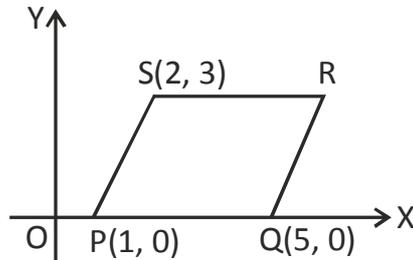| Class : 9 | Mathematics |

1. In the given figure PQRS is a parallelogram. Find the coordinates of R.

(A) (5, 2) (B) (5, 3) (C) (6, 2) (D) (6, 3)

2. The perpendicular distance of a point from the x-axis is 2 units and its perpendicular distance from the y-axis is 3 units. Find the co-ordinates of the point if it lies in the III Quadrant.

(A) (−3, −2) (B) (−2, −3)

(C) (3, −2) (D) (−3, 2)

3. ABCD is a parallelogram as shown in the figure. If AB = 2AD and P is the mid-point of AB, find the measure of $\angle$ CPD.
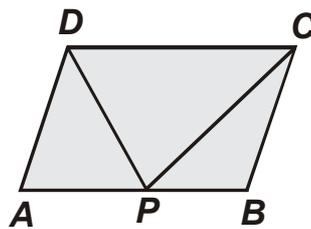
(A) 90° (B) 60° (C) 45° (D) 135°

4. If $\left(5+2\sqrt{6}\right)^{x^2-3} + \left(5-2\sqrt{6}\right)^{x^2-3} = 10$, find x.
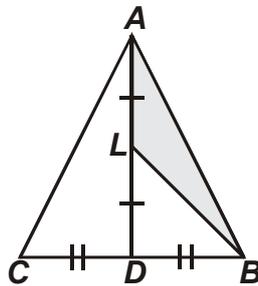
    (A) 2, –2   (B) $\sqrt{2},\ -\sqrt{2}$

    (C) 2, $-\sqrt{2}$ (D) 2, –2, $\sqrt{2},\ -\sqrt{2}$

5. **In the given figure, D is the mid-point of BC and L is the mid-point of AD. If ar ($\triangle$ ABL) = x ar ($\triangle$ ABC), what is the value of x ?**

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

6.　The length of a minute hand of a clock is 4 cm. Find the displacement and the average velocity of the tip of the minute hand when it moves from 3.15 p.m. to 3.30 p.m.

(A) $4\sqrt{2}$ cm, $\dfrac{\sqrt{2}}{225}$ cm s^{-1}　　(B) $4\sqrt{2}$ cm, $\dfrac{4}{225}$ cm

(C) $2\sqrt{4}$ cm, $\dfrac{1}{225}$ cm s^{-1}　　(D) $4\sqrt{2}$ cm, $\dfrac{2}{225}$ cm s^{-1}

7.　The gravitational force on the Moon is $\dfrac{1}{6}$ that of the gravitational force on the Earth. Which of the options listed below about the mass and weight of a 600 g object on the Moon are both true ? (Assume 100 g = 1 N on the Earth).

	Mass on Moon	Weight on Moon
(A)	100 g	1 N
(B)	100 g	6 N
(C)	600 g	1 N
(D)	600 g	6 N

8.　A series of compressions and rare fractions of a sound wave shown below is 12 m. What is the wavelength of the wave ?

(A) 3 m　　(B) 4 m　　(C) 9 m　　(D) 12 m

3
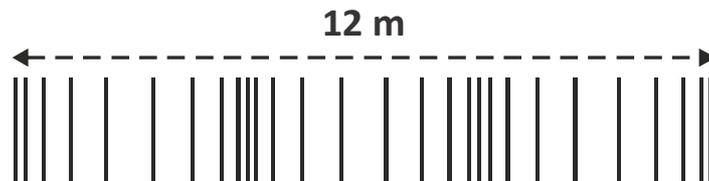
9. **Two trains P and Q, 125 m and 100 m long are moving in opposite directions on parallel tracks. The velocity of the train Q is three times that of the train P. The trains take 4 s to pass each other, calculate the velocity of each train ?**

(a) 14.1 m/s, 42.3 m/s   (b) 15.8 m/s, 39.7 m/s

(c) 17.5 m/s, 48.6 m/s   (c) 19.2 m/s, 51.9 m/s

10. **When a car is accelerating on a level road, what are the changes to its kinetic energy, heat produced and chemical potential energy ?**

(A) Increase, increase, decrease

(B) Increase, decrease, increase

(C) Increase, increase, increase

(D) Decrease, increase increase

11. **Which one best explains why moist air causes a cold window to mist up ?**

	Changes of state	Name of process
(A)	Vapour to liquid	Condensation
(B)	Liquid to vapour	Evaporation
(C)	Vapour to solid	Freezing
(D)	Liquid to solid	Freezing

12. **A molecule that contains two atoms is diatomic. If the molecule contains three atoms, it is triatomic and so on. Which one in the table is correct for all the three molecules ?**

|	Diatomic	Triatomic	Tetratomic
(A)	Cl_2	NO_2	CH_4
(B)	H_2	N_2O	NH_3
(C)	N_2	NCl_3	PH_3
(D)	CO	CoO	PCl_3

13 **Which model of the atom representing the arrangement of the sub-atomic particles is incorrect?**

Key (p) = Proton,   (n) = Neutron,   (e)= Electron

(A)

(B)

(C)

(D)
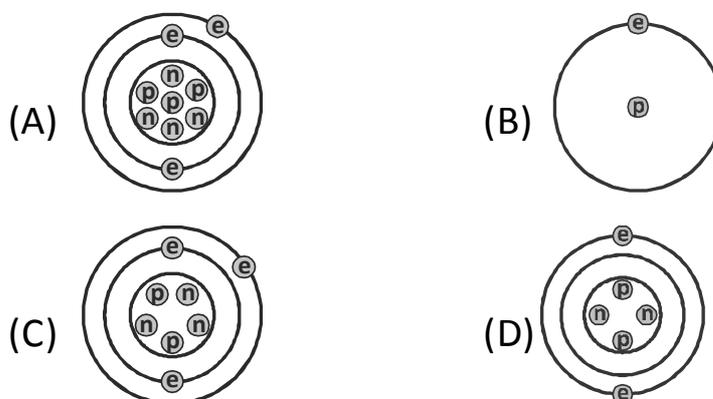
14. **How is Brownian motion caused ?**

(A) Through temperature fluctuations within the liquid phase

(B) Through attraction and repulsion between the charges on the colloidal particles

(C) Through collision of molecules between the colloidal particles

(D) Through pressure variations within the liquid phase

15. **Which of the following mixtures will be the most difficult to separate ?**

(A) Iron filings (powder) + sand

(B) Sand + water

(C) Sawdust + stones

(D) Nitrogen + oxygen

16.   **Identify P in the given concept map.**
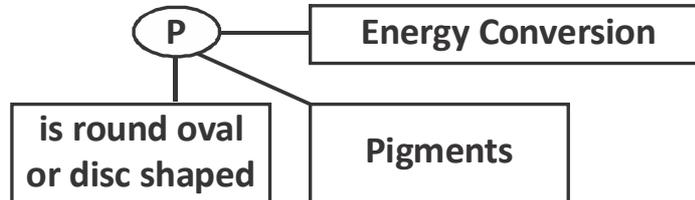
(A) Cell membrane   (B) Mitochondria

(C) Chloroplast   (D) Nucleus

17.   **Which of the following characteristics are applicable to cockroach ?**

> (i)   Bilaterally symmetrical and segmented body
> (ii)   Unjointed body and legs
> (iii) Open circulatory system
> (iv)   Three pairs of wings and two pairs of legs

(A) Only (i) and (ii)   (B) Only (ii) and (iii)

(C) Only (i) and (iii)   (D) Only (ii) and (iv)

18.   **The table given below shows a list of organisms and its method of reproduction. What do P, Q and R represent ?**

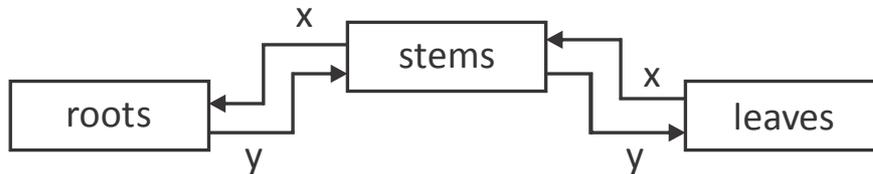| Organism	Method of reproduction
Amoeba	P
Hydra	Q
Mucor	R

(A) P-Sporulation, Q-Budding, R-Fission

(B) P-Regeneration, Q-Sporulation, R-Budding

(C) P-Binary fission, Q-Sporulation, R-Budding

(D) P-Binary fission, Q-Budding, R-Sporulation

19. **Which of the following is a haploid cell ?**

(A)

(B)

(C)

(D)
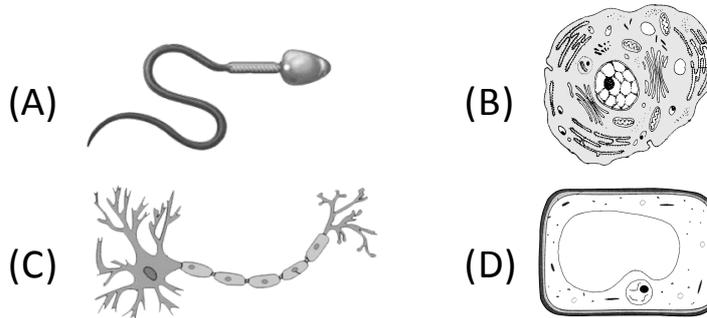
20. **The diagram below shows how both X and Y are transported in a plant.**

What could be represented by X and Y ?

	X	Y
(A)	X – water	Y – mineral salts
(B)	X – starch	Y – water
(C)	X – mineral salts	Y – starch
(D)	X – mineral salts	Y – water

Critical Thinking

21. A situation/statement is given below followed by four options. Choose the best reason.

Electricians wear rubber sole because

(A) these are lighter than leather soles.

(B) these are more durable than leather soles.

(C) rubber is an insulator.

(D) they are more comfortable than leather soles.

22. A police man detained four suspects for a theft case.

P: Hey, I didn't do it !

Q: P did it.

R: Come on, I was not even there when the case took place.
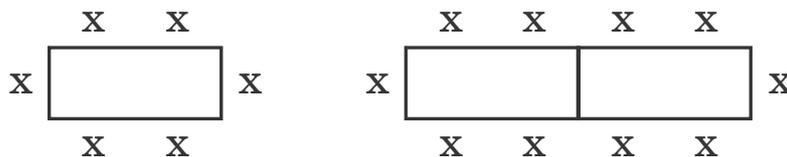
S: Q did it.

Only one suspect told the truth. Who was the thief ?

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

23. Choose the word that is necessary part of the word 'DESERT'.

(A) Cactus   (B) Arid   (C) Oasis   (D) Flat

24. A group of people go to a restaurant for a dinner. They requested to be seated at the same table. The restaurant has only rectangular tables that can be joined end to end to form a large long table. Study the figure below.

```
      x   x              x   x   x   x
   +--------+         +--------+--------+
 x |        | x     x |        |        | x
   +--------+         +--------+--------+
      x   x              x   x   x   x
```

How many tables are needed for 198 people ?

(A) 60   (B) 49   (C) 72   (D) 36

25. **Read both the statements in the given question.**

Statement I. The school authority has asked the X Std. students to attend special classes to be conducted on Sundays.

Statement II. The parents of the X Std. students have withdrawn their wards from attending private tuitions conducted on Sundays.

(A) Statement I is the cause and statement II is its effect.

(B) Statement II is the cause and statement I is its effect.

(C) Both the statements I and II are independent causes.

(D) Both the statements I and II are effects of independent causes.

NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

Solutions for Class : 9

MATHEMATICS

1. **(D)** Distance between PQ = 5 - 1 = 4 units

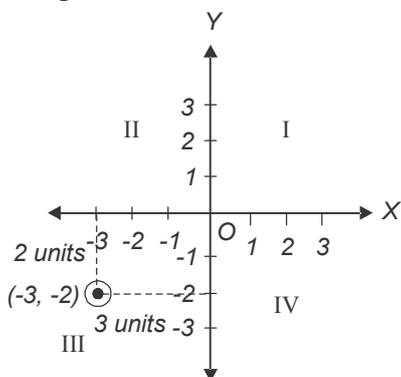   SR is a horizontal line and 'R' is 4 units away from s.

   ∴ r = (2 + 4, 3) = (6, 3)

2. **(A)** The perpendicular distance of a point from x-axis = 2 units.

   The perpendicular distance of a point from y-axis = 3 units

   Given, that the point lies in the III Quadrant

   ⇒ Both the coordinates of the point are negative.

   ∴ The required coordinates of the point are (–3, –2).

3. **(A)** As shown in the figure, since P is the midpoint of AB and AB = 2AD,

   we have AB = 2AP = 2AD.

   or AP = AD.

   i.e., triangle ADP is an isosceles triangle.

   If   ADP = x

   and   ADP = x, then,

      A = 180° – 2x

   ⇒   B = 2x

      CPB =   PCB = 90° – x

   Since   APB = 180°

      DPC = 90°

4. **(D)** Given $(5+2\sqrt{6})^{x^2-3}+(5-2\sqrt{6})^{x^2-3}=10$

   In $a\sqrt{b}^{\,x^2\,k}$ $a\sqrt{b}^{\,x^2\,k}$ $2a$

   If $a^2 - b = 1$ then $x^2 - k = \pm 1$

      $x^2 - 3 = \pm 1$

   $x^2 - 3 = 1$ $x^2 - 3 = 1$

   $x^2 = 4$ $x^2 = 2$

   $x = \pm 2$ $x = \pm \sqrt{2}$

      x $2, 2, \sqrt{2}, \sqrt{2}$

5. **(C)** In △ABC, AD is the median

   ∴   ar $(\triangle ABD) = \dfrac{1}{2}$ ar $(\triangle ABC)$

   Again, in △ABD, BL is the median

   ∴   ar $(\triangle ABL) = \dfrac{1}{2}$ ar $(\triangle ABD)$

   $= \dfrac{1}{4}$ ar $(\triangle ABC)$

   ∴ $x = \dfrac{1}{4}$

PHYSICS

6. **(A)** S = $\sqrt{l^2+l^2}=\sqrt{2l^2}=l\sqrt{2}=4\sqrt{2}$

   Average velocity = $\dfrac{S}{t}$

   $= \dfrac{4\sqrt{2}\,cm}{15 \times 60s}=\dfrac{\sqrt{2}}{225}cms^{-1}$

7. **(C)** The mass of an object does not change with gravitational force but its weight does. Thus, the weight of a 600 g or 6 N object on the moon becomes $\frac{1}{6}$ that on the Earth which is 1 N. Thus, options (B) and (D) are incorrect. As the mass of the object on the moon is the same as the mass of the object on the Earth, which is 600 g, options (A) and (B) are incorrect.

8. **(B)** The wavelength of a sound wave is given by the distance between successive compressions or rarefractions. The given diagram shows three wavelengths within 12 m. Each wavelength = 12 m ÷ 3 = 4 m

9. **(A)** Let the velocity of train P be v. Then the velocity of train Q is 3v.

    The relative velocity of train P w.r.t, Q
    $= v_Q - v_P$
    $= v - (-3v) = 4v$

    The distance to be covered = 125 + 100 = 225 m

    $\text{Velocity} = \dfrac{\text{Distance}}{\text{Time}}$

    $4v = \dfrac{225}{4}, v = \dfrac{225}{16} = 14.1 \text{m / s}$

    Velocity of train P = 14.1 m/s

    Velocity of train Q = 3 × 14.1 = 42.3 m/s.

10. **(A)** When a car accelerates on a level road, its speed increases and hence the kinetic energy increases.

    The rate of rubbing of the tyres with the ground as well as the air resistance increases (stronger wind blowing against the car). As a result, more heat is produced.

    The acceleration of the car comes from a higher consumption of car's petrol. Car petrol has the chemical energy that is used to convert it into kinetic energy. Hence, chemical potential energy decreases.

CHEMISTRY

11. **(A)** A window mists up because water vapour condenses to a liquid (water droplets).

Options (B), (C) and (D) : These options do not state the correct changes of state and name of the process, which is condensation.

12. **(B)** H_2 is diatomic, N_2O is triatomic and NH_3 is tetratomic.

    Option (A) : CH_4 is not tetratomic (Four atoms). It has five atoms.

    Option (C) : NCl_3 is not triatomic (three atoms). It has four atoms.

    Option (D) : CoO is not triatomic (three atoms). It has two atoms.

13. **(C,D)** As this atom has 2 protons, it should have 2 electrons and not 3

    Option (A) : This model has the correct number of protons (3) and correct number of electrons (3)

    Option (B) : This model has the correct number of proton (1) and correct number of electron (1)

    Option (D) : This model has the correct number of protons (2) and electrons (2) but the K shell is not filled with electrons instead, the electrons are filled in L shell which is incorrect.

14. **(C)** Brownian motion is caused due to collision of molecules between colloidal particles.

15. **(D)** Nitrogen and oxygen mixture (a gaseous mixture) is difficult to separate as it has to be cooled to very low temperatures to convert them into liquids. Liquid nitrogen (present in liquid air) has the lowest boiling point of – 196 °C. So, on warming liquid nitrogen boils off first to form nitrogen gas, that is collected from the top part of the fractional distillation column. Liquid oxygen (present in liquid air) has a still higher boiling point of −183 °C. So, liquid oxygen boils off last and collected as oxygen gas from the bottom of the fractional distillation column.

BIOLOGY

16. **(C)** Chloroplast are pigment cells or plastids they are round oval ordis

shaped the conversion of light energy to chemical energy.

17. **(C)** Cockroach is bilaterally symmetrical segmented body with open circulatory system.

18. **(D)** Amoeba reproduces by binary fission hydra by budding and mucor by sporulation.

19. **(A)** Sperm is a haploid cell.

20. **(B)** X represents starch made by the leaves which is transported by the phloem tube in the stem from the leaves to all parts of the plant. Y represents water and mineral salts which are absorbed by the roots and transported to all parts of the plant via the xylem tube in the stem.

CRITICAL THINKING

21. **(C)**

22. **(B)**

23. **(B)**

24. **(B)**

25. **(A)**