BITSAT Question Paper 2016

Duration : 3 : 00 Hrs

Exam BITSAT		Total Questions 180				
Marks for Correct Answer 3	Negative Marks 1	Physics 40	Chemistry 40	Mathematics 45	English 15	Logical Reasoning 10

Physics

1. 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) $\frac{C}{g}$

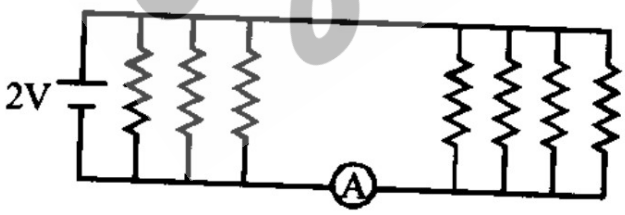
(b) $\frac{C}{P}$

(c) PCg

(d) $\frac{C^2}{g}$

Correct: d

2. Seven resistances, each of value 20Ω, 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) 4/10A

(d) 7/10 A.

Correct: c

3. The frequency of vibration of string is given by $\mathbf{v} = \frac{\mathbf{p}}{2l}\left[\frac{\mathbf{F}}{m}\right]^{1/2}$.

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Here p is a number of segments in the string and l is the length. The dimensional formula for m will be

(a) $\left[\mathrm{M}^{0}\mathrm{LT}^{-1}\right]$

(b) $\left[\mathrm{ML}^{0}\mathrm{T}^{-1}\right]$

(c) $\left[\mathrm{ML}^{-1}\mathrm{T}^{0}\right]$

(d) $\left[\mathbf{M}^{0}\mathbf{L}^{0}\mathrm{T}^{0}\right]$

Correct: c

4. For the equation $A^3v^5d^c$, where F is the force, A is the area, v is the velocity and d is the density, the values of a, b and c are respectively

(a) 1,2,1

(b) 2,1,1

(c) 1,1,2

(d) 0,1,1

Correct: a

5. If the temperature of black body increases from 300 K to 900K, then the rate of energy radiation increases by how much times?

(a) 81

(b) 3

(c) 9

(d) 2

Correct: a

6. A juggler keeps on moving four balls in the air throwing the balls after intervals. When one ball leaves his hand $\left(\mathrm{spcod}=20\mathrm{ms}^{-1}\right)$ the position of other balls (height in m) will be (Take g= $10ms^{-2}$)

(a) 10, 20, 10

(b) 15, 20, 15

(c) 5, 15, 20

(d) 5, 10, 20

Correct: b

7. If a body cools down from 80°C to 60°C in 10 min when the temperature of the surrounding is 30°C, then the temperature of the body after next 10 min will be

(a) 50°C

(b) 48°C

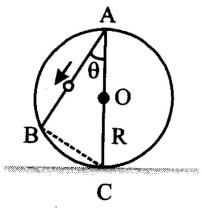
(c) 30°C

(d) None of these

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Correct: b

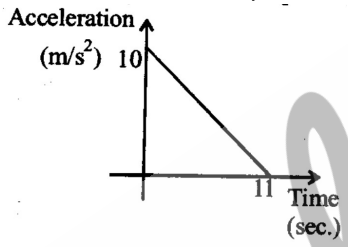
8. A frictionless wire AB is fixed on a sphere of radius R. A very small spherical ball slips on this wire. The time taken by this ball to slip from A to B is



(a) $\frac{\sqrt{2gR}}{g\cos\theta}$
(b) $2\sqrt{gR}\frac{\cos\theta}{g}$
(c) $\sqrt[2]{\frac{R}{g}}$
(d) $\frac{gR}{\sqrt{g\cos\theta}}$

Correct: b

9. A body starts from rest at time t=0, the acceleration time graph is shown in the figure. The maximum velocity attained by the body will be



(a) 110 m/s
(b) 55 m/s
(c) 650 m/s
(d) 550 m/s

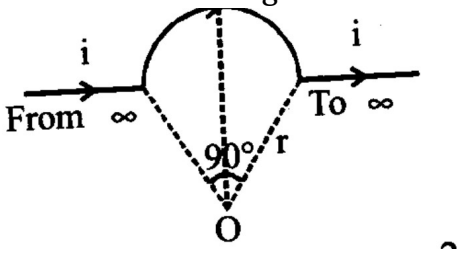
Correct: b

10. A man drives a car from y towards x at speed of 60 km/h. A car leaves station x for station y every 10 min. The distance between x and y is 60 km. The car travels at the speed of 60 km/h. A man drives a car from y towards x at speed of 60 km/h. If he starts at the moment when first car leaves the station y, then how many cars would be meet on the route ?
(a) 20
(b) 7
(c) 10
(d) 2

Correct: b

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11. What is the magnetic field at the centre of arc in the figure below?



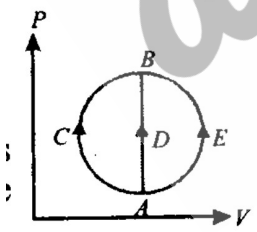
(a) $\frac{\mu_0}{4\pi} \cdot \frac{2}{r}[\sqrt{2}+\pi]$
(b) $\frac{\mu_0}{4\pi} \cdot \frac{2i}{r}\left[\sqrt{2}+\frac{\pi}{4}\right]$
(c) $\frac{\mu_0}{4\pi} \cdot \frac{i}{r}[\sqrt{2}+\pi]$
(d) $\frac{\mu_0}{4\pi} \cdot \frac{i}{r}\left[\sqrt{2}+\frac{\pi}{4}\right]$

Correct: b

12. 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) $4\sqrt{7}\mathrm{km/h}$
(b) $9\sqrt{7}\mathrm{kmh}$
(c) $12\sqrt{7}\mathrm{km/h}$
(d) $15\sqrt{7}\mathrm{km/h}$

Correct: a

13. One mole of an ideal gas is taken from state A to state B by three different processes,
(i) ACB
(ii) ADB
(iii) AEB
as shown in the P-V diagram. The heat absorbed by the gas is

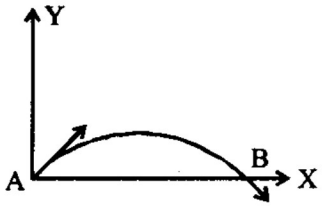


(a) greater in process (ii) than in (i)
(b) the least in process (ii)
(c) the same in (i) and (iii)
(d) less in (iii) than in (ii)

Correct: d

14. The velocity of a projectile at the initial point A is $(2\hat{i}+3\hat{j})$ m/s its velocity (in m/s) at point B is

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(a) $-2\hat{i}+3\hat{j}$
(b) $2\hat{i}-3\hat{j}$
(c) $2\hat{i}+3\hat{j}$
(d) $-2\hat{i}-3\hat{j}$

Correct: b

15. A positive charge q is projected in magnetic field of width $\frac{mv}{\sqrt{2qB}}$ with velocity v. Then the time taken by charged particle to emerge from the magnetic field is
(a) $\frac{m}{\sqrt{2}qB}$
(b) $\frac{\pi m}{4qB}$
(c) $\frac{\pi m}{2qB}$
(d) $\frac{\pi m}{\sqrt{2}qB}$

Correct: b

16. 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

Correct: a

17. 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

Correct: c

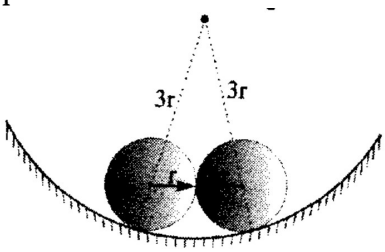
18. At a place, if the earth's horizontal and vertical components of magnetic fields are equal, then the angle of dip will be
(a) 30°

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(b) 90°
(c) 45°
(d) 0°

Correct: c

19. Two equal heavy spheres, each of radius r, are in equilibrium within a smooth cup of radius 3r. The ratio of reaction between the cup and one sphere and that between the two sphere is



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

Correct: b

20. 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 min 2 s
(c) 7 min
(d) 14 min

Correct: a

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

Correct: b

22. A particle of mass m moving in the x direction with speed 2v is hit by another particle of mass 2m moving in the y direction with speed v. If the collision is perfectly inelastic, the percentage loss in the energy during the collision is close to
(a) 56%
(b) 62%

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(c) 44%
(d) 50%

Correct: a

23. A conducting circular loop is placed in a uniform magnetic field, B = 0.025 T with its plane perpendicular to the loop. The radius of the loop is made to shrink at a constant rate of $1 \mathrm{mms}^{-1}$.. The induced e.m.f. when the radius is 2 cm, is
(a) $2\pi\mu V$
(b) $\pi\mu V$
(c) $\frac{\pi}{2}\mu V$
(d) $2\mu V$

Correct: b

24. 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

Correct: b

25. Two simple pendulums of length 0.5 m and 20 m respectively are given small linear displacement in one direction at the same time. They will again be in the phase when the pendulum of shorter length has completed oscillations $[\mathrm{nT}_1 = (\mathrm{n}-1)\mathrm{T}_2$, where T_1 is time period of shorter length & T_2 be time period of longer wavelength and n are no. of oscillations completed]
(a) 5
(b) 1
(c) 2
(d) 3

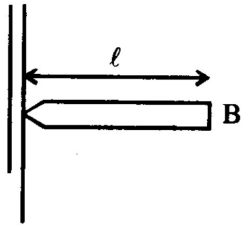
Correct: b

26. 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

Correct: a

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27. A uniform rod AB of length l, and mass m is free to rotate about point A. The rod is released from rest in the horizontal position. Given that the moment of inertia of the rod about A is $\frac{m\ell^2}{3}$, the initial angular acceleration of the rod will be



(a) $\frac{g\ell}{2}$
(b) $\frac{3}{2}g\ell$
(c) $\frac{3g}{2\ell}$
(d) $\frac{2g}{3\ell}$

Correct: c

28. A whistle of frequency 500 Hz tied to the end of a string of length 1.2 m revolves at 400 rev/min. A listener standing some distance away in the plane of rotation of whistle hears frequencies in the range. (Speed of sound = 340 m/s)
(a) 436 to 576
(b) 426 to 586
(c) 426 to 576
(d) 436 to 586

Correct: d

29. A thin rod of length L and mass M is bent at its midpoint into two halves so that the angle between them is 90°. The moment of inertia of the bent rod about an axis passing through the bending point and perpendicular to the plane defined by the two halves of the rod is:
(a) $\frac{ML^2}{24}$
(b) $\frac{ML^2}{12}$
(c) $\frac{ML^2}{6}$
(d) $\frac{\sqrt{2}ML^2}{24}$

Correct: b

30. A circular disc of radius R and thickness has moment inertia I about an axis passing through its centre perpendicular to its plane. It is melted and re-casted into a solid sphere. The moment of inertia of the sphere about its diameter is
(a) I
(b) $\frac{2I}{8}$
(c) $\frac{I}{5}$
(d) $\frac{I}{10}$

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Correct: c

31. 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) $\frac{\sqrt{6}}{2}$

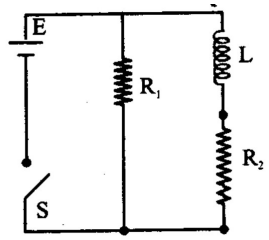
(b) $\sqrt{24}$

(c) 3

(d) $\frac{\sqrt{3}}{2}$

Correct: b

32. An inductor of inductance L = 400 mH and resistors of resistance $R_1 = 2\Omega$ and $R_2 = 2\Omega$ are connected to a battery of emf 12 V as shown in the figure. The internal resistance of the battery is negligible. The switch S is closed at t=0. The potential drop across L as a function of time is



(a) $\frac{12}{t}e^{-3t}\mathrm{V}$

(6) $6\left(1-e^{-t/0.2}\right)\mathbf{V}$

(c) $12e^{-5iv}$

(d) $6e^{-5t}\mathrm{V}$

Correct: c

33. A geo-stationary satellite orbits around the earth in a circular orbit of radius 36,000 km. Then, the time period of a spy satellite orbiting a few hundred km above the earth's surface ($(R_{\text{earth}} =$ = 6,400km) will approximately be

(a) 1/2 hr

(b) 1 hr

(c) 2 hr

(d) 4hr

Correct: c

34. In Young's double slit experiment, the slits are 2 mm apart and are illuminated by photons of two wavelengths $\lambda_1 = 12000A$ and $\lambda_2 = 10000\mathrm{A}$. At what minimum distance from the common central bright fringe on the screen 2 m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other ?

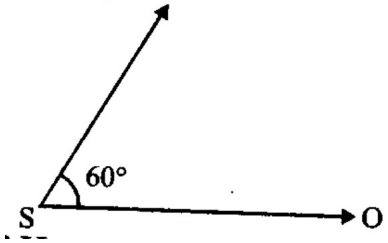
(a) 6mm

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(b) 4mm
(c) 3mm
(d) 8mm

Correct: a

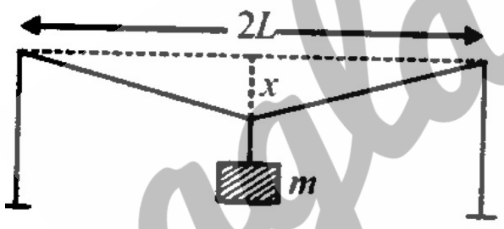
35. A source of sound S emitting waves of frequency 100 Hz and an observer O are located at some distance from each other. The source is moving with a speed of 19.4 ms^{-1} at an angle of 60° with the source observer line as shown in the figure. The observer is at rest. The apparent frequency observed by the observer is (velocity of sound in air 330 ms^{-1})



(a) 103 Hz
(b) 106 Hz
(c) 97 Hz
(d) 100 Hz

Correct: a

36. A mild steel wire of length 2L and cross-sectional area A is stretched, well within elastic limit, horizontally between two pillars (figure). A mass m is suspended from the mid-point of the wire. Strain in the wire is



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

Correct: a

37. If in a wire of Young's modulus Y, longitudinal strain X is produced, then the value of potential energy stored in its unit volume will be
(a) YX^2
(b) $2YX^2$
(c) $Y^2X/2$
(d) $YX^2/2$

Correct: d

38. A parallel plate capacitor with air between the plates has a capacitance of 9 pF. The separation between the plates is d. The space between the plates is now filled with two dielectrics constant $K_1 = 3$ and thickness d/3 while the other one has dielectric constant K, = 6 and thickness 2d/3. Capacitance of the capacitor is now
(a) 1.8 pF
(b) 45 pF
(c) 40.5 pF
(d) 20.25 pF

Correct: c

39. A plano convex lens fits exactly into a plano concave lens. Their plane surface are parallel to each other. If the lenses are made of different materials of refractive indices $\mu_1 \& \mu_2$ 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) $\frac{R}{2-(\mu_1 + \mu_2)}$

Correct: a

40. The Young's modulus of a perfectly rigid body is
(a) unity
(b) zero
(c) infinity
(d) some finite non-zero constant

Correct: c

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) $6.25 \times 10^{-2} M$
(b) $2.421 \times 10^{-2} M$

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(c) $0.1875M$
(d) None of these

Correct: a

42. 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)

Correct: b

43. If a 25.0 mL sample of sulfuric acid is titrated with 50.0 mL of 0.025 M sodium hydroxide to a phenolphthalein endpoint, what is the molarity of the acid?
(a) 0.020M
(b) 0.100M
(c) 0.025M
(d) 0.050M

Correct: c

44. 4g if copper was dissolved in conc. HNO_3 The copper nitrate thus obtained gave 5g of its oxide on strong heating the equivalent weight of copper is
(a) 23
(b) 32
(c) 12
(d) 20

Correct: b

45. The boiling point of water is exceptionally high because
(a) there is a covalent bond between H and O
(b) water molecule is linear
(c) water molecules associate due to hydrogen bonding
(d) water molecules is not linear

Correct: c

46. If the Planck's constant $h = 6.6 \times 10^{-34}$Js , the de Broglie wavelength of a particle having momentum of 3.3×10^{-24}kgms^{-1} will be
(a) $0.002A$

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(b) $0.5A$
(c) $2A$
(d) $500A$

Correct: c

47. The by-product of Solvay-Ammonia process is time to time.
(a) CO_2
(b) NH_3
(c) $CaCl_2$
(d) $CaCO_3$

Correct: c

48. The number of radial nodes of 3s and 2p orbitals are respectively
(a) 2,0
(b) 0,2
(c) 1,2
(d) 2,2

Correct: a

49. Which of the following is similar to graphite
(a) B
(b) BN
(c) B_2H_6
(d) B_4C

Correct: b

50. An e^- has magnetic quantum number as –3, what is its principal quantum number?
(a) 1
(b) 2
(c) 3
(d) 4

Correct: d

51. Amongst the elements with following electronic configurations, which one of them may have the
(a) Ne $\left[3s^2 3p^2\right]$
(b) Ar $\left[3d^{10} 4s^2 4p^3\right]$
(c) Ne $\left[3s^2 3p^l\right]$
(d) Ne $\left[3s^2 3p^3\right]$

Correct: d

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52. At high pressure, the entire surface gets covered by a monomolecular layer of the gas follows
(a) three-halved order
(b) second-order
(c) first-order
(d) zero-order

Correct: d

53. The decreasing order of the ionization potential of the following elements is
(a) $\mathrm{Ne} > \mathrm{Cl} > \mathrm{P} > \mathrm{S} > \mathrm{Al} > \mathrm{Mg}$
(b) $N_c > Cl > P > S > Mg > Al$
(c) $\mathrm{Ne} > \mathrm{Cl} > \mathrm{S} > \mathrm{P} > \mathrm{Mg} > \mathrm{Al}$
(d) $\mathrm{Ne} > \mathrm{Cl} > \mathrm{S} > \mathrm{P} > \mathrm{Al} > \mathrm{Mg}$

Correct: b

54. Electrometallurgical process is used to extract
(a) Fe
(b) Pb
(c) Na
(d) Ag

Correct: c

55. The valency shell of element A contains 3 electrons while the valency shell of element B contains 6 electrons. If A combines with B, the probable formula of the compound formed will be
(a) $\mathrm{AB_2}$
(b) $\mathrm{A_2B}$
(c) $\mathrm{A_2B_3}$
(d) $\mathrm{A_3B_2}$

Correct: c

56. Which of the following is the correct and increasing order of lone pair of electrons on the central atom?
(a) $\mathrm{IF_7} < \mathrm{IF_s} < \mathrm{ClF_3} < \mathrm{XCF_2}$
(b) $\mathrm{IF_7} < \mathrm{XeF_2} < \mathrm{ClF_2} < \mathrm{IF_5}$
(c) $\mathrm{IF_7} < \mathrm{ClF_3} < \mathrm{XeF_2} < \mathrm{IF_5}$
(d) $\mathrm{IF_7} < \mathrm{XeF_2} < \mathrm{IF_5} < \mathrm{ClF_3}$

Correct: a

57. Calcination is used in metallurgy for removal of?

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(a) Water and sulphide
(b) Water and CO_2
(c) CO_2 and H_2S
(d) H_2O and H_2S

Correct: b

58. Which of the following shows correct order of bond length?
(a) $O_2^+ > O_2 > O_2^- > O_2^{2-}$
(b) $O_2^+ < O_2^- > O_2 < O_2^{2-}$
(c) $O_2^+ > O_2 < O_2^- > O_2^{2-}$
(d) $O_2^+ > O_2^2 < O_2^2 > O_2^{2-}$.

Correct: b

59. Which of these doesn't exist?
(a) PH_3
(b) PH_5
(c) LuH_3
(d) PF_5

Correct: b

60. In PO_4^{3-} , the formal charge on each oxygen atom and the P- O bond order respectively are
(a) -0.75,0.6
(b) -0.75, 1.0
(c) -0.75, 1.25
(d) -3, 1.25

Correct: c

61. Which of the following shows maximum magnetic moment?
(a) Mg^{2+}
(b) Ti^{3+}
(c) V^{3+}
(d) Fe^{2+}

Correct: d

62. One moles each of four ideal gases are kept as follows:
I. 1 L of gas (A) at 2 atm pressure
II. 2.5 L of gas (B) at 2 atm pressure
III. 1.25 L of gas (C) at 2 atm pressure
IV. 2.5 of gas (D) at 2.5 atm pressure

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Which of the above gases is kept at highest temperature?
(a) Gas (A)
(b) Gas (B)
(c) Gas (C)
(d) Gas (D)

Correct: d

63. At what temperature, the rate of effusion of N_2 , would be 1.625 times than that of SO_2 at 50°C?
(a) 110K
(b) 173K
(c) 373 K
(d) 273K

Correct: c

64. Which of the following arrangements does not represent the correct order of the property stated against it ?
(a) $V^{2+} < Cr^{2+} < Mn^{2+} < Fe^{2+}$ paramagnetic behaviour
(b) $Ni^{2+} < Co^{2+} < Fe^{2+} < Mn^{2+}$ ionic size
(c) $Co^{3+} < Fe^{3+} < Cr^{3+} < Sc^{3+}$ stability in aqueous solution
(d) $Sc < Ti < Cr < Mn$ number of oxidation states

Correct: a

65. Increasing order of rms velocities of H_2, O_2, N_2 and HBr is
(a) $H_2 > O_2 > N_2 > HBr$
(b) $HBr < O_2 < N_2 < H_2$
(c) $H_2 > N_2 < O_2 > HBr$
(d) $HBr > N_2 < O_2 < H_2$

Correct: b

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

Correct: a

67. For the reaction $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$
Which one of the statement is correct at constant T and P?.
(a) $\Delta H = \Delta E$

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(b) $\Delta H < \Delta E$
(c) $\Delta H > \Delta E$
(d) ΔH Is independent of physical state of the reactants.

Correct: b

68. For a given reaction, $\Delta H = 35.5 kJmol^{-1}$ and $\Delta S = 83.6 JK^{-1}mol^{-1}$. The reaction is spontaneous at : (Assume that and do not vary with temperature)
(a) T > 425K
(b) All temperatures
(c) T > 298 K
(d) T < 425K

Correct: a

69. Chloroform, CHCl, 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 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

Correct: d

70. Given Reaction Energy Change $Li(s) \rightarrow Li(g)$ 161 $Li(g) \rightarrow Li^+(g)$ 520
$\frac{1}{2}F_2(g) \rightarrow F(g)$ T77 $\frac{1}{2}F_2(g) \rightarrow F(g)$ Electron gain enthalpy)
$Li^+(g) + F(g) \rightarrow LiF(s)$ -1047 $Li(s) + \frac{1}{2}F_2(g) \rightarrow LiF(s)$ -617
Based on data provided, the value of electron gain enthalpy of fluorine would be:
(a) $-300 kJmol^{-1}$
(b) $-350 kJmol^{-1}$
(c) $-328 kJmol^{-1}$
(d) $-228 kJmol^{-1}$

Correct: c

71. 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) $\left[Cu(NH_3)_4\right] SO_4 \cdot H_2O$ (square planar)
(b) $\left[Cu(NH_3)_4\right] SO_4$ (Tetrahedral)
(c) $\left[Cu(NH_3)_6 SO_4\right.$ (Octahedral)
(d) $\left[Cu\left(SO_4\right)\left(NH_3\right)_5\right]$ (Octahedral)

Correct: a

72. The pH of 0.1 M solution of the following salts increases in the order :

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(a) $NaCl < NH_4Cl < NaCN < HCl$
(b) $HCl < NH_4Cl < NaCl < NaCN$
(c) $NaCN < NH_4Cl < NaCl < HCl$
(d) $HCl < NaCl < NaCN < NH_4Cl$

Correct: b

73. The hybridisation of Fe in $K_3Fe(CN)_6$, is
(a) sp^3
(b) dsp^3
(c) sp^3d^2
(d) d^2sp^3

Correct: d

74. Which of the following can form buffer solution?
(a) $aq \cdot NH_3 + NH_4OH$
(b) $KOH + HNO_3$
(c) $NaOH + HCl$
(d) $KI + KOH$

Correct: a

75. 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

Correct: a

76. The ratio of oxidation states of Cl in potassium chloride to that in potassium chlorate is
(a) $\frac{+1}{5}$
(b) $\frac{-1}{5}$
(c) $\frac{-2}{5}$
(d) $\frac{+3}{5}$

Correct: b

77. In a S_N^2 substitution reaction of the type $R - Br + Cl^- \xrightarrow{DMF} R - Cl + Br^-$ which one of the following has the highest relative rate?
(a) $CH_3 - CH_2 - CH_2Br$

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(b) $\begin{array}{l} CH_3-CH-CH_2Br \\ \quad\quad CH_3 \end{array}$

(c) $\begin{array}{l} CH_3-C-CH_2Br \\ \quad\quad CH_3 \end{array}$

(d) CH_3CH_2Br

Correct: d

78. In the reaction

$3Br_2 + 6CO_3^{2-} + 3H_2O \rightarrow 5Br^- + BrO_3^- + 6HCO_3^-$

(a) Bromine is oxidised and carbonate is reduced.

(b) Bromine is reduced and water is oxidised

(c) Bromine is neither reduced nor oxidised

(d) Bromine is both reduced and oxidised

Correct: d

79. A gas X at 1 atm is bubbled through a solution containing a mixture of $1MY^-$ and $1MZ^-$ at 25°C. If the reduction potential is Z>Y>X, then

(a) Y will oxidise X and not Z

(b) Y will oxidise Z and not X

(c) Y will oxidise both X and Z

(d) Y will reduce both X and Z

Correct: a

80. The oxidation states of sulphur in the anions SO_3^{2-}, $S_2O_4^{2-}$ and $S_2O_6^{2-}$ follow the order

(a) $SO_3^{2-} < S_2O_4^{2-} < S_2O_6^{2-}$

(b) $S_2O_4^{2-} < S_2O_6^{2-} < SO_3^{2-}$

(c) $S_2O_6^{2-} < S_2O_4^{2-} < SO_3^{2-}$

(d) $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-}$

Correct: d

Mathematics

81. Let A, B, C be finite sets. Suppose that n(A)=10, n(B)=15,n(C)=20, $(n(A \cap B) = 8$ and $n(B \cap C) = 9$. Then the possible value of $n(AUBUC)$ is

(a) 26

(b) 27

(c) 28

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(d) Can be 26 a 27 or 28

Correct: d

82. If matrix $A = \begin{bmatrix} 3 & -2 & 4 \\ 1 & 2 & -1 \\ 0 & 1 & 1 \end{bmatrix}$ and $\mathbf{A}^{-1} = \frac{1}{\mathbf{k}}\mathbf{adj}(\mathbf{A})$ then k is

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

Correct: c

83. Two finite sets have m and n elements. The number of subsets of the first set is 112 more than that of the second set. The values of m and n respectively are,
(a) 4,7
(b) 7,4
(c) 4,4
(d) 7,7

Correct: b

84. Let the orthocentre and centroid of a triangle be A(-3, 5) and B(3, 3) respectively. If C is the circumcentre of this triangle, then the radius of the circle having line segment AC as diameter, is:
(a) $2\sqrt{10}$
(b) $3\sqrt{\frac{5}{2}}$
(c) $\frac{3\sqrt{5}}{2}$
(d) $\sqrt{10}$

Correct: b

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

Correct: b

86. 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,x)

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(b) (∞, 0)
(c) $(-x, x)$
(d) None of these

Correct: d

87. The angle between the lines whose intercepts on the axes are a, -b and b, -a respectively, is
(a) $\tan^{-1} \frac{a^2-b^2}{ab}$
(b) $\tan^{-1} \frac{b^2-a^2}{2}$
(c) $\tan^{-1} \frac{b^2-a^2}{2ab}$
(d) None of these

Correct: c

88. The period of the function f(x)= $|\sin x| - |\cos x|$
(a) π/2
(b) π
(c) 2π
(d) none of these

Correct: b

89. 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) $(x-4)^2 + (y-5)^2 = 13$

Correct: b

90. The domain of the functions $f(x) = \log\left(-\log_{=}\left(1 + \frac{1}{x^{1.4}}\right) - 1\right)$ is
(a) (0,1)
(b) (0,1]
(c) [1 , ∞)
(d) (1 , ∞)

Correct: a

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

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(c) $\frac{m+n}{m-n}\cot\alpha$
(d) $\frac{m+n}{m-n}\cot\theta$

Correct: a

92. 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)

Correct: a

93. The number of roots of equation
$\cos x+\cos 2x+\cos 3x=0$ is $(0\le x\le 2\pi)$
(a) 4
(b) 5
(c) 6
(d) 8

Correct: c

94. The general solution of $\sin x-3\sin 2x+\sin 3x=\cos x-3\cos 2x+\cos 3x$ is
(a) $n\pi+\frac{\pi}{8}$
(b) $\frac{n\pi}{2}+\frac{\pi}{8}$
(c) $(-1)^n\frac{n\pi}{2}+\frac{\pi}{8}$
(d) $2n\pi+\cos^{-1}\frac{3}{2}$

Correct: b

95. $\lim_{x\to 0}\sqrt{\frac{x-\sin x}{x+\sin^2 x}}$ is equal to
(a) 1
(b) 0
(c) ∞
(d) None of these

Correct: b

96. If $\frac{4^n}{n+1}<\frac{(2n)!}{(n!)^2}$ then P(n) is true for
(a) $n\ge 1$
(b) $n>0$
(c) $n<0$

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(d) $n \geq 2$

Correct: d

97. If $\lim_{x \to \frac{\pi}{4}} \frac{4\sqrt{2}-(\cos x+\sin x)^5}{1-\sin 2x}$ then x is equal to
(a) $\sqrt{2}$
(b) $3\sqrt{2}$
(c) $5\sqrt{2}$
(d) None of the above

Correct: c

98. The greatest positive integer, which divides n(n+1)(n+2)(n+3) for all $n \in \mathbf{N}$ is
(a) 2
(b) 6
(c) 24
(d) 120

Correct: c

99. Let T(k) be the statement $1 + 3 + 5 + \ldots + (2k - 1) = k^2 + 10$.Which of the following is correct?
(a) T(1) is true
(b) T(k) is true => T(k+1) is true
(c) T(n) is true for all $n \in \mathbf{N}$
(d) All above are correct

Correct: b

100. The expression in $\frac{\int_0^n [x]dx}{\int_0^n \langle x \rangle dx}$ where [x] and {x} are integral and fractional part of x and $n \in N$ is equal to
(a) $\frac{1}{n-1}$
(b) $\frac{1}{n}$
(c) n
(d) $n - 1$

Correct: d

101. If the amplitude of z−2=3i is π/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

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Correct: d

102. Coefficient of variation of two distributions are 50 and 60, their arithmetic means are 30 and 25, respectively. Difference of their standard deviations is
(a) 0
(b) 1
(c) 1.3
(d) 2.5

Correct: a

103. Roots of equation $x^2 + bx - c = 0 (b, c > 0)$ are
(a) Both positive
(b) Both negative
(c) Of opposite sign
(d) None of these

Correct: c

104. If α and β are the roots of the equations $x^2 + px + \frac{3p}{4} = 0$ such that $|\alpha - \beta| = \sqrt{10}$, then p belongs to the set :
(a) $\{2, -5\}$
(b) $\{-3, 2\}$
(c) $\{-2, 5\}$
(d) $\{3, -5\}$

Correct: c

105. The mean square deviation of a set of n observations $x_1, x_2, \ldots, , x_n$ 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

Correct: a

106. The set of all real x satisfying the inequality $\frac{3-|x|}{4-|x|} \geq 0$ is
(a) [- 3,3] (- ∞, - 4) (4 , ∞)
(b) (- ∞, - 4) (4 , ∞)
(c) (∞, -3) (4, ∞)
(d) (∞, -3) (∞, 3)

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Correct: a

107. If x satisfies $|3x-2|+|3x-4|+|3x-6| \geq 12$ then
(a) $0 \leq x \geq \frac{8}{3}$
(b) $x \geq \frac{8}{3}$ or $\frac{-4}{3}$
(c) $x \leq 0$ or $x \geq \frac{8}{3}$
(d) $x \geq 2$ only

Correct: c

108. Which of the following is not a vertex of the positive region bounded by the inequalities $2x+3y \leq 6, 5x+3y \leq 15$ and $\mathbf{x}, \mathbf{y} \geq 0$
(a) (0,2)
(b) (0,0)
(c) (3,0)
(d) None of these

Correct: d

109. If $\frac{2x+3}{5} < \frac{4x-1}{2}$ then x lies in the interval
(a) $\left[0, \frac{11}{16}\right)$
(b) $\left[\frac{11}{16}, \infty\right)$
(c) $\left(0, \frac{11}{16}\right)$
(d) $\left(\frac{11}{16}, \infty\right)$

Correct: d

110. Let $\vec{a} = \hat{i} - \hat{k}, \vec{b} = x\hat{i} + \hat{j} + (1-x)\hat{k},$ and $\vec{c} = y_i + x\hat{j} + (1+x-y)\hat{k}$ .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

Correct: d

111. 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!

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Correct: d

112. If $f(z) = \frac{7-z}{1-z^2}$ where z=1+2i then $|f(z)|$ is
(a) $\frac{|z|}{2}$
(b) $|z|$
(c) $2|z|$
(d) None of these

Correct: a

113. How many different nine digit numbers can be formed from the number 223355888 by rearranging its digits so that the odd digits occupy even positions ?
(a) 16
(b) 36
(c) 60
(d) 180

Correct: c

114. Four numbers are multiplied together. Then, the probability that the product will be divisible by 5 or 10 is
(a) 369/625
(b) 399/625
(c) 123/625
(d) 133/625

Correct: a

115. The ratio in which the join of (2, 1, 5) and (3,4,3) is divided by the plane(x+y+z) = 1/2 is:
(a) 3:5
(b) 5:7
(c) 1:3
(d) 4:5

Correct: b

116. The coefficient of $\mathbf{x}^3$ in the expansion of $\left(x - \frac{1}{x}\right)^7$
(a) 14
(b) 21
(c) 28
(d) 35

Correct: b

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117. The integer just greater than $(3+\sqrt{5})^{2n}$ is divisible by $(n \in \mathbf{N})$.
(a) 2^{n-1}
(b) 2^{n+1}
(c) 2^{n+2}
(d) Not divisible by 2

Correct: b

118. The lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{z-4}{-k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{1}$ are coplanar if
(a) k=3 or -3
(b) k=0 or -1
(c) k=1 or -1
(d) k=0 or -3

Correct: d

119. If $\sum_{r=0}^{n} \frac{r+2}{r+1}{}^{n}C_r=\frac{2^8-1}{6}$ then n =
(a) 8
(b) 4
(c) 6
(d) 5

Correct: d

120. The coefficient of the middle term in the binomial expansion in power of x, of $(1+ax)^4$ and of $(1-ax)^6$ is same , if a equals
(a) 3/5
(b) 10/3
(c) -3/10
(d) -5/3

121. If a, b, c are in GP., then
(a) a^2, b^2, c^2 are in GP.
(b) $a^2(b+c), c^2(a+b), b^2(a+c)$ are in GP.
(c) $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in GP.
(d) None of these

Correct: a

122. If x>0 ,then $1+\frac{\log_{e^2} x}{1!}+\frac{(\log_{e^2} x)^2}{2!}+\ldots=$
(a) x
(b) $\mathbf{x}^2$
(c) $2x$

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(d) $\sqrt{x}$

Correct: d

123. 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

Correct: c

124. If $\sum_{k=1}^{n} k(k+1)(k-1) = pn^4 + qn^3 + tn^2 + sn$ where p, q, t and s are constants, then the value of s is equal to
(a) -1/4
(b) -1/2
(c) 1/2
(d) 1/4

Correct: b

125. 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

Correct: b

Logical Reasoning

126. 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) 10m, East
(b) 10 m, South-East
(c) 10 m, West
(d) 10 m, North-East

Correct: a

127. If 5#6=121 and 10#8=324, then find the value of 23 # 14=?

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(a) 1369
(b) 1349
(c) 1331
(d) 725

Correct: a

128. 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

Correct: c

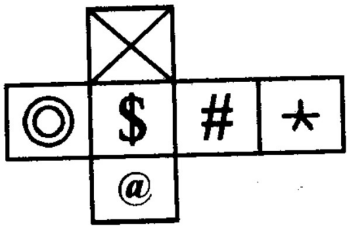
129. Choose the correct alternatives from the given ones that will complete the series.
L_NO__MLLM_00_ML
(a) MNNNO
(b) MONNO
(c) MONON
(d) MONNN

Correct: d

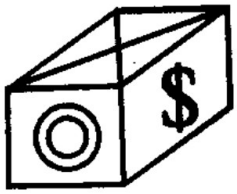
130. In a certain code language, 'SAFER' is written as '5@3#2' and 'RIDE' is written as '2C%#', how would 'FEDS' be written in that code?
(a) 3#05
(b) 3@%5
(c) 3#%5
(d) 3#%2

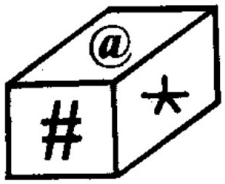
Correct: d

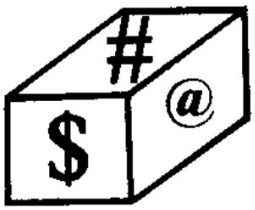
131. Which of the following cube in the answer figure cannot be made based on the unfolded cube in the question figure?

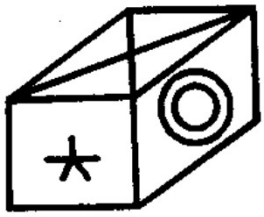


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(a) 

(b) 

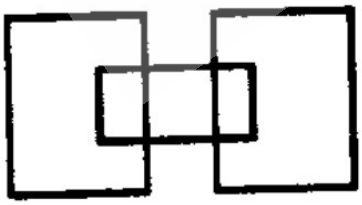
(c) 

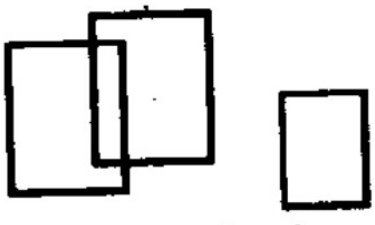
(d) 

Correct: c

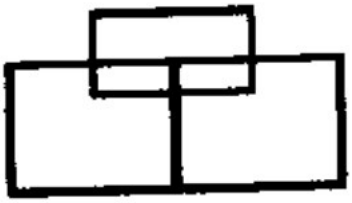
132. Which one of the following diagram represents the correct relationship among Professor, Male and Female.

(a) 

(b) 

(c) 

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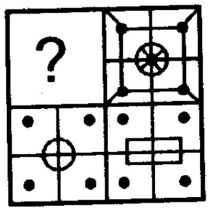
(d) 

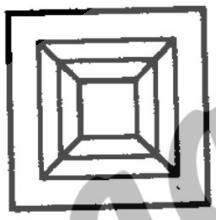
Correct: a

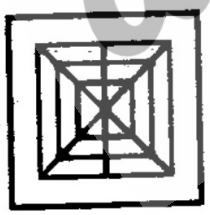
133. If the first and second letters in the word DEPRESSION were interchanged, also the third and fourth letters, the fifth and the sixth letters and so on, then which of the following would be seventh letter from the right.
(a) O
(b) P
(c) R
(d) S

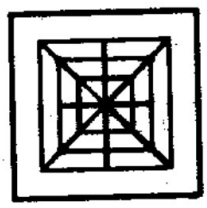
Correct: d

134. Identify the figure that will complete the pattern.

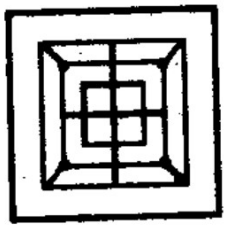


(a) 

(b) 

(c) 

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(d) 

Correct: d

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

Correct: b

English

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

Correct: c

137. Out of the four alternatives, choose the one which express the correct meaning of the word, AUXILIARY
(a) Chief
(b) Supplemental
(c) Negligible
(d) Separate

Correct: b

138. 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) ie., "No correction required" as the answer.
He is really feeling under the weather today, he has a terrible cold.
(I) feeling like the weather
(II) feeling over the weather

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(III) feeling in the weather
(a) Only (I) is correct
(b) Only (III) is correct
(c) Only (II) is correct
(d) No correction required

Correct: d

139. Choose the word opposite is meaning to the given word, RECOMPENSE
(a) Emolument
(b) Reward
(c) Payment
(d) Penalty

Correct: d

140. 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) ie., "No correction required" as the answer.
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

Correct: c

141. In the following question, out of the four alternatives, choose the one which best expresses the meaning of the given word, EMBEZZLE
(a) Misappropriate
(b) Balance
(c) Remunerate
(d) Clear

Correct: a

142. 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 a or less in size is, of course, caveated,

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sincero comprehensive measurement of PM2.5 is not yet being n done and the linkages between pollution, disease and in deaths need further study. What is not in doubt is that 1 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 3 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 is is dumped in the cities ,creating severe particulate pollution. 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. measurement of these particulates is currently absent in many cities, a lacuna that needs to be addressed.
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

Correct: b

143. A part of sentence is underlined. Balance are given alternatives to the underlined part a, b, c and d which may improve the sentence. Choose the correct alternative.
They **requested** me to follow them.
(a) ordered
(b) urged
(c) asked
(d) No improvement

Correct: b

144. 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 a or less in size is, of course, caveated, sincero comprehensive measurement of PM2.5 is not yet being n done and the linkages between pollution, disease and in deaths need further study. What is not in doubt is that 1 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 3 Waste Management Rules, notified to sustainably manage debris that is dumped in the cities, creating ·severe particulate pollution.
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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

Correct: d

145. A part of sentence is underlined. Balance are given alternatives to the underlined part a, b, c and d which may improve the sentence. Choose the correct alternative.
I am fine, what about you?
(a) your

(b) your's
(c) yours
(d) No improvement

Correct: b

146. In each of the following question choose the alternative which is opposite in meaning to the word given capital letters GATHER
(a) Separate
(b) Suspend
(c) Glorify
(d) Spend

Correct: c

147. In each of the following questions choose the alternative which is opposite in meaning to the word given capital letters EXALT
(a) Depreciate
(b) Ennoble
(c) Glorify
(d) Simplify

Correct: a

148. A part of sentence is underlined. Below are given alternatives to the underlined part (a), (b), (c) and (d) which may improve the sentence. Choose the correct alternative.
I am looking after my pen which is missing.
(a) Looking for
(b) Looking in
(c) Looking back
(d) No improvement

Correct: a

149. In each of the following questions choose the alternative which is mostly nearly the same in meaning to the word given capital letters STUBBORN
(a) Easy
(b) Obstinate
(c) Willing
(d) Pliable

Correct: b

150. Choose the word which is closest to the opposite in meaning of the underlined word in the sentence.
Hydra is biologically believed to be <u>immortal.</u>

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(a) undying
(b) perishable
(c) ancient
(d) eternal

Correct: b

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