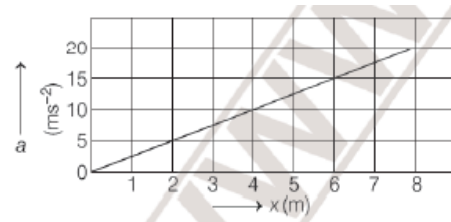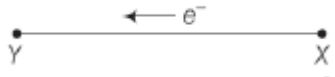| MODEL QUESTION PAPER OF APGET SCHOLARSHIP 2024-25 (FOR ICSE SYLLABUS)	SUBJECT (PHYSICS / CHEMISTRY MATHEMATICS / BIOLOGY)

1. A force of 10 N acts on a body of mass 0.5 kg for 0.25 s starting from rest. What is its momentum now ?
   (a) 0.25 Ns   (b) 2.5 Ns   (c) 0.5 Ns   (d) 0.75 Ns

2. A batsman hits back at ball straight in the direction of the bowler without changing its initial speed of 12 ms^{-1}. If the mass of the ball is 0.15 kg, find the impulse imparted to the ball. (Assume linear motion of the ball)
   (a) $1.8 \text{ N} - \text{s}$ (b) $3.6 \text{ N} - \text{s}$ (c) $3.6 \text{ N} - \text{m}$ (d) $1.8 \text{ N} - \text{m}$

3. A 100 kg gun fires a ball of 1 kg horizontally from a cliff of height 500 m. It falls on the ground at a distance of 400 m from the bottom of the cliff. The recoil velocity of the gun is (take, $g = 10 \text{ ms}^{-2}$)
   (a) 0.2 ms^{-1}.   (b) 0.4 ms^{-1} (c) 0.6 ms^{-1} (d) 0.8 ms^{-1}

4. A force of 10 N is applied on an object of mass 2 kg placed on a rough surface having coefficient of friction equal to 0.2. Work done by applied force in 1 s is
   (a) 120 J   (b) 240 J   (c) 250 J   (d) 100 J

5. A 10 kg brick moves along X-axis. Its acceleration as a function of its position is shown in figure. What is the net work performed on the brick by the force causing the acceleration as the brick moves from $x = 0$ to $x = 8.0$ m ?

   (a) 400 J   (b) 800 J
   (c) 200 J   (d) 100 J

6. A bullet of mass 20 g is moving with a speed of 150 ms^{-1}. It strikes a target and is brought to rest after piercing 10 cm into it. Calculate the average force of resistance offered by the target.
   (a) 2500 N   (b) 2000 J   (c) 2250 N   (d) 2100 J

7. A body of mass 2 kg lifted at a height of 16 m from the surface of earth. The potential energy of the body at given height, is [take, $g = 10 \text{ m/s}^2$]
   (a) 640 J   (b) 320 J   (c) 80 J   (d) 160 J

8. A one kilowatt motor is used to pump water from a well 10 m deep. The quantity of water pumped out per second is nearly
   (a) 1 kg   (b) 10 kg   (c) 100 kg   (d) 1000 kg

9. On centigrade or Celsius scale (°C), the temperature of a body increases by 30°C. The increase in emperature on Fahrenheit scale (°F) is
   (a) 50°   (b) 40°   (c) 30°   (d) 54°

10. Three rods made of the same material and having the same cross-section have been joined as shown in the figure. Each rod is of the same length. The left and right ends are kept at 0°C and 90°C, respectively. The temperature of the junction of the three rods will be

    (a) 45°C   (b) 90°C
    (c) 30°C   (d) 60°C

11. 0.15 kg of ice at 0°C is mixed with 0.30 kg of water at 50°C in a container. The resulting temperature is 6.7°C. Heat of fusion of ice is (given, specific heat of water is 4186Jkg^{-1} K^{-1})
(a) 3.34×10^5 Jkg^{-1} (b) 3.34×10^4 Jkg^{-1}
(c) 3.34×10^2 Jkg^{-1} (d) 3.34×10^6 Jkg^{-1}

12. Two cars moving in opposite directions approach each other with speed of 22 m/s and 16.5 m/s, respectively. The driver of the first car blows a horn having a frequency 400 Hz, then the frequency heard by the driver of the second car is [velocity of sound is 340 m/s]
(a) 350 Hz   (b) 361 Hz   (c) 411 Hz   (d) 448 Hz

13. Twenty million electrons reaches from point X to point Y in two micro second as shown in the figure. Direction and magnitude of the current is
(a) 1.5×10^{-10} A from X to Y (b) 1.6×10^{-6} A from Y to X
(c) 1.5×10^{-13} A from Y to X (d) 1.6×10^{-4} A from X to Y

14. The current in a wire varies with time according to the equation $i = 4 + 2t$, where i is in ampere and t is in second. The quantity of charge which passes through a cross-section of the wire during the time $t = 2$ s to $t = 6$ s is
(a) 40C   (b) 48C   (c) 38C   (d) 43C

15. The resistance of a 10 m long wire is 10Ω. Its length is increased by 25% by stretching the wire uniformly The resistance of wire will change to
(a) 12.5Ω   (b) 14.5Ω   (c) 15.6Ω   (d) 16.6Ω

16. The equivalent resistance of n resistors each of same resistance when connected in series is R. If the same resistances are connected in parallel, the equivalent resistances will be
(a) R/n^2 (b) R/n (c) $n^2 R$ (d) nR

17. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10Ω is
(a) 0.2Ω   (b) 0.5Ω   (c) 0.8Ω   (d) 1.0Ω

18. When a charged particle moves perpendicular to the region of magnetic field, then
(a) magnitude of its velocity keeps on changing   (b) velocity of particle remains constant
(c) direction of momentum keeps on changing   (d) kinetic energy of particle keeps on changing

19. If two parallel current-carrying conductors placed 1 m apart in vacuum are placed such that each carries 1 A current, then there is a force of
(a) 2×10^{-7} N per metre of length   (b) 2×10^7 N per metre of length
(c) 9×10^9 N per metre of length   (d) 9×10^{-9} N per metre of length

20. A moving coil galvanometer is an instrument which
(a) is used to measure EMF
(b) is used to measure potential difference
(c) is used to measure resistance
(d) is a deflection instrument which gives a deflection when a current flows through its coil

21. A concave mirror has a radius of curvature of 20 cm. The image of a object formed in mirror is 2.50 times the size of the object. How far is the mirror from the object?
(a) 5.5 cm   (b) 40 cm   (c) 6 cm   (d)15cm

22. When an object lying in a denser medium is observed from rare medium, then real depth of object is
(a) more than that observed   (b) less than that observed
(c) equals to observed depth   (d) depends on angle of vision

23. The ratio $\dfrac{\text{real depth}}{\text{apparent depth}}$ is equal to
    (a) refractive index of denser medium with respect to air
    (b) refractive index of denser medium with respect to rarer medium
    (c) refractive index of rare medium with respect to air
    (d) refractive index of rare medium with respect to denser medium

24. Mass of nucleus is
    (a) equal to mass of nucleons   (b) more than mass of nucleons
    (c) less than mass of nucleons   (d) may be more or less, depends on size of nucleus

25. Binding energy (E_b) is
    (a) energy required to separate nucleus from its atoms
    (b) energy required to break a nucleus into its nucleons
    (c) energy required to remove all electrons of the atom
    (d) energy required to break an atom into electrons, protons and neutrons

26. Among the period-2 element, the element which has high electron affinity is
    (a) Lithium   (b) Carbon   (c) Chlorine   (d) Fluorine

27. Ionisation potential increases over a period from left to right because the:
    (a) Atomic radius and nuclear charge increases
    (b) Atomic radius and nuclear charge decreases
    (c) Atomic radius increases and nuclear charge decreases
    (d) Atomic radius decreases and nuclear charge increases

28. Element M forms a chloride with the formula MCl_2 which is a solid with high melting point. M would most likely be in the group in which …….. is placed.
    (a) Na   (b) Mg   (c) Al   (d) Si

29. The molecule which contains a triple covalent bond is:
    (a) Ammonia   (b) Methane   (c) Water   (d) Nitrogen

30. The acid which contains four hydrogen atoms is
    (a) Formic   (b) Sulphuric   (c) Nitric   (d) Acetic-acid

31. When red litmus solution is treated with HNO_3, the color of red litmus solution changes to
    (a) Blue   (b) Purple   (c) No color change   (d) Green

32. Which of the following contains maximum number of molecules:
    (a) 4 g of O_2 (b) 4 g of NH_3 (c) 4 g of CO_2 (d) 4 g of SO_2

33. A gas cylinder of capacity of 20 dm^3 is filled with gas X the mass of which is 10 g. when the same cylinder is filled with hydrogen gas at the same temperature and pressure the mass of the hydrogen is 2g, hence the relative molecular mass of the gas is:
    (a) 5   (b) 10   (c) 15   (d) 20

34. Oxygen oxidizes ethyne to carbon dioxide and water as shown by the equation:
    $$2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$$
    What volume of ethyne gas at s.t.p is required to produce 8.4 dm^3 of carbon dioxide at STP?
    [H=1, C=12, O=16]
    (a) 4.2   (b) 5.6   (c) 3.7   (d) 7.2

35. Identify the weak electrolyte from the following:
    (a) Sodium chloride solution   (b) Dilute hydrochloric acid
    (c) Dilute sulphuric acid   (d) Aq. Acetic acid

36. Match the following in column A with the correct answer from the choice given in column B:

Column A	Column B
1. Ammonium hydroxide	(i) Contains only ions
2. Dilute hydrochloric acid	(ii) Contains only molecules
3. Carbon tetrachloride	(iii) Contains ions and molecules

    (a) $1 - (ii), 2 - (iii), 3 - (i)$ (b) $1 - (iii), 2 - (i), 3 - (ii)$

    (c) $1 - (i), 2 - (iii), 3 - (ii)$ (d) $1 - (ii), 2 - (i), 3 - (iii)$

37. The metal other than aluminium, which has a strong affinity for oxygen is:

    (a) Copper   (b) Magnesium   (c) Silver   (d) Gold

38. Brass is an alloy of:

    (a) Copper and tin   (b) Copper and zinc

    (c) Zinc and lead   (d) Lead and tin

39. Name the gas produced when excess ammonia reacts with chlorine.

    (a) N_2 (b) Cl_2 (c) H_2 (d) O_2

40. Lead nitrate decomposes on heating to give:

    (a) NO   (b) N_2O (c) NO_2 (d) N_2O_5

41. Identify the gas evolved when sulphur reacts with concentrated nitric acid

    (a) SO_3 (b) SO_2 (c) N_2 (d) NO_2

42. In the given equation : $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$: Identify the role played by conc. H_2SO_4

    (a) Non-volatile acid   (b) Oxidizing agent

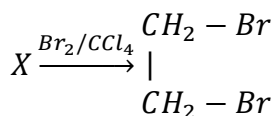   (c) Dehydrating agent   (d) None of the above

43. A hydrocarbon of the general formula C_nH_{2n} is

    (a) $C_{15}H_{30}$ (b) $C_{12}H_{26}$ (c) C_8H_{20} (d) C_6H_{14}

44. Propan-1-ol and Propan-2-ol are

    (a) Position isomers   (b) Chain isomers   (c) Homologous (d) Functional-group isomers

45. Compound X is bubbled through bromine dissolved in CCl_4; X is

$$X \xrightarrow{Br_2/CCl_4} \begin{array}{l} CH_2 - Br \\ | \\ CH_2 - Br \end{array}$$

    (a) Ethane   (b) Ethene   (c) Ethyne   (d) Propane

46. Substitution reactions are characteristic reactions of ……….

    (a) Alkane   (b) Alkene   (c) Alkyne   (d) None of the above

47. An organic weak acid is

    (a) Formic acid   (b) Sulphuric acid   (c) Nitric acid   (d) Hydrochloric acid

48. The functional group present in acetic acid is:

    (a) Ketonic $\backslash C = O$ (b) Hydroxyl $-OH$ (c) Aldehydic $- CHO$ (d) Carboxyl $- COOH$

49. The I.U.P.A.C name of acetylene is:

    (a) Propane   (b) Propyne   (c) Ethene   (d) Ethyne

50. When acid reacts with alcohol in the presence of conc. H_2SO_4, _____is formed.

    (a) Ester   (b) Alkane   (c) Alkene   (d) None of the above

51. Find the amount of the bill when the MRP of the product is 11,000, and discount percent provided is 30% and GST charged 18%?
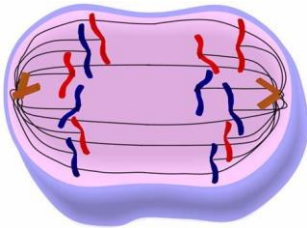
    (a) Rs. 9090   (b) Rs. 9086   (c) Rs. 9080   (d) Rs. 9085

52. John deposited Rs. 50000 in a bank for 1 year and paying an annual interest rate of 14%, compounded quarterly. What is the maturity amount?

    (a) 84,448   (b) 80,448   (c) 84,458   (d) 81,448

53. The perimeter of a square is 44 cm. Then it's area is ___ sq. cm
    (a) 121　　　　　　　　(b) 56　　　　　　　　(c) 76　　　　　　　　(d) 88
54. Which of the following is not a solution of $4a + b = 16$
    (a) (4, 0)　　　　　　　(b) (3, 4)　　　　　　(c) (5, -4)　　　　　(d) (3, 2)
55. If a and b are the roots of the equation $6x^2 + 4x - 2 = 0$, then $\frac{a}{b} + \frac{b}{a} = $ ___
    (a) $-\frac{10}{9}$　　　　　(b) $\frac{10}{3}$　　　　　(c) $-\frac{10}{3}$　　　　(d) $\frac{10}{9}$

56. The sum and product of the roots of the equation $kx^2 + 6x + 4k = 0$ are equal, then the value of k is
    (a) $-\frac{3}{2}$　　　　　(b) $\frac{3}{2}$　　　　　(c) $\frac{2}{3}$　　　　　(d) $-\frac{2}{3}$
57. The present ages of X and Y are represented in the ratio as 6: 4. Five years ago their ages were in the ratio 5 : 3. What are their present ages?
    (a) 25 and 15 year　　(b) 26 and 16 years　　(c) 28 and 18 years　　(d) 30 and 20 years
58. For which value of p given ratios will be equal (3p-5):2 and 1:(8p-6)
    (a) 1　　　　　　　　　(b) 2　　　　　　　　　(c) 3　　　　　　　　　(d) none of these
59. If (x+3) is a factor of $x^2 + 5x + a$, then the value of a is
    (a) 2　　　　　　　　　(b) 0　　　　　　　　　(c) 4　　　　　　　　　(d) 6
60. If $x + a$ is a common factor of expressions $f(x) = x^2 + px + q$ and $g(x) = x^2 + mx + n$; Then find the value of a.
    (a) $\frac{n-q}{m-p}$　　　　　(b) $\frac{p-q}{m-n}$　　　　(c) $\frac{n-p}{m-q}$　　　　(d) none of these
61. If $Q = \begin{bmatrix} 2 & -3 \\ 5 & 6 \end{bmatrix}$, and $R = \begin{bmatrix} 8 & 15 \\ 19 & -15 \end{bmatrix}$, find the matrix P, if PQ = R.
    (a) $\begin{bmatrix} -1 & 2 \\ 7 & 1 \end{bmatrix}$　　　(b) $\begin{bmatrix} 3 & -3 \\ 2 & 4 \end{bmatrix}$　　　(c) $\begin{bmatrix} 9 & 0 \\ 2 & -7 \end{bmatrix}$　　　(d) $\begin{bmatrix} 12 & 4 \\ 3 & 11 \end{bmatrix}$
62. The sum of first 6 terms of an AP is 12 and sum of first 10 terms is 60. find the first term and common difference?
    (a) 3, 2　　　　　　　(b) 2, 3　　　　　　　(c) -3, 2　　　　　　(d) -2, 3
63. The sum of 1st n terms of an AP is $2n^2 + 2n$. Then sum of first 24 terms of the AP is
    (a) 1100　　　　　　　(b) 1200　　　　　　　(c) 1300　　　　　　　(d) 1453
64. The slope of the line $2x - y = 5$ is
    (a) 0　　　　　　　　　(b) 1　　　　　　　　　(c) -1　　　　　　　　(d) 2
65. The areas of two similar triangles are $225\ cm^2$ and $289\ cm^2$ respectively. If the longest side of the larger triangle is 17 cm, find the longest side of the smaller triangle.
    (a) 16 cm　　　　　　　(b) 15 cm　　　　　　(c) 14 cm　　　　　　(d) None of these
66. The length of the radius of two concentric circles is 5 cm and 3 cm respectively. The length of the chord of the larger circle which touches the smaller circle is
    (a) 8 cm　　　　　　　(b) 10 cm　　　　　　(c) 12 cm　　　　　　(d) 18 cm
67. A well is to be made by digging out earth 42 m deep and 3.5 m in diameter. If a worker takes Rs 15 to dig 10 m^3 of earth, find the total cost of digging out the well approximately
    (a) Rs. 606　　　　　　(b) Rs. 506　　　　　　(c) Rs. 516　　　　　(d) Rs. 404
68. A circular tent is cylindrical up to a height of 4 m and conical above it. If the radius of the base is 52.5 m and the slant height of the conical part is 53 m, find the total canvas used in making the tent.
    (a) 10061 m^2　　　　(b) 10065 m^2　　　　(c) 10066 m^2　　　　(d) 10098 m^2
69. (1+tanA+secA) (1+cotA-cosecA) =
    (a) 0　　　　　　　　　(b) 1　　　　　　　　　(c) 2　　　　　　　　　(d) 3
70. Value of $\frac{1}{1-\cos(90°-A)} + \frac{1}{1+\cos(90°-A)}$ is
    (a) $\frac{2}{\sin^2(90°-A)}$　　(b) $\frac{2}{\cos^2(90°-A)}$　　(c) $\frac{2}{\sin^2(90°+A)}$　　(d) $\frac{2}{\cos^2(90°+A)}$
71. What is the angle of elevation of the sun when it casts the shadow of a stick standing perpendicularly on the ground of 1 m height is $\sqrt{3}$m?
    (a) 30°　　　　　　　　(b) 60°　　　　　　　(c) 45°　　　　　　　(d) None of these

72. Weight of few students are given. Find the median weight. 28, 24.5, 20, 36.8, 24, 33.
    (a) 28   (b) 28.5   (c) 26.25   (d) 24.5
73. A histogram is a graphical representation of which of the following
    (a) Ogive   (b) Frequency Distribution
    (c) Cumulative frequency distribution   (d) None of these
74. From a deck of well shuffled 52 cards, the cards that are multiple of 3 are eliminated. The probability
    that a card is drawn is either 6 or a face card is
    (a) $\frac{2}{5}$ (b) $\frac{3}{5}$ (c) $\frac{7}{10}$ (d) $\frac{3}{10}$
75. What is the number of outcomes in the sample space for rolling a dice and tossing a coin together?
    (a) 6   (b) 8   (c) 12   (d) 18
76. Which of the following plastid stores starch?
    (a)Leucoplast   (b)Chromoplast   (c) Chloroplast   (d)Chromatoplast
77. Tonoplast is the covering of which of the following cell organelle
    (a)Mitochondria   (b)Vacuole   (c) Lysosome   (d)Ribosome
78. The replication of DNA takes place during which phase of the cell cycle?
    (a)Interphase   (b)Prophase   (c) Metaphase   (d)Anaphase
79. Identify the stage of cell cycle in the following image

    (a)Early metaphase   (b)Early telophase   (c) Late telophase   (d)Late anaphase
80. Identify the incorrect pair from the following with respect organism and the number of chromosomes
    in it
    (a) Lion- 38 chromosomes   (b) Onion- 16 chromosomes
    (c) Ascaris- 14 chromosomes   (d) Mouse- 40 chromosomes
81. Which of the following is a blood disease caused by single gene mutation?
    (a)Haemophilia   (b) Sickle cell anemia (c) Colour blindness   (d)Albinism
82. Identify the incorrect statement from the following
    (a)There is no net movement of molecules across the membrane in isotonic solution.
    (b)Osmotic pressure is equal to the pressure required to nullify osmosis.
    (c) In hypotonic solution, exosmosis takes place.
    (d)In osmosis, water only transported to short distances.
83. Potometer is a device which measures the rate of
    (a)Water intake by the plant   (b)Water output by the plant
    (c) Water dryness in plant   (d)Both water input and output
84. The loss of water directly from the surface of leaf is called as
    (a)Stomatal transpiration   (b)Cuticular transpiration
    (c) Lenticular transpiration   (d)Mechanical transpiration
85. The light independent reactions occur in which part of the chloroplast?
    (a)Thylakoid   (b)Grana   (c) Stroma   (d)Stromal lamellae
86. The transformation of several glucose molecules to produce starch is called as
    (a)Phosphorylation   (b)Polymerization   (c) Fixation   (d)Photolysis

87. Match the column I with the column II

	Column I		Column II
1	Blood	i	Present in spleen and tonsils
2	Tissue fluid	ii	Present in arteries and veins
3	Lymph	iii	Occupying the spaces between the cells of organs

(a)1-ii, 2-iii, 3-i   (b)1-i, 2-ii, 3-iii   (c) 1-iii, 2-i, 3-ii   (d)1-iii, 2-ii, 3-i

88. The average volume of blood in an adult human being is
   (a)5-6 litres   (b)6-7 litres   (c) 5-7 litres   (d)5-8 litres
89. The specific gravity of urine is
   (a)1.003 – 1.005   (b)1.003- 1.035   (c) 1.005- 1.050   (d)1.001- 1.010
90. Identify the incorrect function of the part of the renal tubule during urine formation
   (a)Glomerulus- Ultrafiltration
   (b)Loop of Henle- Absorption of some water and sodium ions
   (c) PCT- Reabsorbs less amount of water
   (d)Bowman's capsule- Receives glomerular filtrate
91. Identify the correct function of parasympathetic system from the following
   (a) Accelerates heart beat   (b)Constricts pupil of the eye
   (c) Retards the secretion of saliva   (d)Stimulates the secretion of tear glands
92. Which of the following hormone is not secreted by Islets of Langerhans?
   (a)Insulin   (b)Glucagon   (c) Somatostatin   (d)Thyroxine
93. Increased metabolism is the symptom of which of the following disorder?
   (a)Simple goitre   (b)Myxedema
   (c) Cretinism   (d)Exophthalmic goitre
94. Which of the following phase of menstrual cycle lasts for 3-5 days during which blood is discharged?
   (a)Menstrual phase   (b)Follicular phase   (c) Ovulatory phase   (d)Luteal phase
95. The function of enzyme Hyaluronidase secreted by acrosome is
   (a)Protects the wall of the ovum   (b)Dissolves the wall of the ovum
   (c) Dissolves the sperm   (d)Destroys the sperm
96. Which of the following factors is not responsible for population explosion in India?
   (a)Literacy   (b)Mortality rate   (c) Economic reasons   (d)Desire for male child
97. The squeeze out of the walls of the blood vessels is called as
   (a)Diapedesis   (b)Phagocytosis   (c) Pinocytosis   (d)Metabolism
98. The red cross society was found in the year
   (a)1864   (b)1865   (c) 1866   (d)1867
99. The full form pf CNG is
   (a)Combined natural gas   (b)Combustion natural gas
   (c) Compressed natural gas   (d)Costly natural gas
100. The chief radiation pollutant in the nuclear explosions of Japan and Chernobyl is
   (a)Iodine- 131   (b)Iodine-132   (c) Iodine-133   (d) Iodine-134

DETAILED SOLUTIONS

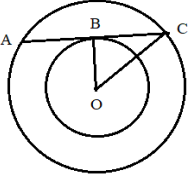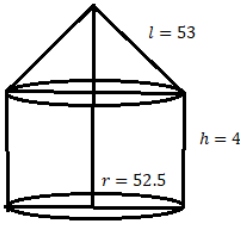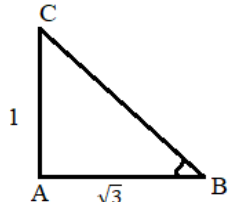| Q.NO.	OPTION	DESCRIPTION
1.	**2**	$Ft = mV_2 - mV_1$ $\Rightarrow 10 \times 0.25 = P_f - P_i, P_f = 2.5Ns$
2.	**2**	Change in momentum, $\Delta\vec{P} = \vec{P_2} - \vec{P_1} = mv(-\hat{\imath}) - mvi$ $\qquad\qquad\qquad\qquad\qquad = -2mvi$ $\Delta\vec{P} \mid = 2mv \quad = 2 \times 0.15 \times 12$ $\qquad\qquad\qquad = \quad 3.6 \text{kgms}^{-1}$ By Impulse momentum theorem, Impulse, $\mid = \mid\Delta p \mid I = 3.6 \text{Ns}$
3.	**2**	Time taken by the ball to reach the ground is $$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 500}{10}}$$ Horizontal distance covered $= ut$ $\therefore 400 \quad = 4 \times 10$ $\quad 4 \quad = 40 \text{ ms}^{-1}.$ According to law of conservation of linear momentum, $0 = Mv + mv$ $$v = \frac{-mu}{M} = -\frac{(1)(40)}{100} = -0.4 \text{ m/s}$$
4.	**2**	Force of friction acting in opposite direction $= \mu mg$ $\qquad\qquad\qquad = 0.2 \times 2 \times 10 = 4 \text{ N}$ Net force on the body, $F = 10 \text{ N} - 4 \text{ N} = 6 \text{ N}$ Acceleration, $a = \frac{\Gamma}{m} = \frac{6}{2} = 3 \text{ ms}^{-2}$ As initial velocity, $u = 0$ $\therefore$ Distance travelled in 4 s, $s = \frac{1}{2}at^2$ $\qquad\qquad = \frac{1}{2} \times 3 \times 16 = 24 \text{ m}$ Work done by applied force, i.e. $W = F \cdot s = 10 \times 24 = 240 \text{ J}$
5.	**2**	According to the graph, the acceleration a varies linearly with the coordinate x. We may write $a = \alpha x$, where α is the slope of the graph. $$\Rightarrow \alpha = \frac{a}{x} = \frac{20}{8} = 2.5 \text{ s}^{-2}$$ The force on the brick is in the positive x-direction and according to Newton's second law, its magnitude is given by $$F = ma = max$$

		If x_f is the final coordinate, the work done by the force is
		$$W = \int_0^{x_f} F dx = ma \times \int_0^{x_f} x dx$$ $$= ma \times \left(\frac{x^2}{2}\right)_0^{x_f} = \frac{ma \times x_f^2}{2}$$ $$= \frac{10 \times 2.5 \times 64}{2} = 800 \text{ J (given, } m = 10 \text{ kg)}$$
6.	3	$$v^2 = u^2 + 2as \quad 0 = 150 \times 130 + 2 \times a \times \frac{10}{100}$$ $$a = \frac{-150 \times 150 \times 105}{72 \times} => a = -112500 \text{ m/sec}^2$$ $$F = ma = \frac{200}{1000} \times 112500$$ $$F = 2250 \text{ N.}$$
7.	2	Potential energy of the body is $mgh = 2(10)(16) = 320J$
8.	2	$\because$ Power $= \frac{\text{work done}}{t} \Rightarrow$ Power $= \frac{mgh}{t}$ putting values (from given data) $$10^3 = \frac{m \times 10 \times 10}{1}$$ $\Rightarrow$ Required mass $= 10$ kg
9.	4	$\Delta c = \frac{5}{9}\Delta F \Rightarrow 30 = \frac{5}{9}\Delta F = \frac{68 \times 9}{5} \Rightarrow 54° = \Delta F$
10.	4	Let the temperature of junction be θ. In equilibrium, rate of flow of heat through rod $1 =$ sum of flow of rate of heat through, 2 and 3. $$\therefore \left(\frac{dQ}{dt}\right)_1 = \left(\frac{dQ}{dt}\right)_2 + \left(\frac{dQ}{dt}\right)_3$$ $$\frac{KA(\theta - 0)}{l} = \frac{KA(90° - \theta)}{l} + \frac{KA(90° - \theta)}{l}$$ $$\theta = 2(90° - \theta)$$ $$\Rightarrow 3\theta = 180°$$ $$\therefore \theta = 60°C.$$
11.	1	Heat lost by the water: $$= m_{\text{water}} S_{\text{water}} (T_f - T_i)$$ $$= 0.30 \times 4186 \times (50.0 - 6.7)$$ $$= 54376.14 \text{ J}$$ Heat required to melt the ice: $$= m_{\text{ice}} L_{\text{fusion}} = 0.15 L_f$$ Heat required to raise the temperature of ice water to the final temperature: $$= m_{\text{ice}} S_{\text{water}} (T_f - T_i)$$ $$= 0.15 \times 4186 \times (6.7 - 0)$$ $$= 4206.93 \text{ J}$$ As we know that, Heat lost is equal to heat gained. $$\Rightarrow 54376.14 \text{ J} = 0.15 L_f + 4206.93 \text{ J}$$ $$L_f = 3.34 \times 10^5 \text{Jkg}^{-1}$$
12.	4	when both source and observer are moving towards each other Let V_1 be the velocity of 1st driver and V_2 be the velocity of 2nd Frequency heard by driver of

		second car, $f_2 = \left(\frac{V_s + V_3}{V_s - V_1}\right) f_1$ $$= \frac{340 + 16.5}{340 - 22} \times 400 = \frac{356.5}{318} \times 400$$ $$\cong 448 \text{ Hz}$$
13.	2	Total charge on ten electrons is $Q = n$ ne [Where $= 1.6 \times 10^{-19} C$] $\quad = 10^7 \times 1.6 \times 10^{-19} C = 1.6 \times 10^{-12} C$ Total taken by ten million electrons to pass from point P to point Q is $t = 1\mu s$) The current $l = \frac{Q}{t} = \frac{1.6 \times 10^{-12}}{10^{-6}} = 1.6 \times 10^{-6}$ A Since the direction of the current is always opposite to the direction of flow of electrons. Therefore due to flow of electrons from point X to point Y the current will flow from point Y to point X.
14.	2	Let dq be the charge which passes in a small interval of time dt. Then dq = Idt or dq = (4 + 2t)dt On integrating, we get $$q = \int_2^6 (4 + 2t)dt = [4t + t^2]_2^6 = 48C$$
15.	3	Given, $l_1 = l + \frac{25}{100} l = \frac{5l}{4}$. Since, volume of wire remains unchanged on increasing length, hence $$A_1 l_1 = Al$$ $$A_1 \times \frac{5l}{4} = Al \text{ or } A_1 = 4A/5$$ Given, $R = \rho l/A = 10\Omega$ and $R_1 = \frac{\rho l_1}{A_1} = \frac{\rho 5l/4}{4A/5} = \frac{25\rho l}{16 A}$ $$\therefore R_1 = \frac{25}{16} \times 10 = \frac{250}{16} = 15.6\Omega$$
16.	1	Effective resistance of n resistance each of the resistance r in series $R_s = r \times n = R$, so $r = R/n$ When these resistance are connected in parallel, the effective resistance $R_p = r/n = \frac{R/n}{n} = R/n^2$
17.	2	$$I = \frac{\varepsilon}{R + r}$$ $\varepsilon = 2.1 \text{ V}, I = 0.2 \text{ A} \quad \therefore \quad 0.2 \times 10 + 0.2 \times r = 2.1$ $2 + 0.2r = 2.1 \Rightarrow 0.2r = 0.1 \text{ or } r = \frac{1}{2} = 0.5\Omega$
18.	3	When a charged particle moves perpendicular to the region of magnetic field, then magnitude of its velocity remains same and direction changes hence direction of momentum changes
19.	1	If two parallel current-carrying conductors placed 1 m apart in vacuum are placed such that each carries 1 A current, then there is a force of 2×10^{-7} N per metre of length
20.	4	A moving coil galvanometer is a device used to detect the current in the circuit
21.	3	For spherical mirror, $f = \frac{R}{2}$ here, $R = 20$ cm, $m = 2.5$

		$\therefore f = \dfrac{R}{2} = \dfrac{20}{2} = 10$ cm Now, $$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$ and magnification $m = \dfrac{-v}{u}$ or $v = -mu$ $$\therefore \frac{1}{f} = \frac{1}{u} - \frac{1}{mu} \Rightarrow u = f\left(1 - \frac{1}{m}\right) = 10\left(1 - \frac{1}{2.5}\right) = 6 \text{ cm}$$
22.	1	When an object lying in a denser medium is observed from rare medium, then real depth of object is more than that observed depth.
23.	2	As we know, refractive index of denser medium w.r.t. rarer medium $=$ $\dfrac{\text{Real depth}}{\text{Apparent depth}}$
24.	3	Mass of nucleus is less than mass of nucleons
25.	2	Binding energy (E_b) is energy required to break a nucleus into its nucleons
26.	4	Size of 'F' is smallest in period 2 & hence effective nuclear chare increases and thus has high electron affinity.
27.	4	Atomic radius decreases and nuclear charge increases.
28.	2	'M' would most likely be in the group in which Mg is placed.
29.	4	Nitrogen: $N \equiv N$
30.	4	Acetic acid, CH_3COOH.
31.	4	There will be no color change as nitric acid is acidic.
32.	2	Since mass is constant for all gases, gas with least molar mass will have most no. of molecules i.e., NH_3.
33.	2	$2 \times$Vapour density = Relative molecular mass $\therefore$ Relative molecular mass $= 2 \times 5 = 10g$
34.	1	2 volume of CO_2 is produced by 1 volume of C_2H_2 $\therefore 8.4\ dm^3$of CO_2 at STP produced from $= \dfrac{1 \times 8.4}{2}$ $= 4.2\ dm^3\ of\ C_2H_2$
35.	4	Aq. acetic acid.
36.	2	NH_4OH is weak electrolyte so it dissociates into ions less & its solution contains both molecules & ions. CCl_4 contains molecules only and Dil. HCl is strong electrolyte & contains only ions.
37.	2	Magnesium.
38.	2	Copper and Zinc
39.	1	$2NH_3 + 3Cl_2 \rightarrow 6HCl + N_2$
40.	3	$2Pb(NO_3)_{2(s)} \rightarrow 2PbO_{(s)} + 4NO_2 + O_2$
41.	4	$S + 6HNO_3 \rightarrow H_2SO_4 + 2H_2O + 6NO_2$
42.	2	S is oxidized SO_2 by H_2SO_4 which acts as oxidizing agent.
43.	1	$C_{15}H_{30}$
44.	1	Propan-1-ol and Propan-2-ol are Position isomers.
45.	2	$H_2C = CH_2 \xrightarrow[\text{addition reaction}]{Br_2/CCl_4} \begin{matrix} CH_2 - Br \\ | \\ CH_2 - Br \end{matrix}$
46.	1	Alkane.
47.	1	Formic acid
48.	4	Carboxyl $- COOH$ $CH_3 - \overset{\overset{O}{\|}}{C} - O - H$ or CH_3COOH

49.	4	$HC \equiv CH$
		Ethyne
50.	1	When acid reacts with alcohol in the presence of conc. H_2SO_4, ester is formed.
51.	2	Total Cost = Rs. 11,000
		Discount = 30%. $\therefore$ Total discount $= \frac{30}{100} \times 11000 = 3300$
		$\therefore$ Cost $= 11000 - 3300 = 7700$
		GST=18%$= \frac{18}{100} \times 7700 = 1380$
		$\therefore$Amount$= 7700 + 1380 = 9086$
52.	1	$C_p = P[(1+r)^{4n} - 1] = 5000\left[\left(1 + \frac{14}{100}\right)^4 - 1\right] = 34448$
		$\therefore A = P + C_P = 50000 + 34448 = 84448$
53.	1	$P = 4x = 44 \Rightarrow x = 11$
		$\therefore A = x^2 = 121$
54.	4	By trial-and-error method
55.	3	$6x^2 + 4x - 2 = 0 \Rightarrow 6x^2 + 6x - 2x - 2 = 0 \Rightarrow (6x - 2)(x + 1) = 0$
		$\therefore x = \frac{1}{3}, x = -1$
		Let $a = \frac{1}{3}, b = -1 \Rightarrow \frac{a}{b} + \frac{b}{a} = -\frac{1}{3} - 3 = -\frac{10}{3}$
56.	1	$kx^2 + 6x + 4k = 0$
		Let a and b be the two roots. Then $a + b = -\frac{6}{k}$ and $ab = \frac{4k}{4} = 4$
		$\therefore -\frac{6}{k} = 4 \Rightarrow k = -\frac{6}{4} = -\frac{3}{2}$
57.	4	Let ages of X and Y be $6x$ and $4x$. Then by the given condition $\frac{6x-5}{4x-5} = \frac{5}{3}$
		$\Rightarrow 18x - 15 = 20x - 25 \Rightarrow 2x = 10 \Rightarrow x = 5$
		$\therefore$ Age of X is $6x = 30$, Y is $4x = 20$.
58.	4	$\frac{3p-5}{2} = \frac{1}{8p-6} \Rightarrow 24p^2 - 48p + 28 = 0 \Rightarrow 6p^2 - 17p + 7 = 0$
		$\Rightarrow 3p(2p - 1) - 7(2p - 1) = 0 \Rightarrow p = \frac{7}{3}, \frac{1}{2}$
59.	4	Clearly $a = 6$
60.	1	When $x^2 + px + q$ is divided by $(x + a)$, the remainder is $q - (p - a)a$
		When $x^2 + mx + n$ is divided by $x + a$, the remainder is $n - (m - a)a$
		$\Rightarrow q - (p - a)a = n - (m - a)a \Rightarrow a = \frac{m-p}{n-q}$
61.	1	Let $P = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$.
		Given that $PQ = R \Rightarrow \begin{bmatrix} a & b \\ c & d \end{bmatrix}\begin{bmatrix} 2 & -3 \\ 5 & 6 \end{bmatrix} = \begin{bmatrix} 8 & 15 \\ 19 & -15 \end{bmatrix}$
		$\Rightarrow \begin{bmatrix} 2a + 5b & -3a + 6b \\ 2c + 5d & -3c + 6d \end{bmatrix} = \begin{bmatrix} 8 & 15 \\ 19 & -15 \end{bmatrix}$.
		Comparing and solving we get $P = \begin{bmatrix} -1 & 2 \\ 7 & 1 \end{bmatrix}$
62.	3	Given $S_6 = 12$ and $S_{10} = 60 \Rightarrow 3[2a + 5d] = 12$ and $5[2a + 9d] = 60$
		$\Rightarrow 2a + 5d = 4 \cdots (i)$ and $2a + 9d = 12 \cdots (ii)$.
		Solving (i) and (ii), $a = -3, d = 2$
63.	2	Given $S_n = 2n^2 + 2n. \therefore S_{24} = 2(24)^2 + 2(24) = 1200$
64.	4	Slope of $ax + by + c = 0$ is $m = -\frac{a}{b}. \therefore m = -\frac{2}{-1} = 2$
65.	2	We know that ratio of area of two triangles is equal to ratio of squares of their
		corresponding sides. $\therefore \frac{289}{225} = \left(\frac{17}{x}\right)^2 \Rightarrow x = 15$

66.	1	From the diagram, OB=3, OC=5 and $OB \perp BC$. $\therefore OB^2 + BC^2 = OC^2$ $\Rightarrow BC = 4$. $\therefore$ Length of AC=8
67.	1	$V = \pi r^2 h = \pi \times \left(\frac{3.5}{2}\right)^2 \times 42 = 404.08.$ For $10m^2 - 15\ Rs$. Then for $404.08m^2 = \frac{404.08 \times 15}{10} = 606\ Rs.$
68.	1	Total canvas= CSA of cone + CSA of cylinder $= \pi rl + 2\pi rh = \pi r(l + 2h) = \frac{22}{7} \times 52.5 \times (53 + 8) = 10061$
69.	2	$(1 + \tan A + \sec A)(1 + \cot A - cosec\ A) = \left(1 + \frac{\sin A}{\cos A} + \frac{1}{\cos A}\right)\left(1 + \frac{\cos A}{\sin A} - \frac{1}{\sin A}\right)$ $= \left(\frac{\cos A + \sin A + 1}{\cos A}\right)\left(\frac{\sin A + \cos A - 1}{\sin A}\right) = \frac{(\cos A + \sin A)^2 - 1}{\sin A.\cos A}$ $= \frac{\sin^2 A + \cos^2 A + 2\sin A\cos A - 1}{\sin A.\cos A} = \frac{2\sin A\cos A}{\sin A\cos A} = 2$
70.	1	$\frac{1}{1 + \cos(90° - A)} + \frac{1}{1 - \cos(90° - A)} = \frac{1 - \cos(90° - A) + 1 + \cos(90° - A)}{1 - \cos^2(90° - A)}$ $= \frac{2}{\sin^2(90° - A)}$
71.	1	Let AC be the stick of length 1m, and AB be the shadow of the stick. $\therefore$ angle between AB and BC is $\tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30°$
72.	3	Writing the given observations in ascending order, we have 20, 24, 24.5, 28, 33, 36.8 Number of observations= 6. $\therefore$ Median= mean of $\left(\frac{n}{2}\right)^{th}$ observation and $\left(\frac{n}{2} + 1\right)^{th}$ observation $\therefore M = \frac{24.5 + 28}{2} = 26.25$
73.	2	By the definition
74.	4	Since the multiples of 3 are eliminated, total 12 cards are eliminated from the pack. Remaining cards $= 40$ P(6)=0 and P(face cards) =12. $\therefore$ P(6 or a face card)= $\frac{12}{40} = \frac{3}{10}$
75.	3	$S = \{1H, 1T, 2H, 2T, 3H, 3T, 4H, 4T, 5H, 5T, 6H, 6T\}$
76.	1	Leucoplasts store reserve food materials such as Starch.
77.	2	The membrane vacuole is called as Tonoplast.
78.	1	During cell cycle, In S phase of the Interphase DNA replication takes place.

79.	**4**	The stage of the cell cycle in the given image is Late anaphase.
80.	**3**	Ascaris is having 4 chromosomes.
81.	**2**	Sickle cell anaemia is caused by single gene mutation.
82.	**3**	In hypotonic solution, endosmosis takes place.
83.	**1**	Potometer is a device used to measure the rate of water intake by plants.
84.	**2**	The loss of water directly from the surface of leaf is called as Cuticular transpiration.
85.	**3**	The light independent reactions occur in stroma of the chloroplast.
86.	**2**	The transformation of several glucose molecules to produce starch is called as Polymerization.
87.	**1**	Blood- Present in arteries, Veins and Capillaries. Tissue fluid- Present between the cells of organs. Lymph- Present in Spleen and tonsils.
88.	**1**	The average volume of blood in an adult human being is 5-6 litres.
89.	**2**	The specific gravity of urine is 1.003- 1.035.
90.	**3**	Proximal convoluted tubule absorbs large amount of water.
91.	**2**	Parasympathetic system decreases heartbeat, Constriction pupil of the eye, stimulates the secretion of saliva, retards the secretion of tear glands.
92.	**4**	Thyroxine is secreted by Thyroid gland.
93.	**4**	In Exophthalmic goitre, increased rate of metabolism can be seen.
94.	**1**	In menstrual phase of menstrual cycle lasts for 3-5 days during which blood is discharged.
95.	**2**	Hyaluronidase secreted by acrosome dissolves the wall of ovum.
96.	**1**	Literacy is not a cause for population explosion in India.
97.	**1**	The squeeze out of the walls of the blood vessels is called as Diapedesis.
98.	**1**	The red cross society was found in the year 1864.
99.	**3**	CNG- Compressed natural gas.
100.	**1**	The chief radiation pollutant in the nuclear explosions of Japan and Chernobyl is Iodine- 131.