

JMI Diploma Engineering - 2018

- The alkali metals form salt-like hydrides by the direct synthesis at elevated temperature. The thermal stability of these hydrides decreases in which of the following order?
 - $\text{LiH} > \text{NaH} > \text{KH} > \text{RbH} > \text{CsH}$
 - $\text{LiH} < \text{NaH} < \text{KH} < \text{RbH} < \text{CsH}$
 - $\text{KH} > \text{NaH} > \text{LiH} > \text{CsH} > \text{RbH}$
 - $\text{NaH} > \text{LiH} > \text{KH} > \text{RbH} > \text{CsH}$
- When sulphur is heated with a NaOH, the compounds formed are.
 - $\text{Na}_2\text{S} + \text{H}_2\text{O}$
 - $\text{Na}_2\text{S} + \text{Na}_2\text{S}_2\text{O}_3 + \text{H}_2\text{O}$
 - $\text{Na}_2\text{SO}_3 + \text{H}_2\text{O}$
 - $\text{Na}_2\text{SO}_3 + \text{H}_2\text{O}$
- Some large white transparent crystals are left out in a bowl for several days. They are then observed to have changed their form into white powder. The crystals may have been of.
 - Ammonium Chloride
 - Sodium Chloride
 - Sodium Carbonate
 - Calcium Oxide
- The correct sequence of increasing covalent Character is represented by:
 - $\text{BeCl}_2 < \text{NaCl} < \text{LiCl}$
 - $\text{NaCl} < \text{LiCl} < \text{BeCl}_2$
 - $\text{BeCl}_2 < \text{LiCl} < \text{NaCl}$
 - $\text{LiCl} < \text{NaCl} < \text{BeCl}_2$
- A compound X on heating gives a colorless gas. The residue is dissolved in water to obtain Y. excess CO_2 is bubbled through aqueous solution of Y when Z is formed. Z on gentle heating gives back X. the compound X is.
 - CaCO_3
 - $\text{Ca}(\text{HCO}_3)_2$
 - Na_2CO_3
 - NaHCO_3
- In the following sequence of reactions, the compound B is: $\text{CH}_3\text{CH}=\text{CHCH}_3 \xrightarrow[\text{Zn}]{\text{O}_3, \text{H}_2\text{O}}$ B. the compound B is.
 - $\text{CH}_3\text{CH}_2\text{CHO}$
 - CH_3CHCH_3
 - $\text{CH}_3\text{CH}_2\text{COCH}_3$
 - CH_3CHO
- Which one of the following conformation of cyclohexane is chiral?
 - Twist boat
 - Rigid
 - Chair
 - Boat
- For the reaction of $\text{A} + \text{B} \rightarrow \text{C} + \text{D}$, doubling the concentration of both the reactants increases the reaction rate by 8 times and doubling the initial concentration of only B simply doubles the reaction rate. The rate law for the reaction is.
 - $r = K [\text{A}] [\text{B}]^2$
 - $r = K [\text{A}] [\text{B}]$
 - $r = K [\text{A}]^{1/2} [\text{B}]$
 - $r = K [\text{A}]^2 [\text{B}]^1$
- If the order of reaction is zero. It means that.
 - Rate of reaction is independent of temperature
 - Rate of reaction is independent of the concentration of the reacting species
 - The rate of formation of activated complex is zero
 - The rate of decomposition of activated complex is zero
- The types of bonds present in $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ are:
 - Electrovalent, and covalent
 - Electrovalent, and coordinate covalent
 - Electrovalent, covalent and coordinate covalent
 - Covalent and coordinate covalent
- Soaps essentially form a colloidal solution in water to remove the greasy matter by.
 - Coagulation
 - Emulsification
 - Adsorption
 - De-emulsification
- The stability of lyophobic colloids is due to
 - Charge on their particles
 - The smaller size of the particles
 - The large size of the particles
 - A large medium of dispersion
- Which of the following is not correct for colloids?
 - Particles size is 103 – 105 pm
 - Show tyndall effect
 - Diffusion rapidly
 - Generally transparent
- In the decay series: $\text{A} \xrightarrow{-\alpha} \text{B} \xrightarrow{-\beta} \text{C}$
 - A and B are isobars
 - A and C are isobars
 - A and C are isotopes
 - B and C are isotopes
- In the reaction, the bombarding projectile X is: ${}^7_3\text{Li} + \text{X} \rightarrow {}^7_4\text{Be} + {}^1_0\text{n}$
 - α - particle
 - Proton
 - Neutron
 - Deuteron

16. Emission of a β - particles by an atom of the element results in the formation of.
- (a) Isotope (b) Isobar
(c) Isomer (d) Isomorph
17. In metallurgy, flux is a substance used to convert.
- (a) Insoluble impurities to a fusible mass
(b) Minerals into silicates
(c) Soluble particles into insoluble particles
(d) Fusible impurities to infusible impurities
18. Coke is used in metallurgical process chiefly as:
- (a) Flux (b) Reducing agent
(c) Slag (d) Oxidising agent
19. The organic compound which are isomeric with one another are:
- (a) Alcohols and aldehydes
(b) Aldehydes and carboxylic acids
(c) Ketones and aldehydes
(d) Alcohols and ketones
20. The number of carbon atom joined in a spherical molecule of buckminsterfullerene is:
- (a) 50 (b) 63
(c) 70 (d) 60
21. A functional group mainly determines the.
- (a) Physical properties (b) Chemical properties
(c) Both (d) None of these
22. Phosphorus exists in the following allotropic forms except:
- (a) White phosphorus (b) Red phosphorus
(c) Blue phosphorus (d) Black phosphorus
23. Which of the following statements is not correct regarding diamond and graphite?
- (a) Diamond is denser than graphite
(b) Diamond is chemically non-reactive whereas graphite is very reactive
(c) Diamond is hard whereas graphite is soft.
(d) Diamond and graphite involve sp_2 hybridization of carbon
24. Which of the following dissolve in H_2SO_4 to give oleum?
- (a) SO_3 (b) S_2O
(c) SO_2 (d) H_2S
25. Which of the following halogens exhibits only one oxidation state.
- (a) I (b) F
(c) Cl (d) Br
26. Which of the following is not true?
- (a) Among halide ions, iodine ion is the most power full reducing agent.
(b) Fluorine is the only halogen which does not show a variable oxidation state
(c) $HOCl$ is a stronger acid than $HOBr$
(d) HF is a stronger acid than HCl
27. All of the following assumptions would be in agreement with the existence of ideal gases, except one which is.
- (a) The particles of such a gas are in random motion.
(b) The gas particles have zero volume.
(c) No forces act on the molecules except during elastic collisions.
(d) Does not obey Newton's laws of motion.
28. The heat of combustion of a fuel.
- (a) Is always positive
(b) Can't be known without calculating it
(c) Is always negative
(d) Is equal to the heat of formation
29. The following reaction is used for the preparation of oxygen gas in the laboratory $2KClO_3 (s) + \text{heat} + \text{catalyst} \rightarrow 2KCl + 3O_2$ Which of the following statement (s) is correct about the reaction?
- (a) It is a combination reaction
(b) It is a decomposition reaction and endothermic in nature
(c) It is a decomposition reaction and accompanied by release of heat
(d) It is a photochemical decomposition reaction and exothermic in nature
30. Which of the following statements about the given reaction are correct?
 $3Fe (s) + 4H_2O (g) \rightarrow Fe_3O_4 (s) + 4H_2 (g)$
- (i) Iron metal is getting oxidized
(ii) Water is getting reduced
(iii) Water is acting as reducing agent
(iv) Water is acting as oxidising agent
- (a) (i), (ii) and (iii) (b) (iii) and (iv)
(c) (i), (ii) and (iv) (d) (ii) and (iv)

31. Which of the following statements is not correct?

- (a) All metal carbonates react with acid to give a salt, water and carbon dioxide
- (b) All metal oxides react with water to give salt and acid
- (c) Some metals react with acids to give salt and hydrogen
- (d) Some nonmetal oxides react with water to form an acid

32. The rate of the gaseous reaction is equal to $K[A][B]$. The volume of the vessel is suddenly reduced to one fourth of the initial volume. The rate of reaction would be...

- | | |
|--------------------|--------------------|
| (a) $\frac{1}{16}$ | (b) $\frac{16}{1}$ |
| (c) $\frac{8}{1}$ | (d) $\frac{1}{8}$ |

33. The blue colour of liquid ammonia solutions of alkali metals is mainly due to.

- (a) Coloured cations
- (b) Ammoniated cations
- (c) Ammoniated electrons
- (d) Colour of liquid ammonia

34. Which of the following statements is not true regarding alkali metals?

- (a) The alkali metals exhibit only +1 oxidation state.
- (b) The alkali metal have high chemical reactivity.
- (c) Since the alkali metal have good tendency to lose s-electron, they behave as strong oxidizing agents.
- (d) The alkali metals dissolve in liquid ammonia to give blue colored solution.

35. In Van der Waals equation of state of the gas law, the constant 'b' is a measure of -

- (a) Volume occupied by the molecules
- (b) Intermolecular attraction
- (c) Intermolecular repulsions
- (d) Intermolecular collisions per unit volume

36. In the reaction $2Al(s) + 6HCl(aq) \rightarrow 2Al^{3+}(aq) + 6Cl^{-}(aq) + 3H_2(g)$.

- (a) 11.2 L $H_2(g)$ at STP is produced every mole of $HCl(aq)$ consumed
- (b) 6L $HCl(aq)$ is consumed for every 3L $H_2(g)$ produced
- (c) 33.6L $H_2(g)$ produced regardless of temperature and pressure for every mole Al that reacts
- (d) 67.2L $H_2(g)$ at STP is produced for every mole of Al that reacts

37. Which one of the following ionic species has the greatest proton affinity to form a stable compound?

- (a) NH_2^{-}
- (b) F^{-}
- (c) HS^{-}
- (d) I^{-}

38. The question given below consists of Assertion (A) and Reason (R). Use the following key to select the correct answer.

Assertion: Both 12g of carbon and 27g of aluminium will have 6.12×10^{23} atoms.

Reason: Gram atomic mass of an element contains Avogadro number of atoms.

- (a) If both assertion and reason are correct and reason is correct explanation for assertion.
- (b) If both assertion and reason are correct but reason is not correct explanation for assertion.
- (c) If assertion is correct but reason is incorrect.
- (d) If assertion is and reason both are incorrect.

39. Rutherford scattering formula fails for very small scattering angles because.

- (a) The kinetic energy of α -particles is larger.
- (b) The gold foil is very thin.
- (c) The full nuclear charge of the target atom is partially screened by its electron.
- (d) All of these

40. An element M has an atomic mass 19 and atomic number 9, its ion is represented by.

- | | |
|-------------|--------------|
| (a) M^{+} | (b) M^{2+} |
| (c) M^{-} | (d) M^{2-} |

41. Choose the incorrect relation on the basis of Bohr's theory:

- (a) Velocity of electron $\propto 1/n$
- (b) Radius of orbit $\propto n^2 Z$
- (c) Frequency of revolution $\propto 1/n^2$
- (d) Force on electron $\propto 1/n^4$

42. According to Bohr's model of the atom, an electron can revolve around the atomic nucleus in a suitable orbit without emitting energy if its orbit.

- (a) Is a perfect circle.
- (b) Is a circle with a large radius.
- (c) Houses a whole number of de Broglie waves.
- (d) Houses odd number of de Broglie waves.

43. The argument which favors the particle nature of cathode rays is that they
- Produce fluorescence
 - Travel through vacuum
 - Get deflected by electric and magnetic fields
 - Cast shadows of objects present in their way
44. Which one of the following statements is incorrect in relation to ionization enthalpy?
- Ionization enthalpy increases for each successive electron
 - The greatest increase in ionization enthalpy is experienced on removal of electron from core noble gas
 - End of valence electrons is marked by a big jump in ionization enthalpy
 - Removal of electron from orbital bearing lower n value is easier than from orbital having higher n value
45. Which of the following represents the correct order of increasing electron again enthalpy with negative sign for the elements O, S, F and Cl?
- $O < S < F < Cl$
 - $F < S < O < Cl$
 - $S < O < Cl < F$
 - $Cl < F < O < S$
46. If 10 g of hydrogen and 64g of oxygen were filled in a steel vessel and exploded, the amount of water produced in this reaction will be;
- 1 mol
 - 2 mol
 - 4 mol
 - 3 mol
47. Identify the correct order of the size of the following.
- $Ca^{2+} < K^+ < Ar < Cl^- < S^{2-}$
 - $Ar < Ca^{2+} < K^+ < Cl^- < S^{2-}$
 - $Ca^{2+} < Ar < K^+ < Cl^- < S^{2-}$
 - $Ca^{2+} < K^+ < Ar < S^{2-} < Cl^-$
48. A sudden large jump between the values of second and third ionization enthalpies of an element would be associated with the electronic configuration.
- $1s^2, 2s^2, 2p^6, 3s^2$
 - $1s^2, 2s^2, 2p^6, 3s^1$
 - $1s^2, 2s^2, 2p^6, 3p^1$
 - $1s^2, 2s^2, 2p^2, 3p^1$
49. Electrovalent bond formation depends on.
- Ionization enthalpy
 - Lattice enthalpy
 - Electron gain enthalpy
 - All of these
50. As compared to covalent compounds, electrovalent compound generally have.
- Low melting points and low boiling points
 - High melting points and high boiling points
 - Low melting points and high boiling points
 - High melting points and low boiling points
51. If 10^{-4} dm^3 of water is introduced into a flask at 300K, how many moles of water are in the vapor phase when equilibrium is established?
- (Given: Vapour pressure of H_2O at 300K is 3170 Pa; $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)
- $1.27 \times 10^{-3} \text{ mol}$
 - $5.56 \times 10^{-3} \text{ mol}$
 - $1.53 \times 10^{-2} \text{ mol}$
 - $4.46 \times 10^{-2} \text{ mol}$
52. In a buffer solution containing equal concentrations of B^- and HB , the K_b for B^- is 10^{-10} the pH of buffer solution is.
- 7
 - 6
 - 4
 - 10
53. In the reaction $Br_2 + 6CO_3^{2-} + 3H_2O \rightarrow 5Br^- + BrO_3^- + 6HCO_3^-$
- Bromine is oxidized and carbonate is reduced
 - Bromine is reduced and carbonate is oxidized
 - Bromine is neither reduced nor oxidized
 - Bromine is both reduced and oxidized
54. Which of the following statements are correct?
- All reaction are oxidation and reduction reactions
 - Oxidizing agent itself undergoes reduction
 - Oxidation and reduction always go side by side
 - Oxidation number during reduction decreases
- i, ii, iii
 - ii, iii, iv
 - i, ii, iv
 - i, iii, iv
55. The property of alkaline earth metals that increases with their atomic number is.
- Solubility of their sulphates in water
 - Ionization enthalpy
 - Electro negativity
 - Solubility of their hydroxides in water
56. The term inertia was first used by.
- Newton
 - Galileo
 - Aristotle
 - Kepler

57. A ball is travelling with uniform translatory motion. This means that.

- (a) It is rest
- (b) The path can be straight line or circular and the ball travels with uniform speed
- (c) All parts of the ball have the same velocity (magnitude and direction) and the velocity is constant
- (d) The centre of the ball moves with constant velocity and the ball spins about its centre uniformly

58. A bullet of mass 40g moving with a speed of 90 ms^{-1} enters a heavy wooden block and is stopped after a distance of 60 cm. The average resistive force exerted by the block on the bullet is.

- (a) 180 N
- (b) 220 N
- (c) 270 N
- (d) 320 N

59. A ball of mass m strikes a rigid wall with speed u and rebounds with the same speed. The impulses imparted to the ball by the wall is.

- (a) $2 mu$
- (b) mu
- (c) Zero
- (d) $-2 mu$

60. Ten one-rupee coins are put on top of each other on a table. Each coin has a mass m . The reaction of the 6th coin (counted from the bottom) on the 7th coin is.

- (a) $4mg$
- (b) $6 mg$
- (c) $7 mg$
- (d) $3 mg$

61. Which of the following is a self adjusting force?

- (a) Static friction
- (b) Rolling friction
- (c) Sliding friction
- (d) Dynamic friction

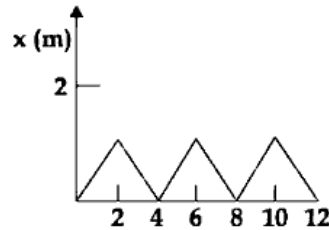
62. The dimensions of reaction are.

- (a) $M^2 LT^3$
- (b) ML^{-1}
- (c) MLT^{-2}
- (d) $ML^2 T^{-1}$

63. A shell of mass 200g is fired by a gun of mass 100kg. If the muzzle speed of the shell is 80 ms^{-1} , then the recoil speed of the gun is.

- (a) 16 cm s^{-1}
- (b) 8 cm^{-1}
- (c) ms^{-1}
- (d) 8 ms^{-2}

64. Figure shows the position - time ($x - t$) graph of one dimensional motion of a body of mass 500g. What is the time interval between two consecutive impulses received by the body?

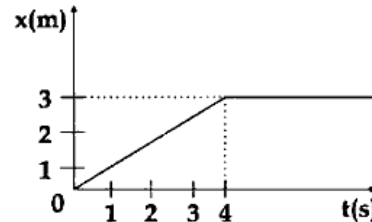


- (a) 2s
- (b) 4s
- (c) 6s
- (d) 8s

65. A passenger getting down from a moving bus falls in the direction of the motion of the bus. This is an example for.

- (a) Second law of motion
- (b) Third law of motion
- (c) Inertia of rest
- (d) Inertia of motion

66. The position-time graph of a body of mass 2 kg is as shown in figure. What is the impulse on the body at $t = 4\text{s}$?



- (a) $\frac{2}{3} \text{ kg ms}^{-1}$
- (b) $-\frac{2}{3} \text{ kg ms}^{-1}$
- (c) $+\frac{2}{3} \text{ kg ms}^{-1}$
- (d) $-\frac{3}{2} \text{ kg ms}^{-1}$

67. Which of the following is a vector quantity?

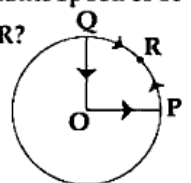
- (a) Temperature
- (b) Current
- (c) Charge
- (d) Magnetic field

68. On an open ground, a motorist follows a track that turns to his left by an angle of 60° after every 500 m. Starting from a given turn, the displacement of the motorist at the third turn is.

- (a) 500 m
- (b) $500\sqrt{3}$
- (c) 1000 m
- (d) $1000\sqrt{3} \text{ m}$

69. A cyclist starts from centre O of a circular park of radius 1 km and moves along the path OPRQO as shown in figure. If he maintains constant speed of 10 ms^{-1} , what is the acceleration at point R?

- (a) 10 ms^{-2}
- (b) 0.1 ms^{-2}
- (c) 0.01 ms^{-2}
- (d) 1 ms^{-2}



70. A cricketer can throw a ball to maximum horizontal distance of 100 m. With the same speed how much height above the ground can the cricketer throw the same ball?

- (a) 50 m (b) 100m
(c) 150 m (d) 200 m

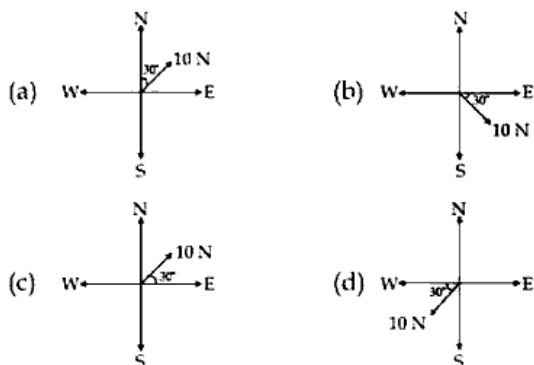
71. A football is kicked into the air vertically upwards with velocity u . The velocity of football at the highest point is

- (a) u (b) $2u$
(c) zero (d) $4u$

72. Centripetal acceleration is

- (a) A constant vector
(b) A constant scalar
(c) A magnitude changing vector
(d) Not a constant vector

73. Which of the following figures represents the force of 10 N in a direction of 30° east of north?



74. The ceiling of a hall is 40 m high. For maximum horizontal distance, the angle at which the ball may be thrown with a speed of 56 ms^{-1} without hitting the ceiling of the hall is.

- (a) 25° (b) 30°
(c) 45° (d) 60°

75. The speed of a projectile at its maximum height is 32 times its initial speed. If the range of the projectile is P times the maximum height attained by it, then P equals

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

76. A 100Ω resistor is connected to a 220 V. The value of current in the circuit is.

- (a) 1.56 A (b) 1.56 mA
(c) 2.2 A (d) 2.2 mA

77. The loss of energy in the form of heat in the iron core of a transformer is

- (a) Iron loss (b) Copper loss
(c) Mechanical (d) None of these

78. Quantity that remains unchanged in a transformer is.

- (a) voltage (b) Current
(c) Frequency (d) None of these

79. Coulomb's law is valid for a.

- (a) Point charge (b) Spherical charge
(c) Line charge (d) Surface charge

80. Direction of current induced in a wire moving in a magnetic field is found using

- (a) Fleming's left hand rule
(b) Fleming's right hand rule
(c) Ampere's rule
(d) Right hand clasp rule

81. Lenz's law is a consequence of the law of conservation of.

- (a) charge (b) Energy
(c) Induced emf (d) Induced current

82. Induction furnace makes use of.

- (a) Self induction (b) Mutual induction
(c) Eddy current (d) None of these

83. The charge on an electron was calculated by.

- (a) Faraday (b) J.J. Thomson
(c) Millikan (d) Einstein

84. The physical quantity which is measured in the unit of WbA^{-1} is.

- (a) Self inductance
(b) Mutual inductance
(c) Magnetic flux
(d) Both (a) and (b)

85. The value of $\frac{1}{4\pi\epsilon_0}$ is.

- (a) $9 \times 10^6 \text{ Nm}^2 \text{ C}^{-2}$ (b) $9 \times 10^7 \text{ Nm}^2 \text{ C}^{-2}$
(c) $9 \times 10^8 \text{ Nm}^2 \text{ C}^{-2}$ (d) $9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$

86. In nuclear reaction, there is conservation of.

- (a) Mass only
(b) Energy only
(c) Momentum only
(d) Mass, energy and momentum

87. Faraday's laws are consequence of the conservation of.

- (a) Charge (b) Energy
(c) Magnetic field (d) Both (b) and (c)

88. The equivalent quantity of mass in electricity is.

- (a) Current (b) Inductance
(c) Potential (d) Charge

89. Work done in taking a mass from one point to another in a gravitational field depends on.

- (a) The end points only
(b) The path followed
(c) The velocity of the mass
(d) Both length of the path and the end points

90. Two identical sphere each mass M & R are separated by a distance $10R$. The gravitational force on mass m placed at the midpoint of the line joining the centers of the spheres is.

- (a) Zero (b) $\frac{2GMm}{25R^2}$
(c) $\frac{GMm}{25R^2}$ (d) $\frac{GMm}{100R^2}$

91. Earth is flattened at the poles and bulges at the equator. This is due to the fact that.

- (a) The earth revolves around the sun in an elliptical orbit.
(b) The angular velocity of spinning about its axis is more at the equator.
(c) The centrifugal force is more at the equator than at poles.
(d) None of these.

92. In motion of an object under the gravitational influence of another object. Which of the following quantities is not conserved?

- (a) Angular momentum (b) Mass of an object
(c) Total mechanical energy (d) Linear momentum

93. Two spheres of mass m and M are situated in air and the gravitational force between them is F . The space around the masses is now filled with a liquid of specific gravity 3. The gravitational force will now be.

- (a) $3F$ (b) F
(c) $\frac{F}{3}$ (d) $\frac{F}{9}$

94. Value of g is

- (a) Maximum at poles
(b) Maximum at equator
(c) Same everywhere
(d) Minimum at poles

95. The value of g is.

- (a) 980 cm/s^2 (b) 9.8 cm/s^2
(c) 980 m/s^2 (d) None of these

96. For a total internal reflection, which of the following is correct?

- (a) Light travels from rare to denser medium
(b) Light travels from denser to rare medium
(c) Light travels in air only
(d) Light travels in water only

97. A boy of height 1 m stands in front of a convex mirror. His distance from the mirror is equal to its focal length. The height of this image is.

- (a) 0.25 m (b) 0.333 m
(c) 0.5 m (d) 0.67 m

98. A plano-convex lens ($f = 20\text{cm}$) is silvered at plane surface. The focal length will be

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

99. When an object is kept at a distance of 30cm from a concave mirror, the image is formed at a distance 10cm. If the object is moved with a speed of 9ms^{-1} , the speed with which image moves is.

- (a) 10 ms^{-1} (b) 1 ms^{-1}
(c) 9 ms^{-1} (d) 0.9 ms^{-1}

100. A convex lens of focal length 0.2m and made of glass ($\mu_g = 1.5$) is immersed in water ($\mu_g = 1.33$). find the change in the focal length of the lens.

- (a) 5.8 m
(b) 0.58 cm
(c) 0.58 m
(d) 5.8 cm

101. Mirage is a phenomenon due to.

- (a) Refraction of light
(b) Reflection of light
(c) Total internal reflection of light
(d) Diffraction of light

102. The near point of a hypermetropic person is 40 cm. The lens to be used for its correction should have the power

- (a) +1.5D (b) +2.5D
(c) -1.5D (d) +0.5D

103. A real image of an object is formed at a distance of 20 cm from a lens. On putting another lens in contact with it, the image is shifted 10 cm towards the combination. The power of the lens is.

- (a) 2 D (b) 5 D
(c) 6 D (d) 10 D

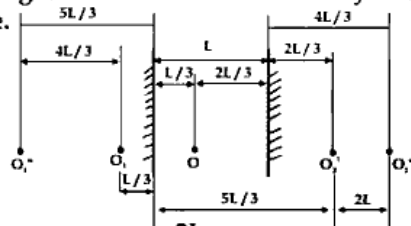
104. When light rays undergo total internal reflection inside a raindrop, which of the rainbow is formed?

- (a) Primary rainbow (b) Secondary
(c) Both (a) and (b) (d) Can't say

105. What can be the largest distance of an image of a real object from a convex mirror of radius of curvature is 20 cm?

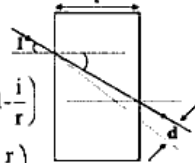
- (a) 10 cm (b) 20 cm
(c) Infinity (d) Zero

106. Two plane mirrors are placed parallel to each other at a distance L apart. A point object O is placed between them, at distance $L/3$ from one mirror. Both mirrors form multiple images. The distance between any two images cannot be.



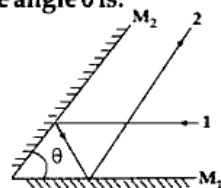
- (a) $\frac{3L}{2}$ (b) $\frac{2L}{3}$
(c) $2L$ (d) L

107. A ray of light is incident on a thick slab of glass of thickness t as shown in the figure. The emergent ray is parallel to the incident ray but displaced sideways by a distance d . If the angles are small then d is.



- (a) $t\left(1 - \frac{i}{r}\right)$ (b) $rt\left(1 - \frac{i}{r}\right)$
(c) $it\left(1 - \frac{r}{i}\right)$ (d) $t\left(1 - \frac{r}{i}\right)$

108. Two plane mirrors, M_1 and M_2 are inclined at angle θ as shown in the figure. A ray of light 1, which is parallel to M_1 strikes M_2 and after two reflection, the ray 2 becomes parallel to M_2 . The angle θ is.



- (a) 0°
(b) 30°
(c) 45°
(d) 60°

109. Which one of the following substances has highest specific heat capacity at room temperature and atmospheric pressure?

- (a) Water (b) Iron
(c) Aluminium (d) Mercury

110. The temperature which has same numerical value on Celsius and Fahrenheit scale is.

- (a) 273 (b) -273
(c) 40 (d) -40

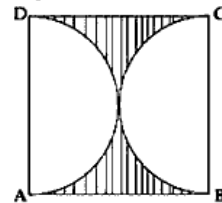
111. Find the unit digit of $1 + 9 + 9^2 + \dots + 9^{2008}$.

- (a) 0 (b) 9
(c) 3 (d) 1

112. If α and β are the roots of $x^2 + px + 1 = 0$ and γ, δ are the roots of $x^2 + qx + 1 = 0$, then value of $(\alpha - \gamma)(\beta - \gamma)(\alpha + \delta)(\beta + \delta)$

- (a) $2p^2$ (b) $2q^2$
(c) $p^2 - q^2$ (d) $q^2 - p^2$

113. If the sides of a triangle are doubled, what will be the effect on its area?



- (a) It becomes 3 times (b) It is doubled
(c) It becomes 4 times (d) It becomes 8 times

114. ABCD is a rectangle with $AD = 10$ cm. If the shaded area is 100 cm^2 , then shortest distance between the semicircles is:

- (a) 5π cm (b) 2.5π cm
(c) $(2.5\pi + 5)$ cm (d) $(2.5\pi - 2.5)$ cm

115. If $p(x)$ is a polynomial such that $f(a), f(b) < 0$, then the number of zeroes lying between a and b is

- (a) at least 1 (b) 2
(c) 1 (d) Nil

116. If zeroes of the polynomial $p(x) = x^3 - 3ax^2 + bx - c$ are in A.P., then

- (a) $2a^3 = ab - c$
(b) $2b^3 = ab + c$
(c) $3a^3 = 2ac - b$
(d) $2c^3 = ac + b$

117. The sum of the deviations of a set of n values $x_1, x_2, x_3, \dots, x_n$, measured from 50 is - 10 and the sum of deviations of the values from 46 is 70. The mean of these values will be.

- (a) 46 (b) 50
(c) 48 (d) 49.5

118. If the ratio of mean and median is 9:10, then ratio of mode and median will be

- (a) 6:5 (b) 10:9
(c) 3:4 (d) 9:8

119. The value of $\frac{1}{1+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{7}} + \dots + \frac{1}{\sqrt{439}+\sqrt{441}}$ is.

- (a) 0 (b) 10
(c) 5 (d) 1

120. A regular polygon is drawn with 27 diagonals. Its interior angle will be.

- (a) 120°
(b) 100°
(c) 140°
(d) 135°

121. The ratio of volume of a cube to the volume of largest sphere inscribed in it is:

- (a) $2:\pi$ (b) $6:\pi$
(c) $4:\pi$ (d) $3:\pi$

122. In a business Rohit gains 20% more profit than Raghav. The percentage by which the profit of Raghav is less than that of Rohit is:

- (a) 20% (b) 25%
(c) 16.67% (d) 17.86%

123. a, b, c are in G.P. If a is the first term and c is the common ratio, then $b =$

- (a) 1 (b) $\frac{1}{a}$
(c) $\frac{1}{c}$ (d) None of these

124. If 1, 2, 3 are the roots of the equation $x^4 + ax^2 + bx + c = 0$ then value of c is.

- (a) 32
(b) 30
(b) 18
(d) -36

125. Find the value $\tan\left(22\frac{1^\circ}{2}\right)$

- (a) $\sqrt{2} - 1$ (b) $1 + \sqrt{2}$
(c) $2 + \sqrt{3}$ (d) $2 - \sqrt{3}$

126. If $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$ the value of $c + \frac{1}{a}$ will be.

- (a) 0 (b) 2
(b) 1 (d) $\frac{1}{2}$

127. If the edge of a cube is doubled then the percentage increase in the volume of the cube will be.

- (a) 700% (b) 500%
(c) 300% (d) 100%

128. A cone, a solid right circular cylinder, & a hemisphere standing on equal bases have same heights. The ratio of their surface areas which is in contact with the air will be.

- (a) $1:3:\sqrt{2}$ (b) $2:1:\sqrt{3}$
(c) $\sqrt{2}:3:2$ (d) $2:1:3$

129. A dealer sold two motorcycles for Rs. 36000 each. On first he gains 20% and on the other he loses 10% On whole transaction he got.

- (a) Loss of Rs. 2000 (b) Profit of Rs. 2000
(c) No loss and no Profit (d) Profit of Rs. 3600

130. An equilateral triangle has its sides $6\sqrt{3}$ cm. The radius of its circum circle will be.

- (a) 3 cm (b) 6 cm
(c) 4 cm (d) $2\sqrt{3}$ cm

131. When 6 is subtracted from each of the given observations, the mean is reduced by 40% If 5 is added to all the given observations, the mean will be.

- (a) 15 (b) 25
(c) 20 (d) 30

132. A rail road curve is to be laid out on a circle. What radius should be used if the track is to turn by 35° in a distance of 154 metres.

- (a) 235 metres (b) 242 metres
(c) 248 metres (d) 252 metres

133. If $\frac{\sin\theta}{x} = \frac{\cos\theta}{y}$ then $\sin\theta - \cos\theta = ?$

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

134. If $21^\circ = \frac{x}{y}$, then value of $\sec 21^\circ - \sin 69^\circ$ is.

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

135. If $\sec x - \cos x = 3$, then the value of $\tan^2 x - \sin^2 x$ will be.

- (a) 9 (b) 5
 (c) 6 (d) 13

136. If the angle of elevation of the tower changes from 30° to 45° , the length of the shadow of a tower decreases by 20 meter. The height of the tower is:

- (a) $20(\sqrt{3} + 1)$ m (b) $10(\sqrt{3} + 1)$ m
 (c) $20(\sqrt{3} - 1)$ m (d) $10(\sqrt{3} - 1)$ m

137. If length and breadth of a cuboid are increased by 20% and 10% respectively and its height is decreased by 30% the change in the volume of the cuboid will be.

- (a) Increase of 10% (b) Decrease of 9.6%
 (c) Decrease of 7.6% (d) No change

138. If $x^a = y^b = z^c$ and $y^2 = xz$ then.

- (a) $a = \frac{2bc}{b+c}$ (b) $b = \frac{2ac}{a+c}$
 (c) $c = \frac{2ab}{b+a}$ (d) $a = \frac{bc}{b+c}$

139. If $x = 3 + 2\sqrt{2}$ then value of $\sqrt{x} - \frac{1}{\sqrt{x}}$ is.

- (a) 0 (b) 1
 (c) 2 (d) $4\sqrt{2}$

140. If $x + \frac{1}{x} = \sqrt{5}$, then value of $x^4 + \frac{1}{x^4}$ is.

- (a) 25 (b) 5
 (c) 7 (d) $5\sqrt{5}$

141. If $x + y + z = 6$ and $xy + yx + zx = 11$, then value of $x^3 + y^3 + z^3 - 3xyz$ will be.

- (a) 24 (b) 18
 (c) 20 (d) 25

142. Find the condition to be satisfied by the coefficients of the equation $px^2 + qx + r = 0$, so that the roots are in the ratio 3:4

- (a) $12q^2 = 49pr$ (b) $12q^2 = -49pr$
 (c) $49q^2 = 12pr$ (d) $49q^2 = -12pr$

143. One coin and one die are thrown together. Find the probability that both outcomes will start from the same letter.

- (a) $\frac{1}{3}$ (b) $\frac{1}{12}$
 (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

144. In a circle of radius 5 cm, XY and XZ are two chords of length 6 cm each. The length of the chord YZ will be.

- (a) 9 cm (b) 8.6 cm
 (c) 9.6 cm (d) 10.4 cm

145. The ratio of volumes of two spheres is $8 : 3\sqrt{3}$. If the sum of their radii is $4 + \sqrt{12}$, the difference of their surface areas will be.

- (a) 20 cm^2 (b) 16 cm^2
 (c) $16\sqrt{3}\pi\text{ cm}^2$ (d) $16\pi\text{ cm}^2$

146. Age of a mother is twice the sum of the ages of her two children. After 21 years her age will be equal to the sum of the ages of her children. The age of the mother is.

- (a) 40 Years (b) 42 Years
 (c) 32 Years (d) 46 Years

147. In a race competition Uday took 2 hrs 40 min & finished his race at 11:50 am. If Mayank took 20% more time to complete his race than that of Uday, find the time at which Mayank will complete his race,

- (a) 12:10 pm (b) 12:12 pm
 (c) 12:22 pm (d) 12:28 pm

148. If $x = \frac{1}{\sqrt{2}} + \frac{1}{2} + \frac{1}{2\sqrt{2}} + \dots \infty$, then find the value of $x + \frac{1}{x}$

- (a) $\sqrt{2}$ (b) $2\sqrt{2}$
 (c) $3\sqrt{2}$ (d) $4\sqrt{2}$

149. If $f(x+2) = x^2 + 7x - 13$, then find the remainder when $f(x)$ is divided by $(x+2)$.

- (a) -25 (b) -12
 (c) -23 (d) -11

150. Twice the square root of the students of class X are playing football, one fourth of the class is sitting in the ground and rest 15 students are decorating the stage for cultural program. How many students are playing football?

- (a) 12 (b) 9
 (c) 8 (d) 16

151. If price of a toy is reduced by Rs. 5, a father can buy 5 more toys to his children for Rs. 300. Then original price of the toys is Rs.

- (a) 24 each (b) 16 each
(c) 20 each (d) 18 each

152. One root of the equation $px^2 + qx + r = 0$, is four times of the other. Then $pr : q^2 =$.

- (a) 1:4 (b) 9:16
(c) 16:9 (d) 4:25

153. How many numbers lie between 50 to 500, which when divided by 7 leave remainder 6?

- (a) 53 (b) 58
(c) 64 (d) 63

154. If for an A.P., $S_{2r} = 3S_r$ (where S_r denotes sum of r terms). Then $S_r : S_{3r} =$.

- (a) 2:5 (b) 3:8
(c) 1:6 (d) 4:15

155. If $P(6, 1)$, $Q(8, 2)$ and $R(9, 4)$ are three vertices of a parallelogram PQRS and A is mid-point of RS, then area of $\triangle APS$ will be.

- (a) 2 square units (b) $\frac{3}{4}$ square units
(c) 1 square unit (d) 1.5 square units

156. An isosceles triangle PQR in which $PR = QR = 6$ cm is inscribed in a circle of radius 9 cm. Area of this triangle will be.

- (a) 8 cm^2 (b) $10\sqrt{3} \text{ cm}^2$
(c) 12 cm^2 (d) $8\sqrt{2} \text{ cm}^2$

157. One interior angle of a rhombus with side 18 cm is 120° . Area of the rhombus will be.

- (a) $162\sqrt{3} \text{ cm}^2$ (b) 144 cm^2
(c) $132\sqrt{3} \text{ cm}^2$ (d) 172 cm^2

158. An equilateral triangle is inscribed in a circle of radius 12 cm. Perimeter of the triangle will be.

- (a) $42\sqrt{2} \text{ cm}$ (b) $36\sqrt{3} \text{ cm}$
(c) 72 cm (d) $42\sqrt{3} \text{ cm}$

159. $\cos^2 1^\circ \cdot \cos^2 2^\circ \cdot \cos^2 3^\circ \dots \dots \cos^2 179^\circ =$

- (a) $\frac{1}{2}$ (b) 1
(c) $\frac{\sqrt{3}}{2}$ (d) 0

160. If $\frac{\sin^2 \theta - 5 \sin \theta + 3}{\cos^2 \theta} = 1$, then θ can be

- (a) 30° (b) 45°
(c) 60° (d) 0°

161. A and B two athletes are running on a round track of length 400 m. The ratio of their speeds is 5:4. How many times the winner will cross the other in a race of 5 km.

- (a) 2 times (b) 3 times
(c) 9 times (d) 6 times

162. A boat is running away from a 150 m high tower standing in the lake. If angle of depression of the boat changes from 45° to 30° in 2 minutes, what will be the speed of the boat?

- (a) $\frac{5(\sqrt{3} - 1)}{4} \text{ m/s}$ (b) $\frac{4(\sqrt{3} - 1)}{5} \text{ m/s}$
(c) $\frac{3(\sqrt{3} - 1)}{2} \text{ km/hr}$ (d) $\frac{5(\sqrt{3} + 1)}{4} \text{ km/hr}$

163. The mean of n observations is \bar{x} . If first observation is increased by 2, second by 4, third by 6 and so on, then new mean will be.

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

164. The marked price of shirt is 50% more than the cost price whereas the selling price is 10% less than the marked price. Profit% on the whole will be.

- (a) 32.5%
(b) 42.5%
(c) 35%
(d) 40%

165. If each edge of a tetrahedron is increased by 10%, its surface area will get increased by

- (a) 21%
(b) 20%
(c) 40%
(d) 24%

166. O is centroid of an isosceles $\triangle PQR$ in which $PQ = PR$ and $OQ = 6$ cm. Find length of the median passing through Q

- (a) 12 cm
(b) 9 cm
(c) 15 cm
(d) 8 cm

167. Rohit is 20% less efficient than Amar in a particular work. If Amar can do that work in 24 days, then how much time will they take together to complete that work:

- (a) 15 days (b) 18 days
(c) $13\frac{1}{3}$ days (d) $12\frac{2}{3}$ days

168. The identity $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$ is not true only when.

- (a) $a > 0, b > 0$ (b) $a > 0, b < 0$
(c) $a < 0, b < 0$ (d) $a < b, b < 0$

169. A triangle is formed by joining mid points of sides of a given triangle and another triangle is formed again by joining mid points of it's sides. The ratio of areas of this triangle to that of the original one will be.

- (a) 1:9 (b) 1:16
(c) 1:8 (d) 1:4

170. The base of a prism is square and its height is 10 cm. If the total surface area is 192 cm^2 , the volume of the prism will be.

- (a) 160 cm^3 (b) 165 cm^3
(c) 180 cm^3 (d) 142 cm^3

Answer Key

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
a	b	a	b	b	d	a	d	b	c	b	d	a	b	b	b	b	b	c	d
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
c	c	d	a	d	d	d	c	b	c	b	b	c	a	a	c	b	a	c	c
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
c	a	c	d	d	b	a	a	d	b	a	c	a	b	d	a	c	c	a	a
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
a	c	a	b	d	d	d	c	b	a	c	b	a	b	c	c	b	c	a	b
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
b	a	c	d	d	d	b	b	a	c	c	d	b	a	a	d	c	d	b	c
102	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
a	c	b	a	a	a	c	d	a	c	d	d	c	b	a	a	d	a	b	c
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
b	c	a	d	a	c	a	c	b	b	c	d	a	a	a	b	c	b	c	c
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
b	a	d	c	d	b	c	b	a	a	c	d	c	c	c	d	a	b	d	a
161	162	163	164	165	166	167	168	169	170										
a	a	d	c	a	b	c	d	d	a										