BITSAT 2022 Paper
(memory based)

PHYSICS

1. Four point charges $-Q$, $-q$, $2q$ and $2Q$ are placed, one at each corner of the square. The relation between Q and q for which the potential at the centre of the square is zero is :

(a) $Q = -q$ (b) $Q = -\frac{1}{q}$

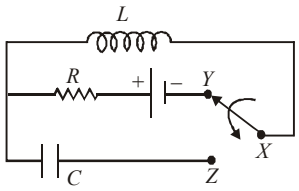
(c) $Q = q$ (d) $Q = \frac{1}{q}$

2. Two long parallel wires carry equal current i flowing in the same direction are at a distance 2d apart. The magnetic field B at a point lying on the perpendicular line joining the wires and at a distance x from the midpoint is –

(a) $\frac{\mu_0 id}{\pi\left(d^2 + x^2\right)}$ (b) $\frac{\mu_0 ix}{\pi\left(d^2 - x^2\right)}$

(c) $\frac{\mu_0 ix}{\left(d^2 + x^2\right)}$ (d) $\frac{\mu_0 id}{\left(d^2 + x^2\right)}$

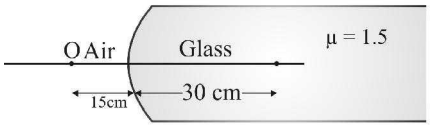
3. In the circuit shown, the symbols have their usual meanings. The cell has emf E. X is initially joined to Y for a long time. Then, X is joined to Z. The maximum charge on C at any later time will be



(a) $\frac{E}{R\sqrt{LC}}$ (b) $\frac{ER}{2\sqrt{LC}}$

(c) $\frac{E\sqrt{LC}}{2R}$ (d) $\frac{E\sqrt{LC}}{R}$

4. A point object O is placed in front of a glass rod having spherical end of radius of curvature 30 cm. The image would be formed at



(a) 30 cm left (b) infinity

(c) 1 cm to the right (d) 18 cm to the left

5. In Young's double slit experiment, $\lambda = 500$nm, d = 1mm, D = 1m. Minimum distance from the central maximum for which intensity is half of the maximum intensity is

(a) 2.5×10^{-4} m (b) 1.25×10^{-4} m

(c) 0.625×10^{-4} m (d) 0.3125×10^{-4} m

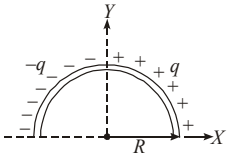
6. What is the voltage gain in a common emitter amplifier, where input resistance is 3 Ω and load resistance 24 Ω, $\beta = 0.6$?
(a) 8.4 (b) 4.8 (c) 2.4 (d) 480

7. The acceleration due to gravity on the surface of the moon is 1/6 that on the surface of earth and the diameter of the moon is one-fourth that of earth. The ratio of escape velocities on earth and moon will be
(a) $\frac{\sqrt{6}}{2}$ (b) $\sqrt{24}$ (c) 3 (d) $\frac{\sqrt{3}}{2}$

8. Given $\vec{P} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ and $\vec{Q} = \hat{j} - 2\hat{k}$. The magnitude of their resultant is
(a) $\sqrt{3}$ (b) $2\sqrt{3}$ (c) $3\sqrt{3}$ (d) $4\sqrt{3}$

9. A particle of mass m executes simple harmonic motion with amplitude a and frequency ν. The average kinetic energy during its motion from the position of equilibrium to the end is
(a) $2\pi^2 ma^2\nu^2$ (b) $\pi^2 ma^2\nu^2$
(c) $\frac{1}{4}ma^2\nu^2$ (d) $4\pi^2 ma^2\nu^2$

10. The dipole moment of the given charge distribution is
(a) $-\frac{4Rq}{\pi}\hat{i}$
(b) $\frac{4Rq}{\pi}\hat{i}$
(c) $-\frac{2Rq}{\pi}\hat{i}$ (d) $\frac{2Rq}{\pi}\hat{i}$



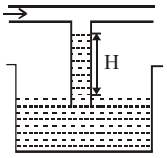
11. At a place, if the earth's horizontal and vertical components of magnetic fields are equal, then the angle of dip will be
(a) 30° (b) 90° (c) 45° (d) 0°

12. The third line of Balmer series of an ion equivalnet to hydrogen atom has wavelength of 108.5 nm. The ground state energy of an electron of this ion will be
(a) 3.4 eV (b) 13.6 eV
(c) 54.4 eV (d) 122.4 eV

13. The binding energy per nucleon of ^{10}X is 9 MeV and that of ^{11}X is 7.5 MeV where X represents an element. The minimum energy required to remove a neutron from ^{11}X is
(a) 7.5 MeV (b) 2.5 MeV
(c) 8 MeV (d) 0.5 MeV

14. If C, the velocity of light, g the acceleration due to gravity and P the atmospheric pressure be the fundamental quantities in MKS system, then the dimensions of length will be same as that of
(a) $\frac{C}{g}$ (b) $\frac{C}{P}$ (c) PCg (d) $\frac{C^2}{g}$

15. Figure shows a capillary rise H. If the air is blown through the horizontal tube in the direction as shown then rise in capillary tube will be
(a) = H
(b) > H
(c) < H
(d) zero



16. A boy running on a horizontal road at 8 km/h finds the rain falling vertically. He increases his speed to 12 km/h and finds that the drops makes 30° with the vertical. The speed of rain with respect to the road is
(a) $4\sqrt{7}$ km/h (b) $9\sqrt{7}$ km/h
(c) $12\sqrt{7}$ km/h (d) $15\sqrt{7}$ km/h

17. A hunter aims his gun and fires a bullet directly at a monkey on a tree. At the instant the bullet leaves the barrel of the gun, the monkey drops. Pick the correct statement regarding the situation.
(a) The bullet will never hit the monkey
(b) The bullet will always hit the monkey
(c) The bullet may or may not hit the monkey
(d) Can't be predicted

18. A particle of mass m_1 moving with velocity v collides with a mass m_2 at rest, then they get embedded. Just after collision, velocity of the system
(a) increases (b) decreases
(c) remains constant (d) becomes zero

19. The ratio of the specific heats of a gas is $\frac{C_p}{C_v} = 1.66$, then the gas may be
(a) CO_2 (b) He (c) H_2 (d) NO_2

20. Two oscillators are started simultaneously in same phase. After 50 oscillations of one, they get out of phase by π, that is half oscillation. The percentage difference of frequencies of the two oscillators is nearest to
(a) 2% (b) 1% (c) 0.5% (d) 0.25%

21. A juggler keeps on moving four balls in the air throwing the balls after intervals. When one ball leaves his hand (speed = 20 ms^{-1}) the position of other balls (height in m) will be (Take g = 10 ms^{-2})
(a) 10, 20, 10 (b) 15, 20, 15
(c) 5, 15, 20 (d) 5, 10, 20

22. If a stone of mass 0.05 kg is thrown out a window of a train moving at a constant speed of 100 km/h then magnitude of the net force acting on the stone is
(a) 0.5 N (b) zero (c) 50 N (d) 5 N

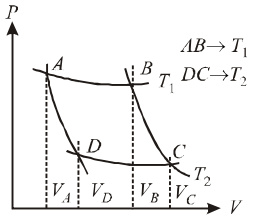
23. A body of mass M hits normally a rigid wall with velocity V and bounces back with the same velocity. The impulse experienced by the body is
(a) MV (b) 1.5 MV (c) 2 MV (d) zero

24. A hoop rolls down an inclined plane. The fraction of its total kinetic energy that is associated with rotational motion is
(a) 1 : 2 (b) 1 : 3 (c) 1 : 4 (d) 2 : 3

25. Infinite number of masses, each 1 kg are placed along the x-axis at $x = \pm 1m, \pm 2m, \pm 4m, \pm 8m, \pm 16m$ ..... the magnitude of the resultant gravitational potential in terms of gravitational constant G at the orgin ($x = 0$) is
(a) $G/2$ (b) G (c) $2G$ (d) $4G$

26. Water of volume 2 litre in a container is heated with a coil of 1 kW at 27°C. The lid of the container is open and energy dissipates at rate of 160 J/s. In how much time temperature will rise from 27°C to 77°C?
[Given specific heat of water is 4.2 kJ/kg]
(a) 8 min 20 s (b) 6 min2 s
(c) 7 min (d) 14 min

27. In the following P-V diagram of an ideal gas, two adiabates cut two isotherms at $T_1 = 300$K and $T_2 = 200$K. The value of $V_A = 2$ unit, $V_B = 8$ unit, $V_C = 16$ unit. Find the value of V_D.



(a) 4 unit (b) < 4 unit
(c) > 5 unit (d) 5 unit

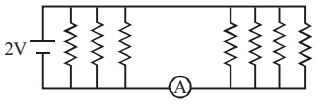
28. The mass of H_2 molecule is 3.32×10^{-24} g. If 10^{23} hydrogen molecules per second strike 2 cm^2 of wall at an angle of 45° with the normal, while moving with a speed of 10^5 cm/s, the pressure exterted on the wall is nearly.
(a) 1350 N/m^2 (b) 2350 N/m^2
(c) 3320 N/m^2 (d) 1660 N/m^2

29. The wavelength of two waves are 50 and 51 cm respectively. If the temperature of the room is 20°C then what will be the number of beats produced per second by these waves, when the speed of sound at 0°C is 332 m/s?
(a) 24 (b) 14
(c) 10 (d) None of these

30. The figure shows the interference pattern obtained in a double-slit experiment using light of wavelength 600nm. 1, 2, 3, 4 and 5 are marked on five fringes.
The third order bright fringe is
(a) 2 (b) 3 (c) 4 (d) 5

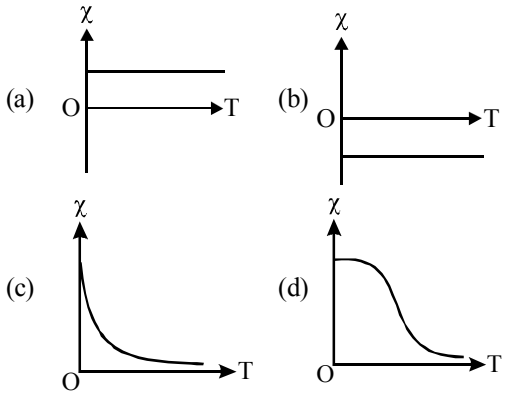
31. Electric potential at any point is V = –5x + 3y + $\sqrt{15}$z, then the magnitude of the electric field is
(a) $3\sqrt{2}$ (b) $4\sqrt{2}$ (c) $5\sqrt{2}$ (d) 7

32. Seven resistances, each of value 20 Ω, are connected to a 2 V battery as shown in the figure. The ammeter reading will be



(a) 1/10 A (b) 3/10 A
(c) 4/10 A (d) 7/10 A.

33. The variation of magnetic susceptibility (χ) with temperature for a diamagnetic substance is best represented by



34. A copper rod of length ℓ rotates about its end with angular velocity ω in uniform magnetic field B. The emf developed between the ends of the rod if the field is normal to the plane of rotation is

(a) $B\omega\ell^2$ (b) $\frac{1}{2} B\omega\ell^2$

(c) $2\ B\omega\ell^2$ (d) $\frac{1}{4} B\omega\ell^2$

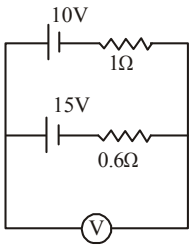
35. A 10V battery with internal resistance 1Ω and a 15V battery with internal resistance 0.6 Ω are connected in parallel to a voltmeter (see figure). The reading in the voltmeter will be close to :

(a) 12.5 V

(b) 24.5 V

(c) 13.1 V

(d) 11.9 V



36. 10 forks are arranged in increasing order of frequency in such a way that any two nearest tuning forks produce 4 beats/sec. The highest frequency is twice of the lowest. Possible highest and the lowest frequencies (in Hz) are

(a) 80 and 40 (b) 100 and 50
(c) 44 and 22 (d) 72 and 36

37. A charged particle enters in a uniform magnetic field with a certain velocity. The power delivered to the particle by the magnetic field depends on

(a) force exerted by magnetic field and velocity of the particle.
(b) angular speed ω and radius r of the circular path.
(c) angular speed ω and acceleration of the particle.
(d) None of these

38. A resistor and an inductor are connected to an ac supply of 120 V and 50 Hz. The current in the circuit is 3 A. If the power consumed in the circuit is 108 W, then the resistance in the circuit is

(a) 12 Ω (b) 40 Ω
(c) $\sqrt{(52\times25)}\Omega$ (d) 360 Ω

39. In an electron gun, the potential difference between the filament and plate is 3000 V. What will be the velocity of electron emitting from the gun?

(a) 3×10^8 m/s (b) 3.18×10^7 m/s
(c) 3.52×10^7 m/s (d) 3.26×10^7 m/s

40. A radioactive substance with decay constant of $0.5s^{-1}$ is being produced at a constant rate of 50 nuclei per second. If there are no nuclei present initially, the time (in second) after which 25 nuclei will be present is

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

CHEMISTRY

41. The 25 mL of a 0.15 M solution of lead nitrate, $Pb(NO_3)_2$ reacts with all of the aluminium sulphate, $Al_2(SO_4)_3$, present in 20 mL of a solution. What is the molar concentration of the $Al_2(SO_4)_3$?

$$3Pb(NO_3)_2(aq)+Al_2(SO_4)_3(aq)\longrightarrow 3PbSO_4(s)+2Al(NO_3)_3(aq)$$

(a) 6.25×10^{-2} M (b) 2.421×10^{-2} M
(c) 0.1875 M (d) None of these

42. 100 mL O_2 and H_2 kept at same temperature and pressure. What is true about their number of molecules

(a) $NO_2 > NH_2$
(b) $NO_2 < NH_2$
(c) $NO_2 = NH_2$
(d) $NO_2 + NH_2 = 1$ mole

43. If the Planck's constant h = 6.6×10^{-34} Js, the de Broglie wavelength of a particle having momentum of 3.3×10^{-24} kg ms^{-1} will be

(a) 0.002 Å (b) 0.5 Å (c) 2 Å (d) 500 Å

44. Amongst the elements with following electronic configurations, which one of them may have the highest ionization energy?

(a) [Ne] $3s^23p^2$ (b) [Ar] $3d^{10}4s^24p^3$
(c) [Ne] $3s^23p^1$ (d) [Ne] $3s^23p^3$

45. Which of the following is the correct and increasing order of lone pair of electrons on the central atom?

(a) $IF_7 < IF_5 < ClF_3 < XeF_2$
(b) $IF_7 < XeF_2 < ClF_2 < IF_5$
(c) $IF_7 < ClF_3 < XeF_2 < IF_5$
(d) $IF_7 < XeF_2 < IF_5 < ClF_3$

46. According to molecular orbital theory which of the following statement about the magnetic character and bond order is correct regarding O_2^+

(a) Paramagnetic and Bond order < O_2
(b) Paramagnetic and Bond order > O_2
(c) Diamagnetic and Bond order < O_2
(d) Diamagnetic and Bond order > O_2

47. If V is the volume of one molecule of gas under given conditions, the van der Waal's constant b is

(a) 4V (b) $\frac{4V}{N_0}$
(c) $\frac{N_0}{4V}$ (d) $4VN_0$

48. For vaporization of water at 1 atmospheric pressure, the values of ΔH and ΔS are 40.63 $kJmol^{-1}$ and 108.8 $JK^{-1}\ mol^{-1}$, respectively. The temperature when Gibbs energy change (ΔG) for this transformation will be zero, is:
(a) 293.4 K (b) 273.4 K
(c) 393.4 K (d) 373.4 K

49. For the reaction taking place at certain temperature

$NH_2COONH_4(s) \rightleftharpoons 2NH_3(g) + CO_2(g)$,

if equilibrium pressure is 3X bar then $\Delta_r G°$ would be
(a) $-RT \ln 9 - 3RT \ln X$
(b) $RT \ln 4 - 3RT \ln X$
(c) $-3RT \ln X$
(d) None of these

50. The pH of 0.1 M solution of the following salts increases in the order :
(a) $NaCl < NH_4Cl < NaCN < HCl$
(b) $HCl < NH_4Cl < NaCl < NaCN$
(c) $NaCN < NH_4Cl < NaCl < HCl$
(d) $HCl < NaCl < NaCN < NH_4Cl$

51. When N_2O_5 is heated at certain temperature, it dissociates as

$N_2O_5(g) \rightleftharpoons N_2O_3(g) + O_2(g)$; $K_c = 2.5$. At the same time N_2O_3 also decomposes as :

$N_2O_3(g) \rightleftharpoons N_2O(g) + O_2(g)$. If initially 4.0 moles of N_2O_5 are taken in 1.0 litre flask and allowed to dissociate. Concentration of O_2 at equilibrium is 2.5 M. Equilibrium concentration of N_2O_5 is :
(a) 1.0 M (b) 1.5 M
(c) 2.166 M (d) 1.846 M

52. Consider the reactions
(A) $H_2O_2 + 2HI \rightarrow I_2 + 2H_2O$
(B) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$
Which of the following statements is correct about H_2O_2 with reference to these reactions? Hydrogen peroxide is _____ .
(a) an oxidising agent in both (A) and (B)
(b) an oxidising agent in (A) and reducing agent in (B)
(c) a reducing agent in (A) and oxidising agent in (B)
(d) a reducing agent in both (A) and (B)

53. Following are colours shown by some alkaline earth metals in flame test. Which of the following are not correctly matched?

	Metal	**Colour**
(i)	Calcium	Apple green
(ii)	Strontium	Crimson
(iii)	Barium	Brick red

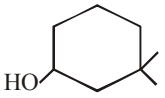
(a) (i) and (iii) (b) (i) only
(c) (ii) only (d) (ii) and (iii)

54. Beryllium shows diagonal relationship with aluminium. Which of the following similarity is incorrect ?
(a) Be forms beryllates and Al forms aluminates
(b) $Be(OH)_2$ like $Al(OH)_3$ is basic.
(c) Be like Al is rendered passive by HNO_3.
(d) Be_2C like Al_4C_3 yields methane on hydrolysis.

55. An element X occurs in short period having configuration $ns^2\ np^1$. The formula and nature of its oxide is
(a) XO_3, basic (b) XO_3, acidic
(c) X_2O_3, amphoteric (d) X_2O_3, basic

56. Which of the following is strongest nucleophile
(a) Br^- (b) $:OH^-$
(c) $:CN^-$ (d) $C_2H_5\bar{O}:$

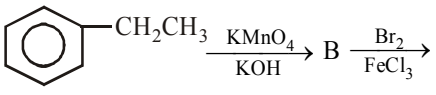
57. The IUPAC name of the compound is



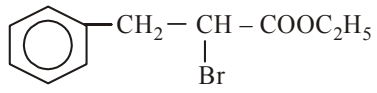
(a) 3, 3-dimethyl - 1- cyclohexanol
(b) 1, 1-dimethyl-3-hydroxy cyclohexane
(c) 3, 3-dimethyl-1-hydroxy cyclohexane
(d) 1, 1-dimethyl-3-cyclohexanol

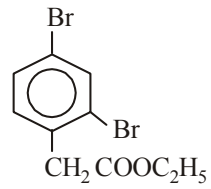
58. Which of the following will have a meso-isomer also?
(a) 2, 3- Dichloropentane
(b) 2, 3-Dichlorobutane
(c) 2-Chlorobutane
(d) 2-Hydroxypropanoic acid

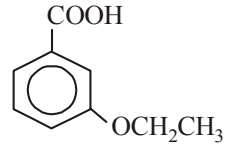
59. In a set of reactions, ethylbenzene yielded a product D.

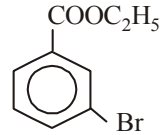


$C \xrightarrow[H^+]{C_2H_5OH} D$

(a) 

(b) 

(c) 

(d) 

60. Identify the incorrect statement from the following:
(a) Ozone absorbs the intense ultraviolet radiation of the sun.
(b) Depletion of ozone layer is because of its chemical reactions with chlorofluoro alkanes.
(c) Ozone absorbs infrared radiation.
(d) Oxides of nitrogen in the atmosphere can cause the depletion of ozone layer.

61. Each edge of a cubic unit cell is 400 pm long. If atomic mass of the element is 120 and its density is 6.25 g/cm^3, the crystal lattice is : (use $N_A = 6 \times 10^{23}$)
(a) primitive (b) body centered
(c) face centered (d) end centered

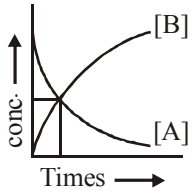
62. Chloroform, $CHCl_3$, boils at 61.7 °C. If the K_b for chloroform is 3.63°C/molal, what is the boiling point of a solution of 15.0 kg of $CHCl_3$ and 0.616 kg of acenaphthalene, $C_{12}H_{10}$?
(a) 61.9 (b) 62.0
(c) 52.2 (d) 62.67

63. pH of a 0.1 M monobasic acid is found to be 2. Hence, its osmotic pressure at a given temperature TK is
(a) 0.1 RT (b) 0.11 RT
(c) 1.1 RT (d) 0.01 RT

64. On passing a current of 1.0 ampere for 16 min and 5 sec through one litre solution of $CuCl_2$, all copper of the solution was deposited at cathode. The strength of $CuCl_2$ solution was (Molar mass of Cu= 63.5; Faraday constant = 96,500 Cmol^{-1})
(a) 0.01 N (b) 0.01 M
(c) 0.02 M (d) 0.2 N

65. A 100.0 mL dillute solution of Ag^+ is electrolysed for 15.0 minutes with a current of 1.25 mA and the silver is removed completely. What was the initial $[Ag^+]$?
(a) 2.32×10^{-1} (b) 2.32×10^{-4}
(c) 2.32×10^{-3} (d) 1.16×10^{-5}

66. The accompanying figure depicts a change in concentration of species A and B for the reaction $A \rightarrow B$, as a function of time. The point of inter section of the two curves represents



(a) $t_{1/2}$ (b) $t_{3/4}$
(c) $t_{2/3}$
(d) Data insufficient to predict

67. The rate constant of a reaction is 1.5×10^{-3} at 25°C and 2.1×10^{-2} at 60°C. The activation energy is

(a) $\frac{35}{333} R \log_e \frac{2.1 \times 10^{-2}}{1.5 \times 10^{-2}}$

(b) $\frac{298 \times 333}{35} R \log_e \frac{21}{1.5}$

(c) $\frac{298 \times 333}{35} R \log_e 2.1$

(d) $\frac{298 \times 333}{35} R \log_e \frac{2.1}{1.5}$

68. Freundlich equation for adsorption of gases (in amount of x g) on a solid (in amount of m g) at constant temperature can be expressed as

(a) $\log \frac{x}{m} = \log p + \frac{1}{n} \log K$

(b) $\log \frac{x}{m} = \log K + \frac{1}{n} \log p$

(c) $\frac{x}{m} \propto p^n$

(d) $\frac{x}{m} = \log p + \frac{1}{n} \log K$

69. Which of the following feature of catalysts is described in reactions given below?

(i) $CO(g) + 2H_2(g) \xrightarrow{Cu/ZnO-Cr_2O_3} CH_3OH(g)$

(ii) $CO(g) + H_2(g) \xrightarrow{Cu} HCHO(g)$

(iii) $CO(g) + 3H_2(g) \xrightarrow{Ni} CH_4(g) + H_2O(g)$

(a) Activity (b) Selectivity
(c) Catalytic promoter (d) Catalytic poison

70. Which of the following is not a member of chalcogens?
(a) O (b) S (c) Se (d) Po

71. Pick out the wrong statement.
(a) Nitrogen has the ability to form $p\pi$-$p\pi$ bonds with itself.
(b) Bismuth forms metallic bonds in elemental state.
(c) Catenation tendency is higher in nitrogen when compared with other elements of the same group.
(d) Nitrogen has higher first ionisation enthalpy when compared with other elements of the same group.

72. Which of the following element do not form complex with EDTA?
(a) Ca (b) Mg (c) Be (d) Sr

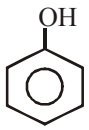
73. Which one of the following cyano complexes would exhibit the lowest value of paramagnetic behaviour ?

(a) $[Co(CN)_6]^{3-}$ (b) $[Fe(CN)_6]^{3-}$

(c) $[Mn(CN)_6]^{3-}$ (d) $[Cr(CN)_6]^{3-}$

(At. Nos : Cr = 24, Mn = 25, Fe = 26, Co = 27)

74. When an aqueous solution of copper (II) sulphate is saturated with ammonia, the blue compound crystallises on evaporation. The formula of this blue compound is:
(a) $[Cu(NH_3)_4]SO_4 . H_2O$ (square planar)
(b) $[Cu(NH_3)_4]SO_4$ (Tetrahedral)
(c) $[Cu(NH_3)_6]SO_4$ (Octahedral)
(d) $[Cu(SO_4)(NH_3)_5]$ (Octahedral)

75.  $\xrightarrow{NaOH}$ [X] $\xrightarrow{CH_2=CHCH_2Cl}$ [Y] .

Here [Y] is a
(a) single compound
(b) mixture of two compounds
(c) mixture of three compounds
(d) no reaction is possible

76. Following compounds are given:
(1) CH_3CH_2OH (2) CH_3COCH_3

(3) $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}}HOH$ (4) CH_3OH

Which of the above compound(s), on being warmed with iodine solution and NaOH, will give iodoform?
(a) (1) and (2) (b) (1), (3) and (4)
(c) only (2) (d) (1), (2) and (3)

77. Arrange the following alcohols in increasing order of their reactivity towards the reaction with HCl.
$(CH_3)_2CH$-OH (1), $(CH_3)_3C$-OH (2), $(C_6H_5)_3C$-OH (3)
(a) 1 < 2 < 3 (b) 2 < 1 < 3
(c) 3 < 1 < 2 (d) 2 < 3 < 1

78. Thirty percent of the bases in a sample of DNA extracted from eukaryotic cells is adenine. What percentage of cytosine is present in this DNA?
(a) 10% (b) 20%
(c) 30% (d) 40%

79. The blue colour of snail is due to presence of
(a) Albumin (b) Haemocyanin
(c) Globulins (d) Fibrinogen

80. Which of the following is a diamine?
(a) Dopamine (b) Histamine
(c) Meprobamate (d) Chlorphenamine

ENGLISH PROFICIENCY

81. Choose the word which is most similar in meaning to the word 'Optimistic'.
(a) Favourable (b) Gloomy
(c) Hopeful (d) Rude

82. Choose the word which is most opposite in meaning to the word 'Drowsy'.
(a) Sleepy (b) Nodding
(c) Yawning (d) Wakeful

Direction (83-85): Which of the following phrases (I), (II), and (III) given below each sentence should replace the phrase printed in bold letters to make the sentence grammatically correct? Choose the best option among the five given alternatives that reflect the correct use of phrase in the context of the grammatically correct sentence. If the sentence is correct as it is, mark (d) i.e., "No correction required" as the answer.

83. He is really feeling **under the weather** today; he has a terrible cold.
(I) feeling like the weather
(II) feeling over the weather
(III) feeling in the weather
(a) Only (I) is correct
(b) Only (III) is correct
(c) Only (II) is correct
(d) No correction required

84. By working part-time and looking after his old mother, he managed to get the best for both worlds.
(I) the best at both worlds
(II) the best of both worlds
(III) the best on both worlds
(a) Only (I) is correct
(b) Only (II) is correct
(c) Only (III) is correct
(d) No correction required

85. Hey, Nanny, speak about the devil and you are here.
(I) speak at the devil
(II) speak on the devil
(III) speak of the devil
(a) Only (I) is correct
(b) Only (II) is correct
(c) Only (III) is correct
(d) No correction required

DIRECTION (86-90): Read the following passage carefully and answer the questions given below it.

The likelihood of at least 600,000 deaths being caused annually in India by fine particulate matter pollution in the air is cause for worry, even if the data released by the World Health Organisation are only a modelled estimate. The conclusion that so many deaths could be attributed to particulate matter 2.5 micrometres or less in size is, of course, caveated, since comprehensive measurement of PM2.5 is not yet being done and the linkages between pollution, disease and deaths need further study. What is not in doubt is that residents in many urban areas are forced to breathe unhealthy levels of particulates, and the smallest of these - PM10 and less - can penetrate and get lodged deep in the lungs. The WHO Global Burden of Disease study has been working to estimate pollution-linked health impacts, such as stroke and ischaemic heart disease, acute lower respiratory infection and chronic obstructive pulmonary disease. Data on fine particulates in India show that in several locations the pollutants come from burning of biomass, such as coal, fuel wood, farm litter and cow dung cakes. In highly built-up areas, construction debris, road dust and vehicular exhaust add to the problem. The Prime Minister launched an Air Quality Index last year aimed at improving pollution control. The new data, which the WHO says provide the best evidence available on the terrible toll taken by particulates, should lead to intensified action. A neglected aspect of urban air pollution control is the virtual discarding of the Construction and Demolition Waste Management Rules, notified to sustainably manage debris that is dumped in the cities, creating severe particulate pollution.
The Environment Ministry has highlighted the role that debris can play as a resource. Municipal and government contracts are, under the rules, required to utilise up to 20 per cent materials made from construction and demolition waste, and local authorities must place containers to hold debris. This must be implemented without delay. Providing cleaner fuels and scientifically designed cookstoves to those who have no option but to burn biomass, would have a big impact on reducing particulate matter in the northern and eastern States, which are the worst-hit during winter, when biomass is also used for heating. Greening the cities could be made a mission, involving civil society, with a focus on landscaping open spaces and paving all public areas to reduce dust. These measures can result in lower PM10 and PM2.5 levels. Comprehensive measurement of these particulates is currently absent in many cities, a lacuna that needs to be addressed.

86. According to the WHO Global Burden of Disease study which of the following is/are pollution linked health impacts?
(I) Infection of the lower respiratory system
(II) Chronic obstructive pulmonary disease
(III) Stroke and ischaemic heart disease
(a) Only (I) (b) Only (III)
(c) Both (I) and (II) (d) All of the above

87. The conclusion regarding the deaths attributed to particulate matter 2.5 micrometers is considered to be caveated because
(a) Measurement of all aspects of PM2.5 has been done comprehensively
(b) Measurement of all aspects of PM2.5 is not radical
(c) Relation between pollution, disease and death is complete
(d) None of these

88. Which of the following is/are not true in the context of the passage?
(a) Eastern and Southern states are worst hit in winter by burning of biomass.
(b) The smallest particulate matter PM2.5 penetrates and gets lodged in lungs.
(c) Data on fine particulates in India show that in several locations the pollutants come from the smoke emitted by vehicles.
(d) None is true

89. As per the given passage, which of the following is/are the measures for lowering particulate matter in the atmosphere?

(I) Making cleaner fuels available
(II) Landscaping open areas
(III) Providing cooking stoves designed scientifically
(a) Only (I) (b) Both (I) and (II)
(c) All of the above (d) None of these

90. If sentence (B) "The Finance Ministry's warning to potential investors in bitcoin and other cryptocurrencies has come at a time when a new, seemingly attractive investment area has opened up that few have enough information about." is the first sentence, what is the order of other sentences after rearrangement?
(A) One of the main reasons for this volatility is speculation and the entry into the market of a large number of people lured by the prospect of quick and easy profits.
(B) The Finance Ministry's warning to potential investors in bitcoin and other cryptocurrencies has come at a time when a new, seemingly attractive investment area has opened up that few have enough information about.
(C) A number of investors, daunted by the high price of bitcoin, have put their money into less well-established and often spurious cryptocurrencies, only to lose it all.
(D) Investment in bitcoin and other cryptocurrencies increased tremendously in India over the past year, but most new users know close to nothing of the technology, or how to verify the genuineness of a particular cryptocurrency.
(E) The price of bitcoin, the most popular of all cryptocurrencies, not only shot up by well over 1000% over the course of the last year but also fluctuated wildly.
(F) The government's caution comes on top of three warnings issued by the Reserve Bank of India since 2013.
(a) CDEFA (b) EAFDC
(c) DCAEF (d) ECDAF

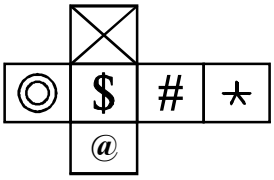
91. If sentence (C) "Clinical trials involving human subjects have long been a flashpoint between bioethicists and clinical research organisations (CROs) in India." is the first sentence, what is the order of other sentences after rearrangement?
(A) Such over-volunteering occurs more frequently in bioequivalence studies, which test the metabolism of generics in healthy subjects.
(B) Landmark amendments to the Drugs and Cosmetics Act in 2013 led to better protection of vulnerable groups such as illiterate people, but more regulation is needed to ensure truly ethical research.
(C) Clinical trials involving human subjects have long been a flashpoint between bioethicists and clinical research organisations (CROs) in India.
(D) The big problem plaguing clinical research is an over-representation of low-income groups among trial subjects.
(E) While CROs have argued that more rules will stifle the industry, the truth is that ethical science is often better science.
(F) Sometimes CROs recruit them selectively, exploiting financial need and medical ignorance; at other times people over-volunteer for the money.
(a) ABDFE (b) BDEAF
(c) DFAEB (d) BEDFA

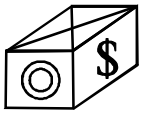
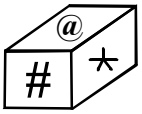
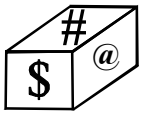
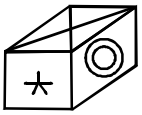
DIRECTION (92-93): Read the sentence to find out whether there is any grammatical error or idiomatic error in it. The error, if any, will be in one part of the sentence. The letter of that part is the answer. If there is no error, the answer is (d). (Ignore errors of punctuation, if any.)

92. Despite being (a)/ a good teacher, (b)/ he has no influence on his pupil. (c)/ No error (d)
93. Yesterday, when we were returning from the party, (a)/ our car met with an accident, (b)/ but we were fortunate to reach our home safely. (c)/ No error (d)
94. A group of sheep is known as :
(a) bunch (b) herd
(c) band (d) fleet
95. A group of trees is known as:
(a) grove (b) parliament
(c) heap (d) hedge

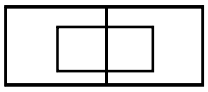
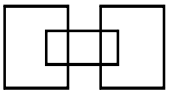
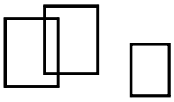
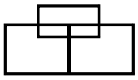
LOGICAL REASONING

96. In a code language, if REGAINS is coded as QDFZHMR, then the word PERIODS will be coded as -
(a) ODQNHCR (b) ODDQHCR
(c) ODQHNCR (d) ODQHNRC
97. If 5 # 6 = 121 and 10 # 8 = 324, then find the value of 23 # 14 = ?
(a) 1369 (b) 1349 (c) 1331 (d) 725
98. Which of the following cube in the answer figure cannot be made based on the unfolded cube in the question figure?



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

99. Which one of the following diagram represents the correct relationship among
Professor, Male and Female.

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

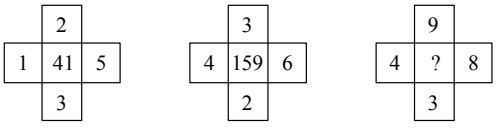
100. Select the related letter/word/ number from the given alternatives.
Distance : Odometer :: ? : Barometer
(a) Humidity (b) Pressure
(c) Thickness (d) Wind

101. Find the odd word/letters/ number pair/number from the given alternatives.
(a) 24-1614 (b) 270-569
(c) 120-4325 (d) 162-6930

102. Choose the correct alternatives from the given ones that will complete the series.
L_N O__MLLM_OO_ML
(a) MNNNO (b) MONNO
(c) MONON (d) MONNN

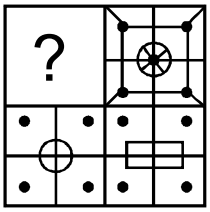
103. Choose the correct alternatives from the given ones that will complete the series.
22, 26, 53, 69, 194, ?
(a) 230 (b) 260 (c) 250 (d) 245

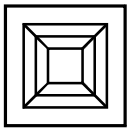
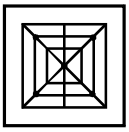
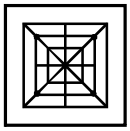
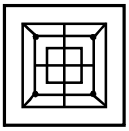
104. Select the missing number from the given responses.



(a) 888 (b) 788 (c) 848 (d) 842

105. Identify the figure that will complete the pattern.



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

MATHEMATICS

106. The domain of the function $f(x) = \sqrt{x^2 - [x]^2}$, where [x] denotes the greatest integer less than or equal to x, is
(a) $(0, \infty)$ (b) $(-\infty, 0)$
(c) $(-\infty, \infty)$ (d) None of these

107. If $m\sin\theta = n\sin(\theta + 2\alpha)$ then $\tan(\theta + \alpha)$ is
(a) $\frac{m+n}{m-n}\tan\alpha$ (b) $\frac{m+n}{m-n}\tan\theta$
(c) $\frac{m+n}{m-n}\cot\alpha$ (d) $\frac{m+n}{m-n}\cot\theta$

108. Number of solutions of equation $\sin 9\theta = \sin\theta$ in the interval $[0, 2\pi]$ is
(a) 16 (b) 17 (c) 18 (d) 15

109. A pole stands vertically inside a triangular park ABC. If the angle of elevation of the top of the pole from each corner of the park is same, then the foot of the pole is at the
(a) centroid (b) circumcentre
(c) incentre (d) orthocentre

110. Let A, B, and C are the angles of a plain triangle and $\tan\frac{A}{2} = \frac{1}{3}$, $\tan\frac{B}{2} = \frac{2}{3}$. Then $\tan\frac{C}{2}$ is equal to
(a) 7/9 (b) 2/9 (c) 1/3 (d) 2/3

111. If the amplitude of $z - 2 - 3i$ is $\pi/4$, then the locus of $z = x + iy$ is
(a) $x + y - 1 = 0$ (b) $x - y - 1 = 0$
(c) $x + y + 1 = 0$ (d) $x - y + 1 = 0$

112. The roots of the equation $x^4 - 2x^3 + x = 380$ are :

(a) $5, -4, \frac{1 \pm 5\sqrt{-3}}{2}$

(b) $-5, 4, \frac{-1 \pm 5\sqrt{-3}}{2}$

(c) $5, 4, \frac{-1 \pm 5\sqrt{-3}}{2}$

(d) $-5, -4, \frac{1 \pm 5\sqrt{-3}}{2}$

113. Roots of the equation $x^2 + bx - c = 0 (b, c > 0)$ are

(a) Both positive (b) Both negative
(c) Of opposite sign (d) None of these

114. In how many ways can 12 gentlemen sit around a round table so that three specified gentlemen are always together?

(a) 9! (b) 10! (c) 3! 10! (d) 3! 9!

115. The number of ways in which first, second and third prizes can be given to 5 competitors is

(a) 10 (b) 60 (c) 15 (d) 125

116. The coefficient of x^3 in the expansion of $\left(x - \frac{1}{x}\right)^7$ is :

(a) 14 (b) 21 (c) 28 (d) 35

117. If $x > 0$, the $1 + \frac{\log_{e^2} x}{1!} + \frac{(\log_{e^2} x)^2}{2!} + \ldots\ldots =$

(a) x (b) x^2 (c) 2x (d) $\sqrt{x}$

118. If a, b, c are in G.P., then

(a) a^2, b^2, c^2 are in G.P.

(b) $a^2(b+c), c^2(a+b), b^2(a+c)$ are in G.P.

(c) $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in G.P.

(d) None of these

119. The locus of the point of intersection of the lines $x = a\left(\frac{1-t^2}{1+t^2}\right)$ and $y = \frac{2at}{1+t^2}$ represent (t being a parameter)

(a) circle (b) parabola
(c) ellipse (d) hyperbola

120. The equation of the circle which passes through the point (4, 5) and has its centre at (2, 2) is

(a) $(x-2) + (y-2) = 13$
(b) $(x-2)^2 + (y-2)^2 = 13$
(c) $(x)^2 + (y)^2 = 13$
(d) $(x-4)^2 + (y-5)^2 = 13$

121. Eccentricity of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ if it passes through point (9, 5) and (12, 4) is

(a) $\sqrt{3/4}$ (b) $\sqrt{4/5}$
(c) $\sqrt{5/6}$ (d) $\sqrt{6/7}$

122. Consider the equation of a parabola $y^2 + 4ax = 0$, where $a > 0$ which of the following is/are correct?

(a) Tangent at the vertex is $x = 0$
(b) Directrix of the parabola is $x = 0$
(c) Vertex of the parabola is not at the origin
(d) Focus of the parabola is at (a, 0)

123. The value of $\lim_{n \to \infty} \frac{1+2+3+\ldots n}{n^2 + 100}$ is equal to :

(a) ∞ (b) $\frac{1}{2}$ (c) 2 (d) 0

124. $\lim_{x \to 0} \sqrt{\frac{x - \sin x}{x + \sin^2 x}}$ is equal to

(a) 1 (b) 0
(c) ∞ (d) None of these

125. The probability of getting 10 in a single throw of three fair dice is :

(a) $\frac{1}{6}$ (b) $\frac{1}{8}$ (c) $\frac{1}{9}$ (d) $\frac{1}{5}$

126. Number of solutions of the equation

$\tan^{-1}(1+x) + \tan^{-1}(1-x) = \frac{\pi}{2}$ are

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

127. If $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is an orthogonal matrix, then

(a) $a = -2, b = -1$ (b) $a = 2, b = 1$
(c) $a = 2, b = -1$ (d) $a = -2, b = 1$

128. The points represented by the complex numbers $1+i, -2+3i, \frac{5}{3}i$ on the argand plane are

(a) vertices of an equilateral triangle
(b) vertices of an isosceles triangle
(c) collinear
(d) None of these

129. If matrix $A=\begin{bmatrix}3 & -2 & 4\\ 1 & 2 & -1\\ 0 & 1 & 1\end{bmatrix}$ and

$A^{-1}=\frac{1}{k}\text{adj}(A)$, then k is

(a) 7 (b) -7 (c) 15 (d) -11

130. If x, y, z are complex numbers, and

$\Delta=\begin{vmatrix}0 & -y & -z\\ \bar{y} & 0 & -x\\ \bar{z} & \bar{x} & 0\end{vmatrix}$ then Δ is

(a) purely real (b) purely imaginary
(c) complex (d) 0

131. If $f(x)=\sin x$, when x is rational
$=\cos x$, when x is irrational

Then the function is
(a) discontinuous at $x=n\pi+\pi/4$
(b) continuous at $x=n\pi+\pi/4$
(c) discontinuous at all x
(d) none of these

132. If $f(x)=\begin{cases}1, \text{when } 0<x\le\frac{3\pi}{4}\\ 2\sin\frac{2}{9}x, \text{when } \frac{3\pi}{4}<x<\pi\end{cases}$

(a) $f(x)$ is continuous at $x=0$
(b) $f(x)$ is continuous at $x=\pi$
(c) $f(x)$ is continuous at $x=\frac{3\pi}{4}$
(d) $f(x)$ is discontinuous at $x=\frac{3\pi}{4}$

133. The value of c in (0, 2) satisfying the mean value theorem for the function $f(x)=x(x-1)^2, x\in[0,2]$ is equal to

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

134. If $y=\frac{x}{x+1}+\frac{x+1}{x}$, then $\frac{d^2y}{dx^2}$ at $x=1$ is equal to

(a) $\frac{7}{4}$ (b) $\frac{7}{8}$ (c) $\frac{1}{4}$ (d) $\frac{-7}{8}$

135. Let $y=e^{2x}$. Then $\left(\frac{d^2y}{dx^2}\right)\left(\frac{d^2x}{dy^2}\right)$ is

(a) 1 (b) e^{-2x}
(c) $2e^{-2x}$ (d) $-2e^{-2x}$

136. A ball is dropped from a platform 19.6m high. Its position function is –
(a) $x=-4.9t^2+19.6\ (0\le t\le 1)$
(b) $x=-4.9t^2+19.6\ (0\le t\le 2)$
(c) $x=-9.8t^2+19.6\ (0\le t\le 2)$
(d) $x=-4.9t^2-19.6\ (0\le t\le 2)$

137. The value of the integral $\int_a^b\frac{\sqrt{x}dx}{\sqrt{x}+\sqrt{a+b-x}}$ is:

(a) π (b) $\frac{1}{2}(b-a)$
(c) $\pi/2$ (d) $b-a$

138. $\int\frac{e^{x^2}(2x+x^3)}{(3+x^2)^2}dx$ is equal to :

(a) $\frac{e^{x^2}}{(3+x^2)}+k$ (b) $\frac{1}{2}\frac{e^{x^2}}{(3+x^2)^2}+k$
(c) $\frac{1}{4}\frac{e^{x^2}}{(3+x^2)^2}+k$ (d) $\frac{1}{2}\frac{e^{x^2}}{(3+x^2)}+k$

139. If $\int_0^a f(2a-x)dx=m$ and $\int_0^a f(x)dx=n$, then $\int_0^{2a}f(x)dx$ is equal to

(a) $2m+n$ (b) $m+2n$
(c) $m-n$ (d) $m+n$

140. An integrating factor of the differential equation $\sin x\frac{dy}{dx}+2y\cos x=1$ is

(a) $\sin^2 x$ (b) $\frac{2}{\sin x}$
(c) $\log|\sin x|$ (d) $\frac{1}{\sin^2 x}$

141. The expression satisfying the differential equation $\left(x^2-1\right)\frac{dy}{dx}+2xy=1$ is

(a) $x^2y-xy^2=c$

(b) $(y^2-1)x=y+c$

(c) $(x^2-1)y=x+c$

(d) none of these

142. Let $\vec{a}=\hat{i}-\hat{k}$, $\vec{b}=x\hat{i}+\hat{j}+(1-x)\hat{k}$ and $\vec{c}=y\hat{i}+x\hat{j}+(1+x-y)\hat{k}$. Then $[\vec{a},\vec{b},\vec{c}]$ depends on

(a) only y (b) only x

(c) both x and y (d) neither x nor y

143. If $\hat{i}+\hat{j},\hat{j}+\hat{k},\hat{i}+\hat{k}$ are the position vectors of the vertices of a triangle ABC taken in order, then $\angle A$ is equal to

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{5}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{3}$

144. The projection of line joining (3, 4, 5) and (4, 6, 3) on the line joining (–1, 2, 4) and (1, 0, 5) is

(a) $\frac{4}{3}$ (b) $\frac{2}{3}$ (c) $\frac{8}{3}$ (d) $\frac{1}{3}$

145. Which of the following statements is correct?

(a) Every L.P.P. admits an optimal solution.

(b) A L.P.P. admits a unique optimal solution.

(c) If a L.P.P. admits two optimal solutions, it has an infinite number of optimal solutions.

(d) The set of all feasible solutions of a L.P.P. is not a convex set.

146. If the constraints in a linear programming problem are changed then

(a) The problem is to be re-evaluated.

(b) Solution is not defined.

(c) The objective function has to be modified.

(d) The change in constraints is ignored.

147. In a binomial distribution, the mean is 4 and variance is 3. Then its mode is :

(a) 5 (b) 6

(c) 4 (d) None of these

148. The sum $1+\frac{1+a}{2!}+\frac{1+a+a^2}{3!}+....\infty$ is equal to

(a) e^a (b) $\frac{e^a-e}{a-1}$

(c) $(a-1)e^a$ (d) $(a+1)e^a$

149. The Boolean expression

$\sim(p\vee q)\vee(\sim p\wedge q)$ is equivalent to :

(a) p (b) q (c) ~q (d) ~p

150. If in a frequency distribution, the mean and median are 21 and 22 respectively, then its mode is approximately

(a) 25.5 (b) 24.0 (c) 22.0 (d) 20.5

Physics							
Question No	Answer Key	Question No	Answer Key	Question No	Answer Key	Question No	Answer Key
1	a	11	c	21	b	31	d
2	b	12	c	22	a	32	c
3	d	13	b	23	c	33	b
4	a	14	d	24	a	34	b
5	c	15	b	25	c	35	c
6	d	16	a	26	a	36	d
7	d	17	b	27	a	37	d
8	d	18	b	28	b	38	a
9	d	19	b	29	b	39	d
10	b	20	b	30	a	40	d

Chemistry							
Question No	Answer Key	Question No	Answer Key	Question No	Answer Key	Question No	Answer Key
41	a	51	d	61	b	71	c
42	c	52	b	62	d	72	c
43	c	53	a	63	b	73	a
44	d	54	b	64	a	74	a
45	a	55	c	65	d	75	c
46	b	56	c	66	a	76	d
47	d	57	a	67	b	77	a
48	d	58	b	68	b	78	b
49	d	59	d	69	b	79	b
50	b	60	c	70	d	80	c

English Proficiency & Logical Reasoning							
Question No	Answer Key	Question No	Answer Key	Question No	Answer Key		
81	c	91	d	101	d		
82	d	92	c	102	d		
83	d	93	d	103	a		
84	b	94	b	104	a		
85	c	95	a	105	c		
86	d	96	c				
87	b	97	a				
88	d	98	b				
89	d	99	a				
90	b	100	b				

Mathematics							
Question No	Answer Key	Question No	Answer Key	Question No	Answer Key		
106	d	121	d	136	b		
107	a	122	d	137	b		
108	b	123	a	138	d		
109	a	124	b	139	d		
110	a	125	b	140	a		
111	d	126	c	141	c		
112	a	127	a	142	d		
113	c	128	c	143	d		
114	d	129	c	144	a		
115	b	130	b	145	c		

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