

# Science

SCHOOL OLYMPIAD

# Olympiad Previous Year Paper



**nstse**  
Test • Assess • Achieve

**1**

Original Paper  
Full Solution



preparing future champions

01 If  $x^{\left(\frac{-p}{q}\right)^{-1}} = \left(\frac{1}{x}\right)^k$  then k =

- (A)  $\frac{p}{q}$  (B)  $-\frac{p}{q}$  (C)  $\frac{1}{p}$  (D)  $\frac{q}{p}$

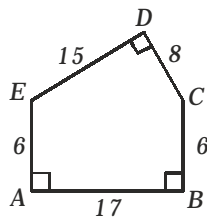
02  $(-12) \times 6 - (-12) \times 4 \div (-2 \times \quad) = ?$

- (A) 1 (B) 0  
(C) 120 (D) 20

03 A piece of string is 40 cm long. It is cut into three pieces. The longest piece is 5 cm more than twice as long as the middle-sized and the shortest piece is half of the middle piece. Find the length of the longest piece (in cm)

- (A) 27 (B) 25 (C) 4 (D) 9

04 Find the area of the following figure.



- (A) 140 units<sup>2</sup> (B) 162 units<sup>2</sup>  
(C) 172 units<sup>2</sup> (D) 200 units<sup>2</sup>

SCHOOL OLYMPIAD

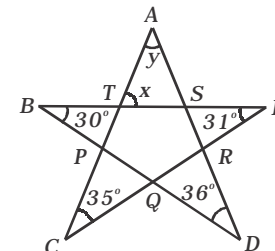
05 Of the 120 people in the room,  $\frac{3}{5}$ th are women. If  $\frac{2}{3}$ rd of the people are married, what is the maximum number of women in the room who could be unmarried ?

- (A) 40 (B) 20 (C) 30 (D) 60

06 A jar contains black and white marbles. If there are ten marbles in the jar, which of the following could not be the ratio of black to white marbles ?

- (A) 9:1 (B) 7:3  
(C) 1:10 (D) 1:4

07 Find the angles  $x$  and  $y$  in the following figure.



- (A)  $x = 71^\circ$  and  $y = 61^\circ$  (B)  $x = 61^\circ$  and  $y = 71^\circ$   
(C)  $x = 66^\circ$  and  $y = 48^\circ$  (D)  $x = 48^\circ$  and  $y = 66^\circ$

08 The sum of three expressions is  $x^2 + y^2 + z^2$ . If two of them are  $4x^2 - 5y^2 - z^2$  and  $-3x^2 + 4y^2 + 2z^2$ , find the third expression.

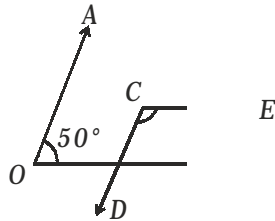
- (A)  $2x^2 + 2z^2$  (B)  $2y^2$   
(C)  $2x^2 + 2y^2 - z^2$  (D)  $-2y^2 - 2z^2$

**09** Which of the following is equal to

$$x + y - [z - x - \{y + z - (x + y) - (z + x - y + z + x)\}]$$

- (A)  $3x$  (B)  $2y$  (C)  $x$  (D)  $x + 2y$

**10** In the below given figure, it is given that  $AO \parallel CD$ ,  $OB \parallel CE$  and  $\angle AOB = 50^\circ$ . Find the measure of  $\angle ECD$ .



- (A)  $50^\circ$  (B)  $90^\circ$  (C)  $110^\circ$  (D)  $130^\circ$

**11** Angles ratio of quadrilateral is 1:2:3:4. What is the size of the greatest angle?

- (A)  $144^\circ$  (B)  $180^\circ$  (C)  $160^\circ$  (D)  $170^\circ$

**12**  $(-8) \div 0 = ?$

- (A)  $-8$  (B)  $0$   
(C) not defined (D) Any real number

**13** If a piece of cloth  $2\frac{1}{2}$  m long costs ₹128  $\frac{1}{3}$ , then the cost of 1 m cloth is

- (A) ₹ 110 (B) ₹  $\frac{154}{3}$   
(C) ₹  $\frac{140}{3}$  (D) ₹  $\frac{55}{3}$

**14**  $7^{20} \times 49^5 \times 343^{-10} =$

- (A)  $7^2$  (B)  $7$  (C)  $1$  (D)  $49^2$

**15** Find the value of  $9^{4.5} : 3^7$ .

- (A)  $9 : 1$  (B)  $3 : 1$  (C)  $9 : 2$  (D)  $3 : 2$

**16** If  $P = 3x - 4y - 8z$ ,  $Q = -10y + 7x + 11z$  and  $R = 19z - 6y + 4x$ , find  $P - Q + R$ .

- (A)  $13x - 20y + 16z$  (B)  $0$   
(C)  $x + y + z$  (D)  $2x - 4y + 3z$

**17** Sum of two natural numbers is 30. If one number is one-fifth of other the product of those numbers is

- (A) 200 (B) 216 (C) 125 (D) 225

**18** If  $\left(4^{\frac{1}{3}}\right)^{2x+\frac{1}{2}} = \frac{1}{32}$ , find  $x$ .

- (A)  $-2$  (B)  $4$  (C)  $-6$  (D)  $-4$

**19**  $(a - 1)(a + 1)(a^2 + 1)(a^4 + 1)(a^8 + 1) = ?$

- (A)  $a^4 - 4$  (B)  $a^8 - 16$   
(C)  $a^{16} - 1$  (D)  $a^{16} - 16$

**20** The price of a house increases by 25% after 10 years, reduces by 25% during the subsequent 10 years. If the present cost is ₹ 10 lakh, what will be its cost after 20 years?

- (A) ₹ 937500 (B) ₹ 900000  
(C) ₹ 850000 (D) ₹ 725000

21 A small bottle holds 0.845 kg of sauce. How much sauce will be there in 72 such bottles?

- (A) 60.84 kg                      (B) 22.815 kg  
(C) 34.92 kg                      (D) .095 kg

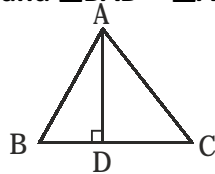
22 Identify the point that always lie in the interior of a triangle.

- (A) Orthocentre and incentre  
(B) Incentre and circumcentre  
(C) Centroid and Orthocentre  
(D) Centroid and Incentre

23 Naresh sold two books for ₹ 600 each there by gaining 20% on one book and losing 20% on the other book. Find his overall loss or gain percent.

- (A) 5% loss                      (B) 5% gain  
(C) 4% loss                      (D) 4% profit

24 In the adjoining figure find the measure of  $\angle BAC$  if  $\angle ABD = \angle CAD$  and  $\angle BAD = \angle ACD$ .



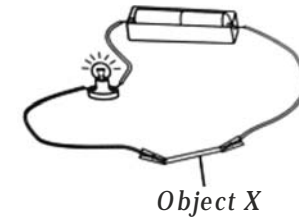
- (A)  $120^\circ$     (B)  $60^\circ$     (C)  $75^\circ$     (D)  $90^\circ$

25 The fifth part of a number when increased by 5 equals its fourth part decreased by 5. Find the number.

- (A) 80    (B) 100    (C) 160    (D) 200

SCHOOL OLYMPIAD

26 When an object X is connected in the circuit shown below, the bulb lights up.



What can you conclude from this observation ?

- (A) Object X is an electrical insulator.  
(B) Object X is an electrical conductor.  
(C) Electric current does not flow through an open circuit.  
(D) Both (A) and (B)

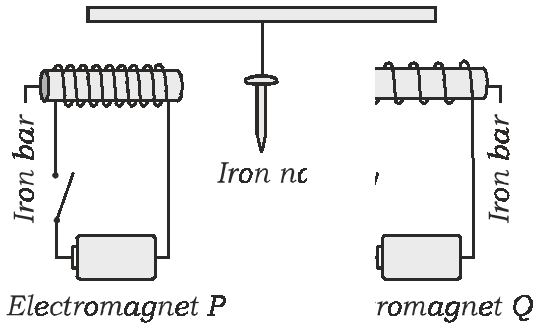
27 Which of the following properties remains constant when a metal rod is heated ?

- (A) Length                      (B) Density  
(C) Volume                      (D) Mass

28 A school bus takes 45 minutes to cover a distance of 18 km. Calculate its speed in km/h.

- (A) 11 km/h                      (B) 15 km/h  
(C) 18 km/h                      (D) 24 km/h

- 29 An iron nail is suspended freely midway between electromagnet P and electromagnet Q as shown.



If both the circuits are closed, what will happen to the iron nail ?

- (A) There is no change in the position of iron nail.
- (B) Iron nail moves towards electromagnet Q.
- (C) Iron nail moves towards electromagnet P.
- (D) Both (A) and (B).

- 30 Which of these is an example of contraction ?

- (A) Riveting steel plates together
- (B) Skating on ice
- (C) Sagging of telephone wires
- (D) Drinking through a straw

- 31 Two boys X and Y participated in a 200 m race. Boy X finished the race in 20 seconds and boy Y finished it in 25 seconds. Who ran faster ?

- (A) Boy X
- (B) Boy Y
- (C) Boys X and Y
- (D) None of the boys

SCHOOL OLYMPIAD

- 32 Identify the incorrect statement.

- (A) When an electric current flows through a conductor, heat is produced.
- (B) Room heater, electric bulb etc, utilize the heating effect of current.
- (C) Electromagnets are used in electric bells and buzzers.
- (D) An electric circuit is a continuous, non-conducting path for flow of electric current.

- 33 A metal ball heated to a temperature of 150° C is placed at a room temperature of 25° C. At what temperature will it stop radiating heat ?

- (A) 0° C
- (B) 25° C
- (C) 100° C
- (D) 120° C

- 34 Which of the following will increase the period of a pendulum ?

- (A) Use a heavier pendulum bob.
- (B) Shorten the length of the pendulum.
- (C) Swing with a larger angle of oscillation.
- (D) Use a longer pendulum.

- 35 Which one becomes a strongest electro-magnet with the given turns of wire on a coil and flow of current through it ?

	Number of turns of wire	Current in wire
(A)	10	0.1 A
(B)	20	0.1 A
(C)	20	0.5 A
(D)	10	0.5 A

**36** A mixture of five parts of iron filings and three parts of sulphur are strongly heated. Which of the following does not take place ?

- (A) Heat is given off.
- (B) Light is given off.
- (C) A chemical change takes place.
- (D) The black residue is attracted to a magnet.

**37** Which substance is used to neutralise the acidity in soil ?

- (A) Ammonium sulphate
- (B) Calcium hydroxide
- (C) Sodium chloride
- (D) Calcium nitrate

**38** Which of the following is mostly affected by a strong typhoon ?

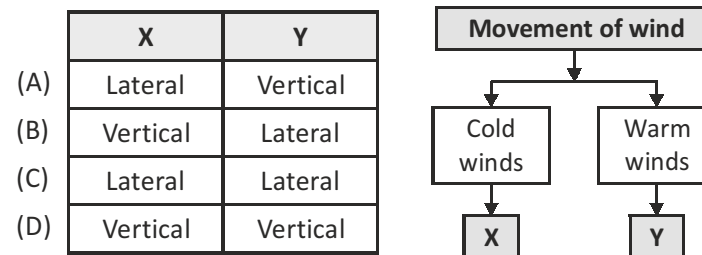
- (A) Areas along the shores
- (B) Fertile valley
- (C) High mountains
- (D) Wide plateaus

**39** Identify an exothermic process.

- (A) Melting of ice
- (B) Evaporation of ethanol
- (C) Formation of iodine vapour from iodine crystals
- (D) Condensation of water vapour to form liquid droplets.

SCHOOL OLYMPIAD **42**

**40** Study the flow chart given below and identify 'X' and 'Y'.



**41** Which of the following elements burn in oxygen to form an oxide, which when mixed with water, gives an acidic solution with a pH less than 7 ?

- (A) Calcium
- (B) Copper
- (C) Magnesium
- (D) Sulfur

**42** Which of these changes indicate a chemical change ?

- (A) The reaction is reversible.
- (B) There is no energy change.
- (C) A new chemical substance is formed.
- (D) Heat and light are not given off.

**43** Which of the following is true of all acids in aqueous solution ?

- (A) They conduct electricity.
- (B) They turn universal indicator red.
- (C) They react with all metals to give hydrogen gas.
- (D) They react with ammonium salts to give ammonia gas.

**44** Match the entries in Column-I with those in Column-II.

Column I		Column II	
a	Burning of wood	1	Physical change
b	Formation of days and nights	2	Slow change
c	Curdling of milk	3	Periodic change
d	Melting of ice	4	Chemical change

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

**45** Which of the following equations represents neutralisation ?

- (A) Sodium hydroxide + chloric acid → sodium chloride + water  
 (B) Calcium carbonate → calcium oxide + carbon dioxide  
 (C) Hydrogen + oxygen → water  
 (D) Methane + oxygen → carbon dioxide + water

SPACE FOR ROUGH WORK

**46** A rain forest is a very wet place. What helps plants survive there ?

- (A) Thick stems that store water  
 (B) Roots that grow close to the ground  
 (C) Stems that move around  
 (D) Large, pointed leaves

**47** Which organism(s) is/are both a predator and a prey in the given food chain ?

Banana → Fruit fly → Frog → Snake → Eagle.

- (1) Fruit fly                      (2) Frog  
 (3) Snake                      (4) Eagle  
 (A) 2 only                      (B) 2 and 3 only  
 (C) 1, 2 and 3 only                      (D) 1, 2, 3 and 4

**48** Which organisms are most important for adding nutrients to the soil ?

- (A) Consumers                      (B) Scavengers  
 (C) Producers                      (D) Decomposers

**49** Study the chart.



It shows that P develops into Q after P undergoes processes S and T. What can P, Q, S and T be ?

	P	Q	S	T
(A)	Flower	Fruit	Fertilisation	Pollination
(B)	Flower	Pollination	Fertilisation	Fruit
(C)	Flower	Fruit	Pollination	Fertilisation
(D)	Seed	Seedling	Fertilisation	Pollination

**50** How will an oxygen molecule travel after it enters the body from the atmosphere?

- (A) Trachea → bronchiole → alveoli  
 (B) Bronchus → bronchiole → alveoli  
 (C) Bronchus → trachea → bronchiole → alveoli  
 (D) Trachea → bronchiole → bronchus → alveoli

**51** What are the products of aerobic and anaerobic respiration in humans?

	Aerobic respiration			Anaerobic respiration		
	Carbon dioxide	Lactic acid	Water	Carbon dioxide	Lactic acid	Water
(A)	✓	✓	✗	✓	✓	✓
(B)	✓	✗	✓	✓	✓	✓
(C)	✓	✗	✓	✗	✓	✓
(D)	✗	✓	✗	✓	✗	✗

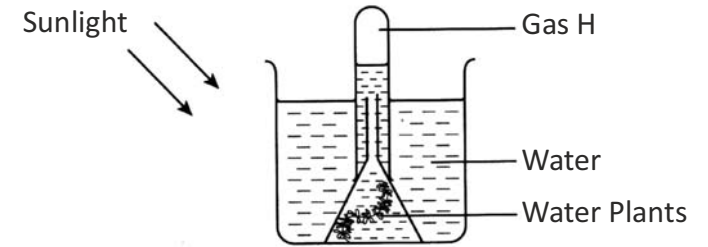
Key: ✓ = is a product      Key: ✗ = is not product

**52** What can we do to prevent landslides on a slope?

- i) Grow more trees on the slope.  
 ii) Grow grass on the slope.  
 iii) Have more cattle grazing on the slope.  
 iv) Stop cutting down trees that have grown healthily on the slope.

- (A) i and ii only      (B) i, ii and iv only  
 (C) iii and iv only      (D) i, iii and iv only

**53** Gas H is collected when the set-up below is left for four hours under the sun.



Which of the following statements about Gas H are true?

- i) It is produced when water plants make food.  
 ii) It can be used to light up a glowing splinter.  
 iii) It turns limewater chalky.

- (A) i and ii only      (B) i and iii only  
 (C) ii and iii only      (D) i, ii and iii

**54** Four types of organisms are listed.

- Carnivores
- Decomposers
- Herbivores
- Producers

In an ecosystem, in which order does energy flow through these organisms?

- (A) 2 → 1 → 3 → 4      (B) 2 → 3 → 1 → 4  
 (C) 4 → 1 → 3 → 2      (D) 4 → 3 → 1 → 2



**55** How do penguins keep themselves warm ?

- i) They have a layer of fat or blubber beneath their skin.
- ii) They have a webbed feet
- iii) They huddle together.
- iv) They have feathers.

- (A) i and iii only      (B) ii and iv only
- (C) i, iii and iv only      (D) ii, iii and iv

SPACE FOR ROUGH

SCHOOL OLYMPIAD

**Class : 7**

**Critical Thinking**

**56** The nine keys to nine padlocks have all been mixed up. How many times must you try at the most to match each key to its correct padlock ?

- (A) 28      (B) 32      (C) 36      (D) 38

**57** How many times does the digit '5' appear in a book that has 255 pages ?

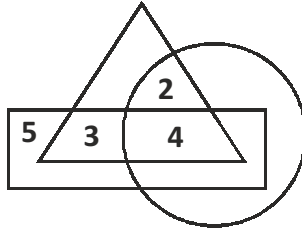
- (A) 182      (B) 48      (C) 66      (D) 52

**58** Identify the last diagram to continue with the logical pattern.



SPACE FOR ROUGH WORK

- 59** In the given figure if triangle represents healthy people, rectangle represents old persons and circle represents men. Then how many men are healthy but not old ?



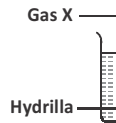
- (A) 3      (B) 4      (C) 6      (D) 2

- 60** Starting from the least, arrange these sporting events in increasing order of the number of players in the playing area during a game.

- (A) Hockey, Boxing, Basket ball, Tennis doubles  
 (B) Boxing, Tennis doubles, Basket ball, Hockey  
 (C) Basket ball, Boxing, Hockey, Tennis doubles  
 (D) Boxing, Basket ball, Tennis doubles, Hockey

SPACE FOR ROUGH WORK

- 55** Study the diagram below. A Hydrilla plant was placed in a test-tube set-up left under the test-tube. After some time, Gas X was observed to have formed. Which of the following statements are true?



- (I) It can light up a glowing splinter brightly.  
 (II) It is needed for combustion.  
 (III) It is needed by all living organisms.  
 (IV) It turns limewater milky.
- (A) I & III  
 (B) I, II & III  
 (C) I, II & IV  
 (D) II, III & IV

### Question number 56 to 60

This new section 'Critical Thinking', has been introduced only from 2018-19 in the NSTSE pattern and hence has no 'Past' questions.

56. A Hydrilla plant was placed in a test-tube set-up left under the test-tube. After some time, Gas X was observed to have formed. Which of the following statements are true?

- (I) It can light up a glowing splinter brightly.  
 (II) It is needed for combustion.  
 (III) It is needed by all living organisms.  
 (IV) It turns limewater milky.
- (A) I & III  
 (B) I, II & III  
 (C) I, II & IV  
 (D) II, III & IV

### Question number 61 to 65

This new section 'Critical Thinking', has been introduced only from 2018-19 in the NSTSE pattern and hence has no 'Past' questions.

## Key and Solutions

CODE: 446 Mathematics

1. (D)  $x^{\left(\frac{-p}{q}\right)^{-1}} = \left(\frac{1}{x}\right)^k$

$$x^{\left(\frac{-p}{q}\right)^{-1}} = x^{-k}$$

$$-k = \left(\frac{-p}{q}\right)^{-1}$$

$$-k = -\frac{q}{p}$$

$$k = \frac{q}{p}$$

2. (B) LHS =  $(-12) \times 6 - (-12) \times 4$   
 $\div (-2 \times -12)$

$$= (-12) \times 6 - \frac{(-12 \times 4)}{(-2 \times -12)}$$

$$= -72 - \frac{(-48)}{24}$$

$$= -72 + 2$$

$$= -70$$

3. (B) Let the middle string length be  $x$  cm

Given  $\frac{x}{2} + x + 2x + 5 = 40$

$$\frac{x}{2} + 3x = 35$$

$$\frac{7x}{2} = 35$$

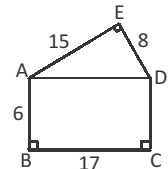
$$x = 10 \text{ cm}$$

Longest piece =  $2x + 5 = 25$  cm

4. (B) Area of pentagon = Area of rectangle + Area of triangle

$$= (6 \times 17) + \frac{1}{2} \times 15 \times 8$$

$$= 102 + 60 = 162 \text{ units}^2$$



5. (A) Number of women =  $120 \times \frac{3}{5} = 72$

$$\frac{3}{5} = 72$$

Number of married persons

$$= \frac{2}{3} \times 120 = 80$$

Number of unmarried =  $120 - 80 = 40$

This 40 may be women to become

maximum women are unmarried

6. (C) 1 : 10 can not be the number of marbles ratio of the jar.

SCHOOL OLYMPIAD

7. (C) exterior angle property of triangle

$$x = 35^\circ + 31^\circ = 66^\circ$$

$$\angle AST = 30^\circ + 36^\circ = 66^\circ = 66^\circ$$

$$\text{But } x + \angle AST + y = 180^\circ$$

$$66^\circ + 66^\circ + y = 180^\circ$$

$$y = 48^\circ$$

8. (B) Third expression

$$= (x^2 + y^2 + z^2) - [(4x^2 - 5 - 3z^2) + (-3x^2 + 4y^2 + 2z^2)]$$

$$= x^2 + y^2 + z^2 - [4x^2 - 5y^2 - 3x^2 + 4y^2 + 2z^2]$$

$$= x^2 + y^2 + z^2 - x^2 + y^2 - 2z^2 = 2y^2$$

9. (D) LHS =  $x + y - [z - x - \{y + -x - y - (3 + x - y - z - x)\}]$

$$= x + y - [z - x - \{z - x - (-y - x - y - (3 + x - y - z - x))\}]$$

$$= x + y - [z - x - \{z - x + y + x + y - [z - x - z + x - (-y - x - y - (3 + x - y - z - x))]\}]$$

$$= x + y - [z - x - z + x - (-y - x - y - (3 + x - y - z - x))]$$

$$= x + y - [-y]$$

$$= x + y + y = x + 2y$$

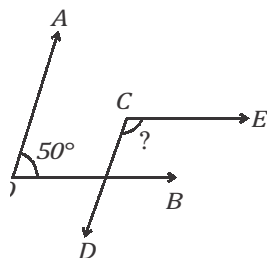
10. (D)  $\angle CDB = \angle AOB = 50^\circ$

[Since corresponding angles are equal]

$$\text{But } \angle C + \angle CDB = 180^\circ$$

$$\angle C + 50^\circ = 180^\circ$$

$$\angle C = 130^\circ$$



$$x + 2x + 3x + 4x = 360^\circ$$

$$10x = 360^\circ$$

$$x = 36^\circ$$

$$\text{Greatest angle} = 4x = 4 \times 36^\circ = 144^\circ$$

Division by zero is not undefined

Cost of 1 m cloth

$$= \frac{\text{Total cost}}{\text{Total length}} = \frac{128 \frac{1}{3}}{2 \frac{1}{2}}$$

$$= \left(\frac{385}{3}\right) \div \left(\frac{5}{2}\right) \text{ m} = \frac{385}{3} \times \frac{2}{5} \text{ m}$$

$$= \frac{154}{3} \text{ per metre}$$

$$\text{LHS} = 7^{20} \times 7^{10} \times 7^{-30}$$

$$= 7^{20+10-30} = 7^0 = 1$$

$$9^{4.5} : 3^7 = (3^2)^{4.5} : 3^7$$

$$= 3^9 : 3^7 = 3^2 : 1 = 9 : 1$$

$$P - Q + R = 3x - 4y - 8z - (-10y + 7x + 11z) + 19z - 6y + 4x$$

$$= 3x - 4y - 8z + 10y - 7x - 11z + 19z - 6y + 4x$$

$$= 7x - 7x - 10y + 10y - 19z + 19z$$

$$= 0$$

17. (C) Let the number be 'x'

$$\text{Given } x + \frac{x}{5} = 30$$

$$\frac{6x}{5} = 30$$

$$x = 25$$

$$\therefore \frac{x}{5} = 5$$

$$\therefore x \times \frac{x}{5} = 25 \times 5 = 125$$

18. (D)  $4 \left(\frac{4x+1}{2}\right)^{\frac{1}{3}} = 2^{-5}$

$$2^2 \left(\frac{4x+1}{6}\right) = 2^{-5}$$

$$\frac{4x+1}{3} = -5$$

$$4x + 1 = -15$$

$$4x = -16$$

$$x = -4$$

19. (C)  $(a-1)(a+1)(a^2+1)(a^4+1)(a^8+1)$

$$= (a^2-1)(a^2+1)(a^4+1)(a^8+1)$$

$$= (a^4-1)(a^4+1)(a^8+1)$$

$$= (a^8-1)(a^8+1)$$

$$= a^{16} - 1$$

20. (A) Value of house after 10 years

$$= ₹ 10,00,000 \times \frac{125}{100}$$

$$= ₹ 12,50,000$$

Value of house 10 years

$$= ₹ 12,50,000 \times \frac{75}{100}$$

$$= ₹ 9,37,500$$

21. (A) Required value =  $72 \times 0.845$  kg = 60.84 kg

22. (D) Centroid & incentre are always interior of a triangle

23. (C) CP of first book = ₹ 600  $\times \frac{100}{120} = ₹ 500$

CP of second book = ₹ 600

$$\times \frac{100}{80} = ₹ 750$$

$$\text{Total CP} = ₹ 500 + ₹ 750 = ₹ 1,250$$

$$\text{Total SP} = 2 \times ₹ 600 = ₹ 1,200$$

$$\text{Total loss} = ₹ 50$$

Total loss percentage =

$$\frac{₹ 50}{₹ 1250} \times 100 = 4\%$$

24. (D) Let  $\angle ABD = \angle CAD = x$  &

$$\angle BAD = \angle ACD = y$$

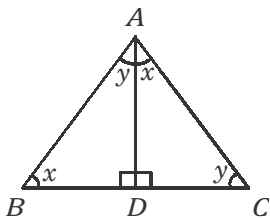
In  $\triangle ABD$

$$\angle B + \angle BAD + \angle D = 180^\circ$$

$$x + y + 90^\circ = 180^\circ$$

$$x + y = 90^\circ$$

$$\text{But } \angle BAC = x + y = 90^\circ$$



25. (D) Let the number be 'x'

$$\text{Given } \frac{x}{5} + 5 = \frac{x}{4} - 5$$

$$5 + 5 = \frac{x}{4} - \frac{x}{5}$$

$$10 = \frac{x}{20}$$

$$x = 200$$

CODE: 446

Physics

26. (B) As object X is an electrical conductor, it allowed electric current to flow through it and the bulb lighted up.
27. (D) Mass remains constant when a metal rod is heated.
28. (D) 45 minutes =  $\frac{45}{60} = \frac{3}{4}$  h  
 Distance covered = 18 km  
 Time taken =  $\frac{3}{4}$  h  
 $\therefore$  Speed =  $(18 \div \frac{3}{4})$  km/h

$$\left(18 \times \frac{4}{3}\right) \text{ km/h} = 24 \text{ km/h.}$$

The iron nail will move towards electromagnet P as it has more coils of wire around it than electromagnet Q and thus, it exerts a stronger magnetic force than electromagnet Q.

An example of contraction is riveting steel plates together.

**Option (B).** Skating on ice involves using pressure to melt ice.

**Option (C).** Sagging of telephones wires is an example of expansion.

**Option (D).** Drinking through a straw is possible because of atmospheric pressure.

31. (A) Speed of boy X is 200 m  $\div$  20 s = 10 m/s

$$\text{Speed of boy Y is } 200 \text{ m} \div 25 \text{ s} = 8 \text{ m/s}$$

Thus, the speed of boy X is 10 m/s and that of boy Y is 8 m/s. So, boy X ran faster than boy Y. Both the boys ran the same distance, but one of them is faster than the other, because boy X covered more distance in a unit time than boy Y.

CODE: 446

Chemistry

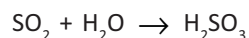
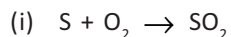
32. (D) Statements (A), (B) and (C) are correct. An electric circuit is a continuous, conducting path for flow of electric current.
33. (B) Heat will flow from a region of higher temperature to a region of lower temperature until equilibrium of temperature is reached i.e., 25° C.
34. (D) As the length of a pendulum is longer, its period will also increase.

$$T = 2\pi\sqrt{\frac{l}{g}}$$

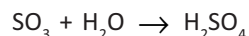
35. (C) The strength of an electromagnet depends on the number of turns of wire on a coil and flow of current through it. Among the given options, the coil with 20 turns of wire and 0.5 A flow of current through it makes it the strongest electromagnet.

36. (D) Iron, when mixed with sulphur in the right proportion and heated forms a new substance, i.e., iron sulphide, a black residue. Iron sulphide is not attracted to a magnet. Both iron and sulphur in the iron sulphide cannot be seen and identified. Iron sulphide being a black residue is not attracted to a magnet.
37. (B) Calcium hydroxide (slaked lime) is used to reduce the acidity in soil.
38. (A) Areas along the shores will be mostly affected by a strong typhoon.
39. (D) An exothermic process releases net heat energy when water vapour molecules come together to form liquid droplets as weak intermolecular attractive forces are formed amongst them.
40. (A) Cold winds which are heavy move towards places of low pressure and show lateral/sideways movement. Warm winds being lighter, rise up and show vertical movement.

41. (D) Calcium, Copper and Magnesium burn in oxygen to form metallic oxides that are basic in nature. Sulphur being a non-metal burns in oxygen to form an acidic oxide, sulphur dioxide. In excess of oxygen, it forms sulphur trioxide. When these oxides dissolve in water, they form sulphurous and sulphuric acid respectively as given below with a pH of less than 7.



(Sulphurous acid)



(Sulphuric acid)

42. (C) A chemical change always involves the formation of a new chemical substance.

**Option (A) :** Chemical changes are not reversible.

**Option (B) :** Chemical changes involve energy changes.

**Option (D) :** Heat and light are often given off during chemical changes.

As acids contain ions which have been formed by dissociation of the acid molecules in water, they are electrolytes. So, they conduct electricity.

The correct combination is a-4, b-3, c-2, d-1

Burning of wood – chemical change

Formation of days and nights – periodic change.

Curdling of milk – slow change

Melting of ice – physical change

Sodium hydroxide and hydrochloric acid react to form sodium chloride and water which is a neutralisation reaction.

**Option (B) :** It is thermal decomposition of calcium carbonate.

**Option (C) :** It is burning (combustion) of hydrogen gas.

**Option (D) :** It is burning (combustion) of methane gas.

**CODE: 446 Biology**

46. (B) Rain forest have a shallow layer of fertile soil so trees need only shallow roots to reach the nutrient. Plants in rain forest grow roots close to the ground to survive.

47. (B) In the given food chain frog and snake are both a prey and a predator. The prey of frog is fruitfly and snake is its predator and the prey of snake is the frog and its predator is the eagle.

48. (D) Decomposers helps to reduce dead organic matter to minerals or as nutrients to the soil.

49. (C) Given flow chart shows the process of formation of fruit from flower. Flowers develop into fruit after pollination and fertilization.

Pollination takes place before fertilization

50. (A) Trachea → bronchus → bronchiole → alveoli

51. (B) Byproducts of aerobic respiration are carbon dioxide and water and in anaerobic respiration are lactic acid, and it needs to be oxidised to carbon dioxide and water.

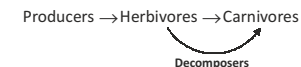
52. (B) Grass the roots of plants on hill slopes can slow down the flow of rain water.

The roots of grass and plants bind the soil together and thus prevent the soil from being washed down by rain water or blown away by wind. Hence, the grass growing on hill slopes prevents soil erosion.

53. (A) Gas H is oxygen gas. It is produced when plants make food during photosynthesis. It is used when living things including plants carry out respiration.

[In sunlight, plants carry out both photosynthesis and respiration, plants produce a lot of oxygen in photosynthesis but they use only part of it for respiration. The remaining oxygen is given out by plants through tiny openings called stomata found mainly on their leaves.]

54. (D) Transfer of energy flow is



55. (C) Penguins have a thick layer of feathers to trap air to reduce heat loss from their bodies to the cold surroundings. Air is a poor conductor of heat.

Penguins have a layer of fat or blubber beneath their skin to keep them warm when swimming in water.

Penguins huddle together without moving for days when the temperature is very low. This behavioural adaptation helps the birds to keep warm and also conserves energy as they do not need to move about to keep warm.

**CODE: 446 Critical Thinking**

56. (C) The table below shows the number of tries to each padlock in the worst-case scenario.

A	B	C	D	E	F	G	H	I
8	7	6	5	4	3	2	1	0

$$0 + 1 + 2 + \dots + 6 + 7 + 8 = 36$$

I must try 36 times at the most.


57. (D) digit '5' in the ones place :  
5, 15, 25, ... , 255 = 26 times

digit '5' in the tens place :  
50, 51, 52, ... , 255 = 26 times

digit '5' in the hundreds place : 0

$$26 + 26 = 52$$

The digit '5' appears 52 times in a book that has 255 pages.

58. (A) 

The symbols are mirror images of 5, 4, 3, 2 in the first row and 9, 8, 7 in the second row. Hence the next one is 6.

59. (D)

60. (B) Boxing, Tennis doubles, Basket ball, Hockey

**THE END**