

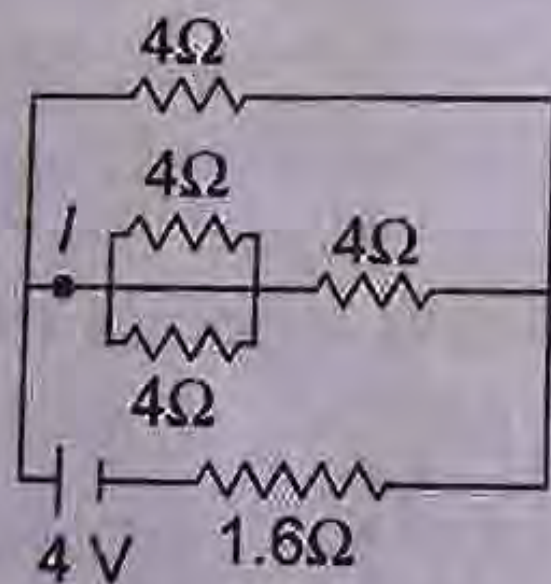
Part I

Physics

1. A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. It is suspended in mid-air by a uniform horizontal magnetic field B . The magnitude of B (in tesla) is (assume $g = 9.8 \text{ ms}^{-2}$)

- (a) 2 (b) 1.5
(c) 0.55 (d) 0.65

2. In the circuit shown the value of I in ampere is



- (a) 1 (b) 0.60 (c) 0.4 (d) 1.5

3. When light of wavelength 300 nm falls on a photoelectric emitter, photoelectrons are liberated. For another emitter, light of wavelength 600 nm is sufficient for liberating photoelectrons. The ratio of the work function of the two emitters is

- (a) 1 : 2 (b) 2 : 1
(c) 4 : 1 (d) 1 : 4

4. A monatomic gas is suddenly compressed to $(1/8)$ th of its initial volume adiabatically. The ratio of its final pressure to the initial pressure is (Given, the ratio of the specific heats of the given gas to be $5/3$)

- (a) 32 (b) $40/3$
(c) $24/5$ (d) 8

5. The intensity of the magnetic induction field at the centre of a single turn circular coil of radius 5 cm carrying current of 0.9 A is
 (a) $36\pi \times 10^{-7}$ T (b) $9\pi \times 10^{-7}$ T
 (c) $36\pi \times 10^{-6}$ T (d) $9\pi \times 10^{-6}$ T

6. A capacitor of capacity $0.1 \mu\text{F}$ connected in series to a resistor of $10 \text{ M}\Omega$ is charged to a certain potential and then made to discharge through resistor. The time in which the potential will take to fall to half its original value is

(Given, $\log_{10} 2 = 0.3010$)

- (a) 2 s (b) 0.693 s
 (c) 0.5 s (d) 1.0 s
7. If the force is given by $F = at + bt^2$ with t as time. The dimensions of a and b are
 (a) $[\text{MLT}^{-4}]$, $[\text{MLT}^{-2}]$
 (b) $[\text{MLT}^{-3}]$, $[\text{MLT}^{-4}]$
 (c) $[\text{ML}^2\text{T}^{-3}]$, $[\text{ML}^2\text{T}^{-2}]$
 (d) $[\text{ML}^2\text{T}^{-3}]$, $[\text{ML}^3\text{T}^{-4}]$

8. A ray of light is incident on the interface between water and glass at an angle i and refracted parallel to the water surface, then value of μ_g will be



- (a) $(4/3) \sin i$ (b) $\frac{1}{\sin i}$
 (c) $\frac{4}{3}$ (d) 1

9. A body is moved in straight line by constant power of machine. What will be the relation between the travelling distance and time?

- (a) $s^2 \propto t^3$ (b) $s^2 \propto t^3$
 (c) $s^3 \propto t^2$ (d) $s \propto t^3$

10. Magnetic moment of bar magnet is M . The work done to turn the magnet by 90° of magnet in direction of magnetic field B will be

- (a) Zero (b) $\frac{1}{2} MB$
 (c) $2 MB$ (d) MB

11. Voltage V and current i in AC circuit are given by

$$V = 50 \sin(50t) \text{ volt}$$

$$i = 50 \sin\left(50t + \frac{\pi}{3}\right) \text{ mA}$$

The power dissipated in circuit is

- (a) 5.0 W (b) 2.5 W
 (c) 1.25 W (d) zero

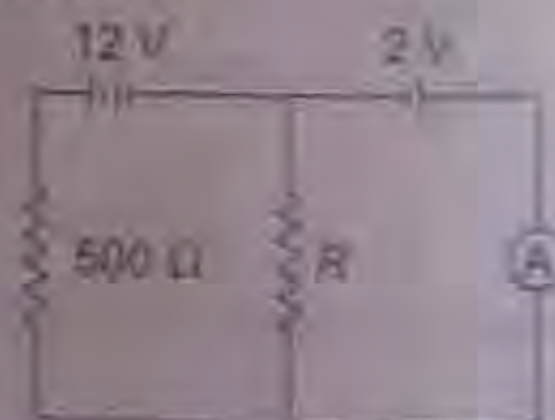
12. A simple wave motion represents by $y = 5(\sin 4\pi t + \sqrt{3} \cos 4\pi t)$. Its amplitude is

- (a) 5 (b) $5\sqrt{3}$
 (c) $10\sqrt{3}$ (d) 10

13. A large open tank has two holes in the wall. One is a square hole of side L at a depth from the top and the other is a circular hole of radius R at a depth $4y$ from the top. When the tank is completely filled with water, the quantities of water flowing out per second from the two holes are the same. Then, the value of R is

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

14. In the circuit shown below, the ammeter reading is zero. Then, the value of the resistance R is



- (a) 50Ω (b) 100Ω
 (c) 200Ω (d) 400Ω

15. The dimensional formula for inductance is
 (a) $[\text{ML}^2\text{T}^{-2}\text{A}^{-2}]$ (b) $[\text{ML}^2\text{TA}^{-2}]$
 (c) $[\text{ML}^2\text{T}^{-1}\text{A}^{-2}]$ (d) $[\text{ML}^2\text{T}^{-2}\text{A}^{-2}]$

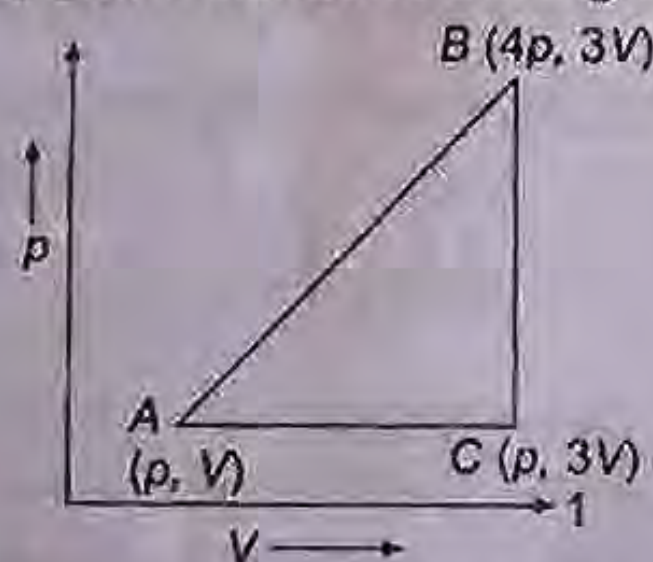
16. The maximum current that can be measured by a galvanometer of resistance $40\ \Omega$ is $10\ \text{mA}$. It is converted into a voltmeter that can read upto $50\ \text{V}$. The resistance to be connected in series with the galvanometer (in ohms) is

- (a) 2010 (b) 4050
(c) 5040 (d) 4960

17. For a given velocity, a projectile has the same range R for two angles of projection if t_1 and t_2 are the time of flight in the two cases, then

- (a) $t_1 t_2 \propto R$ (b) $t_1 t_2 \propto R^2$
(c) $t_1 t_2 \propto \frac{1}{R^2}$ (d) $t_1 t_2 \propto \frac{1}{R}$

18. A sample of ideal monoatomic gas is taken round the cycle $ABCA$ as shown in the figure. The work done during the cycle is



- (a) $3\ pV$ (b) zero
(c) $9\ pV$ (d) $6\ pV$

19. A sound source is moving towards stationary listener with $\frac{1}{10}$ th of the speed of sound. The ratio of apparent to real frequency is

- (a) $\left(\frac{9}{10}\right)^2$ (b) $\frac{10}{9}$ (c) $\frac{11}{10}$ (d) $\left(\frac{11}{10}\right)^2$

20. A satellite is in a circular orbit round the earth at an altitude R above the earth's surface, where R is the radius of the earth. If g is the acceleration due to gravity on the surface of the earth, the speed of the satellite is

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

21. A $10\ \text{kg}$ stone is suspended with a rope of breaking strength $30\ \text{kg-wt}$. The minimum time in which the stone can be raised through a height $10\ \text{m}$ starting from rest is (Taking $g = 10\ \text{Nkg}^{-1}$)

- (a) $0.5\ \text{s}$ (b) $1.0\ \text{s}$
(c) $\sqrt{\frac{2}{3}}\ \text{s}$ (d) $2.0\ \text{s}$

22. How much work must be done by a force on $50\ \text{kg}$ body in order to accelerate it from rest to $20\ \text{m/s}$ in $10\ \text{s}$?

- (a) $10^3\ \text{J}$ (b) $10^4\ \text{J}$
(c) $2 \times 10^3\ \text{J}$ (d) $4 \times 10^4\ \text{J}$

23. A and B are two metals with threshold frequencies $1.8 \times 10^{14}\ \text{Hz}$ and $2.2 \times 10^{14}\ \text{Hz}$. Two identical photons of energy $0.825\ \text{eV}$ each are incident on them. Then photoelectrons are emitted by (Taking $h = 6.6 \times 10^{-34}\ \text{J-s}$)

- (a) B alone
(b) A alone
(c) Neither A nor B
(d) Both A and B

24. The square of resultant of two equal forces is three times their product. Angle between the forces is

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

25. An object placed on a ground is in stable equilibrium. If the object is given a slight push, then initially the position of centre of gravity

- (a) moves nearer to ground
(b) rises higher above the ground
(c) remains as such
(d) may remain at same level

26. The maximum height attained by a projectile when thrown at an angle θ with the horizontal is found to be half the horizontal range. Then, θ is equal to

- (a) $\tan^{-1}(2)$ (b) $\frac{\pi}{6}$
(c) $\frac{\pi}{4}$ (d) $\tan^{-1}\left(\frac{1}{2}\right)$

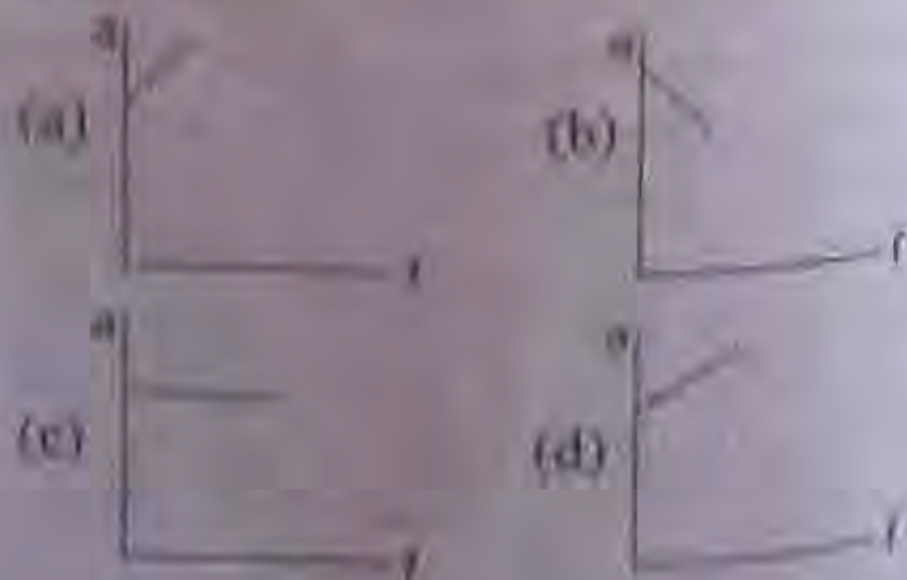
27. A shell of mass 20 kg at rest explodes into two fragments whose masses are in the ratio 2 : 3. The smaller fragment moves with a velocity of 6 ms^{-1} . The kinetic energy of the larger fragment is
 (a) 96 J (b) 216 J
 (c) 144 J (d) 360 J
28. If the displacement of simple pendulum at any time is 0.02 m and acceleration is 2 m/s^2 , then in this time angular velocity will be
 (a) 100 rad/s (b) 10 rad/s
 (c) 1 rad/s (d) 0.1 rad/s
29. Which is constant, the earth revolving around the sun?
 (a) Angular momentum
 (b) Linear momentum
 (c) Rotational kinetic energy
 (d) Kinetic energy
30. In non-elastic collision,
 (a) momentum is conserved
 (b) energy is conserved
 (c) momentum and energy are conserved
 (d) momentum and energy are non-conserved
31. A mica slit of thickness t and refractive index μ is introduced in the ray from the first source S_1 . By how much distance of fringes pattern will be displaced?
 (a) $\frac{d}{D}(\mu - 1)t$ (b) $\frac{D}{d}(\mu - 1)t$
 (c) $\frac{d}{(\mu - 1)D}$ (d) $\frac{D}{d}(\mu - 1)$
32. The refractive index of water is $4/3$ and that of glass is $5/3$. What will be the critical angle for the ray of light entering water from the glass?
 (a) $\sin^{-1}\left(\frac{4}{5}\right)$ (b) $\sin^{-1}\left(\frac{5}{4}\right)$
 (c) $\sin^{-1}\left(\frac{1}{2}\right)$ (d) $\sin^{-1}\left(\frac{2}{1}\right)$
33. The produced rays in sonography are
 (a) microwaves (b) infrared waves
 (c) sound waves (d) ultra sound
34. The ratio of secondary of primary turns of step up transformer is 4 : 1. If a current of 4 A is applied to the primary, the induced current in secondary will be
 (a) 8 A (b) 2 A
 (c) 1 A (d) 0.5 A
35. The minimum force required to move a body up an inclined plane is three times the minimum force required to prevent it from sliding down the plane. If the coefficient of friction between the body and the inclined plane is $\frac{1}{2\sqrt{3}}$, the angle of the inclined plane is
 (a) 60° (b) 45°
 (c) 30° (d) 15°
36. If k_s and k_p respectively are effective spring constant in series and parallel combination of springs as shown in figure, find $\frac{k_s}{k_p}$



- (a) $\frac{9}{2}$ (b) $\frac{3}{7}$ (c) $\frac{2}{9}$ (d) $\frac{7}{3}$

37. The power dissipated across resistance R which is connected across a battery of potential V is P . If resistance is doubled then the power becomes
 (a) $1/2$ (b) 2
 (c) $1/4$ (d) 2

38. A body moves with uniform acceleration then which of the following graph is correct?



39. The rate at which a black body emits radiation at a temperature T is proportional to
- (a) $\frac{1}{T}$ (b) T
(c) T^3 (d) T^4
40. Two equal charges q are kept fixed at a and $+a$ along the x -axis. A particle of mass

m and charge $\frac{q}{2}$ is brought to the origin and given a small displacement along the x -axis, then

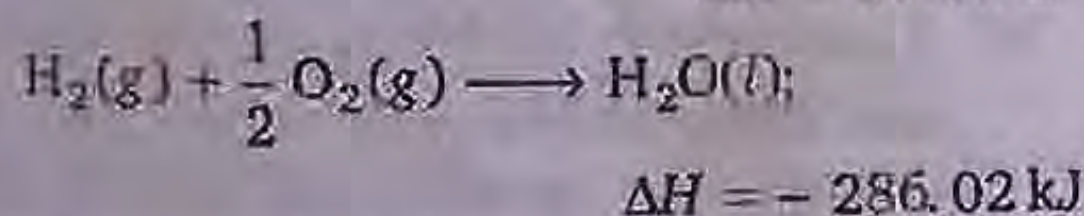
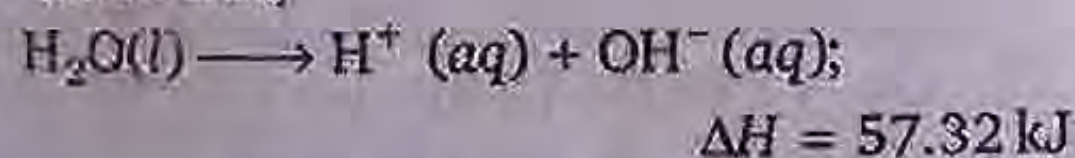
- (a) the particle executes oscillatory motion
(b) the particle remains stationary
(c) the particle executes SHM along x -axis
(d) the particle executes SHM along y -axis

Chemistry

41. The ionic conductance of Ba^{2+} and Cl^- are respectively 127 and $76 \Omega^{-1} \text{cm}^2$ at infinite dilution. The equivalent conductance (in $\Omega^{-1} \text{cm}^2$) of BaCl_2 at infinite dilution will be
- (a) 330 (b) 203
(c) 139.5 (d) 51

42. If the elevation in boiling point of a solution of 10 g of solute (mol. wt. = 100) in 100 g of water is ΔT_b , the ebullioscopic constant of water is
- (a) $\frac{\Delta T_b}{10}$ (b) ΔT_b
(c) $10 \Delta T_b$ (d) $100 \Delta T_b$

43. Given that;

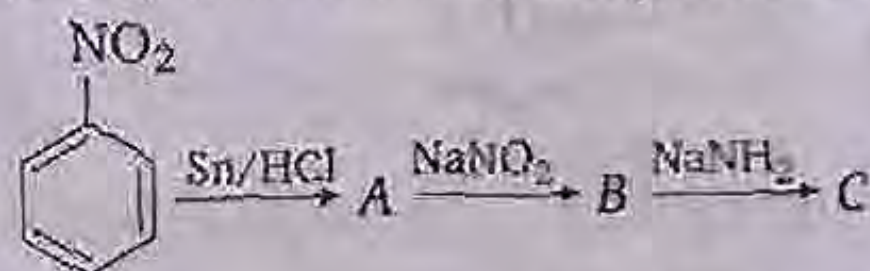


Then calculate the enthalpy of formation of OH^- at 25°C .

- (a) -228.8 kJ (b) -343.52 kJ
(c) $+228.8 \text{ kJ}$ (d) $+343.52 \text{ kJ}$
44. Calculate the amount of heat evolved when 500 cm^3 of 0.1 M HCl is mixed with 200 cm^3 of 0.2 M NaOH .
- (a) 57.3 kJ (b) 2.865 kJ
(c) 2.292 kJ (d) 0.573 kJ
45. Which of the following will be the most effective in the coagulation of $\text{Fe}(\text{OH})_3$ sol?

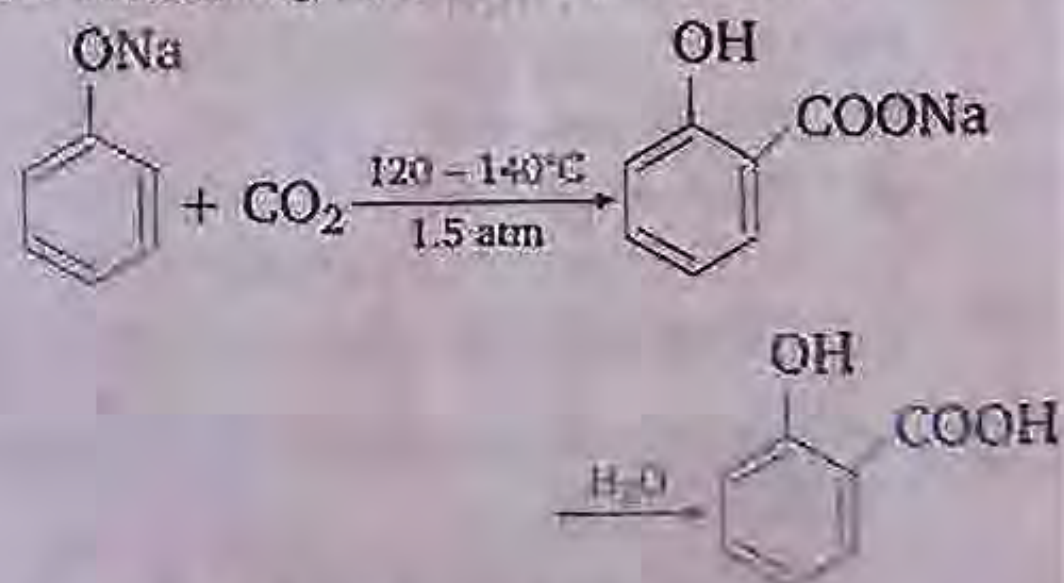
- (a) $\text{Mg}_3(\text{PO}_4)_2$ (b) BaCl_2
(c) NaCl (d) KCN

46. Identify 'C' in the following reaction;



- (a) benzamide (b) benzoic acid
(c) chlorobenzene (d) aniline

47. The following reaction is known as



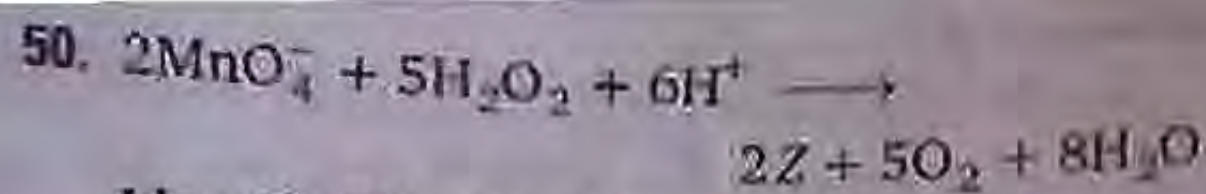
- (a) Friedel-Craft reaction
(b) Kolbe reaction
(c) Reimer-Tiemann reaction
(d) Wittig reaction

48. Which of the following is isoelectronic of carbon?

- (a) Na^+ (b) Al^{3+} (c) O^{2-} (d) N^+

49. In which of the following species only one type of hybridisation is present?

- (a) $\text{CH}_3-\text{CH}_2-\text{CH}=\text{CH}_2$
(b) $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_2$
(c) $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$
(d) $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_2$



Identify Z in the above reaction

- (a) Mn^{2+} (b) Mn^{4+}
(c) Mn (d) MnO_2

51. In the titration of NaOH and HCl, which of the following indicator will be used?

- (a) Methyl orange
(b) Methyl red
(c) Both (a) and (b)
(d) None of (a) and (b)

52. Which of the following is correct IUPAC name for $\text{K}_2[\text{Cr}(\text{CN})_2\text{O}_2(\text{O})_2\text{NH}_3]$?

- (a) Potassium amminecyanoperoxodioxochromatic (IV)
(b) Potassium amminecyanoperoxodioxochromium (V)
(c) Potassium amminecyanoperoxodioxochromium (VI)
(d) Potassium amminedicyanodioxoper-oxochromate (VI)

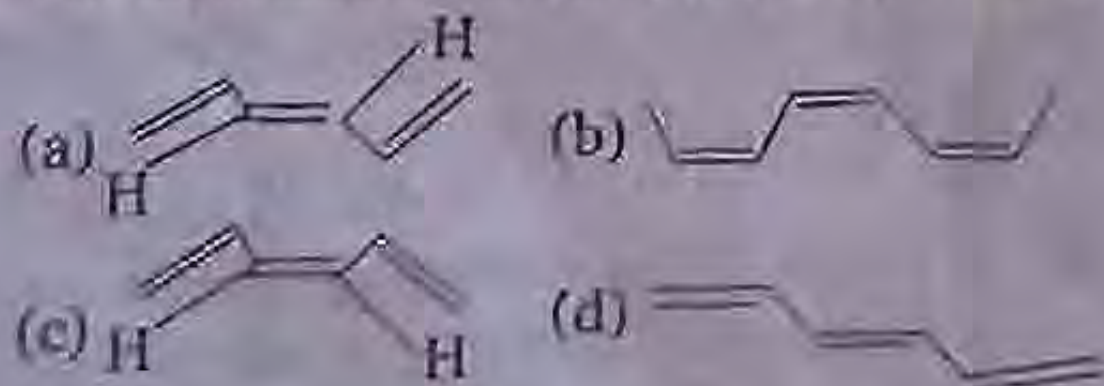
53. Which of the following is process used for the preparation of acetone?

- (a) Waber process
(b) Wacker process
(c) Wolf-Kishner reduction
(d) Gattermann-Koch synthesis

54. Lindane can be obtained by the reaction of benzene with

- (a) CH_3Cl /anhydrous AlCl_3
(b) $\text{C}_2\text{H}_5\text{I}$ /anhydrous AlCl_3
(c) CH_3COCl /anhydrous AlCl_3
(d) Cl_2 in sunlight

55. The structure of *cis*-bis (propenyl) ethene is



56. 5 moles of $\text{Ba}(\text{OH})_2$ are treated with excess of CO_2 . How much BaCO_3 will be formed?

- (a) 39.4 g (b) 197 g
(c) 591 g (d) 985 g

57. A diatomic molecule has a dipole moment of 1.2 D. If its bond distance is 1.0 Å, what fraction of an electronic charge, e , is on each atom?

- (a) 25% of e (b) 50% of e
(c) 60% of e (d) 75% of e

58. A gas is heated through 1°C in a closed vessel and so the pressure increases by 0.4%. The initial temperature of the gas was

- (a) -23°C (b) $+23^\circ\text{C}$
(c) 250°C (d) 523°C

59. For $2\text{NOBr}(\text{g}) \rightleftharpoons 2\text{NO}(\text{g}) + \text{Br}_2(\text{g})$

at equilibrium, $p_{\text{Br}_2} = \frac{p}{q}$ and p is the total

pressure, the ratio $\frac{K_p}{p}$ will be

- (a) $\frac{1}{3}$ (b) $\frac{1}{9}$ (c) $\frac{1}{27}$ (d) $\frac{1}{81}$

60. The decomposition temperature maximum for

- (a) MgCO_3 (b) CaCO_3
(c) BaCO_3 (d) SrCO_3

61. When some amount of zinc is treated separately with excess of sulphuric acid and excess of sodium hydroxide solution, the ratio of volumes of hydrogen evolved is

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

62. A compound (A) when treated with NO_2 and then ammonia gave (B). (B) when treated with bromine and caustic potash produced (C). (C) on treatment with NaNO_2 and HCl at 0°C and then boiling produce *ortho*-cresol. Compound (A) is

- (a) *o*-chlorotoluene
(b) *o*-toluic acid
(c) *m*-toluic acid
(d) *n*-bromotoluene

63. Alizarin is an example of

- (a) triaryl dye
(b) azo dye
(c) vat dye
(d) anthraquinone dye

64. What will be the main product when acetylene reacts with hypochlorous acid?
 (a) Trichloro acetaldehyde
 (b) Acetaldehyde
 (c) Dichloro acetaldehyde
 (d) Chloro acetaldehyde
65. Barium titanate has the perovskite structure, i.e., a cubic lattice with Ba^{2+} ions at the corners of the unit cell, oxide ions at the face centres and titanium ions at the body centre. The molecular formula of barium titanate is
 (a) BaTiO_3 (b) BaTiO_4
 (c) BaTiO_2 (d) BaTiO
66. Which of the following hormone, is responsible for the growth of animals?
 (a) Auxin (b) Insulin
 (c) Adrenaline (d) Somatotropin
67. Which of the following have the largest ionic size?
 (a) F^- (b) O^{2-} (c) Na^+ (d) Mg^{2+}
68. If the radius of H is 0.53 \AA then what will be the radius of ${}_3\text{Li}^{2+}$?
 (a) 0.17 \AA (b) 0.36 \AA
 (c) 0.53 \AA (d) 0.59 \AA
69. Which of the following will have highest value of $\text{p}K_a$?
 (a) $\text{FCH}_2\text{CH}_2\text{COOH}$
 (b) $\text{CH}_3\text{CH}_2\text{F COOH}$
 (c) $\text{CH}_3\text{CH}_2\text{Br COOH}$
 (d) $\text{CH}_3\text{CH}_2\text{COOH}$
70. Gas (A) + $\text{NaOH} \longrightarrow \text{B} \xrightarrow{\text{A}} \text{C} \xrightarrow{\text{H}^+} \text{D}$
 C and D decolourises acidified KMnO_4 . Identify C and D.
 (a) Na_2CO_3 , NaOH
 (b) $(\text{COOH})_2$, $(\text{COONa})_2$
 (c) $(\text{COONa})_2$, $(\text{COOH})_2$
 (d) None of the above
71. The polymer polyurethanes are formed by treating di-isocyanate with
 (a) butadiene (b) isoprene
 (c) glycol (d) acrylonitrile
72. What will be the volume of O_2 at NTP liberated by 5 A current flowing for 193 s through acidulated water?
 (a) 56 mL (b) 112 mL
 (c) 158 mL (d) 965 mL
73. CO_2 goes to air, causes green house effect and gets dissolved in water. What will be the effect on soil fertility and pH of the water?
 (a) Increase (b) Decrease
 (c) Remain same (d) None of these
74. $2\text{N}_2\text{O}_5 \rightleftharpoons 4\text{NO}_2 + \text{O}_2$
 If rate and rate constant for above reaction are $2.40 \times 10^{-5} \text{ mol L}^{-1} \text{ s}^{-1}$ and $3 \times 10^{-5} \text{ s}^{-1}$ respectively, then calculate the concentration of N_2O_5 .
 (a) 1.4 (b) 1.2 (c) 0.04 (d) 0.8
75. The molecule BF_3 and NF_3 both are covalent compounds, but BF_3 is non-polar and NF_3 is polar. The reason is that
 (a) boron is a metal and nitrogen is a gas in uncombined state.
 (b) BF_3 bonds have no dipole moment whereas NF_3 bond have dipole moment.
 (c) atomic size of boron is smaller than that of nitrogen.
 (d) BF_3 is symmetrical molecule whereas NF_3 is unsymmetrical.
76. 1.2% NaCl solution is isotonic with 7.2% glucose solution. What will be the van't Hoff factor, i ?
 (a) 0.5 (b) 1
 (c) 2 (d) 6
77. Green vitriol is
 (a) ferrous sulphate
 (b) tin oxide
 (c) zinc oxide
 (d) ferrous carbonate
78. 2-bromopentane with alcoholic KOH yields a mixture of three alkenes. Which of the following alkene is predominant?
 (a) 1-pentene

- (b) *Cis*-2-pentene
- (c) *Trans*-2-pentene
- (d) *Cis*-1-pentene

79. In which of the following compounds, the bond length between hybridised carbon atom and other carbon atom is minimum?

- (a) Butane
- (b) Propyne
- (c) Propene
- (d) Butene

80. Which of the following is IUPAC name of compound?



- (a) 1, 4-dichloro-2, 6-dioxo-4-carboxy-1-oic acid
- (b) 2,4-dioxo-1, 4-dichlorohexane-1-carboxylic acid
- (c) 1,4-dichloro-2, 4, 6-dioxocyclohexane-1-carboxylic acid
- (d) 1, 4-dichloro-4-formyl-2, 6-dioxocyclohexane-1-carboxylic acid

English Proficiency

Directions (Q.Nos. 81 to 83) Out of the four alternatives, choose the one which expresses the right meaning of the given word.

81. Dubious

- (a) Doubtful
- (b) Disputable
- (c) Duplicate
- (d) Dangerous

82. Flabbergasted

- (a) Scared
- (b) Embarrassed
- (c) Dumbfounded
- (d) Humiliated

83. Eternal

- (a) Innumerable
- (b) Unmeasurable
- (c) Prolonged
- (d) Perpetual

Directions (Q.Nos. 84 to 86) Choose the word opposite in meaning to the given word.

84. Despair

- (a) Belief
- (b) Trust
- (c) Hope
- (d) Faith

85. In toto

- (a) Bluntly
- (b) Partially
- (c) Entirely
- (d) Strongly

86. Protean

- (a) Amateur
- (b) Catholic
- (c) Unchanging
- (d) Rapid

Directions (Q.Nos. 87 to 89) A part of the sentence is underlined. Below are given alternatives to the underlined part at a, b and c, which may improve the sentence. Choose the correct alternative. In case no improvement is needed, your answer is 'd'.

87. He declined all the allegations against him.

- (a) spurned
- (b) refused
- (c) refuted
- (d) No improvement

88. It is time we leave.

- (a) left
- (b) have to leave
- (c) would leave
- (d) No improvement

89. We spent an hour discussing about his character.

- (a) on his character
- (b) of his character
- (c) his character
- (d) No improvement

Directions (Q.Nos. 90 to 92) Sentences are given with blanks to be filled in with an appropriate and suitable word. Four alternatives are suggested for each question. Choose the correct alternative out of the four.

90. Are you really desirous visiting Japan?

- (a) of
- (b) in
- (c) to
- (d) about

91. When Indians from the South move North, they find certain aspects of life quite from their own.

- (a) strange (b) separate
(c) different (d) divergent

92. The sky is overcast, we the storm will soon burst.

- (a) expect (b) hope
(c) trust (d) suspect

Directions (Q. Nos. 93 to 95) The first and the last parts of the sentence are numbered 1 to 6. The rest of the sentence is spelt into four parts and named P, Q, R and S. These four parts are not given in their proper order. Read the parts and find out which of the four combinations is correct. Then find the correct answer.

93. 1. Early to bed, early to rise, makes a man healthy, wealthy and wise.

P. But for the morning tea, I had to wait for someone to get up before me.

Q. This saying inspired me to rise early.

R. That day I was the first to get up.

S. One day I got up early in the morning.

6. Then I realised that it was a waste of time to get up early and wait for the morning tea.

- (a) QSRP (b) QPRS
(c) PQRS (d) SPQR

94. 1. A wood-cutter was cutting a tree on a river bank.

P. He knelt down and prayed.

Q. His axe slipped and fell into the water.

R. God Mercury appeared before him and asked about the matter.

S. He could not get it back as the river was very deep.

6. He dived into the water and came up with an axe of good.

- (a) RPQS (b) RPSQ
(c) QSRP (d) QSPR

95. 1. A dog stole a piece of meat from a butcher's shop.

P. He barked in anger.

Q. He ran to the jungle with the piece of meat.

R. He saw his reflection.

S. He crossed a river on the way.

6. He lost his piece of meat.

- (a) QPSR
(b) QSRP
(c) QPRS
(d) SRPQ

Logical Reasoning

96. In a certain code MONKEY is XDJMNL. How is 'TIGER' written as?

- (a) QDFHS (b) SDFHS
(c) SHFDQ (d) LJHFS

97. Find the missing number from the given responses.



- (a) 31 (b) 229
(c) 234 (d) 312

98. If the day before yesterday was Thursday, when will Sunday be?

- (a) tomorrow
(b) day after tomorrow
(c) today
(d) two days after today

99. In a row of children Ravi is fourth from right and Shyam is second from left. When they interchange positions Ravi is ninth from right. What will be Shyam position from left?

- (a) Fifth (b) Sixth
(c) Seventh (d) Eighth



Answer Figures



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

101. Which represents carrot, food, vegetable?



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

102. "All the members of the Tennis club are members of the badminton club too". No woman plays badminton?

- (a) Some women play Tennis
- (b) No member of the Tennis club plays badminton
- (c) Some women are members of the Tennis club
- (d) No woman is a member of Tennis club

103. Which number is wrong in the given series:
1, 9, 25, 50, 81
(a) 1 (b) 25 (c) 50 (d) 81

104. In the following question and Δ stands for any of the Mathematical signs at different places, which are given as choices under each question. Select the choice with the correct sequence of signs which when substituted makes the question as correct equation?

$$24 \Delta 4 \Delta 5 \Delta 4$$

- (a) $\times + =$ (b) $= \times +$
- (c) $+ \times =$ (d) $= + \times$

105. Which answer figure is the exact mirror image of the given figure when the mirror is held from the right at PQ?



Answer Figures



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

Mathematics

106. The equation of the base BC of an equilateral $\triangle ABC$ is $x + y = 2$ and A is $(2, -1)$. The length of the side of the triangle is

- (a) $\sqrt{2}$ (b) $\left(\frac{3}{2}\right)^{1/2}$
- (c) $\left(\frac{1}{2}\right)^{1/2}$ (d) $\left(\frac{2}{3}\right)^{1/2}$

107. The equation of the circle circumscribing the triangle formed by the lines $x + y = 6$, $2x + y = 4$ and $x + 2y = 5$ is

- (a) $x^2 + y^2 + 17x + 19y - 50 = 0$
- (b) $x^2 + y^2 - 17x - 19y - 50 = 0$
- (c) $x^2 + y^2 + 17x - 19y - 50 = 0$
- (d) $x^2 + y^2 - 17x - 19y + 50 = 0$

108. The length of the tangent from $(5, 1)$ to the circle $x^2 + y^2 + 6x - 4y - 3 = 0$ is

- (a) 7
- (b) 49
- (c) 63
- (d) 21

109. If the length of the major axis of the ellipse $\left(\frac{x^2}{a^2}\right) + \left(\frac{y^2}{b^2}\right) = 1$ is three times the length of minor axis, its eccentricity is

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

110. S and T are the foci of the ellipse $\left(\frac{x^2}{a^2}\right) + \left(\frac{y^2}{b^2}\right) = 1$ and B is an end of the minor axis. If STB is an equilateral triangle, then eccentricity of the ellipse is

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

111. The difference of the focal distance of any point on the hyperbola is equal to its

(a) latusrectum
(b) eccentricity
(c) length of the transverse axis
(d) half the length of the transverse axis

112. If $A + B + C = 180^\circ$, then

$\frac{\cot A + \cot B + \cot C}{\cot A \cot B \cot C}$ is equal to

(a) 1 (b) $\cot A \cos B \cot C$
(c) -1 (d) 0

113. The angles of a triangle are in AP and the least angle is 30° . The greatest angle in radians is

(a) $\frac{7\pi}{12}$ (b) $\frac{2\pi}{3}$ (c) $\frac{5\pi}{6}$ (d) $\frac{\pi}{2}$

114. If $\tan 20^\circ = p$, then $\frac{\tan 160^\circ - \tan 110^\circ}{1 + \tan 160^\circ \tan 110^\circ}$ is equal to

(a) $\left(\frac{1-p^2}{2p}\right)$ (b) $\left(\frac{2p}{1+p^2}\right)$
(c) $\left(\frac{1+p}{2p}\right)$ (d) $\left(\frac{1-p}{2p}\right)$

115. If $4\sin^{-1}x + \cos^{-1}x = \pi$, then x is equal to

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

116. In a ΔABC , $a = 2$, $b = 3$ and $\sin A = \frac{2}{3}$.

Then, $\cos C$ is equal to

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$
(c) $\frac{2}{\sqrt{13}}$ (d) $\frac{1}{\sqrt{13}}$

117. The vector equation

$$\mathbf{r} = \mathbf{i} - 2\mathbf{j} - \mathbf{k} + t(6\mathbf{j} - \mathbf{k})$$

represents a straight line passing through the points

(a) $(0, 6, -1)$ and $(1, -2, -1)$
(b) $(0, 6, -1)$ and $(-1, -4, -2)$
(c) $(1, -2, -1)$ and $(1, 4, -2)$
(d) $(1, -2, -1)$ and $(0, -6, 1)$

118. The work done by the force $4\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$ in moving a particle along a straight line from the point $(3, 2, -1)$ to $(2, -1, 4)$ is

(a) 0 units (b) 4 units
(c) 15 units (d) 19 units

119. $\lim_{x \rightarrow 0} \left(\frac{(2+x)\sin(2+x) - 2\sin 2}{x} \right)$ is equal to

(a) $\sin 2$ (b) $\cos 2$
(c) 1 (d) $2\cos 2 + \sin 2$

120. If $f(x) = \frac{3x + \tan^2 x}{x}$ is continuous at $x = 0$, then $f(0)$ is equal to

(a) 3 (b) 2 (c) 4 (d) 0

121. If x is measured in degree, then $\frac{d}{dx}(\cos x)$ is equal to

(a) $-\sin x$ (b) $-\frac{180}{\pi} \sin x$
(c) $-\frac{\pi}{180} \sin x$ (d) $\sin x$

122. $\left(\frac{d}{dx}\right)[\log(\sec x - \tan x)]$ is equal to

(a) $-\sec x$ (b) $\sec x + \tan x$
(c) $\sec x$ (d) $\sec x - \tan x$

123. If $x = \cos^3 \theta$ and $y = \sin^3 \theta$, then $1 + \left(\frac{dy}{dx}\right)^2$ is equal to

(a) $\tan^2 \theta$ (b) $\cot^2 \theta$
(c) $\sec^2 \theta$ (d) $\operatorname{cosec}^2 \theta$

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

(a) $-\frac{1}{t^2}$ (b) $-\frac{1}{2at^3}$ (c) $\frac{1}{t^2}$ (d) $-\frac{a}{2t^3}$

125. If the rate of change in the circumference of a circle is 0.3 cm/s, then the rate of change in the area of the circle when the radius is 5 cm, is
 (a) 1.5 sq cm/s
 (b) 0.5 sq cm/s
 (c) 5 sq cm/s
 (d) 3 sq cm/s
126. If $y = x^3 - ax^2 + 48x + 7$ is an increasing function for all real values of x , then a lies in
 (a) $(-14, 14)$
 (b) $(-12, 12)$
 (c) $(-16, 16)$
 (d) $(-21, 21)$
127. Rolle's theorem is not applicable for the function $f(x) = |x|$ in the interval $[-1, 1]$ because
 (a) $f'(1)$ does not exist
 (b) $f'(-1)$ does not exist
 (c) $f(x)$ is discontinuous at $x = 0$
 (d) $f'(0)$ does not exist
128. $\int \frac{2dx}{(e^x + e^{-x})^2}$ is equal to
 (a) $-\frac{e^{-x}}{(e^x + e^{-x})} + C$
 (b) $-\frac{1}{(e^x + e^{-x})} + C$
 (c) $\frac{1}{(e^x + 1)^2} + C$
 (d) $\frac{1}{(e^x - e^{-x})^2} + C$
129. $\int_0^{\pi/2} \frac{\sin^n \theta}{\sin^n \theta + \cos^n \theta} d\theta$ is equal to
 (a) 1
 (b) 0
 (c) $\frac{\pi}{2}$
 (d) $\frac{\pi}{4}$
130. $\int_0^{\pi} \cos^{101} x dx$ is equal to
 (a) $\frac{\pi}{4}$
 (b) $\frac{1}{102}$
 (c) $\left(\frac{\pi}{3}\right)^{101}$
 (d) 0
131. $\lim_{n \rightarrow \infty} \left[\frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{6n} \right]$
 (a) $\log 2$
 (b) $\log(1 + \sqrt{5})$
 (c) $\log 6$
 (d) 0
132. By eliminating the arbitrary constant A and B from $y = Ax^2 + Bx$, we get the differential equation
 (a) $\frac{d^2y}{dx^2} = 0$
 (b) $x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} + 2y = 0$
 (c) $\frac{d^2y}{dx^2} = 0$
 (d) $x^2 \frac{d^2y}{dx^2} + y = 0$
133. If $f(x) = \frac{\log(1+ax) - \log(1-bx)}{x}$ for $x \neq 0$ and $f(0) = k$ and $f(x)$ is continuous at $x = 0$, then k is equal to
 (a) $a + b$
 (b) $a - b$
 (c) a
 (d) b
134. If $4 - 5i$ is a root of the quadratic equation $x^2 + ax + b = 0$, then (a, b) is equal to
 (a) $(8, 41)$
 (b) $(-8, 41)$
 (c) $(41, 8)$
 (d) $(-41, 8)$
135. If α and β are the roots of the quadratic equation $4x^2 + 3x + 7 = 0$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is
 (a) $-\frac{3}{4}$
 (b) $-\frac{3}{7}$
 (c) $\frac{3}{7}$
 (d) $\frac{4}{7}$
136. If α, β are the roots of $ax^2 + bx + c = 0$ and $\alpha + k, \beta + k$ are the roots of $px^2 + qx + r = 0$, then $\frac{b^2 - 4ac}{q^2 - 4pr}$ is equal to
 (a) $\frac{a}{p}$
 (b) 1
 (c) $\left(\frac{a}{p}\right)^2$
 (d) 0
137. Area of the triangle in the argand diagram formed by the complex numbers $z, iz, z + iz$, where $z = x + iy$ is
 (a) $|z|$
 (b) $|z|^2$
 (c) $2|z|^2$
 (d) $\frac{1}{2}|z|^2$

138. The sum of n terms of the series $\frac{1}{2} + \frac{3}{4} + \frac{7}{8} + \frac{15}{16} + \dots$ is
- (a) $n - 1 + 2^{-n}$ (b) 1
(c) $n - 1$ (d) $1 + 2^{-n}$

139. $0.2 + 0.22 + 0.222 + \dots$ to n terms is equal to

- (a) $\left(\frac{2}{9}\right) - \left(\frac{2}{81}\right)(1 - 10^{-n})$
(b) $n - \left(\frac{1}{9}\right)(1 - 10^{-n})$
(c) $\left(\frac{2}{9}\right)\left[n - \left(\frac{1}{9}\right)(1 - 10^{-n})\right]$
(d) $\left(\frac{2}{9}\right)$

140. The number of ways in which a team of 11 players can be selected from 22 players including 2 of them and excluding 4 of them is

- (a) ${}^{16}C_{11}$ (b) ${}^{16}C_5$
(c) ${}^{16}C_9$ (d) ${}^{20}C_8$

141. The number of ways four boys can be seated around a round table in four chairs of different colours is

- (a) 24 (b) 12
(c) 23 (d) 64

142. If the coefficient of second, third and fourth terms in the expansion of $(1 + x)^n$ are in AP, then n is equal to

- (a) 7 (b) 4 (c) 5 (d) 6

143. If

$$\Delta = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = k(a - b)(b - c)(c - a),$$

then k is equal to

- (a) -2 (b) 1
(c) 2 (d) abc

144. $\begin{vmatrix} a+b & a & b \\ a & a+c & c \\ b & c & b+c \end{vmatrix}$ is equal to

- (a) $4abc$ (b) abc
(c) $a^2b^2c^2$ (d) $4a^2bc$

145. If $\Delta_1 = \begin{vmatrix} x & a & b \\ b & x & a \\ a & b & x \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$ are the

given determinants, then

- (a) $\Delta_1 = 3(\Delta_2)^2$
(b) $\left(\frac{d}{dx}\right)(\Delta_1) = 3\Delta_2$
(c) $\left(\frac{d}{dx}\right)(\Delta_1) = 3(\Delta_2)^2$
(d) $\Delta_1 = 3(\Delta_2)^{3/2}$

146. The system

$$x + 4y - 2z = 3, 3x + y + 5z = 7$$

and $2x + 3y + z = 5$ has

- (a) infinite number of solutions
(b) unique solution
(c) trivial solution
(d) no solution

147. If the three points $(k, 2k)$, $(2k, 3k)$, $(3, 1)$ are collinear, then k is equal to

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

148. The foot of the perpendicular from the point $(3, 4)$ on the line $3x - 4y + 5 = 0$ is

- (a) $\left(\frac{81}{25}, \frac{92}{25}\right)$ (b) $\left(\frac{92}{25}, \frac{81}{25}\right)$
(c) $\left(\frac{46}{26}, \frac{54}{24}\right)$ (d) $\left(-\frac{81}{25}, -\frac{92}{25}\right)$

149. A kite is flying at an inclination of 60° with the horizontal. If the length of the thread is 120 m, then the height of the kite is

- (a) $60\sqrt{3}$ m (b) 60 m
(c) $\frac{60}{\sqrt{3}}$ m (d) 120 m

150. If the focus of parabola is at $(0, -3)$ and its directrix is $y = 3$, then its equation is

- (a) $x^2 = -12y$ (b) $x^2 = 12y$
(c) $y^2 = -12x$ (d) $y^2 = 12x$