

SCIENCE

PHYSICS

- 1) Which statement best describes how the mass and speed of an object affect its kinetic energy?
 - a) An object with same mass but higher speed will have less kinetic energy.
 - b) An object with less mass and lower speed will have more kinetic energy.
 - c) An object with greater mass and higher speed will have more kinetic energy.
 - d) An object with greater mass but lower speed will have more kinetic energy.
- 2) A machine gun fires 60 bullets per minute with a velocity of 700 m/s. If each bullet has a mass of 50 g . the power developed by the gun is:
 - a) 250 W
 - b) 50 W
 - c) 12250 W
 - d) 2250 W
- 3) If the kinetic energy of a body becomes 256 times its initial value, then the new linear momentum will be:
 - a) The same as the initial value
 - b) 8 times the initial value
 - c) 16 times the initial value
 - d) 32 times the initial value
- 4) A body of mass 2 kg is thrown upward with an initial velocity of 20 m/s. After 2 seconds, its kinetic energy will be: ($g = 10 \text{ m/s}^2$)
 - a) 100 J
 - b) 0 J
 - c) 400 J
 - d) 200 J
- 5) A construction worker needs to lift a heavy metal beam using a lever but has a limited length of plank. Which adjustment would allow the worker to lift the beam with the least effort if the position of the fulcrum can be changed but the plank length remains constant?
 - a) Keep the fulcrum fixed at any point
 - b) Move the fulcrum closer to the beam
 - c) Place the fulcrum at the center of the plank
 - d) Move the fulcrum closer to the worker
- 6) A slotted head screw is torqued to 4 Nm using a screw driver having a blade of 5 mm width. The couple force exerted by the blade edges on the screw slot is
 - a) 4 N
 - b) 800 N
 - c) 400 N
 - d) 20 N
- 7) Condition of static equilibrium of a planar force system is written as
 - a) $\Sigma F = 0$
 - b) $\Sigma M = 0$
 - c) $\Sigma F = 0$ and $\Sigma M = 0$
 - d) None of these
- 8) The number of compressions or rarefactions per unit time gives ____
 - a) Frequency
 - b) Time period
 - c) Amplitude
 - d) Pitch
- 9) When we change feeble sound too loud sound we increase its
 - a) Frequency
 - b) amplitude
 - c) velocity
 - d) wavelength
- 10) In case of transverse waves the particles of a medium vibrate:
 - a) In the direction of wave propagation
 - b) Opposite to the direction of wave propagation
 - c) At the right angles to the direction of wave propagation
 - d) None of the above
- 11) Human eye has a near point i.e. distance of distinct vision at approximately 25 cm . For a normal eye, which of the following statements is true?
 - a) The image formed on the retina is virtual, erect and diminished.
 - b) The image formed on the retina is real, inverted and diminished.
 - c) The image formed on the retina is real, inverted and magnified.
 - d) The image formed on the retina is virtual, erect and magnified.
- 12) The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?
 - a) Between the principal focus and the centre of curvature
 - b) At the centre of curvature
 - c) Beyond the centre of curvature
 - d) Between the pole of the mirror and its principal focus.

- 13) Where should an object be placed in front of a convex lens to get a real image of the size of the object?
- At the principal focus of the lens
 - At twice the focal length
 - At infinity
 - Between the optical centre of the lens and its principal focus.
- 14) A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R' , then the ratio R/R' is -
- 1/25
 - 1/5
 - 5
 - 25
- 15) An electric bulb is rated 220 V and 100 W. When it is operated on 110 V, the power consumed will be -
- 100 W
 - 75 W
 - 50 W
 - 25 W
- 16) Two conducting wires of the same material and of equal lengths and equal diameters are first connected in series and then parallel in a circuit across the same potential difference. The ratio of heat produced in series and parallel combinations would be -
- 1: 2
 - 2: 1
 - 1: 4
 - 4: 1
- 17) An electric bulb is connected to a 220 V generator. The current is 0.50 A. What is the power of the bulb?
- 110W
 - 200W
 - 40W
 - 80W
- 18) An electric refrigerator rated 400 W operates 8 hour/day. What is the cost of the energy to operate it for 30 days at Rs 3.00 per kW h?
- 150
 - 288
 - 350
 - 100
- 19) 100 J of heat is produced each second in a 4Ω resistance. The potential difference across the resistor.
- 50 V
 - 10 V
 - 20 V
 - 5 V
- 20) A concave mirror is used to form an image of an object placed beyond its centre of curvature. The image formed will be:
- Real, inverted and magnified
 - Real, inverted and diminished
 - Virtual, erect and magnified
 - Virtual, erect and diminished

CHEMISTRY

- 21) Which of the following statements about molecules is correct?
- A molecule of an element always contains two atoms
 - A molecule of a compound contains atoms of only one element.
 - A molecule is the smallest particle of a substance that can normally exist independently and retain its chemical properties.
 - All molecules are electrically charged.
- 22) An atom has 17 electrons and 18 neutrons. Which of the following is correct?
- Atomic number = 18, Mass number = 35
 - Atomic number = 17, Mass number = 35
 - Atomic number = 35, Mass number = 17
 - Atomic number = 17, Mass number = 18
- 23) A student places an iron nail in copper sulphate solution. After some time, the blue colour of the solution becomes lighter and a reddish-brown substance is deposited on the nail.
- Combination reaction + oxidation
 - Displacement reaction + redox reaction
 - Double displacement reaction + reduction only
 - Decomposition reaction + oxidation only
- 24) Which of the following reactions does NOT produce carbon dioxide gas?
- (a) $\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow$ (b) $\text{NaHCO}_3 + \text{HCl} \rightarrow$ (c) $\text{CaCO}_3 + 2\text{HCl} \rightarrow$ (d) $\text{NaOH} + \text{HCl} \rightarrow$
- 25) Consider the following statements:
- Atomic number represents the number of protons in a neutral atom.
 - Mass number is the sum of protons and neutrons.

3. Isotopes have the same atomic number but different mass numbers.

4. Isobars have the same number of neutrons.

Which of the above statements are correct?

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

26) Assertion (A): Magnesium reacts with dilute hydrochloric acid to produce hydrogen gas.

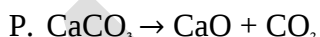
Reason (R): Magnesium is more reactive than hydrogen and therefore displaces hydrogen from hydrochloric acid.

Choose the correct option:

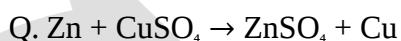
- (a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false. (d) A is false, but R is true.

27) Match Column I with Column II.

1. Combination



2. Decomposition



3. Displacement



4. Double displacement



- (a) 1–R, 2–P, 3–Q, 4–S (b) 1–P, 2–R, 3–S, 4–Q (c) 1–Q, 2–P, 3–R, 4–S (d) 1–S, 2–Q, 3–P, 4–R

28) A student has four solutions:

P. pH = 2

Q. pH = 5

R. pH = 7

S. pH = 11

Which statement is correct?

- (a) P is weaker than Q because its pH is lower. (b) S is acidic because its pH is greater than 7.
(c) R is neutral, while P is more acidic than Q. (d) Q is more acidic than P because 5 is closer to 7.

29) Which one is the odd one out? (Reason for choosing the odd one out should be based on their chemical nature rather than merely their formula.)

- (a) NaCl (b) Na_2CO_3 (c) NaHCO_3 (d) HCl

30) An element X has atomic number 12 and element Y has atomic number 17.

Which of the following is most likely to be the formula of the compound formed between X and Y?

- (a) XY (b) X_2Y (c) XY_2 (d) X_2Y_3

31) A packet of potato chips is left open for several days. The chips develop an unpleasant smell and taste. The manufacturer normally fills the packet with nitrogen gas before sealing it. Which of the following statements correctly explains this situation?

- (a) Rancidity occurs because carbohydrates in the chips react with nitrogen; filling the packet with nitrogen increases the rate of rancidity.
(b) Rancidity is mainly due to oxidation of fats and oils; replacing oxygen with nitrogen helps prevent rancidity.
(c) Rancidity occurs because proteins react with moisture; nitrogen removes the water present in the chips.
(d) Rancidity is a reduction reaction of fats caused by nitrogen; therefore nitrogen accelerates the reaction.

32) Assertion (A): Aqueous HCl conducts electricity.

Reason (R): HCl produces ions when dissolved in water.

Choose the correct answer:

- (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 the correct explanation of A.
(c) A is true but R is false. (d) A is false but R is true.

- 33) An element X has 11 protons and 12 neutrons, while element Y has 17 protons and 18 neutrons. When X and Y combine chemically, which of the following statements is correct?
- X has atomic number 12 and forms X^{2+} ; the formula of the compound is XY_2 .
 - X has atomic number 11 and forms X^+ ; Y has atomic number 17 and forms Y^- ; the formula of the compound is XY .
 - X and Y are isotopes because their mass numbers are different.
 - X and Y form a compound with the formula X_2Y because X has two neutrons more than protons.
- 34) Four students make the following statements about the development of atomic models:
- Dalton proposed that atoms are indivisible particles and that atoms of the same element are identical in mass and properties.
 - Thomson's model explained the presence of a positively charged sphere with electrons embedded in it.
 - Rutherford's α -particle scattering experiment showed that most of the space inside an atom is empty and that positive charge is concentrated in a very small region.
 - Bohr proposed that electrons can revolve around the nucleus in any orbit and can possess any value of energy.
- Which of the following is correct?
- A, B & C only
 - A & D only
 - B, C, & D only
 - A, B, C & D
- 35) Three students make the following statements:
- Student P: "NaOH is a base because it produces OH^- ions in aqueous solution."
- Student Q: "When HCl reacts with NaOH, the reaction is a neutralisation reaction and NaCl is formed."
- Student R: "When Na_2CO_3 reacts with HCl, hydrogen gas is evolved." Which student(s) is/are correct?
- P only
 - P and Q only
 - Q and R only
 - P, Q and R

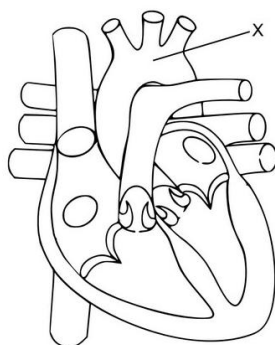
BIOLOGY

- 36) Which of the following statements regarding photosynthesis are correct?
- Chlorophyll is necessary for photosynthesis.
 - Carbon dioxide is required for the formation of food.
 - Oxygen is absorbed from the atmosphere as the main raw material.
 - Sunlight provides the energy required for photosynthesis.
- I and II only
 - I, II and IV only
 - II, III and IV only
 - I, II, III and IV
- 37) Assertion (A): Digestion of food is completed mainly in the small intestine.
Reason (R): The small intestine receives digestive secretions from the liver, pancreas and intestinal glands.
- Both A and R are true, and R is the correct explanation of A
 - Both A and R are true, but R is not the correct explanation of A
 - A is true, but R is false
 - A is false, but R is true
- 38) A student kept a destarched plant in darkness for several hours and then exposed one leaf to sunlight while covering another portion of the same leaf with opaque paper. After a few hours, the leaf was tested for starch. Which observation would provide the strongest evidence for the role of sunlight?
- Both covered and uncovered regions turn blue-black
 - Only the region exposed to sunlight turns blue-black
 - Only the covered region turns blue-black
 - Neither region turns blue-black

39) Match Column I with Column II:

Column I	Column II
A. Xylem	1. Transport of food
B. Phloem	2. Absorption of water
C. Root hair	3. Transport of water
D. Stomata	4. Transpiration

- (a) A-1, B-3, C-2, D-4 (b) A-3, B-2, C-1, D-4
(c) A-3, B-1, C-2, D-4 (d) A-4, B-1, C-2, D-3
- 40) Statement I: Transpiration can contribute to the upward movement of water in plants.
Statement II: Loss of water vapour from leaves creates a pull that helps draw water upward through the xylem.
- (a) Both statements I and II are correct (b) Both statements I and II are incorrect
(c) Statement I is correct and II is incorrect (d) Statement I is incorrect and II is correct
- 41) A plant is placed under conditions in which its stomata remain widely open for a prolonged period. Which combination is most likely to occur?
- (a) Decreased transpiration and increased water loss
(b) Increased transpiration and increased water loss
(c) Decreased transpiration and decreased water absorption
(d) No change in transpiration or water loss
- 42) Which pair is correctly matched?
- (a) RBC — Blood clotting (b) WBC — Oxygen transport
(c) Platelets — Blood clotting (d) Plasma — Production of antibodies only
- 43) Which sequence correctly represents the movement of oxygenated blood after it returns from the lungs?
- (a) Pulmonary vein → left atrium → left ventricle → aorta
(b) Pulmonary artery → left atrium → left ventricle → aorta
(c) Pulmonary vein → right atrium → right ventricle → aorta
(d) Vena cava → left atrium → left ventricle → aorta
- 44) Identify the structure labelled as 'X' from the given diagram of heart.



- (a) Right atrium (b) Left atrium (c) Pulmonary artery (d) Aorta
- 45) A patient has severely impaired kidney function and accumulates harmful metabolic wastes in the blood. A medical procedure is used to remove these wastes from the blood. Which process is being referred to?
- (a) Transpiration (b) Dialysis (c) Absorption (d) Assimilation
- 46) If the process of selective reabsorption in a nephron is greatly reduced, which change would most likely occur?
- (a) No filtration of blood would occur
(b) Urine formation would stop completely
(c) More useful substances would remain in the filtrate and be lost in urine
(d) The urinary bladder would produce urine

47) Which sequence correctly represents the major events involved in the formation of urine in a nephron?

- (a) Tubular secretion → selective reabsorption → ultrafiltration
- (b) Ultrafiltration → selective reabsorption → tubular secretion
- (c) Selective reabsorption → ultrafiltration → tubular secretion
- (d) Ultrafiltration → tubular secretion → digestion

48) Match the Following.

Column I	Column II
A. Auxin	1. Inhibits growth and promotes dormancy
B. Gibberellin	2. Promotes cell division
C. Cytokinin	3. Promotes growth and cell elongation
D. Absciscic acid	4. Promotes stem growth

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

49) A plant is placed near a window. After several days, its shoot bends towards the source of light. Which combination correctly identifies the movement, stimulus and hormone involved?

- (a) Geotropism — gravity — cytokinin
- (b) Phototropism — light — auxin
- (c) Hydrotropism — water — gibberellin
- (d) Thigmotropism — touch — absciscic acid

50) Consider the following statements about the human nervous system:

- I. A neuron is the structural and functional unit of the nervous system.
- II. A synapse is a junction between two neurons.
- III. The spinal cord participates in reflex actions.
- IV. The peripheral nervous system includes the brain and spinal cord.

Which option is correct?

- (a) I and II only
- (b) II, III and IV only
- (c) I, II, III and IV
- (d) I, II and III only

MATHEMATICS

51) Which of the following is irrational?

- (a) $\sqrt{16} + \sqrt{9}$
- (b) $\sqrt{2} \cdot \sqrt{8}$
- (c) $\sqrt{3} + \sqrt{12}$
- (d) $\sqrt{5} \cdot \sqrt{20}$

52) The value of $\frac{(2^3 \times 3^2)^2}{2^4 \times 3^3}$ is:

- (a) 12
- (b) 18
- (c) 24
- (d) 36

53) $\sqrt{50} - \sqrt{18} + \sqrt{8}$ simplifies to:

- (a) $2\sqrt{2}$
- (b) $3\sqrt{2}$
- (c) $4\sqrt{3}$
- (d) $5\sqrt{2}$

54) The HCF of 18 and 24 is:

- (a) 3
- (b) 6
- (c) 9
- (d) 12

55) The degree of $(x - 1)(7x^3 - 3x + 1)$ is:

- (a) 1
- (b) 3
- (c) 4
- (d) 7

56) If $p(x) = x^2 - 5x + 6$, then $p(2)$ equals:

- (a) 0
- (b) 1
- (c) 2
- (d) 4

57) Solve for x: $\frac{2x-1}{3} - \frac{x+3}{4} = 1$

- (a) 5
- (b) 6
- (c) 7
- (d) 8

58) The point $(-3, 4)$ lies in which quadrant?

- (a) I
- (b) II
- (c) III
- (d) IV

59) The complement of 35° is:

- (a) 45° (b) 55° (c) 65° (d) 145°
- 60) In a triangle, if two angles are 50° and 60° , the third angle is:
 (a) 60° (b) 70° (c) 80° (d) 90°
- 61) In a rhombus, the diagonals are:
 (a) Equal and bisect each other (b) Unequal and perpendicular bisectors
 (c) Equal and perpendicular (d) Parallel to the sides
- 62) If the circumference of a circle is 44cm, its radius is:
 (a) 3.5 cm (b) 7 cm (c) 14 cm (d) 22 cm
- 63) The perimeter of a square whose area is 64cm^2 is:
 (a) 16 cm (b) 24 cm (c) 32 cm (d) 64 cm
- 64) The mean of 5, 7, 9, 11, and x is 9. Then x is:
 (a) 11 (b) 12 (c) 13 (d) 14
- 65) A die is thrown once. The probability of getting a prime number is:
 (a) $\frac{1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$
- 66) Which fraction has a terminating decimal expansion?
 (a) $\frac{7}{12}$ (b) $\frac{13}{40}$ (c) $\frac{5}{18}$ (d) $\frac{11}{30}$
- 67) Simplify: $\frac{(3^2)^3}{3^4}$
 (a) 3 (b) 3^2 (c) 3^4 (d) 3^6
- 68) Rationalise: $\frac{5}{\sqrt{3}+\sqrt{2}}$
 (a) $5(\sqrt{3}-\sqrt{2})$ (b) $5(\sqrt{3}+\sqrt{2})$ (c) $\sqrt{3}-\sqrt{2}$ (d) 1
- 69) If α and β are zeroes of $x^2 - 7x + 10$, then $\alpha + \beta$ is:
 (a) -7 (b) 7 (c) 10 (d) -10
- 70) The remainder when $x^3 - 2x + 5$ is divided by $x - 2$ is:
 (a) 5 (b) 7 (c) 9 (d) 13
- 71) A factor of $x^2 - 9x + 20$ is:
 (a) $x - 4$ (b) $x + 4$ (c) $x - 5$ (d) $x + 5$
- 72) The solution of $\frac{x-2}{3} + \frac{x+1}{2} = 5$ is:
 (a) $\frac{31}{5}$ (b) 6 (c) 7 (d) 8
- 73) For $x + y = 9$, $x - y = 3$, the value of x is:
 (a) 3 (b) 6 (c) 9 (d) 12
- 74) The roots of $x^2 - 5x + 6 = 0$ are:
 (a) 1, 6 (b) 2, 3 (c) -2, -3 (d) 0, 6
- 75) The distance between (1,2) and (4,6) is:
 (a) 4 (b) 5 (c) 6 (d) 7
- 76) A triangle with sides 6 cm, 8 cm and 10 cm is:
 (a) Acute-angled (b) Obtuse-angled (c) Right-angled (d) Equilateral
- 77) One angle of a parallelogram is 65° . Its adjacent angle is:
 (a) 65° (b) 90° (c) 115° (d) 295°
- 78) An angle at the centre standing on an arc is 100° . The angle at the circumference on the same arc is:
 (a) 25° (b) 50° (c) 100° (d) 200°
- 79) The area of a triangle with base 12 cm and height 7 cm is:
 (a) 19 cm^2 (b) 42 cm^2 (c) 84 cm^2 (d) 96 cm^2
- 80) The volume of a cylinder with radius 3 cm and height 5 cm is:

- (a) $15\pi \text{ cm}^3$ (b) $30\pi \text{ cm}^3$ (c) $45\pi \text{ cm}^3$ (d) $90\pi \text{ cm}^3$
- 81) The median of 3,8,5,11,6 is:
 (a) 5 (b) 6 (c) 8 (d) 11
- 82) A die is thrown once. The probability of getting a number greater than 4 is:
 (a) $\frac{1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$
- 83) In a right triangle, $\sin \theta = \frac{3}{5}$. If θ is acute, then $\cos \theta$ is:
 (a) $\frac{3}{5}$ (b) $\frac{4}{5}$ (c) $\frac{5}{3}$ (d) $\frac{1}{5}$
- 84) If $\text{HCF}(84, 126) = h$ and $\text{LCM}(84, 126) = l$, then $h \times l$ equals:
 (a) 5292 (b) 10584 (c) 15876 (d) 21168
- 85) Simplify: $\frac{1}{\sqrt{5}-\sqrt{3}} - \frac{1}{\sqrt{5}+\sqrt{3}}$
 (a) $\sqrt{3}$ (b) $\sqrt{5}$ (c) $2\sqrt{3}$ (d) $2\sqrt{5}$
- 86) If $x - 2$ is a factor of $x^3 + kx^2 - 4x - 4$, then k equals:
 (a) -1 (b) 0 (c) 1 (d) 2
- 87) If $x + y = 7$ and $xy = 10$, then $x^2 + y^2$ equals:
 (a) 19 (b) 29 (c) 39 (d) 49
- 88) The equations $2x + 3y = 7$ and $4x + 6y = 14$ have:
 (a) No solution (b) One solution (c) Infinitely many solutions (d) Exactly two solutions
- 89) For what value of k does $x^2 - 2(k+1)x + k^2 = 0$ have equal roots?
 (a) $-\frac{1}{2}$ (b) $\frac{1}{2}$ (c) 1 (d) 2
- 90) The point dividing $(2, -3)$ and $(8, 9)$ internally in the ratio 1: 2 is:
 (a) (4,1) (b) (6,5) (c) (5,3) (d) (3,4)
- 91) The area of a triangle with sides 13 cm, 14 cm and 15 cm is:
 (a) 42 cm^2 (b) 84 cm^2 (c) 96 cm^2 (d) 105 cm^2
- 92) A rhombus has diagonals 16 cm and 30 cm. Its side length is:
 (a) 15 cm (b) 16 cm (c) 17 cm (d) 23 cm
- 93) A chord of a circle of radius 13 cm is 10 cm long. Its distance from the centre is:
 (a) 5 cm (b) 10 cm (c) 12 cm (d) 13 cm
- 94) A sector of radius 14 cm has an angle of 90° . Its area is:
 (a) $49\pi \text{ cm}^2$ (b) $98\pi \text{ cm}^2$ (c) $196\pi \text{ cm}^2$ (d) $392\pi \text{ cm}^2$
- 95) A cone has radius 7 cm and height 24 cm. Its curved surface area is:
 (a) $175\pi \text{ cm}^2$ (b) $350\pi \text{ cm}^2$ (c) $525\pi \text{ cm}^2$ (d) $700\pi \text{ cm}^2$
- 96) The mean of five numbers is 18. If one number is removed, the mean of the remaining four numbers is 16. The removed number is:
 (a) 18 (b) 24 (c) 26 (d) 28
- 97) Two fair coins are tossed. The probability of getting at least one head is:
 (a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $\frac{3}{4}$ (d) 1
- 98) If $\tan \theta = \frac{3}{4}$ for an acute angle θ , then $\sin \theta + \cos \theta$ equals:
 (a) $\frac{7}{5}$ (b) 1 (c) $\frac{3}{5}$ (d) $\frac{4}{5}$
- 99) A pole 10 m high casts a shadow $10\sqrt{3}$ m long. The angle of elevation of the sun is:
 (a) 15° (b) 30° (c) 45° (d) 60°

100) The sum of two numbers is 35 and their difference is 9. The larger number is:

- (a) 13 (b) 18 (c) 22 (d) 26

SOLUTIONS

- 1) (c) An object with greater mass and higher speed will have more kinetic energy.
Because kinetic energy is directly proportional to the mass, increasing the mass of an object increases its kinetic energy.
Kinetic energy is also directly proportional to the square of the speed; therefore, a higher speed results in significantly more kinetic energy.
Consequently, an object that has both greater mass and higher speed will inherently possess the maximum kinetic energy compared to lighter or slower objects.
- 2) (c) Given: $v = 700 \text{ m/s}$, $m = 50 \text{ g} = 0.05 \text{ kg}$, $n/t = 60 \text{ bullets /min} \Rightarrow 1 \text{ bullet /s}$
The power developed by the gun is given by formula -
Power = Work done / time = Energy consumed / time
$$\text{Power} = n \times \frac{\frac{1}{2}mv^2}{t}$$
$$\text{Power} = \frac{n}{t} \times \frac{1}{2}mv^2$$
$$\text{Power} = 1 \times \frac{1}{2} \times 0.05 \times 700^2$$
$$\text{Power} = 12250 \text{ watt}$$
- 3) (c) Concept: The relation between momentum and energy is given as:
$$\frac{p^2}{2m} = E$$

Where, p is the momentum of particle.
 m is the mass of the particle.
 E is the kinetic energy of the particle.
Explanation:
The kinetic energy of the body becomes 256 times its initial value.
Let initial kinetic energy is $E_1 = E$ with momentum p_1 .
Final kinetic energy is $E_2 = 256E$ with momentum p_2 .
Hence,
$$\frac{p_2}{p_1} = \frac{(\sqrt{2mE_2})}{(\sqrt{2mE_1})} p_2 = p_1 \times \frac{(\sqrt{2mE_2})}{(\sqrt{2mE_1})} = p_1 \sqrt{\frac{E_2}{E_1}} \text{ So, } p_2 = p_1 \sqrt{\frac{256E}{E}} = 16p_1$$

Hence, final linear momentum is **16** times of its initial value.
- 4) (b) As, body is moving upward, $a = -g$, where g = acceleration due to gravity
So, $v = u - gt$
Given, $u = 20 \text{ m/s}$, $t = 2 \text{ sec}$ and $g = 10 \text{ m/s}^2$
On putting in the above formula, we get, $v = 20 - 10 \times 2 = 0$
Using, $\text{K.E.} = \frac{1}{2}mv^2$
Where, K.E. = kinetic energy of the body
- m = mass of the body
- v = velocity of the body
On putting the values, $\text{K.E.} = \frac{1}{2} \times 2 \times 0 = 0 \text{ J}$
Therefore, the kinetic energy of the body of mass 2 kg is zero.
- 5) (b) To lift the heavy metal beam with the least effort, the construction worker needs to maximize the Mechanical Advantage of the lever system. In this scenario:
- The Load Arm is the distance from the fulcrum to the heavy metal beam.

- The Effort Arm is the distance from the fulcrum to the end of the plank where the worker applies force.

Since the total length of the plank is constant, any change in the fulcrum position affects both arms simultaneously. To minimize the effort required, the formula shows that we must either increase the Effort Arm or decrease the Load Arm:

$$\text{Effort} = (\text{Load} \times \text{Load Arm}) / \text{Effort Arm}$$

By moving the fulcrum closer to the beam, the worker effectively reduces the length of the Load Arm and increases the length of the Effort Arm. This configuration significantly increases the Mechanical Advantage, allowing the heavy beam to be lifted with much less physical force.

If the fulcrum were moved closer to the worker, the effort arm would shorten and the load arm would lengthen, making the beam much harder to lift. Placing it in the center provides a neutral advantage ($MA = 1$), which does not minimize the effort. Therefore, moving the fulcrum closer to the beam is the correct adjustment to lift the beam with the least effort.

- 6) (b) To determine the couple force exerted by the blade edges on the screw slot, we need to calculate the force applied by the screwdriver blade and then multiply it by the lever arm.

The formula for torque is given by:

$$\text{Torque} = \text{Force} \times \text{Lever Arm}$$

In this case, the torque is 4 Nm and the width of the screwdriver blade is 5 mm. However, we need to convert the width of the blade to meters before proceeding with the calculation. 1 mm is equal to 0.001 meters.

$$\text{Width of the screwdriver blade} = 5 \text{ mm} = 5 \times 0.001 \text{ m} = 0.005 \text{ m}$$

Now we can rearrange the formula for torque to solve for force:

$$\text{Force} = \text{Torque} / \text{Lever Arm}$$

$$\text{Force} = 4\text{Nm} / 0.005 \text{ m} = 800 \text{ N}$$

Therefore, the couple force exerted by the blade edges on the screw slot is 800 N.

- 7) (c) If the forces acting on the free-body are non-concurrent then the equivalent resultant will be a single force acting at a common point and a moment about the same point. The effect of such a force system will be to translate the body as well as to rotate it. Hence, for equilibrium to exist, both the force and moment must be null vectors. i.e $\Sigma F = 0, \Sigma M = 0$
- 8) (d) The number of compressions or rarefactions per unit time defines pitch. The pitch is directly proportional to frequency.
- 9) (b) Loudness is directly proportional to the amplitude of a sound. The larger the amplitude the louder the sound and the more energy the sound waves contain. Hence, when we change feeble sound to loud sound we increase its amplitude. Hence option B is the correct answer
- 10) (c) At the right angles to the direction of wave propagation

Explanations: In a transverse wave when the wave moves forward, the particles of the medium vibrate perpendicular to the direction of motion of the wave.

- 11) (b) The image is formed on the retina by successive refractions at the cornea, the aqueous humor, the lens, and the vitreous humor. The human eyes lens acts as convex in nature. and forms a real, inverted, and diminished image on the retina which is perceived by the optic nerve tract that carries the image to the brain for the processing of the information.

Thus, from the above discussion, we can say that the image formed on the retina is real, inverted, and diminished.

- 12) (d) Between the pole of the mirror and its principal focus.

A concave mirror forms a virtual and erect image only when the object is placed between the poles of the

mirror and its principal focus.

This image is larger than the size of object, ie, it is magnified.

13) (b) At twice the focal length The object should be placed at twice the focal length in front of a convex lens to get a real image of the size of the object.

14) (d) Resistance of this wire, $R = \rho \frac{l}{A}$

Resistance of a piece of length $\frac{l}{5} = \rho \frac{l}{5A} = \frac{R}{5}$

The equivalent resistance of the 5 wires in parallel is R' . Then

$$\frac{1}{R'} = \frac{1}{R/5} + \frac{1}{R/5} + \frac{1}{R/5} + \frac{1}{R/5} + \frac{1}{R/5}$$

$$\frac{1}{R'} = \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R}$$

$$\frac{1}{R'} = \frac{25}{R}$$

$$\frac{R}{R'} = 25$$

15) (d) Resistance of the bulb is given by,

$$R = \frac{V^2}{P} = \frac{220^2}{100} \\ = 484\Omega$$

Power consumed by the bulb when operated on 110 V

$$P = \frac{V^2}{R} = \frac{110^2}{484} \\ = 25 \text{ W}$$

16) (c) For series combination

Total resistance $R = R_1 + R_2 + \dots \dots \dots$

So calculating the series resistance in the given combination we get $\Rightarrow R_p = R + R = 2R - (i)$

For parallel combination

Total resistance $1/R = 1/R_1 + 1/R_2 + \dots \dots \dots$

So calculating the parallel resistance in the given combination we get

$$\Rightarrow 1/R_p = 1/R + 1/R$$

$$\Rightarrow 1/R_p = 2/R$$

$$\Rightarrow R_p = R/2 - (ii)$$

To find the ratio we will combine equations (i) and (ii) we get

$$\Rightarrow R_p/R_s = (R/2)/2R = 1/4$$

The ratio of heat produced is 1: 4

17) (c) Voltage (V) = 220 V

Current (I) = 0.5A.

The voltage and current of a bulb are given, the power is calculated through the derived formula of Power.

And we know that

Power = Voltage $\times$ Current

$$P = 220 \times 0.5$$

$$P = 22 \times 0.5$$

$$P = 110W$$

Thus, the required power is 11 W

18) (b) Power of the electric refrigerator,

$$P = 400 \text{ W} = \frac{400}{1000} \text{ kW} = 0.4 \text{ kW}$$

Time for which the refrigerator operates,

$$t = 30 \times 8 \text{ h} = 240 \text{ h}$$

$$\therefore \text{Energy consumed} = P \times t$$

$$= 0.4 \text{ kW} \times 240 \text{ h}$$

$$= 96 \text{ kWh}$$

Cost of the energy to operate refrigerator at a rate of Rs 3.00 per kWh = $96 \times 3.00 = \text{Rs}288.00$

19) (c) The rate of consumption of electrical energy per unit time is electrical Power. it is given as

$$P = \frac{V^2}{R} = I^2 R$$

Calculation:

Given heat energy = 100 J

Resistance $R = 4\Omega$

$$100 = \frac{V^2}{4\Omega} \times 1$$

$$\text{time } t = 1 \text{ s} \quad V^2 = 400$$

$$\Rightarrow V = 20$$

20) (b) When an object is placed beyond the centre of curvature (C) of a concave mirror, the image formed will be real, inverted, and diminished. The image is physically located between the focus (F) and the centre of curvature (C) and image will be Real, inverted and diminished

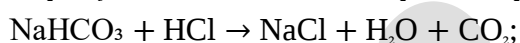
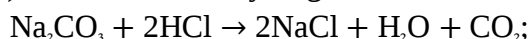
21) (c) A molecule is the smallest particle of a substance that can normally exist independently and retain its chemical properties. Molecules need not contain exactly two atoms: O_2 is diatomic, O_3 is triatomic and P_4 is polyatomic. Compounds contain atoms of two or more different elements, and molecules are normally electrically neutral.

22) (b) For a neutral atom, electrons = protons. Therefore, 17 electrons means 17 protons, so atomic number $Z = 17$. Mass number $A = \text{protons} + \text{neutrons} = 17 + 18 = 35$.

23) (b) Iron is more reactive than copper and displaces copper from CuSO_4 :

$\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$. The reddish-brown deposit is copper. Fe is oxidised by losing electrons and Cu^{2+} is reduced by gaining electrons. Hence it is both displacement and redox.

24) (d) Carbonates and hydrogencarbonates react with acids to release CO_2 .



$\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ is neutralisation and produces no CO_2 .

25) (a) Statements 1, 2 and 3 are correct. Atomic number = number of protons; mass number = protons + neutrons; isotopes have the same atomic number but different mass numbers. Isobars have the same mass number, not the same number of neutrons.

26) (a) Mg is more reactive than hydrogen and therefore displaces hydrogen from dilute HCl: $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$. Both Assertion and Reason are true, and the Reason correctly explains the Assertion.

27) (a) 1–R, 2–P, 3–Q, 4–S.

28) (c) pH below 7 is acidic, 7 is neutral and above 7 is basic. Thus R (pH 7) is neutral; P (pH 2) and Q (pH 5) are acidic; S (pH 11) is basic. Lower pH means greater acidity, so P is more acidic than Q.

29) (d) NaCl , Na_2CO_3 and NaHCO_3 are sodium salts. HCl is an acid, not a sodium salt. Therefore HCl is the odd one out based on chemical nature.

- 30) (c) Atomic number 12 is Mg, which forms X^{2+} . Atomic number 17 is Cl, which forms Y^- . Two Y^- ions are needed to balance one X^{2+} ion, giving XY_2 .
- 31) (b) Potato chips contain fats and oils. When exposed to oxygen in air, these fats undergo oxidation, producing unpleasant smell and taste. This process is called rancidity.
The chips packet is filled with nitrogen to reduce the amount of oxygen inside the packet. Since nitrogen is relatively unreactive, it slows down the oxidation of fats and thereby prevents rancidity.
- 32) (a) HCl produces H_3O^+ and Cl^- ions when dissolved in water. These mobile ions carry electric charge, so aqueous HCl conducts electricity. Both Assertion and Reason are true, and the Reason correctly explains the Assertion.
- 33) (b) X has 11 protons, so atomic number 11 and it forms X^+ by losing one electron. Y has 17 protons, so atomic number 17 and it forms Y^- by gaining one electron. The charges balance in a 1:1 ratio, so the compound is XY. Neutrons affect mass number, not the usual ionic charge.
- 34) (a) A, B and C are correct. Dalton described atoms as indivisible and atoms of the same element as identical in his model. Thomson proposed a positive sphere with electrons embedded in it. Rutherford showed that most of the atom is empty space and positive charge is concentrated in a tiny nucleus. Bohr did not permit arbitrary orbits and arbitrary energies; electrons occupy specific permitted energy levels. Therefore D is false.
- 35) (b) P is correct because NaOH gives OH^- ions in aqueous solution.
Q is correct because $HCl + NaOH \rightarrow NaCl + H_2O$ is neutralisation.
R is incorrect because $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$; carbon dioxide, not hydrogen, is evolved. Hence P and Q only
- 36) (b) Chlorophyll is necessary for photosynthesis because it traps light energy, while carbon dioxide provides carbon for the formation of carbohydrates. Sunlight supplies the energy needed for the process. Oxygen is not a raw material for photosynthesis; rather, it is released as a product.
- 37) (a) The small intestine is the major site of digestion because it receives bile from the liver, pancreatic juice from the pancreas and intestinal secretions from intestinal glands. These secretions contain substances that help complete the digestion of carbohydrates, proteins and fats, making the reason a correct explanation of the assertion.
- 38) (b) Iodine turns blue-black in the presence of starch. Since the plant was destarched initially, starch formed during the experiment would be due to photosynthesis. If only the region exposed to sunlight turns blue-black, it demonstrates that sunlight is necessary for photosynthesis.
- 39) (c) Xylem transports water and minerals from the roots to other parts of the plant, whereas phloem transports food. Root hairs increase the surface area for absorption of water from the soil, while stomata are involved in gaseous exchange and transpiration.
- 40) (a) Water vapour is continuously lost from aerial parts of plants through transpiration. This loss creates a transpiration pull, which helps draw water upward through the xylem. Therefore, transpiration plays an important role in the ascent of sap.

- 41)(b) Stomata are openings through which water vapour is lost from leaves. When stomata remain widely open, transpiration generally increases, resulting in greater loss of water vapour. Thus, prolonged stomatal opening can increase both transpiration and water loss.
- 42)(c) Platelets play an important role in blood clotting. RBCs are mainly involved in oxygen transport, while WBCs help defend the body against infections. Plasma is the liquid component of blood and transports various dissolved substances.
- 43)(a) Oxygenated blood returning from the lungs enters the left atrium through the pulmonary veins. It then passes into the left ventricle and is pumped into the aorta, which distributes it to different parts of the body through systemic circulation.
- 44)(d) Structure X is the aorta, the largest artery arising from the left ventricle. It carries oxygenated blood from the heart to the systemic circulation. In the diagram, it is identifiable by its large arch and the branches arising from its upper portion.
- 45)(b) Dialysis is an artificial method used when kidneys cannot adequately remove wastes from the blood. In an artificial kidney or dialysis procedure, wastes and excess substances are removed from the blood, helping compensate for impaired kidney function.
- 46)(c) Selective reabsorption returns useful substances and appropriate amounts of water from the filtrate to the blood. If this process is greatly reduced, more useful substances would remain in the filtrate and consequently could be lost from the body through urine.
- 47)(b) Urine formation involves three major processes: ultrafiltration of blood, selective reabsorption of useful substances and water, and tubular secretion of certain wastes and excess substances into the filtrate.
- 48)(a) Auxins promote growth and cell elongation, gibberellins promote stem growth, cytokinins promote cell division, and abscisic acid generally inhibits growth and is associated with dormancy. Therefore, A-3, B-4, C-2 and D-1 is the correct matching.
- 49)(b) The directional growth of a plant shoot towards light is called positive phototropism. Light acts as the stimulus, and auxin plays an important role in differential growth of the shoot, causing it to bend towards the light source.
- 50)(d) Neurons are the basic structural and functional units of the nervous system, and a synapse is the junction through which communication occurs between neurons. The spinal cord plays an important role in reflex actions. The brain and spinal cord constitute the central nervous system, not the peripheral nervous system, making statement IV incorrect.
- 51)(c): $\sqrt{3} + \sqrt{12} = \sqrt{3} + 2\sqrt{3} = 3\sqrt{3}$ which cannot be expressed in the form $\frac{p}{q}$, where p, q are integers and $q \neq 0$. Therefore, it is irrational.
- 52)(a): $\frac{(2^3 \times 3^2)^2}{2^4 \cdot 3^3} = \frac{2^6 \times 3^4}{2^4 \times 3^3} = 2^2 \times 3 = 12$
- 53)(c) $\sqrt{50} - \sqrt{18} + \sqrt{8} = 5\sqrt{2} - 3\sqrt{2} + 2\sqrt{2} = 4\sqrt{2}$

54)(b) $18 = 2 \times 3^2$, $24 = 2^3 \times 3$. The common factors are $2 \times 3 = 6$. Hence, HCF = 6.

55)(c) $(x-1)(7x^3-3x+1) = 7x^4-3x^2+x-7x^3+3x-1 = 7x^4-7x^3-3x^2+4x-1$

The highest power of x is 4. Therefore, its degree is 4.

56)(a) $p(2) = 2^2 - 5(2) + 6 = 4 - 10 + 6 = 0$.

57)(a) $\frac{2x-1}{3} - \frac{x+3}{4} = 1 \Rightarrow 4(2x-1) - 3(x+3) = 12 \Rightarrow 8x-4-3x-9 = 12 \Rightarrow 5x = 25$

58)(b): For $(-3,4)$, the x -coordinate is negative and the y -coordinate is positive. Therefore, the point lies in quadrant II.

59)(b) Complementary angles have sum 90° . $90^\circ - 35^\circ = 55^\circ$.

60)(b) The sum of the interior angles of a triangle is 180° . Therefore, third angle is $180^\circ - 50^\circ - 60^\circ = 70^\circ$

61)(b) In a rhombus, diagonals are unequal but perpendicular bisectors of each other.

62)(b) $2\pi r = 44 \Rightarrow r = \frac{22}{\pi} = \frac{\frac{22}{7}}{\frac{22}{7}} = 7$

63)(c) Side = $\sqrt{64} = 8 \Rightarrow$ Perimeter = $4 \times 8 = 32$

64)(c) Mean = $\frac{5+7+9+11+x}{5} \Rightarrow 9 = \frac{32+x}{5} \Rightarrow 32+x = 45 \Rightarrow x = 13$

65)(c) Primes on die are 2, 3 and 5. Therefore $P(\text{prime}) = \frac{3}{6} = \frac{1}{2}$.

66)(b) A rational number has a terminating decimal expansion if the denominator in lowest form has only the prime factors 2 and/or 5. $40 = 2^3 \times 5$.

Therefore, $\frac{13}{40}$ has a terminating decimal expansion.

67)(b) $\frac{(3^2)^3}{3^4} = \frac{3^6}{3^4} = 3^{6-4} = 3^2$.

68)(a) $\frac{5}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}} = \frac{5(\sqrt{3}-\sqrt{2})}{3-2} = 5(\sqrt{3}-\sqrt{2})$.

69)(b) For $ax^2 + bx + c$, the sum of zeroes is: $\alpha + \beta = -\frac{b}{a}$.

Here, $a = 1$ and $b = -7$. $\alpha + \beta = -\frac{-7}{1} = 7$.

70)(c) By the Remainder Theorem, the remainder is $p(2)$.

$p(2) = 2^3 - 2(2) + 5 = 8 - 4 + 5 = 9$.

71)(a) $x^2 - 9x + 20 = x^2 - 4x - 5x + 20 = x(x-4) - 5(x-4) = (x-4)(x-5)$.

Thus, $x-4$ is a factor.

72)(a) $\frac{x-2}{3} + \frac{x+1}{2} = 5$.

Multiplying by 6: $2(x-2) + 3(x+1) = 30 \Rightarrow 2x-4+3x+3 = 30 \Rightarrow 5x-1 = 30 \Rightarrow x = \frac{31}{5}$.

73)(b) Adding the two equations: $(x+y) + (x-y) = 9+3 \Rightarrow 2x = 12 \Rightarrow x = 6$.

74)(b) $x^2 - 5x + 6 = 0 \Rightarrow (x-2)(x-3) = 0$. Therefore, $x = 2$ or $x = 3$.

75) (b) Using the distance formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$d = \sqrt{(4 - 1)^2 + (6 - 2)^2} = \sqrt{3^2 + 4^2} = \sqrt{25} = 5.$$

76) (c) $6^2 + 8^2 = 36 + 64 = 100 = 10^2$.

By the converse of Pythagoras' theorem, the triangle is right-angled.

77) (c) Adjacent angles of a parallelogram are supplementary. $180^\circ - 65^\circ = 115^\circ$.

78) (b) The angle at the centre is twice the angle at the circumference standing on the same arc.

$$\text{Angle at circumference} = \frac{100^\circ}{2} = 50^\circ.$$

79) (b) Area of triangle $= \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 12 \times 7 = 42 \text{ cm}^2$.

80) (c) $V = \pi r^2 h = \pi(3)^2(5) = 45\pi \text{ cm}^3$.

81) (b) Arrange the data: 3, 5, 6, 8, 11.

The middle value is 6. Therefore, the median is 6.

82) (b) Numbers greater than 4 are 5 and 6. Thus, there are 2 favourable outcomes out of 6.

$$P = \frac{2}{6} = \frac{1}{3}.$$

83) (b) Using $\sin^2 \theta + \cos^2 \theta = 1$, $\cos^2 \theta = 1 - \left(\frac{3}{5}\right)^2 = 1 - \frac{9}{25} = \frac{16}{25}$.

$$\text{Since } \theta \text{ is acute, } \cos \theta = \frac{4}{5}.$$

84) (b) For two positive integers, $\text{HCF} \times \text{LCM} = \text{product of the numbers}$.

$$\text{Therefore, } h \times l = 84 \times 126 = 10584.$$

85) (a) $\frac{1}{\sqrt{5}-\sqrt{3}} - \frac{1}{\sqrt{5}+\sqrt{3}} = \frac{(\sqrt{5}+\sqrt{3})-(\sqrt{5}-\sqrt{3})}{(\sqrt{5}-\sqrt{3})(\sqrt{5}+\sqrt{3})} = \frac{2\sqrt{3}}{5-3} = \frac{2\sqrt{3}}{2} = \sqrt{3}$.

86) (c) If $x - 2$ is a factor, then $p(2) = 0$. $2^3 + k(2)^2 - 4(2) - 4 = 0$

$$8 + 4k - 8 - 4 = 0 \Rightarrow 4k - 4 = 0 \Rightarrow k = 1.$$

87) (b) Using $x^2 + y^2 = (x + y)^2 - 2xy \Rightarrow x^2 + y^2 = 7^2 - 2(10) = 49 - 20 = 29$.

88) (c) The second equation is twice the first: $2(2x + 3y = 7) \Rightarrow 4x + 6y = 14$.

Both equations represent the same line. Hence, there are infinitely many solutions.

89) (a) For equal roots, the discriminant must be zero. $D = b^2 - 4ac = 0$.

$$\text{Here, } a = 1, b = -2(k + 1), c = k^2.$$

$$\text{Therefore, } [-2(k + 1)]^2 - 4k^2 = 0 \Rightarrow 4(k + 1)^2 - 4k^2 = 0 \Rightarrow (k + 1)^2 - k^2 = 0 \Rightarrow 2k + 1 = 0 \Rightarrow k = -\frac{1}{2}.$$

90) (a) Using the section formula for ratio 1: 2:

$$x = \frac{1(8) + 2(2)}{1+2} = \frac{12}{3} = 4, y = \frac{1(9) + 2(-3)}{1+2} = \frac{3}{3} = 1. \text{ Therefore, the point is } (4, 1).$$

91)(b) The semi-perimeter is: $s = \frac{13+14+15}{2} = 21$.

$$\text{By Heron's formula: Area} = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{21(21-13)(21-14)(21-15)} \\ = \sqrt{21 \times 8 \times 7 \times 6} = \sqrt{7056} = 84 \text{ cm}^2.$$

92)(c) The diagonals of a rhombus bisect each other at right angles.

$$\text{Half-diagonals are: } \frac{16}{2} = 8 \text{ cm}, \frac{30}{2} = 15 \text{ cm}.$$

$$\text{The side is the hypotenuse of a right triangle: } s = \sqrt{8^2 + 15^2} = \sqrt{64 + 225} = \sqrt{289} = 17 \text{ cm}.$$

93)(c) The perpendicular from the centre to a chord bisects the chord.

$$\text{Half the chord: } \frac{10}{2} = 5 \text{ cm}.$$

$$\text{Using Pythagoras: } d = \sqrt{13^2 - 5^2} = \sqrt{169 - 25} = \sqrt{144} = 12 \text{ cm}.$$

94)(a) Area of a sector is: $\frac{\theta}{360^\circ} \pi r^2$.

$$\text{Thus, Area} = \frac{90}{360} \times \pi \times 14^2 = \frac{1}{4} \times 196\pi = 49\pi \text{ cm}^2.$$

95)(a) First find the slant height: $l = \sqrt{r^2 + h^2} = \sqrt{7^2 + 24^2} = \sqrt{49 + 576} = \sqrt{625} = 25 \text{ cm}.$

$$\text{Curved surface area of cone: } \pi r l = \pi \times 7 \times 25 = 175\pi \text{ cm}^2.$$

96)(c) Total of the five numbers: $5 \times 18 = 90$.

$$\text{Total of the remaining four numbers: } 4 \times 16 = 64.$$

$$\text{The removed number is: } 90 - 64 = 26.$$

97)(c) The sample space is: $\{HH, HT, TH, TT\}$.

Three outcomes contain at least one head:

$$\text{Therefore, } P(\text{at least one head}) = \frac{3}{4}.$$

98)(a) If $\tan \theta = \frac{3}{4}$, take the opposite side as 3 and adjacent side as 4. The hypotenuse is: $\sqrt{3^2 + 4^2} = 5$.

$$\text{Therefore, } \sin \theta = \frac{3}{5}, \cos \theta = \frac{4}{5}. \text{ Hence, } \sin \theta + \cos \theta = \frac{3}{5} + \frac{4}{5} = \frac{7}{5}.$$

99)(b) $\tan \theta = \frac{\text{height}}{\text{shadow}} = \frac{10}{10\sqrt{3}} = \frac{1}{\sqrt{3}}$. Since $\tan 30^\circ = \frac{1}{\sqrt{3}}$, $\theta = 30^\circ$.

100) (c) Let the larger number be x and the smaller number be y .

$$x + y = 35 \text{ and } x - y = 9.$$

$$\text{Adding the equations: } 2x = 44 \Rightarrow x = 22. \text{ Therefore, the larger number is 22.}$$