Powered with NCERT Locater, Tips, Tricks & Concept Notes
NEW SYLLABUS

Disha JEET
PYQs Pakki

ERRORLESS

37 YEARS

NTA NEET U G

Chapter-wise & Topic-wise

PHYSICS

PHYSICS
CHEMISTRY
BIOLOGY

Errorless 37 Years NEET
Errorless 37 Years NEET
Errorless 37 Years NEET

One Stop Solution for
NEET
Based on NEW SYLLABUS

• Separate Chapter on Experimental Skills
180 ... stio ble

DISHA
...cation Inc

Powered with
**NCERT Locater,
Tips, Tricks &
Concept Notes**
NEW SYLLABUS

Disha JEET
PYQs Pakki

ERRORLESS

37 YEARS

NTA **NEET** UG

Chapter-wise & Topic-wise

PHYSICS

Solved Papers
(2024 - 1988) with
Value Added Notes

Win
Rewards Worth
₹ 1 CRORE
look inside for
details

19th Edition

- 37 Years | 47 Papers | 29 Chapters | 235 Topics
- Aligned as per 11th & 12th New NCERT Books
- Answer Key validated with NTA
- Included 2023 Manipur & 2022 Ph II Papers
- Separate Chapter on Experimental Skills

1800+ Milestone Problems

DISHA™
Publication Inc

Buying Books from Disha is always Rewarding

This time we are appreciating your writing Creativity.
Write a review of the product you purchased on Amazon/Flipkart

Take a screen shot / Photo of that review

Scan this QR Code ➜
Fill Details and submit | That's it … Hold tight n wait.
At the end of the month, you will get a surprise gift from Disha Publication

Scan this QR code

Write To Us At

feedback_disha@aiets.co.in

www.dishapublication.com

DISHA™
Publication Inc

Free Sample Contents

Class XI

This sample book is prepared from the book **"Errorless 37 Years NTA NEET (UG) Chapter-wise & Topic-wise PHYSICS Solved Papers (2024 - 1988) with Value Added Notes 19th Edition | New Syllabus PYQs Question Bank for 2025 Exam".**

ISBN - 9789362258137

MRP- 475/-

In case you like this content, you can buy the **Physical Book** or **E-book** using the ISBN provided above.

The book & e-book are available on all leading online stores.

Contents

Class XI

* Marked Chapters/Topics are not present in new NCERT books but retained by NTA for NEET.

Class XII

For future updates on NEET Scan the QR Code.

You also get Latest Syllabus, Past NEET Papers, Mock Tests and more content here NEET 2024 Retest also Available.

https://bit.ly/3cfB81I

NEET 2024 Paper Code Q3
Page Reference in Disha's 37 Years Physics

Qn	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Page	B-207	B-139	B-193	B-40	B-83	B-38	A-47	B-64	B-104	B-155	B-167	A-45	B-192	A-140	B-14	A-85	A-32	B-154	A-64	B-126	B-19	A-2	A-123	B-91	A-108
Qn	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Page	B-168	B-142	B-84	A-65	B-180	A-158	A-129	B-193	B-13	A-90	B-113	B-113	B-128	B-35	A-149	A-17	B-189	A-162	A-111	B-92	B-100	A-133	B-83	B-17	A-4

Trend Analysis	2024		2023		2022		2021		2020		2019	
	Qns.	LOD	Qns.	LOD	Qns.	LOD	Qns.	LOD	Qns.	LOD	Qns.	LOD
The International System of Units											1	Easy
Significant Figures					1	Easy			1	Easy		
Dimensions of Physical Quantities	1	Avg.			3	Avg.	1	Avg.	1	Easy		
Dimensional Analysis and its Applications	1	Avg.			1	Avg.	1	Avg.				
Errors in Measurement					1 1	Easy Avg.			1	Easy		

Topic-1.2: The International System of Units

1. The unit of thermal conductivity is :

NCERT | Page-17 / N-1 | 2019

(a) $J\,m\,K^{-1}$ (b) $J\,m^{-1}\,K^{-1}$

(c) $W\,m\,K^{-1}$ (d) $W\,m^{-1}\,K^{-1}$

2. The unit of permittivity of free space, ε_o is

NCERT | Page-17 / N-2 | 2004

(a) $Coulomb^2/(Newton\text{-}metre)^2$

(b) $Coulomb/Newton\text{-}metre$

(c) $Newton\text{-}meter^2/Coulomb^2$

(d) $Coulomb^2/Newton\text{-}meter^2$

Topic-1.3: Significant Figures

3. The area of a rectangular field (in m^2) of length 55.3 m and breadth 25 m after rounding off the value of correct significant digits is:

NCERT | Page-30 | 2022

(a) 1382   (b) 1382.5

(c) 14×10^2 (d) 138×10^1

4. Taking into account of the significant figures, what is the value of 9.99 m – 0.0099 m?

NCERT | Page-28 | 2020

(a) 9.98 m   (b) 9.980 m

(c) 9.9 m   (d) 9.9801 m

Topic-∗: Errors in Measurement

5. The diameter of a spherical bob, when measured with vernier callipers yielded the following values: 3.33 cm, 3.32 cm, 3.34 cm, 3.33 cm and 3.32 cm. The mean diameter to appropriate significant figures is:

NCERT | Page-23 | Manipur 2023

(a) 3.33 cm   (b) 3.32 cm

(c) 3.328 cm   (d) 3.3 cm

6. The errors in the measurement which arise due to unpredictable fluctuations in temperature and voltage supply are   **NCERT | Page-23 | 2023**

(a) Instrumental errors

(b) Personal errors

(c) Least count errors

(d) Random errors

7. A metal wire has mass (0.4 ± 0.002) g, radius (0.3 ± 0.001) mm and length (5 ± 0.02) cm. The maximum possible percentage error in the measurement of density will nearly be

NCERT | Page-25 | 2023

(a) 1.2%   (b) 1.3%

(c) 1.6%   (d) 1.4%

8. The percentage error in the measurement of g is : [Given that g = $\dfrac{4\pi^2 L}{T^2}$, L = (10 ± 0.1) cm,

T = (100 ± 1)s] **NCERT | Page-25 | RS 2022**

(a) 7%   (b) 2%

(c) 5%   (d) 3%

9. Time intervals measured by a clock give the following readings :

1.25 s, 1.24 s, 1.27 s, 1.21 s and 1.28 s

What is the percentage relative error of the observations? **NCERT | Page-25 | Ph-II 2020**

(a) 1.6%   (b) 2%

(c) 4%   (d) 16%

10. In an experiment, the percentage of error occurred in the measurement of physical quantities A, B, C an D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement X, where X = $\dfrac{A^2\ B^{1/2}}{C^{1/3}\ D^3}$ will be :

NCERT | Page-25 | 2019

(a) $\left(\dfrac{3}{13}\right)$%   (b) 16%

(c) −10%   (d) 10%

11. In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows P = $\dfrac{a^3 b^2}{cd}$ % error in P is:

NCERT | Page-25 | 2013

(a) 10%   (b) 7%

(c) 4%   (d) 14%

12. A student measures the distance traversed in free fall of a body, initially at rest in a given time. He uses this data to estimate g, the acceleration due to gravity. If the maximum percentage errors in measurement of the distance and the time are e_1 and e_2 respectively, the percentage error in the estimation of g is

2010 M

(a) $e_2 - e_1$ (b) $e_1 + 2e_2$

(c) $e_1 + e_2$ (d) $e_1 - 2e_2$

13. If the error in the measurement of radius of a sphere is 2%, then the error in the determination of volume of the sphere will be:

NCERT | Page-25 | 2008

(a) 4%   (b) 6%

(c) 8%   (d) 2%

14. The density of a cube is measured by measuring its mass and length of i ts sides. If the maximum error in the measurement of mass and length are 4% and 3% respectively, the maximum error in the measurement of density will be

NCERT | Page-25 | 1996

(a) 7% (b) 9%   (c) 12% (d) 13%

15. The percentage errors in the measurement of mass and speed are 2% and 3% respectively. The error in kinetic energy obtained by measuring mass and speed will be

NCERT | Page-25 | 1995

(a) 12%   (b) 10%

(c) 8%   (d) 2%

16. A certain body weighs 22.42 gm and has a measured volume of 4.7 cc. The possible error in the measurement of mass and volume are 0.01 gm and 0.1 cc. Then maximum error in the density will be **NCERT | Page-25 | 1991**

(a) 22%   (b) 2%

(c) 0.2%   (d) 0.02%

Topic-1.4: Dimensions of Physical Quantities

17. The quantities which have the same dimensions as those of solid angle are :

NCERT | Page-N-7 | 2024

(a) strain and angle

(b) stress and angle

(c) strain and arc

(d) angular speed and stress

18. The mechanical quantity, which has dimensions of reciprocal of mass (M^{-1}) is

NCERT | Page-31 / N-7 | Manipur 2023

(a) Torque

(b) Gravitational constant

(c) Angular momentum

(d) Coefficient of thermal conductivity

19. Match List-I with List-II

NCERT | Page-31, 32 / N-7 | 2022

	List-I		List-II
(A)	Gravitational constant (G)	(i)	$[L^2T^2]$
(B)	Gravitational potential energy	(ii)	$[M^{-1}L^3T^{-2}]$
(C)	Gravitational potential	(iii)	$[LT^{-2}]$
(D)	Gravitational intensity	(iv)	$[ML^2T^{-2}]$

Choose the **correct answer** from the options given below:

(a) A–ii; B–iv; C–i; D–iii
(b) A–ii; B–iv; C–iii; D–i
(c) A–iv; B–ii; C–i; D–iii
(d) A–ii; B–i; C–iv; D–iii

20. The physical quantity that has the same dimensional formula as pressure is:

NCERT | Page-32 / N-1 | 2022

(a) Coefficient of viscosity
(b) Force
(c) Momentum
(d) Young's modulus of elasticity

21. The dimensions $[MLT^{-2} A^{-2}]$ belong to the:

(a) self inductance **NCERT | Page-32 / N-7 | 2022**
(b) magnetic permeability
(c) electric permittivity
(d) magnetic flux

22. If E and G respectively denote energy and gravitational constant, then $\dfrac{E}{G}$ has the dimensions of **NCERT | Page-31 / N-7 | 2021**

(a) $[M^2] [L^{-2}] [T^{-1}]$ (b) $[M^2] [L^{-1}] [T^0]$

(c) $[M] [L^{-1}] [T^{-1}]$ (d) $[M] [L^0] [T^0]$

23. Dimensions of stress are:

NCERT | Page-31 / N-7 | 2020

(a) $[ML^2T^{-2}]$ (b) $[ML^0T^{-2}]$
(c) $[ML^{-1} T^{-2}]$ (d) $[MLT^{-2}]$

24. The pair of quantities having same dimensions is **NCERT | Page-31 / N-7 | Kar. 2013**

(a) Young's modulus and energy
(b) impulse and surface tension
(c) angular momentum and work
(d) work and torque

25. The dimensions of $(\mu_0 \in_0)^{\frac{-1}{2}}$ are

NCERT | Page-31 / N-7 | 2012 M, 2011

(a) $[L^{1/2} T^{-1/2}]$ (b) $[L^{-1} T]$
(c) $[L T^{-1}]$ (d) $[L^{-1/2} T^{1/2}]$

26. The dimension of $\dfrac{1}{2}\varepsilon_0 E^2$, where ε_0 is permittivity of free space and E is electric field, is: **NCERT | Page-31 / N-8 | 2010**

(a) $[ML^2 T^{-2}]$ (b) $[ML^{-1}T^{-2}]$
(c) $[ML^2T^{-1}]$ (d) $[MLT^{-1}]$

27. Which two of the following five physical parameters have the same dimensions?

NCERT | Page-31 / N-7 | 2008

(A) Energy density (B) Refractive index
(C) Dielectric constant (D) Young's modulus
(E) Magnetic field

(a) (B) and (D) (b) (C) and (E)
(c) (A) and (D) (d) (A) and (E)

28. The ratio of the dimension of Planck's constant and that of the moment of inertia is the dimension of **NCERT | Page-31 / N-7 | 2005**

(a) time
(b) frequency
(c) angular momentum
(d) velocity

29. The dimensions of universal gravitational constant is **NCERT | Page-31 / N-7 | 2004**

(a) $[M^{-2} L^2 T^{-1}]$ (b) $[M^{-1} L^3 T^{-2}]$
(c) $[M L^2 T^{-1}]$ (d) $[M^{-2} L^3 T^{-2}]$

30. The dimensions of Planck's constant are same as **NCERT | Page-31 / N-7 | 2001**

(a) energy (b) power
(c) momentum (d) angular momentum

31. Which one of the following groups have quantities that do not have the same dimensions?

NCERT | Page-31 / N-7 | 2000

(a) pressure, stress (b) velocity, speed
(c) force, impulse (d) work, energy

32. The force F on a sphere of radius 'a' is moving in a medium with velocity v is given by $F = 6\pi\eta av$. The dimensions of η are

NCERT | Page-31 / N-8 | 1997

(a) $[ML^{-3}]$ (b) $[ML^{-2}]$
(c) $[ML^{-1}]$ (d) $[ML^{-1}T^{-1}]$

33. An equation is given as : $\left(P + \dfrac{a}{V^2}\right) = b\dfrac{\theta}{V}$

where P = Pressure, V = Volume & θ = Absolute temperature. If a and b are constants, then dimensions of a will be

NCERT | Page-32 / N-9 | 1996

(a) $[ML^5T^{-2}]$ (b) $[M^{-1}L^5T^2]$
(c) $[ML^{-5}T^{-1}]$ (d) $[ML^5T^1]$

34. Which of the following will have the dimensions of time   **NCERT | Page-31 / N-7 | 1996**

(a) LC   (b) $\dfrac{R}{L}$ (c) $\dfrac{L}{R}$ (d) $\dfrac{C}{L}$

35. Turpentine oil is flowing through a tube of length ℓ and radius r. The pressure difference between the two ends of the tube is p. The viscosity of oil is given by

$$\eta = \frac{p\left(r^2 - x^2\right)}{4vl}$$

where v is the velocity of oil at a distance x from the axis of the tube. The dimensions of η are   **NCERT | Page-32 / N-9 | 1993**

(a) $[M^0L^0T^0]$ (b) $[MLT^{-1}]$
(c) $[ML^2T^{-2}]$ (d) $[ML^{-1}T^{-1}]$

36. Of the following quantities, which one has dimension different from the remaining three?

NCERT | Page-31 / N-7 | 1989

(a) Energy per unit volume
(b) Force per unit area
(c) Product of voltage and charge per unit volume
(d) Angular momentum.

Topic-1.5: Dimensional Formulae and Dimensional Equations

---

37. The dimensional formula for magnetic flux is

NCERT | Page-31 / N-7 | 1999

(a) $[ML^2T^{-2}A^{-1}]$ (b) $[ML^3T^{-2}A^{-2}]$
(c) $[M^0L^{-2}T^2A^{-2}]$ (d) $[ML^2T^{-1}A^2]$

38. The dimensional formula for permeability μ is given by   **NCERT | Page-31 / N-7 | 1991**

(a) $[MLT^{-2}A^{-2}]$ (b) $[M^0L^1T]$
(c) $[M^0L^2T^{-1}A^2]$ (d) None of the above

39. According to Newton, the viscous force acting between liquid layers of area A and velocity gradient $\Delta V/\Delta Z$ is given by $F = -\eta A\dfrac{\Delta V}{\Delta Z}$

where η is constant called coefficient of viscosity. The dimensional formula of η is

NCERT | Page-31 / N-8 | 1990

(a) $ML^{-2}T^{-2}$ (b) $M^0L^0T^0$
(c) ML^2T^{-2} (d) $ML^{-1}T^{-1}$

40. The dimensional formula of pressure is

NCERT | Page-31 / N-8 | 1990

(a) $[MLT^{-2}]$ (b) $[ML^{-1}T^2]$
(c) $[ML^{-1}T^{-2}]$ (d) $[MLT^2]$

41. The dimensional formula of torque is

NCERT | Page-31 / N-7 | 1989

(a) $[ML^2T^{-2}]$ (b) $[MLT^{-2}]$
(c) $[ML^{-1}T^{-2}]$ (d) $[ML^{-2}T^{-2}]$

42. Dimensional formula of self inductance is

NCERT | Page-31 / N-7 | 1989

(a) $[MLT^{-2}A^{-2}]$ (b) $[ML^2T^{-1}A^{-2}]$
(c) $[ML^2T^{-2}A^{-2}]$ (d) $[ML^2T^{-2}A^{-1}]$

43. The dimensional formula for angular momentum is   **NCERT | Page-31 / N-7 | 1988**

(a) $[M^0L^2T^{-2}]$ (b) $[ML^2T^{-1}]$
(c) $[MLT^{-1}]$ (d) $[ML^2T^{-2}]$

44. If C and R denote capacitance and resistance, the dimensional formula of CR is

(a) $[M^0L^0T^1]$ **NCERT | Page-31 / N-7 | 1988**
(b) $[M^0L^0T^0]$
(c) $[M^0L^0T^{-1}]$
(d) not expressible in terms of M,L,T.

Topic-1.6: Dimensional Analysis and its Applications

---

45. A force defined by $F = \alpha t^2 + \beta t$ acts on a particle at a given time t. The factor which is dimensionless, if α and β are constants, is:

NCERT | Page-N-8 | 2024

(a) $\dfrac{\beta t}{\alpha}$ (b) $\dfrac{\alpha t}{\beta}$

(c) $\alpha\beta t$ (d) $\dfrac{\alpha\beta}{t}$

46. Plane angle and solid angle have:

NCERT | Page-17 / N-7 | 2022

(a) Dimensions but no units
(b) No units and no dimensions
(c) Both units and dimensions
(d) Units but no dimensions

47. If force $[F]$, acceleration $[A]$ and time $[T]$ are chosen as the fundamental physical quantities. Find the dimensions of energy.

NCERT | Page-33 / N-8 | 2021

(a) $[F][A^{-1}][T]$ (b) $[F][A][T]$

(c) $[F][A][T^2]$ (d) $[F][A][T^{-1}]$

48. A physical quantity of the dimensions of length that can be formed out of c, G and $\dfrac{e^2}{4\pi\varepsilon_0}$ is

[c is velocity of light, G is universal constant of gravitation and e is charge]

NCERT | Page-33 / N-7 | 2017

(a) $c^2\left[G\dfrac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$ (b) $\dfrac{1}{c^2}\left[\dfrac{e^2}{G4\pi\varepsilon_0}\right]^{1/2}$

(c) $\dfrac{1}{c}G\dfrac{e^2}{4\pi\varepsilon_0}$ (d) $\dfrac{1}{c^2}\left[G\dfrac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

49. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are three fundamental constants. Which of the following combinations of these has the dimension of length? **NCERT | Page-33 / N-8 | Ph-II 2016**

(a) $\sqrt{\dfrac{hc}{G}}$ (b) $\sqrt{\dfrac{Gc}{h^{3/2}}}$

(c) $\sqrt{\dfrac{hG}{c^{3/2}}}$ (d) $\sqrt{\dfrac{hG}{c^{5/2}}}$

50. If energy (E), velocity (V) and time (T) are chosen as the fundamental quantities, the dimensional formula of surface tension will be: **NCERT | Page-33 / N-7 | 2015**

(a) $[EV^{-1}T^{-2}]$ (b) $[EV^{-2}T^{-2}]$

(c) $[E^{-2}V^{-1}T^{-3}]$ (d) $[EV^{-2}T^{-1}]$

51. If dimensions of critical velocity υ_c of a liquid flowing through a tube are expressed as $[\eta^x\rho^y r^z]$, where η, ρ and r are the coefficient of viscosity of liquid, density of liquid and radius of the tube respectively, then the values of x, y and z are given by : **NCERT | Page-33 / N-8 | 2015 RS**

(a) $-1, -1, 1$ (b) $-1, -1, -1$

(c) $1, 1, 1$ (d) $1, -1, -1$

52. If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimensions of mass are : **NCERT | Page-33 / N-7 | 2014**

(a) $[F\,V\,T^{-1}]$ (b) $[F\,V\,T^{-2}]$

(c) $[F\,V^{-1}\,T^{-1}]$ (d) $[F\,V^{-1}\,T]$

53. The density of material in CGS system of units is 4g/cm^3. In a system of units in which unit of length is 10 cm and unit of mass is 100 g, the value of density of material will be

NCERT | Page-17 / N-3 | 2011 M

(a) 0.4   (b) 40   (c) 400   (d) 0.04

54. If the dimensions of a physical quantity are given by $M^a L^b T^c$, then the physical quantity will be: **NCERT | Page-31 / N-8 | 2009**

(a) Velocity if $a = 1$, $b = 0$, $c = -1$

(b) Acceleration if $a = 1$, $b = 1$, $c = -2$

(c) Force if $a = 0$, $b = -1$, $c = -2$

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

55. Dimensions of resistance in an electrical circuit, in terms of dimension of mass [M], of length [L], of time [T] and of current [I], would be **NCERT | Page-33 / N-8 | 2007**

(a) $[ML^2T^{-2}]$ (b) $[ML^2T^{-1}I^{-1}]$

(c) $[ML^2T^{-3}I^{-2}]$ (d) $[ML^2T^{-3}I^{-1}]$

56. The velocity v of a particle at time t is given by $v = at + \dfrac{b}{t+c}$, where a, b and c are constant. The dimensions of a, b and c are respectively

NCERT | Page-32 / N-8 | 2006

(a) $[L^2, T \text{ and } LT^2]$ (b) $[LT^2, LT \text{ and } L]$

(c) $[L, LT \text{ and } T^2]$ (d) $[LT^{-2}, L \text{ and } T]$

57. Which of the following is a dimensional constant? **NCERT | Page-31 / N-7 | 1995**

(a) Refractive index

(b) Poissons ratio

(c) Relative density

(d) Gravitational constant

58. In a particular system, the unit of length, mass and time are chosen to be 10 cm, 10 g and 0.1 s respectively. The unit of force in this system will be equivalent to **NCERT | Page-17 / N-3 | 1994**

(a) 0.1 N   (b) 1 N

(c) 10 N   (d) 100 N

59. The time dependence of a physical quantity p is given by $p = p_0 \exp(-\alpha t^2)$, where α is a constant and t is the time. The constant α

NCERT | Page-32 / N-8 | 1993

(a) is dimensionless　　(b) has dimensions T^{-2}

(c) has dimensions T^2　(d) has dimensions of p

60. P represents radiation pressure, c represents speed of light and S represents radiation energy striking unit area per sec. The non zero integers x, y, z such that $P^x\, S^y\, c^z$ is dimensionless are

NCERT | Page-33 / N-8 | 1992

(a) $x = 1, y = 1, z = 1$　(b) $x = -1, y = 1, z = 1$

(c) $x = 1, y = -1, z = 1$　(d) $x = 1, y = 1, z = -1$

61. The frequency of vibration f of a mass m suspended from a spring of spring constant k is given by a relation of the type $f = c\, m^x\, k^y$, where c is a dimensionless constant. The values of x and y are **NCERT | Page-33 / N-9 | 1990**

(a) $x = \dfrac{1}{2}, y = \dfrac{1}{2}$　　(b) $x = -\dfrac{1}{2}, y = -\dfrac{1}{2}$

(c) $x = \dfrac{1}{2}, y = -\dfrac{1}{2}$　　(d) $x = -\dfrac{1}{2}, y = \dfrac{1}{2}$

62. If $x = at + bt^2$, where x is the distance travelled by the body in kilometers while t is the time in seconds, then the unit of b is

NCERT | Page-17 / N-2 | 1989

(a) km/s　　　　　　　(b) kms

(c) km/s^2　　　　　　(d) kms^2

ANSWER KEY

1	(d)	8	(d)	15	(c)	22	(b)	29	(b)	36	(d)	43	(b)	50	(b)	57	(d)		
2	(d)	9	(a)	16	(b)	23	(c)	30	(d)	37	(a)	44	(a)	51	(d)	58	(a)		
3	(c)	10	(b)	17	(a)	24	(d)	31	(c)	38	(a)	45	(b)	52	(d)	59	(b)		
4	(a)	11	(d)	18	(b)	25	(c)	32	(d)	39	(d)	46	(d)	53	(b)	60	(c)		
5	(a)	12	(b)	19	(a)	26	(b)	33	(a)	40	(c)	47	(c)	54	(d)	61	(d)		
6	(d)	13	(b)	20	(d)	27	(c)	34	(c)	41	(a)	48	(d)	55	(c)	62	(c)		
7	(c)	14	(d)	21	(b)	28	(b)	35	(d)	42	(c)	49	(c)	56	(d)				

Hints & Solutions

1. **(d)** In steady state, the amount of heat flowing from one face to the other face in time dt is given by

$$dH = \frac{kA(T_1 - T_2)dt}{\ell} \implies \frac{dH}{dt} = \frac{kA}{\ell}\,\Delta T$$

(k = coefficient of thermal conductivity)

$$\therefore\ k = \frac{\ell\, dH}{A\, dt\, \Delta T}$$

Unit of $k = Wm^{-1}\, K^{-1}$

2. **(d)** $\varepsilon_o = \dfrac{q^2}{(r^2)4\pi F}$

$\Rightarrow$ unit of ε_o is (coulomb)^2/ newton-metre^2

3. **(c)** Area = length × breadth

= 55.3 × 25

As, Answer of multiplication is rounded off to the same number of significant figure as present in least precise term.

Here, 25 has least significant figure and it is 2 so, Answer will also have 2 SF.

Therefore, correct option is (c) i.e. 14×10^2

4. **(a)** In subtraction the number of decimal places in the result should be equal to the number of decimal places of that term in the operation which contain lesser number of decimal places.

9.99

$-\,0.0099$

————

9.9801

As the least number of decimal places is 3. So, answer should be 9.98 m.

5.　**(a)**　Mean diameter,

$$\overline{d} = \frac{[3.33\,cm + 3.32\,cm + 3.34\,cm + 3.33\,cm + 3.32\,cm]}{5}$$

$= 3.328$ cm

After rounding off to 2 decimal places,

$\overline{d} = 3.33$ cm

6.　**(d)**　Random errors is also called chance error. It occurs due to parameter which are beyound the control of experimeter.

7.　**(c)**　Density, $\rho = \dfrac{\text{mass}}{\text{volume}} = \dfrac{M}{\pi r^2 l}$

$$\frac{\Delta\rho}{\rho} = \frac{\Delta M}{M} + \frac{2\Delta r}{r} + \frac{\Delta l}{l} = \left(\frac{0.002}{0.4} + \frac{2 \times 0.001}{0.3} + \frac{0.02}{5}\right)$$

$$\frac{\Delta\rho}{\rho} = 0.0156$$

% error in density $\dfrac{\Delta\rho}{\rho}\% = 1.56\% \approx 1.6\%$

8.　**(d)**　Given,

$$g = \frac{4\pi^2 L}{T^2}$$

% erroring, $\dfrac{\Delta g}{g} \times 100 = \dfrac{\Delta L}{L} \times 100 + 2\dfrac{\Delta T}{T} \times 100$

$$= \left(\frac{0.1}{10} \times 100\right) + 2\left[\frac{1}{100} \times 100\right] = 1 + 2 = 3\%$$

> **NOTES**　In multiplication and division of two measured quantities, the relative error in final result is the sum of relative error in the measured quantities.

9.　**(a)**　Average value of time interval

$$\overline{T} = \frac{1.25 + 1.24 + 1.27 + 1.21 + 1.28}{5} = \frac{625}{5} = 1.25\ s$$

Absolute errors in the measured values of time intervals are

$|\Delta T_1| = 1.25 - 1.25 = 0$

$|\Delta T_2| = 1.25 - 1.24 = 0.01$

$|\Delta T_3| = |1.25 - 1.27| = 0.02$

$|\Delta T_4| = |1.25 - 1.21| = 0.04$

$|\Delta T_5| = |1.25 - 1.28| = 0.03$

Mean absolute error,

$$\Delta\overline{T} = \frac{|\Delta T_1| + |\Delta T_2| + |\Delta T_3| + |\Delta T_4| + |\Delta T_5|}{5}$$

$$= \frac{0 + 0.01 + 0.02 + 0.04 + 0.03}{5} = \frac{0.1}{5} = 0.02\ s$$

$\therefore$　Percentage relative error $= \dfrac{\Delta\overline{T}}{T} \times 100$

$$= \frac{0.02}{1.25} \times 100 = 1.6\%.$$

10.　**(b)**　Given, $x = \dfrac{A^2 B^{1/2}}{C^{1/3} D^3}$

% error, $\dfrac{\Delta x}{x} \times 100 = 2\dfrac{\Delta A}{A} \times 100 + \dfrac{1}{2}\dfrac{\Delta B}{B} \times$

$100 + \dfrac{1}{3}\dfrac{\Delta C}{C} \times 100 + 3\dfrac{\Delta D}{D} \times 100$

$$= 2 \times 1\% + \frac{1}{2} \times 2\% + \frac{1}{3} \times 3\% + 3 \times 4\%$$

$$= 2\% + 1\% + 1\% + 12\% = 16\%$$

11.　**(d)**　Given, $P = \dfrac{a^3 b^2}{cd}$

Therefore, $\dfrac{\Delta P}{P} \times 100\% = 3\dfrac{\Delta a}{a} \times 100\%$

$+ 2\dfrac{\Delta b}{b} \times 100\% + \dfrac{\Delta c}{c} \times 100\% + \dfrac{\Delta d}{d} \times 100\%$

$$= 3 \times 1\% + 2 \times 2\% + 3\% + 4\% = 14\%$$

> **NOTES**　When we multiply or divide two measured quantities, the relative error in the final result is equal to the sum of the relative errors in the measured quantities. And when we add or subtract two measured quantities the absolute error in the final result is equal to the sum of the absolute error in the measured quantities.

12.　**(b)**　From $h = ut + \dfrac{1}{2}gt^2 \Rightarrow g = \dfrac{2h}{t^2}[\because u = 0]$

$\ln g = \ln h - 2\ln t$

$$\left(\frac{\Delta g}{g}\times 100\right)_{max} = \frac{\Delta h}{h}\times 100 + 2\frac{\Delta t}{t}\times 100$$

$$= e_1 + 2e_2$$

13. **(b)** Given, error in the measurement of radius of a sphere $\frac{\Delta r}{r}\times 100 = 2\%$

Volume of the sphere V $= \frac{4}{3}\pi r^3$

∴ Error in the volume $\frac{\Delta V}{V}\times 100$

$$= \pm 3\cdot\frac{\Delta r}{r}\times 100 = 3\times 2\% = \pm 6\%$$

14. **(d)** As we know, density $= \frac{mass}{volume}$

Maximum error in the measurement of density

$$\rho = \frac{M}{L^3}$$

$$\therefore \frac{\Delta\rho}{\rho} = \frac{\Delta M}{M} + 3\frac{\Delta L}{L}$$

% error in density = % error in Mass

+3 (% error in length)

$$= 4 + 3(3) = 13\%$$

15. **(c)** Percentage error in mass $\left(\frac{\Delta m}{m}\times 100\right) = 2$

and percentage error in speed $\left(\frac{\Delta v}{v}\times 100\right) = 3$.

Kinetic energy, $k = \frac{1}{2}mv^2$.

∴ Error in measurement of kinetic energy $\frac{\Delta K}{K}$

$$= \frac{\Delta m}{m} + 2\left(\frac{\Delta v}{v}\right)$$

$$= \left(\frac{2}{100}\right) + \left(2\times\frac{3}{100}\right) = \frac{8}{100} = 8\%$$

∴ % age error = 8%.

16. **(b)** Density, D $= \frac{Mass(M)}{Volume(V)}$

$$\therefore \frac{\Delta D}{D} = \frac{\Delta M}{M} + \frac{\Delta V}{V} = \left(\frac{0.01}{22.42} + \frac{0.1}{4.7}\right)\times 100$$

$$= 2\%$$

17. **(a)** Solid angle $d\Omega = \frac{dA}{r^2}$ has dimensions $[M^0L^0T^0]$

Strain $= \frac{\Delta\ell}{\ell}$ has dimensions $[M^0L^0T^0]$

Angle measured in radians $\theta = \frac{\ell}{r}$ is also dimensionless $[M^0L^0T^0]$

Solid angle, strain and angle are dimensionless.

NOTES Angle, trigonometric function, $(\cos\theta, \sin\theta, \tan\theta)$ Logarithmic function (log x), exponential function (e^x), Ratio, Pure number are dimensionless.

18. **(b)** Gravitational force, F $= \frac{GM_1M_2}{r^2}$

$$\Rightarrow [G] = \frac{[F][r]^2}{[M_1][M_2]} = \frac{\left[MLT^{-2}\right]\left[L^2\right]}{[M][M]}$$

$$\Rightarrow [G] = [M^{-1}\,L^3\,T^{-2}]$$

Torque T = F · r $= [ML^2\,T^{-2}]$

Angular momentum, L = Mvr $= [ML^2\,T^{-1}]$

19. **(a)** $[G] = \left[\frac{Fr^2}{m_1m_2}\right] = \frac{MLT^{-2}L^2}{M^2} = M^{-1}L^3\,T^2$

$[U] = [W] = ML^2\,T^{-2}$

$[V] = \left[\frac{U}{M}\right] = \frac{ML^2T^{-2}}{M} = L^2\,T^{-2}$

$[I] = \left[\frac{F}{M}\right] = LT^{-2}$

20. **(d)** Pressure $= \frac{F}{A}$ and Young's modulus

$$Y = \frac{Stress}{Strain} = \frac{F/A}{\Delta\ell/\ell_0}$$

Hence the dimensions of pressure (P) and Young's modulus (Y) are same.

21. (b) For circular loop at centre,

$$B = \frac{\mu_0 i}{2r} \Rightarrow \mu_0 = \frac{2Br}{I}$$

$$|\mu_0| = \frac{[B][r]}{[I]} = \frac{[MLT^{-2}A^{-1}L^{-1}][L]}{[A]}$$

$$= MLT^{-2}A^{-2}$$

22. (b) Dimensional formula of energy $E = \frac{1}{2}mv^2$

$$[E] = [M^1 L^2 T^{-2}] \qquad \text{...(i)}$$

Dimensional formula of gravitational constant

$$G = \frac{Fr^2}{m_1 m_2}$$

$$[G] = [M^{-1} L^3 T^{-2}] \qquad \text{...(ii)}$$

From eq. (i) & (ii)

$$\therefore \frac{E}{G} = \frac{\left[M^1 L^2 T^{-2}\right]}{\left[M^{-1} L^3 T^{-2}\right]} = \left[M^2 L^{-1} T^0\right]$$

NOTES
Numerical constant like, $\frac{1}{2}$, 1, 2 or 2π has no dimension.

23. (c) $\text{Stress} = \frac{\text{Force}}{\text{Area}}$

Dimensions of force = $[MLT^{-2}]$
Dimensions of area = $[L^2]$

$$\therefore \text{Stress} = \frac{[MLT^{-2}]}{[L^2]} = [ML^{-1}T^{-2}]$$

24. (d) Work = Force × displacement
$= [MLT^{-2}][L] = [ML^2T^{-2}]$
Torque = Force × force arm
$\quad$ = mass × acceleration × length
$\quad$ = $[M] \times [LT^{-2}] \times [L] = [M L^2 T^{-2}]$

NOTES If dimensions are given, physical quantity may not be unique as many physical quantities have same dimensions. *e.g.*, If the dimensional formula of a physical quantity is $[ML^2T^{-2}]$ it may be work or energy or torque.

25. (c) $(\mu_0 \varepsilon_0)^{-1/2} = \frac{1}{\sqrt{\mu_0 \varepsilon_0}} \Rightarrow c$ = speed of light

where ε_0 = permittivity of free space

μ_0 = permeability of free space

So dimensions of $(\mu_0 \varepsilon_0)^{-1/2}$ will be $[LT^{-1}]$

26. (b) $\frac{1}{2}\varepsilon_0 E^2$ represents energy density *i.e.*,

energy per unit volume.

$$\Rightarrow \left[\frac{1}{2}\varepsilon_0 E^2\right] = \frac{[ML^2 T^{-2}]}{[L^3]} = [ML^{-1}T^{-2}]$$

27. (c) Energy density $= \frac{\text{Energy}}{\text{Volume}}$

$$\Rightarrow \frac{[ML^2 T^{-2}]}{[L^3]} = [ML^{-1}T^{-2}]$$

Refractive index and dielectric constant have no dimensions.

Young's Modulus $= \frac{F}{A} \times \frac{l}{\Delta l}$

$$\Rightarrow \frac{[MLT^{-2}]}{[L^2]} \cdot \frac{[L]}{[L]} = [ML^{-1}T^{-2}].$$

Magnetic field, $B = \frac{F}{i\ell} = \frac{[MLT^{-2}]}{[A][L]}$

$= [MT^{-2}A^{-1}].$

28. (b) Dimension formula for the planck's constant, $h = [ML^2 T^{-1}]$

Dimension formula for the moment of inertia, $I = [ML^2]$

So, the ratio between the plank's constant and moment of inertia is

$$\Rightarrow \frac{h}{I} = \frac{[ML^2 T^{-1}]}{[ML^2]} \Rightarrow [T^{-1}]$$

$$\Rightarrow \frac{h}{I} = [T^{-1}] \Rightarrow \text{dimension of frequency}$$

29. (b) $F = \dfrac{G\, M_1 m_2}{r^2} \Rightarrow G = \dfrac{F\, r^2}{M_1 m_2}$

$\therefore$ dimension of G is $\dfrac{[MLT^{-2}][L^2]}{[M][M]}$

$= [M^{-1}L^3T^{-2}]$

30. (d) We know that $E = h\nu$

$h = \dfrac{E}{\nu} = \dfrac{[ML^2T^{-2}]}{[T^{-1}]} = [ML^2T^{-1}]$

Angular momentum $= I\omega$

$= [ML^2][T^{-1}] = [ML^2T^{-1}]$

31. (c) Force has dimension $[MLT^{-2}]$ while impulse has dimension $[MLT^{-1}]$, both have different dimensions.

32. (d) $F = 6\pi\eta\, av$

$\eta = \dfrac{F}{6\pi\, av} = \dfrac{[MLT^{-2}]}{[L][LT^{-1}]} = [ML^{-1}\,T^{-1}]$

33. (a) $\left(P + \dfrac{a}{V^2}\right) = b\dfrac{\theta}{V}$

According to the principle of homogeneity quantity with same dimension can be added or subtracted.

Hence, Dimension of P = Dimension of $\dfrac{a}{V^2}$

$\Rightarrow$ Dimension of $\dfrac{\text{Force}}{\text{Area}}$ = Dimension of $\dfrac{a}{V^2}$

$\Rightarrow \left[\dfrac{MLT^{-2}}{L^2}\right] = \dfrac{a}{[L^3]^2} \Rightarrow a = [M\,L^5\,T^{-2}]$

NOTES To get the dimensions of physical constant, we write any formula or equation incorporating the given constant and then by substituting the dimensional formula of all other quantities, we can find the dimensions of the required constant or coefficients.

34. (c) $\varepsilon = -L\dfrac{di}{dt}$ ....(i)

$\varepsilon = iR$ ....(ii)

From (i) & (ii), $iR = -L\dfrac{di}{dt}$

$\therefore$ Dimension of L.H.S. = Dimension of R.H.S.

$[A]\, R = L\, [AT^{-1}] \Rightarrow \dfrac{L}{R} = [T]$

NOTES $\dfrac{L}{R}$ is time constant of R-L circuit so,

dimensions of $\dfrac{L}{R}$ is same as that of time.

35. (d) $\eta = \dfrac{p(r^2 - x^2)}{4vl} = \dfrac{[ML^{-1}T^{-2}][L^2]}{[LT^{-1}][L]}$

$= [ML^{-1}T^{-1}]$

NOTES According to the principle of homogeneity, the dimensions of each term on the L.H.S. must be equal to the dimensions of the terms on the R.H.S. Only then dimensional equation or formula is dimensionally correct.

36. (d) For angular momentum, the dimensional formula is $[ML^2T^{-1}]$. For other three, it is $[ML^{-1}T^{-2}]$.

37. (a) Dimension of magnetic flux

= Dimension of magnetic field × Dimension of area

$[ML^0T^{-2}A^{-1}]\, [L^2] = [ML^2T^{-2}A^{-1}]$

38. (a) We have

$B = \dfrac{\mu_0}{4\pi}\dfrac{id\,\ell\sin\theta}{r^2}$ [By Biot-Savart's law]

$[\mu_0] = \dfrac{[B][r^2]}{[i][d\,\ell]}$

$= \dfrac{MLT^{-2}\, L^2}{AL \times A \times L} = MLT^{-2}A^{-2}$

NOTES Also find the dimensional formula by using the relation,

Speed of light, $c = \dfrac{1}{\sqrt{\mu_0 \varepsilon_0}}$

39. (d) $F = -\eta A \dfrac{\Delta V}{\Delta Z} \Rightarrow \eta = (-1)\dfrac{F\Delta Z}{A\Delta V}$

So dimensional formula of η

$\Rightarrow \dfrac{[MLT^{-2}][L]}{[L^2][LT^{-1}]} \Rightarrow [ML^{-1}T^{-1}]$

40. (c) Pressure = Force / Area

So dimensional formula $= \dfrac{[MLT^{-2}]}{[L^2]}$

$= [ML^{-1}T^{-2}]$

41. (a) τ = Force × distance

So dimensional formula,

$= [MLT^{-2}][L] = [ML^2T^{-2}]$

42. (c) $L = \varepsilon\left(\dfrac{dt}{dI}\right) = \dfrac{W}{q}\left[\dfrac{dt}{di}\right] = \dfrac{W}{i \cdot t}\left[\dfrac{dt}{di}\right]$

or, $[L] = \dfrac{[ML^2T^{-2}][T]}{[AT][A]} = [ML^2T^{-2}A^{-2}]$

43. (b) Angular momentum
= Momentum of inertia × Angular velocity

So dimensional formula,

$= [ML^2] \times [T^{-1}] = [ML^2T^{-1}]$

44. (a) $CR = \left(\dfrac{q}{V}\right)\left(\dfrac{V}{i}\right) \Rightarrow \left(\dfrac{i \cdot t}{i}\right) \Rightarrow t$ = time

$= [T] = [M^0L^0T^1]$

RC is the time constant of the circuit.

45. (b) From principle of homogeneity

$[F] = [\alpha t^2] = [\beta t] \Rightarrow [\alpha t] = \dfrac{[F]}{[t]}$ and $[\beta] = \dfrac{[F]}{[t]}$

$\therefore \dfrac{[\alpha t]}{[\beta]} = [F^0 t^0]$

$\therefore \dfrac{\alpha t}{\beta}$ = dimensionless

46. (d) Plane angle unit is radian, whereas solid angle unit is steradian, but they don't have any dimensions.

NOTES Angle is exceptional physical quantity, which though is a ratio of two similar physical quantities angle $= \dfrac{\text{arc}}{\text{radius}}$ but still requires a unit to specify it.

47. (c) Energy, $E \propto F^a A^b T^c$

$[E] = [F^a][A^b][T^c]$

$\Rightarrow [ML^2T^{-2}] = [MLT^{-2}]^a [LT^{-2}]^b [T]^c$

$[ML^2T^{-2}] = [M^a L^{a+b} T^{-2a-2b+c}]$

Comparing dimensions on both sides.

$a = 1; a + b = 2$ and $-2 = -2a - 2b + c$

$\therefore b = 1$ and $-2 = -2 - 2 + c$ or, $c = 2$

$\therefore$ Dimensions of energy $= [FAT^2]$

48. (d) Let dimensions of length is related as,

$[L] = [c]^x [G]^y \left[\dfrac{e^2}{4\pi\varepsilon_0}\right]^z \Rightarrow \dfrac{e^2}{4\pi\varepsilon_0} = [ML^3T^{-2}]$

$[L] = [LT^{-1}]^x [M^{-1}L^3T^{-2}]^y [ML^3T^{-2}]^z$

$[L] = [L^{x+3y+3z} M^{-y+z} T^{-x-2y-2z}]$

Comparing both sides

$-y + z = 0 \Rightarrow y = z$ ...(i)

$x + 3y + 3z = 1$ ...(ii)

$-x - 4z = 0$ ($\because$ y = z) ...(iii)

From (i), (ii) and (iii)

$z = y = \dfrac{1}{2}, \; x = -2$

Hence, $[L] = c^{-2}\left[G \cdot \dfrac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

49. (c) Let the dimension of length depends on h, G, c as

$\ell \propto h^x G^y c^z$

$M^0 L^1 T^0 = (ML^2 T^{-1})^x (M^{-1}L^3 T^{-2})^y (LT^{-1})^Z$

$\qquad = M^{x-y} L^{2x + 3y + z} T^{-x - 2y - Z}$

Equating :

$\left. \begin{array}{l} x - y = 0 \\ 2x + 3y + z = 1 \\ -x - 2y - z = 0 \end{array} \right\} \Rightarrow x = \dfrac{1}{2}; y = \dfrac{1}{2}; z = -\dfrac{3}{2}$

$\Rightarrow \ell \propto \dfrac{\sqrt{hG}}{c^{3/2}}$

50. (b) As we know that, surface tension(s)

$= \dfrac{\text{Force}[F]}{\text{Length}[L]}$

So, $[S] = \dfrac{[MLT^{-2}]}{[L]} = [MT^{-2}]$

Energy, $(E) = $ Force × Displacement,

$[E] = [ML^2T^{-2}]$

Velocity $(V) = \dfrac{\text{displacement}}{\text{time}}$

$[V] = [LT^{-1}]$

Let surface tension expressed as,

$s = E^a V^b T^c$ where a, b, c are constant.

Put the value

$\dfrac{[MLT^{-2}]}{[L]} = [ML^2T^{-2}]^a \left[\dfrac{L}{T}\right]^b [T]^c$

From the principle of homogeneity,

Equating the dimension of LHS and RHS

$[ML^0T^{-2}] = [M^a L^{2a + b} T^{-2a - b + c}]$

$\Rightarrow \quad a = 1, 2a + b = 0, -2a - b + c = -2$

$\Rightarrow \quad a = 1, b = -2, c = -2$

Hence, the dimensions of surface tension are $[E\ V^{-2}\ T^{-2}]$

NOTES Length, mass and time are arbitrarily chosen as fundamental quantities in mechanics.
In fact any three quantities in mechanics can be termed as fundamental as all other quantities can be expressed in terms of these. If force (F) and acceleration (a) are taken as fundamental quantities, then mass will be defined as force (F)/acceleration (a) and will be termed as derived quantity.

51. (d) Applying dimensional method :

$v_c = \eta^x \rho^y r^z$

here,

dimension of critical velocity, $V_0 = [LT^{-1}]$

co-efficient of viscosity, $\eta = \dfrac{F}{6\pi r v}$

so dimension of $\eta = \dfrac{[MLT^{-2}]}{[L][LT^{-1}]} = [ML^{-1}T^{-1}]$

dimension of density, $\rho = \dfrac{[M]}{[L^3]} = [ML^{-3}]$

dimension of radius, $r = [L]$

Put these values in equation (i),

$[M^0LT^{-1}] = [ML^{-1}T^{-1}]^x [ML^{-3}T^0]^y [M^0LT^0]^z$

Equating powers both sides

$x + y = 0; -x = -1 \therefore x = 1$

$1 + y = 0 \therefore y = -1$

$-x - 3y + z = 1$

$-1 - 3(-1) + z = 1$

$-1 + 3 + z = 1$

$\therefore z = -1$

52. (d) Force = mass × acceleration

$\Rightarrow$ Mass $= \dfrac{\text{force}}{\text{acceleration}} = \dfrac{\text{force}}{\text{velocity}/\text{time}}$

$= [F\ V^{-1}\ T]$

53. **(b)** In CGS system, density $d = 4\dfrac{g}{cm^3}$

unit of length = 1 cm
unit of mass = 1 g
And in another system of units

The unit of mass is 100g and unit of length is 10 cm, so substitute these values

$$\text{Density} = \frac{4\left(\dfrac{100g}{100}\right)}{\left(\dfrac{10}{10}cm\right)^3} = \frac{\left(\dfrac{4}{100}\right)}{\left(\dfrac{1}{10}\right)^3}\frac{(100g)}{(10cm)^3}$$

$$= \frac{4}{100} \times (10)^3 \cdot \frac{100g}{(10cm)^3} = 40 \text{ unit}$$

54. **(d)** Pressure $= \dfrac{\text{Force}}{\text{Area}}$

$$\Rightarrow \frac{[MLT^{-2}]}{[L^2]} = [ML^{-1}T^{-2}]$$

$$\Rightarrow a = 1, b = -1, c = -2.$$

55. **(c)** As we know that

$$R = \frac{[V]}{[I]} = \frac{w}{q \cdot i} = \frac{w}{i \cdot t \cdot i}$$

Dimension of Resistance

$$= \left[\frac{ML^2T^{-2}}{I^2\,T}\right] = [ML^2T^{-3}I^{-2}]$$

56. **(d)** Dimension of $a.t$ = dimension of velocity
$a.t = [LT^{-1}] \Rightarrow [a = LT^{-2}]$

Dimension of c = dimension of t

(two physical quantity of same dimension can only be added)

So, dimension of $c = [T]$

Dimension of $\dfrac{b}{t+c}$ = Dimension of velocity

$$\frac{[b]}{[T]} = [LT^{-1}] \Rightarrow [b \cdot T^{-1}] = [LT^{-1}]$$
$$\Rightarrow b = [L]$$

So, answer is $[LT^{-2}]$, $[L]$ and $[T]$

57. **(d)** A quantity which has dimensions and a constant value is called dimensional constant. Therefore, gravitational constant (G) is a dimensional constant. Value of $G = 6.67 \times 10^{-11}$ m²/kg/sec² dimension of $G = [M^{-1}L^3T^{-2}]$

58. **(a)** As we know force = Mass × Acceleration
= Mass × length × time⁻² = (10g)(10 cm)(0.1s)⁻²
= $(10^{-2}$ kg) $(10^{-1}$m$)$ $(10^{-1}$s$)^{-2} = 10^{-1}$N.

59. **(b)** In $p = p_0 \exp(-\alpha t^2)$, where αt^2 where is dimensionless

$$\therefore \alpha = \frac{1}{t^2} = \frac{1}{[T^2]} = [T^{-2}]$$

60. **(c)** Let the expression, $\alpha = P^x S^y c^z$ ...(i)

and given that dimension of $\alpha = [M^0 L^0 T^0]$

            ...(ii)

= dimensionless

Dimension of radiation pressure $P = \dfrac{\text{Force}}{\text{Area}}$

$$= \frac{[MLT^{-2}]}{[L\;]} = [ML^{-1}T^{-2}]$$

Dimension of radiation energy/unit area unit time

$$S = \frac{\text{Energy}}{\text{Area} \times \text{Time}} = \frac{[ML^2T^{-2}]}{[L^2][T]} = [MT^{-3}]$$

Dimension of speed of light, $c = [LT^{-1}]$

By equation (i) we get,

So, the dimension of $\alpha = [ML^{-1}T^{-2}]^x [MT^{-3}]^y$ $[LT^{-1}]^z$

According to equation (ii),

$\Rightarrow [M^0L^0T^0] = [ML^{-1}T^{-2}]^x [MT^{-3}]^y [LT^{-1}]^z$

$\Rightarrow [M^0L^0T^0] = [M^{x+y} L^{-x+z} T^{-2x-3y-z}]$

Applying the principle of homogenity of dimension we get,

$x + y = 0$ ...(iii)

$-x + z = 0$ ...(iv)

$-2x - 3y - z = 0$ ...(v)

After solving above three equation we get,

$x = 1; \ y = -1; \ z = 1$

NOTES Try out the given alternatives.
When $x = 1, y = -1, z = 1$

$P^x S^y c^z = P^1 S^{-1} c^1 = \dfrac{Pc}{S}$

$= \dfrac{[ML^{-1}T^{-2}][LT^{-1}]}{[ML^2T^{-2} / L^2T]} = [M^0L^0T^0]$

61. **(d)** $f = c \, m^x \, k^y$;

Spring constant k = force/length.

$[M^0L^0T^{-1}] = [M^x][MT^{-2}]^y$

$= [\ M^{x+y} \ T^{-2y}]$

$\Rightarrow x + y = 0, -2y = -1$ or $y = \dfrac{1}{2}$

Therefore, $x = -\dfrac{1}{2}$

NOTES The method of dimensions cannot be used to derive relations other than product of power functions.

62. **(c)** Given, $x = at + bt^2$

where, x = distance in km

$\qquad t$ = time in sec

By the principle of homogencity, the dimensions of each terms of a dimensional equation on both sides are the same.

So, from equation, $x = at + bt^2$

dimension of left side $= [L]$

dimension of right side should be $= [L]$

According to homogeneity's law,

$[L] = [b][T^2]$

$[b] = \dfrac{[L]}{[T^{+2}]}$ = dimension of acceleration

so unit of b should be km/sec^2.

Edited By

Kalpana Bhargav

Mohammad Salman

Typeset By

DISHA DTP Team

Buying Books from Disha is always Rewarding

This time we are appreciating your writing Creativity.

Write a review of the product you purchased on Amazon/Flipkart

Take a screen shot / Photo of that review

Scan this QR Code ➜
Fill Details and submit | That's it ... Hold tight n wait.
At the end of the month, you will get a surprise gift from Disha Publication

Scan this QR code

Write To Us At

feedback_disha@aiets.co.in

www.dishapublication.com

DISHA™
Publication Inc

Free Sample Contents

Class XI

This sample book is prepared from the book **"Errorless 37 Years NTA NEET (UG) Chapter-wise & Topic-wise CHEMISTRY Solved Papers (2024 - 1988) with Value Added Notes 19th Edition | New Syllabus PYQs Question Bank for 2025 Exam".**

ISBN - 9789362257604

MRP- 425/-

In case you like this content, you can buy the **Physical Book** or **E-book** using the ISBN provided above.

The book & e-book are available on all leading online stores.

Contents

Class XI

* Marked Chapters/Topics are not present in New NCERT book but retained by NTA for NEET.

Class XII

---

* Marked Chapters/Topics are not present in New NCERT book but retained by NTA for NEET.

For future updates on NEET Scan the QR Code.

You also get Latest Syllabus, Past NEET Papers, Mock Tests and more content here
NEET 2024 Retest also Available.

https://bit.ly/3cfB81I

NEET 2024 Paper Code Q3 (Solution in e-Course)
Page Reference in Disha's 37 Years Chemistry

Qn	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Page	A-123	B-2	B-57	A-42	A-116	B-96	B-109	B-198	A-25	A-102	B-43	B-168	A-25	B-25	B-77	A-35	B-44	A-14	A-59	A-89	A-16	B-63	A-2	B-57	B-63

Qn	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Page	B-185	B-109	A-70	A-99	B-197	A-55	B-79	A-105	B-141	A-71	B-68	B-76	B-25	A-118	B-95	B-44	B-198	B-96	B-5	A-33	B-167	B-198	A-55	A-71	A-3

1 Some Basic Concepts of Chemistry

Trend Analysis	2024		2023		2022		2021		2020		2019	
Topic	Qns.	LOD	Qns.	LOD	Qns.	LOD	Qns.	LOD	Qns.	LOD	Qns.	LOD
Mole Concept and Molar Masses	1	Avg.							1	Easy	1	Easy
Percentage Composition	1	Avg.					1	Avg.				
Stoichiometry and Stoichiometric Calculations			1	Avg.	1	A						

Topic-1.3: Properties of Matter and their Measurement

1. At S.T.P. the density of CCl_4 vapours in g/L will be nearest to : **1988**
(a) 6.87   (b) 3.42
(c) 10.26   (d) 4.57

Topic-1.5: Laws of Chemical Combinations

2. A mixture of gases contains H_2 and O_2 gases in the ratio of 1 : 4 (w/w). What is the molar ratio of the two gases in the mixture ? **2015**
(a) 4 : 1   (b) 16 : 1
(c) 2 : 1   (d) 1 : 4

3. If Avogadro number N_A, is changed from 6.022×10^{23} mol^{-1} to 6.022×10^{20} mol^{-1} this would change : **NCERT | Page-15 / N-15 | 2015 RS**
(a) the definition of mass in units of grams
(b) the mass of one mole of carbon
(c) the ratio of chemical species to each other in a balanced equation.
(d) the ratio of elements to each other in a compound

4. What volume of oxygen gas (O_2) measured at 0°C and 1 atm, is needed to burn completely 1L of propane gas (C_3H_8) measured under the same conditions ? **2008**
(a) 7 L   (b) 6 L
(c) 5 L   (d) 10 L

5. The molecular weight of O_2 and SO_2 are 32 and 64 respectively. At 15°C and 150 mm Hg pressure, one litre of O_2 contains 'N' molecules. The number of molecules in two litres of SO_2 under the same conditions of temperature and pressure will be : **NCERT | Page-15 / N-15 | 1990**
(a) N/2   (b) N
(c) 2N   (d) 4N

Topic-1.7: Atomic and Molecular Masses

6. The number of water molecules is maximum in : **NCERT | Page-18 / N-18 | 2015 RS**
(a) 18 molecules of water
(b) 1.8 gram of water
(c) 18 gram of water
(d) 18 moles of water

7. An element, X has the following isotopic composition : **NCERT | Page-17 / N-17 | 2007**
^{200}X : 90% ^{199}X : 8.0 % ^{202}X : 2.0%
The weighted average atomic mass of the naturally occuring element X is closest to
(a) 201 amu   (b) 202 amu
(c) 199 amu   (d) 200 amu

8. Specific volume of cylindrical virus particle is 6.02×10^{-2} cc/g whose radius and length are 7 Å & 10 Å respectively. If $N_A = 6.02 \times 10^{23}$, find molecular weight of virus **2001**
(a) 3.08×10^3 kg/mol
(b) 3.08×10^4 kg/mol
(c) 1.54×10^4 kg/mol
(d) 15.4 kg/mol

9. Boron has two stable isotopes, ^{10}B (19%) and ^{11}B (81%). Average atomic weight for boron in the periodic table is **NCERT | Page-17 / N-17 | 1990**
   - (a) 10.8
   - (b) 10.2
   - (c) 11.2
   - (d) 10.0

Topic 1-8: Mole Concept and Molar Masses

10. The highest number of helium atoms is in

NCERT | Page-N-18 | 2024
   - (a) 4 mol of helium
   - (b) 4 u of helium
   - (c) 4 g of helium
   - (d) 2.271098 L of helium at STP

11. One mole of carbon atom weighs 12 g, the number of atoms in it is equal to, (Mass of carbon-12 is 1.9926×10^{-23} g)

NCERT | Page-18 / N-18 | Ph-II 2020
   - (a) 6.022×10^{23}
   - (b) 1.2×10^{23}
   - (c) 6.022×10^{22}
   - (d) 12×10^{22}

12. Which one of the following has maximum number of atoms ? **NCERT | Page-18 / N-18 | 2020**
   - (a) 1 g of Mg(s) [Atomic mass of Mg = 24]
   - (b) 1 g of O_2(g) [Atomic mass of O = 16]
   - (c) 1 g of Li(s) [Atomic mass of Li = 7]
   - (d) 1 g of Ag(s) [Atomic mass of Ag = 108]

13. The number of moles of hydrogen molecule required to produce 20 moles of ammonia through Haber's process is:

NCERT | Page-18 / N-18 | 2019
   - (a) 10
   - (b) 20
   - (c) 30
   - (d) 40

14. In which case the number of molecules of water maximum? **NCERT | Page-18 / N-18 | 2018**
   - (a) 18 mL of water
   - (b) 0.18 g of water
   - (c) 10^{-3} mol of water
   - (d) 0.00224 L of water vapours at 1 atm and 273 K

15. Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2. When 0.1 mole of XY_2 weighs 10 g and 0.05 mole of X_3Y_2 weighs 9 g, the atomic weights of X and Y **Ph-II 2016**
   - (a) 20, 30
   - (b) 30, 20
   - (c) 40, 30
   - (d) 60, 40

16. Which has the maximum number of molecules among the following ? **NCERT | Page-18 / N-18 | 2011 M**
   - (a) 44 g CO_2
   - (b) 48 g O_3
   - (c) 8 g H_2
   - (d) 64 g SO_2

17. The number of atoms in 0.1 mol of a triatomic gas is : **2010**
   ($N_A = 6.02 \times 10^{23}$ mol^{-1})
   - (a) 6.026×10^{22}
   - (b) 1.806×10^{23}
   - (c) 3.600×10^{23}
   - (d) 1.800×10^{22}

18. Volume occupied by one molecule of water (density = 1 g cm^{-3}) is : **2008**
   - (a) 9.0×10^{-23} cm^3
   - (b) 6.023×10^{-23} cm^3
   - (c) 3.0×10^{-23} cm^3
   - (d) 5.5×10^{-23} cm^3

19. The maximum number of molecules is present in
   - (a) 15 L of H_2 gas at STP **2004**
   - (b) 5 L of N_2 gas at STP
   - (c) 0.5 g of H_2 gas
   - (d) 10 g of O_2 gas

20. Which has maximum number of molecules? **2002**
   - (a) 7 g N_2
   - (b) 2 g H_2
   - (c) 16 g NO_2
   - (d) 16 g O_2

21. Assuming fully decomposed, the volume of CO_2 released at STP on heating 9.85 g of $BaCO_3$ (Atomic mass, Ba = 137) will be **2000**
   - (a) 2.24 L
   - (b) 4.96 L
   - (c) 1.12 L
   - (d) 0.84 L

22. Haemoglobin contains 0.334% of iron by weight. The molecular weight of haemoglobin is approximately 67200. The number of iron atoms (at. wt. of Fe is 56) present in one molecule of haemoglobin are **1998**
   - (a) 1
   - (b) 6
   - (c) 4
   - (d) 2

23. The weight of one molecule of a compound $C_{60}H_{122}$ is **NCERT | Page-18 / N-18 | 1995**
   - (a) 1.2×10^{-20} gram
   - (b) 1.4×10^{-21} gram
   - (c) 5.025×10^{23} gram
   - (d) 6.023×10^{23} gram

24. If N_A is Avogadro's number then number of valence electrons in 4.2g of nitride ions (N^{3-}) is
   - (a) $2.4 N_A$
   - (b) $4.2 N_A$ **1994**
   - (c) $1.6 N_A$
   - (d) $3.2 N_A$

25. The number of oxygen atoms in 4.4 g of CO_2 is **NCERT | Page-18 / N-18 | 1990**
   - (a) 1.2×10^{23}
   - (b) 6×10^{22}
   - (c) 6×10^{23}
   - (d) 12×10^{23}

26. The number of gram molecules of oxygen in 6.02×10^{24} CO molecules is

NCERT | Page-18 / N-18 | 1990
   - (a) 10 g molecules
   - (b) 5 g molecules
   - (c) 1 g molecules
   - (d) 0.5 g molecules

27. 1 c.c. N_2O at NTP contains : **1988**

(a) $\dfrac{1.8}{224} \times 10^{22}$ atoms

(b) $\dfrac{6.02}{22400} \times 10^{23}$ molecules

(c) $\dfrac{1.32}{224} \times 10^{23}$ electrons

(d) all the above

Topic-1.9: Percentage Composition

28. A compound X contains 32% of A, 20% of B and remaining percentage of C. Then, the empirical formula of X is :
(Given atomic masses of A = 64; B = 40; C = 32 u) **NCERT | Page-N-19, 20 | 2024**
(a) A_2BC_2 (b) ABC_3
(c) AB_2C_2 (d) ABC_4

29. An organic compound contains 78% (by wt.) carbon and remaining percentage of hydrogen. The right option for the empirical formula of this compound is : [Atomic wt. of C is 12, H is 1]

NCERT | Page-19 / N-19 | 2021

(a) CH_4 (b) CH (c) CH_2 (d) CH_3

30. An organic compound contains carbon, hydrogen and oxygen. Its elemental analysis gave C, 38.71% and H, 9.67%. The empirical formula of the compound would be : **2008**
(a) CH_3O (b) CH_2O
(c) CHO (d) CH_4O

31. Percentage of Se in peroxidase anhydrase enzyme is 0.5% by weight (at. wt. = 78.4) then minimum molecular weight of peroxidase anhydrase enzyme is **NCERT | Page-19 / N-19 | 2001**
(a) 1.568×10^3 (b) 15.68
(c) 2.136×10^4 (d) 1.568×10^4

32. An organic compound containing C, H and O gave on analysis C – 40% and H – 6.66%. Its empirical formula would be

NCERT | Page-19 / N-19 | 1999 / 94

(a) C_3H_6O (b) CHO
(c) CH_2O (d) CH_4O

33. An organic compound containing C, H and N gave the following analysis :
C = 40% ; H = 13.33% ; N = 46.67%

Its empirical formula would be

NCERT | Page-19 / N-19 | 1998

(a) $C_2H_7N_2$ (b) CH_5N
(c) CH_4N (d) C_2H_7N

34. The percentage weight of Zn in white vitriol $[ZnSO_4.7H_2O]$ is approximately equal to
$(Zn = 65, S = 32, O = 16$ and $H = 1)$

NCERT | Page-19 / N-19 | 1995

(a) 33.65 % (b) 32.56 %
(c) 23.65 % (d) 22.65 %

35. A metal oxide has the formula Z_2O_3. It can be reduced by hydrogen to give free metal and water. 0.1596 g of the metal oxide requires 6 mg of hydrogen for complete reduction. The atomic weight of the metal is **1989**
(a) 27.9 (b) 159.6 (c) 79.8 (d) 55.8

Topic-1.10: Stoichiometry and Stoichiometric Calculations

36. The **right** option for the mass of CO_2 produced by heating 20 g of 20% pure limestone is (Atomic mass of Ca = 40)

$$\left[CaCO_3 \xrightarrow{1200\,K} CaO + CO_2 \right]$$
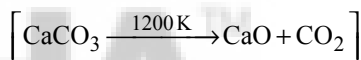
(a) 1.12 g (b) 1.76 g **2023**
(c) 2.64 g (d) 1.32 g

37. What mass of 95% pure $CaCO_3$ will be required to neutralise 50 mL of 0.5 M HCl solution according to the following reaction?
$CaCO_3(s) + 2HCl(aq) \rightarrow$
$CaCl_2(aq) + CO_2(g) + H_2O(l)$
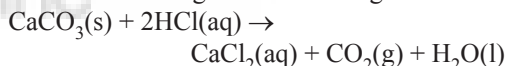
NCERT | Page-20 / N-20 | 2022

[Calculate upto second place of decimal point]
(a) 1.32 g (b) 3.65 g
(c) 9.50 g (d) 1.25 g

38. What fraction of Fe exists as Fe(III) in $Fe_{0.96}O$? (Consider $Fe_{0.96}O$ to be made up of Fe(II) and Fe(III) only) **RS 2022**

(a) $\dfrac{1}{20}$ (b) $\dfrac{1}{12}$ (c) 0.08 (d) $\dfrac{1}{16}$

39. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H_2SO_4. The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be **2018**
(a) 1.4 (b) 3.0
(c) 4.4 (d) 2.8

40. 20.0 g of a magnesium carbonate sample decomposes on heating to give carbon dioxide and 8.0 g magnesium oxide. What will be the percentage purity of magnesium carbonate in the sample ? **2015 RS**
(a) 75   (b) 96
(c) 60   (d) 84

41. What is the mass of precipitate formed when 50 mL of 16.9% solution of $AgNO_3$ is mixed with 50 mL of 5.8% NaCl solution ? **2015 RS**
(Ag = 107.8, N = 14, O = 16, Na = 23, Cl = 35.5)
(a) 28 g   (b) 3.5 g
(c) 7 g   (d) 14 g

42. When 22.4 litres of $H_2(g)$ is mixed with 11.2 litres of $Cl_2(g)$, each at S.T.P., the moles of $HCl(g)$ formed is equal to : **2014**
(a) 1 mole of HCl (g)
(b) 2 moles of HCl (g)
(c) 0.5 moles of HCl (g)
(d) 1.5 moles of HCl (g)

43. 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much ? **2014**
(At. wt. Mg = 24 ; O = 16)
(a) Mg, 0.16 g   (b) O_2, 0.16 g
(c) Mg, 0.44 g   (d) O_2, 0.28 g

44. In an experiment it showed that 10 mL of 0.05 M solution of chloride required 10 mL of 0.1 M solution of $AgNO_3$, which of the following will be the formula of the chloride (*X* stands for the symbol of the element other than chlorine): **Kar. 2013**
(a) X_2Cl (b) X_2Cl_2
(c) XCl_2 (d) XCl_4

45. 6.02×10^{20} molecules of urea are present in 100 mL of its solution. The concentration of solution is : **2013**
(a) 0.01 M   (b) 0.001 M
(c) 0.1 M   (d) 0.02 M

46. 10 g of hydrogen and 64 g of oxygen were filled in a steel vessel and exploded. Amount of water produced in this reaction will be:
NCERT | Page-20 / N-20 | 2009
(a) 3 mol   (b) 4 mol
(c) 1 mol   (d) 2 mol

47. How many moles of lead (II) chloride will be formed from a reaction between 6.5 g of PbO and 3.2 g of HCl ? **2008**
(a) 0.044   (b) 0.333
(c) 0.011   (d) 0.029

48. Number of moles of MnO_4^- required to oxidize one mole of ferrous oxalate completely in acidic medium will be : **2008**
(a) 0.6 moles   (b) 0.4 moles
(c) 7.5 moles   (d) 0.2 moles

49. The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphite ion in acidic solution is **2007**
(a) 4/5   (b) 2/5
(c) 1   (d) 3/5

50. The number of moles of $KMnO_4$ reduced by one mole of KI in alkaline medium is: **2005**
(a) one   (b) two
(c) five   (d) one fifth

51. The mass of carbon anode consumed (giving only carbon dioxide) in the production of 270 kg of aluminium metal from bauxite by the Hall process is (Atomic mass: Al = 27) **2005**
(a) 270 kg   (b) 540 kg
(c) 90 kg   (d) 180 kg

52. In Haber process 30 litres of dihydrogen and 30 litres of dinitrogen were taken for reaction which yielded only 50% of the expected product. What will be the composition of gaseous mixture under the aforesaid condition in the end? **2003**
(a) 20 litres ammonia, 25 litres nitrogen, 15 litres hydrogen
(b) 20 litres ammonia, 20 litres nitrogen, 20 litres hydrogen
(c) 10 litres ammonia, 25 litres nitrogen, 15 litres hydrogen
(d) 20 litres ammonia, 10 litres nitrogen, 30 litres hydrogen

53. In the reaction
$4 NH_3 (g) + 5 O_2 (g) \rightarrow 4 NO(g) + 6 H_2O(l)$
When 1 mole of ammonia and 1 mole of O_2 are made to react to completion,
NCERT | Page-20 / N-20 | 1998
(a) 1.0 mole of H_2O is produced
(b) 1.0 mole of NO will be produced
(c) all the oxygen will be consumed
(d) all the ammonia will be consumed

54. One litre hard water contains 12.00 mg Mg^{2+}. Mili-equivalents of washing soda required to remove its hardness is :

NCERT | Page-20 / N-20 | 1998

(a) 1   (b) 12.16

(c) 1×10^{-3} (d) $12.\ 16 \times 10^{-3}$

55. Liquid benzene (C_6H_6) burns in oxygen according to the equation

$2C_6H_6(l) + 15O_2(g) \longrightarrow 12CO_2(g) + 6H_2O(g)$

How many litres of O_2 at STP are needed to complete the combustion of 39 g of liquid benzene? (Mol. wt. of O_2 = 32, C_6H_6 = 78)

NCERT | Page-20 / N-20 | 1996

(a) 74 L   (b) 11.2 L

(c) 22.4 L   (d) 84 L

56. What is the weight of oxygen required for the complete combustion of 2.8 kg of ethylene ?

(a) 2.8 kg   (b) 6.4 kg   **1989**

(c) 9.6 kg   (d) 96 kg

ANSWER KEY

1	(a)	7	(d)	13	(c)	19	(a)	25	(a)	31	(d)	37	(a)	43	(a)	49	(b)	55	(d)
2	(a)	8	(b)	14	(a)	20	(b)	26	(b)	32	(c)	38	(b)	44	(c)	50	(b)	56	(c)
3	(b)	9	(a)	15	(c)	21	(c)	27	(d)	33	(c)	39	(d)	45	(a)	51	(c)		
4	(c)	10	(a)	16	(c)	22	(c)	28	(b)	34	(d)	40	(d)	46	(b)	52	(c)		
5	(c)	11	(a)	17	(b)	23	(b)	29	(d)	35	(d)	41	(c)	47	(d)	53	(c)		
6	(d)	12	(c)	18	(b)	24	(a)	30	(a)	36	(b)	42	(a)	48	(a)	54	(a)		

Hints & Solutions

1. **(a)** 1 mol CCl_4 vapour = 12 + 4 × 35.5
= 154 g = 22.4 L at STP

$\therefore$ Density = $\dfrac{154}{22.4}\, gL^{-1} = 6.875\, gL^{-1}$

2. **(a)** Ratio of weight of gases = $w_{H_2} : w_{O_2} = 1 : 4$

Ratio of moles of gases = $n_{H_2} : n_{O_2} = \dfrac{1}{2} : \dfrac{4}{32}$

$\therefore$ Molar Ratio = $\dfrac{1}{2} \times \dfrac{32}{4} = 4 : 1$

3. **(b)** If 6.022×10^{23} mol^{-1} changes to 6.022×10^{20} mol^{-1} then this would change mass of one mole of carbon from 12 g to 12 mg.

NOTES Mass of $_{12}C$ carbon is used to define the atomic mass unit. In this system, $_{12}C$ is assigned a mass of exactly 12 a.m.u.

Earlier one mole was defined as the amount of substance that contains as many particles as there are atoms in exactly 12 g of the $_{12}C$ isotope. From November 2018, one mole is defined as exactly $6.02214076 \times 10^{23}$ constitutive particles, which may be atoms, molecules, ions or electrons.

Hence, if we change the value of N_A from 6.022×10^{23} mol^{-1} to 6.022×10^{20} mol^{-1} then mass of one mole of carbon will also change.

The definition of mass is independent of Avogadro number N_A.

4. **(c)** Writing the equation of combustion of propane (C_3H_8), we get

$\underset{\substack{1vol \\ 1L}}{C_3H_8} + \underset{\substack{5vol \\ 5L}}{5O_2} \rightarrow 3CO_2 + 4H_2O$
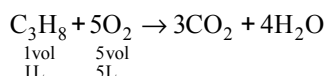
From the above equation we find that we need 5 L of oxygen at **N.T.P.** to completely burn 1 L of propane at N.T.P.

If we change the conditions for both the gases from N.T.P. to same conditions of temperature and pressure. The same results are obtained. *i.e.* 5 L is the correct answer.

5. **(c)** According to Avogadro's law "equal volumes of all gases contain equal numbers of molecules under similar conditions of temperature and pressure". Thus if 1 L of one gas contains N molecules, 2 L of any gas under the same conditions will contain 2N molecules.

6. **(d)** No. of moles of water

In 1.8 g of H_2O = 0.1 moles

In 18 g of H_2O = 1 moles

1 mole contains 6.022×10^{23} molecules of water

therefore maximum number of molecules is in 18 moles of water.

NOTES
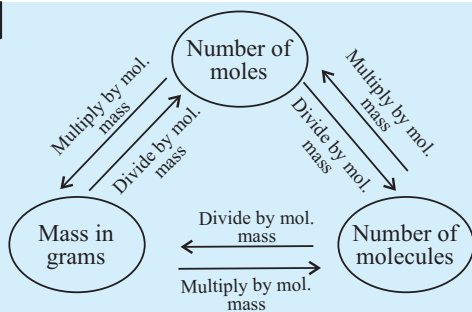
7. **(d)** Average isotopic mass of

$$X = \frac{200\times90+199\times8+202\times2}{90+8+2}$$

$$= \frac{18000+1592+404}{100}$$

$$= \frac{19996}{100} = 199.96 \simeq 200\,\text{amu}$$

NOTES Average atomic mass =

(Mass of isotope A × % natural abundance of A) + (Mass of isotope B × % natural abundance of B) + ...
_____
(% Natural abundance of A + % natural abundance of B) + ...

8. **(d)** Specific volume (volume of 1 g) of cylindrical virus particle = 6.02×10^{-2} cc/g

Radius of virus (r) = 7 Å = 7×10^{-8} cm

Length of virus = 10×10^{-8} cm

Volume of virus

$$= \pi r^2 l = \frac{22}{7}\times(7\times10^{-8})^2\times10\times10^{-8}$$

$$= 154 \times 10^{-23} \text{ cc}$$

Wt. of one virus particle $= \dfrac{\text{volume}}{\text{specific volume}}$

Mol. wt. of virus = Wt. of N_A particle

$$= \frac{154\times10^{-23}}{6.02\times10^{-2}}\times6.02\times10^{23}$$

$$= 15400 \text{ g/mol} = 15.4 \text{ kg/mol}$$

9. **(a)** Average atomic mass $= \dfrac{19\times10+81\times11}{100}$

$$= 10.81$$

10. **(a)** 4 g of He $= \dfrac{4g}{4g\ mol^{-1}} = 1$ mol,

$$2.271 \text{ L of He} = \frac{2.271}{22.7} = 0.1 \text{ mol}$$

Thus, 4 mol of He has the highest number of atoms.

11. **(a)** Number of atoms in 1 mole of carbon $= 6.022 \times 10^{23}$

12. **(c)** Number of atoms

$$= \frac{W}{\text{Molar mass}}\times N_A \times \text{atomicity}$$

(a) Number of Mg atoms $= \dfrac{1}{24}\times N_A \times 1$

(b) Number of O atoms $= \dfrac{1}{32}\times N_A \times 2$

(c) Number of Li atoms $= \dfrac{1}{7}\times N_A \times 1$

(d) Number of Ag atoms $= \dfrac{1}{108}\times N_A \times 1$

13. **(c)** $N_2 + 3H_2 \longrightarrow 2NH_3$
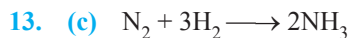
1 mol $NH_3 = \dfrac{3}{2}$ mol H_2

20 mol $NH_3 = \dfrac{3}{2} \times 20$ mol H_2 = 30 mol H_2

∴ 30 moles of H_2 are required.

14. **(a)**

(1) Mass of water = 18 × 1 = 18 g

Molecules of water = mole × N_A

$$= \frac{18}{18}N_A = N_A$$

(2) Molecules of water = mole × N_A

$$= \frac{0.18}{18}N_A = 10^{-2} N_A$$

(3) Molecules of water = mole × N_A = 10^{-3} N_A

(4) Moles of water = $\dfrac{0.00224}{22.4}$ = 10^{-4}

Molecules of water = mole × N_A = 10^{-4} N_A

15. (c) Let us assume that atomic weight of X is A_X and Y is A_Y

No. of moles = $\dfrac{\text{Mol. wt. in gms}}{\text{Molar mass}}$

$\Rightarrow$ n_{XY_2} = 0.1 = $\dfrac{10}{A_X + 2A_Y}$

$\Rightarrow$ $A_X + 2A_Y = 100$ ... (1)

$n_{X_3Y_2}$ = 0.05 = $\dfrac{9}{3A_X + 2A_Y}$

$\Rightarrow$ $3A_X + 2A_Y = 180$ ... (2)

From solving eq. (1) and (2), we get –

$A_X = 40$, $A_y = 30$

16. (c) No. of molecules = moles × N_A

Moles of CO_2 = $\dfrac{44}{44}$ = 1, N_A

Moles of O_3 = $\dfrac{48}{48}$ = 1, N_A

Moles of H_2 = $\dfrac{8}{2}$ = 4, $4N_A$

Moles of SO_2 = $\dfrac{64}{64}$ = 1, N_A

17. (b) The number of atoms in 0.1 mol of a triatomic gas = $0.1 \times 3 \times 6.023 \times 10^{23}$

= 1.806×10^{23}

18. (b) Molar mass of H_2O = 18 gm mol^{-1}

Volume of one mole of water

$$V = \dfrac{m}{d} = \dfrac{18}{1} = 18 \text{ cm}^3 / \text{mol}$$

Volume of one molecule of water

$$= \dfrac{18 \text{ cm}^3 / \text{mol}}{6.022 \times 10^{23}}$$

$$= 2.989 \times 10^{-23} \text{ cm}^3$$

$$= 3.0 \times 10^{-23} \text{ cm}^3.$$

19. (a) No. of molecules in different cases

(a) ∵ 22.4 litre at STP contains
= 6.023×10^{23} molecule of H_2

∴ 15 litre at STP contains = $\dfrac{15}{22.4} \times 6.023 \times 10^{23}$

(b) ∵ 22.4 litre at STP contains
= 6.023×10^{23} molecule of N_2

∴ 5 litre at STP contians = $\dfrac{5}{22.4} \times 6.023 \times 10^{23}$

(c) ∵ 2 g of H_2 = 6.023×10^{23} molecules of H_2

∴ 0.5 g of H_2 = $\dfrac{0.5}{2} \times 6.023 \times 10^{23}$

(d) Similarly 10 g of O_2 gas

$$= \dfrac{10}{32} \times 6.023 \times 10^{23} \text{ molecules}$$

Thus (a) will have maximum number of molecules.

20. (b) 2g of H_2 means one mole of H_2, hence contains 6.023×10^{23} molecules. Others have less than one mole, so have less no. of molecules.

21. (c) $\underset{197\,g}{BaCO_3} \rightarrow BaO + CO_2$

As 197 g of $BaCO_3$ will release
22.4 litre of CO_2 at STP

∴ 1 g of $BaCO_3$ will release = $\dfrac{22.4}{197}$ litre of CO_2

and 9.85 g of $BaCO_3$ will release carbon dioxide

$$= \dfrac{22.4}{197} \times 9.85 = 1.12 \text{ litre of } CO_2$$

22. (c) Given : Percentage of the iron = 0.334%; Molecular weight of the haemoglobin = 67200 and atomic weight of iron = 56. We know that the number of iron atoms

$$= \dfrac{\text{Molecular wt. of haemoglobin} \times \% \text{ of iron}}{100 \times \text{Atomic weight of iron}}$$

$$= \dfrac{67200 \times 0.334}{100 \times 56} = 4$$

23. (b) Molecular weight of $C_{60}H_{122}$
= $(12 \times 60) + 122 = 842$.

Therefore, weight of one molecule

$$= \frac{\text{Molecular weight of } C_{60}H_{122}}{\text{Avogadro's number}}$$

$$= \frac{842}{6.023 \times 10^{23}} = 1.36 \times 10^{-21} g \simeq 1.4 \times 10^{-21} g$$

24. **(a)** No. of moles of nitride ion

$$= \frac{4.2}{14} = 0.3 \text{ mol} = 0.3 \times N_A \text{ nitride ions.}$$

Valence electrons $= 8 \times 0.3 \, N_A = 2.4 \, N_A$

NOTES Nitride ion has seven protons in the nucleus and ten electrons surrounding the nucleus. Therefore total no. of electrons is 10. Number of valence electrons is $(5 + 3) = 8$.

25. **(a)** 1 mol of $CO_2 = 44$ g of CO_2

$$4.4 \text{ g } CO_2 = \frac{4.4}{44} = 0.1 \text{ mol } CO_2$$

$$= 6 \times 10^{22} \text{ molecules}$$

$= 2 \times 6 \times 10^{22}$ atoms or 1.2×10^{23} atoms of oxygen.

26. **(b)** 6.02×10^{23} molecules of CO = 1mole of CO
6.02×10^{24} CO molecules = 10 moles of CO
= 10 g atoms of O = 5 g molecules of O_2

27. **(d)** At NTP, 22400 cc of N_2O
$= 6.02 \times 10^{23}$ molecules
$\therefore 1$ cc of N_2O contain

$$= \frac{6.02 \times 10^{23}}{22400} \text{ molecules}$$

$$= \frac{3 \times 6.02 \times 10^{23}}{22400} = \frac{1.8}{224} \times 10^{22} \text{ atoms}$$

$(\because N_2O$ molecule has 3 atoms)
No. of electrons in a molecule of N_2O
$= 7 + 7 + 8 = 22$
Hence, no. of electrons

$$= \frac{6.02 \times 10^{23}}{22400} \times 22 = \frac{1.32 \times 10^{23}}{224} \text{ electrons.}$$

28. **(b)** Let's take 100g of this compound.
$\Rightarrow$ Masses present : A = 32g, B = 20g, C = 48g.
$\Rightarrow$ Number of moles :

$$A = \frac{32}{64} = 0.5, B = \frac{20}{40} = 0.5, C = \frac{48}{32} = 1.5$$

Dividing these moles by smallest mole value:
A : B : C = 1 : 1 : 3
$\Rightarrow$ Empirical Formula = ABC_3

29. **(d)**

Element	Mass percentage	No. of mole	Mole ratio
C	78%	$\frac{78}{12} = 6.5$	$\frac{6.5}{6.5} = 1$
H	22%	$\frac{22}{1} = 22$	$\frac{22}{6.5} = 3.38 = 3$

$\therefore$ Possible empirical formula is CH_3.

30. **(a)**

Element	%	Atomic weight	Atomic ratio	Simple ratio
C	38.71	12	$\frac{38.71}{12} = 3.23$	$\frac{3.23}{3.23} = 1$
H	9.67	1	$\frac{9.67}{1} = 9.67$	$\frac{9.67}{3.23} = 3$
O	$100 - (38.71 + 9.67)$ $= 51.62$	16	$\frac{51.62}{16} = 3.23$	$\frac{3.23}{3.23} = 1$

Thus, empirical formula is CH_3O.

31. **(d)** Suppose the mol. wt. of enzyme $= x$
Given 100 g of enzyme wt. of Se = 0.5 g

$\therefore$ In x g of enzyme wt. of Se $= \frac{0.5}{100} \times x$

Hence $78.4 = \frac{0.5 \times x}{100}$

$\therefore x = 15680 = 1.568 \times 10^4$

32. **(c)** Table for empirical formula.

Element	%	At. wt	Relative number	Ratio
C	40	12	$\frac{40}{12} = 3.33$	$\frac{3.33}{3.33} = 1$
H	6.66	1	$\frac{6.66}{1} = 6.66$	$\frac{6.66}{3.33} = 2$
O	53.34	16	$\frac{53.34}{16} = 3.33$	$\frac{3.33}{3.33} = 1$

(% of O in organic compound

$= 100 - (40 + 6.66) = 53.34\%$)

$\therefore$ Empirical formula of organic compound
= CH_2O.

33. (c) Table for empirical formula

Element	%	At. wt.	Relative Number	Ratio
C	40.00	12	$\dfrac{40}{12} = 3.33$	$\dfrac{3.33}{3.33} = 1$
H	13.33	1	$\dfrac{13.33}{1} = 13.33$	$\dfrac{13.33}{3.33} = 4$
N	46.67	14	$\dfrac{46.67}{14} = 3.33$	$\dfrac{3.33}{3.33} = 1$

Hence, empirical formula = CH_4N

34. (d) Molecular weight of $ZnSO_4.7H_2O$

= $65 + 32 + (4 \times 16) + 7(2 \times 1 + 16) = 287$.

$\therefore$ percentage mass of zinc (Zn)

= $\dfrac{65}{287} \times 100 = 22.65\%$

35. (d) The reaction can be given as

$Z_2O_3 + 3H_2 \longrightarrow 2Z + 3H_2O$

0.1596 g of Z_2O_3 react with H_2 = 6 mg = 0.006 g

$\therefore$ 1 g of H_2 react with

= $\dfrac{0.1596}{0.006} = 26.6\,g$ of Z_2O_3

$\therefore$ Eq. wt. of Z_2O_3 = 26.6

(from the definition of eq. wt.)

Eq. wt. of Z + Eq. wt. of O (8) = 26.6

$\Rightarrow$ Eq. wt. of Z = 26.6 – 8 = 18.6

Valency of metal in Z_2O_3 = 3

Eq. wt.of metal = $\dfrac{\text{Atomic wt.}}{\text{valency}}$

$\therefore$ At. wt. of Z = 18.6 × 3 = 55.8

36. (b) $CaCO_3 \xrightarrow{1200\ K} CaO + CO_2$

     1 mol   1 mol
     100 g   44 g

As $CaCO_3$ is 20% pure, So, mass of pure

$CaCO_3$ = $20 \times \dfrac{20}{100}$ = 4 g

100 g $CaCO_3$ produces 44 g CO_2

$\therefore$ 4 g $CaCO_3$ produces $\dfrac{44}{100} \times 4$ g CO_2

= 1.76 g CO_2

37. (a) From the given reaction,

No. of moles of $CaCO_3$

= $\dfrac{1}{2} \times$ mole of HCl = $\dfrac{1}{2} \times 0.5 \times \dfrac{50}{1000} = 0.0125$

Mass of pure $CaCO_3$ = 0.0125 × 100 = 1.25 g

Mass of impure sample = $\dfrac{1.25 \times 100}{95}$ = 1.32 g.

38. (b) Suppose, Fe^{2+} in $Fe_{0.96}$ O = x
and Fe^{3+} in $Fe_{0.96}$ O = 0.96 – x

$\therefore$ Total positive charge in
$Fe_{0.96}$ O = (0.96 – x) × 3 + 2x

Total negative charge = 2 × 1= 2

$\therefore$ (0.96 – x) × 3 + 2x = 2

$\Rightarrow$ 2.88 – 3x + 2x = 2 $\Rightarrow$ 2.88 – x = 2 $\Rightarrow$ x = 0.88

$\therefore$ Fe^{3+} = 0.96 – 0.88 = 0.08

$\therefore$ Fraction of Fe^{3+} = $\dfrac{0.08}{0.96} = \dfrac{8}{96} = \dfrac{1}{12}$

39. (d) $HCOOH \xrightarrow[\substack{\text{Dehydrating} \\ \text{agent}}]{H_2SO_4} CO + H_2O$

[H_2O absorbed by H_2SO_4]

At start (moles)	$\dfrac{2.3}{46} = \dfrac{1}{20}$	0	0
Final moles	0	$\dfrac{1}{20}$	$\dfrac{1}{20}$

$H_2C_2O_4 \xrightarrow{H_2SO_4} CO + CO_2 + H_2O$

[H_2O absorbed by H_2SO_4]

At start (moles)	$\dfrac{4.5}{90} = \dfrac{1}{20}$	0	0	0
Final moles	0	$\dfrac{1}{20}$	$\dfrac{1}{20}$	$\dfrac{1}{20}$

CO_2 is absorbed by KOH.

So, the remaining product is only CO.

Moles of CO formed from both reactions

= $\dfrac{1}{20} + \dfrac{1}{20} = \dfrac{1}{10}$

Left mass of CO = moles × molar mass

$= \dfrac{1}{10} \times 28 = 2.8$ g

40. (d) $MgCO_3 \longrightarrow MgO + CO_2$
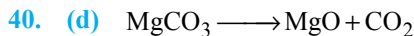
Moles of MgO = $\dfrac{8}{M_{MgO}}$

The molar mass of MgO (M_{MgO}), 24 + 16 = 40

Moles of MgO = $\dfrac{8}{40} = 0.2$ moles

Amount of $MgCO_3$ is required
     = 0.2 moles × M_{MgCO_3}
M_{MgCO_3} = 24 + 12 + 3 × 16 = 84
Amount of $MgCO_3$ is required
     = 0.2 moles × 84 = 16.8 g
Purity of sample $MgCO_3$

$= \dfrac{16.8}{20} \times 100 = 84\%.$

41. (c) 50 mL of 16.9% solution of $AgNO_3$
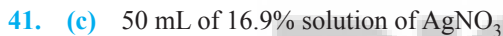
$\left(\dfrac{16.9}{100} \times 50\right) = 8.45$ g of $AgNO_3$

$n_{mole} = \dfrac{8.45g}{(107.8 + 14 + 16 \times 3)\, g/mol}$

$= \left(\dfrac{8.45\,g}{169.8g/mol}\right) = 0.0497$ moles

50 mL of 5.8% solution of NaCl contain

NaCl = $\left(\dfrac{5.8}{100} \times 50\right) = 2.9$ g

$n_{NaCl} = \dfrac{2.9g}{(23 + 35.5)\,g/mol} = 0.0495$ moles
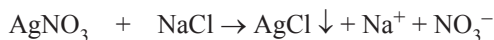
$AgNO_3$ + NaCl → AgCl↓ + Na^+ + NO_3^-
1 mole   1 mole   1 mole
∴ 0.049 mole   0.049 mole 0.049 mole of AgCl

$n = \dfrac{w}{M} \rightarrow w = (n_{AgCl}) \times$ Molecular Mass

$= (0.049) \times (107.8 + 35.5) = 7.02$ g

42. (a) $H_2(g)$ + $Cl_2(g) \longrightarrow 2HCl(g)$
initial 22.4 L   11.2 L   0
          = 1 mole   = 0.5 mole
final   1 – 0.5   0.5 – 0.5   2 × 0.5
Moles of HCl formed = 2 × 0.5 = 1

43. (a) Mg + $\dfrac{1}{2}O_2 \longrightarrow MgO$
     Initially 1g   0.56
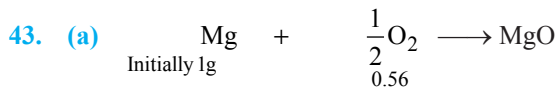
or $\dfrac{1}{24}$ mole $\dfrac{0.56}{32}$ mole

     0.0417 mole   0.0175 mole
     (0.0417 – 2 × 0.0175) 0 mole
     = 0.0067 mole

∴ Mass of Mg = 0.0067 × 24 = 0.16 g

44. (c) Millimoles of solution of chloride
= 0.05 × 10 = 0.5 m mol
Millimoles of $AgNO_3$ solution = 10 × 0.1 = 1 m mol
So, the millimoles of $AgNO_3$ are double than the chloride solution.
∴ $XCl_2 + 2AgNO_3 \longrightarrow 2AgCl + X(NO_3)_2$

45. (a) $M = \dfrac{6.02 \times 10^{20} \times 1000}{100 \times 6.02 \times 10^{23}} = \dfrac{6.02 \times 10^{21}}{6.02 \times 10^{23}}$
= 0.01 M
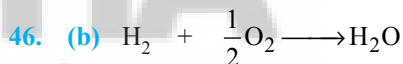
46. (b) H_2 + $\dfrac{1}{2}O_2 \longrightarrow H_2O$
10g   64g
(5 mol) (2 mol)
In this reaction oxygen is the limiting reagent. Hence, amount of H_2O produced depends on the amount of O_2 taken.
∵ 0.5 mole of O_2 gives H_2O = 1 mol
∴ 2 mole of O_2 gives H_2O = 4 mol

NOTES When there is not enough of one reactant in a chemical reaction, the reaction stops. To find the amount of product produced, we must determine reactant that will limit the chemical reaction (the limiting reagent) we can find the limiting reagent by calculating the amount of product that can be formed by each reactant, the one that produces less product is the limiting reagent.

47. (d) Writing the equation for the reaction, we get

$$PbO + 2HCl \longrightarrow PbCl_2 + H_2O$$

$$\underset{= 223\,g}{\underset{207 + 16}{PbO}} \quad \underset{= 73g}{\underset{2 \times 36.5}{}} \quad \underset{= 278g}{\underset{207 + 71}{}}$$
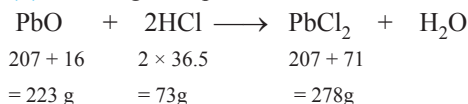
From this equation we find 223 g of PbO reacts with 73 g of HCl to form 278 g of $PbCl_2$.

If we carry out the reaction between 3.2 g HCl and 6.5 g PbO.

Amount of PbO that reacts with 3.2 g HCl

$$= \frac{223}{73} \cdot 3.2 = 9.77 \text{ g.}$$

Since amount of PbO present is only 6.5 g so PbO is the limiting reagent.

Amount of $PbCl_2$ formed by 6.5 g of PbO

$$= \frac{278}{223} \cdot 6.5\,g$$

Number of moles of $PbCl_2$ formed

$$= \frac{278}{223} \cdot \frac{6.5}{278} \text{ moles} = 0.029 \text{ moles.}$$

48. (a) The oxidation of Fe^{2+} to Fe^{3+} involves 1 mole of electrons. The oxidation of oxalate ions to CO_2 involves 2 moles of electrons.

$$\therefore \quad Fe^{2+} + C_2O_4^{2-} \longrightarrow Fe^{3+} + 2CO_2 + 3e^- \ ...(i)$$

In acidic medium,

$$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O \quad ...(ii)$$

Balance the equation by multiply equation (i) with 5 and equation (ii) with 3.

We get,

$$5Fe^{2+} + 5C_2O_4^{2-} \longrightarrow 5Fe^{3+} + 10CO_2 + 15e^-$$

$$\underline{3MnO_4^- + 24H^+ + 15e^- \longrightarrow 3Mn^{2+} + 12H_2O}$$

$$5Fe^{2+} + 3MnO_4^- + 5C_2O_4^{2-} + 24H^+ \longrightarrow$$

$$5Fe^{3+} + 3Mn^{2+} + 10CO_2 + 12H_2O$$
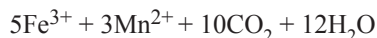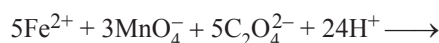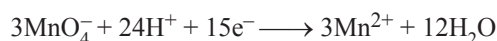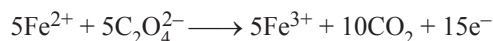
Thus from the above equation 3 moles of $KMnO_4$ are required to oxidise 5 moles of Ferrous oxalate in acidic medium.

Hence, number of moles of $KMnO_4$ required to oxidise one mole of ferrous oxalate

$$= 1 \times \frac{3}{5} = 0.6 \text{ moles}$$

NOTES In acidic medium Mn takes up five electrons and making it an oxidizing agent. In strongly alkaline solution it takes up only 1 electrons and making it much weaker oxidising agent. In neutral medium it gives up 3 electrons to form MnO_2.

Acidic medium:

$$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$$
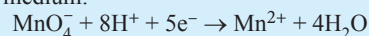
Alkaline medium: $MnO_4^- + e^- \rightarrow MnO_4^{2-}$

Neutral medium:

49. (b) The balance chemical equation is :

$$2MnO_4^- + 6H^+ + 5SO_3^{2-} \longrightarrow$$

$$2Mn^{2+} + 5SO_4^{2-} + 3H_2O$$
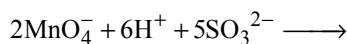
From the equation it is clear that

5 moles of SO_3^{2-} = 2 moles of MnO_4^-

1 mole of SO_3^{2-} = $\frac{2}{5}$ moles of MnO_4^-

Therefore, $\frac{2}{5}$ mol of MnO_4^- require to oxidise 1 mol of SO_3^{2-} in acidic medium.

50. (b) In weak alkaline medium, the equation is:

$$2MnO_4^- + H_2O + I^- \longrightarrow 2MnO_2 + IO_3^- + 2O\,H^-$$

Hence, one mole of KI reduce, 2 moles of $KMnO_4$

51. (c) $2Al_2O_3 + 3C \longrightarrow Al + 3CO_2$

Gram equivalent of Al_2O_3 = Gram equivalent of C

Now equivalent weight of Al = $\frac{27}{3}$ = 9

Equivalent weight of C

$$= \frac{12}{4} = 3 \ (\overset{0}{C} \rightarrow \overset{+4}{CO_2})$$

No. of gram equivalent of Al = $\frac{270 \times 10^3}{9}$

$$= 30 \times 10^3$$

Hence,

No. of gram equivalent of C = 30×10^3

Again,

No. of gram equivalent of C

$$= \frac{\text{mass in gram}}{\text{gram equivalent weight}}$$

$$\Rightarrow 30 \times 10^3 = \frac{\text{mass}}{3}$$

$$\Rightarrow \text{mass} = 90 \times 10^3 \text{ g} = 90 \text{ kg}$$

52. (c)

$$N_2 + 3H_2 \rightarrow 2NH_3$$

| 1 vol. | 3 vol. | 2 vol. |
| 10 litre | 30 litre | 20 litre |
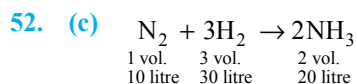
It is given that only 50% of the expected product is formed hence, only 10 litre of NH_3 is formed.

N_2 used = 5 litres, left = 30 – 5 = 25 litres

H_2 used = 15 litres, left = 30 – 15 = 15 litres

53. (c) According to Stoichiometry, they should react as follow:

$$4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O$$

| 4 moles | 5 moles | 4 moles | 6 moles |
| 0.8 moles | 1 mole | 0.8 moles | 1.2 moles |
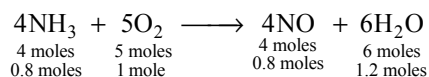
Thus, for 1 mole of O_2 only 0.8 moles of NH_3 is consumed. Hence O_2 is consumed completely.

54. (a) $Mg^{2+} + Na_2CO_3 \longrightarrow MgCO_3 + 2Na^+$

    1 g eq.   1g eq.

1 g eq. of Mg^{2+} = 12 g of Mg^{2+} = 12000 mg

= 1000 milli eq. of Na_2CO_3

$\therefore$ 12 mg Mg^{2+} = 1 milli eq. Na_2CO_3

55. (d)

$$2C_6H_6 + 15O_2(g) \longrightarrow 12CO_2(g) + 6H_2O(g)$$

  2(78)   15(32)
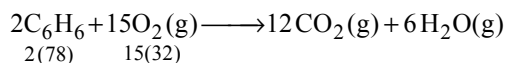
$\because$ 156 g of benzene, required oxygen

= 15 × 22.4 litre

$\therefore$ 1g of benzene, required oxygen

$$= \frac{15 \times 22.4}{156} \text{litre}$$

$\therefore$ 39 g of benzene, required oxygen

$$= \frac{15 \times 22.4 \times 39}{156} = 84.0 \text{ litre}$$

56. (c) $C_2H_4 + 3O_2 \longrightarrow 2CO_2 + 2H_2O$

    28 kg   96 kg

As 28 kg of C_2H_4 undergo complete combustion by 96 kg of O_2

$\therefore$ 2.8 kg of C_2H_4 undergo complete combustion by 9.6 kg of O_2.

Disha PYQs JEET Pakki

ERRORLESS

37 YEARS

NTA NEET UG

Chapter-wise & Topic-wise

BIOLOGY

Solved Papers (2024 - 1988) with Value Added Notes

SAMPLE

19th Edition

- 37 Years | 47 Papers | 32 Chapters | 214 Topics
- Aligned as per 11th & 12th New NCERT Books
- Answer Key validated with NTA
- Included 2023 Manipur & 2022 Ph II Papers

3400+ Milestone Problems

DISHA
Publication Inc

Edited By

Md. Muzaffar Imam

Tarana Kulshreshtha

Arushi Tyagi

Ritesh

Typeset By

DISHA DTP Team

Buying Books from Disha is always Rewarding

This time we are appreciating your writing Creativity.

Write a review of the product you purchased on Amazon/Flipkart

Take a screen shot / Photo of that review
Scan this QR Code ➔

Fill Details and submit | That's it … Hold tight n wait.

At the end of the month, you will get a surprise gift from Disha Publication

Scan this QR code

Write To Us At

feedback_disha@aiets.co.in

www.dishapublication.com

DISHA™
Publication Inc

Free Sample Contents

Class XI

4. Animal Kingdom (Zoology) A-47 – A-70

Topic-4.1: Basis of Classification

Topic-4.2: Classification of Animals

This sample book is prepared from the book **"Errorless 37 Years NTA NEET (UG) Chapter-wise & Topic-wise BIOLOGY Solved Papers (2024 - 1988) with Value Added Notes 19th Edition | New Syllabus PYQs Question Bank for 2025 Exam".**

ISBN - 9789362259479

MRP- 600/-

In case you like this content, you can buy the **Physical Book** or **E-book** using the ISBN provided above.

The book & e-book are available on all leading online stores.

Contents

Class XI

Class XII

Chapters/Topics are not present in new NCERT Book but retained by NTA for NEET.

For future updates on NEET Scan the QR Code.

You also get Latest Syllabus, Past NEET Papers, Mock Tests and more content here
NEET 2024 Retest also Available.

https://bit.ly/3cfB81I

NEET 2024 Paper Code Q-3
Page Reference in Disha's 37 Years Biology

Qn	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
Page	A-135	A-171	B-182	A-91	A-140	B-199	A-12	B-199	A-73	B-247	B-1	B-102	B-169	B-216	A-196	A-76	A-89	B-247	A-12	A-73	B-243	B-181	B-52	A-140	A-195
Qn	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Page	A-153	B-243	A-155	A-117	A-92	B-52	B-97	B-52	A-171	B-52	A-117	B-243	A-73	B-96	B-1	A-184	A-142	B-234	A-138	A-185	A-174	A-73	B-102	B-199	A-196
Qn	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
Page	A-223	A-106	B-123	B-20	B-131	A-275	B-204	A-157	B-129	B-151	B-147	A-208	B-63	B-24	A-48	A-155	B-182	B-156	B-97	A-261	B-187	B-40	A-101	B-188	B-28
Qn	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
Page	A-210	B-151	A-47	B-40	A-238	B-182	A-117	A-48	A-250	B-20	B-216	A-106	A-48	A-236	A-262	B-151	A-140	B-21	B-131	A-101	B-97	B-53	A-223	A-117	A-267

4 Animal Kingdom

Trend Analysis	2024		2023		2022		2021		2020		2019	
	Qns.	LOD	Qns.	LOD	Qns.	LOD	Qns.	LOD	Qns.	LOD	Qns.	LOD
Topic Basis of Classification	1	Avg.	4	Easy, Avg., Diffi.			3	Avg.	1	Avg.	2	Avg.
Classification of Animals	2	Avg., Diffi.	1	Avg.	4	Avg., Diffi.	1	Easy	3	Avg., Diffi.	2	Diffi.

Topic-4.1: Basis of Classification

1. Consider the following statements :
   NCERT | Page-N-39 | 2024
   A. Annelids are true coelomates
   B. Poriferans are pseudocoelomates
   C. Aschelminthes are acoelomates
   D. Platyhelminthes are pseudocoelomates
   Choose the correct answer from the options given below :
   (a) B only   (b) A only
   (c) C only   (d) D only

2. Radial symmetry is NOT found in adults of phylum _____. **NCERT | Page-47 / N-38 | 2023**
   (a) Ctenophora
   (b) Hemichordata
   (c) Coelenterata
   (d) Echinodermata

3. Bilaterally symmetrical and acoelomate animals are exemplified by
   NCERT | Page-48 / N-39 | 2020
   (a) Platyhelminthes
   (b) Aschelminthes
   (c) Annelida
   (d) Ctenophora

4. Which of the following animals are true coelomates with bilateral symmetry?
   NCERT | Page-47, 48 / N-38, 39 | 2019
   (a) Annelids
   (b) Adult echinoderms
   (c) Aschelminthes
   (d) Platyhelminthes

5. Consider following features:
   NCERT | Page-49 / N-40 | 2019
   (i) Organ system level of organisation
   (ii) Bilateral symmetry
   (iii) True coelomates with segmentation of body
   Select the correct option of animal groups which possess all the above characteristics.
   (a) Annelida, Arthropoda and Chordata
   (b) Annelida, Arthropoda and Mollusca
   (c) Arthropoda, Mollusca and Chordata
   (d) Annelida, Mollusca and Chordata

6. Which of the following characteristics is mainly responsible for diversification of insects on land?
   2015 RS
   (a) Bilateral symmetry
   (b) Exoskeleton
   (c) Eyes
   (d) Segmentation

7. Radial symmetry is usually associated with
   NCERT | Page-47 / N-38 | 1996
   (a) aquatic mode of life
   (b) lower grade of organisation
   (c) creeping mode of locomotion
   (d) sedentary mode of life

8. True coelom is the space lying between the alimentary canal and body wall enclosed by the layers of **NCERT | Page-48 / N-39 | 1996**
   (a) ectoderm on both sides
   (b) endoderm on one side and ectoderm on the other

(c) mesoderm on one side and ectoderm on the other

(d) mesoderm on both sides

9. The organisms attached to the substratum, generally, possess   **1995**

(a) radial symmetry

(b) one single opening of digestive canal

(c) asymmetrical body

(d) cilia on surface to create water current

10. Radial symmetry is often exhibited by animals having   **NCERT | Page-47 / N-38 | 1994**

(a) one opening of alimentary canal

(b) aquatic mode of living

(c) benthos/sedentary living

(d) ciliary mode of feeding

11. Coelom derived from blastocoel is known as

NCERT | Page-48 / N-39 | 1994

(a) enterocoelom

(b) schizocoel

(c) pseudocoelom

(d) haemocoelom

12. Metamorphosis of insects is regulated through hormone   **1991**

(a) pheromone

(b) thyroxine

(c) ecdysone

(d) all the above

13. Ecdysis is shedding of   **1990**

(a) stratum corneum

(b) epidermis

(c) dermis

(d) stratum Malpighi

Topic-4.2: Classification of Animals

14. Match List I with List II :

NCERT | Page-N-42, 44, 45, 47 | 2024

List I	List II
A. Pleurobrachia	I. Mollusca
B. Radula	II. Ctenophora
C. Stomochord	III. Osteichthyes
D. Air bladder	IV. Hemichordata

Choose the correct answer from the options given below

(a) A-IV, B-II, C-III, D-I

(b) A-II, B-I, C-IV, D-III

(c) A-II, B-IV, C-I, D-III

(d) A-IV, B-III, C-II, D-I

15. Match List I with List II :

NCERT | Page-N-47, 48 | 2024

List I	List II
A. *Pterophyllum*	I. Hag fish
B. *Myxine*	II. Saw fish
C. *Pristis*	III. Angel fish
D. *Exocoetus*	IV. Flying fish

Choose the correct answer from the options given below :

(a) A-II, B-I, C-III, D-IV

(b) A-III, B-I, C-II, D-IV

(c) A-IV, B-I, C-II, D-III

(d) A-III, B-II, C-I, D-IV

16. The following are the statements about non-chordates: **NCERT | Page-N-45, 46 | 2024**

A. Pharynx is perforated by gill slits.

B. Notochord is absent.

C. Central nervous system is dorsal.

D. Heart is dorsal if present.

E. Post anal tail is absent.

Choose the most appropriate answer from the options given below:

(a) A & C only   (b) A, B & D only

(c) B, D & E only   (d) B, C & D only

17. Match List-I with List-II.

NCERT | Page-49, 51, 54 / N-40, 41, 45 | Manipur 2023

	List-I		List-II
(A)	Contractile vacuole	(I)	*Asterias*
(B)	Water vascular system	(II)	*Amoeba*
(C)	Canal system	(III)	*Spongilla*
(D)	Flame cells	(IV)	*Taenia*

Choose the correct answer from the options given below

(a) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

(b) (A)-(II), (B)-(I), (C)-(III), (D)-(IV)

(c) (A)-(IV), (B)-(II), (C)-(I), (D)-(III)

(d) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)

18. Select the correct statements :

NCERT | Page-49, 51 / N-40, 41, 42 | Manipur 2023

(A) Platyhelminthes are triploblastic pseudo-coelomate and bilaterally symmetrical organisms.

(B) Ctenophores reproduce only sexually and fertilization is external.

(C) In tapeworm, fertilization is internal but sexes are not separate.

(D) Ctenophores are exclusively marine, diploblastic and bioluminescent organisms.

(E) In sponges, fertilization is external and development is direct.

Choose the correct answer from the options given below:

(a) (A) and (E) only

(b) (B) and (D) only

(c) (A), (C) and (D) only

(d) (B), (C) and (D) only

19. Select the correct statements with reference to chordates. **NCERT | Page-54, 55 / N-45, 46 | 2023**

I. Presence of a mid-dorsal, solid and double nerve cord.

II. Presence of closed circulatory system.

III. Presence of paired pharyngeal gill slits.

IV. Presence of dorsal heart

V. Triploblastic pseudocoelomate animals.

Choose the correct answer from the options given below:

(a) I, III and IV only   (b) II and III only

(c) II, IV and V only   (d) III, IV and V only

20. The unique mammalian characteristics are:

NCERT | Page-59, 60 / N-50, 51 | 2023

(a) hairs, tympanic membrane and mammary glands

(b) hairs, pinna and mammary glands

(c) hairs, pinna and indirect development

(d) pinna, monocondylic skull and mammary glands

21. In which of the following animals, digestive tract has additional chambers like crop and gizzard? **NCERT | Page-58 / N-49 | 2022**

(a) *Bufo, Balaenoptera, Bangarus*

(b) *Catla, Columba, Crocodilus*

(c) *Pavo, Psittacula, Corvus*

(d) *Corvus, Columba, Chameleon*

22. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**. **NCERT | Page-55 / N-46 | 2022**

Assertion (A): All vertebrates are chordates but all chordates are not vertebrates.

Reason (R): Notochord is replaced by vertebral column in the adult vertebrates.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(a) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(b) (A) is correct but (R) is not correct

(c) (A) is not correct but (R) is correct

(d) Both (A) and (R) are correct and (R) is the correct explanation of (A)

23. Select the incorrect statements with respect to Cyclostomes . **NCERT | Page-56/ N-47 | Ph-II 2022**

(i) They lack scales and paired fins.

(ii) They have circular mouth with jaws.

(iii) They bear 6-15 pairs of gills.

(iv) They migrate to deep sea for spawning.

Choose the most appropriate answer from the options given below :

(a) (i) and (iv) only   (b) (i) and (ii) only

(c) (ii) and (iii) only   (d) (ii) and (iv) only

24. Which of the following animals has three chambered heart? **NCERT | Page-58 / N-49 | Ph-II 2022**

(a) *Pteropus*   (b) *Scoliodon*

(c) *Hippocampus*   (d) *Chelone*

25. Read the following statements

NCERT | Page-50, 52, 53 / N-41, 43, 44 | 2021

(i) Metagenesis is observed in Helminths.

(ii) Echinoderms are triploblastic and coelomate animals.

(iii) Round worms have organ-system level of body organization.

(iv) Comb plates present in ctenophores help in digestion.

(v) Water vascular system is characteristic of Echinoderms.

Choose the correct answer from the options given below.

(a) (ii), (iii) and (v) are correct

(b) (iii), (iv) and (v) are correct

(c) (i), (ii) and (iii) are correct

(d) (i), (iv) and (v) are correct

26. Match List - I with List - II.

List-I	List-II
(A) Metamerism	(i) Coelenterata
(B) Canal system	(ii) Ctenophora
(C) Comb plates	(iii) Annelida
(D) Cnidoblasts	(iv) Porifera

Choose the correct answer from the options given below.

NCERT | Page-49, 50, 51, 52 / N-40, 41, 42, 43 | 2021

	(A)	(B)	(C)	(D)
(a)	(iv)	(i)	(ii)	(iii)
(b)	(iv)	(iii)	(i)	(ii)
(c)	(iii)	(iv)	(i)	(ii)
(d)	(iii)	(iv)	(ii)	(i)

27. Match the following:

List-I		List-II
(A) *Physalia*	(i)	Pearl oyster
(B) *Limulus*	(ii)	Portuguese Man of War
(C) *Ancylostoma*	(iii)	Living fossil
(D) *Pinctada*	(iv)	Hookworm

Choose the correct answer from the options given below.

	(A)	(B)	(C)	(D)
(a)	(i)	(iv)	(iii)	(ii)
(b)	(ii)	(iii)	(i)	(iv)
(c)	(iv)	(i)	(iii)	(ii)
(d)	(ii)	(iii)	(iv)	(i)

28. Which one of the following organisms bears hollow and pneumatic long bones?

(a) *Ornithorhynchus* (b) *Neophron*
(c) *Hemidactylus* (d) *Macropus*

29. Match the following columns and select the correct option.

Column-I		Column-II
(A) Gregarious, polyphagous pest	(i)	*Asterias*
(B) Adult with radial symmetry and larva with bilateral symmetry	(ii)	*Scorpion*
(C) Book lungs	(iii)	*Ctenoplana*
(D) Bioluminescence	(iv)	*Locusta*

	(A)	(B)	(C)	(D)
(a)	(iv)	(i)	(ii)	(iii)
(b)	(iii)	(ii)	(i)	(iv)
(c)	(ii)	(i)	(iii)	(iv)
(d)	(i)	(iii)	(ii)	(iv)

30. Which of the following statements are true for the phylum-Chordata?

(i) In Urochordata notochord extends from head to tail and it is present throughout their life.
(ii) In Vertebrata notochord is present during the embryonic period only.
(iii) Central nervous system is dorsal and hollow.
(iv) Chordata is divided into 3 subphyla: Hemichordata, Tunicata and Cephalochordata.

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

31. Match the following columns and select the correct option.

Column-I		Column-II
(A) 6-15 pairs of gill slits	(i)	*Trygon*
(B) Heterocercal caudal fin	(ii)	Cyclostomes
(C) Air Bladder	(iii)	*Chondrichthyes*
(D) Poison sting	(iv)	*Osteichthyes*

	(A)	(B)	(C)	(D)
(a)	(iii)	(iv)	(i)	(ii)
(b)	(iv)	(ii)	(iii)	(i)
(c)	(i)	(iv)	(iii)	(ii)
(d)	(ii)	(iii)	(iv)	(i)

32. Match the following genera with their respective phylum:

Column-I		Column-II
(A) *Ophiura*	(i)	Mollusca
(B) *Physalia*	(ii)	Platyhelminthes
(C) *Pinctada*	(iii)	Echinodermata
(D) *Planaria*	(iv)	Coelenterata

Select the correct option :

(a) (A)-(iii), (B)-(iv), (C)-(ii), (D)-(i)
(b) (A)-(iv), (B)-(i), (C)-(iii), (D)-(ii)
(c) (A)-(iii), (B)-(iv), (C)-(i), (D)-(ii)
(d) (A)-(i), (B)-(iii), (C)-(iv), (D)-(ii)

33. Match the following organisms with their respective characteristics:

(A) *Pila* (i) Flame cells
(B) *Bombyx* (ii) Comb plates
(C) *Pleurobrachia* (iii) Radula
(D) *Taenia* (iv) Malpighian tubules

Select the correct option from the following:

	(A)	(B)	(C)	(D)
(a)	(iii)	(ii)	(i)	(iv)
(b)	(iii)	(iv)	(ii)	(i)
(c)	(ii)	(iv)	(iii)	(i)
(d)	(iii)	(ii)	(iv)	(i)

34. Which of the following animals does not undergo metamorphosis?

(a) Earthworm
(b) Tunicate
(c) Starfish
(d) Moth

35. An important characteristic that Hemichordates share with Chordates is :

NCERT | Page-55 / N-46 | 2018

(a) Ventral tubular nerve cord

(b) Pharynx with gill slits

(c) Pharynx without gill slits

(d) Absence of notochord

36. Which one of these animals is not a homeotherm?

NCERT | Page-58 / N-49 | 2018

(a) *Macropus*   (b) *Chelone*

(c) *Psittacula*   (d) *Camelus*

37. In case of poriferans, the spongocoel is lined with flagellated cells called:

NCERT | Page-49 / N-40 | 2017

(a) oscula   (b) choanocytes

(c) mesenchymal cells (d) ostia

38. Which among these is the correct combination of aquatic mammals?

NCERT | Page-59, 60 / N-50, 51 | 2017

(a) Dolphins, Seals, *Trygon*

(b) Whales, Dolphins, Seals

(c) *Trygon*, Whales, Seals

(d) Seals, Dolphins, Sharks

39. Which of the following featrues is not present in the Phylum - Arthropoda?

NCERT | Page-53 / N-44 | 2016

(a) Chitinous exoskeleton

(b) Metameric segmentation

(c) Parapodia

(d) Jointed appendages

40. Which of the following characteristic features always holds true for the corresponding group of animals?   **NCERT | Page-54, 56, 58 / N-45, 47, 49 | 2016**

(a) Cartilaginous   *Chondrichthyes*
    endoskeleton

(b) Viviparous   *Mammalia*

(c) Possess a mouth   Chordata
    with an upper and
    a lower jaw

(d) 3 - chambered heart   *Reptilia*
    with one incompletely
    divided ventricle

41. Which one of the following characteristics is not shared by birds and mammals?

NCERT | Page-59, 60 / N-48, 49 | 2016

(a) Ossified endoskeleton

(b) Breathing using lungs

(c) Viviparity

(d) Warm blooded nature

42. Body having meshwork of cell, internal cavities lined with food filtering flagellated cells and indirect development are the characteristics of phylum.

(a) Porifera   (b) Mollusca **2015 RS**

(c) Protozoa   (d) Coelenterate

43. Metagenesis refers to:

NCERT | Page-50 / N-41 | 2015 RS

(a) Alteration of generation between asexual and sexual phases of an organisms

(b) Occurrence of a drastic change in form during post-embroyonic development

(c) Presence of a segmented body and parthenogenetic mode of reproduction

(d) Presence of different morphic forms

44. A jawless fish, which lays eggs in fresh water and whose ammocoetes larvae after metamorphosis return to the ocean is: **NCERT | Page-56 / N-47 | 2015 RS**

(a) *Myxine*   (b) *Neomyxine*

(c) *Petromyzon*   (d) *Eptatretus*

45. Which of the following animals is not viviparous?

NCERT | Page-60 / N-51 | 2015 RS

(a) Elephant   (b) Platypus

(c) Whale   (d) Flying fox (Bat)

46. Which of the following represents the correct combination without any exception?

NCERT | Page-56, 58, 59, 60 / N-47, 49, 50, 51 | 2015 RS

	Characteristics	**Class**
(a)	Mouth ventral, gills without operculum; skin with placoid scales; persistent notochord	*Chondrichthyes*
(b)	Sucking and circular mouth; jaws absent, integument without scales; paired appendages	*Cyclostomata*
(c)	Body covered with feathers; skin moist and glandular; fore-limbs form wings; lungs with air sacs	*Aves*
(d)	Mammary gland; hair on body; pinnae; two pairs of Limbs	*Mammalia*

47. Select the Taxon mentioned that represents both marine and fresh water species:

NCERT | Page-50 / N-41 | 2014

(a) Echinoderms   (b) Ctenophora

(c) Cephalochordata (d) Cnidaria

48. Which one of the following living organisms completely lacks a cell wall?

NCERT | Page-50 / N-41 | 2014

(a) Cyanobacteria   (b) Sea – fan (*Gorgonia*)

(c) *Saccharomyces*   (d) Blue–green algae

49. *Planaria* possesses high capacity of:
    (a) Metamorphosis   **NCERT | Page-51 / N-42 | 2014**
    (b) Regeneration
    (c) Alternation of generation
    (d) Bioluminescence

50. A marine cartilaginous fish that can produce electric current is: **NCERT | Page-57 / N-48 | 2014**
    (a) *Pristis*   (b) *Torpedo*
    (c) *Trygon*   (d) *Scoliodon*

51. Which one of the following groups of animals reproduces only by sexual means?
    NCERT | Page-51 / N-42 | Kar.2013
    (a) Ctenophora   (b) Cnidaria
    (c) Porifera   (d) Protozoa

52. Which group of animals belong to the same phylum?   **NCERT | Page-53 / N-44 | 2013**
    (a) Earthworm , Pinworm, Tapeworm
    (b) Prawn, Scorpion, *Locusta*
    (c) Sponge, Sea anemone, Starfish
    (d) Malarial parasite, *Amoeba*, Mosquito

53. One of the representatives of phylum Arthropoda is :   **NCERT | Page-53 / N-44 | 2013**
    (a) Silverfish   (b) Pufferfish
    (c) Flying fish   (d) Cuttlefish

54. Which of the following are correctly matched with respect to their taxonomic classification?
    NCERT | Page-53 / N-44 | 2013
    (a) Centipede, millipede, spider, scorpion-Insecta
    (b) House fly, butterfly, tse tse fly, silverfish-Insecta
    (c) Spiny anteater, sea urchin, sea cucumber-Echinodermata
    (d) Flying fish, cuttlefish, silverfish-Pisces

55. Sharks and dogfishes differ from skates and rays by   **NCERT | Page-57 / N-48 | Kar.2013**
    (a) Their pectoral fins distinctly marked off from cyclindrical bodies
    (b) Gill slits are ventrally placed
    (c) Head and trunk are widened considerably
    (d) Distinct demarcation between body and tail

56. Match the name of the animal (column I), with one characteristics (column II), and the phylum/class (column III) to which it belongs:
    NCERT | Page-50, 53, 56 / N-41, 44, 47 | 2013

	Column I	Column II	Column III
(a)	*Ichthyophis*	terrestrial	Reptilia
(b)	*Limulus*	body covered by chitinous exoskeleton	Pisces

(c) *Adamsia*   radially symmetrical   Porifera

(d) *Petromyzon*   ectoparasite   Cyclostomata

57. The characteristics of class *Reptilia* are:
    NCERT | Page-58 / N-49 | Kar.2013
    (a) Body covered with dry and cornified skin, scales over the body are epidermal, they do not have external ears
    (b) Body covered with moist skin which is devoid of scales, the ear is represented by a tympanum, alimentary canal, urinary and reproductive tracts open into a common cloaca
    (c) Fresh water animals with bony endoskeleton, air-bladder to regulate buoyancy
    (d) Marine animals with cartilaginous endoskeleton, body covered with placoid scales

58. Which one of the following animals is correctly matched with its one characteristics and the taxon?
    NCERT | Page-50, 59, 60 / N-41, 50, 51 | Kar.2013

	Animal	**Characteristic**	**Taxon**
(a)	Duckbilled platypus	Oviparous	Mammalian
(b)	Millipede	Ventral nerve cord	Arachnida
(c)	Sea Anemone	Triploblastic	Cnidaria
(d)	Silverfish	Pectoral and Pelvic fins	Chordata

59. In which one of the following the genus name, its two characters and its phylum are not correctly matched, whereas the remaining three are correct
    NCERT | Page-49, 53, 54 / N-40, 44, 45 | 2012

	Genus name	Two characters	Phylum
(a)	*Pila*	(i) Body Segmented, (ii) Mouth with radula	Mollusca
(b)	*Asterias*	(i) Spiny Skinned, (ii) Water vascular system	Echinodermata
(c)	*Sycon*	(i) Pore bearing, (ii) Canal system	Porifera
(d)	*Periplaneta*	(i) Jointed appendages, (ii) Chitinous exoskeleton	Arthropoda

60. Which one of the following pairs of animals are similar to each other pertaining to the feature stated against them?

NCERT | Page-52, 57, 58, 59, 60 / N-43, 48, 49, 50, 51 | 2012 M

(a) *Pteropus* and *Ornithorhyncus* - Viviparity

(b) Garden lizard and Crocodile - Three chambered heart

(c) *Ascaris* and *Ancylostoma* - Metameric segmentation

(d) Sea horse and Flying fish - Cold blooded (poikilothermal)

61. Which one of the following categories of animals, is correctly described with no single exception in it?

NCERT | Page-49, 57, 58, 60 / N-40, 48, 49, 51 | 2012 M

(a) All sponges are marine and have collared cells.

(b) All mammals are viviparous and possess diaphragm for breathing.

(c) All bony fishes have four pairs of gills and an operculum on each side.

(d) All reptiles possess scales, have a three chambered heart and are cold blooded (poikilothermal).

62. Which one of the following statements is totally wrong about the occurrence of notochord, while the other three are correct?

NCERT | Page-55, 57, 59 / N-46, 48, 50 | 2011 M

(a) It is present only in larval tail in *Ascidians*

(b) It is replaced by a vertebral column in adult frog

(c) It is absent throughout life in humans from the very beginning

(d) It is present throughout life in *Amphioxus*

63. The figure shows four animals (i), (ii), (iii) and (iv). Select the correct answer with respect to a common characteristics of two of these animals.

NCERT | Page-50, 51, 53 / N-41, 42, 44 | 2011 M

(i) (ii)

(iii) (iv)
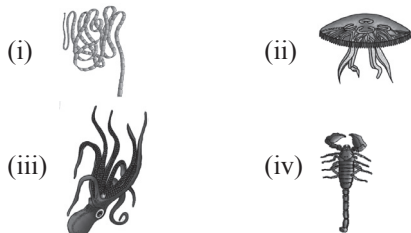
(a) (i) and (iv) respire mainly through body wall

(b) (ii) and (iii) show radial symmetry

(c) (i) and (ii) have cnidoblasts for self-defense

(d) (iii) and (iv) have a true coelom

64. What will you look for to identify the sex of the following? 2011

(a) Female *Ascaris*- Sharply curved posterior end

(b) Male frog- A copulatory pad on the first digit of the hind limb

(c) Female cockroach-Anal cerci

(d) Male shark-Claspers borne on pelvic fins

65. Which one of the following groups of animals is correctly matched with its one characteristic feature without even a single exception?

NCERT | Page-54, 56, 58, 60 / N-45, 47, 49, 51 | 2011

(a) *Reptilia* : possess 3 - chambered heart with one incompletely divided ventricle

(b) Chordata : possess a mouth provided with an upper and lower jaw

(c) *Chondrichthyes* : possess cartilagious endoskeleton

(d) *Mammalia* : give birth to young one.

66. In which one of the folllowing, the genus name, its two characters and its class/phylum are correctly matched? 2011

	Genus name		Two characters	Class/ phylum
(a)	*Ascaris*	(i)	Body segmented	Annelida
		(ii)	Males and females distinct	
(b)	*Sala-mandra*	(i)	A tympanum represents ear	Amphibia
		(ii)	Fertilization is external	
(c)	*Pteropus*	(i)	Skin possesses hair	Mammalia
		(ii)	Oviparous	
(d)	*Aurelia*	(i)	Cnidoblasts	Coelen-terata
		(ii)	Organ level of organization	

67. Which one of the following kinds of animals are triploblastic? NCERT | Page-51 / N-42 | 2010

(a) Flat worms (b) Sponges

(c) Ctenophores (d) Corals

68. One example of animals having a single opening to the outside that serves both as mouth as well as anus is: NCERT | Page-47 / N-38 | 2010

(a) *Octopus* (b) *Asterias*

(c) *Ascidia* (d) *Fasciola*

69. Which one of the following statements about certain given animals is correct?

NCERT | Page-51, 52, 53 / N-42, 43, 44 | 2010

(a) Round worms (Aschelminthes) are pseudo-coelomates

(b) Molluscs are acoelomates

(c) Insects are pseudocoelomates

(d) Flat worms (Platyhelminthes) are coelomates

70. Which one of the following statements about all the four of *Spongilla*, *Leech*, Dolphin and Penguin is correct?

NCERT | Page-49, 50, 52, 58 / N-40, 41, 43, 49 | 2010

(a) Penguin is homeothermic while the remaining three are poikilothermic

(b) Leech is a fresh water form while all others are marine

(c) *Spongilla* has *special* collared cells called choanocytes, not found in the remaining three

(d) All are bilaterally symmetrical

71. Which one of the following groups of animals is bilaterally symmetrical and triploblastic?

NCERT | Page-52 / N-43 | 2009

(a) Aschelminthes (round worms)

(b) Ctenophores

(c) Sponges

(d) Coelenterates (Cnidarians)

72. *Ascaris* is characterized by

NCERT | Page-52 / N-43 | 2009

(a) absence of true coelom but presence of metamerism

(b) presence of neither true coelom nor metamerism

(c) presence of true coelom but absence of metamerism

(d) presence of true coelom and metamerism (metamerisation)

73. Which one of the following pairs of animals comprises 'jawless fishes'? **NCERT | Page-56 / N-47 | 2009**

(a) Mackerals and Rohu

(b) Lampreys and Hag fishes

(c) Guppies and Hag fishes

(d) Lampreys and eels

74. Which one of the following is NOT a characteristic of phylum Annelida?

NCERT | Page-52 / N-43 | 2008

(a) Closed circulatory system

(b) Segmentation

(c) Pseudocoelom

(d) Ventral nerve cord

75. Which one of the following phyla is correctly matched with its two general characteristics?

NCERT | Page-53, 54, 55 / N-44, 45, 46 | 2008

(a) Arthropoda - Body divided into head, thorax and abdomen and respiration by mouth

(b) Chordata - Notochord at some stage and separate anal and urinary openings to the outside

(c) Echinodermata - Pentamerous radial symmetry and mostly internal fertilization

(d) Mollusca - Normally oviparous and development through a trochophore or veliger larva

76. Which one of the following groups of three animals each is correctly matched with their one characteristic morphological feature?

NCERT | Page-50, 51 & 53 / N-41, 42, 43 | 2008

Animals		Morphological feature
(a) Liver fluke, Sea anemone, Sea cucumber	-	Bilateral symmetry
(b) Centipede, Prawn Sea urchin	-	Jointed appendages
(c) Scorpion, Spider, Cockroach	-	Ventral solid central nervous system
(d) Cockroach, Locust, *Taenia*	-	Metameric segmentation

77. Which one of the following is a matching pair of a body feature and the animal possessing it?

NCERT | Page-52 / N-43 | 2007

(a) Ventral central nervous system - Leech

(b) Pharyngeal gill slits absent in embryo - *Chameleon*

(c) Ventral heart - Scorpion

(d) Post-end tail - *Octopus*.

78. What is true about *Nereis*, scorpion, cockroach and silver fish? **2007**

(a) They all posses dorsal heart

(b) None of them is aquatic

(c) They all belong to the same phylum

(d) They all have jointed paired appendages

79. Which of the following pairs are correctly matched?
NCERT | Page-50,54 & 58 / N-41, 45, 49 | 2007

Animals	-	Morphological features
(i) Crocodile	-	4-chambered heart
(ii) Sea urchin	-	Parapodia
(iii) *Obelia*	-	Thecodont
(iv) Lemur	-	Thecodont

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

80. Biradial symmetry and lack of cnidoblasts are the characteristics of **NCERT | Page-51 / N-42 | 2006**
(a) *Ctenoplana* and *Beroe*
(b) *Aurelia* and *Paramecium*
(c) *Hydra* and *starfish*
(d) Starfish and sea anemone

81. Two common characters found in centipede, cockroach and crab are **2006**
(a) Jointed legs and chitinous exoskeleton
(b) Green gland and tracheae
(c) Book lungs and antennae
(d) Compound eyes and anal cerci

82. Metameric segmentation is the characteristic of
NCERT | Page-52, 53 / N-43, 44 | 2006
(a) Echinodermata and Annelida
(b) Annelida and Arthropoda
(c) Mollusca and Chordata
(d) Platyhelminthes and Arthropoda

83. Which one of the following is a matching set of a phylum and its three examples?
NCERT | Page-49,50,51 & 53 / N-40, 41, 42, 44 | 2006
(a) Platyhelminthes - *Planaria, Schistosoma, Enterobius*
(b) Mollusca - *Loligo, Teredo, Octopus*
(c) Porifera - *Spongilla, Euplectella, Pennatula*
(d) Cnidaria - *Bonellia, Physalia, Aurelia*

84. In which one of the following sets of animals do all the four give birth to young ones?
NCERT | Page-59, 60 / N-50, 51 | 2006
(a) Platypus, Penguin, Bat, Hippopotamus
(b) Shrew, Bat, Cat, Kiwi
(c) Kangaroo, Hedgehog, Dolphin, Loris
(d) Lion, Bat, Whale, Ostrich

85. Annual migration does not occur in the case of **2006**
(a) Siberian crane (b) Salamander
(c) Arctic tern (d) Salmon

86. From the following statements select the wrong one. **NCERT | Page-49, 50 / N-40, 41 | 2005**
(a) Prawn has two pairs of antennae
(b) Nematocysts are characteristic of the Pylum Cnidaria

(c) Millepedes have two pairs of appendages in each segment of the body
(d) Animals belonging to Phylum Porifera are exclusively marine

87. In contrast to Annelids the Platyhelminths show: **NCERT | Page-51 / N-42 | 2005**
(a) Absence of body cavity
(b) Bilaterial symmetry
(c) Radial symmetry
(d) Presence of pseudocoel

88. Which one of the following characters is not typical of the class Mammalia?
NCERT | Page-59 / N-50 | 2005
(a) Thecodont dentition
(b) Alveolar lungs
(c) Ten pairs of cranial nerves
(d) Seven cervical vertebrae

89. The animals with bilateral symmetry in young stage, and radial pentamerous symmetry in the adult stage, belong to the phylum
NCERT | Page-54 / N-45 | 2004
(a) Annelida
(b) Mollusca
(c) Cnidaria
(d) Echinodermata

90. In Arthropoda, head and thorax are often fused to form cephalothorax, but in which one of the following classes, is the body divided into head, thorax and abdomen? **NCERT | Page-53 / N-44 | 2004**
(a) Insecta
(b) Myriapoda
(c) Crustacea
(d) Arachnida and Crustacea

91. One of the following is a very unique feature of the mammalian body:
NCERT | Page-59, 60 / N-50, 51 | 2004
(a) Homeothermy
(b) Presence of diaphragm
(c) Four chambered heart
(d) Rib cage

92. During its life-cycle, *Fasciola hepatica* (liver fluke) infects its intermediate host and primary host at the following larval stages respectively:
NCERT | Page-51 / N-42 | 2003
(a) miracidium and metacercaria
(b) redia and miracidium
(c) cercaria and redia
(d) metacercaria and cercaria

93. *Sycon* belongs to a group of animals, which are best described as **NCERT | Page-49 / N-40 | 2003**
(a) multicellular having tissue organization, but no body cavity
(b) unicellular or acellular
(c) multicellular without any tissue organization
(d) multicellular with a gastrovascular system

94. Which one of the following is a matching pair of an animal and a certain phenomenon it exhibits?
(a) *Taenia* – Polymorphism **2003**
(b) *Pheretima* – Sexual dimorphism
(c) *Musca* – Complete metamorphosis
(d) *Chameleon* – Mimicry

95. Given below are four matchings of an animal and its kind of respiratory organ :
NCERT | Page-53, 55 / N-44, 45 | 2003
(i) Silver fish – trachea
(ii) Scorpion – book lung
(iii) Sea squirt – pharyngeal gills
(iv) Dolphin – skin
The correct matchings are
(a) (iii) and (iv)   (b) (i) and (iv)
(c) (i), (ii) and (iii)   (d) (ii) and (iv)

96. In which of the following notochord is present in embryonic stage?
NCERT | Page-54, 55 / N-45, 46 | 2002
(a) All chordates   (b) Some chordates
(c) Vertebrates   (d) Non chordates

97. In which of the following animal post anal tail is found? **NCERT | Page-58 / N-46 | 2001**
(a) Earthworm   (b) Lower invertebrate
(c) Scorpion   (d) Snake

98. In which of the following, haemocyanin pigment is found ? **2001**
(a) Mollusca   (b) Annelida
(c) Echinodermata   (d) Lower chordata

99. Fish which can be used in biological control of mosquitoes/Larvicidal fish is **2001**
(a) *Eel*   (b) *Carp*
(c) Cat Fish   (d) *Gambusia*

100. What is common between *Ascaris lumbricoides* and *Anopheles stephensi*? **2000**
(a) Sexual dimorphism
(b) Hibernation
(c) Anaerobic respiration
(d) Metamerism

101. Blastopore is the opening of **2000**
(a) coelenteron   (b) coelom
(c) blastocoel   (d) archenteron

102. Cell-tissue-body organisation is characteristic of **NCERT | Page-50 / N-41 | 2000**
(a) Star fish   (b) *Hydra*
(c) Liver fluke   (d) Sponge

103. Indicate the correct statement
NCERT | Page-59, 60 / N-50, 51 | 2000
(a) Camel has biconcave red blood cells
(b) Bat bears feathers
(c) Rat bears cloaca
(d) Platypus lays eggs

104. Most appropriate term to describe the life cycle of *Obelia* is **NCERT | Page-50 / N-41 | 1998**
(a) metagenesis
(b) metamorphosis
(c) alternation of generations
(d) neoteny

105. The long bones are hollow and connected by air passages these are characteristics of
NCERT | Page-58 / N-49 | 1998
(a) mammals   (b) reptilia
(c) aves   (d) all land vertebrates

106. In desert grasslands which type of animals are relatively more abundant? **1998**
(a) Arboreal   (b) Aquatic
(c) Fossorial   (d) Diurnal

107. What is common among silverfish, scorpion, crab and honey bee? **NCERT | Page-53 / N-44 | 1997**
(a) Compound eyes   (b) Poison gland
(c) Jointed legs   (d) Metamorphosis

108. What is true about all sponges without exception?
NCERT | Page-49 / N-40 | 1996
(a) They are all marine
(b) They have flagellated collar cells
(c) They have a mixed skeleton consisting of spicules and spongin fibres
(d) They reproduce only asexually by budding

109. Functionwise, just as there are nephridia in an earthworm, so are **1996**
(a) parotid glands in toad
(b) statocysts in prawn
(c) flame cells in liver fluke
(d) myotomes in fish

110. Pneumatic bones are expected to be found in
NCERT | Page-58, 59 / N-49, 50 | 1996
(a) pigeon   (b) house lizard
(c) frog's tadpole   (d) flying fish

111. The flightless bird Cassowary is found in **1996**
(a) Mauritius   (b) Australia
(c) New Zealand   (d) Indonesia

112. Besides annelida and arthropoda, the metamerism is exhibited by   **NCERT | Page-55 / N-46 | 1995**
   (a) cestoda   (b) chordata
   (c) mollusca   (d) acanthocephala

113. Special character of Coelenterates is
   NCERT | Page-50 / N-41 | 1994
   (a) polymorphism   (b) nematocysts
   (c) flame cells   (d) hermaphroditism

114. Which one belongs to Platyhelminthes?
   NCERT | Page-50 / N-41 | 1994
   (a) *Schistosoma*   (b) *Trypanosoma*
   (c) *Plasmodium*   (d) *Wuchereria*

115. Point out the non-parasite
   NCERT | Page-50 / N-41 | 1994
   (a) Tapeworm   (b) Mosquito
   (c) Leech   (d) Sea anemone

116. Tube feet occur in   **NCERT | Page-54 / N-45 | 1994**
   (a) Cockroach   (b) Star Fish
   (c) Cuttle Fish   (d) Cat Fish

117. All chordates possess
   (a) exoskeleton **NCERT | Page-54, 55 / N-45, 46 | 1994**
   (b) limbs
   (c) skull
   (d) axial skeletal rod of notochord

118. A common characteristic of all vertebrates is
   NCERT | Page-55 / N-46 | 1994
   (a) presence of skull
   (b) division of body into head, neck, trunk and tail
   (c) presence of two pairs of functional appendages
   (d) body is covered with an exoskeleton

119. Closed circulatory system occurs in
   NCERT | Page-53, 54 / N-44, 45 | 1994
   (a) snail   (b) cockroach
   (c) cuttle Fish   (d) all of these

120. Budding is a normal mode of asexual reproduction in
   (a) starfish and Hydra   **1993**
   (b) Hydra and sponges
   (c) tapeworm and Hydra
   (d) sponge and starfish

121. What is true about *Taenia saginata*?
   NCERT | Page-51 / N-42 | 1993
   (a) Life history has pig as intermediate host
   (b) There are two large suckers on scolex
   (c) Rostellar hooks are absent
   (d) Rostellum has double circle of hooks

122. Which one assists in locomotion?
   NCERT | Page-52 / N-43 | 1993
   (a) Trichocysts in *Paramecium*
   (b) Pedicellariae of Star Fish
   (c) Clitellum in *Pheretima*
   (d) Posterior sucker in *Hirudinaria*

123. Eye of the molluscan group that resembles vertebrate eye is   **NCERT | Page-53 / N-44 | 1993**
   (a) bivalvia   (b) gastropoda
   (c) pelecypoda   (d) cephalopoda

124. The cervical vertebrae in humans is   **1993**
   (a) same as in whale
   (b) more than that in rabbit
   (c) double than that of horse
   (d) less than that in giraffe

125. What is common in Whale, Bat and Rat? **1993**
   (a) Absence of neck
   (b) Muscular diaphragm between thorax and abdomen
   (c) Extra-abdominal testes to avoid high temperature of body
   (d) Presence of external ears

126. Gorilla, Chimpanzee, Monkeys and Humans belongs to the same   **1993**
   (a) species   (b) genus
   (c) family   (d) order

127. All vertebrates possess
   NCERT | Page-54, 55 / N-45, 46 | 1993
   (a) renal portal system
   (b) dorsal hollow central nervous system
   (c) four chambered ventral heart
   (d) pharyngeal gill slits

128. A larval stage occurs in the life history of all members of the group   **1993**
   (a) frog, lizard and cockroach
   (b) ascaris, housefly and frog
   (c) housefly, earthworm and mosquito
   (d) butterfly, frog and mosquito

129. Tracheae of cockroach and mammal are similar in having   **1993**
   (a) paried nature
   (b) non-collapsible wall
   (c) ciliated inner lining
   (d) origin from head

130. Which one of the following animals possesses nerve cells but no nerves?   **1993**
   (a) Hydra   (b) Tapeworm
   (c) Earthworm   (d) Frog's tadpole

131. What is common between Ostrich, Penguin and Kiwi?   **NCERT | Page-58, 59 / N-49, 50 | 1993**
   (a) Running birds   (b) Migratory birds
   (c) Flightless birds (d) Four toed birds

132. The simplest type of canal system in Porifera is
   (a) ascon type   (b) leucon type **1992**
   (c) sycon type   (d) radial type

133. What is correct about *Taenia*?

NCERT | Page-51 / N-42 | 1992

(a) Male organs occur in posterior proglottides

(b) Male organs occur in anterior proglottides

(c) Female organs occur in anterior proglottides

(d) Mature proglottides contain both male and female organs

134. *Ascaris* larva is called 1992

(a) cysticercus (b) rhabditiform

(c) hexacanth (d) onchosphere

135. Adult *Culex* and *Anopheles* can be distinguished with the help of NCERT | Page-53 / N-44 | 1992

(a) mouth parts/colour (b) sitting posture

(c) antennae/wings (d) feeding habits

136. Star fish belongs to 1992

(a) Asteriodea (b) Ophiuroidea

(c) Holothuroidea (d) Crinoidea

137. Aristotle's lantern occurs in class 1992

(a) Echinoidea (b) Asteroidea

(c) Holothuroidea (d) Ophiuroidea

138. An egg laying mammal is

NCERT | Page-60 / N-51 | 1992

(a) Kangaroo (b) Platypus

(c) Koala (d) Whale

139. Sound box of birds is called 1992

(a) pygostyle (b) larynx

(c) syrinx (d) synsacrum

140. Bladderworm/cysticercus is the larval stage of

1991

(a) Tapeworm (b) Roundworm

(c) Pinworm (d) Liver Fluke

141. The excretory structures of flatworms/*Taenia* are

(a) flame cells NCERT | Page-51 / N-42 | 1991

(b) protonephridia

(c) malpighian tubules

(d) green glands

142. Classification of Porifera is based on

NCERT | Page-49 / N-40 | 1991

(a) branching (b) spicules

(c) reproduction (d) symmetry

143. *Ascaris lumbricoides* infection occurs through

NCERT | Page-52 / N-43 | 1991

(a) sole of uncovered feet

(b) contaminated cooked measly pork

(c) improperly cooked measly pork

(d) from air through inhalation

144. An insect regarded as greatest mechanical carrier of diseases is 1991

(a) *Pediculus* (b) *Cimex*

(c) *Musca* (d) *Xenopsylla*

145. Which one occurs in *Echinodermata*?

NCERT | Page-54 / N-45 | 1991

(a) Bilateral symmetry (b) Radial symmetry

(c) Porous body (d) Soft skin

146. Kidney of adult rabbit is 1991

(a) pronephros (b) metanephros

(c) mesonephros (d) opisthonephros

147. Onchosphere occurs in 1990

(a) *Ascaris* (b) *Fasciola*

(c) *Taenia* (d) *Planaria*

148. *Taenia saginata* differs from *Taenia solium* in

(a) absence of scolex hooks 1990

(b) absence of scolex hooks and uterine branching

(c) absence of scolex hooks and presence of both male and female reproductive organs

(d) presence of scolex hooks

149. Malpighian tubules are NCERT | Page-53 / N-44 | 1990

(a) excretory organs of insects

(b) excretory organs of annelids

(c) respiratory organs of insects

(d) respiratory organs of annelids

150. Kala-azar and Oriental Sore are spread by 1990

(a) Housefly (b) Bed Bug

(c) Sand Fly (d) Fruit Fly

151. Penguin occurs in 1990

(a) Australia (b) Antarctica

(c) Africa (d) America

152. Transfer of *Taenia* to secondary host occurs as

NCERT | Page-51 / N-42 | 1989

(a) onchosphere (b) cysticercus

(c) morula (d) egg.

153. Jelly Fishes belongs to class

NCERT | Page-50 / N-41 | 1989

(a) Hydrozoa (b) Scyphozoa

(c) Anthozoa (d) None of these

154. A chordate character is

(a) gills NCERT | Page-55 / N-46 | 1989

(b) spiracles

(c) postanal tail

(d) chitinous exoskeleton

155. Flight muscles of birds are attached to 1989

(a) clavicle (b) keel of sternum

(c) scapula (d) coracoid

156. Wish bone of birds is from 1989

(a) pelvic girdle

(b) skull

(c) hind limbs

(d) pectoral girdle/clavicles

157. Eutherians are characterised by   **1989**
    (a) hairy skin
    (b) true placentation
    (c) ovoviviparity
    (d) glandular skin

158. Animals/organisms floating on the surface of water are   **1988**
    (a) plankton   (b) pelagic
    (c) benthos   (d) neritic

159. Organ Pipe Coral is   **1988**
    (a) *Tubipora*   (b) *Astraea*
    (c) *Helipora*   (d) *Fungia*

160. Silk thread is obtained from Silk Moth during
    NCERT | Page-53 / N-44 | 1988
    (a) pupal state   (b) larval state
    (c) nymph state   (d) adult state

161. A wood boring mollusc/Shipworm is   **1988**
    (a) *Chiton*   (b) *Teredo*
    (c) *Limax*   (d) *Patella*

162. Which is not a true amphibian animal?
    NCERT | Page-57, 58 / N-48, 49 | 1988
    (a) Salamander   (b) Toad
    (c) Tortoise   (d) Frog

163. Fire bellied toad is   **1988**
    (a) *Amphiuma*   (b) *Discoglossus*
    (c) *Necturus*   (d) *Salamandra*

164. *Necturus* is   **1988**
    (a) Hell Bender   (b) Congo Eel
    (c) Mud Puppy   (d) Blind Worm

165. *Typhlops* is   **1988**
    (a) Sea Snake   (b) Glass Snake
    (c) Blind Snake   (d) Grass Snake

166. Both male and female pigeons secrete milk through
    (a) Salivary glands   **1988**
    (b) Modified sweat glands
    (c) Crop
    (d) Gizzard

167. Feet of kingfisher are modified for   **1988**
    (a) wading   (b) perching
    (c) running   (d) catching

168. Bird vertebrae are   **1988**
    (a) acoelous   (b) heterocoelous
    (c) amphicoelous   (d) procoelous

169. Hair occur in all mammals except those of   **1988**
    (a) Rodentia   (b) Chiroptera
    (c) Primata   (d) Cetacea

ANSWER KEY

1	(b)	18	(d)	35	(b)	52	(b)	69	(a)	86	(d)	103	(d)	120	(b)	137	(a)	154	(c)
2	(b)	19	(b)	36	(b)	53	(a)	70	(c)	87	(a)	104	(a)	121	(c)	138	(b)	155	(b)
3	(a)	20	(b)	37	(b)	54	(b)	71	(a)	88	(c)	105	(c)	122	(d)	139	(c)	156	(d)
4	(a)	21	(c)	38	(b)	55	(a)	72	(b)	89	(d)	106	(c)	123	(d)	140	(a)	157	(b)
5	(a)	22	(d)	39	(c)	56	(d)	73	(b)	90	(a)	107	(c)	124	(a)	141	(a)	158	(a)
6	(b)	23	(d)	40	(a)	57	(a)	74	(c)	91	(b)	108	(b)	125	(b)	142	(b)	159	(a)
7	(d)	24	(d)	41	(c)	58	(a)	75	(d)	92	(a)	109	(c)	126	(d)	143	(b)	160	(a)
8	(d)	25	(a)	42	(a)	59	(a)	76	(c)	93	(c)	110	(a)	127	(b)	144	(c)	161	(b)
9	(a)	26	(d)	43	(a)	60	(d)	77	(a)	94	(c)	111	(b)	128	(d)	145	(b)	162	(c)
10	(c)	27	(d)	44	(c)	61	(c)	78	(a)	95	(c)	112	(b)	129	(b)	146	(b)	163	(b)
11	(c)	28	(b)	45	(b)	62	(c)	79	(b)	96	(a)	113	(b)	130	(a)	147	(c)	164	(c)
12	(c)	29	(a)	46	(a)	63	(d)	80	(a)	97	(d)	114	(a)	131	(c)	148	(b)	165	(c)
13	(a)	30	(c)	47	(d)	64	(d)	81	(a)	98	(a)	115	(d)	132	(a)	149	(a)	166	(c)
14	(b)	31	(d)	48	(b)	65	(c)	82	(b)	99	(d)	116	(b)	133	(d)	150	(c)	167	(a)
15	(b)	32	(c)	49	(b)	66	(b)	83	(b)	100	(a)	117	(d)	134	(b)	151	(b)	168	(b)
16	(c)	33	(b)	50	(b)	67	(a)	84	(c)	101	(d)	118	(a)	135	(b)	152	(a)	169	(d)
17	(b)	34	(a)	51	(a)	68	(d)	85	(b)	102	(b)	119	(c)	136	(a)	153	(b)		

Hints & Solutions

1. **(b)** Poriferans are the acoelomates.
    Aschelminthes are pseudocoelomates.
    Platyhelminthes are acoelomates.

2. **(b) Radial symmetry** is found in adults of phylum of Ctenophore, Coelenterate and Echinodermata.

    NOTES When any plane passing through ventral axis of body divide organism in two identical halves.

3. **(a)** Platyhelminthes are bilaterally symmetrical, triploblastic and acoelomate animals with organ level of organisation.

    NOTES The body plane of most animals, including humans, exhibit mirror symmetry, also called bilateral symmetry. A body that is bilaterally symmetrical is easier for the brain to recognize while in different orientations and positions, thus making visual perception easier.

4. **(a) Annelids** exhibit bilateral symmetry with metameric segmentation where external segments correspond to internal segments.

5. **(a)** Organ system of organisation, bilateral symmetry and true coelomates with segmented body are found in annelid, arthropoda and chordates.
    In mollusca , the body is unsegmented.

6. **(b)** The exoskeleton of insects consists of **chitinous** cuticle. It gets hardened due to deposition of calcium. It prevents dessication and gives protection.

7. **(d)** Radial Symmetry is usually associated with sedentary mode of life (e.g. cnidarians). In radial symmetry body is in the form of flat or tall cylinder and can be divided into similar halves by more than two planes passing through one main axis. It is found in some sponges, hydras, jellyfish, sea urchin, etc.

8. **(d) Coelom** is a fluid filled space between body wall and alimentary canal which is lined by parietal peritoneum (mesoderm) on the outer side and visceral peritoneum (mesoderm) on the inner side. In the given diagram, coelom is surrounded by mesoderm.
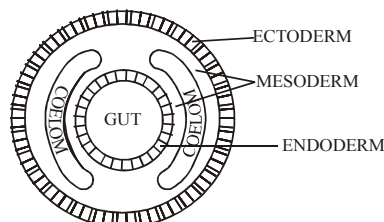
9. **(a)** The organisms, which are attached to substratum, generally, possess radial symmetry in all vertical planes.

10. **(c)** In radial symmetry – body is cut longitudinally through any radius into two equal halves. Present in **sessile animals** *i.e.* star fish that live in the sea bottom. The given diagram shows the radial symmetry.
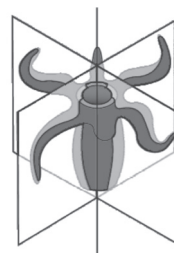
Fig.: Radical symmetry

11. **(c)** Coelom or body cavity, when derived from blastocoel is pseudocoelom as in nematodes, rotifers. Schizocoel is true coelom derived from mesodermal segments.

12. **(c) Metamorphosis** of insects is regulated through *ecdysone hormone*.

    NOTES Ecdysone is a steroidal prohormone of the major insect molting hormone 20-hydroxyecdysone, which is secreted from the prothoracic glands. Insect molting hormones (ecdysone and its homologues) are generally called ecdysteroids.

13. **(a)** Stratum corneum is the outermost, partially cornified layer of scale like cells. Small fragments of this layer are periodically shed off from the body known as ecdysis. The new layer is regularly formed by underlaying stratum germinativum.

14. **(b)** A-II, B-I, C-IV, D-III

15. **(b)** A-III, B-I, C-II, D-IV

16. **(c)** Perforated pharyngeal gill slits and dorsal central nervous system are the characteristics of chordates.

> **NOTES** Characteristics of Non-Chordates
> Non-chordates exhibit a wider range of body symmetries compared to chordates:
> - They are cold-blooded.
> - They can be acoelomates, pseudocoelomates, and coelomates.
> - Also, their germ layer can be diploblastic or triploblastic.
> - Post-anal tail is absent.
> - Exoskeleton is present while the endoskeleton is absent.
> - The regeneration power of non-chordates is good.
> - They have a protoplasmic to organ system level of organization.
> - The gut is present dorsal to the nerve cord.
> - Anus is generally absent. If present, it opens on the last segment.
> - Respiration in non-chordates occurs through diffusion across the body surface.
> - Gill slits are absent.

17. **(b)** (A)- (II), (B)-(I), (C)-(III),(D)-(IV).
Contractile vacuole → *Amoeba*
Water vascular system → *Asterias*
Canal system → *Spongilla*
Flame cells → *Taenia*

18. **(d)** Only statement (B), (C) and (D) are correct.
Ctenophores reproduce only sexually and fertilization is external.
In tapeworm, fertilization is internal but sexes are not separate.
Ctenophores are exclusively marine, diploblastic and bioluminescent organisms.

19. **(b)** The correct statement regarding chordates are II and III.
The chordate characters are presence of closed circulatory system and presence of pharyngeal gill slits. Nerve cord is dorsal, hollow and single. Heart is ventral. They are triploblastic and coelomate.

20. **(b)** The unique mammalian characteristics are presence of hairs, pinna and mammary gland. Presence of tympanic membrane is present in amphibians too and monocondylic skull is present in reptiles and aves.

21. **(c)** The digestive tract of birds has additional chambers, the **crop** and **gizzard**. Example: *Corvus* (Crow), *Columba* (Pigeon), *Psittacula* (Parrot), *Struthio* (Ostrich), *Pavo* (Peacock), *Aptenodytes* (Penguin), *Neophron* (Vulture).

> **NOTES** Crop and Gizzard is defined as a thick-walled muscular organ that has functions similar to the human stomach. It is also observed in birds. It is composed of structures which mainly helps in increasing the surface area of the food so that enzymes can act efficiently.

22. **(d)** The members of subphylum Vertebrata possess notochord during the embryonic period. The notochord is replaced by a cartilaginous or bony vertebral column in the adult. Thus all vertebrates are chordates but all chordates are not vertebrates.

23. **(d)** In the given statements, statement (i) and (iii) are correct and statements (ii) and (iv) are incorrect. The correct statements are cyclostomes have a circular mouth without jaws and they migrate from marine water to fresh water for spawning respectively. So the correct option is (d).

24. **(d)** *Chelone* (turtle) is an example of reptile. The heart of reptiles are usually three-chambered except crododiles. So the correct option is (d).

25. **(a)** Statements (ii), (iii) and (v) are correct
- **Metagenesis** (alternation of generation) is observed in members of phylum Coelenterata (Cnidaria).
- Comb plates present in ctenophores help in locomotion.

26. **(d)** The correct match is as follows -
(A)-(iii), (B)-(iv), (C)-(ii), (D)-(i)
Metamerism is commonly seen in the members of phylum Annelida.
Water canal system is present in the members of phylum Porifera.
The body of **Ctenophores** bears 8 external rows of ciliated comb plates which help in locomotion.
Cnidoblasts or cnidocytes are characteristic feature of Cnidarians (Coelentrata).

27. **(d)** *Physalia* is a marine hydrozoans and is also known as Portuguese man of war or blue bottle jelly fish. *Limulus* is known as king crab and is considered as living fossil. *Pinctada* is named as pearl oyster and the *Ancylostoma* is called hookworm.

28. **(b)**
    - Hollow and pneumatic long bones are present in animals that belong to class Aves e.g., *Neophron* (vulture).
    - *Ornithorhynchus* (Platypus) and *Macropus* (Kangaroo) belong to class Mammalia.
    - *Hemidactylus* (Wall lizard) is a member of class Reptilia.

29. **(a)** *Locusta* is a gregareous pest. In Echinoderms, adults are radially symmetrical but larvae are bilaterally symmetrical. Scorpions respire through book lungs. Bioluminescence is well marked in Ctenophores.

30. **(c)** In vertebrata, *notochord* is present during embryonic period only as it is replaced by vertebral column. In chordates, central nervous system is dorsal and hollow.

NOTES The notochord derives during gastrulation (infolding of the blastula, or early embryo) from cells that migrate anteriorly in the midline between the hypoblast and the epiblast (inner and outer layers of the blastula). These cells coalesce immediately beneath the developing central nervous system.

31. **(d)** *Trygon* - A fish possessing a poison sting
    Cyclostomes - They have 6-15 pairs of gill slits
    Chondrichthyes - They are cartilaginous fish with heterocercal caudal fins.
    Osteichthyes - They are bony fish having air or gas bladder that helps in controlling buoyancy.

32. **(c)** *Ophiura* is an echinoderm commonly known as brittle star.
    Physalia is coelenterate (cnidarian) commonly known as portuguese man of war.
    Pinctada is pearl oyster belonging to taxon bivalve molluscs.
    Planaria belongs to platyhelminthes (flatworms).

33. **(b)** **Pila** is a member of mollusca. The mouth contains a rasping organ for feeding called radula. *Bombyx* is an arthropod. In Bombyx excretion takes place through malpighian tubules. *Pleurobrachia* is a ctenophore. The body bears eight external rows of ciliated comb plates, which help in locomotion. *Taenia* is a platyhelminth that has specialised cells, called flame cells, which help in osmoregulation and excretion.

34. **(a)** **Metamorphosis** refers to transformation of larva into adult. Animal that perform metamorphosis are said to have indirect development. Metamorphosis includes, in insects, the transformation of a maggot into an adult fly and a caterpillar into a butterfly and, in amphibians, the changing of a tadpole into a frog. In earthworm development is direct which means no larval stage are there and hence no metamorphosis.

35. **(b)** Pharyngeal gill slits are present in hemichordates and in chordates. Notochord is present in chordates only. Ventral tubular nerve cord is present in non-chordates. In the given diagram gill slits are shown.
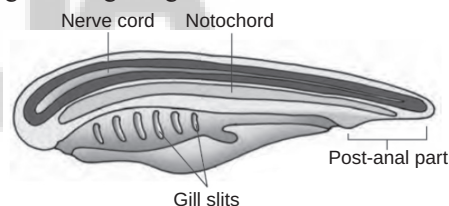
Fig.: Chordata characteristics

36. **(b)** The two extremes in the animal kingdom are **endothermic homeotherms** and **ectothermic poikilotherms**. Most mammals, including humans, as well as most birds are endothermic homeotherms, while most fish, invertebrates, reptiles, and amphibians are ectothermic poikilotherms. *Chelone* (Turtle) belongs to class reptilia which is poikilotherm or cold blooded.

37. **(b)** In **poriferans** (sponges) choanocytes (collar cells) form lining of spongocoel. Flagella present in collar cells provide circulation to water in water canal system.

NOTES By cooperatively moving their flagella, choanocytes generate a flow of water through the sponges' pores, into the spongocoel, and out through the osculum.

38. (b) Sharks and *Trygon* (sting ray) are the members of cartilaginous fish while Whale, Dolphin and Seals are aquatic mammals belong to class mammalia.

39. (c) All arthropods possess a stiff exoskeleton (external skeleton) composed primarily of chitin. Arthropod bodies are divided into segments. **Parapodia** are paired, lateral appendages extending from the body segments and are found in aquatic annelids. Arthropod appendages may be either biramous (branched) or uniramous (unbranched). They possess jointed appendages.

40. (a) Chondrichthyes always have cartilaginous endoskeleton. Most mammals are viviparous, giving birth to young. However, the five species of monotreme, the platypuses and the echidnas, lay eggs. Chordates have jawless animals (Agnatha) as well. Most reptiles have 3 chambered heart. Crocodilians have 4 chambered hearts. Turtles have 3 chambered heart but with an incomplete wall in the single ventricle, so their hearts are functionally 4 chambered.

41. (c) Giving birth to young that develop within the mother's body rather than hatching from eggs. All mammals except the monotremes are viviparous.

42. (a) Members of phylum **Porifera** have cellular level of organisation thus have meshwork of cell, fertilisation is internal and development is indirect.

43. (a) Metagenesis is defined as alternation of generation found in phylum cnidaria (eg. *Obelia*). In this phenomenon one generation of an organism reproduces asexually, followed by a sexually reproducing generation.

44. (c) *Petromyzon marinus*, commonly known as sea lamprey lays eggs in fresh water and its larvae, after metamorphosis, return to the ocean (saline water).

45. (b) *Platypus (Ornithorhynchus)* is an oviparous (egg laying animal). It belongs to class-mammalia.

Fig.: *Ornithorhynchus*

46. (a)
(i) Aves possess dry skin, without glands except oil gland near the base of tail.
(ii) Pinnae are not found in aquatic animals and egg laying mammals.
(iii) In cyclostomes, unpaired appendages (joints) are found.

47. (d) Members of Ctenophora, Cephalochordata and Echinodermata are exclusively marine. Member of **Cnidaria** are both marine and fresh water.

48. (b) *Gorgonia* (sea-fan) is an animal. All animals lack cell wall.

NOTES Gorgonia is a genus of soft corals, sea fans in the family Gorgoniidae.

49. (b) *Planaria* is a flatworm which possesses a high capacity of regeneration.

50. (b) *Torpedo* is a sluggish fish. It is carnivorous. The prey is killed due to electric shock. The shock can also be harmful for human beings.

51. (a) In Ctenophora, sexes are not separate. Reproduction takes place only by sexual means.

52. (b) Prawn , Scorpion and *Locusta* belong to phylum Arthropoda.

53. (a) Representative of Phylum Arthropoda is Silverfish. Arthropoda is the largest phylum of Animalia, which covers two-thirds of all named species.

54. (b) House fly, butterfly, tse tse fly, silverfish all belongs to insecta.

55. (a) Sharks and dogfishes have cylindrical body while skates and rays have flattened body with winglike pectoral fins which are not distinct from body.

56. **(d)** *Ichthyophis* – Amphibian
Limulus – Arthropoda
Adamsia – Cnidaria
Petromyzon – Jawless vertebrate & ectoparasite, cyclostomate

57. **(a)** In option (a), all the characteristics belong to class Reptilia. In options (b), (c) and (d) the characteristics belong to the classes Amphibia, *Osteichthyes* and *Chondrichthyes* respectively.

58. **(a) Duckbilled platypus** is oviparous and comes under phylum mammalia. Millipede belongs to the phylum arthropoda. Sea-anemone is diploblastic and belongs to phylum cnidaria. Silver-fish is an insect belonging to phylum arthropoda, having long antennae, no wings and move in a wiggling motion that resembles the movement of a fish.

59. **(a)** Molluscans are soft bodied animals. Their body is unsegmented with a distinct head, muscular foot and visceral hump. In *Pila,* the buccal cavity contains a rasping organ, the radula with transverse rows of teeth. Given diagram represents the example of Mollusca.

Fig.: *Pila*

60. **(d)** Sea horse and flying fish are cold blooded animals. *Ornithorhyncus* is oviparous. Crocodile has four chambered heart. *Ascaris* and *Ancylostoma* are segmented roundworms.

61. **(c)** Sponges are generally marine but some live in the fresh water such as *spongilla lacustris*. Some mammals are oviparous too e.g. *(Ornithorhnycus)*. Crocodile is a member of reptiles that have a four-chambered heart.

62. **(c) Notochord** is a flexible rod like structure that forms the main support of the body in the lowest chordates. It is not absent in humans through out their life. Notochord is present in embryonic stage and get changed or replaced by vertebral column in the adult.

63. **(d)** From annelida to chordata all organisms are eucoelomate. (iii)-Mollusca (Octopus), (iv)-Arthropoda (Scorpion) have a true coelom.

64. **(d)** A male shark possesses a pair of **claspers** which are inserted into a female shark's cloaca (an opening on the underside of the body) at the time of mating. Claspers are located on the inner edge of the pelvic fins near the male's cloaca. The function of claspers is to introduce sperm into a female shark's body for the purpose of fertilizing her eggs. Female sharks do not have claspers.

65. **(c)** *Chondrichthyes* are the cartilaginous fish with a flexible skeleton made of cartilage rather than bone. The given diagrams shows the examples of cartilaginous fishes.
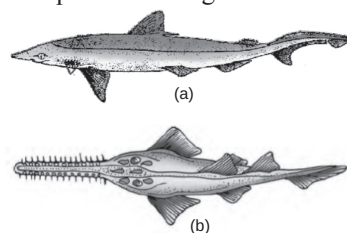
Fig.: Example of Cartilaginous fishes: (a) *Scoliodon*; (b) *Pristis*

66. **(b)** *Salamandra* (Salamander) is a member of class-Amphibia. It has a tympanum representing the ear and fertilisation is external.

| NOTES | *Pteropus* is a genus of megabats which are among the largest bats in the world. They are commonly known as fruit bats or flying foxes, among other colloquial names. They live in the tropics and subtropics of Asia, Australia, East Africa, and some oceanic islands in the Indian and Pacific Oceans. |

67. **(a)** Triploblastic condition can be seen in **Flat worms**. Ctenophores, sponges and corals are diploblastic. Diploblastic and triploblastic conditions are shown by the given figure.
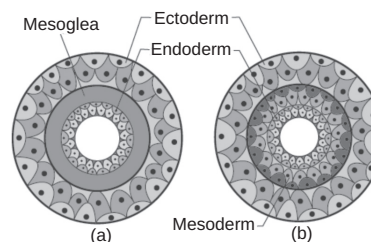
Fig.: Showing germinal layers: (a) Diploblastic (b) Triploblastic

68. (d) *Fasciola*, a flatworm has a single body cavity to the outside that serves both as mouth for ingestion and anus for egestion of undigested food. This is known as blind sac plan.

69. (a) Pseudo-coelomates are animals that have false or pseudo coelom. Examples are aschelminthes.

NOTES Coelomates are animals that has true coelom enclosed by mesoderm on both sides. Examples: from annelida to arthropoda are coelomates. Hence roundworms are pseudocoelomates, molluses and insects are coelomates while flatworms are acoelomates.

70. (c) *Spongilla* is a fresh water sponge that belongs to phylum porifera. It has special collared cells called choanocytes. Choanocytes are not found in leech, dolphin and penguin.

71. (a) Aschelminthes is bilaterally symmetrical and triploblastic. These are mostly aquatic, free living or parasitic. Their body is three layered which is ectoderm, mesoderm and endoderm.

72. (b) *Ascaris* is a common parasite found in the large intestine of man. It is world wide in distribution. The number of worms may be 500 or more in a single host. *Ascaris* is characterised by presence of neither true coelom nor metamerism.

73. (b) Lampreys and hagfishes are unusual, jawless fish that comprise the order Cyclostomata, so named because of the circular shape of the mouth. The brains of lampreys and hagfishes differ a lot, but they also show a large number of similarities, as do all craniate brains.

74. (c) Characteristic of phylum-**Annelida** not includes pseudocoelomate. Pseudocoelomate animal include the Rotifera and Nematoda.

75. (d) Mollusca mostly oviparous and a few viviparous. The development may be direct or indirect with trochophore, velliger and glochidium.

76. (c) Scorpion, spider and cockroach have ventral solid central nervous system. All three belongs to phylum-Arthopoda.
— Spider belong to class-Archnida
— Scorpion belong to c1ass- Archnida
— Cockroach belong to class-Insecta

77. (a) Leech has ventral central nervous system which consists of nerve ring, and a solid, double, mid ventral nerve cord with ganglia.

78. (a) *Nereis* (belonging to class polychaeta of phylum Annelida), scorpion and cockroach (belonging to phylum arthropoda) and silver fish all have dorsal heart.

79. (b) Crocodile belongs to class reptilia which has four chambered heart. Lemur teeth are embedded in the sockets of two which is known as thecodont.

80. (a) *Aurelia*, Hydra & Sea anemone have the characteristic cnidoblast cells. Cnidoblast is shown in the given figure.

Fig.: Diagrammatic view of Cnidoblast

81. (a) Jointed legs & chitinous exoskeleton are the common characters found in centipede, cockroach & crab.

82. (b) Metameric segmentation means body is divided externally as well as internally. This characteristic is present in annelida (*eg.* earth worm) and arthropoda (*eg.* cockroach). Their body is divided externally and internally as well.

83. (b) Mollusca is the second-largest phylum of invertebrate animals after the Arthropoda. The members are known as molluscs or mollusks. They are soft-bodied, bilaterally symmetrical, segmented, coelomate animals; usually shelled having a mantle, ventral foot, anterior head, and a dorsal visceral mass. *Loligo*, *Teredo Octopus* are some examples of mollusca.

84. (c) Penguin, Kiwi & Ostrich all belong to class Aves of chordata (*i.e.* birds) and they do not give birth to their young ones, they are oviparous, while Kangaroo, Hedgehog,

Dolphin, Loris all belong to class **mammalia** and are viviparous.

85. (b) Salamander does not undergo any annual migration as it occurs in Siberian crane, Arctic tern and Salmon mainly for the search of food or for breeding.

86. (d) Animals belonging to Phylum Porifera are mostly marine except a few which are found in fresh water- *e.g. Spongilla*, *Euspongia*.

87. (a) Platyhelminthes includes flat worms. There is no body cavity. The animals are therefore acoelomates. Annelids also have bilateral symmetry. They are coelomate having a perivisceral cavity divided into compartments.

88. (c) Mammals have 12 pairs of cranial nerves.

> **NOTES** The cranial nerves are 12 pairs of nerves that can be seen on the ventral (bottom) surface of the brain. Some of these nerves bring information from the sense organs to the brain; other cranial nerves control muscles; other cranial nerves are connected to glands or internal organs such as the heart and lungs.

89. (d) Echinoderms show bilateral symmetry in their larval stage and pentamerous radial symmetry in the adult stage. Annelids are bilaterally symmetrical, coelenterates show radial symmetry. Molluscs are also bilaterally symmetrical.

90. (a) Insects show a distinct division into head, thorax and abdomen. In crustaceans and myriapods head and thorax are fused. In arachnids body is divided into prothorax, mesothorax and metathorax.

91. (b) Presence of diaphragm which separates the thoracic cavity from the abdominal cavity is the characteristic feature of all mammals.

92. (a) When in contact with water, the egg capsule form non feeding larva miracidium. Miracidium enters the body of snail to form sporocyst . The sporocyst develops into redia. Redia form cercaria and come out of snail. They get encysted forming metacercaria.

93. (c) Sponges show cellular grade of organization. They do not have tissue system. *Sycon* is a sponge.

94. (c) *Obelia* exhibits polymorphism. Round worm (*Ascaris*) exhibits sexual dimorphism. *Pheretima* is a hermaphrodite and *Chameleon* shows camouflage.

> **NOTES** Musca is a genus of flies. It includes Musca domestica (the housefly), as well as Musca autumnalis (the face fly or autumn housefly). It is part of the family Muscidae.

95. (c) *Sea squirt* is *Herdmania*. Dolphin is an aquatic mammal and breathes through lungs.

96. (a) Presence of notochord in any stage of the life cycle is a major chordate characteristic.

> **NOTES** Notochord is a cartilaginous skeletal rod supporting the body in all embryonic and some adult chordate animals.

97. (d) The spinal cord extends beyond the animal's anus present in the posterior region of the body is a post-anal tail. Post anal tails are a feature of all chordates and therefore out of four options, the snake will possess the post-anal tail.

98. (a) Haemocyanin is the pigment carrying O_2 in molluscs. Annelids have erythrocruosin.

> **NOTES** These metalloproteins contain two copper atoms that reversibly bind a single oxygen molecule. They are second only to hemoglobin in frequency of use as an oxygen transport molecule.

99. (d) *Gambusia* fish is used in biological control of mosquitoes/Larvicidal.

> **NOTES** Gambusia is a large genus of viviparous fish in the family Poeciliidae (order Cyprinodontiformes). **Gambusia** contains over 40 species, most of which are principally found in freshwater habitats, though some species may also be found in brackish or saltwater habitats. Mosquito fishes **(Gambusia spp.)**, so called for their ability to eat numerous mosquito larvae, actually often eat other Diptera, especially adults fallen to the water surface.

100. (a) Sexual dimorphism is common between *Ascaris lubricoides* and *Anopheles stephensi*. Male and female round worms can be morphologically differentiated. Female *Anopheles* mosquito is sanguivorous whereas male *Anopheles* mosquito sucks nectar.

101. (d) **Coelom** is a fluid filled space between body wall and alimentary canal which is lined by mesoderm on both sides. Coelenteron is the sac like body cavity in coelenterates. Blastocoel is the fluid filled cavity of blastocyst. Archenteron is the gut cavity in the gastrula enclosed by the endoderm. The open and of it is called blastopore.

102. (b) Sponges show cell aggregate body organization. Cell tissue organization appear in coelenterates. **Platyhelminthes** show tissue organ organizations.

> **NOTES** Hydra is a genus of small, fresh-water organisms of the phylum Cnidaria and class Hydrozoa. They are native to the temperate and tropical regions. Biologists are especially interested in Hydra because of their regenerative ability – they do not appear to die of old age, or indeed to age at all.

103. (d) Duck-billed *Platypus* is an egg laying mammal.

104. (a) Metamorphosis is the gradual transformation of the embryo to the adult through a larval and pupal stage. Alternation of generation is seen in the plant kingdom wherein a haploid gametophyte generation alternates with diploid sporophyte generation. Phenomenon of sexual reproduction by a larva is known as neoteny *e.g.* Axolotl larva. In *Obelia* polyps reproduce medusaes asexually and medusae form the polyps sexually. Such alternation of asexual and sexual phases in the life cycle of *Obelia* is called metagenesis.

105. (c) Hollow bones are characteristic adaptive features of birds. It reduces their body weight and is a major flight adaptation.

106. (c) Fossorial are the animals which live beneath the soil (in low temperature) and are found abundant in desert grasslands.

107. (c) Silver fish (Insecta), scorpion (Arachnida); crab (Crustacea) and honey bee (Insecta) all belong to phylum Arthropoda which is characterized by the presence of jointed appendages. **Poison gland** occur only in scorpion. Compound eyes and metamorphosis are the characteristic of insects.

108. (b) Sponges are marine with the exception of family spongilidae, the members of which occur in fresh water *e.g. Spongilla*. Their endoskeleton is made of either spicules or spongin fibres or both. Sponges reproduce asexually by fragmentation or by budding or through gemmules and reduction bodies. Sponges also exhibit sexual reproduction.

109. (c) Toads possess a pair of large parotid glands behind the tympana. They produce a milky poisonous fluid. Statocysts are the organs of equilibrium and sensory perception located at the base of antennae. Flame cells in liver fluke are the excretory organs.

110. (a) Birds have pneumatic bones.

> **NOTES** The pneumatic bones are important to birds for respiration. They are hollow bones which are connected to the bird's respiratory system and are important for birds to be able to breathe. Examples of pneumatic bones are the skull, humerus, clavicle, keel (sternum), pelvic girdle, and the lumbar and sacral vertebrae.

111. (b) **Flightless birds** are restricted to the islands of Australia and New Guinea.

112. (b) **Metamerism** is an important character of annelida and arthropoda. The body is divided externally into segments called metameres. Metamerism is also exhibited by chordata due to repetition of a succession of homologous structures along anterio-posterior axis.

113. (b) Presence of nematocysts or stinging cells are the characteristic feature of the phylum Coelenterata. It serves the function of offence and defence by producing toxin to kill the prey & enemy.

114. (a) *Schistosoma* (Blood fluke) – Platyhelminthes
Trypanosoma – Aschelminthes
Wuchereria – Aschelminthes
Plasmodium – Protozoa

115. (d) Sea anemone (*Adamsia*) is marine animal attached to the empty shell of gastropods occupied by hermit crab. They live as symbionts, not as parasites.

Tapeworm
Leech   ] are parasites
Mosquitoes

116. (b) Tube feet is the **locomotory organ** that occurs in star fishes.

NOTES Tube feet are small tube-like projections on the underside (oral side) of echinoderms. They are part of the water vascular system of echinoderms. Tube feet are used to move, feed and breathe. They are arranged in grooves along the arms. They operate through hydraulic pressure.

117. (d) Animal in the phylum chordata have a notochord, a dorsal hollow nerve cord pharyngal slits, thyroid gland and a anal tail. Notochord is a rod-like structure that develops dorsally along the length of the embryo in chordata.

118. (a) **Vertebrates** are also known as craniata due to presence of skull in all its members.

119. (c) Cockroach & snail have open type of circulatory system.
Closed type of blood circulatory system occurs in cuttlefish.

NOTES Closed circulatory systems (evolved in echinoderms and vertebrates) have the blood closed at all times within vessels of different size and wall thickness. In this type of system, blood is pumped by a heart through vessels, and does not normally fill body cavities. Blood flow is not sluggish.

120. (b) Budding is an asexual mode of reproduction in *Hydra* & sponges.

121. (c) Rostellum and hooks are absent in *Taenia saginata*.

NOTES A rostellum is a knob-like protrusion at the extreme anterior end of a tapeworm, as an extension of the tegument. It is globular, spiny structure when it protrudes, and a circular hollow pit when retracted. It is structurally composed of a number of concentric rows of hooks.

122. (d) *Hirudinaria* (leech), does not possesses setae or parapodia for locomotion. Its posterior sucker helps in locomotion.

Fig.: Hirudinaria

123. (d) Class **Cephalopoda** of the phylum Mollusca has well developed eyes and resemble vertebrate eyes *e.g.*, *Octopus*, *Sepia* etc.

124. (a) The number of cervical vertebrae are same in man & whale that is 7 in number.

125. (b) **Diaphragm** is present in mammals as a muscular seperator between thorax and abdominal region.

126. (d) Gorilla, Chimpanzee, Monkeys and Man belongs to same order- Primates of class mammalia.

NOTES Some characteristics of primates are, brains that are larger than those of most other mammals (larger brain/body ratio than similar-sized non-primates), claws that have been modified into flattened nails, typically only one offspring per pregnancy, and a trend toward holding the body upright.

127. (b) Dorsal hollow nervous system is one of the important feature of **vertebrates**.

128. (d) A larval stage occurs in the life history of butterfly, frog and mosquito.

129. (b) **Tracheal tube** of cockroach and human have non-collapsible wall. Each tracheal tube is lined with cuticle which prevents collapsing.

130. (a) Nerve cells are present in the form of network of neurons in **Hydra** but the brain and nerves are absent.

131. (c) Ostrich, Kiwi, Penguin are all flightless birds.

132 (a) Presence of canal system - a network of channels for water transport - is an important feature in sponges. Ascon type of canal is simplest in Porifera which brings in food, oxygen and carries away CO_2 and nitrogenous waste.

133. (d) The body of *Taenia* is ribbon like and is divided into segments called proglottids. Each proglottid has one or two sets of male and female reproductive organs.

134. (b) *Ascaris* larva is also called rhabditiform.

NOTES In the free-living cycle: Rhabditiform larvae are passed in the stool of an infected definitive host, develop into either infective filariform larvae (direct development) or free-living adult males and females that mate and produce eggs, from which rhabditiform larvae hatch and eventually become infective filariform larvae.

135. (b) The body of an adult lies more or less parallel to the surface in *Culex* where as in *Anopheles* the body lies at an angle of 45° to the surface.

136. (a) Star fish belongs to the class – Asteroidea.

NOTES Starfish or sea stars are star-shaped echinoderms belonging to the class Asteroidea. Common usage frequently finds these names being also applied to ophiuroids, which are correctly referred to as brittle stars or basket stars. Starfish are also known as Asteroids due to being in the class Asteroidea.

137. (a) Jaw apparatus is called **Aristotle's Lantern** which is present in the Class Echinoidae of the Phylum Echinodermata.

NOTES The highly developed jaw apparatus of the sea urchin, named after Aristotle, is the most famous and controversial among the eponymous structures of echinoderms. Jacob Klein, in his Naturalis Dispositio Echinodermatum was the first to specifically refer to it as "Aristotle's lantern" in 1734.

138. (b) **Prototherians** are egg laying mammals, they share characters with reptiles.
*e.g.***, -** *Duck bill Platypus*

139. (c) Sound box or syrinx is present below trachea which produces sound in birds.

140. (a) Bladderworm or cysticerus larva forms in tapeworm.

NOTES Cysticercus is a scientific name given to the young tapeworms belonging to the genus Taenia. It is a small, sac-like vesicle resembling a bladder; hence, it is also known as bladder worm. It is filled with fluid, in which the main body of the larva, called scolex, resides.

141. (a) Excretory system of *Taenia* consists of a pair of peculiar flame cells, which absorb the waste material from the body and discharges it through excretory duct.

142. (b) The term porifera was given by Grant, the phylum includes animals with pores in their body. Its classification is based on skeleton or spicules.

143. (b) *Ascaris* enters into the human by eating semi-cooked (improperly) cooked pork contaminated with *Ascaris*.

144. (c) *Musca* is the zoological name of house fly which is regarded as mechanical carrier of many diseases.

145. (b) Larval stage of **Echinoderms** have bilateral symmetry and the adults have radial symmetry, pentamerous i.e., body parts arranged in five or multiples of five.

146. (b) **Metanephric kidney** is found differentiated into cortex and medulla and duct of such kidney is ureter.

147. (c) Onchosphere is the larval stage in *Taenia solium*.

148. (b) *Taenia saginata* lacks rostellum and scolex hooks.

149. (a) Malpighian tubules are fine, unbranched, yellow tubules that lie more or less free in the haemocoel. They open into alimentary canal. They absorb nitrogenous waste product, and thus acts as excretory organs in insects.

150. (c) Sand fly is the vector of Kala azar, causes severe liver infection.

NOTES Sand fly adults are small flies – only about 3 mm long – and are golden, brownish or gray colored. They have long, piercing mouthparts that are well adapted for sucking blood from their selected host. Sand flies hold their hairy-looking wings in a vertical V-shape when at rest, a characteristic that distinguishes them from some other small flies. Also, the six legs on the adults are extremely long, being longer than the insect's body.

151. (b) Penguin is a flightless bird found in colder regions like Antarctica.

152. (a) The eggs of *Taenia* pass out through human faeces which is eaten by pigs, eggs and develops into onchosphere, then to cyst larva in the muscle of pig; The entry stage into secondary host (pig) is onchosphere.

153. (b) Animals which are marine, solitary, bell or umbrella shaped belong to class Scyphozoa e.g., Jelly fish.

154. (c) **Chordates** are featured by the presence of the following characters.
- Notochord (cephalic or head region)
- Pharyngeal gill silts
- Postanal tail.

155. (b) In birds flight muscles or breast muscles are attached to the large sternum or breast bone. The wings are powered by these flight muscles.

156. (d) Two clavicles are fused with inter clavicle to form a fork shaped bone called wish bone or furcula or bone of merry thoughts.

157. (b) Eutherians are placental animals. The foetus develop inside uterus of female where they are nourished by special structure called placenta.

158. (a) Organisms passively floating on the surface of water are planktons. Floating animals are called zooplanktons and plants are phytoplanktons.

159. (a) *Tubipora* is organ pipe coral included in class Anthozia.

160. (a) Caterpillar larva is a **voracious** eater, it gets matured and by secreting silk thread changes into pupa which encloses into silk cocoon.

161. (b) *Teredo* (shipworm) is the member of class – Bivalvia (double shell plates). Shipworms are in fact not worms at all, but rather a group of marine molluscs (Eulamellibranchiata) in the family Teredinidae. They bore into submerged wood, and bacteria in a special organ called the gland of Deshayes enabling them to digest cellulose. The shipworms belong to several genera of which *Teredo* is the most commonly mentioned. The best known species is *Teredo navalis*.

162. (c) Tortoise (*Testudo*) is a member of order- Chelonia, class – Reptiles.

163. (b) Fire bellied toad (*Bombina orientalis*) is a member of family Discoglossidae of order Anura of class Amphibia. Its belly is red or orange-red.

164. (c) **Necturus** (Mud puppy) order – Urodela class – Amphibia is a species of which salamanders is a part of the genus *Necturus*.

165. (c) Typhlops is a non-poisonous blind snake.

NOTES Typhlops is a genus of blind snakes in the family Typhlopidae. The genus is endemic to the West Indies. Typhlops hectus is a fossorial species that occurs in a range of habitats including various types of forests.

166. (c) Crop in birds stores & softens food and secretes milk in pigeons.

167. (a) In birds, hind limbs are variously modified for various functions like perching, grasping etc. In the kingfisher they are modified for wading.

168. (b) Bird vertebrae are heterocoelous. Acoelous vertebrae are found in mammals.

169. (d) Members of the order Cetacea of class Mammalia are aquatic animals like whales, dolphins having smooth and hairless skin.