



# Monthly Progressive Test

Class: IX(S)

Subject: PCMB

Test Booklet No.: MPT06

Test Date: 

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Time: 120 mins

Full Marks: 200

## Solutions

### Physics

1. Ⓓ

Apparent motion of the Sun around the Earth

2. Ⓓ

G is universal constant

3. Ⓐ

$$F \propto \frac{1}{d^2} \quad \frac{F'}{F} = \frac{d^2}{4d^2} \Rightarrow F' = \frac{F}{4}$$

4. Ⓑ

$$\text{Apply } F = \frac{G \cdot m_1 \cdot m_2}{d^2}$$

5. Ⓐ

$$k = gR^2 \Rightarrow \ln k = \ln g + 2 \ln R$$

on differentiating both sides, we get

$$0 = \left( \frac{dg}{g} + 2 \frac{dR}{R} \right) \Rightarrow 0 = \frac{dg}{g} \times 100 + 2 \frac{dR}{R} \times 100$$

$$\Rightarrow 0 = 2\% + 2 \left( \frac{dR}{R} \times 100 \right)$$

$$\Rightarrow \frac{dR}{R} \times 100 = -1\%$$

6. Ⓑ

$$u = mg(2) = mg'(4)$$

$$g' = \frac{g}{2} = 4.9 \text{ m/s}^2$$

7. Ⓐ

Areal velocity is constant

8. Ⓒ

$$\text{As } GM = gR^2$$

9. Ⓒ

$$\text{As } g_H = g \left( 1 - \frac{2H}{R} \right)$$

10. Ⓑ

$$\text{As } g_d = g \left( 1 - \frac{d}{R} \right)$$

11. Ⓐ

It is free fall

12. Ⓒ

In downfall, velocity increases

13. Ⓐ

$$g \propto r$$

14. Ⓓ

$$F \propto m_1 \cdot m_2 \quad \therefore \frac{F'}{F} = \frac{4(m_1 \cdot m_2)}{(m_1 \cdot m_2)}$$

$$F' = 4F$$

15. Ⓑ

$$F = \frac{G \cdot m_1 \cdot m_2}{d^2}$$

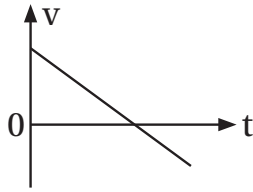
is independent of place of location

16. Ⓑ

$$v - u = \frac{1}{2} \times 11 \times 10 = 55$$

$$v = 55 \text{ m/s as } u = 0 \text{ m/s}$$

17. (B)



18. (B)

$$\text{As } v = u - at$$

19. (A)

$$\text{As } v \propto t$$

20. (A)

Velocity direction changes at every point

21. (A)

Can be worked out by  $GM = gR^2$

22. (B)

$$m \cdot g \cdot (1) = m \cdot (2g) \times \left(\frac{1}{2}\right)$$

23. (C)

$$g' = g \left(1 - \frac{d}{R}\right)$$

$$\frac{g - g'}{g} = \frac{64}{100} = \frac{d}{R}$$

$$d = 0.64 R$$

24. (C)

$T^2 \propto r^3$  law of period

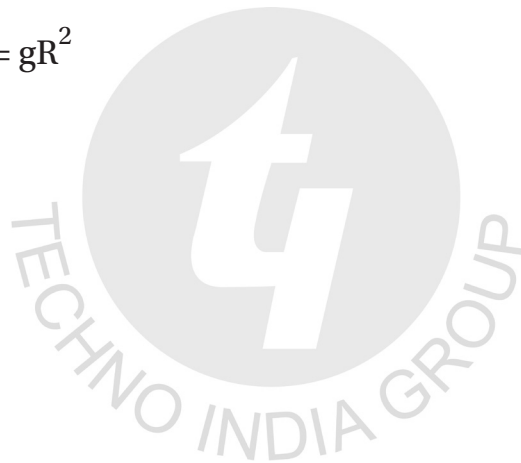
$T^2 = kr^3$  st line passing through origin

25. (A)

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

$$T^2 = \frac{4\pi^2}{g} \cdot \ell \Rightarrow T^2 = (K) \times \frac{1}{g}$$

So graph is a straight line passing through origin.



26. (A)

Kalium is the Latin name of *Potassium*.

27. (A)

$$\begin{aligned}\text{M.W of ammonia (NH}_3\text{)} &= 1 \times 14 + 3 \times 1 \\ &= 14 + 3 \\ &= 17\end{aligned}$$

M.W expressed in gram is called Gram molecular Mass.

So, the gram molecular mass of ammonia = 17 grams.

28. (C)

$$\text{Mass of 2.5 gm atoms of calcium} = (40 \times 2.5) \text{ g} = 100 \text{ g}$$

29. (B)

The molecular formula of nitre is  $\text{KNO}_3$ . Chemical name is potassium nitrate.

30. (A)

Valency of an atom is its combining capacity (power) to form a compound.

31. (D)

Important information required to write a chemical formula is symbols as well as valency.

32. (B)

Ratio of number of moles of a component to the total number of moles is known as molefraction.

Number of moles of solute in one litre of solution is called molarity, not molarity.  
Number of moles of solute in the kilogram of solvent is called molality, not molarity.

33. (A)

To determine atomic weight of an element, oxygen scale is considered. This is correct oxygen is highly reactive molecule and it can react with most of the elements. Thus assertion and reason both are correct and reason is the correct explanation of assertion.

34. (A)

$$\text{M.W. of O}_2 = 32$$

$$32 \text{ g O}_2 \equiv 1 \text{ mole O}_2$$

[5]

$$8 \text{ g O}_2 \equiv \frac{8}{32} \text{ mole O}_2 \\ \equiv 0.25 \text{ mole O}_2.$$

Thus, Assertion: 8 g oxygen molecule (atomic mass: O = 16) is equal to 0.25 mole oxygen molecule. This is correct number of mole(n) =  $\frac{\text{Mass(w)}}{\text{Modern mass(m)}}$ . This is correct, also the correct explanation of Assertion. Thus 'A' is correct.

35. ©

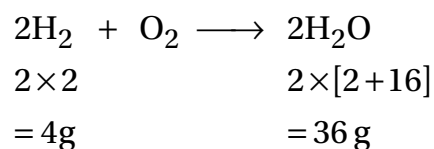
$$\text{Number of moles of carbon, } n_c = \frac{\text{mass(w)}}{\text{at weight}} \\ = \frac{0.9}{12} \\ = 0.075 \text{ moles}$$

36. Ⓐ

$$12.044 \times 10^{22} \text{ molecules} \equiv \frac{12.044 \times 10^{22}}{6.022 \times 10^{23}} \\ \equiv 0.2 \text{ mole}$$

$$\text{So, mass of Nitrogen} = 0.2 \times 28 \\ = 5.6 \text{ g}$$

37. ©

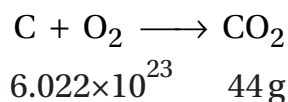


$$4 \text{ g H}_2 \equiv 36 \text{ g H}_2\text{O}$$

$$0.1 \text{ g H}_2 \equiv \frac{36 \times .1}{4} \text{ g H}_2\text{O}$$

$$\equiv 0.9 \text{ g H}_2\text{O}$$

38. Ⓑ

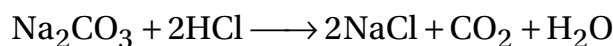


[6]

$\therefore 6.022 \times 10^{23} \text{ C} \equiv 44 \text{ g CO}_2 \text{ produce}$

$$3.011 \times 10^{22} \text{ C} \equiv \frac{44 \times 3.011 \times 10^{22}}{6.022 \times 10^{23}} \\ \equiv 2.2 \text{ g}$$

39. (A)



$$2 \times 6.022 \times 10^{23} \qquad 44 \text{ g}$$

44 g  $\text{CO}_2 \equiv 2 \times 6.022 \times 10^{23}$  molecules

$$0.22 \text{ g CO}_2 \equiv \frac{2 \times 6.022 \times 10^{23} \times 0.22}{44} \text{ molecule} \\ \equiv 6.022 \times 10^{21}$$

40. (C)

$$\text{M.W of CaCO}_3 = 40 + 12 + 3 \times 16 = 100$$

$$\text{So, \% of oxygen} = \frac{48}{100} \times 100 = 48$$

41. (D)

Aluminium bicarbonate,  $\text{Al}(\text{HCO}_3)_3$ , Atomicity = 16 = x

Aluminium sulphate,  $\text{Al}_2(\text{SO}_4)_3$ , Atomicity = 17 = y

Calcium phosphate,  $\text{Ca}_3(\text{PO}_4)_2$ , Atomicity = 13 = z

$$\text{So, } y > x > z; \quad \frac{x+y}{2} = \frac{33}{2} = 16.5 > z; \quad \frac{z+y}{2} = \frac{30}{2} = 15 < x$$

42. (B)

Boiling of a substance occurs at a particular temperature known as boiling point and at atmospheric pressure boiling occurs.

43. (C)

Brownian movement is due to impact of particles of the dispersion medium on the particles of the dispersed phase.

44. (A)

The best method to separate the components of an ink is chromatography. This is based on the different ratio of adsorption of the different components of ink.

45. (D)

Statement (I) oil in water is an example of liquid-liquid homogeneous mixture is wrong. This is heterogeneous mixture statement II. Brass is an example of solid-solid

heterogeneous mixture—is wrong. This is homogeneous mixture statement III, nitric acid in water is an example of liquid-liquid heterogeneous mixture. This is also wrong. This is a homogeneous mixture

46. Ⓓ

$$0.46 \text{ g sodium} = \frac{0.46}{23} = 0.02 \text{ mole}$$

$$0.88 \text{ g carbondioxide} = \frac{0.88}{44} = 0.02 \text{ mole}$$

$$1.2044 \times 10^{21} \text{ water molecule} = \frac{1.2044}{6.022} \times \frac{10^{21}}{10^{23}} = 0.002 \text{ mole}$$

47. Ⓒ

Sulphur =  $S_8$ 

$$1 \text{ mole of } S_8 \text{ molecule} \equiv 6.022 \times 10^{23} \text{ molecules}$$

$$0.1 \text{ mole of } S_8 \text{ molecule} \equiv 6.022 \times 10^{23} \times 0.1 \text{ molecules}$$

$$\equiv 6.022 \times 10^{22} \text{ molecules}$$

1 molecule of  $S_8$  contains 8 atoms of S

$$6.022 \times 10^{22} \text{ molecule of } S_8 \text{ contains } 8 \times 6.022 \times 10^{22} \text{ S}$$

48. Ⓒ

$$2 \text{ gm calcium} = \frac{2}{40} = 0.05 \text{ mole} = X$$

$$18.066 \times 10^{21} \text{ iron atom} = \frac{18.066}{6.022} \times \frac{10^{21}}{10^{23}} = 0.03 \text{ mole} = Y$$

$$0.1 \text{ gm CaCO}_3 = \frac{0.1}{100} = 0.001 \text{ mole} = Z$$

$$\therefore \text{ Now } (X + Y + Z) = (0.05 + 0.03 + 0.001)$$

$$= 0.081$$

49. Ⓒ

$$15.055 \times 10^{23} \text{ nitrogen molecule} \equiv \frac{15.055 \times 10^{23}}{6.022 \times 10^{23}} \equiv 2.5 \text{ mole}$$

$$18.066 \times 10^{21} \text{ nitrogen molecule} \equiv \frac{18.066 \times 10^{21}}{6.022 \times 10^{23}} \equiv 0.03 \text{ mole}$$

$$\therefore \text{ Number of mole of Nitrogen remains} = (2.5 - 0.03) = 2.47 \text{ mole}$$

50. (A)

$$\text{M.W. of SO}_2 = 32 + 2 \times 16 = 64$$

$$\begin{aligned} \text{No. of moles of SO}_2, n_{\text{SO}_2} &= \frac{\text{Mass}(w)}{\text{M.W.}(m)} \\ &= \frac{32}{64} \end{aligned}$$

$$\text{M.W. of CH}_4 = 16 \quad = \frac{1}{2} = 0.5 \text{ moles}$$

$$\text{No. of moles of CH}_4, n_{\text{CH}_4} = \frac{w}{m} = \frac{8}{16} = 0.5 \text{ mole}$$

This, Assertion Both 32 g of  $\text{SO}_2$  & 8 g  $\text{CH}_4$  contains same number of moles.

Reasons-equal moles of two compounds contain same number of molecules.

Reason is the correct explanation of assertion.

## Mathematics

51. (D)

any number

52. (A)

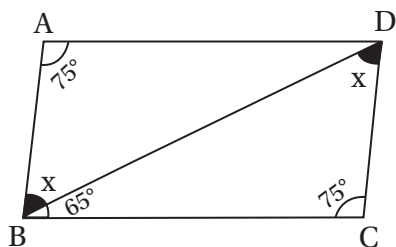
parallel to y-axis

53. (A)

In  $\triangle OAP$  and  $\triangle OBP$ ,  $OA = OB$ ,  $OP = OP$ ,  $\angle AOP = \angle BOP$

$\therefore \triangle OAP \cong \triangle OBP$  (S-A-S)

54. (A)



$$\therefore x + 65^\circ + 75^\circ = 180^\circ$$

$$\Rightarrow x + 140^\circ = 180^\circ$$

$$\Rightarrow x = 40^\circ$$

55. (C)

$OA = OB \Rightarrow \triangle ABO$  is an isosceles triangle.



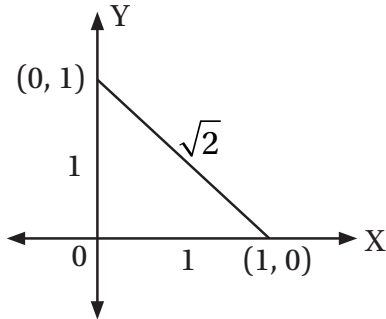
$\angle A = \angle B$ . Again  $\angle A = 60^\circ \Rightarrow \angle B = 60^\circ$

$\Rightarrow \angle AOB = 60^\circ$

Now,  $\angle AOC = 120^\circ$

$$\begin{aligned}\angle ADC &= \frac{1}{2} \angle AOC \quad (\because AC \text{ subtends the angles at the centre } O \text{ and in the} \\ &= \frac{1}{2} \times 120^\circ \quad \text{remaining part of the circle at } D) \\ &= 60^\circ\end{aligned}$$

56. Ⓓ



$$\text{Perimeter} = (1 + 1 + \sqrt{2}) \text{ units}$$

$$= (2 + \sqrt{2}) \text{ units}$$

57. Ⓐ

$(20, 5)$  is a point on the line  $l$ .

$$\therefore a = -5$$

58. Ⓑ

In  $\triangle PBQ$  and  $\triangle QCR$ ,  $PB = QC$ ,  $BQ = CR$ ,  $\angle PBQ = \angle QCR$

$\therefore \triangle PBQ \cong \triangle QCR$  (S-A-S)  $\therefore PQ = QR \Rightarrow \angle QPR = 45^\circ$ .

$\therefore$  A and R both are true but R is not the correct explanation of A.

59. Ⓐ

A square is a rectangle because its each angle is  $90^\circ$ . Here assertion and reason both are true. Reason is correct explanation of (A).

60. Ⓐ

$$\text{Area of } \triangle ROS = \sqrt{8 \times 3 \times 3 \times 2} \text{ m}^2 = 12\text{m}^2$$

61. Ⓓ

$$\text{Let } ON = xm \quad \therefore RN^2 = (5)^2 - x^2 = 25 - x^2$$

[10]

$$\begin{aligned} \text{Again, } RN^2 &= (6)^2 - (5-x)^2 = 36 - 25 + 10x - x^2 \\ &= 11 + 10x - x^2 \end{aligned}$$

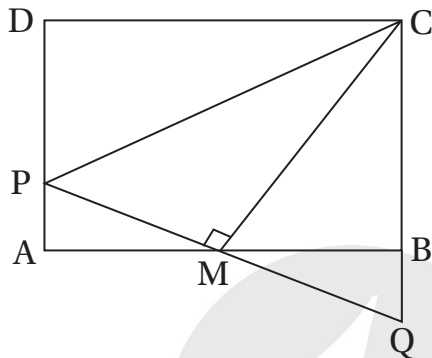
$$\therefore 25 - x^2 = 11 + 10x - x^2 \Rightarrow 10x = 14 \Rightarrow x = 1.4$$

$$\therefore RN = \sqrt{25 - 1.96} \text{ m} = \sqrt{23.04} \text{ m} = 4.8 \text{ m}$$

62. (A)

$$RM = 2RN = 9.6 \text{ m}$$

63. (D)



$$\Delta PMA \cong \Delta QMB \text{ (by ASA)} \Rightarrow \left. \begin{array}{l} PA = BQ \\ PM = MQ \end{array} \right\} \text{ by CPCT}$$

$$\Delta CMP \cong \Delta CMQ \text{ (by SAS)} \Rightarrow PC = CQ \text{ (by CPCT) (proved)}$$

64. (B)

$$\Delta PAD \cong \Delta PBC \text{ (by SAS)} \Rightarrow DP = CP$$

65. (D)

$$\begin{aligned} \text{Co-ordinates of centroid} &= \left( \frac{-2+4+4}{3}, \frac{3-3+5}{3} \right) \\ &= \left( 2, \frac{5}{3} \right) \end{aligned}$$

66. (C)

$$\sqrt{13-x\sqrt{10}} = \sqrt{8} + \sqrt{5}$$

$$\Rightarrow 13 - x\sqrt{10} = 13 + 2\sqrt{40} = 13 + 4\sqrt{10}$$

$$\Rightarrow x = -4$$

67. (A)

$$\begin{aligned} a &= \frac{1}{3-2\sqrt{2}}, \quad b = \frac{1}{3+2\sqrt{2}} \\ a &= \frac{3+2\sqrt{2}}{9-8}, \quad b = \frac{3-2\sqrt{2}}{9-8} \end{aligned}$$

$$\Rightarrow a = 3 + 2\sqrt{2}, \quad b = 3 - 2\sqrt{2}$$

$$\therefore a + b = 3 + 2\sqrt{2} + 3 - 2\sqrt{2} = 6$$

$$ab = (3 + 2\sqrt{2})(3 - 2\sqrt{2}) = 9 - 8 = 1$$

$$a^2 + b^2 = (a + b)^2 - 2ab = 6^2 - 2 \times 1 = 34$$

68. Ⓓ

$$x + y = 4, \quad 4 + 0 = 4, \quad 0 + 4 = 4, \quad 2 + 2 = 4$$

69. Ⓐ

$$\angle PAB = \angle PBA = \angle APB = 60^\circ$$

$$\angle DAP = \angle PBC = 30^\circ$$

Now,  $\triangle PAD \cong \triangle PBC$  (by SAS)

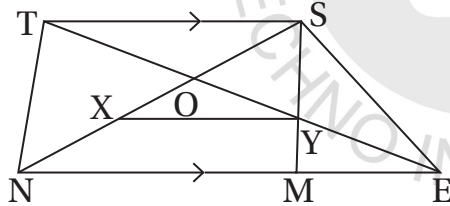
$$\Rightarrow DP = PC \Rightarrow \angle PDC = \angle PCD$$

$$\angle APD = \angle ADP = 75^\circ; \quad \angle BPC = \angle BCP = 75^\circ$$

$$\therefore \angle DPC = 360^\circ - (75^\circ + 75^\circ + 60^\circ) = 150^\circ$$

$$\angle PDC = \angle PCD = 15^\circ.$$

70. Ⓓ



$$\triangle STY \cong \triangle MEY$$

$$\therefore SY = MY, \quad ST = ME$$

$$\therefore \text{In } \triangle SNM, \quad XY = \frac{1}{2} NM$$

$$= XY = \frac{1}{2} (NE - ME)$$

$$= \frac{1}{2} (NE - ST)$$

71. Ⓓ

$$AB = 8 \text{ cm} \quad AM = MB = 4 \text{ cm}$$

$$CD = 6 \text{ cm} \quad CN = ND = 3 \text{ cm}$$

$$MN = 1 \text{ cm}$$

$$r^2 = OM^2 + AM^2 \quad \text{and} \quad r^2 = ON^2 + CN^2$$

[12]

$$\Rightarrow r^2 = OM^2 + 4^2 \quad \text{and} \quad r^2 = ON^2 + 3^2$$

$$OM^2 + 16 = ON^2 + 9$$

$$\Rightarrow 16 - 9 = ON^2 - OM^2 = (ON - OM)(ON + OM) = ON + OM$$

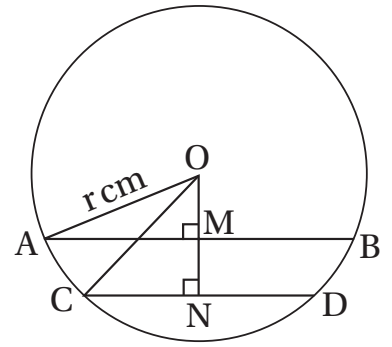
$$\Rightarrow 7 = OM + ON = OM + OM + MN = 2OM + 1$$

$$\Rightarrow OM = \frac{6}{2} = 3$$

$$\text{From (1) } r^2 = 4^2 + 3^2 = 5^2$$

$$\therefore r = 5$$

$$\therefore \text{radius} = 5 \text{ cm}$$



72. (A)

$$\angle A + \angle B + \angle C + \angle D = 360^\circ$$

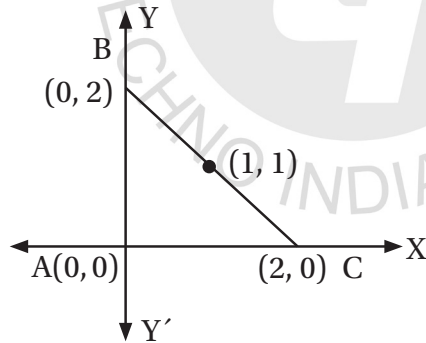
$$\Rightarrow 2(\angle B + \angle D) + \angle B + \angle D = 360^\circ$$

$$\Rightarrow 3(\angle B + \angle D) = 360^\circ$$

$$\Rightarrow \angle B + \angle D = 120^\circ$$

$$\therefore \angle B = 120^\circ - 60^\circ = 60^\circ$$

73. (A)



$$\text{Orthocentre} = (0, 0)$$

$$\text{Circumcentre} = (1, 1)$$

$$\text{distance} = \sqrt{1^2 + 1^2} = \sqrt{2} \text{ units}$$

74. (D)

$$\frac{xy}{x+y} = 2 \quad \frac{x-y}{xy} = \frac{1}{3}$$

$$\frac{x+y}{xy} = \frac{1}{2} \quad \frac{1}{y} - \frac{1}{x} = \frac{1}{3}$$

$$\frac{1}{y} + \frac{1}{x} = \frac{1}{2} \quad \dots \dots (1)$$

$$\frac{1}{y} - \frac{1}{x} = \frac{1}{3} \quad \dots \dots (2)$$

(-) (+) (-)

$$\frac{2}{x} = \frac{1}{2} - \frac{1}{3} = \frac{3-2}{6} = \frac{1}{6}$$

$$\therefore x = 12$$

75. (A)

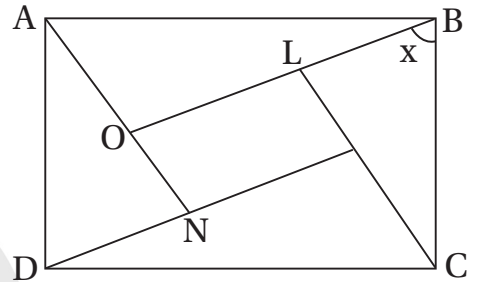
In  $\triangle ABO$  and  $\triangle BCL$

(i)  $AB = BC$  (sides of the square)

(ii)  $\angle ABO = \angle BCL$  ( $= 90^\circ - x$ )

(iii)  $\angle OAB = \angle LBC$  ( $= x$ )

$\triangle ABO \cong \triangle BCL$  (by ASA)



## Biology

76. (D)

All of the above

These are young cells, hence vacuole is small and nucleus is central

77. (C)

Connective tissue

Bones have a matrix between their cells

78. (C)

Protoplasm

Protoplasm is cytoplasm plus nucleus

79. (D)

Lymph

Lymph serves as a 'middle man', transporting oxygen, food materials, hormones, etc to body cells, while transporting  $\text{CO}_2$  and other metabolic wastes from body cells to blood.

80. (D)

Both B and C

81. Ⓐ

Axon

82. Ⓑ

Lateral meristem

The cork cambium is lateral meristem and is responsible for secondary growth that replaces the epidermis in roots and stems.

83. Ⓒ

3

Sieve tubes, companion cells and phloem parenchyma are the living components of phloem.

84. Ⓑ

Fibres

Fibres are phloem sclerenchyma, hence dead

85. Ⓒ

Have cytoplasm

The nucleus is lost upon maturity.

86. Ⓐ

Companion cells

The sieve tubes lose their nucleus upon maturity and hence are regulated by the neighbouring companion cells

87. Ⓒ

Sclerenchyma

88. Ⓐ

Both Assertion and Reason are true and Reason is the correct explanation of the Assertion

The squamous epithelial cells are flat and very thin, facilitating exchange of gases.

89. Ⓑ

Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion

90. Ⓓ

Assertion is false but Reason is true

Adipocytes contain fats

91. ©  
Epidermal tissue  
Epidermis is a plant tissue
92. Ⓑ  
Cranium  
Cranium is a part of the skull which specifically protects the brain
93. ©  
The cerebrospinal fluid provides buoyancy
94. Ⓑ  
Trachea and bronchi  
The C-shaped rings of cartilage keep the trachea and bronchi open at all times
95. Ⓐ  
Unidirectional  
From roots to leaves, via the stem
96. Ⓓ  
Tendons  
Tendons are a type of connective tissue which connects muscles to bones
97. ©  
Axon hillock
98. Ⓐ  
Synapse
99. Ⓐ  
Cyton
100. ©  
From dendrites to axon, via cyton