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A-23 FIEE Complex, Okhla Phase II

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HINTS & SOLUTIONS

PHYSICS

SPEED TEST

1

Chapter-wise

Physical World, Units & Measurements

Maximum Marks: 200 **Time: 1 Hour**

GENERAL INSTRUCTIONS

- This test contains 50 questions divided into two sections, Section-A consists of 35 MCQs and Section-B consists of 15 MCQs. For each Multiple Choice Question only one option is correct. Darken the correct circle/bubble in the Response Grid provided.
- Each correct answer will get you 4 marks and 1 mark shall be deducted for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

SECTION-A

1. The density of material in CGS system of units is $4\,g/cm^3$. 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

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

2. The dimensions of $\left(\frac{B^2}{\mu_0}\right)$ will be : (if μ_0 : permeability of free space and B : magnetic field)

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

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

3. The respective number of significant figures for the numbers 23.023, 0.0003 and 2.1×10^{-3} are

(a) 5, 1, 2 (b) 5, 1, 5 (c) 5, 5, 2 (d) 4, 4, 2

4. The distance of the Sun from earth is 1.5×10^{11} m and its angular diameter is (2000) s when observed from the earth. The diameter of the Sun will be :

(a) 2.45×10^{10} m (b) 1.45×10^{10} m

(c) 1.45×10^{9} m (d) 0.14×10^{9} m

5. Given below are two statements: One is labelled as Assertion (A) and other is labelled as Reason (R).

Assertion (A): Time period of oscillation of a liquid drop depends on surface tension (S), if density of the liquid is p and radius of the drop is r, then $T = K\sqrt{\frac{pr^3}{S^{3/2}}}$ is dimensionally correct, where K is dimensionless.

Reason (R): Using dimensional analysis we get R.H.S. having different dimension than that of time period.

In the light of above statements, choose the correct answer from the options given below.

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

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

(c) (A) is true but (R) is false

(d) (A) is false but (R) is true

6. The pressure on a square plate is measured by measuring the force on the plate and length of the sides of the plate by using the formula $P = \frac{F}{\ell^2}$. If the maximum errors in the measurement of force and length are 4% and 2% respectively, then the maximum error in the measurement of pressure is

(a) 1% (b) 2% (c) 8% (d) 10%

7. The siemen is the SI unit of

(a) resistivity (b) resistance

(c) conductivity (d) conductance

8. An object is moving through the liquid. The viscous damping force acting on it is proportional to the velocity. Then dimensions of constant of proportionality are

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

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

9. The least count of a stop watch is 0.2 second. The time of 20 oscillations of a pendulum is measured to be 25 second. The percentage error in the measurement of time will be

(a) 8% (b) 1.8% (c) 0.8% (d) 0.1%

10. If force (F), length (L) and time (T) are taken as the fundamental quantities. Then what will be the dimension of density :

(a) $[FL^{-4} T^2]$ (b) $[FL^{-3} T^2]$

(c) $[FL^{-5} T^2]$ (d) $[FL^{-3} T^3]$

RESPONSE GRID					
1. ⓐⓑⓒⓓ	**2.** ⓐⓑⓒⓓ	**3.** ⓐⓑⓒⓓ	**4.** ⓐⓑⓒⓓ	**5.** ⓐⓑⓒⓓ
6. ⓐⓑⓒⓓ	**7.** ⓐⓑⓒⓓ	**8.** ⓐⓑⓒⓓ	**9.** ⓐⓑⓒⓓ	**10.** ⓐⓑⓒⓓ

11. The physical quantity which has the dimensional formula $[M^1T^{-3}]$ is
(a) surface tension (b) solar constant
(c) density (d) compressibility

12. The dimensions of Wien's constant are
(a) $[ML^0TK]$ (b) $[M^0LT^0K]$
(c) $[M^0L^0TK]$ (d) [MLTK]

13. If the capacitance of a nanocapacitor is measured in terms of a unit '*u*' made by combining the electric charge '*e*', Bohr radius 'a_0', Planck's constant 'h' and speed of light '*c*' then
(a) $u = \frac{e^2h}{a_0}$ (b) $u = \frac{hc}{e^2a_0}$ (c) $u = \frac{e^2c}{ha_0}$ (d) $u = \frac{e^2a_0}{hc}$

14. The dimensions of $\frac{1}{\epsilon_o}\frac{e^2}{hc}$ are
(a) $M^{-1}L^{-3}T^4A^2$ (b) $ML^3T^{-4}A^{-2}$
(c) $M^0L^0T^0A^0$ (d) $M^{-1}L^{-3}T^2A$

15. The density of a cube is measured by measuring its mass and length of its 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
(a) 7% (b) 9% (c) 12% (d) 13%

16. Which is different from others by units ?
(a) Phase difference (b) Mechanical equivalent
(c) Loudness of sound (d) Poisson's ratio

17. A quantity *X* is given by $\varepsilon_0 L\frac{\Delta V}{\Delta t}$ where ϵ_0 is the permittivity of the free space, *L* is a length, D*V* is a potential difference and D*t* is a time interval. The dimensional formula for *X* is the same as that of
(a) resistance (b) charge
(c) voltage (d) current

18. If the error in the measurement of the volume of sphere is 6%, then the error in the measurement of its surface area will be
(a) 2% (b) 3% (c) 4% (d) 7.5%

19. In the formula $X = 5YZ^2$, X and Z have dimensions of capacitance and magnetic field, respectively. What are the dimensions of Y in SI units ?
(a) $[M^{-3}L^{-2}T^8A^4]$ (b) $[M^{-1}L^{-2}T^4A^2]$
(c) $[M^{-2}L^0T^{-4}A^{-2}]$ (d) $[M^{-2}L^{-2}T^6A^3]$

20. Multiply 107.88 by 0.610 and express the result with correct number of significant figures.
(a) 65.8068 (b) 65.807 (c) 65.81 (d) 65.8

21. Which of the following is a dimensional constant?
(a) Refractive index (b) Poissons ratio
(c) Strain (d) Gravitational constant

22. If E, m, J and G represent energy, mass, angular momentum and gravitational constant respectively, then the dimensional formula of EJ^2/m^5G^2 is same as that of the
(a) angle (b) length (c) mass (d) time

23. The refractive index of water measured by the relation $m = \frac{\text{real depth}}{\text{apparent depth}}$ is found to have values of 1.34, 1.38, 1.32 and 1.36; the mean value of refractive index with percentage error is
(a) $1.35 \pm 1.48\%$ (b) $1.35 \pm 0\%$
(c) $1.36 \pm 6\%$ (d) $1.36 \pm 0\%$

24. If e is the charge, V the potential difference, T the temperature, then the units of $\frac{eV}{T}$ are the same as that of
(a) Planck's constant (b) Stefan's constant
(c) Boltzmann's constant (d) gravitational constant

25. The dimensions of mobility are
(a) $M^{-2}T^2A$ (b) $M^{-1}T^2A$
(c) $M^{-2}T^3A$ (d) $M^{-1}T^3A$

26. Two quantities A and B have different dimensions which mathematical operation given below is physically meaningful?
(a) A/B (b) A + B (c) A – B (d) A = B

27. The velocity of water waves (v) may depend on their wavelength l, the density of water r and the acceleration due to gravity, g. The method of dimensions gives the relation between these quantities is
(a) v (b) $v^2 \propto g\lambda$
(c) $v^2 \propto g\lambda^2$ (d) $v^2 \propto g^{-1}\lambda^2$

28. Match **List-I** with **List-II**:

List-I	List-II
(A) h (Planck's constant)	(I) $[MLT^{-1}]$
(B) E (kinetic energy)	(II) $[ML^2T^{-1}]$
(C) V (electric potential)	(III) $[ML^2T^{-2}]$
(D) P (linear momentum)	(IV) $[ML^2A^{-1}T^{-3}]$

Choose the correct answer from the options given below:
(a) (A) → (I), (B) → (II), (C) → (IV), (D) → (III)
(b) (A) → (II), (B) → (III), (C) → (IV), (D) → (I)
(c) (A) → (III), (B) → (II), (C) → (IV), (D) → (I)
(d) (A) → (III), (B) → (IV), (C) → (II), (D) → (I)

RESPONSE GRID

11. ⓐⓑⓒⓓ	**12.** ⓐⓑⓒⓓ	**13.** ⓐⓑⓒⓓ	**14.** ⓐⓑⓒⓓ	**15.** ⓐⓑⓒⓓ
16. ⓐⓑⓒⓓ	**17.** ⓐⓑⓒⓓ	**18.** ⓐⓑⓒⓓ	**19.** ⓐⓑⓒⓓ	**20.** ⓐⓑⓒⓓ
21. ⓐⓑⓒⓓ	**22.** ⓐⓑⓒⓓ	**23.** ⓐⓑⓒⓓ	**24.** ⓐⓑⓒⓓ	**25.** ⓐⓑⓒⓓ
26. ⓐⓑⓒⓓ	**27.** ⓐⓑⓒⓓ	**28.** ⓐⓑⓒⓓ		

29. A physical quantity of the dimensions of length that can be formed out of c, G and $\frac{e^2}{4\pi\varepsilon_0}$ is [c is velocity of light, G is universal constant of gravitation and e is charge]

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

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

30. The unit of impulse is the same as that of

(a) energy (b) power

(c) momentum (d) velocity

31. If Q denote the charge on the plate of a capacitor of capacitance C then the dimensional formula for $\frac{Q^2}{C}$ is

(a) $[L^2M^2T]$ (b) $[LMT^2]$

(c) $[L^2MT^{-2}]$ (d) $[L^2M^2T^2]$

32. The mass of the liquid flowing per second per unit area of cross-section of the tube is proportional to (pressure difference across the ends)^n and (average velocity of the liquid)^m. Which of the following relations between m and n is correct?

(a) $m = n$ (b) $m = -n$

(c) $m^2 = n$ (d) $m = -n^2$

33. The force is given in terms of time t and displacement x by the equation

$F = A\cos Bx + C\sin Dt$

The dimensional formula of $\frac{AD}{B}$ is :

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

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

34. Turpentine oil is flowing through a capillary 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 : $\eta = \frac{p(r^2 - x^2)}{4v\ell}$. Here v is velocity of oil at a distance x from the axis of the tube. From this relation, the dimensional formula of η is

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

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

35. Given that $y = A\sin\left[\left(\frac{2\pi}{\lambda}(ct - x)\right)\right]$, where y and x are measured in metre. Which of the following statements is true?

(a) The unit of λ is same as that of x and A

(b) The unit of λ is same as that of x but not of A

(c) The unit of c is same as that of $\frac{2\pi}{\lambda}$

(d) The unit of (ct – x) is same as that of $\frac{2\pi}{\lambda}$

SECTION-B

36. If L = 2.331 cm, B = 2.1 cm, then L + B =

(a) 4.431 cm (b) 4.43 cm

(c) 4.4 cm (d) 4 cm

37. In the relation $x = \cos(\omega t + kx)$, the dimension(s) of ω is/are

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

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

38. In a vernier callipers, ten smallest divisions of the vernier scale are equal to nine smallest division on the main scale. If the smallest division on the main scale is half millimeter, then the vernier constant is

(a) 0.5 mm (b) 0.1 mm

(c) 0.05 mm (d) 0.005 mm

39. A simple pendulum is being used to determine the value of gravitational acceleration *g* at a certain place. The length of the pendulum is 25.0 cm and a stop watch with 1 s resolution measures the time taken for 40 oscillations to be 50 s. The accuracy in *g* is:

(a) 5.40% (b) 3.40%

(c) 4.40% (d) 2.40%

40. In the eqn. $\left(P + \frac{a}{V^2}\right)(V - b) = \text{constant}$, the unit of a is

(a) dyne cm^5 (b) dyne cm^4

(c) dyne/cm^3 (d) dyne cm^2

41. The dimensions of Reynold's constant are

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

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

42. Which of the following do not have the same dimensional formula as the velocity?

Given that m_0 = permeability of free space, e_0 = permittivity of free space, n = frequency, l = wavelength, P = pressure, r = density, w = angular frequency, k = wave number,

(a) $1/\sqrt{\mu_0\varepsilon_0}$ (b) nl (c) $\sqrt{P/\rho}$ (d) ωk

RESPONSE GRID					
	29. ⓐⓑⓒⓓ	**30.** ⓐⓑⓒⓓ	**31.** ⓐⓑⓒⓓ	**32.** ⓐⓑⓒⓓ	**33.** ⓐⓑⓒⓓ
	34. ⓐⓑⓒⓓ	**35.** ⓐⓑⓒⓓ	**36.** ⓐⓑⓒⓓ	**37.** ⓐⓑⓒⓓ	**38.** ⓐⓑⓒⓓ
	39. ⓐⓑⓒⓓ	**40.** ⓐⓑⓒⓓ	**41.** ⓐⓑⓒⓓ	**42.** ⓐⓑⓒⓓ	

43. Unit of magnetic moment is

(a) ampere–metre^2 (b) ampere–metre

(c) weber–metre^2 (d) weber/metre

44. An experiment is performed to obtain the value of acceleration due to gravity g by using a simple pendulum of length L. In this experiment time for 100 oscillations is measured by using a watch of 1 second least count and the value is 90.0 seconds. The length L is measured by using a meter scale of least count 1 mm and the value is 20.0 cm. The error in the determination of g would be:

(a) 1.7% (b) 2.7% (c) 4.4% (d) 2.27%

45. **Statement I :** When we change the unit of measurement of a quantity, its numerical value changes.

Statement II : Smaller the unit of measurement smaller is its numerical value.

(a) Both statement I and II are correct.

(b) Both statement I and II are incorrect.

(c) Statement I is correct but statement II is incorrect.

(d) Statement II is correct but statement I is incorrect.

46. A travelling microscope has 20 divisions per cm on the main scale while its Vernier scale has total 50 divisions and 25 Vernier scale divisions are equal to 24 main scale divisions, what is the least count of the travelling microscope?

(a) 0.001 cm (b) 0.002 mm

(c) 0.002 cm (d) 0.005 cm

47. A silver wire has mass (0.6 ± 0.006) g, radius (0.5 ± 0.005) mm and length (4 ± 0.04) cm. The maximum percentage error in the measurement of its density will be :

(a) 4% (b) 3% (c) 6% (d) 7%

48. A student measuring the diameter of a pencil of circular cross-section with the help of a vernier scale records the following four readings 5.50 mm, 5.55 mm, 5.45 mm, 5.65 mm, The average of these four reading is 5.5375 mm and the standard deviation of the data is 0.07395 mm. The average diameter of the pencil should therefore be recorded as :

(a) (5.5375 ± 0.0739) mm (b) (5.5375 ± 0.0740) mm

(c) (5.538 ± 0.074) mm (d) (5.54 ± 0.07) mm

49. Match **List-I** with **List-II**.

List-I	**List-II**
(A) Capacitance, C	(i) $M^1L^1T^{-3}A^{-1}$
(B) Permittivity of free space, ε_0	(ii) $M^{-1}L^{-3}T^4A^2$
(C) Permeability of free space, μ_0	(iii) $M^{-1}L^{-2}T^4A^2$
(D) Electric field, E	(iv) $M^1L^1T^{-2}A^{-2}$

Choose the correct answer from the options given below

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

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

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

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

50. Which of the following is not a dimensionless quantity ?

(a) Relative magnetic permeability (μ_r)

(b) Power factor

(c) Permeability of free space (μ_0)

(d) Quality factor

RESPONSE GRID					
	43. ⓐⓑⓒⓓ	**44.** ⓐⓑⓒⓓ	**45.** ⓐⓑⓒⓓ	**46.** ⓐⓑⓒⓓ	**47.** ⓐⓑⓒⓓ
	48. ⓐⓑⓒⓓ	**49.** ⓐⓑⓒⓓ	**50.** ⓐⓑⓒⓓ		

PHYSICS CHAPTER-WISE SPEED TEST-1			
Total Questions	50	Total Marks	200
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	60	Qualifying Score	120
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

HINTS & SOLUTIONS

PHYSICS (Chapter-wise Tests)

Speed Test-1

1. **(b)** In CGS system,

$d = 4\frac{g}{cm^3}$

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

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

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

2. **(c)** Energy per unit volume, $u = \frac{B^2}{2\mu_0}$

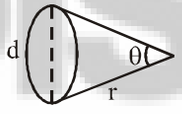
$$\left[\frac{B^2}{\mu_0}\right] = [u] = \frac{[ML^2T^{-2}]}{[L^3]} = [ML^{-1}T^{-2}]$$

3. **(a)** Number of significant figures in 23.023= 5
Number of significant figures in 0.0003 = 1
Number of significant figures in 2.1×10^{-3} = 2

4. **(c)** We have

$1s = \frac{1}{3600°}$

So, $2000s = \left(\frac{2000}{3600}\right)^\circ = \left(\frac{2000}{3600}\times\frac{\pi}{180}\right)$ rad



as $d = r\theta = 1.5\times10^{11}\times\frac{2000}{3600}\times\frac{\pi}{180} = \frac{3000\times10^{11}\times\pi}{3600\times180}$
$= 1.45\times10^9$ m

5. **(d)** Given, $T = k\sqrt{\frac{\rho r^3}{S^{\frac{3}{2}}}}$

Dimension of LHS = M^0L^0T

$$\text{Dimension of RHS} = \frac{\left[M^{\frac{1}{2}}L^{-\frac{3}{2}}\right]\left[L^{\frac{3}{2}}\right]}{\left[MT^{-2}\right]^{\frac{3}{4}}} = M^{\frac{1}{8}}L^0T^{\frac{3}{2}}$$

Dimension of L.H.S ≠ Dimension of R.H.S
So, assertion is false and reason is true.

6. **(c)** $\frac{\Delta P}{P}\times100 = \frac{\Delta F}{F}\times100 + 2\frac{\Delta\ell}{\ell}\times100 = 4\% + 2\times2\%$
$= 8\%$

7. **(d)** Conductance,

$G = \frac{1}{\text{resistance}} = \text{mho}(\Omega^{-1})$ or siemen (S)

8. **(d)** $F\propto v \Rightarrow F = kv \Rightarrow [k] = \left[\frac{F}{v}\right] = \left[\frac{MLT^{-2}}{LT^{-1}}\right] = [ML^0T^{-1}]$

9. **(c)** $\frac{0.2}{25}\times100 = 0.8\%$

10. **(a)** As, density = $[F]^a[L^b][T^c]$
$[ML^{-3}] = [MLT^{-2}]^a\ [L]^b[T]^c$
$[ML^{-3}] = [M^aL^aT^{-2a}L^bT^c]$
$[M^1L^{-3}] = [M^aL^{a+b}T^{-2a+c}]$
On comparing
a = 1, a + b = –3, 1 + b = –3, b = –4
–2a + c = 0 ⇒ c = 2a
c = 2 ∴ Density = $[F^1L^{-4}T^2]$

11. **(b)** Solar constant = energy/area/time

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

12. **(b)** $b = \lambda_m T = LK = [M^0L^1T^0K^1]$

13. **(d)** Let unit 'u' related with e, a_0, h and c as follows.

$[u] = [e]^a[a_0]^b[h]^c[C]^d$

Using dimensional method,
$[M^{-1}L^{-2}T^{+4}A^{+2}] = [A^1T^1]^a[L]^b[ML2T^{-1}]^c[LT^{-1}]^d$
$[M^{-1}L^{-2}T^{+4}A^{+2}] = [M^cL^{b+2c+d}T^{a-c-d}A^a]$
$a = 2,\ b = 1,\ c = -1,\ d = -1$

$\therefore\ u = \frac{e^2a_0}{hc}$

14. **(c)** From $F = \frac{1}{4\pi\varepsilon_o}\frac{e^2}{r^2}$

$\therefore\ \frac{e^2}{\varepsilon_o} = 4\pi Fr^2$ (dimensionally)

$\frac{e^2}{\varepsilon_o hc} = \frac{4\pi Fr^2}{hc} = \frac{(MLT^{-2})L^2}{ML^2T^{-1}[LT^{-1}]} = [M^0L^0T^0A^0]$,

$\frac{e^2}{\varepsilon_o hc}$ is called fine structure constant & has value $\frac{1}{137}$.

15. **(d)** Density = $\frac{\text{Mass}}{\text{Volume}}$

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

% error in density = % error in Mass + 3 (% error in length]
$= 4 + 3(3) = 13\%$

16. **(d)** Poisson's ratio is a unitless quantity.

17. **(d)** Dimensionally $\varepsilon_0 L$ = Capacitance (c)

$\therefore\ \varepsilon_0 L\frac{\Delta V}{\Delta t} = \frac{C\Delta V}{\Delta t} = \frac{q}{\Delta t} = I$

18. **(c)** $\frac{\Delta V}{V} = 3\frac{\Delta r}{r}$ or $6\% = 3\frac{\Delta r}{r}$ or $\frac{\Delta r}{r} = 2\%$

Now surface area $s = 4\pi r^2$ or $\log s = \log 4\pi + 2\log r$

$\therefore \quad \frac{\Delta s}{s} = 2\frac{\Delta r}{r} = 2\times 2\% = 4\%.$

19. **(a)** $X = 5YZ^2 \Rightarrow Y \propto \frac{X}{Z^2}$ ...(i)

$X = \text{Capacitance} = \frac{Q}{V} = \frac{Q^2}{W} = \frac{[A^2T^2]}{[ML^2T^{-2}]}$

$X = [M^{-1}L^{-2}T^4A^2]$

$Z = B = \frac{F}{IL} \qquad [\because F = ILB]$

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

$Y = \frac{[M^{-1}L^{-2}T^4A^2]}{[MT^{-2}A^{-1}]^2} \Rightarrow Y = [M^{-3}L^{-2}T^8A^4]$ (Using (i))

20. **(d)** Number of significant figures in multiplication is three, corresponding to the minimum number

$107.88 \times 0.610 = 65.8068 = 65.8$

21. **(d)** A quantity which has dimensions and a constant value is called dimensional constant. Therefore, gravitational constant (G) is a dimensional constant.

22. **(a)** $\frac{[ML^2T^{-2}][ML^2T^{-1}]^2}{[M^5][M^{-1}L^3T^{-2}]^2} = [M^0L^0T^0] = \text{angle.}$

23. **(a)** The mean value of refractive index,

$\mu = \frac{1.34 + 1.38 + 1.32 + 1.36}{4} = 1.35$

and

$\Delta\mu = \frac{|(1.35-1.34)| + |(1.35-1.38)| + |(1.35-1.32)| + |(1.35-1.36)|}{4}$

$= 0.02$

Thus $\frac{\Delta\mu}{\mu}\times 100 = \frac{0.02}{1.35}\times 100 = 1.48$

24. **(c)** $\frac{eV}{T} = \frac{W}{T} = \frac{PV}{T} = R$

and $\frac{R}{N} = \text{Boltzmann constant.}$

25. **(b)** $\text{Mobility } \mu = \frac{\text{drift velocity}}{\text{electric field}} \frac{V_d}{E} = \frac{(ms^{-1})}{(Vm^{-1})} = \frac{m^2s^{-3}}{V}$

$\left(\because \text{Volt} = V = \frac{\text{joule(J)}}{\text{coulomb(C)}}\right)$

$= \frac{m^2s^{-1}C}{J} = \frac{m^2s^{-1}As}{kgm^2s^{-2}}$ [Coulomb, c = As]

$= kg^{-1}s^2A = M^{-1}T^2A$

26. **(a)**

27. **(b)** $v = k\lambda^a\rho^b g^c$

$[M^0LT^{-1}] = L^a(ML^{-3})^b(LT^{-2})^c$

$= M^bL^{a-3b+c}T^{-2c}$

$\therefore \quad b = 0;\ a - 3b + c = 1$

$-2c = -1 \Rightarrow \quad c = 1/2 \qquad \therefore \quad a = \frac{1}{2}$

$v \propto \lambda^{1/2}\rho^0 g^{1/2} \quad \text{or} \quad v^2 \propto \lambda g$

28. **(b)** Planck's constant,

$h = \frac{E}{V} = [ET] = ML^2T^{-2}\times T = [ML^2T^{-1}]$

Kinetic energy,

$[E] = \frac{1}{2}mv^2 = [ML^2T^{-2}]$

Electric potential,

$[V] = \left[\frac{U}{q}\right] = \frac{ML^2T^{-2}}{AT} = [ML^2T^{-3}A^{-1}]$

Linear momentum,

$[P] = mv = M\times LT^{-1} = [MLT^{-1}]$

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

$L = [c]^x[G]^y\left[\frac{e^2}{4\pi\varepsilon_0}\right]^z$

$\frac{e^2}{4\pi\varepsilon_0} = ML^3T^{-2}$

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

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

Comparing both sides

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

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

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

From (i), (ii) & (iii)

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

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

30. **(c)** Impulse = change in momentum

31. **(c)** We know that $\frac{Q^2}{2C}$ is energy of capacitor so it represent the dimension of energy = $[ML^2T^{-2}]$.

32. **(b)** Let $M = p^nv^m$

$ML^{-2}T^{-1} = (ML^{-1}T^{-2})^n(LT^{-1})^m = M^nL^{-n+m}T^{-2n-m}$

$\therefore \quad n = 1;\ -n + m = -2$

$\therefore \quad m = -2 + n = -2 + 1 = -1 \qquad \therefore \quad m = -n$

33. **(b)** Dimension of $A = MLT^{-2}$, $B = T^{-1}$, $D = L^{-1}$

$\text{Dimension} = \frac{AB}{D} = \frac{MLT^{-2}T^{-1}}{L^{-1}} = ML^2T^{-3}$

34. **(a)** $\eta = \frac{p(r^2 - x^2)}{4vl} = \frac{[ML^{-1}T^{-2}][L^2]}{[LT^{-1}][L]} = [ML^{-1}T^{-1}]$

35. **(a)** The unit of λ, x and A are the same

36. **(c)** $L + B = 2.331 + 2.1 \cong 4.4$ cm

Since minimum significant figure is 2.

37. **(c)** Given, $x = \cos(\omega t + kx)$

$(\omega t + kx)$ is an angle and hence it is a dimension less quantity.

$[(\omega t + kx)] = [M^0L^0T^0]$

or $[\omega t] = [M^0L^0T^0]$

$[\omega] = \frac{[M^0L^0T^0]}{[T]} = [M^0L^0T^{-1}]$

38. **(c)** $10\,VD = 9MD, 1VD = \frac{9}{10}MD$

Vernier constant = 1 MD – 1 VD

$= \left(1 - \frac{9}{10}\right)MD = \frac{1}{10}MD = \frac{1}{10} \times \frac{1}{2} = 0.05\,mm$

39. **(c)** Given, Length of simple pendulum, $l = 25.0$ cm

Time of 40 oscillation, $T = 50s$

Time period of pendulum

$T = 2\pi\sqrt{\frac{\ell}{g}} \Rightarrow T^2 = \frac{4\pi^2\ell}{g} \Rightarrow g = \frac{4\pi^2\ell}{T^2}$

$\Rightarrow$ Fractional error in g = $\frac{\Delta g}{g} = \frac{\Delta l}{l} + \frac{2\Delta T}{T}$

$\Rightarrow \frac{\Delta g}{g} = \left(\frac{0.1}{25.0}\right) + 2\left(\frac{1}{50}\right) = 0.044$

$\therefore$ Percentage error in $g = \frac{\Delta g}{g} \times 100 = 4.4\%$

40. **(b)** As $\frac{a}{V^2} = P$

$\therefore\ a = PV^2 = \frac{dyne}{cm^2}(cm^3)^2 = dyne\,cm^4$

41. **(a)** Reyonld's constant is a pure number, hence it has no dimensions.

42. **(d)** $\omega k = \frac{1}{T} \times \frac{1}{L} = [L^{-1}T^{-1}]$

The dimensions of the quantities in a, b, c are of velocity $[LT^{-1}]$

43. **(a)** M = Pole strength × length

= amp – metre × metre = amp – metre^2

44. **(b)** According to the question.

$t = (90 \pm 1)$ or, $\frac{\Delta t}{t} = \frac{1}{90}$

$l = (20 \pm 0.1)$ or, $\frac{\Delta l}{l} = \frac{0.1}{20}$

$\frac{\Delta g}{g}\% = ?$

As we know,

$t = 2\pi\sqrt{\frac{l}{g}} \Rightarrow g = \frac{4\pi^2 l}{t^2}$

or, $\frac{\Delta g}{g} = \pm\left(\frac{\Delta l}{l} + 2\frac{\Delta t}{t}\right) = \left(\frac{0.1}{20} + 2 \times \frac{1}{90}\right) = 0.027$

$\therefore\ \frac{\Delta g}{g}\% = 2.7\%$

45. **(c)** We know that $Q = n_1u_1 = n_2u_2$ are the two units of measurement of the quantity Q and n_1, n_2 are their respective numerical values. From relation $Q_1 = n_1u_1 = n_2u_2$, nu = constant $\Rightarrow n \propto 1/u$ i.e., smaller the unit of measurement, greater is its numerical value.

46. **(c)** 1 MSD = $\frac{1}{20}$ cm

1 VSD = $\frac{24}{25}$ MSD = $\frac{24}{25} \times \frac{1}{20}$ cm

$\therefore$ Least count = $\frac{1}{20}\left(1 - \frac{24}{25}\right)$ cm

[$\because$ Least count = 1MSD – 1VSD]

$= \frac{1}{20} \times \frac{1}{25} = \frac{1}{500}\,cm = 0.002\,cm$

47. **(a)** We have

$\rho = \frac{m}{v} = \frac{m}{\frac{4}{3}\pi r^2 h} \Rightarrow \frac{\Delta\rho}{\rho} = \frac{\Delta m}{m} + \frac{2\Delta r}{r} + \frac{\Delta h}{h}$

$= \frac{0.006}{0.6} + \frac{2 \times 0.005}{0.5} + \frac{0.04}{4}$

$= 0.01 + 2 \times 0.01 + 0.01 = 0.01 + 0.02 + 0.01 = 0.04$

So, $\frac{\Delta\rho}{\rho} \times 100 = 4\%$

48. **(d)** Average diameter, $d_{av} = 5.5375$ mm

Deviation of data, $\Delta d = 0.07395$ mm

As the measured data have two digits after decimal, therefore answer should be in two digits after decimal.

$\therefore d = (5.54 \pm 0.07)$ mm

49. **(a)** Charge Q = CV

$\Rightarrow C = \frac{Q}{V} = \frac{(A \times T)^2}{M\,L^2\,T^{-2}} = M^{-1}\,L^{-2}\,T^4\,A^2$

Electric Field, $E = \frac{F}{q} = \frac{M\,L\,T^{-2}}{AT} = M\,L\,T^{-3}A^{-1}$

Force, $F = \frac{q_1\,q_2}{4\pi\,\epsilon_0\,r^2} \Rightarrow \epsilon_0 = M^{-1}\,L^{-3}\,T^4\,A^2$

Speed of light, $C = \frac{1}{\sqrt{\mu_0\,\epsilon_0}}$

$\Rightarrow \mu_0 = \frac{1}{\epsilon_0\,C^2} = \frac{1}{\left[M^{-1}L^{-3}T^4A^2\right]\left[LT^{-1}\right]^2}$

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

50. **(c)** As $B = \frac{\mu_0 i}{2\pi r}$

$[\mu_0] = \left[\frac{B \times 2\pi r}{i}\right] = \left[\frac{N}{Am} \times \frac{m}{A}\right] = \left[\frac{N}{A^2}\right] = MLT^{-2}A^{-2}$

Clearly, μ_0 is not a dimensionless quantity.

BIOLOGY

SPEED TEST

59

Chapter-wise

The Living World

(Botany)

Maximum Marks: 200 **Time: 1 Hour**

GENERAL INSTRUCTIONS

- This test contains 50 questions divided into two sections, Section-A consists of 35 MCQs and Section-B consists of 15 MCQs. For each Multiple Choice Question only one option is correct. Darken the correct circle/bubble in the Response Grid provided.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

Section-A

1. The living organisms can be unexceptionally distinguished from the non-living things on the basis of their ability for
(a) interaction with the environment and progressive evolution
(b) reproduction
(c) growth and movement
(d) responsiveness to touch.

2. Which one of the following animals is correctly matched with its particular named taxonomic category?
(a) Tiger - *tigris*, the species
(b) Cuttle fish - mollusca, a class
(c) Humans - primata, the family
(d) Housefly - musca, an order

3. Taxonomic hierarchy refers to
(a) Step-wise arrangement of all categories for classification of plants and animals
(b) A group of senior taxonomists who decide the nomenclature of plants and animals
(c) A list of botanists or zoologists who have worked on taxonomy of a species or group
(d) Classification of a species based on fossil record

4. Choose correct scientific name of mango.
(a) *Mangifera Indica*
(b) *Mangifera indica* Linn
(c) *Mangifera indica* Hook
(d) *Mangifera indica* L

5. Arrange the following taxonomic categories in increasing number of common characteristics w.r.t. plant mango
(i) Dicotyledonae (ii) Polymoniales
(iii) *Mangifera* (iv) Angiospermae
(v) Anacardiaceae
(a) (i) → (iv) → (ii) → (v) → (iii)
(b) (i) → (iv) → (iii) → (ii) → (v)
(c) (iv) → (i) → (ii) → (v) → (iii)
(d) (iv) → (i) → (iii) → (v)→ (ii)

6. The common characteristics between brinjal and wheat can be observed maximum at the level of their.
(a) Division (b) Phylum
(c) Kingdom (d) Both (b) and (c)

7. Study of number of chromosomes for resolving difficulties in classification is used in
(a) Chemotaxonomy
(b) Morphotaxonomy
(c) Cytotaxonomy
(d) Biochemical taxonomy

8. Choose the correct statement from the following statements.
(i) Each genus has only one specific epithet representing different organisms.
(ii) Genera are aggregates of closely related species.
(iii) Families are characterised on the basis of vegetative features of plant species.
(iv) The similar characters are less in number as compared to different genera.
(v) The taxonomic categories from species to kingdom have been shown in ascending order starting.
(a) (i) and (iv) (b) (ii), (iv) and (v)
(c) (iii), (iv) and (v) (d) All of these

9. The main objective of plant taxonomy is
(a) to study the world's flora
(b) to provide a method for identification and nomenclature
(c) to provide Latin 'scientific' names for every group of plants in the world
(d) all of these

10. Which one of the following has least similar characters?
(a) Family (b) Class
(c) Genus (d) Species

11. Match column I with column II for housefly classification and select the correct option using the codes given below.

	Column I		**Column II**
A.	Family	(i)	Diptera
B.	Order	(ii)	Arthropoda
C.	Class	(iii)	Muscidae
D.	Phylum	(iv)	Insecta

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

Response Grid

1. (a)(b)(c)(d)	2. (a)(b)(c)(d)	3. (a)(b)(c)(d)	4. (a)(b)(c)(d)	5. (a)(b)(c)(d)
6. (a)(b)(c)(d)	7. (a)(b)(c)(d)	8. (a)(b)(c)(d)	9. (a)(b)(c)(d)	10. (a)(b)(c)(d)
11. (a)(b)(c)(d)				

12. Match the items given in column I with those in column II and select the correct option given below.

	Column I		Column II
A.	Herbarium	(i)	It is a place having a collection of preserved plants and animals.
B.	Key	(ii)	A list that enumerates methodically all the species found in an area with brief description aiding identification.
C.	Museum	(iii)	Is a place where dried and pressed plant specimens mounted on sheets are kept.
D.	Catalogue	(iv)	A booklet containing a list of characters and their alternates which are helpful in identification of various taxa.

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

13. Match the following and choose the correct combination from the options given.

	Column I (Common name)		Column II (Taxonomic category Order)
A.	Wheat	(i)	Primata
B.	Mango	(ii)	Diptera
C.	Housefly	(iii)	Sapindales
D.	Man	(iv)	Poales

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

14. Which of the following statement is not true?
(a) Homeostasis is a fundamental property of life
(b) When the external temperature is warm, the superficial blood vessels constrict to prevent loss of body heat
(c) Human beings are endothermic
(d) Human beings are homeothermic

15. Species is :
(a) population of individuals having same genotypes and phenotypes
(b) a group of individuals inhabiting a geographical area
(c) a group of interbreeding populations
(d) population of one type

16. The usage of binomial names, for plant species was accepted by all after the publication of the work by :
(a) Hooker (b) Linnaeus
(c) Bentham (d) Darwin

17. Which of the following is less general in characters as compared to genus ?
(a) Species (b) Division
(c) Class (d) Family

18. A taxon with reference to classification of living organisms can be defined as
(a) a group of similar genera
(b) a group of similar species
(c) a group of organisms based on chromosome numbers
(d) a group of any one rank of organisms

19. Species are considered as
(a) Real units of classification devised by taxonomists
(b) Real basic units of classification
(c) The lowest units of classification
(d) Artificial concept of human mind which cannot be defined in absolute terms

20. Linneaus system of classification is :
(a) Natural (b) Artificial
(c) Phylogenetic (d) Progressive

21. The book systema naturae was written by
(a) Carolus Von Linnaeus
(b) Hutchinson
(c) Engler and Prantl
(d) Bentham & Hooker

22. **Statement I:** The first word in a biological name represents the genus.
Statement II: The second component denotes the specific epithet.
(a) Both the Statement I and Statement II are incorrect.
(b) Statement I is correct and Statement II is incorrect.
(c) Statement I is incorrect and Statement II is correct.
(d) Both Statement I and Statement II are correct.

23. What is true for individuals of same species?
(a) Live in same niche
(b) Live in same habitat
(c) Interbreeding
(d) Live in different habitat

24. **Statement I:** Identification is the process by which anything is grouped into convenient categories based on some easily observable characters.
Statement II: 'Animals', 'mammals', 'dogs' are all systematic.
(a) Both the Statement I and Statement II are incorrect.
(b) Statement I is correct and Statement II is incorrect.
(c) Statement I is incorrect and Statement II is correct.
(d) Both Statement I and Statement II are correct.

25. An animal with same generic, specific and subspecific names is
(a) man (b) gorilla
(c) rabbit (d) elephant

Response Grid					
	12. (a) (b) (c) (d)	13. (a) (b) (c) (d)	14. (a) (b) (c) (d)	15. (a) (b) (c) (d)	16. (a) (b) (c) (d)
	17. (a) (b) (c) (d)	18. (a) (b) (c) (d)	19. (a) (b) (c) (d)	20. (a) (b) (c) (d)	21. (a) (b) (c) (d)
	22. (a) (b) (c) (d)	23. (a) (b) (c) (d)	24. (a) (b) (c) (d)	25. (a) (b) (c) (d)	

26. **Assertion (A):** We sense our environment through our external organs.
Reason (R): Plants respond to external factors like light, water, temperature, other organisms, pollutants, etc.
(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).

27. Which of the following is against the rules of ICBN?
(a) Generic and specific names should be written starting with small letters.
(b) Hand written scientific names should be underlined.
(c) Every species should have a generic name and a specific epithet.
(d) Scientific names are in Latin and should be italized.

28. The category which includes related families is
(a) Class (b) Phylum
(c) Order (d) Kingdom

29. **Statement I:** Museums have collections of preserved plant and animal specimens for study and reference.
Statement II: Large animals are preserved in insect boxes after collecting, killing and pinning.
(a) Both the Statement I and Statement II are incorrect.
(b) Statement I is correct and Statement II is incorrect.
(c) Statement I is incorrect and Statement II is correct.
(d) Both Statement I and Statement II are correct.

30. **Assertion (A):** Reproduction cannot be an all-inclusive defining characteristic of living organisms.
Reason (R): There are many organisms which do not reproduce (mules, sterile worker bees, infertile human couples, etc).
(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).

31. Classification based on sequencing of DNA and chemical nature of protein is
(a) Chemotaxonomy
(b) Cytotaxonomy
(c) Adansonian taxonomy
(d) Karyotaxonomy

32. **Statement I:** The keys are based on the contrasting characters generally in a pair called couplet.
Statement II: Keys are generally hypothetical in nature.
(a) Both the Statement I and Statement II are incorrect.
(b) Statement I is correct and Statement II is incorrect.
(c) Statement I is incorrect and Statement II is correct.
(d) Both Statement I and Statement II are correct.

33. Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?
(a) Biological names can be written in any language
(b) The first word in a biological name represents the genus name, and the second is a specific epithet
(c) The names are written in Latin and are italicised
(d) When written by hand, the names are to be underlined

34. Which of the following statements is/are incorrect?
(i) Flora contains the actual account of habitat and distribution of plants of a given area.
(ii) Taxonomic aids help in correct identification.
(iii) Manuals are useful in providing information for identification of names of species found in an area.
(iv) Monographs contain information on any one taxon.
(a) (i) and (ii)
(b) (ii), (iii) and (iv)
(c) (ii) and (iv)
(d) (i), (ii), (iii) and (iv)

35. **Assertion (A):** Characterisation, identification, classification and nomenclature are the processes that are basic to taxonomy.
Reason (R): External and internal structure of organisms are essential and form the basis of modern taxonomic studies.
(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).

Section-B

36. No non-living object is capable of reproduction or replication by itself. Although reproduction can not be an all-inclusive defining characteristics of living organisms because
(a) Organisms like mules do not reproduce
(b) It brings about variation in offsprings
(c) Clones are blueprints of their parents
(d) Drones (male honey bees) are produced parthenogenetically

37. Which of the following have more characters in common?
(a) Order (b) Class
(c) Phylum (d) Family

38. Mark the odd one in the following:
(a) Family (b) Class
(c) Taxon (d) Phylum

39. **Assertion (A):** Insects represent a group of organisms sharing common features
Reason (R): Insects are recognisable concrete objects which can be classified, and thus were given a rank or category.
(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).

Response Grid					
	26. ⓐ ⓑ ⓒ ⓓ	27. ⓐ ⓑ ⓒ ⓓ	28. ⓐ ⓑ ⓒ ⓓ	29. ⓐ ⓑ ⓒ ⓓ	30. ⓐ ⓑ ⓒ ⓓ
	31. ⓐ ⓑ ⓒ ⓓ	32. ⓐ ⓑ ⓒ ⓓ	33. ⓐ ⓑ ⓒ ⓓ	34. ⓐ ⓑ ⓒ ⓓ	35. ⓐ ⓑ ⓒ ⓓ
	36. ⓐ ⓑ ⓒ ⓓ	37. ⓐ ⓑ ⓒ ⓓ	38. ⓐ ⓑ ⓒ ⓓ	39. ⓐ ⓑ ⓒ ⓓ	

40. Choose the incorrect statements (i-v) from the following.
(i) Herbarium is a store house of collected plant specimens that are dried, pressed and preserved on sheets.
(ii) Plant species in botanical gardens are grown for decoration purposes.
(iii) Biological museums are generally set up in educational institutes such as schools and colleges.
(iv) A Zoo is a place where wild animals are kept for entertainment purpose.
(v) The keys are based on the similar characters generally called couplet.
(a) Only (v) (b) (i), (iii) and (v)
(c) (ii), (iv) and (v) (d) all of these

41. Which of the following option is correct?
(a) Only living organisms grow.
(b) Plants grow only up to a certain age.
(c) The growth in living organisms is from inside.
(d) All of the above.

42. Which of the following is most important for speciation ?
(a) Seasonal isolation (b) Reproductive isolation
(c) Behavioural isolation (d) Temporal isolation

43. **Statement I:** Metabolic reactions can be demonstrated inside the body of cell.
Statement II: The sum total of all the chemical reactions occurring in our body is metabolism.
(a) Both the Statement I and Statement II are incorrect.
(b) Statement I is correct and Statement II is incorrect.
(c) Statement I is incorrect and Statement II is correct.
(d) Both Statement I and Statement II are correct.

44. All members of different species of plants and animals present in particular area make up
(a) Population (b) Community
(c) Ecosystem (d) Biosphere

45. Which of the following statements regarding growth is **incorrect**?
(a) In animals growth is seen up to a certain age.
(b) Increase in body mass is considered as growth.
(c) Growth by cell division occurs continuously throughout their life span in animals.
(d) Increase in mass and number of individuals is the characteristics feature of animal growth.

46. Which two points are known as the twin characteristics of growth?
(i) Increase in mass
(ii) Differentiation
(iii) Increase in number of individuals
(iv) Response to stimuli
(a) (i) and (ii) (b) (i) and (iv)
(c) (ii) and (iii) (d) (i) and (iii)

47. Which of the following statements regarding growth is incorrect?
(a) In plants, growth by cell division is seen only upto a certain stage.
(b) Growth exhibited by non-living objects is by accumulation of material on the surface.
(c) A multicellular organism grows by cell division.
(d) Growth in *in-vitro* culture of unicellular organisms can be observed by counting the number of cells.

48. Match the taxonomic categories given in column I with their feature given in column II.

	Column-I		**Column-II**
A.	Taxon	(i)	Basic unit of classification
B.	Species	(ii)	A taxonomic group of any rank
C.	Phylum	(iii)	Division is the same category in case of plants
D.	Genus	(iv)	Identified based on a number of similar characters
		(v)	Group of related species having more character in common with others species

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

49. 'Taxa' differs from 'taxon' due to being:
(a) a higher taxonomic category than taxon.
(b) lower taxonomic category than taxon.
(c) the plural of taxon.
(d) the singular of taxon.

50. Taxonomic hierarchy refers to:
(a) step-wise arrangement of all categories for classification of plants and animals.
(b) a group of senior taxonomists who decide the nomenclature of plants and animals.
(c) a list of botanists or zoologists who have worked on taxonomy of a species or group.
(d) classification of a species based on fossil record.

Response Grid	40. ⓐ ⓑ ⓒ ⓓ 41. ⓐ ⓑ ⓒ ⓓ 42. ⓐ ⓑ ⓒ ⓓ 43. ⓐ ⓑ ⓒ ⓓ 44. ⓐ ⓑ ⓒ ⓓ 45. ⓐ ⓑ ⓒ ⓓ 46. ⓐ ⓑ ⓒ ⓓ 47. ⓐ ⓑ ⓒ ⓓ 48. ⓐ ⓑ ⓒ ⓓ 49. ⓐ ⓑ ⓒ ⓓ 50. ⓐ ⓑ ⓒ ⓓ

BIOLOGY CHAPTER-WISE SPEED TEST-59			
Total Questions	50	Total Marks	200
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	60	Qualifying Score	130
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

HINTS AND SOLUTIONS

BIOLOGY (Chapter-wise Tests)

SPEED TEST-59

1. **(a)** There are several factors and processes which differentiate living beings with non-living beings like reproduction, respiration, growth, etc. But among them reproduction is the only characteristic which differentiates without any exception, living being from non-living beings.
2. **(a)** *Panthera tigris* is the scientific name of tiger.
3. **(a)** **4.** **(b)** **5.** **(c)**
6. **(a)** The common characteristics between brinjal and wheat can be observed maximum at the level of their division.
7. **(c)** Cytotaxonomy is the study of chromosome number, size and behaviour.
8. **(b)** Statement ii, iv and v are correct while Each genus may have one or more than one specific epithets representing different organisms, but having morphological similarities. And Families are characterised on the basis of both vegetative and reproductive features of plant species.
9. **(d)**
10. **(b)** The number of similar characters of categories decreases from lowest rank to highest rank in a taxonomic hierarchy. Out of the given categories i.e., family, class, genus and species, the class being the highest category possesses the least similar characters.
11. **(a)** **12.** **(d)** **13.** **(b)**
14. **(b)** When external temperature is warm, the superficial blood vessels dilate to lose the body heat.
15. **(c)** The biological species concept was formulated by Theodosium Dobzhansky and Ernst Mayr. According to this concept "A species is a reproductive community of populations whose members can interbreed with each other but not with the members of other species.
16. **(b)** Carolus Von Linnaeus in his book Genera Plantanum made use of the artificial system of classification. He distinguished between the natural and artificial systems. He used the binomial nomenclature system and classified organisms into genius and species.
17. **(a)** Species is the lowest taxonomic category. Class is a category made of one or more related orders possessing similar correlated characters, Family is composed of one to many related genera. Division comprises of several related classes.
18. **(d)** Taxon is a grouping of organisms of any level in hierarchy of classification based on some common characteristic.
19. **(c)** Species is the lowest or basic taxonomic category comprising of one or more natural population of individuals that interbreed freely.
20. **(b)** Carolus Linnaeus system of classification is artificial.
21. **(a)** Carolus Von Linnaeus wrote the book systema Naturae.
22. **(d)**
23. **(c)** Individuals of the same species can interbreed. No two individuals share the same ecological niche.
24. **(a)** Classification is the process by which anything is grouped into convenient categories based on some easily observable characters. 'Animals', 'mammals', 'dogs' are all taxa.
25. **(b)** Trinomial nomenclature of gorilla is *Gorilla gorilla gorilla*.
26. **(c)** We senses our environment through our sense organs.
27. **(a)** The first word denoting the genus starts with a capital letter while the specific epithet starts with a small letter.
28. **(c)** Many related families can be grouped under an order.
29. **(b)** Insects are preserved in insect boxes after collecting, killing and pinning. Larger animals like birds and mammals are usually stuffed and preserved.
30. **(d)**
31. **(a)** Chemotaxonomy is the method of biological classifi cation based on similarities in the structure of certain compounds among the organisms being classified.
32. **(b)** Keys are generally analytical in nature.
33. **(a)** Universal rules of nomenclature are as follows:
(i) Biological names are generally in Latin and written in italics. They are Latinised or derived from Latin irrespective of their origin.
(ii) The first word in a biological name represents the genus while the second component denotes the specific epithet.
(iii) Both the words in a biological name, when handwritten, are separately underlined, or printed in italics to indicate their Latin origin.
(iv) The first word denoting the genus starts with a capital letter while the specific epithet starts with a small letter.
34. **(d)** All the above statements are correct.
35. **(a)** External and internal structure, along with the structure of cell, development process and ecological information of organisms are essential and form the basis of modern taxonomic studies. Hence, characterisation, identification, classification and nomenclature are the processes that are basic to taxonomy.
36. **(a)** Reproduction is a characteristic feature of all living organisms.
37. **(b)** Animals in lower hierarchy possess more characters in common.
38. **(c)** Phylum, class and family are classificatory units.
39. **(d)**
40. **(c)** Plant species in botanical gardens are grown for identification purposes and each plant is labelled indicating its botanical/scientific name and its family. Zoo is a place where wild animals are kept in protected environments under human care and which enable us to learn about their food habits and behaviour. The keys are based on the contrasting characters generally in a pair called couplet.
41. **(c)** Growth is the act or process, or a manner of growing; development; gradual increase. It is an exclusive event in majority of the higher animals and plants. In plants, growth occurs continuously throughout their life span and in animal, growth is seen only up to a certain age. In living organisms, growth is from inside. Therefore, it cannot be taken as a defining property of living organisms.
42. **(b)** The most important process for formation of new species is reproductive isolation as this prevents interbreeding in between members of a population, thus giving rise to new species.

43. **(c)** Metabolic reactions can be demonstrated outside the body in cell-free systems.

44. **(b)** Members of same species form population and members of different species form community.

45. **(c)** Growth may be defined as a positive change in size, often over a period of time. It can occur as a stage of maturation or a process toward fullness or fulfillment. Growth by cell division occurs continuously throughout their life span in plants.

46. **(d)** Increase in mass & increase in number of individual.

47. **(a)** In plants, growth by cell division occurs continuously throughout their life span.This continuos growth in plant is axial (i.e., takes place on two axes) and unique. Plant growth consists of primary and secondary growth, on the basis of time when it occurs.

48. **(c)** A-(i), B-(i), C-(iii), D-(v)

49. **(c)** Taxa is a plural form of taxon. **Taxon** is a grouping of organisms of any level in hierarchial classification which is based on some common characteristics. It represents real biological objects placed in any category while category itself is an abstract term.

50. **(a)** **Taxonomical hierarchy** (introduced by linneaus) is arrangement of various taxonomic levels in the descending order, starting from kingdom upto species. The hierarchy indicates the various levels of kinship. The number of similar characters of categories decreases from lowest rank to highest rank i.e., from species to kingdom. There are 7 obligate categories which constitute taxonomical hierarchy. In addition to these obligate categories there are some optional categories are as follows. e.g., Tribe, subclass, superclass, etc.