

Shift 2

Tribhuvan University

2080

Full Marks: 140

Time: 2 hours

Pass Marks: 56

1. Least count of a stopwatch is 0.2 sec. The time of 20 oscillations of a pendulum is measured to be 25 sec. The maximum % error in measurement is:

- a. 16%
- b. 0.8%
- c. 1%
- d. 8%

5. A balloon filled with helium is left in air: It will [IOE 2077]

- a. rise in air indefinitely
- b. fall in air indefinitely
- c. rise and halt after certain height
- d. fall and halt after certain height

2. Which of the following results in acceleration? [IOE 2078]

- a. Angular momentum
- b. Linear momentum
- c. Torque
- d. Force

6. 10gm of water is given a heat 420 J. Find the raise in temperature

- a. $1^{\circ}C$
- b. $1K$
- c. $10^{\circ}F$
- d. $10K$

3. The value of g will increase 1% of its value at the surface of earth at a height ($R_e = 6400 \text{ km}$)

- a. 6400 km
- b. 2560 km
- c. 64000 km
- d. 57600 km

7. If the height of Kulekhani Hydro – power dam is 50 m . What will be difference in temperature of water at the top and bottom of the dam ?

- a. $0.50^{\circ}C$
- b. $0.42^{\circ}C$
- c. $0.30^{\circ}C$
- d. $0.12^{\circ}C$

4. The maximum acceleration of a body executing SHM is a_0 and maximum velocity is v_0 . The amplitude is given by

- a. v_0^2
- b. $v_0 a_0$
- c. $\frac{1}{a_0 v_0}$
- d. $\frac{v_0^2}{a_0}$

8. Image from a convex lens is formed beyond 1.5F. The object should be placed at

- c. Beyond $2F$
d. Infinity

9. Chromatic aberration is due to

- a. Deviation
b. Dispersion
c. Interference
d. Diffraction

10. 8 small drop of capacitance and radius V combines to form a big drop of radius R then the capacitance of big drop will be

- a. $2 C$
b. $4 C$
c. $8 C$
d. $16 C$

11. the neutral temperature of a thermo couple is $300^\circ C$. what is the inversion temperature if the temperature of cold junction is $10^\circ C$?

- a. $590^\circ C$
b. $610^\circ C$
c. $310^\circ C$
d. $290^\circ C$

12. When a charged particle enters in strong magnetic field, its kinetic energy

- a. Increases
b. Decreases
c. Remain constant
d. First increases and becomes constant

13. Magnetic flux ϕ in Weber in a closed circuit of resistance 10Ω varies with time t (sec) as $\phi = 6t^2 - 5t + 1$. The magnitude of induced current at $t = 0.25$ s is

- a. $0.8 A$
b. $0.6 A$
c. $0.4 A$
d. $0.2 A$

14. Red light of 6500\AA from distant falls on a slit of 0.5 mm wide. The distance between two dark band on each side of central bright band of diffraction pattern on screen placed at 1.8 m from slit will be:

- a. $2.34mm$
b. $1.67mm$
c. $4.68mm$
d. $9.34mm$

15. Phase difference between two waves $y_1 = a \sin \omega t$ and $y_2 = a \cos \omega t$

- a. 0°
b. π
c. $\frac{\pi}{2}$
d. $\frac{3\pi}{4}$

16. If electron , proton , neutron & α – particle are deflected in the same electric field with same velocity what will be the deflection in them ?

- a. Proton less than electron
b. Proton more than electron
c. Electron more than α – particled. Proton more then α – particle

17. Forbidden energy gap in a conductor is:

- a. 6 eV
b. 0 eV
c. 1.1 eV
d. 0.7 eV

18. The domain of function $\log_e(x^2 - x^2)$ is [IOE 2076]

- a. $(-\infty, \infty)$
b. $[-a, a]$
c. $[0, \infty)$
d. $(-a, a)$

19. The element in the first row and third column of the inverse of the matrix $\begin{bmatrix} 1 & 2 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ **is**

- a. 1
- b. 7
- c. -2
- d. 0

20. The values of z for which $|z + i| = |z - i|$ **are**

- a. Any purely real number
- b. Any complex number
- c. Any natural number
- d. Any purely imaginary number

21. In how many ways can be 4 boys and 3 girls be arranged in a row so that a boy and a girl are alternate?

- a. $7!$
- b. $4! \times 3!$
- c. $P(4, 3) \times 3!$
- d. 4×3

22. If $\cos \left[x \cos^{-1} \left(-\frac{1}{2} \right) \right] = -\frac{1}{\sqrt{2}}$, **then x is equal to:**

- a. $\frac{1}{8}$
- b. $\frac{5}{8}$
- c. $\frac{3}{8}$
- d. $\frac{9}{8}$

23. The general solution of the equation

$$\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1$$

- a. $n\pi + \frac{\pi}{4}$
- b. $n\pi \pm \frac{\pi}{4}$
- c. $n\pi - \frac{\pi}{4}$
- d. The solution does not exist

24. The expression

$$\frac{(a + b + c)(c + a - b)(a + b - c)(b + c - a)}{4b^2c^2}$$

is :

- a. $\cos 2A$
- b. $1 - \cos A$
- c. $\sin^2 A$
- d. $1 + \cos A$

25. If $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a} = 0$ **then** $\vec{a} \cdot (\vec{b} \times \vec{c})$ **is equal to**

- a. a
- b. $\pm abc$
- c. 0
- d. None

26. If the sum of the slopes of the lines represented by

$$4x^2 + 2hxy - 7y^2 = 0$$

is equal to the product of slopes then the value of h is :

- a. 4
- b. -4
- c. -6
- d. -2

27. The equation of the circle center at (3, -4) and touching x – axis is :

- a. $(x - 3)^2 + (y - 4)^2 = 4^2$
- b. $(x - 3)^2 + (y + 4)^2 = 4^2$
- c. $(x - 3)^2 + (y - 4)^2 = 3^2$
- d. $(x - 3)^2 + (y + 4)^2 = 3^2$

28. The eccentricity of the ellipse $4x^2 + 9y^2 = 36$ **is :**

- a. $\frac{1}{2}$
- b. $\frac{1}{3}$
- c. $\frac{\sqrt{5}}{3}$
- d. $\frac{3}{\sqrt{5}}$

29. The eccentricity of the hyperbola $16x^2 - 9y^2 = -144$ **is**

- a. $\frac{5}{3}$
 b. $\frac{5}{4}$
 c. $\frac{3}{5}$
 d. $\frac{4}{5}$

- a. $\frac{1}{1+x^2}$
 b. $\frac{1}{\sqrt{1-x^2}}$
 c. $\frac{2}{1+x^2}$
 d. $\frac{1}{2}$

30. Let L_1 be the line of intersection of the planes $3x + 2y + z = 5$ and $x + y - 2z = 3$ and L_2 be the line of intersection of the planes $2x - y - z = 0$ and $7x + 10y - 8z = 0$

Then the angle between L_1 and L_2 is

- a. 90°
 b. $\cos^{-1} \left(\frac{1}{\sqrt{3}} \right)$
 c. $\cos^{-1} \left(\frac{2}{3} \right)$
 d. $\cos^{-1} \left(\frac{1}{3} \right)$

31. $\lim_{x \rightarrow \pi/2} \frac{\sec 3x}{\sec x} =$ [IOE 2074]

- a. $-1/3$
 b. $1/3$
 c. 0
 d. 1

32. $x^3 \sin(y) + \cos(x)y^3 = 0$, then $\frac{dy}{dx} =$

- a. $\sqrt{3}$
 b. $1/\sqrt{3}$
 c. $1/2$
 d. 1

a. $-\frac{[x^3 \sin(y) - 3y^2 \sin(x)]}{[x^2 \cos(y) + y^3 \cos(x)]}$
b. $-\frac{[3x^2 \sin(y) - y^3 \sin(x)]}{[x^3 \cos(y) + 3y^2 \cos(x)]}$

c. 0
d. $-\frac{[3x^3 \sin(y) - y^3 \sin(x)]}{[x^3 \cos(y) + 3y^3 \cos(x)]}$

33. The differential coefficient of $\tan^{-1} \left(\frac{\sqrt{1+x^2}-1}{x} \right)$ with respect to $\tan^{-1} x$ is

- 34.** The equation of the tangent to the curve is $y = 2x^2 - 3x - 1$ at the point $(1, -2)$ is
- a. $x - y + 3 = 0$
 b. $x - y - 3 = 0$
 c. $x + y + 3 = 0$
 d. $x + y - 3 = 0$
- 35.** What is the maximum value of $(\frac{1}{x})^x$?
- a. $e^{1/e}$
 b. $(\frac{1}{e})^e$
 c. e^{-e}
 d. None

36. $\int_0^{\pi/4} \frac{\tan^2 \theta}{\sin^2 \theta} d\theta$ [IOE 2076]

- a. $\sqrt{3}$
 b. $1/\sqrt{3}$
 c. $1/2$
 d. 1

37. The area bounded by the lines $x = 0$, $x = 2$ and curves $y = 2^x$, $y = 2x - x^2$ is:

- a. $\frac{4}{\log_e 2} - \frac{4}{3}$
 b. $\frac{3}{\log_e 2} - \frac{3}{4}$
 c. $\frac{3}{\log_e 2} - \frac{4}{3}$
 d. $\frac{3}{\log_e 2}$

38. Which of the following is used as anti knocking material?

- a. T.E.L
 b. C₂H₅OH

- c. glyoxal
d. Freon

45. In which of the following is the oxidation number of carbon zero

- a. $\text{C}_6\text{H}_{12}\text{O}_6$
b. $\text{C}_{11}\text{H}_{22}\text{O}_{11}$
c. CH_2F_2
d. all of these

39. Gobar gas mainly contains

- a. methane
b. butane
c. ethane
d. propane

40. Which of following allotrope of sulphur is most stable

- a. Rhombic sulphur
b. Monoclinic sulphur
c. Milk sulphur
d. Plastic sulphur

41. When red phosphorus is heated with nitric acid, _____ is formed.

- a. HPO_2
b. HPO_3
c. H_2PO_3
d. H_3PO_4

42. When NaCl is dissolved in water, Na^+ ion is [IOE 2075]

- a. Hydrolysed
b. Oxidised
c. Reduced
d. Hydrated

43. Copper matte is [IOE 2074]

- a. copper sulphate and iron sulphate
b. copper sulphide and iron sulphide
c. copper oxide and iron oxide
d. copper chloride and iron chloride

44. Iron is heated to red hot and cooled slowly in a heating process . This process is called [IOE 2076]

- a. annealing
b. quenching
c. tempering
d. none

45. In which of the following is the oxidation number of carbon zero

- a. $\text{C}_6\text{H}_{12}\text{O}_6$
b. $\text{C}_{11}\text{H}_{22}\text{O}_{11}$
c. CH_2F_2
d. all of these

46. O.N. of cobalt in $[\text{Co}(\text{CO})_4]$ is

- a. +3
b. 0
c. +5
d. -1

47. Ionic bond is highly favoured between

- a. Large cation & small anion
b. Large cation & large anion
c. Small cation & small anion
d. Small cation & large anion

48. Which of the following is correct ? [IOE 2074]

- a. $\text{Cu} = [\text{Ar}] 4s^2 3d^{10}$
b. $\text{Cr} = [\text{Ar}] 4s^2 3d^4$
c. $\text{Cr} = [\text{Ar}] 4s^2 3d^5$
d. $\text{Mn} = [\text{Ar}] 4s^2 3d^5$

49. He is as old as

- a. me
b. I
c. her
d. him

50. Several theories on the topic discussed.

- a. was
b. is
c. has been
d. were

51. I am surprised ____ the results. [IOE 2077]

- a. by
b. with

c. at
d. of

58. The antonym of the word 'novice' is [IOE 2074]

- a. recruit
b. apprentice
c. veteran
d. amateur

52. Gopal killed Ram . Its pattern is [IOE 2075]

- a. S + V + O
b. S + V + SC
c. S + V + OC
d. S + V + Adverbial

53. Before he shifted to Pokhara, he _____ in Kathmandu.

- a. lived
b. was living
c. had lived
d. had been living

54. They publish the newspaper daily. Its passive voice is

- a. The newspaper are published
b. The newspaper is published daily.
c. The newspaper was published
d. None.
daily..

55. Which of the following vowels is there in the word 'tongue'?

- a. /a/
b. /a:/
c. /ɔ:/
d. /a:/

56. After I got home from school, I walked the dog, put away laundry, and finished my homework.
It is a _____.

- a. Simple Sentence
b. Compound Sentence
c. Complex Sentence
d. Compound-Complex Sentence

57. These days I am in hot water. It means

- a. I am in love
b. I am in Pond
c. I am in a big trouble
d. I am still swimming.

58. The antonym of the word 'novice' is [IOE 2074]

- a. recruit
b. apprentice
c. veteran
d. amateur

59. I wish I a bird.

- a. am
b. was
c. were
d. Where

60. Public speaking _____ a skill.

- a. are
b. have
c. has
d. is

61. Two bullets are fired horizontally with velocity u_1 and u_2 in opposite direction from top tower. The time after which their velocity become perpendicular to each other is

- a. $\frac{2u_1u_2}{(u_1 + u_2)g}$
b. $\frac{\sqrt{u_1u_2}}{g}$
c. $\frac{u_1 + u_2}{g}$
d. $\frac{\sqrt{u_1^2 + u_2^2}}{g}$

62. The apparent change in weight of a mass in bringing from pole of earth to equator is 0.4 N. The apparent change in weight of mass is taken from pole to a place of latitude of 45° is:

- a. 0.3 N
b. 0.2 N
c. 0.1 N
d. 0

63. The total energy of particle executing SHM is E. The KE of particle at half of amplitude is:

- a. $E/2$
 b. $E/\sqrt{2}$
 c. $E/4$
 d. $3E/4$

64. An object weighs 30 g in air and 25 g when totally immersed in water density of object is:

a. 4 g/cc
 b. 5 g/cc
 c. 6 g/cc
 d. 8 g/cc

c. 99990 Ω

d. 9990 Ω

65. Kinetic energy of 1gm N_2 at $127^\circ C$ is [IOE 2077]

a. 4.99KJ
 b. 0.178 KJ
 c. 8.31KJ
 d. 5.68KJ

69. If proton and α – particle moving with same energy normally in a uniform magnetic field then the ratio of their radii and time period will be

a. 1 : 1 and 1 : 2
 b. 1 : 2 and 1 : 1
 c. 1 : 2 and 2 : 1
 d. 2 : 1 and 2 : 1

66. A diver in water at a depth 1 m sees the whole outside world in a horizontal circle of radius _____. when the refractive index is μ .

- a. $\frac{1}{\mu - 1}$
 b. $\frac{1}{\sqrt{\mu^2 - 1}}$
 c. $\frac{\mu}{\sqrt{\mu^2 - 1}}$
 d. $\frac{1}{\mu}$
- 67. Two capacitors of $6\mu F$ at 500 V and $2\mu F$ at 220 V are joined in parallel with their unlike plates together . The common potential difference is [IOE 2074]**
- a. 125 V
 b. 225 V
 c. 325 V
 d. 425 V

- 68. An ammeter of 10Ω resistance has a scale of 100 divisions and indicates $1 \mu A$ per division. It is covered into voltmeter reading 10 v at maximum deflection what is the resistance used in series:**
- a. $1 k\Omega$
 b. $0.1 k\Omega$

70. Mutual inductance of two coils in 5 mH. The current changes from 3A to 2A is 0.01 sec, then the emf produced is:

a. 0.5 V
 b. 1 V
 c. 2 V
 d. 5 V

71. The speed of sound in air $320m/s$. A closed organ pipe of length 1 m can resonate with a frequency of

a. 80 Hz
 b. 240 Hz
 c. 400 Hz
 d. All

72. A train 'A' is travelling at a speed of 108 km/hr. The train approaching another train 'B' standing on the platform. The engine of the train 'B' blow its horn. The frequency of horn as observed by driver in train A is 504 Hz. The frequency of train 'B' (speed of sound = 220 m/sec)

a. 504 Hz
 b. 458 Hz
 c. 550 Hz
 d. 407 Hz

73. How many fast moving electrons strike on target per second to get total anode current 0.02 A?

a. 1.25×10^{17}
 b. 1.25×10^{18}
 c. 1.25×10^{19}
 d. 1.25×10^{20}

74. Two radioactive materials **a** and **b** have decay constant 5λ and 2λ respectively . Initially both materials have same numbers of nuclei , then the ratio will be $\frac{1}{e^3}$ after time [IOE 2075]

- a. λ sec
- b. $\frac{1}{\lambda}$ sec
- c. 9λ sec
- d. $\frac{1}{9\lambda}$ sec

c. AP

d. None

75. The domain and range of the function $y = \frac{1}{x}$ are

- a. $(-\infty, \infty)$ and $(0, \infty)$
- b. $R - \{0\}$ and $R - \{0\}$
- c. $(-\infty, 0)$ and $[0, \infty)$
- d. $(0, \infty)$ and $(-\infty, \infty)$

75. The domain and range of the function $y = \frac{1}{x}$ are

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

79. $\frac{(x-y)}{x} + \frac{(x-y)^2}{2x^2} + \frac{(x-y)^3}{3x^3} + \dots =$ [IOE 2074]

- a. $\log \frac{x+y}{y}$
- b. $\log \frac{x}{x+y}$
- c. $\log \frac{x}{y}$
- d. $\log \frac{y}{x}$

80. $\sin^{-1}\left(\frac{1}{\sqrt{5}}\right) + \cot^{-1}(3)$ is [IOE 2078]

- a. $\tan C$

- b. 0

- c. 1

- d. -1

82. The vector $14\vec{i} - 34\vec{j} + 12\vec{k}$ [IOE 2078]

- a. is perpendicular to $4\vec{i} - 12\vec{j} + 8\vec{k}$
- b. is parallel to $4\vec{i} - 12\vec{j} + 8\vec{k}$
- c. Makes $\frac{\pi}{3}$ with $4\vec{i} - 12\vec{j} + 8\vec{k}$. None

- a. $\sin 8\theta - i \cos 8\theta$
- b. $\sin 8\theta - i \cos 8\theta$
- c. $\cos 8\theta - i \sin 8\theta$
- d. $\cos 8\theta + i \sin 8\theta$

a. One values

b. Two values

76. If $A = \begin{bmatrix} 0 & 2 & 0 \\ 0 & 0 & 3 \\ -2 & 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 5 & -4 & 0 \end{bmatrix}$, then the element of 3rd row and third column in AB will be

- 77.** $\left(\frac{\cos \theta + i \sin \theta}{\sin \theta + i \cos \theta} \right)^4$

- a. $\sin 8\theta + i \cos 8\theta$
- b. $\sin 8\theta - i \cos 8\theta$
- c. $\cos 8\theta - i \sin 8\theta$
- d. $\cos 8\theta + i \sin 8\theta$

83. If the lines represented by $ax^2 + 2hxy + by^2 = 0$ are equally inclined to the lines given by $ax^2 + 2hxy + by^2 + \lambda(x^2 + y^2) = 0$, then λ has [IOE 2078]

c. Infinite values

d. No value

84. If $lx + my = 1$ tangent to $x^2 + y^2 = a^2$, the point (l, m) lies on circle [IOE 2074]

a. $x^2 + y^2 = a^2$
b. $x^2 + y^2 = \frac{1}{a^2}$
c. $x^2 + y^2 = 2a^2$

85. If $x + y = k$ is normal to $y^2 = 12x$, then find the value of k [IOE 2078]

a. 3
b. 6
c. 9
d. 12

86. The d.c's of line passing through $(1, 0, 0), (0, 1, 0)$ and making an angle $\frac{\pi}{4}$ with plane $x + y = 3$ is [IOE 2078]

- a. $< 1, 1, \sqrt{2} >$
b. $< 1, \sqrt{2}, 1 >$
c. $< \sqrt{2}, 1, 1 >$
d. $< 1, 1, 2 >$

87. $\lim_{x \rightarrow 0} \frac{x \sin x - \log(1+x^2)}{x^2} =$ [IOE 2075]

a. 0
b. 1
c. $\frac{1}{2}$
d. 2

88. If $y = \cosh t, x = \sinh t$

$\frac{dy}{dx} =:$ [IOE 2078]

a. $\tanh t$
b. $-\tanh t$

c. $\coth t$

d. $-\coth t$

89. $\int \frac{1}{\cos x \sqrt{\cos 2x}} dx =$ [IOE 2075]

- a. $\sin^{-1}(\tan x) + c$
b. $\sin^{-1}(\cot x) + c$
c. $\cos^{-1}(\tan x) + c$
d. $\cos^{-1}(\cot x) + c$

90. The reaction $\text{CH}_3\text{Br} + \text{C}_6\text{H}_5\text{Br} + \text{Na} \longrightarrow \text{CH}_3 - \text{C}_6\text{H}_5 + 2\text{NaBr}$ is called,

- a. Wurtz reaction
b. Wurtz-fittig reaction
c. Sand Mayer's reaction
d. Friedel craft's reaction

91. Ammonia reacts with Nessler's reagent in presence of 'X' to give brown ppt. compound 'X' is [IOE 2077]

- a. KCl
b. HCl
c. KClO_4
d. NaOH

92. German silver is an alloy of

- a. Copper, zinc and nickel
b. Copper and silver
c. Copper, zinc and tin
d. Copper, zinc and silver

93. Which one of the following pairs of compounds illustrate the law of multiple proportions?

- a. H_2S and SO_2
b. NH_3 and NCl_3
c. FeCl_2 and FeCl_3
d. CuO and Cu_2O

94. 100ml of a dibasic acid solution contains 3.15gm of the acid 10ml of this solution neutralizes 10ml of 0.5N NaOH solution. The mol. Wt of acid is

- a. 63
- b. 126
- c. 31.5
- d. 30

invasions from foreign nations, the life was unsafe and property unprotected, the people were forced to congregate in towns in such a compact way that it led to awful insanitation and diseases. The traditional knowledge of domestic and personal health and hygiene was ignored.

Women were confined indoors for fear of insults and a train of social and unhealthy dangers followed all round. It is a problem how now we can restore the original conditions of healthy and happy life in India. This is a socio-economic problem which needs to be given priority to bring back the original culture and restore welfare of women and children in India.

95. The precipitation of CaF_2 ($K_{\text{sp}} = 1.7 \times 10^{-10}$) is obtained when equal volume of the following are mixed

- a. $10^{-4} \text{ M } \text{Ca}^{++} + 10^{-4} \text{ M } \text{F}^-$ b. $10^{-2} \text{ M } \text{Ca}^{++} + 10^{-3} \text{ M } \text{F}^-$
- c. $10^{-5} \text{ M } \text{Ca}^{++} + 10^{-3} \text{ M } \text{F}^-$ d. $10^{-3} \text{ M } \text{Ca}^{++} + 10^{-5} \text{ M } \text{F}^-$

96. Aluminium oxide may be electrolyzed at 1000°C to furnish aluminium metal (at mass = 27, 1 faradays = 96500 coulomb). The cathode reaction is



To prepare 5.12 kg of aluminium metal by this method, we require

- a. $5.49 \times 10^4 \text{ C}$ of electricity
- b. $5.49 \times 10^1 \text{ C}$ of electricity
- c. $5.49 \times 10^7 \text{ C}$ of electricity
- d. $1.83 \times 10^7 \text{ C}$ of electricity

Read the following passage carefully, and find out the correct answers for the questions given below:
(Questions from 97 to 100)

At one time in the history of India, most women knew very well how to bring up their infants and they lived a perfectly healthy life, free from diseases. The overall standard of women and children in the country was much better than that of other civilizations of that period. But ever since India was exposed to frequent foreign

97. What was the main cause of poor health conditions of women in India?

- a. Women were confined indoors.
- b. Illiteracy among women.
- c. Frequent foreign invasions.
- d. Awful sanitation.

98. What question has the writer posed before the readers?

- a. How to check foreign invasion?
- b. Why has the traditional knowledge been ignored?
- c. What should be done for infants and women?
- d. How to restore the original conditions of healthy and happy life in India?

99. What does the word 'congregate' mean in the passage?

- a. forced
- b. assemble

- d. settle

Solutions

Q6. Select from the answer choices the word which is nearly opposite in meaning to 'confine' used in the passage?

- nearly opposite in meaning to 'confine' used in the passage?**

1. b $\frac{\Delta t}{t} \times 100\% = \frac{0.2}{25} \times 100\% = 0.8\%$

2. d

a. forced b. directed
c. to keep out d. reject

$$\frac{t}{\Delta t} \times 100\% = \frac{0.2}{25} \times 100\% = 0.8\%$$

2

$$F = ma$$

3

Answer Key

1.b	2.d	3.d	4.d	5.c	6.d	7.d	8.c
9.b	10.a	11.a	12.c	13.d	14.c	15.c	16.a
17.b	18.d	19.b	20.a	21.b	22.d	23.d	24.c
25.b	26.d	27.b	28.c	29.b	30.a	31.a	32.b
33.d	34.b	35.a	36.d	37.c	38.a	39.a	40.a
41.d	42.d	43.b	44.a	45.d	46.b	47.a	48.d
49.b	50.d	51.c	52.a	53.d	54.b	55.b	56.c
57.c	58.c	59.c	60.d	61.b	62.b	63.d	64.c
65.b	66.b	67.c	68.c	69.a	70.a	71.d	72.b
73.a	74.b	75.b	76.b	77.d	78.b	79.c	80.c
81.d	82.d	83.c	84.b	85.c	86.a	87.a	88.a
89.a	90.b	91.d	92.a	93.d	94.b	95.b	96.c
97.c	98.d	99.b		100.c			

1 =

• n = 100

11

57600km

4

3

$$v_0 = \omega a$$

$$v_0^2 = \omega^2 a^2 = a \times a_0$$

$$a = \frac{v_0^2}{g_0}$$

۵

$$\rho_{He} << \rho_{air}$$

Initially, it will rise. After a certain height, it expands and the weight of air displaced will be just equal to the weight of helium gas, and the balloon halts.

Capacitance of big drop (C) = $2C$.

6. d

$$Q = ms\Delta\theta$$

$$420 = 10 \times 10^{-3} \times 4200 \times \Delta\theta$$

$$\Rightarrow \Delta\theta = 10K$$

7. d

$$mgh = msd\theta$$

$$\text{using } g = 10 \text{ m/s}^2 \text{ and } s = 4,200 \text{ J/kg}^0 C$$

$$\text{we get, } d\theta = 0.12^\circ C$$

8. c

When the object lies beyond $2f$, the image will be formed between f and $2f$ (i.e. $1.5f$) and image will be real, inverted and smaller in size.

9. b

Chromatic aberration : Inability of a lens to form images of different color at the same point on the principal axis .

Big Drop Small Drop		
Q	$n^{1/3} r$	n^{nq}
R	$n^{1/3} C$	
C		$n^{1/3} C$
σ	$n^{1/3} \sigma$	
$U' (\text{P.E})$		$n^{5/3} U$
$\frac{4}{3}\pi R^3 = 8 \times \frac{4}{3}\pi r^3$		
As, $C = 4\pi\epsilon_0 R ; C\alpha R$		

$$C' = n \frac{1}{3} C = 8 \frac{1}{3} C = 2C$$

15. c

$$Y_1 = a \sin \omega t, \phi_1 = \omega t$$

$$Y_2 = a \cos \omega t$$

$$\begin{aligned} &= a \sin \left(\omega t + \frac{\pi}{2} \right), \phi_2 = \omega t + \frac{\pi}{2} \\ \text{Phase difference} &= \phi_2 - \phi_1 = \omega t - \frac{\pi}{2} - \omega t = \frac{\pi}{2} \end{aligned}$$

11. a

$$\begin{aligned} \theta_n &= \frac{\theta_i + \theta_o}{2} \rightarrow \theta_i = 2\theta_n - \theta_o \\ \theta_i &= 2 \times 300 - 10 = 590^\circ C \end{aligned}$$

12. c

Since, only direction of charge particle is changed inside magnetic field. And kinetic energy is scalar quantity. So, it remains unchanged.

16. a

The transverse deflection in electric field

$$\begin{aligned} 13. d \\ \phi &= 6t^2 - 5t + 1 \end{aligned}$$

$$E = -\frac{d\phi}{dt} = -12t + 5$$

$$y \propto \frac{1}{m}$$

at t=0.25 sec

$$E = -12 \times 0.25 + 5 = 2$$

Since mass of electron is least, it has maximum deflection

17. b

$$i = \frac{E}{R} = \frac{2}{10} = 0.2A$$

14. c

Distance between first two dark bands on each side of central maximum is the width of central maximum

$$= \frac{2\lambda D}{d} = 4.68mm$$

18. d
For $\log_e(a^2 - x^2)$ to be valid $a^2 - x^2 > 0$ This only valid for
 $x \in (-a, a)$

19. b

$$A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$$

22. d
 $\cos \left[x \cos^{-1} \left(-\frac{1}{2} \right) \right] = -\frac{1}{\sqrt{2}}$

$$|A| = 1$$

$$\cos[x \frac{2\pi}{3}] = -\frac{1}{\sqrt{2}}$$

$$adj(A) = \begin{bmatrix} 1 & 2 & -1 \\ -2 & 1 & 1 \\ 7 & -2 & 1 \end{bmatrix}^T$$

$$A^{-1} = \frac{adj(A)}{|A|}$$

$$A^{-1} = \begin{bmatrix} 1 & -2 & 7 \\ 2 & 1 & -2 \\ -1 & 1 & 1 \end{bmatrix}$$

23. d
 $\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1$

20. a
 $\tan x = 1 = \tan \frac{\pi}{4}$ [$\tan x = \tan \alpha$]

$$x = n\pi + \frac{\pi}{4}$$

But at $x = \frac{\pi}{4}$

$$\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = \frac{-\infty}{\infty} \neq 1$$

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

24. c

$$\frac{(a+b+c)(c+a-b)(a+b-c)(b+c-a)}{4b^2c^2}$$

$$= \frac{2s(2s-2b)(2s-2c)(2s-2a)}{4b^2c^2}$$

21. b

$$m_1 + m_2 = m_1 m_2$$

$$= \frac{16s(s-b)(s-c)(s-a)}{4b^2c^2}$$

$$= -\frac{2h}{b} = \frac{a}{b}$$

$$= \frac{4s(s-b)(s-c)(s-a)}{b^2c^2}$$

$$-a = 2h$$

$$= \frac{4\Delta^2}{b^2c^2}$$

$$= \frac{4(\frac{abc}{4R})^2}{b^2c^2}$$

$$-4 = 2h$$

$$h = -2$$

$$27. \text{ b}$$

$$\text{Radius of circle touching x-axis} = |\text{y-coordinate}| = 4$$

$$\text{Equation of circle is } (x - 3)^2 + (y + 4)^2 = 4^2$$

$$28. \text{ c}$$

$$4x^2 + 9y^2 = 36$$

$$= \frac{4(2R \sin A)^2}{16R^2}$$

$$= \sin^2 A$$

$$\frac{x^2}{9} + \frac{y^2}{4} = 36$$

$$25. \text{ b}$$

$\vec{a}, \vec{b}, \vec{c}$ are mutually perpendicular to each other from first case.

$$\vec{a} \cdot (\vec{b} \times \vec{c})$$

$$\vec{a} \cdot (bc \sin 90^\circ)$$

$$29. \text{ b}$$

$$\pm abc$$

$$26. \text{ d}$$

$$e = \sqrt{1 - \frac{b^2}{a^2}} = \sqrt{1 - \frac{4}{9}} = \frac{\sqrt{5}}{3}$$

$$16x^2 - 9y^2 = -144$$

$$\frac{x^2}{9} - \frac{y^2}{16} = -1$$

$$\therefore l_2 : m_2 : n_2 = 2 : 1 : 3$$

$$e = \sqrt{1 + \frac{a^2}{b^2}} = \sqrt{1 + \frac{9}{16}} = \frac{5}{4}$$

Since, $l_1 l_2 + m_1 m_2 + n_1 n_2 = -10 + 7 + 3 = 0$, angle is 90° .

30. a

$$\lim_{x \rightarrow \pi/2} \frac{\sec 3x}{\sec x} = \lim_{x \rightarrow \pi/2} \frac{\cos x}{\cos 3x} =$$

If l_1, m_1, n_1 are direction ratios of L_1

$$3l_1 + 2m_1 + n_1 = 0$$

$$l_1 + m_1 - 2n_1 = 0$$

$$\therefore \frac{l_1}{-4-1} = \frac{m_1}{1+6} = \frac{n_1}{3-2}$$

$$\frac{l_1}{-5} = \frac{m_1}{7} = \frac{n_1}{1}$$

$$\therefore l_1 : m_1 : n_1 = -5 : 7 : 1$$

If l_2, m_2, n_2 are the direction ratios of L_2 ,

$$2l_2 - m_2 - n_2 = 0$$

$$3x^2 \sin(y) + x^3 \cos(y) \frac{dy}{dx} - \sin(x)y^3 + 3y^2 \frac{dy}{dx} \cos(x) = 0$$

$$\frac{dy}{dx} = - \frac{[3x^2 \sin(y) - y^3 \sin(x)]}{[x^3 \cos(y) + 3y^2 \cos(x)]}$$

33. d

$$\text{Let } y = \tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$$

$$\frac{l_2}{8+10} = \frac{m_2}{-7+16} = \frac{n_2}{20+7}$$

Putting $x = \tan \theta$ we get

$$\frac{l_2}{18} = \frac{m_2}{9} = \frac{n_2}{27}$$

$$y = \tan^{-1}\left(\frac{\sqrt{1+\tan^2 \theta} - 1}{\tan \theta}\right)$$

$$y - y_1 = m(x - x_1)$$

$$= \tan^{-1} \left(\frac{\sec \theta - 1}{\tan \theta} \right)$$

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

$$= \tan^{-1} \left(\frac{1 - \cos \theta}{\sin \theta} \right)$$

$$x - y - 3 = 0$$

$$= \tan^{-1} \left(\frac{2 \sin^2 \theta / 2}{2 \sin \theta / 2 \cos \theta / 2} \right)$$

$$= \tan^{-1}(\tan \theta / 2)$$

$$\log y = x \log \left(\frac{1}{x} \right)$$

$$= \theta / 2 = \frac{1}{2} \tan^{-1} x$$

Now,

$$\frac{1}{y} \frac{dy}{dx} = \log \left(\frac{1}{x} \right) + x \frac{1}{x} \left(-\frac{1}{x^2} \right)$$

$$\frac{1}{y} \frac{dy}{dx} = \log \left(\frac{1}{x} \right) - 1$$

$$\frac{1}{x} = e$$

$$= \frac{1}{2} \frac{d \tan^{-1} x}{d \tan^{-1} x} = \frac{1}{2}$$

$$= \frac{1}{2} \frac{d \tan^{-1} x}{d \tan^{-1} x} = \frac{1}{2}$$

34. b

$$y = 2x^2 - 3x - 1$$

$$\frac{dy}{dx} = 4x - 3$$

$$\frac{dy}{dx}|_1 = 4 \times 1 - 3 = 1$$

36. d

$$y = e^{1/e}$$

$$\int_0^{\pi/4} \frac{\tan^2 \theta}{\sin^2 \theta} d\theta$$

Gobar gas is mostly composed of methane and carbon dioxide, with trace quantities of hydrogen sulfide (H_2S), moisture, and siloxanes.

$$\int_0^{\pi/4} \sec^2 \theta d\theta$$

40. a

Rhombic sulphur is the most stable allotropic form of sulphur.

$$\tan \theta \Big|_0^{\pi/4}$$

41. d

Red phosphorus react with nitric acid to produce phosphoric acid, nitrogen dioxide and water.

1



37. c

Required area(A):

$$= \int_0^2 [2^x - (2x - x^2)] dx$$

43. b



$$= \left[\frac{2^x}{\log 2} - x^2 + \frac{x^3}{3} \right]_0^2$$

44. a

It is annealing which is performed to toughen the iron.

$$= \frac{4}{\log_e 2} - 4 + \frac{8}{3} - \frac{1}{\log_e 2}$$

45. d



$$= \frac{3}{\log_e 2} - \frac{4}{3}$$



38. a

The best example of an anti-knocking agent is Tetraethyl lead (T.E.L).



where x is the O.N. of carbon

39. a

46. b

$$x + 4 \times (0) = 0$$

$$\therefore x = 0$$

Note: In complex compound O.N. of compound is zero.

56. c

57. c

58. c

The meaning of NOVICE is a person admitted to probationary membership in a religious community.

According to Fajan's rule smaller the size of cation and larger the size of anion, higher will be the covalent character in an ionic bond.

So most favourable condition for ionic bonding is when the size of cation is large and size of anion is small.

48. d



The meaning of APPRENTICE is one bound by indenture to serve another for a prescribed period with a view to learning an art or trade.



49. b

50. d

51. c

52. a

53. d

54. b

55. b

62. b

$$\Delta mg = mR\omega^2 = 0.4N$$

The meaning of RECRUIT is to fill up the number of new members

The meaning of VETERAN is a former member of the armed forces.

The meaning of AMATEUR is one who engages in a pursuit, study, science, or sport as a pastime rather than as a profession.

The meaning of NOVICE is a person admitted to probationary forces.

The meaning of APPRENTICE is one bound by indenture to serve another for a prescribed period with a view to learning an art or trade.

59. c

60. d

61. b

$$\vec{V}_1 \cdot \vec{V}_2 = 0$$

or, $(u_1 \hat{i} - g t \hat{j}) \cdot (-u_2 \hat{i} - g t \hat{j}) = 0$

or, $-u_1 u_2 + g^2 t^2 = 0$

or, $t = \frac{\sqrt{u_1 u_2}}{g}$

$$\begin{aligned} \text{Again, } \Delta mg' &= mg - mg(1 - \frac{R\omega^2}{g} \cdot \cos^2 45^\circ) \\ &= mR\omega^2 \times \frac{1}{2} = \frac{0.4}{2} = 0.2 N \end{aligned}$$

$$\therefore r = \frac{1}{\sqrt{\mu^2 - 1}}$$

67. c

63. d

$$E = \frac{1}{2}m\omega r^2$$

$$\text{or, } E = \frac{1}{2}m\omega(r^2 - y^2)$$

$$\text{or, } E = \frac{1}{2}m\omega(r^2 - \frac{r^2}{4}) = \frac{3E}{4}$$

64. c

$$\begin{aligned} \text{Loss in wt} &= \text{upthrust} \\ \text{or, } 30-25 &= V\sigma_w \\ \text{or, } V &= 5cc \end{aligned}$$

$$\text{or, } \rho = \frac{30}{5} = 6g/cc$$

65. b

$$n = \frac{w}{M} = \frac{1gm}{28gm} = \frac{1}{28}$$

$$\begin{aligned} KE &= \frac{3}{2}nRT = \frac{3}{2} \times \frac{1}{28} \times 8.314 \times (127 + 273) = \\ 178.15J & \end{aligned}$$

66. b

Field of vision of fish or man inside water to see the world outside is circular and its radius when observer is at depth 'h' is

$$r = \frac{h}{\sqrt{\mu^2 - 1}} \text{ and area A} = \pi \left[\frac{h}{\sqrt{\mu^2 - 1}} \right]^2$$

$$\begin{aligned} \text{For unlike plates join together } V_{\text{common}} &= \frac{C_1V_1 - C_2V_2}{C_1 + C_2} = \\ \frac{6 \times 500 - 2 \times 200}{6 + 2} &= 325 \text{ V} \end{aligned}$$

68. c

$$\begin{aligned} i_g &= 100 \text{ divisions} \times 1 \mu A / \text{division} \\ &= 100 \mu A = 10^{-4} A \end{aligned}$$

Series resistance required

$$\begin{aligned} R &= \frac{V}{i_g} - G \\ &= \frac{10}{10^{-4}} - 10 = 99990 \Omega \end{aligned}$$

69. a

$$\begin{aligned} r &= \frac{mv}{Bq} = \frac{\sqrt{2mK}}{Bq} \\ r &\propto \frac{\sqrt{m}}{q} \text{ at constant } \{K\} \end{aligned}$$

$$\frac{r_p}{r_\alpha} = \frac{\frac{\sqrt{m_p}}{q_p}}{\frac{\sqrt{m_\alpha}}{q_\alpha}}$$

$$\begin{aligned} &= \sqrt{\frac{m_p}{m_\alpha}} \times \frac{q_\alpha}{q_p} \\ &= \sqrt{\frac{m}{4m}} \times \frac{2e}{e} = 1 : 1 \end{aligned}$$

73. a

$$T = \frac{2\pi m}{Bq} \propto \frac{m}{q}$$

$$I = \frac{q}{t}$$

$$\frac{T_p}{T_\alpha} = \frac{\frac{m_p}{q_p}}{\frac{m_\alpha}{p_\alpha}} = \frac{m_p}{m_\alpha} \times \frac{q_\alpha}{q_p} = \frac{m}{4m} \times \frac{2e}{e} = 1 : 2$$

$$\frac{n}{t} = \frac{i}{e} = 1.25 \times 10^{17}$$

70. a

$$E = L \frac{dl}{dt} = 5 \times 10^{-3} \times \frac{(3 - 2)}{0.001}$$

or, $E = 5 \times 10^{-3} \times 100$

$$\therefore E = 0.5V$$

74. b

$$\frac{a}{b} = \frac{1}{e^3}$$

71. d

$$N_1 = \frac{v}{4L} = \frac{320}{4} \times 1 = 80 \text{ Hz}$$

$$N_2 = 3n_1 = 3 \times 80 = 240 \text{ Hz}$$

$$N_3 = 5n_1 = 5 \times 80 = 400 \text{ Hz}$$

72. b

$$f' = 504Hz$$

$$v_s = 108km/hr = 108 \times \frac{5}{18}m/s = 30m/s$$

In the function $y = \frac{1}{x}$, x can take all the values of $x \in R$ except 0.

Hence domain of f(x) is $R - \{0\}$

$$V = 330m/s$$

$$f' = \frac{v}{v - v_s} \times f$$

In the function $f^{-1}(x) = \frac{1}{x}$, x can take all the values of $x \in R$ except 0.

Hence range of f(x) is $R - \{0\}$

$$f = 458.18Hz$$

76. b

$$C_{33} = (-2)3 + 2.5 + 0.0 = -6 + 10 = 4$$

77. d

$$\left(\frac{\cos \theta + i \sin \theta}{\sin \theta + i \cos \theta} \right)^4$$

$$\left(\frac{\cos \theta + i \sin \theta}{\sin \theta + i \cos \theta} \times \frac{\sin \theta - i \cos \theta}{\sin \theta - i \cos \theta} \right)^4$$

$$\left[\frac{2 \cos \theta \sin \theta - i \cos^2 \theta + i \sin^2 \theta + \cos \theta \sin \theta}{\sin^2 \theta + \cos^2 \theta} \right]^4$$

$$\left[\frac{-i(\cos 2\theta + i \sin 2\theta)}{1} \right]^4$$

$$(\sin 2\theta - i \cos 2\theta)^4$$

$$[-i(\cos 2\theta + i \sin 2\theta)]^4$$

$$i^4 (\cos 2\theta + i \sin 2\theta)^4$$

$$(\cos 2\theta + i \sin 2\theta)^4$$

$$\cos 8\theta + i \sin 8\theta$$

78. b

b^2, a^2, c^2 are in A.P.

$$\text{or, } a^2 - b^2 = c^2 - a^2$$

$$\text{or, } (a - b)(a + b) = (c + a)(c - a)$$

$$\text{or, } \frac{a - b}{c + a} = \frac{c - a}{a + b}$$

$$\text{or, } \frac{a - b}{(b + c)(c + a)} = \frac{c - a}{(b + c)(a + b)}$$

$$\text{or, } \frac{1}{b - c} - \frac{1}{c + a} = \frac{1}{a + b} - \frac{1}{b + c}$$

$$\text{or, } \frac{2}{(b + c)} = \frac{1}{a + b} + \frac{1}{c + a}$$

$$\begin{aligned} &\text{i.e. } \frac{1}{a + b} \cdot \frac{1}{b + c'} \frac{1}{c + a} \text{ are in A.P.} \\ &\therefore (a + b), (b + c'), (c + a) \text{ are in H.P.} \end{aligned}$$

79. c

$$\frac{(x - y)}{x} + \frac{(x - y)^2}{2x^2} + \frac{(x - y)^3}{3x^3} + \dots$$

$$= - \log(1 - \frac{(x - y)}{x})$$

$$= - \log \frac{y}{x}$$

$$= \log \frac{x}{y}$$

80. c

$$\sin^{-1}\left(\frac{1}{\sqrt{5}}\right) + \cot^{-1}(3)$$

$$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right)$$

$$\frac{x^2 - y^2}{a - b} = \frac{xy}{h}$$

$$\tan^{-1} \frac{1}{2} + \frac{1}{3} = \tan^{-1} 1 = \frac{\pi}{4}$$

$$1 - \frac{1}{2} \frac{3}{3}$$

Which is same as the equation of the bisectors of the angles between the lines $ax^2 + 2hxy + by^2 = 0$

Equation of the bisectors of the angle between these lines doesn't depend on λ .

81. d

$$A + B + C = 180^\circ$$

$$A + B = 180^\circ - 45^\circ = 135^\circ$$

$$\tan(A + B) = \tan(135^\circ) = -1$$

$$\frac{\tan A + \tan B}{1 - \tan A \tan B} = -1$$

$$\tan A + \tan B = -1 + \tan A \tan B$$

$$\tan A + \tan B - \tan A \tan B = -1$$

82. d

83. c

Equation of the bisectors of the angle between the lines $ax^2 + 2hxy + by^2 + \lambda(x^2 + y^2) = 0$

$$\frac{x^2 - y^2}{(a + \lambda) - (b + \lambda)} = \frac{xy}{h}$$

$$-\frac{y}{6} = -1$$

Slope of normal = $-\frac{dy}{dx}$ = $-\frac{6}{y}$

$$2y \frac{dy}{dx} = 12$$

$$\frac{dy}{dx} = \frac{6}{y}$$

clearly, (l, m) lies in $x^2 + y^2 = 1$.

$$y^2 = 12x$$

85. c

Slope of $x + y = k$ is -1 .

$$y = 6$$

$$= \int \frac{dy}{\sqrt{1-y^2}} = \sin^{-1} y + c = \sin^{-1}(\tan x) + c$$

When $y = 6$, $x = 3$

Hence $k = x + y = 6 + 3 = 9$

86. a

$$\lim_{x \rightarrow 0} \frac{x \sin x - \log(1+x^2)}{x^2}$$

$$= 1 - \lim_{x^2 \rightarrow 0} \frac{\log(1+x^2)}{x^2} = 1 - 1 = 0$$

87. a



91. d

$$\lim_{x \rightarrow 0} \frac{x \sin x}{x^2} - \frac{\log(1+x^2)}{x^2}$$

92. a

For example, bromobenzene reacts with methyl bromide in presence of sodium. dry ether to form alkyl benzene.

93. d

The masses of Cu reacting with a fixed masses of oxygen bear a simple ration of 1:2.

88. a

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{\sinh t}{\cosh t} = \tanh t$$

94. b

$$\begin{aligned} \text{Strength of acid} &= \frac{10 \times 0.5}{10} = 0.5N \\ \text{Normality} &= \frac{\text{wt in g per liter}}{\text{eq wt}} \end{aligned}$$

89. a

$$\begin{aligned} &\int \frac{1}{\cos x \sqrt{\cos 2x}} dx \\ &= \int \frac{1}{\sqrt{\frac{1-\tan^2 x}{1+\tan^2 x}}} dx \\ &= \int \frac{\sec^2 x}{\sqrt{1-\tan^2 x}} dx \\ &\text{Put, } y = \tan x \\ &dy = \sec^2 x dx \end{aligned}$$

95. b

$$\text{a. } Q_1 = 0.5 \times 10^{-4} \times (0.5 \times 10^{-4})^2 = 1.25 \times 10^{-13}$$

b. $Q_2 = 0.5 \times 10^{-2} \times (0.5 \times 10^{-3})^2 = 1.25 \times 10^{-9}$

c. $Q_3 = 0.5 \times 10^{-5} \times (0.5 \times 10^{-3})^2 = 1.25 \times 10^{-12}$

d. $Q_4 = 0.5 \times 10^{-3} \times (0.5 \times 10^{-5})^2 = 1.25 \times 10^{-14}$

since $Q_2 > K_{sp}$, it will precipitate.



To deposit 9g of Al, 96500 C is required

To deposit 5.12×1000 g of Al, 5.49×10^7 C is required

97. c

98. d

99. b

100. c