2021-22

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National Level Science Talent Search Examination

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CLASS VIII

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Name _____

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Questions : 60 **Time : 60 minutes**

INSTRUCTIONS

Read all instructions carefully before attempting any question.

- Ensure that the 'Class' printed here and inside, is the same as the test you are appearing for.
- You must complete the paper within the time allotted.
- Do not open this question paper until you are permitted to.
- You are not allowed to use a calculator.
- Figures herein are not to scale. Hence, you cannot depend on the estimate of size or measurement. Use your knowledge of the subject.
- Rough work shall be carried out only in the space provided for the same throughout this booklet. No separate sheets are allowed for the same.
- Return your answer sheet to the invigilator soon after completion and before leaving the examination hall. Take the question paper with you.
- There is no negative marking.
- Results would be made available on **www.unifiedcouncil.com**

PAPER CODE	UN446

UCN/QP-VIII/02

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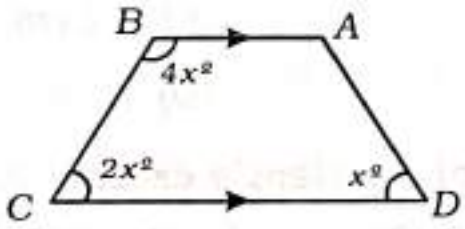
Class : 8 **Mathematics**

01 π is a _____ number.

(A) Rational (B) Whole

(C) Natural (D) Irrational

02 In the given figure, ABCD is a trapezium. Find the value of $\angle BAD$.



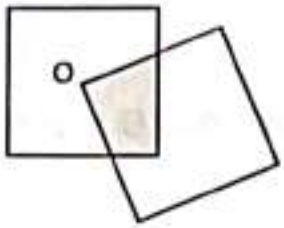
(A) 30° (B) 40° (C) 60° (D) 150°

03 If $\frac{6x+7}{3x+2} = \frac{4x+5}{2x+3}$ then x = _____

(A) $-\frac{7}{9}$ (B) -1 (C) $-\frac{11}{9}$ (D) $-\frac{11}{7}$

Space for Rough work

04 Shown below are two congruent squares of 24 cm^2 area each. If 'O' is the centre of one square, then area of shaded region is ____



(A) 18 cm^2 (B) 12 cm^2

(C) 6 cm^2 (D) 8 cm^2

05 The length of a rectangle exceeds its breadth by 9 cm. If the length and breadth are each increased by 3 cm, the area of the new rectangle will be 84 cm^2 more than that of the given rectangle. Find the length of the given rectangle.

(A) 9 cm (B) 13 cm

(C) 17 cm (D) 19 cm

Space for Rough work

06 If $(x + 1)$ is a factor of $x^4 + (p - 3)x^3 - (3p - 5)x^2 + (2p - 9)x + 6$, what is the value of p ?

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

07 If $2^a + 3^b = 17$ & $2^{a+1} - 3^{b+1} = -11$ then the values of a & b respectively are

(A) -2 & 3 (B) 2 & -3

(C) 2 & 3 (D) 3 & 2

08 $\left(\frac{x^{-1} + y^{-1}}{x^{-1}}\right)^{-1} - \left(\frac{x^{-1} - y^{-1}}{x^{-1}}\right)^{-1} =$

(A) $\frac{2y^2}{y^2 - x^2}$ (B) $\frac{2xy}{x^2 - y^2}$

(C) $\frac{2x^2}{x^2 + y^2}$ (D) $\frac{2y^2}{x + y^2}$

Space for Rough work

09 Find the cost of painting the four walls of a room 10 metres long, 5 metres broad and 6 metres high at the cost of ₹ 4 per square metre.

(A) ₹ 720 (B) ₹ 880

(C) ₹ 360 (D) ₹ 1200

10 If $4(4x)^7 = 4^{6^2}$, then what is the value of x ?

(A) 5 (B) 25 (C) 64 (D) 256

11 $$\frac{3(4+2m^2-m)-6(3m^2+m+2)}{2(2m-3)+3(m+2)} = ?$$

(A) $\frac{3(3m+4)}{7}$ (B) $\frac{3(4m+3)}{7}$

(C) $\frac{3(3m-4)}{7}$ (D) $\frac{-3(4m+3)}{7}$

Space for Rough work

12 ₹ 207 divided among three friends A, B and C in the ratio $\frac{1}{6}:\frac{1}{4}:\frac{1}{3}$. then B's share = ___

(A) ₹ 46 (B) ₹ 92

(C) ₹ 138 (D) ₹ 69

13 Identify the greatest among the options.

(A) $(9)^{100}$ (B) $(81)^{49}$

(C) $(27)^{64}$ (D) 3^{198}

14 $\sqrt[3]{x^2\left(x^4+3y^4\right)-y^2\left(3x^4+y^4\right)}$ = ?

(A) $(x+y)$ (B) $(x-y)$

(C) (x^2-y^2) (D) (x^3-y^3)

Space for Rough work

15 If $x = \frac{a-b}{a+b+c+b} = \frac{b-c}{a+b+c+d} = \frac{c-d}{a+b+c+d} = \frac{d-a}{a+b+c+d}$, then find x^3 ?

(A) 1 (B) 8 (C) 0 (D) 27

16 If p = 24 then $\sqrt{p(p^2+3p+3)+1}$ = ?

(A) 5 (B) 7

(C) 123 (D) 125

17 A solution of 150 litres contains 60% of milk and the rest water. How much water must be added to the above solution such that the resulting mixture contains 50% of water (in Litres) ?

(A) 60 (B) 80 (C) 20 (D) 30

Space for Rough work

18 If $\sqrt{3\sqrt{3\sqrt{3\sqrt{3\sqrt{3}}}}} = 3^n$, find the value of n.

(A) $\frac{11}{24}$ (B) $\frac{15}{16}$ (C) $\frac{63}{64}$ (D) $\frac{31}{32}$

19 A number consists of two digits. The digit in the ten's place exceeds the digit in the unit's place by 4. The sum of the digits is $\frac{1}{7}$ of the number. The number is :

(A) 62 (B) 73

(C) 95 (D) 84

20 In a division sum, the divisor is 12 times the quotient and 5 times the remainder. If the remainder is 48, what is the dividend ?

(A) 240 (B) 576

(C) 4800 (D) 4848

Space for Rough work

21 The difference between the compound interest and the simple interest on a certain sum of money for 2 years at 11% per annum is ₹ 363. Find the sum.

(A) ₹ 33,000 (B) ₹ 31,000

(C) ₹ 30,000 (D) ₹ 32,000

22 The speed of a metro train is 54 km/hr excluding stoppage time and including stoppage, the speed is 45 km/hr then for how many minutes does it stop per hour ?

(A) 9 (B) 10 (C) 20 (D) 11

23 The volume of a cubical box is 13.824 cubic metres. Find the length of each side of the box.

(A) 2.4 m (B) 2.6 m

(C) 1.4 m (D) 1.6 m

Space for Rough work

24 $\dfrac{(126)^{\frac{1}{2}}(63)^{\frac{1}{2}}(45)^{\frac{1}{2}}}{(147)^{\frac{1}{2}}(243)^{\frac{1}{2}}} =$ _____

(A) $2^{\frac{1}{2}}$ (B) $10^{\frac{1}{2}}$

(C) $5^{\frac{1}{2}}$ (D) $7^{\frac{1}{2}}$

25 **Square root of sum of cubes of first 10 natural numbers is ____**

(A) 45 (B) 50

(C) 55 (D) 100

Space for Rough work

26 **Which of the following does not produce a sound ?**

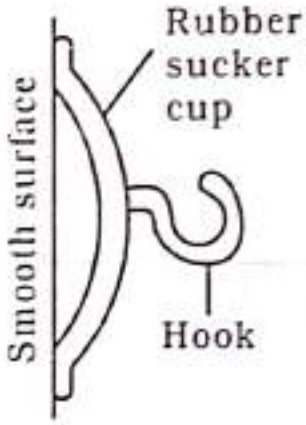
(A) A bell ringing under water.

(B) A gun fired in a room with no echoes

(C) A hammer hitting a block of rubber.

(D) An explosion in outer space.

27 **A rubber sucker is shown below.**



It sticks to the surface because the

(A) air outside the cup is at higher pressure.

(B) air outside exerts a force on the cup.

(C) cup is sucked by the air inside.

(D) both (A) and (B)

Space for Rough work

28 A wooden block was pushed across different surfaces using the same force. The table below shows the distance moved by the wooden block on each surface. Which surface produced the most frictional force ?

	Surfaces	Distance moved by block (cm)
(A)	Sand paper	11
(B)	Silk	24
(C)	Smeared with oil	28
(D)	Carpet	19

29 Which of the following does not conduct electricity ?

(A) $CuSO_4$ Solution (B) Graphite

(C) Acidified water (D) Solid NaCl

30 How many characters or dot patterns are there in a Braille system ?

(A) 23 (B) 46

(C) 63 (D) 86

31 Identify the similarity and difference between a low-pitch sound and a high-pitch sound produced by the same instrument.

	Similarity	Difference
(A)	Speed	Frequency
(B)	Wavelength	Frequency
(C)	Frequency	Wavelength
(D)	Frequency	Speed

32 **Which of the following belongs to electro-static force ?**

(A) Two planets attract one another.

(B) Two surfaces rub against each other.

(C) A field pattern is formed when iron fillings are sprinkled around a magnet.

(D) A plastic ruler attracts tiny pieces of paper after rubbing with a woollen cloth.

33 **Which of the following combinations is possible ?**

	Charge P	Charge Q	Effect
(A)	Positive	Positive	Attraction
(B)	Positive	Negative	Attraction
(C)	Negative	Negative	Attraction
(D)	Negative	Positive	Repulsion

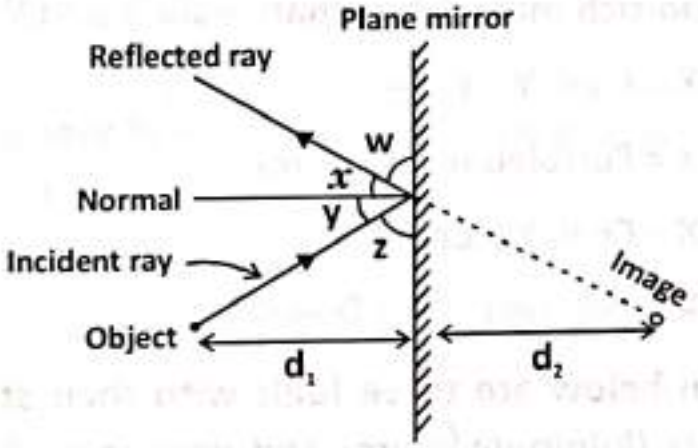
34 **Which electrolyte would you use for electro-plating an iron nail with copper metal ?**

(A) Copper oxide (B) Iron sulphate

(C) Iron nitrate (D) Copper sulphate

Space for Rough work

35 An image of an object is formed in a plane mirror as shown below.



Identify the correct option.

	Distance	Angle
(A)	d_1 is equal to d_2	$x \neq y$
(B)	d_1 is greater than d_2	$x \neq y$
(C)	d_1 is equal to d_2	$w = z$
(D)	d_1 is lesser than d_2	$w = z$

Space for Rough work

36 When X is heated in the absence of air, Y is formed. Y is tough, porous and a black substance. X and Y are carbon-rich materials. What could X and Y be ?

(A) X = Coal, Y = Coke

(B) X = Petroleum, Y = Petrol

(C) X = Coal, Y = Coal tar

(D) X = Petroleum, Y = Diesel

37 Given below are three fuels with their state, calorific values (kilojoule/gram) and products of combustion respectively.

P : Solid, 33, CO_2 and forms solid residue.

Q : Liquid, 48, CO_2 and no residue is formed.

R : Gas, 150, Explodes forming steam and no residue is formed.

Which one of the three fuels is most ideal ?

(A) Fuel R (B) Fuel P

(C) Fuel Q (D) Fuels P and R

Space for Rough work

38 **What is the common product (gas) formed when zinc reacts separately with a dilute acid and a dilute base ?**

(A) Hydrogen (B) Oxygen

(C) Carbon dioxide (D) Nitrogen

39 **A polyester fabric should not be ironed with a hot iron because**

(A) it is a waste of electricity.

(B) it will melt.

(C) it will catch fire.

(D) it will lose its colour.

40 **Wood or coal when burnt in air release X particles into the atmosphere and when inhaled by humans cause a disease Y. What are X and Y ?**

(A) Burnt carbon, respiratory disease.

(B) Burnt carbon, nervous disease.

(C) Unburnt carbon, respiratory disease.

(D) Unburnt carbon, nervous disease.

Space for Rough work

41 **In the oil wells, natural gas forms the top most layer, followed by oil and finally water. This is because**

(A) oil and gas are heavier than water.

(B) gas and oil are lighter than water.

(C) oil and gas stick to each other.

(D) none of these.

42 **A student burnt the given fibres one by one with a match stick and observed the following.**

I - Nylon **II - Wool** **III - Cotton**

IV - Silk **V - Polyester**

Which statement is true ?

(A) II and III burn to form a residue.

(B) I and V melt on burning.

(C) II and IV burn with smell of burning hair.

(D) All of the above

Space for Rough work

43 **Which of the given statements is not true ?**

(A) Among all the naturally occurring elements, around eighty percent are metlas.

(B) Non-metals are more abundant than metals.

(C) Sodium and potassium are soft like wax.

(D) Bromine is a reddish brown liquid at room temperature.

44 **A good fuel has ignition temperature and calorific value that are respectively**

(A) low and high. (B) low and low.

(C) high and high. (D) high and low.

45 **Which metal does not react with dilute hydrochloric acid to produce hydrogen gas ?**

(A) Iron (B) Zinc

(C) Copper (D) Magnesium

Space for Rough work

46 **When can you say an animal is extinct ?**

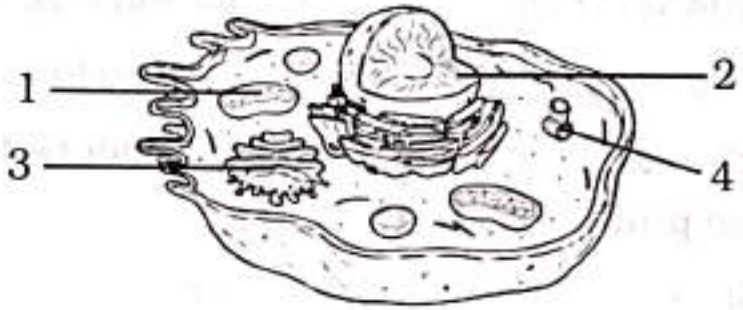
(A) when it is in its habitat.

(B) when it is hiding.

(C) when there are only a few left in the world.

(D) when it is no longer living.

47 **The diagram shows a cell. Which structure should be labelled the nucleus ?**



(A) 1 (B) 2

(C) 3 (D) 4

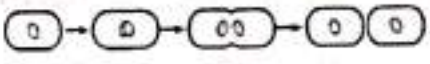
Space for Rough work

48 **Which diagram is the best example of an organism undergoing sexual reproduction ?**

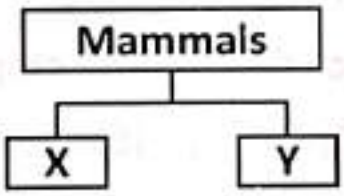
(A) 
Strawberry plant

(B) 
Jellyfish

(C) 
Hydra

(D) 
Bacterium

49 **There are many kinds of mammals. They can be classified in different ways.**



Study the chart above. Which of the following can sub-headings X and Y be ?

	X	Y
(A)	External fertilisation	Internal fertilisation
(B)	Reproduce by giving birth to young alive	Reproduce by laying eggs
(C)	One cell	Many cells
(D)	Sexual reproduction	Asexual reproduction

50 **Usually an egg is released from a female reproductive system every month. However, why do most of the eggs not develop into babies ?**

(A) They do not get sufficient oxygen to develop into babies.

(B) They do not get sufficient food to develop into babies.

(C) They are not fertilised by sperms.

(D) They do not have nuclei.

51 **Why are earthworrms good friends of farmers ?**

i) Their castings make the soil fertile.

ii) They help to drain and aerate the soil when they make tunnels in the soil.

iii) They loosen and mix the soil evenly when they burrow through the soil.

iv) They do not destroy the crops.

(A) i and iii only (B) i and iii only

(C) ii and iii only (D) i, ii iii and iv

Space for Rough work

52 **A bag made of a special material allows oxygen gas but not other gases or air pollutants to pass through it. What can you conclude from the information given ?**

(A) The bag is made from nylon.

(B) The bag is made from polyester.

(C) The bag is made partially permeable cell membrane.

(D) The bag is waterproof.

53 **What is the basic unit of life ?**

(A) Tissue (B) Cell

(C) Organ (D) System

54 **A scientist observes a cell that has cell wall, no nucleus, and no visible organelles. What kind of cell is the scientist observing ?**

(A) Protist (B) Gamete

(C) Plant cell (D) Prokaryote

Space for Rough work

55 What are some advantages biotechnology has brought to mankind ?

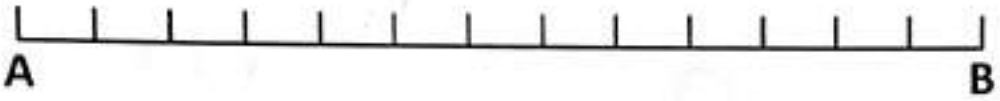
1. Better yield of crops.
2. Decrease usage of pesticides
3. Pest resistant crops.
4. Producing crops with better nutritional value.

(A) 1 only (B) 2 only

(C) 1 and 3 only (D) 1, 2, 3 and 4

Space for Rough work

56 There are 12 points along line AB, excluding A and B. How many lines segments can be counted altogether ?



(A) 90 (B) 91

(C) 100 (D) 101

57 A, B, C, D, E, F and G are sitting in a row facing North.

F is to the immediate right of E.

E is 4th to the right of G.

C is the neighbour of B and D.

Person who is third to the left of D is at one of the ends.

Which of the following statement is not true ?

(A) E is to the immediate left of D

(B) A is at one of the ends

(C) G is to the immediate left of B

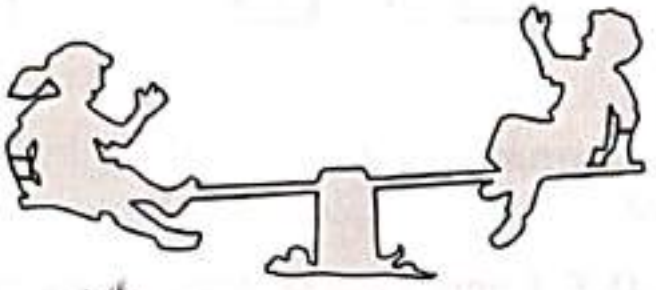
(D) F is second to the right of D

58 A cow produces a calf at the beginning of every year. The young cow will become productive and conceive in the fourth year and gives birth to another calf the beginning of every year, starting from the following year. How many cows will there be in the eighth year ?

(A) 12 (B) 17

(C) 22 (D) 19

59 **The person on the left is lower than the person on the right. What can be person on the right do in order to make the seesaw more level ?**



(A) Slide forward (B) Sit up straight

(C) Slide backward (D) Lean forward

60 **Identify the correct logo of Chevrolet compary.**

(A)  (B) 

(C)  (D) 

Space for Rough work

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CLASS IX

Please fill the following details immediately

Name _____

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Questions : 60 **Time : 60 minutes**

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- There is no negative marking.
- Results would be made available on **www.unifiedcouncil.com**
- For **classes 8, 9 & 10**, "**Innovation Challenge**" is being conducted by **Techfest IIT Bombay** in association with **Unified Council**. For details and to participate, please turn to the last page.

Techfest™

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01 Choose the simplest value of $\sqrt{15-2\sqrt{15-2\sqrt{15-2\sqrt{15.....\infty}}}}$

(A) 3 (B) –5 (C) 2 (D) –10

02 Which of the following is a rational number ?

(A) Area of a circle with radius $\frac{1}{\pi}$

(B) Radius of a circle with area $\frac{1}{\pi}$

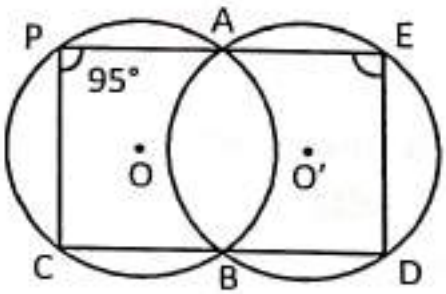
(C) Circumference of a circle with radius $\frac{1}{\pi}$

(D) Radius of a circle with circumference $\frac{1}{\pi}$

03 Three cubes of metal whose edges are 4 cm, 3 cm and 5 cm are melted and made a new cube. Select the option that shows correctly the diagonal of new cube.

(A) 6 cm (B) $6\sqrt{2}$ cm (C) $6\sqrt{3}$ cm (D) 9 cm

04 Two circles intersect in A and B. P, A, E are collinear points. C, B, D are collinear points PCDE is a quadrilateral. If $\angle CPE = 95°$. Identify the value of $\angle PED$.



(A) 65° (B) 105° (C) 95° (D) 85°

05 Identify the value of

$$\left[\frac{(x+1)^2(x^2-x+1)^2}{(x^3+1)^2}\right]^{-2}\left[\frac{(x-1)^2(x^2+x+1)^2}{(x^3-1)^2}\right]^{-2}$$

(A) $(x+1)^4$ (B) $(x^3+1)^4$

(C) 1 (D) $[(x^3+1)(x^3-1)]^2$

06 In a parallelogram ABCD, if AB = $2x + 5$, CD = $y + 1$, AD = $y + 5$ and BC = $3x - 4$, what is the ratio of AB and BC ?

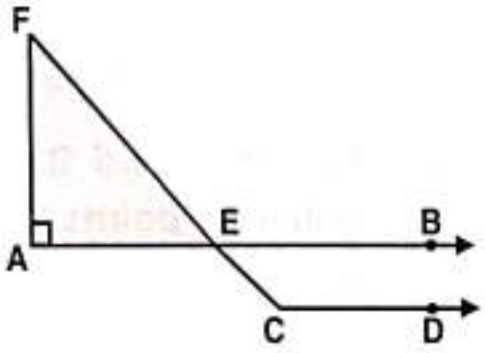
(A) 71 : 21 (B) 12 : 11 (C) 31 : 35 (D) 4 : 7

07 If $p(x) = \frac{x+2}{x-1}$, then which of the following is incorrect?

(A) $p(0) = -2$ (B) $p(1) = 0$

(C) $p(-2) = 0$ (D) $p(2) = 4$

08 In the given figure, AB || CD and $\angle F = 30°$. Select option that shows correctly the angle of ECD.

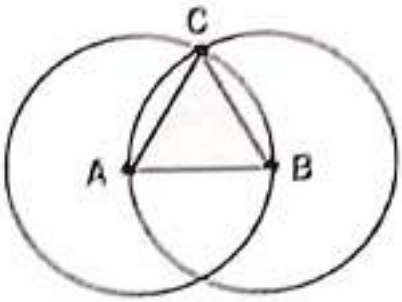


(A) 60° (B) 90° (C) 120° (D) 30°

09 ABCD is a cyclic quadrilateral in which $\angle A = (x + y + 10)°$, $\angle B = (y + 48)°$, $\angle C = (2y + 17)°$ & $\angle D = (x + y)°$. Choose the biggest angle.

(A) 121° (B) 134° (C) 91° (D) 111°

10 In the figure given, if A and B are the centres of the two intersecting circles, what type of a triangle is ΔABC ?



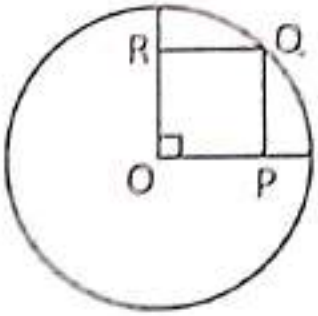
(A) An obtuse angled

(B) A right triangle

(C) An isosceles right angled triangle

(D) An equilateral triangle

11 In the given figure 'O' is the centre of circle with radius 5 cm. OPQR is a rectangle. Choose the option of PR length.



(A) 4 cm (B) 5 cm

(C) 6 cm (D) Cann't be determined

12 A sphere and cone are having same radii and height of the cone is equal to diameter of the sphere. Volume of cone is 100 cm^3. Find the volume of sphere.

(A) 100 cm^3 (B) 200 cm^3

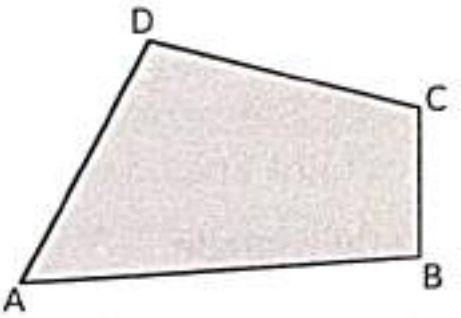
(C) 300 cm^3 (D) 400 cm^3

13 Identify a factor of $\left(\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3}\right)$

(A) $\left(x+\sqrt{6}\right)$ (B) $\left(x-\sqrt{6}\right)$

(C) $\left(\sqrt{2}x-\sqrt{3}\right)$ (D) $\left(\sqrt{2}x+\sqrt{3}\right)$

14 In a quadrilateral ABCD, $\angle B = 90°$, $\angle C - \angle D = 60°$ and $\angle A - \angle C - \angle D = 10°$. Find $\angle A$, $\angle C$ and $\angle D$.



(A) 140°, 95°, 35° (B) 110°, 80°, 20°

(C) 120°, 85°, 25° (D) 80°, 65°, 5°

15 Find the area of the triangle whose sides are 71.5 cm, 12 cm and 72.5 cm.

(A) 374.5 cm^2 (B) 572 cm^2

(C) 456 cm^2 (D) 429 cm^2

16 Choose the simplest value of $\sqrt{448} - \sqrt{252} + \sqrt{847} - \sqrt{567}$

(A) $\sqrt{175}$ (B) $\sqrt{99}$ (C) $\sqrt{112}$ (D) $\sqrt{252}$

17 Exterior angle of a triangle is 135° and the two interior opposite angles of the exterior angle are differ by 5°. Find the measure of the biggest angle of the triangle.

(A) 65° (B) 60° (C) 55° (D) 70°

18 Identify the factors of $[x^2 + x(a + b + c) + ab + ac]$.

(A) $(x + a)(x + b + c)$ (B) $(x + a)(x + a + c)$

(C) $(x + b)(x + a + c)$ (D) $(x + c)(x + a + b)$

19 The perpendicular distance of a point from the X-axis is 5 units and its perpendicular distance from the Y-axis to that point is 4 units. This point lies in IV quadrant. Choose the coordinates of the given point.

(A) (4, 5) (B) (4, –5)

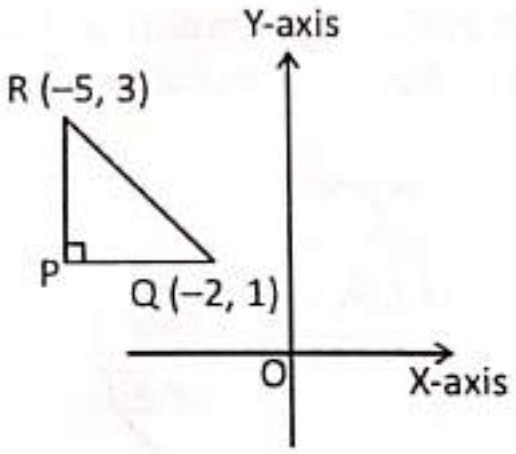
(C) (5, –4) (D) (–5, –4)

20 Which of the following equation represents a straight line passing through the points (1, 2.5), (0, 2) and (–2, 1) ?

(A) $2x - y = -4$ (B) $x - 2y = -4$

(C) $2x + y = 4$ (D) $x + 2y = -4$

21 On the cartesion plane, PQR is a right angled triangle. PQ is parallel to X-axis and PR is parallel to Y-axis. Choose the coordinates of P ?



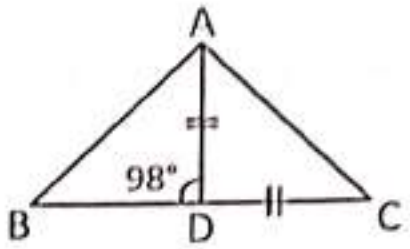
(A) (5, –3) (B) (2, –5)

(C) (–5, 1) (D) (–1, 5)

22 If $x = -2$ and $y = 3$ is the solution of the equation $3x + 5y = k$, identify the value of k.

(A) -1 (B) 4 (C) -21 (D) 9

23 In ΔABC, AD bisects $\angle BAC$ and AD = DC. If $\angle ADB = 98°$, select option correctly showing the value of $\angle ABD$.



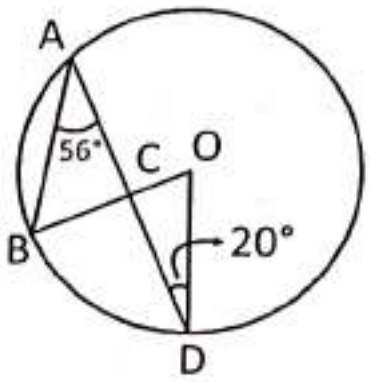
(A) 33° (B) 54° (C) 72° (D) 96°

24 In a parallelogram ABCD, AB = 13 cm, BC = 14 cm & AC = 15 cm. Identify the option that shows correctly the area of the parallelogram ABCD.

(A) 84 cm^2 (B) 42 cm^2

(C) 168 cm^2 (D) 126 cm^2

25 In the given figure, O is the centre of a circle. ACD is a straight line and BO is a radius of the circle. If $\angle BAC = 56°$ & $\angle CDO = 20°$. Find the value of $\angle ACO$.



(A) 130° (B) 112° (C) 110° (D) 132°

26 **An object has a body mass of 62 kg on the Earth. One day it is brought to an unknown planet. When it is measured on a spring balance, its weight is 279 N. What is the gravitational force of the unknown planet ?**

(A) 9.8 N/kg (B) 7.6 N/kg

(C) 6.4 N/kg (D) 4.5 N/kg

27 **A boy moved a body through 3 m in four different ways. In which of the following cases was the work done the maximum ?**

(A) Pushing a body over an inclined plane

(B) Lifting a body vertically upwards

(C) Pushing a body over smooth rollers

(D) Pushing on a plane horizontal surface

28 **A cyclist undergoes a uniform acceleration of 5.0 m/s^2. If his initial speed is 2.0 m/s, how long does he take to reach a speed of 15.0 m/s ?**

(A) 3.0 s (B) 2.6 s

(C) 10 s (D) 65 s

29 **When a force is applied to a body, several effects are possible. Which of the following effects does not occur?**

(A) The body speeds up.

(B) The body rotates.

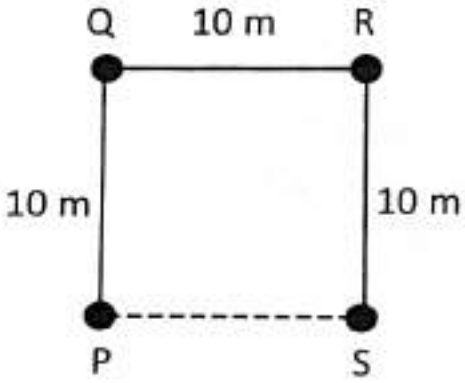
(C) The body changes direction.

(D) The mass of the body decreases.

30 A lady runs up a flight of stairs. She accelerates in the first 4 steps, then decelerates in the last 3 steps. Eventually she is at rest at the top. From the second to the third step, what is the status of both kinetic and potential energy ?

	Kinetic	Potential
(A)	Increasing	Increasing
(B)	Decreasing	Increasing
(C)	Decreasing	Decreasing
(D)	Increasing	Decreasing

31 PQRS is a square with side 10 m as shown below. A boy takes 5.0 s to walk from P to Q, and 5.0 s to walk from Q to R and then another 5.0 s to walk from R to S.



Find the magnitude of his average speed and velocity from P to S.

	Speed (m/s)	Velocity (m/s)
(A)	2.0	0.50
(B)	2.0	0.67
(C)	2.0	2.00
(D)	6.0	0.67

32 A man with a box on his head is climbing up a ladder. What work is said to be done by the man on the box ?

(A) Positive
(B) Negative
(C) Zero
(D) Undefined

33 The total mass of a helium balloon and basket is 50 kg. The balloon rises with a constant velocity of 0.8 m/s. What is the net force acting on the balloon ?

(A) 0 N
(B) 40 N
(C) 50 N
(D) 500 N

34 A ball of mass 2 kg and another of mass 4 kg are dropped together from a 60 feet tall building. What will be the ratio of their kinetic energies after a fall of 30 feet ?

(A) $\sqrt{2}:1$
(B) $1:4$
(C) $1:2$
(D) $1:\sqrt{2}$

35 Rahul takes 1 minute to raise a box to a height of 1 metre and Rohan takes 1 / 2 minute to do the same. Which of the following is true of the energy spent by the two ?

(A) Energy spent by Rahul is more.
(B) Energy spent by both Rahul and Rohan is the same.
(C) Energy spent by Rohan is more.
(D) Energy spent by Rahul is less.

Space for Rough work

36 **The molecular formula of P_2O_5 means that**

(A) its molecule contains 2 atoms of P and 5 atoms of O.

(B) the ratio of the mass of P to the mass O in the molecule is 2 : 5.

(C) there are twice as many P atoms in the molecule as there are O atoms.

(D) the ratio of the mass of P to the mass of O in the molecule is 5 : 2.

37 **Which of the following about the particles in a dilute ethanol solution at room temperature is correct ?**

	Ethanol molecules	Water
(A)	Close together, vibrate at fixed positions	Close together, vibrate at fixed positions
(B)	Widely separated, vibrate at fixed positions	Widely separated, moving at random
(C)	Close together, vibrate at fixed positions	Widely separated, not moving
(D)	Widely separated, moving at random	Close together, moving at random

38 **What is a sol ?**

(A) A solid dispersed in a liquid

(B) A liquid dispersed in a gas

(C) A gas dispersed in a liquid

(D) A gas dispersed in a solid

39 When 8.4 g of magnesium carbonate is heated, it decomposes into magnesium oxide and carbon dioxide. Calculate the mass of magnesium oxide formed.

(A) 2.5 g (B) 4 g (C) 6.2 g (D) 9.1 g

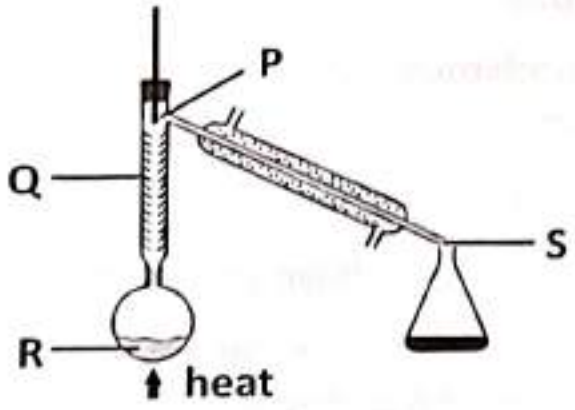
40 Match the entries in Column I with those in Column II.

	Column- I		Column - II
a.	Evaporation	1.	Liquid to gas at a fixed temperature
b.	Boiling	2.	Solid to gas
c.	Sublimation	3.	Gas to solid
d.	Hoar frost	4.	Liquid to gas at any temperature

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

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

41 The diagram given below shows the process of distillation of liquid mixtures.



When the thermometer shows a constant temperature, at which point will there be the highest proportion of the liquid with a higher boiling point ?

(A) S (B) P (C) R (D) Q

42 A sample of sulfur has a mass of 6.4 g. Calculate the number of moles of this sulfur sample.

(A) 0.2 mol. (B) 0.5 mol.

(C) 0.6 mol. (D) 0.9 mol.

43 A gas is easily compressed. Which of the following best explains this behaviour of a gas ?

(A) A gas is made up of tiny particles that move in random motion.

(B) Gas particles contract and become smaller when pressure is applied.

(C) Gas particle exert an attractive force on one another when in contact.

(D) The volume of gas particles is negligible compared to the volume occupied by the gas.

44 Which factor is important for two substances to be separated by paper chromatography ?

(A) They both must be liquids.

(B) They both must have different solubilities in the same solvent.

(C) They both must have different colours.

(D) They both must have different sizes.

45 The relative atomic mass of fluorine is 19. What is the mass of 3 mol of fluorine gas ?

(A) 110 g (B) 112 g

(C) 114 g (D) 120 g

46 Which of the following air pollutants could cause rain to the acidic ?

(A) Carbon monoxide (B) Dust particles

(C) Lead compounds (D) Sulphur dioxide

47 Which of the following is a communicable disease ?

(A) Cancer (B) Allergy

(C) Typhoid (D) Diabetes

48 Which of the following is NOT a cause of soil erosion ?

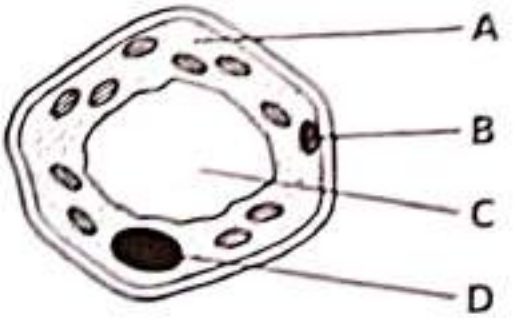
(A) Faulty methods of agriculture

(B) Deforestation

(C) Overgrazing

(D) Biomagnification

49 Which structure in the plant cell contains chromosomes ?



(A) A (B) B

(C) C (D) D

50 In which structure the cells divide by mitosis only ?

(A) Ovary (B) Root tip

(C) Anther (D) Testis

51 **What does 'Livestock' refers to ?**

(A) Pet and wild animals.

(B) Poultry and wild animals.

(C) Domestic animals which are kept for use or profit.

(D) None of the above

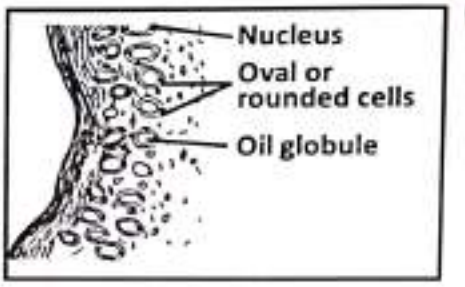
52 **Identify the tissue shown in the given diagram.**

(A) Areolar connective tissue

(B) Skeletal tissue

(C) Adipose tissue

(D) Muscular tissue



53 **Identify the group to which the pictures given below belong to**

(A) Bryophytes

(B) Algae

(C) Pteridophytes

(D) Fungi

54 **Starfish is a/an**

(A) fish (B) reptile

(C) amphibian (D) echinoderm

55 **Define 'Vector'.**

(A) Microorganisms which cause many diseases

(B) Animals that carry the infecting agents from a sick person to a healthy person

(C) Infected person

(D) Diseased plants

56 **Many business offices are located in buildings having 2-8 floors. If a building has more than 3 floors, it has a lift. If the above statements are true, which of the following must be true ?**

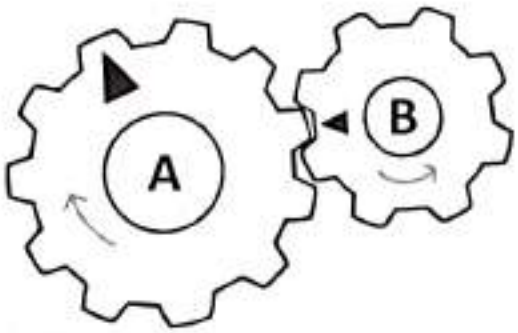
(A) 2nd floors do not have lifts

(B) 7th floors have lifts

(C) Only floors above the 3rd floors have lifts

(D) All floors may be reached by lifts

57 **Two gears A and B with black arrows are shown below. A rotates in clockwise direction. How many complete rotations does the gear B have to make for the black arrows to meet ?**



(A) 10 (B) 8 (C) 14 (D) 6

Space for Rough work

58 A man is going with a girl. Somebody asked his relationship with the girl. He replied, 'My paternal uncle is the paternal uncle of her paternal uncle'. How the man is related to the girl ?

(A) Father (B) Nephew

(C) Grand father (D) Brother

59 Last summer, Malik spent two weeks at a summer camp. There, he went hiking, swimming and canoeing. This summer, Malik looks forward to attending a two-week music camp, where he hopes to sing, dance and learn to play the guitar.

(A) Malik parents want him to learn to play the guitar.

(B) Malik prefers music to outdoor activities.

(C) Malik goes to some type of camp every summer.

(D) Malik likes to sing and dance.

60 Four people witnessed a mugging. Each gave a different description of the mugger. Which description is probably right ?

(A) He was average height, thin and middle-aged.

(B) He was tall, thin and middle-aged.

(C) He was tall, thin and young.

(D) He was tall, of average weight and middle-aged.

Space for Rough work

Techfest
3rd-5th January 2020

Innovation Challenge 2019-2020

Innovation Challenge (IC) is a programme implemented by Techfest IIT Bombay, in association with Unified Council, for students studying in classes 8, 9 and 10 to spur their minds for an innovative outburst. **There is no registration fee.** To register and find out your zone, **visit www.techfest.org/innovationchallenge.**

To participate in this IC, please read the following and upload your answer.

Innovation Challenge — Water Crisis

With increasing human population and degrading environmental conditions, the availability of usable water is decreasing. According to a UN report on the state of the world's water, more than 5 billion people could suffer water shortages by 2050, on account of climate change, increased demand and polluted supplies.

To ensure water security for all, **take part in this year's Innovation Challenge – Water Crisis** and thinking out of the box, suggest a solution to overcome the problem of shortage of usable water, thereby ensuring water security for all.

Your suggestion will be judged on the basis of its feasibility of implementation & acceptance, originality and social and economic impact.

Time-slots for Uploading Answer			
Zone 1	Zone 2	Zone 3	Zone 4
17th Dec. 2019 2 p.m. to 8 p.m.	18th Dec. 2019 2 p.m. to 8 p.m.	19th Dec. 2019 2 p.m. to 8 p.m.	20th Dec. 2019 2 p.m. to 8 p.m.

Register, find out your zone and to upload your answer, visit www.techfest.org/innovationchallenge

Each participant will be awarded a Participation Certificate from Techfest-IIT Bombay . Winners will be awarded Gifts & Certificates and will be taken for a visit to the Vikram Sarabhai Space Centre, Kerala.

The top 20 rank holders will be invited to IIT Bombay with an accompanying adult to participate in the finals to be held from 3rd to 5th January 2020.

Free accommodation will be provided by TechFest, IIT Bombay.

To know the required format for your submission and other details, visit:
www.techfest.org/innovationchallenge