particles X and Y having equal charges, after being accelerated through the same potential difference, enter a region of uniform magnetic field and describe circular paths of radii R_1 and R_2, respectively. The ratio of masses of X and Y is

(a) $(R_1/R_2)^{1/2}$ (b) (R_2/R_1)

(c) $(R_1/R_2)^2$ (d) (R_1/R_2)

31. A glass capillary tube of internal radius r = 0.25 mm is immersed in water. The top end of the tube projected by 2 cm above the surface of the water. At what angle does the liquid meet the tube? Surface tension of water = 0.7 N/m.

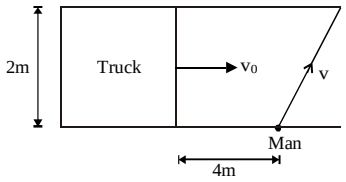
(a) $\theta = 90°$ (b) $\theta = 70°$

(c) $\theta = 45°$ (d) $\theta = 35°$

32. A particle of mass 2 m is projected at an angle of 45° with the horizontal with a velocity of $20\sqrt{2}$ m/s. After 1s, explosion takes place and the particle is broken into two equal pieces. As a result of explosion, one part comes to rest. The maximum height from the ground attained by the other part is

(a) 50 m (b) 25m (c) 40 m (d) 35m

33. A 2 m wide truck is moving with a uniform speed v_0 = 8 m/s along a straight horizontal road. A pedestrain starts to cross the road with a uniform speed v when the truck is 4 m away from him. The minimum value of v so that he can cross the road safely is



(a) 2.62 m/s (b) 4.6 m/s

(c) 3.57 m/s (d) 1.414 m/s

34. A neutron moving with speed v makes a head on collision with a hydrogen atom in ground state kept at rest. The minimum kinetic energy of the neutron for which inelastic collision takes place is

(a) 10.2 eV (b) 20.4 eV

(c) 12.1 eV (d) 16.8 eV

35. Vertical displacement of a Planck with a body of mass m on it is varying according to law $y = \sin \omega t + \sqrt{3} \cos \omega t$. The minimum value of $\omega$for which the mass just breaks off the Planck and the moment it occurs first after t = 0, are given by

(a) $\sqrt{g/2}, \frac{\sqrt{2}}{6}\frac{\pi}{\sqrt{g}}$ (b) $\frac{g}{\sqrt{2}}, \frac{2}{3}\sqrt{\pi/g}$

(c) $\sqrt{g/2}, \frac{\pi}{3}\sqrt{2/g}$ (d) $\sqrt{2g}, \sqrt{2\pi/3g}$

36. A parallel plate capacitor of capacitance C is connected to a battery and is charged to a potential difference V. Another capacitor of

capacitance 2C is similarly charge to a potential difference 2V. The charging battery is now disconnected and the capacitors are connected in parallel to each other in such a way that the positive terminal of one is connected to the negative terminal of the other. The final energy of the configuration is

(a) Zero (b) $\frac{3}{2}CV^2$

(c) $\frac{25}{6}CV^2$ (d) $\frac{9}{2}CV^2$

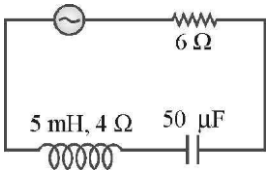
37. In the circuit shown below, the ac source has voltage $V = 20\cos(\omega t)$ volt with $\omega = 2000$ rad/s. The amplitude of the current will be nearest to

(a) 2A

(b) 3.3A

(c) $2/\sqrt{5}$A

(d) $\sqrt{5}$A



38. A constant voltage is applied between the two ends of a uniform metallic wire. Some heat is developed in it. The heat developed is doubled if

(a) both the length and the radius of the wire are halved.

(b) both the length and the radius of the wire are doubled.

(c) the radius of the wire is doubled.

(d) the length of the wire is doubled.

39. The frequency of a sonometer wire is 100 Hz. When the weights producing the tensions are completely immersed in water, the frequency becomes 80 Hz and on immersing the weights in a certain liquid, the frequency becomes 60 Hz. The specific gravity of the liquid is

(a) 1.42 (b) 1.77 (c) 1.82 (d) 1.21

40. A long straight wire along the Z-axis carries a current I in the negative Z-direction. The magnetic vector field $\vec{B}$ at a point having coordinates (x, y) in the $Z = 0$ plane is

(a) $\frac{\mu_0 I\left(y\hat{i} - x\hat{j}\right)}{2\pi\left(x^2 + y^2\right)}$ (b) $\frac{\mu_0 I\left(x\hat{i} + y\hat{j}\right)}{2\pi\left(x^2 + y^2\right)}$

(c) $\frac{\mu_0 I\left(x\hat{j} - y\hat{i}\right)}{2\pi\left(x^2 + y^2\right)}$ (d) $\frac{\mu_0 I\left(x\hat{i} - y\hat{j}\right)}{2\pi\left(x^2 + y^2\right)}$

CHEMISTRY

41. Which of the following pollutants is main product of automobiles exhaust?

(a) C O (b) CO_2

(c) NO (d) Hydrocarbons

42. The disease caused the high concentration of hydrocarbon pollutants in atmosphere is/are

(a) silicosis (b) TB

(c) cancer (d) asthma

43. The element, with atomic number 118, will be

(a) alkali (b) noble gas

(c) lanthanide (d) transition element

44. Which law of the thermodynamics helps in calculating the absolute entropies of various substances at different temperatures?

(a) First law (b) Second law

(c) Third law (d) Zeroth law

45. The color of $CoCl_3.5NH_3.H_2O$ is

(a) red (b) orange

(c) orange - yellow (d) pink

46. The metal present in vitamin B_{12} is

(a) magnesium (b) cobalt

(c) copper (d) zinc

47. Cobalt (60) isotope is used in the treatment of :

(a) Heart diseases (b) Skin diseases

(c) Diabetes (d) Cancer

48. Polymer used in bullet proof glass is

(a) Lexan (b) PMMA

(c) Nomex (d) Kevlar

49. What is the correct increasing order of Bronsted bases?

(a) $ClO_4^- < ClO_3^- < ClO_2^- < ClO^-$

(b) $ClO_4^- > ClO_3^- > ClO_2^- > ClO^-$

(c) $ClO_3^- < ClO_4^- < ClO_2^- < ClO^-$

(d) $ClO^- > ClO_3^- > ClO_2^- < ClO_4^-$

50. The boiling point of alkyl halide are higher than those of corresponding alkanes because of

(a) dipole-dipole interaction

(b) dipole-induced dipole interaction

(c) H-bonding

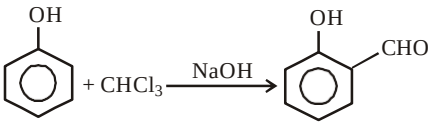
(d) None of the above

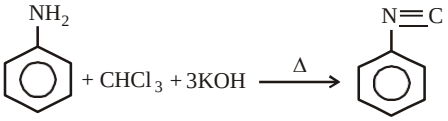
51. Some salts containing two different metallic elements give test for only one of them in solution, such salts are

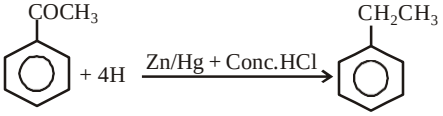
(a) double salts (b) normal salts

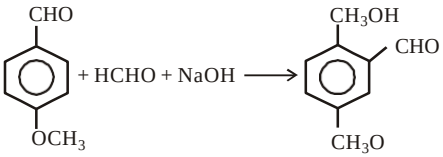
(c) complex salts (d) None of these

52. The carbylamine reaction is

(a) 

(b) 

(c) 

(d) 

53. Laughing gas is
(a) nitrogen pentoxide
(b) nitrous oxide
(c) nitrogen trioxide
(d) nitric oxide

54. The anthracene is purified by
(a) crystallisation (b) filtration
(c) distillation (d) sublimation

55. The common name of $K[PtCl_3(\eta^2.C_2H_4)]$ is
(a) potassium salt (b) Zeise's salt
(c) complex salt (d) None of these

56. The by product of Solvay-ammonia process is
(a) CO_2 (b) NH_3 (c) $CaCl_2$ (d) $CaCO_3$

57. Semiconductor materials like Si and Ge are usually purified by
(a) distillation (b) zone refining
(c) liquation (d) electrolytic refining

58. Which of the following is a strong base?
(a) PH_3 (b) AsH_3 (c) NH_3 (d) SbH_3

59. Ordinary glass is :
(a) Sodium silicate
(b) Calcium silicate
(c) Sodium and calcium silicate
(d) Mixed salt of Na and Ca

60. The prefix 10^{18} is
(a) giga (b) kilo (c) exa (d) nano

61. Which of the following is the most basic oxide?
(a) Sb_2O_3 (b) Bi_2O_3 (c) SeO_2 (d) Al_2O_3

62. Which one of the following does not follow octate rule?
(a) PF_3 (b) BF_3 (c) CO_2 (d) CCl_4

63. Which of the following according to Le-Chatelier's principle is correct?
(a) Increase in temperature favours the endothermic reaction
(b) Increase in temperature favours the exothermic reaction
(c) Increase in pressure shifts the equilibrium in that side in which number of gaseous moles increases
(d) All of the above are true

64. The efficiency of fuel cell is given by the expression, η is
(a) $\eta = -\frac{nFE_{cell}}{\Delta H} \times 100$
(b) $\eta = -\frac{nFE_{cell}}{\Delta S} \times 100$
(c) $\eta = -\frac{nFE_{cell}}{\Delta A} \times 100$
(d) None of the above

65. The mass of the substance deposited when one Faraday of charge is passed through its solution is equal to
(a) relative equivalent weight
(b) gram equivalent weight
(c) specific equivalent weight
(d) None of the above

66. The unit of rate constant for reactions of second order is
(a) $L\ mol^{-1}s^{-1}$ (b) $L^{-1}\ mol\ s^{-1}$
(c) $L\ mol\ s^{-1}$ (d) s^{-1}

67. In a first order reaction with time the concentration of the reactant decreases
(a) linearly (b) exponentially
(c) no change (d) None of these

68. The P—P—P angle in P_4 molecule and S—S—S angle in S_8 molecule is(in degree) respectively
(a) 60°, 107° (b) 107°, 60°
(c) 40°, 60° (d) 60°, 40°

69. The number of elements present in the d-block of the periodic table is
(a) 40 (b) 41 (c) 45 (d) 46

70. Which of the following represents hexadentate ligand?
(a) EDTA (b) DMG
(c) Ethylenediamine (d) None of the above

71. Which one of given elements shows maximum number of different oxidation states in its compounds?
(a) Am (b) Fm (c) La (d) Gd

72. $K_4[Fe(CN)_6]$ is used in detecting.

(a) Fe^{3+} ion (b) Cu^{+} ion
(c) Cu^{3+} ion (d) Fe^{2+} ion

73. A spontaneous reaction is impossible if
(a) both ΔH and ΔS are negative
(b) both ΔH and ΔS are positive
(c) ΔH is negative and ΔS is positive
(d) ΔH is positive and ΔS is negative

74. Which one the following removes temporary hardness of water ?
(a) Slaked lime (b) Plaster of Paris
(c) Epsom (d) Hydrolith

75. Graphite is a
(a) molecular solid (b) covalent solid
(c) ionic solid (d) metallic solid

76. Which of the following ionic substances will be most effective in precipitating the sulphur sol?
(a) KCl (b) $BaCl_2$
(c) $Fe_2(SO_4)_3$ (d) Na_3PO_4

77. Which of the following fluorides of xenon is impossible?
(a) XeF_2 (b) XeF_3 (c) XeF_4 (d) XeF_6

78. Thomas slag is
(a) $Ca_3(PO_4)_2$
(b) $CaSiO_3$
(c) Mixture of (a) and (b)
(d) $FeSiO_3$

79. A sequence of how many nucleotides in messenger RNA makes a codon for an amino acid?
(a) Three (b) Four (c) One (d) Two

80. Which of the following molecule/ion has all the three types of bonds, electrovalent, covalent and co-ordinate :
(a) HCl (b) NH_4^+
(c) Cl^- (d) H_2O_2

ENGLISH PROFICIENCY

DIRECTIONS (Qs. 81-83): Choose the word which best expreses the meaning of the underlined word in the sentence.

81. Decay is an <u>immutable</u> factor of human life.
(a) important (b) unique
(c) unchangeable (d) awful

82. It was an <u>ignominious</u> defect for the team.
(a) shameful (d) admirable
(c) unaccountable (d) worthy

83. The attitude of western countries towards the third world countries is rather <u>callous</u> to say the least.
(a) cursed (d) unkend
(c) unfeeling (d) passive

DIRECTIONS (Qs. 84-86): Fill in the blank.

84. Freedom and equality are the_____rights of every human.
(a) inalienable (b) inscrutable
(c) incalculable (d) institutional

85. The team was well trained and strong, but some how their_____was low.
(a) morale (d) moral
(c) feeling (d) consciousness

86. His speech was disappointing: it_____ all the major issues.
(a) projected (b) revealed
(c) skirted (d) analysed

DIRECTIONS (Qs. 87-89): Choose the word which is closest to the opposite in meaning of the underlined word in the sentence.

87. Hydra is biologically believed to be immortal.
(a) undying (b) perishable
(c) ancient (d) eternal

88. The Gupta rulers <u>patronised</u> all cultural activities and thus Gupta period was called the golden era in Indian History.
(a) criticised (b) rejected
(c) opposed (d) spurned

89. The General Manager is quete <u>tactful</u> and handles the workers union very effectively.
(a) incautious (b) discreet
(c) strict (d) disciplined

DIRECTIONs (Qs. 90-92): In each ot the following questions, out of the four alternatives, choose the one which can be substituted for the given words/ sentence.

90. A person who does not believe in any religion
(a) Philatelist (b) Rationalist
(c) Atheist (d) Pagan

91. A person who believes that pleasure is the chief good
(a) Stoic (d) Hedonist
(c) Epicure (d) Sensual

92. A person who is incharge of museum.
(a) caretaker (b) warden
(c) supervisor (d) curator

DIRECTIONS (Qs. 93-95): Choose the order of the sentences marked A, B, C, D and E to form a logical paragraph.

93. A. Tasty and healthy food can help you bring out their best.
B. One minute they are toddlers and next you see them in their next adventure.
C. Your young ones seem to be growing so fast.

D. Being their loving custodians, you always want to see them doing well.
E. Their eye sparkle with curiosity and endless questions on their tongues.

Codes

(a) DBCEA (b) CADEB
(c) CBEDA (d) ECABD

94. A. It is hoping that overseas friends will bring in big money and lift the morale of the people.
B. But a lot needs to be done to kick start industrial revival.
C. People had big hopes from the new government.
D. So far government has only given an incremental push to existing policies and programmes.
E. Government is to go for big time reforms, which it promised.

Codes

(a) BCDAE (b) EADCB
(c) DABCE (d) CDEAB

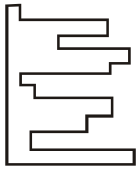
95. A : Forecasting the weather has always been a defficult business.
B : During a period of drought, steams and rivers dried up, the cattle died from thirst and were ruined.
C : Many different things affect the weather and we have to study them carefully to make accurate forecast.
D : Ancient egyptians had no need of weather in the Nille valley hardly ever changes.
E: In early times, when there were no instruments, such as their mometer or the barometer, a man looked for tell tale signs in the sky.

(a) ABDCE (b) EDCBA
(c) ACBDE (d) BDCAE

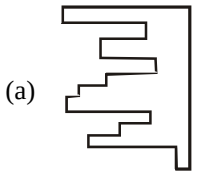
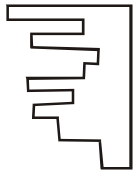
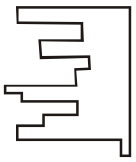
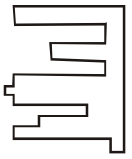
LOGICAL REASONING

96. Choose the correct answer figure which will make a complete square on joining with the problem figure

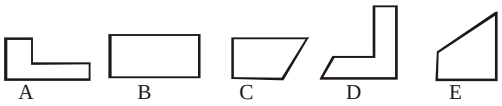
Problem figure



Answer Figures

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

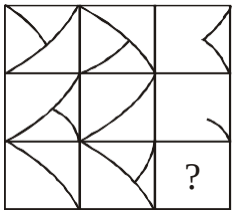
97. In the following question, five figures are given. Out of them, find the three figures that can be joined to form square.



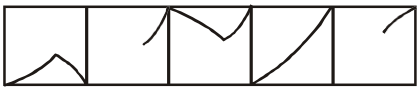
(a) ABC (b) BCD
(c) ACE (d) CDE

98. Choose the answer figure which completes the problem figure matrix.

Problem Figures

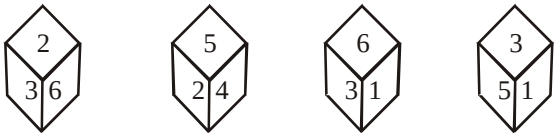


Answer Figures



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

99. What is the opposite of 3, if four different positions of dice are as shown below :



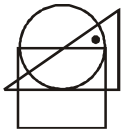
(i) (ii) (iii) (iv)

(a) 6 (b) 4 (c) 1 (d) 2

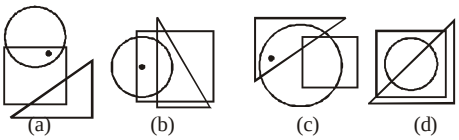
100. In the following questions, one or more dots are placed in the figure marked as (A). The figure is followed by four alternatives marked as (a), (b), (c) and (d). One out of these four options

contains region(s) common to the circle, square, triangle, similar to that marked by the dot in figure (A).

Problem Figure



(A)



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

101. Complete the series by replaing '? mark

G4T, J9R, M20P, P43N, S90L

(a) S90L (b) V185J (c) M20P (d) P43N

102. Neeraj starts walking towards South. After walking 15 m, he turns towards North. After walking 20 m, he turns towards East and walks 10 m. He then turns towards South and walks 5 m. How far is he from his original position and in which direction?

(a) 10 m, East (b) 10 m, South-East

(c) 10 m, West (d) 10 m, North-East

103. The average age of 8 men is increased by 2 yr when one of them whose age is 20 yr is replaced by a new man. What is the age of the new man

(a) 28 yr (b) 36 yr (c) 34 yr (d) 35 yr

104. Shikha is mother-in-law of Ekta who is sister-in-law of Ankit. Pankaj is father of Sanjay, the only brother of Ankit. How is Shikha related to Ankit?

(a) Mother-in-law (b) Aunt

(c) Wife (d) Mother

105. In a queue of children, Arun is fifth from the left and Suresh is sixth from the right. When they interchange their places among themselves, Arun becomes thirteenth from the left. Then, what will be Suresh's position from the right?

(a) 8th (b) 14th (c) 15th (d) 16th

MATHEMATICS

106. $\lim\limits_{x\to\infty} \dfrac{\int_0^{2x} xe^{x^2}dx}{e^{4x^2}}$ equals

(a) 0 (b) ∞ (c) 2 (d) $\frac{1}{2}$

107. If ω is the complex cube root of unity, then the value of $\omega+\omega^{\left(\frac{1}{2}+\frac{3}{8}+\frac{9}{32}+\frac{27}{128}+\ldots\right)}$ is

(a) -1 (b) 1 (c) $-i$ (d) i

108. The root of the equation

$2(1+i)x^2-4(2-i)x-5-3i=0$ which has greater modulus is

(a) $\dfrac{3-5i}{2}$ (b) $\dfrac{5-3i}{2}$

(c) $\dfrac{3-i}{2}$ (d) none

109. The value of $\frac{3}{4}+\frac{15}{16}+\frac{63}{64}+\ldots$ upto n terms is

(a) $n-\dfrac{4^n}{3}-\dfrac{1}{3}$ (b) $n+\dfrac{4^{-n}}{3}-\dfrac{1}{3}$

(c) $n+\dfrac{4^n}{3}-\dfrac{1}{3}$ (d) $n-\dfrac{4^{-n}}{3}+\dfrac{1}{3}$

110. The period of $\tan 3\theta$ is

(a) π (b) $3\pi/4$

(c) $\pi/2$ (d) None of these

111. If a function f(x) is given by

$$f(x)=\frac{x}{1+x}+\frac{x}{(x+1)(2x+1)}+\frac{x}{(2x+1)(3x+1)}+\infty$$, then at x = 0, f(x)

(a) has no limit

(b) is not continuous

(c) is continuous but not differentiable

(d) is differentiable

112. If g is the inverse of function f and $f'(x)=\sin x$, then $g'(x)$ is equal to

(a) cosec {g(x)} (b) sin {g(x)}

(c) $\dfrac{1}{\sin\{g(x)\}}$ (d) None of these

113. A bag contains (2n + 1) coins. It is known that n of these coins have a head on both sides, whereas the remaining (n + 1) coins are fair. A coin is picked up at random from the bag and tossed. If the probability that the toss results in a head is 31/42, then n is equal to

(a) 10 (b) 11 (c) 12 (d) 13

114. If $\phi(x)$ is a differential function, then the solution of the differential equation $dy + \{y\phi'(x) - \phi(x)\phi'(x)\}dx = 0$, is

(a) $y = \{\phi(x) - 1\} + Ce^{-\phi(x)}$

(b) $y\phi(x) = \{\phi(x)\}^2 + C$

(c) $ye^{\phi(x)} = \phi(x)e^{\phi(x)} + C$

(d) $y - \phi(x) = \phi(x)e^{-\phi(x)}$

115. The area of the region $R = \{(x, y): |x| \le |y| \text{ and } x^2 + y^2 \le 1\}$ is

(a) $\frac{3\pi}{8}$ sq units (b) $\frac{5\pi}{8}$ sq units

(c) $\frac{\pi}{2}$ sq units (d) $\frac{\pi}{8}$ sq unit

116. Universal set,

$U = \{x \mid x^5 - 6x^4 + 11x^3 - 6x^2 = 0\}$

$A = \{x \mid x^2 - 5x + 6 = 0\}$

$B = \{x \mid x^2 - 3x + 2 = 0\}$

What is $(A \cap B)'$ equal to ?

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

(c) $\{0, 1, 3\}$ (d) $\{0, 1, 2, 3\}$

117. If $\cos^{-1} x - \cos^{-1} \frac{y}{2} = \alpha$,

then $4x^2 - 4xy \cos\alpha + y^2$ is equal to

(a) $2 \sin 2\alpha$ (b) 4

(c) $4 \sin^2\alpha$ (d) $-4 \sin^2\alpha$

118. If $\frac{e^x + e^{5x}}{e^{3x}} = a_0 + a_1x + a_2x^2 + a_3x^3 + \ldots$ then the value of $2a_1 + 2^3a_3 + 2^5a_5 + \ldots$ is

(a) $e^2 + e^{-2}$ (b) $e^4 - e^{-4}$

(c) $e^4 + e^{-4}$ (d) 0

119 Let a, b and c be three vectors satisfying $a \times b = (a \times c)$, $|a| = |c| = 1$, $|b| = 4$ and $|b \times c| = \sqrt{15}$. If $b - 2c = \lambda a$, then λ equals

(a) 1 (b) – 1 (c) 2 (d) – 4

120. The total number of 4-digit numbers in which the digits are in descending order, is

(a) $^{10}C_4 \times 4!$ (b) $^{10}C_4$

(c) $\frac{10!}{4!}$ (d) None of these

121. The line which is parallel to X-axis and crosses the curve $y = \sqrt{x}$ at an angle of 45°, is

(a) $x = \frac{1}{4}$ (b) $y = \frac{1}{4}$

(c) $y = \frac{1}{2}$ (d) $y = 1$

122. In a ΔABC, the lengths of the two larger sides are 10 and 9 units, respectively. If the angles are in AP, then the length of the third side can be

(a) $5 \pm \sqrt{6}$ (b) $3\sqrt{3}$

(c) 5 (d) None of these

123. The arithmetic mean of the data 0, 1, 2, ..., n with frequencies $1, {}^nC_1, {}^nC_2, \ldots, {}^nC_n$ is

(a) n (b) $\frac{2^n}{n}$ (c) n + 1 (d) $\frac{n}{2}$

124. The mean square deviation of a set of n observation $x_1, x_2, \ldots x_n$ about a point c is defined as $\frac{1}{n}\sum_{i=1}^{n}(x_i - c)^2$.

The mean square deviations about – 2 and 2 are 18 and 10 respectively, the standard deviation of this set of observations is

(a) 3 (b) 2

(c) 1 (d) None of these

125. Let S be the focus of the parabola $y^2 = 8x$ and PQ be the common chord of the circle $x^2 + y^2 - 2x - 4y = 0$ and the given parabola. The area of ΔPQS is

(a) 4 sq units (b) 3 sq units

(c) 2 sq units (d) 8 sq units

126. The number of real roots of the equation $e^{x-1} + x - 2 = 0$ is

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

127. Minimise $Z = \sum_{j=1}^{n}\sum_{i=1}^{m} c_{ij}\, x_{ij}$

Subject to $\sum_{i=1}^{m} x_{ij} = b_j,\ j = 1, 2, ..., n$

$\sum_{j=1}^{n} x_{ij} = b_j, i = 1, 2, ..., m$ is a LPP with number of constraints

(a) $m - n$ (b) mn (c) $m + n$ (d) $\frac{m}{n}$

128. A bag contains 3 red and 3 white balls. Two balls are drawn one by one. The probability that they are of different colours is.

(a) 3/10 (b) 2/5

(c) 3/5 (d) None of these

129. Let M be a 3×3 non-singular matrix with $\det(M) = \alpha$. If $[M^{-1}\ \text{adj}\ (\text{adj}\ (M)] = KI$, then the value of K is

(a) 1 (b) α (c) α^2 (d) α^3

130. Tangents are drawn from the origin to the curve $y = \cos x$. Their points of contact lie on

(a) $x^2y^2 = y^2 - x^2$ (b) $x^2y^2 = x^2 + y^2$

(c) $x^2y^2 = x^2 - y^2$ (d) None of these

131. The slope of the tangent to the curve $y = e^x \cos x$ is minimum at $x = \alpha$, $0 \le a \le 2\pi$, then the value of α is

(a) 0 (b) π (c) 2π (d) $3\pi/2$

132. Two lines $L_1 : x = 5, \frac{y}{3-\alpha} = \frac{z}{-2}$

$L_2 : x = \alpha, \frac{y}{-1} = \frac{z}{2-\alpha}$ are coplanar. Then, α can take value (s)

(a) 1, 4, 5 (b) 1, 2, 5

(c) 3, 4, 5 (d) 2, 4, 5

133. The eccentricity of an ellipse, with its centre at the origin, is 1/2. If one of the directrices is $x = 4$, then the equation of the ellipse is:

(a) $4x^2 + 3y^2 = 1$ (b) $3x^2 + 4y^2 = 12$

(c) $4x^2 + 3y^2 = 12$ (d) $3x^2 + 4y^2 = 1$

134. The function $f(x) = \frac{x}{2} + \frac{2}{x}$ has a local minimum at

(a) $x = 2$ (b) $x = -2$ (c) $x = 0$ (d) $x = 1$

135. If $y = (x + \sqrt{1+x^2})^n$, then $(1 + x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx}$ is

(a) n^2y (b) $-n^2y$ (c) $-y$ (d) $2x^2y$

136. If $\lim_{x\to\infty} x \sin f\left(\frac{1}{x}\right) = A$ and $\lim_{x\to 0} x \sin f\left(\frac{1}{x}\right) = B$, then which one of the following is correct?

(a) A = 1 and B = 0 (b) A = 0 and B = 1

(c) A = 0 and B = 0 (d) A = 1 and B = 1

137. If a and b are non-zero roots of $x^2 + ax + b = 0$ then the least value of $x^2 + ax + b$ is

(a) $\frac{2}{3}$ (b) $-\frac{9}{4}$ (c) $\frac{9}{4}$ (d) 1

138. If $0 < x < \frac{\pi}{2}$, then

(a) $\tan x < x < \sin x$

(b) $x < \sin x < \tan x$

(c) $\sin x < \tan x < x$

(d) None of the above

139. The degree of the differential equation satisfying

$\sqrt{1 - x^2} + \sqrt{1 + y^2} = a(x - y)$ is

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

140. Let f(x) be a polynomial of degree three satisfying $f(0) = -1$ and $f(1) = 0$. Also, 0 is a stationary point of f(x). If f(x) does not have an extremum at $x = 0$, then the value of $\int \frac{f(x)}{x^3 - 1}\, dx$ is

(a) $\frac{x^2}{2} + C$ (b) $x + C$

(c) $\frac{x^3}{6} + C$ (d) None of these

141. The domain of the function

$f(x) = \frac{\sin^{-1}(x-3)}{\sqrt{9 - x^2}}$ is

(a) [1, 2] (b) [2, 3)

(c) [1, 2] (d) [2, 3]

142. If the lines $p_1x + q_1y = 1$, $p_2x + q_2y = 1$ and $p_3x + q_3y = 1$ be concurrent, then the points (p_1, q_1), (p_2, q_2) and (p_3, q_3)

(a) are collinear

(b) form an equilateral triangle

(c) form a scalene triangle

(d) form a right angled triangle

143. Area of the circle in which a chord of length $\sqrt{2}$ makes an angle $\pi/2$ at the centre, is

(a) $\pi/2$ sq units (b) 2π sq units

(c) π sq units (d) $\pi/4$ sq units

144. If $\frac{\cos A}{\cos B} = n$, $\frac{\sin A}{\sin B} = m$, then the value of $(m^2 - n^2)\sin^2 B$ is

(a) $1 + n^2$ (b) $1 - n^2$ (c) n^2 (d) $-n^2$

145. If complex number z_1, z_2 and 0 are vertices of equilateral triangle, then $z_1^2 + z_2^2 - z_1 z_2$ is equal to

(a) 0 (b) $z_1 - z_2$ (c) $z_1 + z_2$ (d) 1

146. If $\rho = \{(x, y) | x^2 + y^2 = 1; x, y \in R\}$. Then, ρ is

(a) reflexive (b) symmetric

(c) transitive (d) anti-symmetric

147. A line makes the same angle θ with each of the X and Z-axes. If the angle β, which it makes with Y-axis, is such that $\sin^2\beta = 3\sin^2\theta$, then $\cos^2\theta$ equals

(a) 2/5 (b) 1/5 (c) 3/5 (d) 2/3

148. If in a binomial distribution $n = 4$, $P(X = 0) = \frac{16}{81}$, then $P(X = 4)$ equals

(a) $\frac{1}{16}$ (b) $\frac{1}{81}$ (c) $\frac{1}{27}$ (d) $\frac{1}{8}$

149. Let $f : R \to R$ be a function such that

$f(x + y) = f(x) + f(y)$, $\forall\ x, y \in R$

If $f(x)$ is differentiable at $x = 0$, then which one of the following is incorrect?

(a) $f(x)$ is continuous, $\forall x \in R$

(b) $f'(x)$ is constant, $\forall x \in R$

(c) $f(x)$ is differentiable, $\forall x \in R$

(d) $f(x)$ is differentiable only in a finite interval containing zero.

150. If binomial coefficients of three consecutive terms of $(1 + x)^n$ are in HP, then the maximum value of n is

(a) 1 (b) 2

(c) 0 (d) None of these

Physics							
Question No	**Answer Key**	**Question No**	**Answer Key**	**Question No**	**Answer Key**	**Question No**	**Answer Key**
1	b	11	c	21	b	31	b
2	a	12	c	22	c	32	d
3	a	13	a	23	a	33	c
4	a	14	b	24	b	34	b
5	d	15	c	25	c	35	a
6	c	16	b	26	b	36	b
7	a	17	c	27	a	37	a
8	d	18	a	28	b	38	b
9	d	19	d	29	b	39	b
10	b	20	c	30	c	40	a
Chemistry							
Question No	**Answer Key**	**Question No**	**Answer Key**	**Question No**	**Answer Key**	**Question No**	**Answer Key**
41	c	51	c	61	b	71	a
42	c	52	b	62	b	72	a
43	b	53	b	63	a	73	d
44	c	54	d	64	a	74	a
45	d	55	b	65	b	75	b
46	b	56	c	66	a	76	c
47	d	57	b	67	b	77	b
48	b	58	c	68	a	78	c
49	a	59	c	69	a	79	a
50	a	60	c	70	a	80	b
English Proficiency & Logical Reasoning							
Question No	**Answer Key**	**Question No**	**Answer Key**	**Question No**	**Answer Key**		
81	c	91	c	101	b		
82	a	92	d	102	a		
83	c	93	c	103	b		
84	a	94	d	104	d		
85	a	95	c	105	b		
86	c	96	c				
87	b	97	c				
88	c	98	b				
89	a	99	b				
90	c	100	c				
Mathematics							
Question No	**Answer Key**	**Question No**	**Answer Key**	**Question No**	**Answer Key**		
106	d	121	c	136	a		
107	a	122	a	137	b		
108	a	123	d	138	d		
109	b	124	a	139	a		
110	d	125	a	140	b		
111	b	126	a	141	b		
112	c	127	c	142	a		
113	a	128	c	143	c		
114	a	129	b	144	b		
115	c	130	c	145	a		

116	c	131	b	146	b		
117	c	132	a	147	c		
118	d	133	b	148	b		
119	d	134	d	149	d		
120	b	135	a	150	d		