VP Milestone
Objective Test-01
Hints & Solutions

DATE: 08/06/2025

ANSWER KEY

PHYSICS	CHEMISTRY	BIOLOGY	MATHEMATICS
1. (A)	21. (A)	41. (C)	61. (B)
2. (B)	22. (C)	42. (B)	62. (A)
3. (A)	23. (D)	43. (A)	63. (B)
4. (B)	24. (D)	44. (A)	64. (D)
5. (D)	25. (B)	45. (A)	65. (A)
6. (A)	26. (D)	46. (B)	66. (C)
7. (A)	27. (C)	47. (C)	67. (B)
8. (A)	28. (D)	48. (C)	68. (A)
9. (A)	29. (D)	49. (C)	69. (A)
10. (A)	30. (A)	50. (C)	70. (A)
11. (D)	31. (B)	51. (C)	71. (B)
12. (A)	32. (B)	52. (A)	72. (A)
13. (D)	33. (C)	53. (A)	73. (C)
14. (C)	34. (B)	54. (A)	74. (C)
15. (C)	35. (C)	55. (D)	75. (A)
16. (B)	36. (D)	56. (B)	76. (C)
17. (A)	37. (A)	57. (B)	77. (A)
18. (A)	38. (C)	58. (C)	78. (A)
19. (B)	39. (A)	59. (C)	79. (B)
20. (B)	40. (A)	60. (A)	80. (A)

PHYSICS

1. **(A)** positive, negative

The moment of force for anticlockwise moment is taken as positive and for clockwise moment is taken as negative

2. **(B)** 4×10^{-19} J

Given, energy of electron = 2.5 eV

1 eV = 1.6×10^{-19} J

Hence,

2.5 eV = $2.5 \times 1.6 \times 10^{-19} = 4 \times 10^{-19}$ J

3. **(A)** 600 J

Given,

Force = 200 N

Displacement = S = 3m

As we know.

Work done = force × displacement in the direction of force

W = F × S

W = 200 × 3

W = 600J

Therefore, work done is 600J.

4. **(B)** (i), (ii) and (iii)

Dynamic equilibrium refers to a state where two or more opposing processes occur at the same rate, resulting in a stable overall condition.

(i) Moon revolving around the earth is an example of dynamic equilibrium as the gravitational force pulling the moon towards the Earth is balanced by the centrifugal force of the moon's motion, resulting in a stable orbit.

(ii) A pebble fixed at the end of a string whirling in a circular path is also an example of dynamic equilibrium as the tension in the string pulling the pebble towards the center is balanced by the centrifugal force of the pebble's motion, keeping it in a stable circular path.

(iii) An aeroplane moving at a constant height is also an example of dynamic equilibrium. It achieves dynamic equilibrium when upward lift on it balances its weight downwards.

(iv) A beam balance balanced in a horizontal position is not an example of dynamic equilibrium because the balance may remain still, it's a static equilibrium where opposing forces (gravity pulling down on each side of the balance) are already balanced without any ongoing processes happening.

5. **(D)** mechanical energy

Mechanical energy, which is the sum of kinetic and potential energy, remains constant during the motion of the body. Initially, when the body is released from a height, it has potential energy. As it falls, this potential energy decreases while its kinetic energy increases. However, the sum of kinetic and potential energy (mechanical energy) remains constant in the absence of external forces like air resistance.

6. **(A)** 1-S, 2-Q, 3-R, 4-P

7. **(A)** 1-P, 2-Q, 3-R, 4-S

8. **(A)** Both Statements I and II are correct.

9. **(A)** Both Statement I and Statement II are true

10. **(A)** Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.

11. **(D)** both (A) and (B)

For stable equilibrium, the center of gravity of a body should be located above the base of the body. Additionally, it should be as close as possible to the geometric center.

12. **(A)** 0.28 J

Given

m = 400g = 0.4 kg

g = 10 m/s^2

n = 7cm = 0.07m

The potential energy of the pendulum at its extreme position (maximum height) = mgh

kinetic energy at this point = 0

Substituting we get,

Total energy = PE + KE = mgh + 0

= $(0.4 \times 10 \times 0.07) + 0 = 0.28$J

13. **(D)** It remains constant

When the spring is compressed, it stores potential energy. Upon release, this potential energy is converted into kinetic energy as the spring propels an object forward. Assuming there are no significant external forces acting on the system (such as friction), the total mechanical energy of the system remains constant.

14. **(C)** nuclear energy changes to electrical energy

Nuclear fission is a nuclear reaction in which the nucleus of an atom splits into smaller parts, releasing a significant amount of energy. This energy is in the form of nuclear energy and is used for constructive purposes to produce electrical energy.

15. **(C)** $K = \dfrac{p^2}{2m}$

The kinetic energy 'K' and momentum 'p' are related as $K = \dfrac{p^2}{2m}$

16. **(B)** According to the principle of moments in equilibrium:

Sum of anticlockwise moments = Sum of clockwise moments

17. **(A)** $\vec{F} = m\vec{a}$ (mass m is constant)

Newton's second law of motion states that

$\vec{F} = m\vec{a}$, or net force is equal to mass times acceleration (when mass m is constant).

18. **(A)** rotational motion

If a body is pivoted at a point and the force is applied on the body at a suitable point, it rotates the body about the axis passing through the pivoted point. This is the turning effect of force and the motion of body is called the rotational motion.

19. **(B)** the one with a smaller base

An object with a larger base of support will have a low centre of gravity because the distribution of mass is spread out over a larger area, which tends to lower the center of gravity whereas that with a smaller base will have a higher centre of gravity because the mass is concentrated over a smaller area.

20. **(B)** they both act in opposite direction

Centripetal Force is a real force which acts towards the centre of the circle whereas centrifugal force is an assumed force which acts away from centre of the circle. Both the forces act in opposite directions.

CHEMISTRY

21. **(A)** Lithium

Lithium, Boron, Carbon, Fluorine is the order of given elements from left to right in period 2. As electronegativity increases from left to right in a period, hence, Lithium has the least electronegativity in the given elements.

22. **(C)** 81.25

According to Dobereneir's triad the atomic mass of Br will be average of the atomic masses of Cl and I

$= \dfrac{35.5 + 127}{2} = 81.25$

23. **(D)** Fluorine

Electron affinity increases from left to right in a period. Out of the given options, Lithium, Carbon and Fluorine are period 2 elements in that order. Hence, Fluorine has the highest electron affinity among period 2 elements.

24. **(D)** K, Cu

Potassium (K) and copper (Cu) are both in the fourth period of the periodic table. A period on the periodic table is a horizontal row of elements

25. **(B)** 18

In 4th period contains elements from atomic number 19 to 36.

So, The number of elements in 4th period of the periodic table is 18.

26. **(D)** All of the above

Relative size:

Ions and atoms have different sizes due to the gain or loss of electrons. When an atom gains electrons, it becomes larger (anion), and when it loses electrons, it becomes smaller (cation).

Electronic configuration:

Ions have a different electronic configuration than their corresponding atoms because they have a different number of electrons.

Presence of charge:

Ions are charged particles (positive or negative) while atoms are electrically neutral.

27. **(C)** Cl

In the period from left to right, the size of the atom decreases due to the increase in nuclear charge. Also, the noble gases are bigger than the halogens as they have octets and a sort of repulsion occurs in the shells.

So, the smallest element in the third period is Chlorine (Cl).

28. **(D)** Na, Al

The element with atomic number 12, then the elements with atomic numbers 11 and 13.

The elements to the left and right of the element with atomic number 12 are Sodium (Na) and Aluminum (Al) respectively.

29. **(D)** Reactivity increases in alkali metals but decreases in halogens.
Alkali metals:
As you move down the alkali metal group (Li, Na, K, Rb, Cs), their reactivity increases because they have a greater tendency to lose their single valence electron, making them more easier to react with other elements.
Halogens:
Conversely, in halogens (F, Cl, Br, I), reactivity decreases down the group. The larger the halogen atom gets, the farther the valence electrons are from the nucleus, making it less likely to attract an electron from another atom and thus, decreasing its reactivity.

30. **(A)** Assertion is true:
Metals generally have low ionization energies because it takes less energy to remove the outermost electron from a metal atom due to their loosely held outer electrons.
Reason is true:
Metals have a tendency to lose electrons because of their low ionization energy, allowing them to form positive ions (cations) when they lose electrons.

31. **(B)** it gains electrons and is reduced
Non-metals accept the electron in valence shell during reactions and are hence reduced.

32. **(B)** Ammonium chloride
When ammonium chloride NH_4Cl is formed cation NH_4^+ (having 3 covalent and one coordinate bond) and anion Cl^- are attracted towards each other, due to electrical charge existing on them and ionic bond is formed. Thus, ammonium chloride having all three types of bonds i.e., covalent, coordinate and ionic bond.

33. **(C)** Insolubility in water
Ionic compounds are soluble in water. They are insoluble in organic solvents. Water [polar solvent] has a high dielectric constant i.e., capacity to weaken the force of attraction, thus resulting in free ions. Organic solvents [non-polar] have low dielectric constants and do not cause dissolution.

34. **(B)** Low melting and low boiling point

There are weak Vander Waals forces of attraction between molecules. Thus, less amount of energy is required to break these forces of attraction.

35. **(C)** BCl_3
In BCl_3, Boron forms three bonds with three chlorine atoms, resulting in only 6 electrons around boron (3 from the bonds).
Conclusion: Boron does not have a complete octet (only 6 electrons). So BCl_3 is electron deficient compound.

36. **(D)** BF_3 (Boron trifluoride):
Boron has only three valence electrons, so it can only form three bonds with fluorine atoms. This gives boron only six electrons around it,
PCl_5 (Phosphorus pentachloride):
Phosphorus can expand its octet. In PCl_5, it forms five bonds with chlorine atoms, resulting in ten electrons around the phosphorus atom. This violates the octet rule.

37. **(A)** HNO_3
A coordinate bond occurs when one atom donates a lone pair of electrons to another atom, to form a bond. In nitric acid (HNO_3), nitrogen atoms donates a lone pair of electrons to the oxygen atom, forming a coordinate bond.

38. **(C)** $A^{3+} + e^- \longrightarrow A^{2+}$ is a reduction reaction.

39. **(A)** Both Assertion and Reason are true, and the Reason is the correct explanation of the Assertion.
Atoms combine either by transfer of valence electrons from one atom to another or by sharing of valence electrons to have an octet in their valence shell.

40. **(A)** Both Statements I and II are correct.
The solubility of NaCl in water is explained by the interaction between the polar water molecules and the charged ions in NaCl. Water molecules surround the Na^+ and Cl^- ions, facilitating their separation from the crystal lattice and leading to the dissolution of NaCl in water.

BIOLOGY

41. **(C)** 44
Humans have 22 pairs of autosomes and one pair of sex chromosomes.

42. **(B)** metaphase
In metaphase, chromosomes are arranged in equatorial plane and spindles attach to their centromeres.

43. **(A)** endosmosis

When raisins are placed in water (hypotonic), endosmosis occurs. Hence, they absorb water and swell up.

44. **(A)** Only 1
The transportation of water in plants is done by xylem vessel.

45. **(A)** phosphate, sugar and nitrogenous bases
Nucleotides consist of phosphate, sugar and nitrogenous base.

46. **(B)** P and Q only as inflated pod shape and green seed color are dominant traits.

47. **(C)** Males have only one X chromosome

48. **(C)** Both parents are heterozygous

49. **(C)** It helps in generating root pressure for water ascent

50. **(C)** Root pressure is the positive pressure that develops in the roots of plants and this happens by the active absorption of nutrients from the soil.

51. **(C)** Xylem conducts water upward in the plant

52. **(A)** Both Assertion and Reason are true, and the Reason is the correct explanation of the Assertion.

53. **(A)** Nerve cells do not divide.

54. **(A)** Both mitochondria and chloroplasts contain their own DNA and divide by simple fission.

55. **(D)** Two daughter cells are produced in mitosis whereas four daughter cells are produced in meiosis.

56. **(B)** Imbibition refers to passive absorption of water by dry substances like cellulose

57. **(B)** Black color is dominant as all the progenies produced are black in color and coat color is not sex linked because sex-linked inheritance is the appearance of a trait which is due to the presence of an allele exclusively either on the X chromosome or on the Y chromosome.

58. **(C)** Reason can be corrected as: The basic principles of genetics were discovered by Mendel in the mid-nineteenth century.

59. **(C)** The structure of DNA was studied by Rosalind Franklin and was finally worked out and given by James Watson and Francis Crick.

60. **(A)** P-II, Q-II, R-I, S-III

MATHEMATICS

61. **(B)** ₹1620
Cost price for shopkeeper = ₹8000. Input GST
= 18% of ₹8000 = ₹1440. Selling price = ₹9000.
Output GST = 18% of ₹9000 = ₹1620.

62. **(A)** ₹120
Cost for dealer = ₹5000 . Input GST = 12% of ₹5000
= ₹600.
Selling price for dealer = ₹5000 + ₹1000 = ₹6000.
Output GST = 12% of ₹6000 = ₹720.
GST payable = ₹720 − ₹600 = ₹120

63. **(B)** ₹14850
Marked Price = ₹15000.
Discount = 10% of 15000 = ₹1500.
Selling Price (Taxable Value)
= 15000 − 1500 = ₹13500.
GST = 10% of 13500 = ₹1350.
Amount paid = 13500 + 1350 = ₹14850.

64. **(D)** 0
In the case of inter-state transaction IGST is applicable. So SGST = ₹0.

65. **(A)** Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
A: Input GST = 10% of 10000 = 1000 (True).
Output GST = 10% of 12000 = 1200 (True).
Net GST = 1200 − 1000 = 200 (True).
R: Correct definition of Net GST.

66. **(C)** ₹7713
Monthly deposit (P) = ₹400. Time (n) = 1 year 6 months = 18 months. Rate (r) = 9% p.a.
Total Principal = P × n = 400 × 18 = ₹7200.

Interest (I) $= P \times \dfrac{n(n+1)}{2 \times 12} \times \dfrac{r}{100} = 400 \times \dfrac{18(18+1)}{24} \times \dfrac{9}{100}$

$= 400 \times \dfrac{18 \times 19}{24} \times \dfrac{9}{100}$

$I = \dfrac{400 \times 18 \times 19 \times 9}{24 \times 100} = \dfrac{4 \times 18 \times 19 \times 9}{24} = \dfrac{18 \times 19 \times 9}{6}$

$= 3 \times 19 \times 9 = 57 \times 9 = ₹513$

Maturity Value = Total Principal + Interest

$= ₹7200 + ₹513 = ₹7713$

67. (B) ₹65550

Monthly deposit = ₹1000. Time = 5 years
= 60 months.

Total deposited = ₹1000 × 60 = ₹60000.

Maturity Value = Total deposited + Interest

$= ₹60000 + ₹5550 = ₹65550.$

68. (A) ₹1500

Monthly deposit = ₹600. Time = 2 years = 24 months.

Total deposited = ₹600 × 24 = ₹14400.

Maturity Value = ₹15900.

Interest = 15900 − 14400 = ₹1500.

69. (A) ₹800

Let the monthly instalment be ₹P.

Time = 2 years = 24 months. Rate = 6%.

Interest = ₹1200.

Formula: $I = P \times \dfrac{n(n+1)}{2 \times 12} \times \dfrac{r}{100} = 1200$

$= P \times \dfrac{24(25)}{24} \times \dfrac{6}{100} = P \times 25 \times 0.06$

$1.5P = 1200 \Rightarrow P = 800$

70. (A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Assertion: Interest is calculated on each month's principal for the duration it stays in the account (True).

Reason: Correct simple interest formula and its application concept in RD (True).

71. (B) ₹750

Number of shares = 100. FV = ₹50.

Dividend rate = 15%. Income per share = 15% of ₹50 = ₹7.50.

Total income = 100 × 7.50 = ₹750.

72. (A) ₹500

Investment = ₹8000. MV = ₹160. FV = ₹100.

Number of shares $= \dfrac{8000}{160} = 50.$

Dividend rate = 10%. Income per share = 10% of ₹100 = ₹10. Total income = 50 × ₹10 = ₹500.

73. (C) ₹30

Investment = ₹4500. Total Dividend = ₹150.

Dividend per share (FV = ₹10, 10% dividend)

= 10% of ₹10 = ₹1. Number of shares $= \dfrac{150}{1} = 150$.

Market Value per share $= \dfrac{\text{Investment}}{\text{Number of shares}}$

$= \dfrac{4500}{150} = ₹30$

74. (C) ₹9000

FV per share = ₹10. MV per share = 12.

Dividend rate = 8%. Annual income per share = 8% of ₹10 = ₹0.80. Desired annual income = ₹600.

Number of shares needed $= \dfrac{600}{0.80} = 750$ shares.

Investment = Number of shares × MV = 750 × ₹12
= ₹9000.

75. (A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Assertion: Dividend per share = 20% of ₹10 = ₹2.

Investment per share = ₹25.

Percentage return $= \left(\dfrac{2}{25} \right) \times 100 = 8\%$ (True).

Reason: Correct formula and concept for percentage return (True).

76. (C) {1, 2, 3, 4}

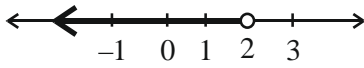$-1 \le 3x - 4 < 11 \Rightarrow 3 \le 3x < 15 \Rightarrow 1 \le x < 5.$

For x ∈ W = {0, 1, 2, 3, 4, ...}, the solution set is {1, 2, 3, 4}.

77. (A) {1, 2}

$2x - 3 \le 5 - x \Rightarrow 3x \le 8 \Rightarrow x \le \dfrac{8}{3} \approx 2.66.$

For x ∈ N = {1, 2, 3 ,...}, the solution set is {1, 2}.

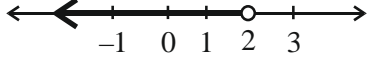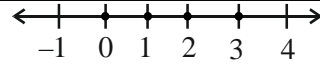**78.** **(A)**

$3 - 2x > x - 3 \Rightarrow 6 > 3x \Rightarrow 2 > x \Rightarrow x < 2.$

For $x \in R$, the solution is all real numbers less than
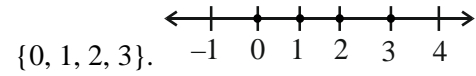
2, represented by

79. **(B)**

$-2 < 2x - 1 \le 5$. Part 1: $-2 < 2x - 1 \Rightarrow -1 < 2x$

$\Rightarrow x > -0.5$. Part 2: $2x - 1 \le 5. \Rightarrow 2x \le 6$

$\Rightarrow x \le 3$.

Combining: $-0.5 < x \le 3$. For $x \in I$, the integers are

$\{0, 1, 2, 3\}$.

80. **(A)** Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Assertion: $-2x > 4 \Rightarrow x < -2$. For $x \in Z$, solution is $\{..., -5, -4, -3\}$ (True).

Reason: Correct rule for reversing inequality sign (True).

[7]