KHOJ-2025

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SCHOLARSHIP FOR HIGH ACHIEVERS AND NEEDY STUDENTS

SCIENCE APTITUDE TEST

CLASS - 10

SOLUTIONS

TEST CODE - 12

WhatsApp Channel

Result will be Declared on 14th Oct. 2025

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PART - I : MENTAL ABILITY

1.

Sol. (d) **TGVVWE**

Letters are written in reverse and move +2. Reverse of CUTTER is RETTUC. Now add 2 to each letter

R + 2 = T, E + 2 = G, T + 2 = V and so on. So code of CUTTER is TGVVWE

2.

Sol. (c) A letter is a part of a word and a word is a part of a sentence

3.

Sol. (d) 6

4.

Sol. (c) The figure is enclosed in a new figure with one more number of sides, in such a way that the upper vertex of the two figures coincides.

5.

Sol. (a) **Flute**

The guitar, violin, and cello are stringed instruments; the flute is a wind instrument.

6.

Sol. (b) **E**

Except E, all other letters are consonant in the English alphabet.

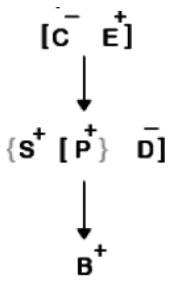
7.

Sol. (a) Using the proper symbol in
(5 > 2 × 1 – 3 > 4 < 1) we get the expression as : 5 × 2 + = 3 × 4 – 1

$\Rightarrow$ 11 = 11, which is true

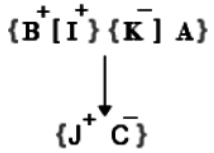
8.

Sol. (a)



9.

Sol. (a)



10.

Sol. (a)

11.

Sol. (c) **acbbca**

The pattern is a a b c c / a a b c c / a a b c c / a a b c c

12.

Sol. (c) Here 2nd number = (1st number × 1) +1

3rd number = (2nd number × 2) + 2

4th number = (3rd number × 3) + 3 and so on.

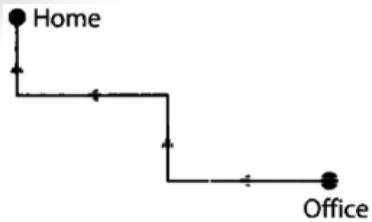
Therefore, 5th number = (4th number 4) + 4 = 574 + 4 = 232

13.

Sol. (a) The colours adjacent to yellow are orange, blue, red and rose. Hence violet will be opposite to yellow.

14.

Sol. (d)



15.

Sol. (d) 22Γ318

PART - II : MATHEMATICS

1.

Sol. (d) 3

$a = 2^2 \times 3x$

$b = 2^2 \times 3 \times 5$

$c = 2^2 \times 3 \times 7$

LCM (a, b, c) = 3780

$3780 = 2^2 \times 3_3 \times 5^1 \times 7_1$

In LCM, we consider highest power

So, x = 3

2.

Sol. (b) 2

Smallest two digit number is 10 and smallest composite number is 4 .

Clearly, 2 is the greatest factor of 4 and 10, so their H.C.F. is 2.

3.

Sol. (c) 3, 5

Explanation:

Sum of zeroes of polynomial

$5x^2 - (3 + k)x + 7$ is $\frac{-[-3+k]}{5}$ i.e., $\frac{3+k}{5}$

According to question,

$\frac{3+k}{5} = 0 \Rightarrow k = -3$

Now, $2x^2 - 2(k+ 11)x + 30$ becomes

$2x^2 - 16x + 30$.

i.e., $2x^2 - 16x + 30 = 0$ or $x^2 - 8x + 15 = 0$

$\Rightarrow$ x = 3, 5

Hence, zeroes of polynomial

$2x^2 - 16x + 30$ are 3, 5.

4.

Sol. (b) –m, m + 3

Given: equation $x^2 - 3x - m(m + 3) = 0$, where m is a constant

The given equation is the form of

$ax^2 + bx + c = 0$

$\therefore$ a = 1, b = -3, c = -m(m + 3)

We know the roots of the equation can be find out using the formula,

$$x = \frac{b \pm \sqrt{b^2-4ac}}{2a}$$

Substituting the values of a, b, c, we get

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-m(m+3)}}{2}$$

$$\Rightarrow \quad x = \frac{3 \pm \sqrt{9+4m^2+12m}}{2}$$

$$\Rightarrow \quad x = \frac{3 \pm (2m + 3)}{2}$$

Or $x = \frac{3 + (2m + 3)}{2}$, $x = \frac{3 - (2m + 3)}{2}$

$\Rightarrow$ x = m + 3 and x = -m are the required roots of the equation

5.

Sol. (a) $\frac{15}{26}$

Let the fraction be $\frac{x}{y}$

According to the question, $\frac{(x-1)}{(y+2)} = \frac{1}{2}$

2x - 2 = y + 2

y = 2x - 4 ...(i)

And,

$\frac{(x-7)}{(y-2)} = \frac{1}{2}$

3x - 21 = y - 2

3x = y + 19 ...(ii)

Using (i) in (ii)

3x = 2x - 4 + 19

x = 15

Using value of x in (i), we get

y = 2 (15) - 4

y = 30 - 4

y = 26

Therefore, required fraction $= \frac{15}{26}$

6.

Sol. (c) 25 years, 20 years, 10 years

Let the present ages of A, B, C and D are x, y, z and t respectively.

Since, present age of D = t = 48 years.

According to question,

$x = y + 5$

$z = \frac{1}{2}y$

$f = 2y + 8$

From (iii), $48 = 2y + 8$

From (iii), $48 = 2y + 8$

From (ii), $z = \frac{1}{2} \times 20 = 10$ years

From (i), $x = 20 + 5 = 25$ years

So, present ages of A, B and C are 25 years, 20 years and 10 years respectively

7.

Sol. (b) **K = 2**

Explanation:

The given equation has infinite solutions, if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \quad \frac{1}{2} = \frac{1}{k} = \frac{-4}{-8} \quad \Rightarrow \frac{1}{2} = \frac{1}{k} \quad \Rightarrow k = 2$

8.

Sol. (c) **50**

Let x be the number of persons and y be the amount received by each person.

$\Rightarrow$ According to the question, $xy = 6500$ ...(i)

$\Rightarrow$ Also, $(x + 15)(y - 30) = 6500$ ...(ii)

$\Rightarrow \quad xy - 30x + 15y - 450 = 6500$

$\Rightarrow \quad 6500 - 30x + 15y - 450 = 6500$ [From (i)]

$\Rightarrow \quad 2x - y + 30 = 0$

$\Rightarrow \quad 2x - \frac{6500}{x} + 30 = 0$ [From (i)]

$\Rightarrow \quad 2x^2 - 6500 + 30x = 0$

$\Rightarrow \quad x^2 + 15x - 3250 = 0$

$\Rightarrow \quad (x - 50)(x + 65) = 0$

$\Rightarrow \quad x = 50$ or $x = -65$

Since, number of persons cannot be negative. Hence, number of persons = 50

9.

Sol. (d) $k \le \frac{9}{8}$

Explanation: We have, $2x^2 + 3x + k = 0$

For real roots, $D \ge 0$

$D = b^2 - 4ac = (3)^2 - 4 \times 2 \times k = 9 - 8k$

$\Rightarrow \quad 9 - 8 \ge 0 \quad \Rightarrow \quad k \le \frac{9}{8}$

10.

Sol. (d) **23**

$a = 7, a_n = 84, S_n = \frac{2093}{2}$

$a_n = a + (n - 1)d$

$84 = 7 + (n - 1)d$

$77 = (n - 1)d$ ...(i)

Now,

$S_n = \frac{n}{2}[2a + (n-1)d]$

$\frac{2093}{2} = \frac{n}{2}[2 \times 7 + 77]$

$2093 = n[14 + 77]$

$n = \frac{2093}{91} \quad \Rightarrow \quad n = 23$

11.

Sol. (a) **158**

20th term from the end = l - 19 d

$= (253 - 19 \times 5) = (253 - 95) = 158.$

12.

Sol. (a) 7.5 cm

$\because \quad \frac{\text{Perimeter } (\Delta ABC)}{\text{Perimeter } (\Delta DEF)} = \frac{AB}{DE}$

$\Rightarrow \quad \frac{32}{24} = \frac{10}{DE}$

$\Rightarrow \quad DE = \frac{10 \times 24}{32} = 7.5\text{cm}$

13.

Sol. (d) 2

O(k, -1) is the centroid of triangle whose vertices are

A(3, -5), B(-7, 4), C(10, -k)

$\therefore \quad k = \frac{x_1 + x_2 + x_3}{3}$

$\Rightarrow \quad \therefore \; k = \frac{3 - 7 + 10}{3} = \frac{6}{3} = 0$

14.

Sol. (b) $\therefore k = \frac{3 - 7 + 10}{3} = \frac{6}{3} = 0$

$= \sqrt{\left(\frac{a}{t^2} - at^2\right)^2 + \left(\frac{-2a}{t} - 2at\right)^2}$

$= a\sqrt{\frac{1}{t^4} + t^4 - 2 + \frac{t}{t^2} + 4t^2 + 8}$

$= a\sqrt{\frac{1}{t^4} + t^4 + \frac{4}{t^2} + 4t^2 + 6}$

$= a\sqrt{\frac{1}{t^4} + t^4 + 4 + 2 + \frac{4}{t^2} + 4t^2}$

$= a\sqrt{\left(t^2 + \frac{1}{t^2} + 2\right)^2}$

$= a\left(t^2 + \frac{1}{t^2} + 2\right)$

$= a\left(t + \frac{1}{t}\right)^2$ units

15.

Sol. (b) a^2b^2

16.

Sol. (d) $b^2 - a^2$

Given,

$a\cot\theta + b\,\text{cosec}\theta = p$

$b\cot\theta + a\,\text{cosec}\theta = q$

$p^2 - q^2 = (a\cot\theta + b\,\text{cosec}\theta)^2 -$

$(b\cot\theta + a\,\text{cosec}\theta)^2$

$= a^2\cot^2\theta + b^2\,\text{cosec}^2\theta + 2ab\cot\theta\,\text{cosec}\theta -$

$(b^2\cot^2\theta + a^2\,\text{cosec}^2\theta + 2ab\cot\,\text{cosec})$

$= a^2\cot^2\theta + b^2\,\text{cosec}^2\theta + 2ab\cot\theta\,\text{cosec}\theta -$

$b^2\cot^2\theta + a^2\,\text{cosec}^2\theta + 2ab\cot\,\text{cosec}$

$= a^2(\cot^2\theta - \text{cosec}^2\theta) + b^2(\text{cosec}^2\theta - \cot^2\theta)$

$= -a^2(\text{cosec}^2\theta - \cot^2\theta) + b^2(\text{cosec}^2\theta - \cot^2\theta)$

$= -a^2 \times 1 + b^2 \times 1 = b^2 - a^2$

17.

Sol. (c) $\frac{m^2 - 1}{n^2 - 1}$

Given: $\tan A = n\tan B$

$\Rightarrow \quad \frac{1}{\tan B} = \frac{n}{\tan A}$

$\Rightarrow \quad \cot B = \frac{n}{\tan A}$

And $\sin A = m \sin B$

$\Rightarrow \quad \frac{1}{\sin B} = \frac{m}{\sin A}$

$\Rightarrow \quad \text{cosec}\,B = \frac{m}{\sin A}$

Now, $\text{cosec}^2B - \cot^2B = 1$

$\Rightarrow \quad \frac{m^2}{\sin^2 A} - \frac{n^2}{\tan^2 A} = 1$

$\Rightarrow \quad \frac{m^2}{\sin^2 A} - \frac{n^2\cos^2 A}{\sin^2 A} = 1$

$\Rightarrow \quad m^2 - n^2\cos^2A = \sin^2A$

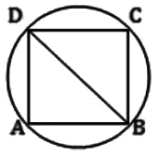
$\Rightarrow \quad m^2 - n^2\cos^2A = 1 - \cos^2A$

$\Rightarrow \quad m^2 - 1 = (n^2 - 1)\cos^2A$

$\Rightarrow \quad \cos^2 A = \frac{m^2 - 1}{n^2 - 1}$

18.

Sol. (c) 288 sq. cm



According to question,

Diameter (BD) = $2 \times$ radius = $2 \times 12 = 24$ cm

Area of square = $\frac{1}{2} \times d^2 = \frac{1}{2} \times 24 \times 24$

= 288 sq. cm

19.

Sol. (c) **31.5 cm²**

Area of quadrant = $\frac{1}{4}\pi r^2$

$= \frac{1}{4} \times \frac{22}{7} \times (7)^2 = \frac{77}{2} cm^2 = 38.5 cm^2$

Area of ΔBAE = $\frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} \times AB \times AE = \frac{1}{2} \times 7 \times 2 = 7 cm^2$

Hence, area of the shaded portion = Area of the quadrant ABDCA - Area of ΔBAE

= (38.5 - 7) cm² = 31.5 cm²

20.

Sol. (d) **6400**

Volume of the wall

= (800 × 600 × 22.5) cm³

Number of bricks = $\frac{\text{volume of the wall}}{\text{volume of 1 brick}}$

$= \left(\frac{800 \times 600 \times 22.5}{25 \times 11.25 \times 6}\right) = 6400$

21.

Sol. (b) $\frac{9}{4}$cm

Radius of sphere (r_1) = 3 cm

$\therefore$ Volume$= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi (3)^3 \text{ cm}^3 = 36\pi \text{cm}^3$

$\therefore$ Volume of water in the cylinder

$= 36\pi cm^3$

Radius of cylindrical vessel (r_2) = 4 cm

Let h be its height, then

$\pi r_2^2 h = 36\pi \Rightarrow \pi(4)^2 h = 36\pi$

$\Rightarrow 16\pi h = 36\pi \Rightarrow h = \frac{36\pi}{10\pi} = \frac{9}{4} cm$

22.

Sol. (a) **91.67 cm³**

Height of ice-cream cone is 9 cm and radius of the hemispherical top is 2.5 cm.

Now, Volume of ice-cream cone = Volume of cone + volume of Hemispherical top

$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$

$= \frac{1}{3}\pi r^2 (h + 2r)$

$= \frac{1}{3} \times \frac{22}{7} \times 2.5 \times 2.5 (9 + 5)$

$= \frac{1}{3} \times \frac{22}{7} \times 2.5 \times 2.5 \times 14$

23.

Sol. (b) 8 Mean = 2.6

Variable(x)	**Frequency(f)**	$f \times x$
1	4	4
2	5	10
3	y	3y
4	1	4
5	2	10
Total	**12 + x**	**28 + 3y**

$\therefore$ Mean$= \frac{\sum fx}{\sum f} \Rightarrow 2.6 = \frac{28 + 3y}{12 + y}$

$\Rightarrow$ 2.6 (12 + y) = 28 + 3y

$\Rightarrow$ 31.2 + 2.6y = 28 + 3y

$\Rightarrow$ 3y - 2.6y = 31.2 - 28

$\Rightarrow$ 0.4y = 3.2

$\Rightarrow$ 4y = 32 $\Rightarrow$ $y = \frac{32}{4} = 8$ $\Rightarrow$ y = 8

24.

Sol. (d) 13

We know that

3 Median= Mode + 2 Mean

3×11 = Mode + 2×10

33 - 20 = Mode

Mode = 13

25.

Sol. (c) $\frac{2}{7}$

Leap year contains 366 days = 364 days + 2 days = $\frac{364}{7}$ weeks + 2 additional days

= 52 weeks + 2 additional days

52 weeks contain 52 Fridays

We will get 53 Fridays if one of the remaining two additional days is a Friday

These additional days can be :

{(Sunday, Monday), (Monday, Tuesday), (Tuesday, Wednesday), (Wednesday, Thursday), (Thursday, Friday), (Friday, Saturday), (Saturday, Sunday)}

Number of total outcomes = 7

Number of possible outcomes = 2

Required Probability of the event

$= \frac{\text{Number of possible outcomes}}{\text{Number of total outcomes}} = \frac{2}{7}$

26.

Sol. (b) $\frac{9}{36}$

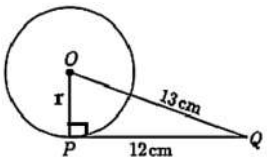
p(odd no. on both side)

Far Case = (1, 1) (3, 1) (5, 1) (1, 3) (3, 3) (5, 3) (1, 5) (3, 5) (5, 5) = 9

P(odd no. on both dice) $= \frac{9}{36}$

27.

Sol. (d) 5



We know that

$PQ \perp OP$

$\therefore$ ΔQPO is right angled Δ

$\therefore$ By python theory. $QO^2 = QP^2 + OP^2$

$(13)^2 = (12)^2 + OP^2$

$r^2 = 169 - 144.$

$r^2 = 25$

r = 5 cm

28.

Sol. (c) 50^0

In ΔAPB,

AP = BP [tangents are equal from an external point to the circle]

$\therefore \angle PAB = \angle PBA$

[$\because$ Angles opp. to equal sides of a triangle are equal] And

$\angle A + \angle PAB + \angle PBA = 180^0$

$80^0 + \angle PBA + \angle PBA = 180^0$

$2\angle PBA = 180^0 - 80^0$

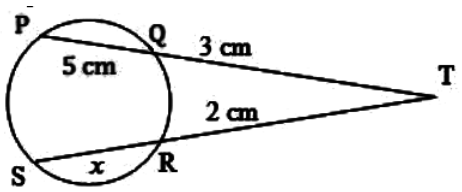
$\angle PBA = \frac{100}{2}$

$\angle PBA = 50^0$

$\therefore$ $\angle PBA = 50^0$

29.

Sol. (b) 10 cm



We know that if two chords intersect each other at T outside the circle, then $TP \times TQ = TS \times TR$ Let SR = cm

$\Rightarrow$ $(5 + 3) \times 3 = (x + 2) \times 2$

$\Rightarrow$ $x + 2 = 12$

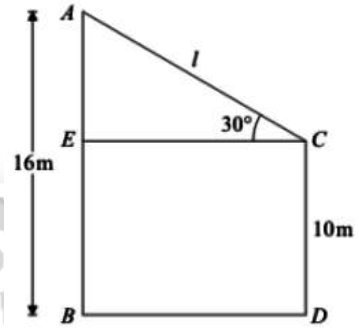
$\Rightarrow$ $x = 10$ cm $x = 10$ cm

30.

Sol. (c) 12

Let AB and CD be the poles such that AB = 16 m and CD = 10 m.

The given information can be represented as



Here, AC is the length of wire which is l.

Also, AE = AB - BE = 16 m - 10 m = 6 m

We have to find the length of wire l.

So we use trigonometric ratios.

In triangle ACE

$$\sin C = \frac{AE}{EC}$$

$$\Rightarrow \sin 30^0 = \frac{6}{1}$$

$$\Rightarrow \frac{1}{2} = \frac{6}{1}$$

$\Rightarrow$ $1 = 12$

PART - III : PHYSICS & CHEMISTRY

1.

Sol. (d) **ii < iii < iv <i**

u = 19.6 m/s, g = 9.8 m/s².

At t = 4 s, v = u - gt = 19.6 - 9.8×4 = -19.6 m/s (magnitude 19.6).

Acceleration = 9.8 m/s² (magnitude).

Displacement s = ut - ½gt²

= 19.6×4 - 0.5×9.8×16 = 0.

Distance travelled = up to max height and back = 2×(u²/2g) = 2×19.6 = 39.2 m.

So magnitudes: displacement 0 < acceleration 9.8 < velocity 19.6 < distance 39.2.

2.

Sol. (d) 10^{19}

V = 32V, R = 40 Ohm, t = 2s

V = IR & I = Q/t

V = QR/t

Q = Vt/R = 32×2 / 40 = 1.6 C

Using Q = ne , n = 10^{19}

3.

Sol. (a) **a convex lens of power +1 D**

Net power = $P_{total} = P_1 + P_2$ = +2 D + (–1 D) = +1 D

combination behaves as a convex lens of power +1 D (f = 1 m).

4.

Sol. (d) **60°**

For reflection by a plane surface, angle of deviation $\delta = 180^0 - 2i$ (where i is angle of incidence). Given $\delta = 120°$,

so $2i = 180^0 - \delta$.

$2i = 60^0$, $i = 30^0$.

5.

Sol. (d) Magnetic field lines emerge from the North pole and enter the South pole outside the magnet; the lines form closed loops (inside they go from S to N).

6.

Sol. (c) **A → r, B → p, C → s, D → q**

Twinkling of stars → atmospheric refraction (r).

Rainbow formation → Dispersion.

Colour of clouds → scattering (s).

Glittering of diamond → multiple internal reflections (q).

7.

Sol. (c) **the shape of the resistor is changed**

Resistivity ρ is a material property (depends on material and temperature) but does not depend on the shape (length/area) of the resistor; R changes with shape, ρ does not.

8.

Sol. (d) Assume all resistors of resistance r.

First 3 are in Parallel so net resistance will be r/3 ,

Which is in series with r, so net resistance of these four will be 4r/3

This is in parallel with r. (bottom most resistor in the diagram)

So Final R_{net} = 4r/7 = 1

r = 7/4 ohm

9.

Sol. (b) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\Rightarrow \frac{1}{f} = \left(\frac{1}{-1.0}\right) - \left(\frac{1}{-0.25}\right) = -1 + 4 = 3$

$\Rightarrow f = \frac{1}{3}\text{m}$, P = +3.0 D

10.

Sol. (b) **Tesla**

SI unit of magnetic field (magnetic flux density B) is tesla (T).

11.

Sol. (d) **BF_3**

BF_3 is a Lewis acid. It has an incomplete octet.

12.

Sol. (a) Reaction: $CaO + HCl \rightarrow CaCl_2 + H_2O \rightarrow$ not give CO_2

13.

Sol. (c) MnO_4^- changes to Mn^{2+} reduced SO_3^{2-} is oxidised to SO_4^{2-} ?

14.

Sol. (a) It is the mixture of 3 parts of conc. HCl and 1 part of HNO_3.

15.

Sol. (c) Isobars have same mass number of atoms of different element.

16.

Sol. (a) $n_1 = \frac{8}{2} = 4$ mol,

$n_2 = \frac{16}{16} = 1$ mol,

$n_3 = \frac{28}{28} = 1$ mol,

$n_4 = \frac{8}{32} = \frac{1}{4}$ mol,

In Option (a) has more number of moles, so it has more number of molecules.

17.

Sol. (b) $MPO_4 \rightarrow M^{3+} + PO_4^{3-}$

$M^{3+} + O^{2-} \rightarrow M_2O_3$

18.

Sol. (b) The mass of electron is 9.1×10^{-31} kg

19.

Sol. (b) Conjugate base of $H_2O \rightarrow OH^- + H^+$

20.

Sol. (c) Dispersed phase fat and dispersion medium is water.

PART - IV : BIOLOGY

1.

Sol. (a) **1-C, 2-B, 3-A, 4-D**

Binary fission is seen in Amoeba (C). Budding is characteristic of Hydra (B). Fragmentation is a mode of reproduction in Spirogyra (A). Spore formation is seen in fungi like Rhizopus (D).

2.

Sol. (a) Immediate energy: glucose from carbs.Fats: slow breakdown, used later. Proteins: reserved for growth/repair; used only in starvation.Thus, glucose oxidation via aerobic/anaerobic respiration is the first pathway for energy during exercise.

3.

Sol. (a) The cell membrane is a living, flexible boundary that is selectively permeable, allowing it to control which substances enter and exit the cell. Statement A describes the cell wall (which is found in plants), and statement C is incorrect as the membrane is made of lipids and proteins.

4.

Sol. (b) Bone is a hard, supportive connective tissue. Blood is a fluid connective tissue that circulates throughout the body. Muscle and nervous tissue are distinct tissue types with different functions and structures.

5.

Sol. (d) The assertion is false. The 'fight or flight' response is a form of hormonal control, not primarily nervous control. While it is initiated by the nervous system, the sustained response is driven by the hormones released by the adrenal gland, which is correctly stated in the reason.

6.

Sol. (a) The assertion is correct. The reason correctly describes a key outcome of vegetative propagation, which is also the defining feature of asexual reproduction, making it a valid explanation.

7.

Sol. (c) Abnormal tall growth $\rightarrow$ Gibberellins/ auxins (promote elongation).Yellowing + early leaf fall $\rightarrow$ Ethylene (induces senescence, abscission). Fruit without fertilization (parthenocarpy) $\rightarrow$ Auxin/ Gibberellin. Thus, a combination of Auxin + Gibberellin + Ethylene explains all observations.

8.

Sol. (c) The uterus is the pear-shaped organ where a fertilized egg (zygote) implants and where the embryo and fetus develop during pregnancy. Gamete production occurs in the ovaries (A), fertilization occurs in the fallopian tubes (B), and hormone secretion is a complex process involving the ovaries and pituitary gland (D).

9.

Sol. (a) Statement I, III, and IV are all correct. Statement II is incorrect because prokaryotic cells (like bacteria) do have ribosomes, even though they lack a nucleus and other membrane-bound organelles.

10.

Sol. (d) Statement I is correct but only for lateral meristems; apical meristems cause primary growth. Statement II is incorrect; xylem and phloem are complex permanent tissues. Statements III and IV are both correct. Therefore, only III and IV are consistently correct.