SMART ACADEMY

Subjects : Physics , Chemistry , Maths , BIOLOGY

PRACTICE TEST

Date : 19-03-2026

Hours : 3 Hours

Total Marks : 80

Physics - Section A (MCQ)

1. Given $\vec{A} = (2\hat{i} - 3\hat{j} + \hat{k})$, $\vec{B} = (3\hat{i} + \hat{j} - 2\hat{k})$ and $\vec{C} = (3\hat{i} + 2\hat{j} + \hat{k})$. $(\vec{A} + \vec{B}) \cdot \vec{C}$ will be

   A) 10   B) 12   C) 18   D) 20

2. The density of a cube is measured by measuring its mass and length of its sides. The % error in the measurement of mass and length are 5 % and 6% respectively. The percentage error in the measurement of density is

   A) 21% B) 23 %   C) 25% D) 27 %

3. The percentage error in the measurement of mass and speed of a particular body is 3% and 4% respectively. The percentage error in the measurement of kinetic energy is

   A) 9 %   B) 10% C) 11% D) 12%

4. Which of the following comes under the category of random errors?

   A) Improper calibration of thermometer
   B) Zero error of $1\mu V$ in voltmeter
   C) Student measures $22°$, where as the correct angle is $20°$
   D) Errors resulting from the fluctuations in electric power supply

5. The pressure on a square plate is measured by measuring the force acting on the plate and length of the sides of the plate. The maximum error in the measurement of force and length are respectively 4% and 2%, the percentage error in the measurement of pressure is

   A) 1%   B) 2%   C) 6%   D) 8%

6. The error in the measurement of length and mass is 3% and 4% respectively. The error in the measurement of density will be

   A) 6% B) 13% C) 9% D) 15%

7. The three vectors $\vec{A} = 3\hat{i} - 2\hat{j} + \hat{k}$, $\vec{B} = \hat{i} - 3\hat{j} + 5\hat{k}$ and $\vec{C} = 2\hat{i} - \hat{j} + 4\hat{k}$ will form

   A) isosceles triangle.
   B) equilateral triangle.
   C) no triangle.
   D) right angled triangle.

8. Vector $\vec{A}$ of magnitude $5\sqrt{3}$ units, another vector $\vec{B}$ of magnitude of 10 units are inclined to each other at an angle of $30°$. The magnitude of vector product of the two vectors is $\left[\sin 30° = \frac{1}{2}\right]$

   A) $5\sqrt{3}$ units   B) 10 units
   C) $25\sqrt{3}$ units   D) 75 units

9. If $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} - \hat{k}$, the magnitude of $[(\vec{a} + 3\vec{b}) \cdot (2\vec{a} - \vec{b})]$ is

   A) -13   B) 13   C) -15   D) 15

10. A unit vector in the direction of resultant vector of $\vec{A} = -2\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{B} = \hat{i} + 2\hat{j} - 4\hat{k}$ is

    A) $\frac{-3\hat{i} + \hat{j} + 5\hat{k}}{\sqrt{35}}$
    B) $\frac{\hat{i} + 2\hat{j} - 4\hat{k}}{\sqrt{35}}$
    C) $\frac{-2\hat{i} + 3\hat{j} + \hat{k}}{\sqrt{35}}$
    D) $\frac{-\hat{i} + 5\hat{j} - 3\hat{k}}{\sqrt{35}}$

11. What is the angle between resultant of $\vec{A} + \vec{B}$ and $\vec{A} \times \vec{B}$?

    A) π rad   B) $0°$
    C) $\frac{\pi}{2}$ rad   D) $\frac{\pi}{4}$ rad

12. The maximum error in the measurement of mass and length is 4% and 3% respectively. The error in the measurement of density of a cube will be

    A) 9% B) 15% C) 13% D) 6%

13. The unit vector $(a\hat{i} + b\hat{j})$ is perpendicular to $(\hat{i} + \hat{j})$. The value of $'b'$ is

    A) $+\frac{1}{\sqrt{3}}$ B) $-\frac{1}{\sqrt{3}}$
    C) $+\frac{1}{2}$ D) $-\frac{1}{\sqrt{2}}$

14. Let $\vec{P} = \hat{I}P\sin\theta - \hat{P}\cos\theta$, be any vector. Another vector $\vec{Q}$ which is perpendicular to $\vec{P}$ is

    A) $(\hat{I}Q\sin\theta + \hat{j}Q\cos\theta)$
    B) $(\hat{I}Q\cos\theta + \hat{j}Q\sin\theta)$
    C) $(\hat{I}Q\cos\theta - \hat{j}Q\sin\theta)$
    D) $(\hat{I}P\sin\theta + \hat{j}P\cos\theta)$

15. If $\sqrt{A^2 + B^2}$ represents the magnitude of resultant of two vectors $\left(\vec{A} + \vec{B}\right)$ and $\left(\vec{A} - \vec{B}\right)$, then the angle between two vectors is

A) $\cos^{-1}\left[-\frac{2(A^2 - B^2)}{(A^2 + B^2)}\right]$
B) $\cos^{-1}\left[-\frac{A^2 - B^2}{A^2 B^2}\right]$
C) $\cos^{-1}\left[-\frac{(A^2 + B^2)}{2(A^2 - B^2)}\right]$
D) $\cos^{-1}\left[-\frac{(A^2 - B^2)}{A^2 + B^2}\right]$

16. Resultant of two vectors $\vec{P}$ and $\vec{Q}$ is of magnitude R_1. If direction of $\vec{Q}$ is reversed, the resultant is of magnitude R_2. The value of $\left(R_1^2 + R_2^2\right)$ is $[\cos(\pi - \theta) = -\cos\theta]$

A) $\left(P^2 + Q^2\right)$
B) $2\left(P^2 + Q^2\right)$
C) $2\left(P^2 - Q^2\right)$
D) $\left(P^2 - Q^2\right)$

17. If $\vec{A} = 3\hat{\imath} - 2\hat{\jmath} + \hat{k}$, $\vec{B} = \hat{\imath} - 3\hat{\jmath} + 5\hat{k}$ and $\vec{C} = 2\hat{\imath} + \hat{\jmath} - 4\hat{k}$ form a right angled triangle then out of the following which one is satisfied?

A) $\vec{B} = \vec{A} + \vec{C}, B^2 = A^2 + C^2$
B) $\vec{A} = \vec{B} + \vec{C}, B^2 = A^2 - C^2$
C) $\vec{C} = \vec{A} + \vec{B}, C^2 = A^2 + B^2$
D) $\vec{A} = \vec{B} + \vec{C}, B^2 = A^2 + C^2$

18. A body of mass $2\ kg$ is acted upon by two forces each of magnitude $1\ N$ and inclined at $60°$ with each other. The acceleration of the body in $\frac{m}{s}$ is $[\cos 60° = 0.5]$

A) $\sqrt{0.35}$
B) $\sqrt{0.65}$
C) $\sqrt{0.75}$
D) $\sqrt{0.20}$

19. The resultant of two vectors $\vec{P}$ and $\vec{Q}$ is $\vec{R}$. When the direction of $\vec{Q}$ is reversed, the resultant is given by $\vec{S}$. Which one of the following is true for vectors $\vec{R}$ and $\vec{S}$?

A) $R^2 - S^2 = \left(P^2 + Q^2\right)$
B) $R^2 - S^2 = 2(\vec{P} \cdot \vec{Q})$
C) $R^2 + S^2 = 4(\vec{P} \cdot \vec{Q})$
D) $R^2 + S^2 = 2\left(P^2 + Q^2\right)$

20. The angle subtended by the vector $\vec{A} = 4\hat{\imath} + 3\hat{\jmath} + 12\hat{k}$ with the x -axis is

A) $\sin^{-1}\left(\frac{4}{13}\right)$
B) $\cos^{-1}\left(\frac{3}{13}\right)$
C) $\cos^{-1}\left(\frac{4}{13}\right)$
D) $\sin^{-1}\left(\frac{3}{13}\right)$

Chemistry - Section A (MCQ)

21. Find the number of moles present in 0.448 L of dihydrogen at STP.

A) 0.08 mol
B) 0.06 mol
C) 0.04 mol
D) 0.02 mol

22. What is the number of hydrogen atoms present in 5.4 g of urea?

A) 9.011×10^{23}
B) 6.022×10^{23}
C) 2.168×10^{23}
D) 3.011×10^{23}

23. Find the number of millimoles for 0.160 g sodium hydroxide.

A) 0.08
B) 0.20
C) 4.0
D) 40.00

24. Calculate number of moles present in $9.10 \times 10^{-2}\ kg$ of water.

A) 0.9
B) 1.8
C) 3
D) 5

25. What volume of $2M H_2SO_4$ is required to form 0.2 N of 100 mL of solution?

A) 5 mL
B) 20 mL
C) 10 mL
D) 50 mL

26. Which of the following factors affect molarity of solution?

A) Nature of solute dissolved
B) Temperature
C) Mass of solvent
D) Molar mass of solvent

27. What is percent atom economy if formula weight of reactants and formula weight of products respectively are $45u$ and $35u$?

A) 77.8%
B) 90.0%
C) 80.5%
D) 71.0%

28. What is value of percent atom economy when reactants having sum of formula weight 78 u results in the formation of a product with formula weight 65 u ?

A) 70%
B) 78%
C) 83%
D) 65%

29. What will be the volume of oxygen gas produced, If the reaction $2KClO_{3(s)} \longrightarrow 2KCl_{(s)} + 3O_{2(g)} \Delta H° = -78kJ$ is carried out at S.T.P.?

A) 48.0 L
B) 44.8 L
C) 22.4 L
D) 67.2 L

30. What is the volume of oxygen required for complete combustion of 0.25 mole of methane at S.T.P.?

A) $22.4 dm^3$
B) $5.6 dm^3$
C) $11.2 dm^3$
D) $7.46 dm^3$

31. What is the volume occupied by 2.5 mol of ammonia gas at STP?

A) $22.4 dm^3$
B) $25.0 dm^3$
C) $33.6 dm^3$
D) $56.0 dm^3$

32. What is the quantity of hydrogen gas liberated when 46 g sodium reacts with excess ethanol? (Given Atomic mass of Na = 23)

A) $2.4 \times 10^{-3} kg$ B) $2.0 \times 10^{-3}\ kg$
C) $4.0 \times 10^{-3} kg$ D) $2.4 \times 10^{-2}\ kg$

33. Which gas among the following contains maximum number of molecules at STP? (Molar masses in $\mathrm{gmol^{-1}} CO_2 = 44, Ar = 39\cdot9, CH_4 = 16, O_2 = 32$)

A) $24\cdot0$ g of O_2 B) $16\cdot0$ g of CH_4
C) $13\cdot3$ g of Ar D) 11 g of CO_2

34. How many molecules are present in $22400\ \mathrm{cm^3}$ of a gas at STP?

A) 22.4×10^{20} B) 6.022×10^{23}
C) 6.022×10^{20} D) 22.4×10^{23}

35. What is the mass in gram of 1 atom of an element if its atomic mass is 10u ?

A) 2.06056×10^{-22} g B) 1.66056×10^{-23} g
C) 1.06056×10^{-24} g D) 3.66056×10^{-25} g

36. Identify number of moles of donor atoms in $2n$ mole of SCN^-.

A) 3n B) 6n C) 4n D) n

37. What is the number of moles of sp^2 hybrid carbon atoms present in n moles of isopentane?

A) zero B) one C) two D) three

38. "Mass can neither be created nor destroyed" is the statement of

A) Gay Lussac Law of gaseous volume
B) Law of definite proportion
C) Law of conservation of mass
D) Law of multiple proportions

39. What is the atomicity of aluminium phosphate?

A) 8 B) 6 C) 5 D) 13

40. The symbol used for hydrogen in Dalton's atomic theory is

A) $\oplus$ B) O C) $\odot$ D) $\mathbb{O}$

Maths - Section A (MCQ)

41. If $p^3 = q^4 = r^6 = t^7 = s^2$, then $\log_t(pqrs) = ...$

A) $\frac{168}{5}$ B) 28 C) $\frac{31}{4}$ D) $\frac{35}{4}$

42. If $x + \log_{15}(5 + 3^x) = x\log_{15} 5 + \log_{15} 24$, then $x = ...$

A) 1 B) 5 C) 2 D) 8

43. If $y = \frac{x^{\frac{2}{3}} - x^{\frac{-1}{3}}}{x^{\frac{2}{3}} + x^{\frac{-1}{3}}}, x \neq 0$, then $(x+1)^2 y_1 =$

A) 2 B) -2 C) $\frac{-1}{3}$ D) 3

44. If $|3x - 2| \leq \frac{1}{2}$ then $x \in$

A) $\left[\frac{1}{2}, \frac{5}{6}\right]$
B) $\left(\frac{1}{2}, \frac{5}{6}\right]$
C) $\left[\frac{1}{2}, \frac{5}{6}\right)$
D) $\left(\frac{1}{2}, \frac{5}{6}\right)$

45. If $\log_2 x + \log_4 x + \log_y x + \log_{16} x - \frac{25}{36}$ and $x = 2^k$, then k is

A) 1 B) $\frac{1}{2}$ C) $\frac{1}{3}$ D) $\frac{1}{8}$

46. If $y = [(x+1)(2x+1)(3x+1)\ldots\ldots\ldots(nx+1)]^4$ then $\frac{dy}{dx}$ at $x = 0$ is

A) $\frac{n(n+1)}{2}$ B) $4n(n+1)$
C) $\left(\frac{n(n+1)}{2}\right)^2$ D) $2n(n+1)$

47. The approximate value of $\log_{10} 1002$ is (Given $\log_{10} e = 0.4343$)

A) 3.0117 B) 3.0009 C) 2.9999 D) 3.1119

48. The decay rate of radio active material at any time t is proportional to its mass at that time. The mass is 27 grams when $t = 0$. After three hours it was found that 8 grams are left. Then the substance left after one more hour is

A) $\frac{27}{8}$ grams B) $\frac{81}{4}$ grams
C) $\frac{16}{3}$ grams D) $\frac{16}{9}$ grams

49. If a body cools from $80°C$ to $50°C$ in the room temperature of $25°C$ in 30 minutes, then the temperature of the body after 1 hour is

A) $31.36°C$ B) $32.25°C$
C) $36.36°C$ D) $33.25°C$

50. The assets of a person are reduced in his business such that the rate of reduction is proportional to the square root of the existing assets. If the assets were initially ₹ $10,00,000$ and due to loss they reduce to ₹ 10,000 after 3 years, then the number of years required for the person to go bankrupt will be

A) $\frac{10}{3}$ B) $\frac{10}{9}$ C) $\frac{20}{9}$ D) $\frac{20}{3}$

BIOLOGY - Section A (MCQ)

51. Fuelgen showed that DNA is present in _____.

A) chromosomes B) nucleosomes
C) chromatin D) nucleotides

52. Identify the substances having glycosidic bond and peptide bond, respectively in their structure:

   A) Glycerol, trypsin   B) Cellulose, lecithin
   C) Inulin, insulin   D) Chitin, cholesterol.

53. Identify the INCORRECT statement with reference to enzymes.

   A) Lock and key analogy for enzyme action is proposed by Emil Fischer.
   B) Induced Fit model for enzyme action is proposed by Koshland.
   C) Increase in substrate concentration decreases the velocity of enzyme activity.
   D) Protease is a purely proteinaceous enzyme.

54. Which one of the following is an example of cane sugar?

   A) Maltose B) Glucose C) Fructose D) Sucrose

55. The rate of enzyme reactions rises with the increase in substrate concentration. But it does NOT increase beyond a certain concentration because_____.

   A) The enzymes undergo denaturation.
   B) Free enzyme molecules to bind with substrate are not available.
   C) The substrate molecules are available.
   D) The reaction has to maintain a minimum velocity

56. A 340 Å long segment of DNA molecule has 20 thymine nitrogenous bases, what will be the number of guanine nitrogen bases in the same segment?

   A) 10   B) 40   C) 80   D) 160

57. Which of the following correctly describes the amphoteric nature of proteins?

   A) Proteins can act as only acids.
   B) Proteins can act as only bases.
   C) Proteins can act as both acids and bases.
   D) Proteins only show presence of non-polar amino acids.

58. Study the following type of secondary metabolite and select the correct option.
   i. Terpenes: Made from mevalonic acid that is composed mainly of carbon and hydrogen
   ii. Phenolics: Made from simple sugars containing benzene rings, hydrogen and oxygen.

   A) I is correct.
   B) ii is correct.

C) Both i and ii are correct.
D) Both i and ii are incorrect.

59. In a 3.2 Kbp long piece of DNA, 820 adenine bases were found. What would be the number of cytosine bases?

   A) 780   B) 1560   C) 740   D) 1480

60. DNA consists of two complementary nucleotide chains. If the sequence of nucleotide in one of the chains is 5'AGCTTCGA3', then the nucleotide sequence in the other chain shall be.

   A) 5'TAGCATAT3'   B) 5'GATCCTAG3'
   C) 3'TCGAAGCTS'   D) 3'GCTAAGCT5'

61. Which of the following is TRUE with respect to reducing sugars?
   i. A sugar that serves as a reducing agent due to presence of free aldehyde or ketone group is called a reducing sugar.
   ii. These sugars reduce the Benedict's reagent (Cu^{2+} to Cu^{+}) since they are capable of transferring hydrogens (electrons) to other compounds.
   iii. Reducing sugars include monosaccharides.

   A) i and iii   B) Only i
   C) ii and iii   D) i, ii and iii

62. Which of the following are the two types of secondary structure of proteins?

   A) δ-helix and β-pleated sheets
   B) α-helix and β-pleated sheets
   C) β-helix and α-pleated sheets
   D) β-helix and δ-pleated sheets

63. Identify the INCCORECT statement with respect to galactose.

   A) Galactose cannot play the same role in respiration as glucose.
   B) Galactose looks very similar to glucose molecules.
   C) Galactose can also exist in a and ß forms.
   D) Glucose and galactose can be easily converted into one another.

64. Monosaccharides have the general molecular formula_____,where n can be 3, 4, 5, 6 and 7.

   A) $(C_6H_2O)\,n$ B) $(CH_2O)\,n$
   C) $(CH_2O_6)\,n$ D) $(C_6H_2O_5)\,n$

65. The enzymes which act outside the cell of which they are synthesized are known as _____ .

   A) exo-enzymes   B) endo-enzymes
   C) ribozymes   D) apo-enzymes

66. Which RNA is present in more amount in the cell?

A) m-RNA   B) t-RNA
C) r-RNA   D) soluble RNA

67. Conjugated proteins consist of a simple protein united with some non-protein substance. The non-protein group is called_____ .

A) mucoprotein   B) lipoprotein
C) prosthetic group   D) globin

68. Histones of_____ are basic proteins.

A) chromoproteins   B) nucleoproteins
C) phytoproteins   D) mucoproteins

69. A protein consisting of more basic amino acids such as_____ , exists as a cation at the physiological pH of 7.4. Such proteins are called basic proteins.

A) lysine and aspartic acid
B) methionine and arginine
C) lysine and arginine
D) proline and cysteine

70. The term 'Protein' was coined by

A) Schleiden   B) M. Wilkins
C) Berzelius   D) Luca Ghini