2 CHAPTER
Soil, Water, Plant Relationship

Q.1 Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I

A. Maximum quantity of water that a given soil can retain against force of gravity

B. Moisture content of a soil at which the water is no longer available in sufficient quantity to sustain plants

C. Volume of water that can be extracted by force of gravity from a unit volume of saturated earth material

D. Maximum rate at which a soil can absorb water through its surface

List-II

1. Specific yield
2. Infiltration capacity
3. Field capacity
4. Permanent wilting point

Codes:

	A	B	C	D
(a)	3	1	4	2
(b)	4	3	1	2
(c)	3	4	1	2
(d)	3	4	2	1

Q.2 Study the following statements:

1. Immediately after rain, when all the gravity water has drained down to water table, the amount of water retained in the soil by molecular attraction, is called pellicular water.
2. The depth of water required to bring moisture content of a given soil upto its field capacity is called soil moisture deficiency.
3. Hygroscopic water is held in soil by surface tension forces.
4. Hygroscopic water is not available for plant use.

The correct statements are

(a) 1, 2 and 3 (b) 1, 2 and 4
(c) 1, 3 and 4 (d) 2, 3 and 4

Q.3 The hygroscopic water is held by a soil moisture tension of around

(a) 1 atm (b) 32 atm
(c) 1/3 atm (d) 2 atm

Q.4 Permanent wilting point moisture content for a crop represents the

(a) hygroscopic water.
(b) capillary water.
(c) field capacity water.
(d) water of adhesion.

Q.5 Irrigation frequency is a function of

(a) crop only.
(b) soil, crop and climate.
(c) soil, crop, climate and fertilizer.
(d) soil and climate.

Q.6 Consider the following statements:

1. Irrigation is done when moisture content falls to the level of willing point.
2. The level up to which moisture content gets increased in soil just after irrigation corresponds to optimum moisture content.

Out of these, the correct statement/s is/are

(a) Only 1 (b) 1 and 2
(c) Only 2 (d) None of these

Q.7 At field capacity, water is held in most of the soils at a tension of

(a) 15 atmospheres.
(b) zero atmosphere.
(c) 1/3 atmosphere.
(d) 1 atmosphere.

Q.8 Cotton is grown in medium textured soil with available soil water of 100 mm/m depth of soil. Given that the root zone depth is 1.5 m, the fraction of available soil water is 0.65 and the application efficiency is 0.65 then the required depth of irrigation application will be equal to

(a) 150 mm (b) 200 mm
(c) 165 mm (d) 250 mm

Q.9 A tube well having a capacity of $4m^3$/hour operates for 20 hours each day during the irrigation season. How much area can be commanded if the irrigation interval is 20 days and depth of irrigation is 7 cm?

(a) $1.71 \times 10^4 m^2$ (b) $1.14 \times 10^4 m^2$
(c) $22.9 \times 10^4 m^2$ (d) $2.29 \times 10^4 m^2$

Q.10 Irrigation water having of SAR of 12 is classified as

(a) Low sodium water
(b) Medium sodium water
(c) High sodium water
(d) very high sodium water

Q.11 In a certain source of irrigation water m_g^{+2} is 4.5 meq/l, C_a^{+2} is 3.5 meq/l and Na^+ is 24 meq/l. The SAR value will be

(a) 10 (b) 12
(c) 16 (d) 18

Q.12 Which of the following statements are correct?

1. Salinity may adversely affect crops if it exceeds permissible limit.
2. Salinity increases the osmotic activities of plants.
3. Salinity may prevent adequate aeration to plants.

(a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 1, 2 and 3

Q.13 Addition of gypsum to irrigation water overcomes the difficulties posed by

(a) high acidity of irrigation supplies.
(b) high sediments is irrigation supplies.
(c) high sodium content in irrigation supplies.
(d) all of the above.

Q.14 After how many days will you recommend supplying irrigation water to a crop having 0.8 m root zone depth, and grown in a soil having field capacity of 30%, permanent wilting of 15%, and density of soil of 1.5 gm/cc? The consumptive use for the crop is 5 mm/day, and only 60% of available moisture is permitted to be availed.

(a) 9 days (b) 15 days
(c) 21 days (d) 40 days

Q.15 Assertion (A): Proportion of sodium ions present in water is measured by a factor called as salinity.
Reason (R): Salinity concentration is measured electrically or by laboratory test.

(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 a correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

Q.16 Assertion (A): Ideal soil for irrigation is sandy soil.
Reason (R): Sandy soil does not hold water tightly.

(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 a correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

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Answers Soil, Water, Plant relationship

1. (c) 2. (b) 3. (b) 4. (a) 5. (b) 6. (d) 7. (c) 8. (a) 9. (d) 10. (b)
11. (b) 12. (b) 13. (c) 14. (c) 15. (d) 16. (d)

Explanations Soil, Water, Plant relationship

3. (b)
Permanent wilting point represents moisture content for hygroscopic water. At PWP, moisture tension is 7-32 atm.

6. (d)
Irrigation is done when moisture content fall to level of optimum moisture content and water content is bought to field capacity just after irrigation.

7. (c)
Soil moisture tension is the pressure which must be exerted on the soil in order to extract water from it. It is measure of tenacity. At field capacity, moisture tension is about $\frac{1}{3}$ to $\frac{1}{10}$ atm.

9. (d)

$Q = 4m^3/hr \times 20\ hr/day$
$\Rightarrow \quad Q = 80\ m^3/day$
$\Rightarrow \quad Q = 9.26 \times 10^{-4}\ m^3/sec$
$B = 20$ days
$\Delta = 7\ cm = 0.07\ m$

$$D = \frac{8.64 \times 20}{0.07}$$

$= 2468.57$ hect/cumecs
Area $= D \times Q$ (Duty x Discharge)
$= 2468.57 \times 9.26 \times 10^{-4}$
$= 2.29$ ha
$= 2.29 \times 10^4 m^2$

11. (b)

$$SAR = \frac{Na^+}{\sqrt{\frac{C_a^{+2} + M_g^{+2}}{2}}} = \frac{24}{\sqrt{\frac{3.5+4.5}{2}}} = 12$$

14. (c)
Depth of irrigation water

$$= \frac{\gamma_d d}{\gamma_w}(FC - OMC)$$

$$= \frac{1.5 \times 0.80}{1}(0.30 - 0.15)$$

$= 0.180\ m = 180$ mm
Water depth to be used $= 0.60 \times 180 = 108$ mm
$\because$ Consumptive use = 5 mm/day
$\therefore$ Frequency of irrigation $= 108/5 = 21.6$ days.

15. (d)
Proportion of sodium ions present in soils is measured by Sodium Absorption Ratio (SAR).

16. (d)
Sand does not hold water tightly and large amount of water drains against gravity. Clay results in poor drainage and aeration, but holds sufficient water against gravity.
Hence, ideal soil for irrigation is a mixture of sand and clay.

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