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NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

Solutions for sample questions

Class : 8

Mathematic

1. (A) The cube in option (A) can be formed by the given net.

2. (D) The angles for the different grades given are $\frac{20}{120} \times 360^\circ = 60^\circ \rightarrow$ (A) is correct;

$$\frac{50}{120} \times 360^\circ = 150^\circ \rightarrow \text{(B) is correct;}$$

$$\frac{45}{120} \times 360^\circ = 135^\circ \rightarrow \text{(C) is correct.}$$

$$\frac{5}{120} \times 360^\circ = 15^\circ \rightarrow \text{(D) is incorrectly labelled as } 20^\circ$$

3. (D) Given $\frac{a^x}{a^y} = a^{10}$ and $(a^y)^3 = a^x$.

$$\Rightarrow \frac{(a^y)^3}{a^y} = a^{10}$$

$$\Rightarrow (a^y)^2 = a^{10}$$

$$\Rightarrow a^{2y} = a^{10}$$

$$\Rightarrow 2y = 10 \Rightarrow y = 5$$

$$a^x = (a^y)^3 = (a^5)^3 = a^{15} \Rightarrow x = 15$$

4. (D) The pentagon can be divided into 3 triangles by joining the vertex A to C and D (See the figure).

$$\text{Angle sum of 1 triangle} = 180^\circ$$

$$\text{Angle sum of 3 triangles}$$

$$= 3 \times 180^\circ = 540^\circ$$

$$\text{Sum of the four equal angles}$$

$$= 540^\circ - 120^\circ = 420^\circ$$

$$\text{Each equal angle}$$

$$= 420^\circ \div 4 = 105^\circ$$

5. (B) Since $x + xy = 391$, then $x(1 + y) = 391$.

We note that $391 = 17 \cdot 23$.

Since 17 and 23 are both prime, then if 391 is written as the product of two positive integers, it must be 1×391 or 17×23 or 23×17 or 391×1 .

Matching x and $1 + y$ to these possible factors, we obtain $(x, y) = (1, 390)$ or $(17, 22)$ or $(23, 16)$ or $(391, 0)$.

Since y is a positive integer, the fourth pair is not possible.

Since $x > y$, the first two pairs are not possible.

Therefore, $(x, y) = (23, 16)$

$$\Rightarrow x + y = 39.$$

Physics

6. (C) Friction between the tyres and the ground as well as between the shoes and the ground is needed for the car or the person to move. Friction between the brakes and the wheels on cars is also important, it has an important role to stop the car.

Friction between the parts in a machine is undesirable as it creates heat and causes the machine to be inefficient as there is mechanical energy lost to the surroundings.

7. (A) As the shiny aluminium foil is pasted on the outer surface of the ball, it behaves like a convex mirror. A candle placed in front of this shiny surface forms an image which is virtual, erect and smaller in size.

8. (C) An object contains both protons and electrons. It will become negatively charged when it gains electrons and contains more electrons than protons.

9. (B) Friction, magnetism and weight are forces. Mass is not a force.
10. (D) When an object moves with constant speed, that implies equilibrium condition. In the case of the airplane described in the question, the thrust is equal to the drag, and the lift is equal to the weight.

Chemistry

11. (A) X cannot react with water, hence, it is below Ca in the reactivity series. X can react with acid; hence, it is above Cu in the reactivity series. XO cannot react with H_2 , hence, it is either Zn or below Zn in the reactivity series. XO can react with C; hence, it is Zn or below Zn in the reactivity series. From all the possible options, Zn is the only possible metal.
12. (B) The rope must be strong enough to support the weight of the climber. It also needs to be flexible in order to go around corners and to be rolled up for easy carrying. The carabiner must be hard enough to keep its shape and strong enough to withstand the pressure of the rope going through it, as well as support the necessary weight.
13. (B) A cup made of styrofoam containing hot tea or coffee can be held in hands since it does not conduct heat.
14. (C) Different varieties of coal have different carbon content.
15. (A) The given figure is of an alloy called bronze. It is made by combining copper and tin.

Biology

16. (D) $44 + XX$ represents the composition of female destined zygote in human beings.
17. (B) The figure given in option 'B' is chlamydomonas. Chlamydomonas is an aquatic photosynthetic organism.
18. (B) Malaria is caused due to the entry of pathogen plasmodium
19. (A) Sandy soil contains large particles of soil hence it cannot hold water and is not good for plants to grow.
20. (A) Zygote → Embryo → Foetus → Baby is the correct sequence shown in sexual reproduction.