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**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.

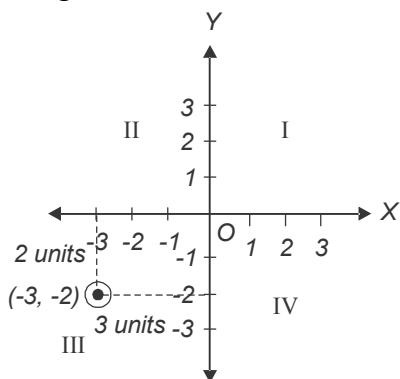
$\therefore r = (2 + 4, 3) = (6, 3)$

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

$\Rightarrow$  Both the coordinates of the point are negative.



$\therefore$  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,

$A = 180^\circ - 2x$

$\Rightarrow B = 2x$

$CPB = PCB = 90^\circ - x$

Since  $\angle APB = 180^\circ$

$DPC = 90^\circ$

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

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

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

$x^2 - 3 = \pm 1$

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

$x^2 = 4 \qquad x^2 = 2$

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

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

5. (C) In  $\triangle ABC$ , AD is the median

$\therefore \text{ar}(\triangle ABD) = \frac{1}{2} \text{ar}(\triangle ABC)$

Again, in  $\triangle ABD$ , BL is the median

$\therefore \text{ar}(\triangle ABL) = \frac{1}{2} \text{ar}(\triangle ABD)$

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

$\therefore x = \frac{1}{4}$

**PHYSICS**

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

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

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

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 rarefactions. The given diagram shows three wavelengths within 12 m. Each wavelength =  $12 \text{ m} \div 3 = 4 \text{ m}$

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 =  $125 + 100$   
 $= 225 \text{ m}$

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

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

Velocity of train P = 14.1 m/s

Velocity of train Q =  $3 \times 14.1 = 42.3 \text{ m/s}$ .

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)  $\text{H}_2$  is diatomic,  $\text{N}_2\text{O}$  is triatomic and  $\text{NH}_3$  is tetraatomic.

Option (A) :  $\text{CH}_4$  is not tetraatomic (Four atoms). It has five atoms.

Option (C) :  $\text{NCl}_3$  is not triatomic (three atoms). It has four atoms.

Option (D) :  $\text{CoO}$  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  $-196^\circ\text{C}$ . 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  $-183^\circ\text{C}$ . 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 or disc

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)**