Class : 10   *Mathematics*

1.   **Identify the correct statement.**

(A) The roots of the quadratic equation $2y^2 + 9y = 0$ are 0 and $\dfrac{9}{2}$

(B) The value of 'k' for which $4m^2 + k - 15 = 0$ has a root m = 3 is 7.

(C) The quadratic equation $(4x - 11)^2 = 0$ has two distinct roots.

(D) $7x^2 - 12x - 18 = 0$ is not a quadratic equation.

2.   **There are 19 hockey players in a club. On a particular day 14 were wearing the prescribed hockey shirts, while 11 were wearing the prescribed hockey pants. None of them was without hockey pant or hockey shirt. How many of them were in complete hockey uniform ?**

(A) 8   (B) 6   (C) 9   (D) 7

3.   **In the given figure, EMG is a straight line. Find the value of cos   .**
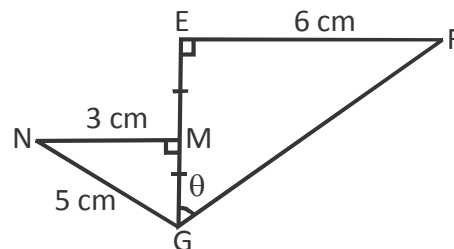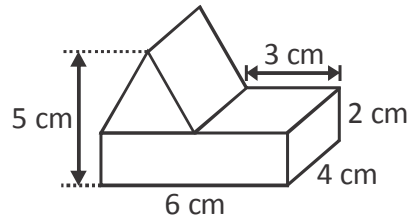

(A) 0.9   (B) 0.8   (C) 0.6   (D) 0.7

4. **The figure shows an isosceles triangle ABC. Find the length of the perpendicular from A to BC.**
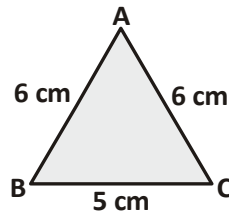

(A) 5.45 cm

(B) 4.55 cm

(C) 5.6 cm

(D) 4.54 cm

5. **A triangular prism is placed on a rectangular prism, as shown. Find the volume of the combined structure.**

(A) 76 cm³

(B) 66 cm³

(C) 72 cm³

(D) 84 cm³

6.   Which of these is the main disadvantage of using nuclear power ?

(A) High risk of explosion

(B) Produces vast amounts of energy

(C) Sustainable source of energy

(D) Radioactive wastes remain radioactive for thousands of years.

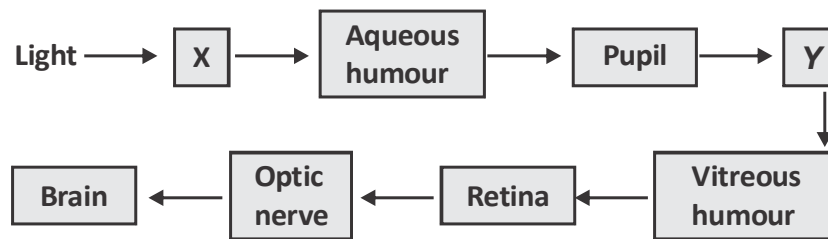7.   A ray of light travels from air to glass as shown below.
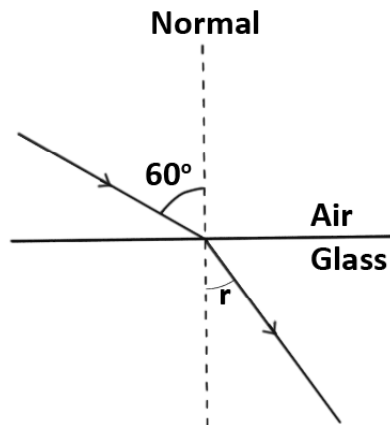
Given that the refractive index of air is 1.0 and the refractive index of glass is 1.5, what is the angle of refraction ?

(A) 22.6°   (B) 30.8°   (C) 35.3°   (D) 40.0°

8.   Only one of the following applies to a concave lens. Identify it.

(A) The focal length is positive.

(B) The object distance can be positive or negative.

(C) The height of the image can be positive or negative.

(D) Image distance is always negative.

9. Velocity of light in water, glass and vacuum have the values V_w, V_g and V_c respectively. Which of the following relations is true ?

(A) $V_w = V_g = V_c$

(B) $V_w > V_g$ but $V_w < V_c$

(C) $V_w = V_g$ but $V_w < V_c$

(D) $V_c > V_w$ but $V_w < V_g$

10. The path taken by light as it enters our eye is shown below.

Light → X → Aqueous humour → Pupil → Y → Vitreous humour → Retina → Optic nerve → Brain

Identify the parts X and Y.

(A) Cornea, Lens

(B) Blindspot, Ciliary muscles

(C) Sclera, Choroid

(D) Lens, Suspensory ligaments

11. **Magnesium is not extracted using the reduction method by carbon because**

(A) the extraction process is slow.

(B) the magnesium obtained is less pure.

(C) magnesium is more reactive than carbon.

(D) the reduction process requires a very high temperature and pressure.

12. **The reaction between hydrochloric acid and sodium hydroxide releases more heat energy than the reaction between ethanoic acid and sodium hydroxide. What is the reason for this difference in heat energy released ?**

(A) Less heat energy is released due to less water formed.

(B) More heat energy is released due to more water formed.

(C) Some heat energy is absorbed for the dissociation of ethanoic acid molecules to form hydrogen ions.

(D) More heat energy is released due to the dissociation of ethanoic acid molecules to form hydrogen ions.

13. **In a neutralisation reaction, sodium hydroxide is neutralised by sulfuric acid. What would be the products of this neutralisation ?**

1. **Hydrogen**   2. **Water**

3. **Sodium Chloride**   4. **Sodium sulfate**

(A) 1 and 3   (B) 2 and 3

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

14. An unbalanced chemical equation has number of atoms of elements are that

(A) less on the left side of the equation.

(B) more on the right side of the equation.

(C) equal on both sides of the equation.

(D) both (A) and (B)

15. The three elements calcium, strontium and barium form a triad. What is the basis of this grouping ?

i) Elements are in the increasing order of their atomic weights.

ii) The atomic weight of the middle element is equal to the average of the atomic weight of extreme elements.

iii) Elements in a triad have similar chemical properties.

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

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

16.   **In which labelled part of the human eye images are formed ?**
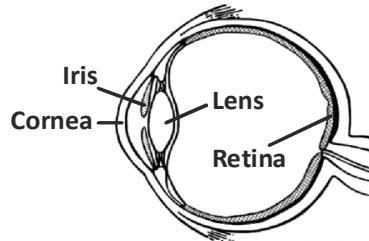
   (A) Iris   (B) Cornea   (C) Lens   (D) Retina

17.   **The figure shows the balance of oxygen and carbon dioxide in the air through plants and animals. Which process represents X and Y ?**
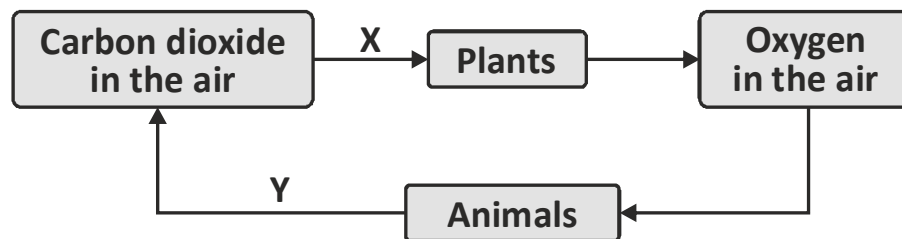
   (A) X - Respiration, Y - Transpiration

   (B) X - Transpiration, Y - Photosynthesis

   (C) X - Respiration, Y - Photosynthesis

   (D) X - Photosynthesis, Y - Respiration

18.   **What happens to the pollen grains after pollination ?**

   (A) Pollen grow grains into a new plant.

   (B) Pollen grains germinate on stigma.

   (C) Pollen grain germinate on petal.

   (D) Pollen grain develop into a fruit.

19. **What will happen if part 'R' is injured ?**
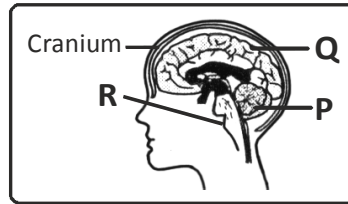
(A) Breathing will be affected.

(B) The person will not be able to think rationally.

(C) Coordination and stability of the body will be adversely affected.

(D) The person will not be able to see.

20. **What is the importance of having many blood vessels in the walls of the small intestine ?**

(A) The blood vessels absorb water from undigested food.

(B) The blood vessels carry the digestive juices to the digestive system.

(C) The blood vessels enable absorption of digested food to take place efficiently.

(D) The blood vessels allow food to enter the bloodstream and be completely digested in the blood.

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

Burns caused by steam are more severe than those caused by boiling water because

(A) steam pierces through the skin quickly.

(B) temperature of steam is higher than that of boiling water.

(C) steam is gas and penetrates the body rapidly.

(D) steam has latent heat which is not present in boiling water.

22. A meteorological report shows the following records of a certain number of days.

> It rained 10 times, either in the morning or in the afternoon.
> There were 8 dry afternoons.
> There were 14 dry mornings.
> Each wet afternoon was preceded by a dry morning.

How many days did the meteorologist record ?

(A) 14 days   (B) 16 days

(C) 18 days   (D) 32 days

23. A box has 16 candies: 12 red and 4 yellow. If you were picking candies from the box without looking, how many candies would you have to pick up to be certain to find two of the same colour ?

(A) 01   (B) 02   (C) 03   (D) 04

24. You have a special clock that produces a beautiful tune everytime the hour hand and minute hand meet each other. How many times in a day do you expect the tune to be played ?

    (A) 22   (B) 23   (C) 24   (D) 25

25. "You must submit your application within 10 days from the date of release of this advertisement." What is the exact date before which the application must be submitted ?

    Statement I: The advertisement was released on 18th February.

    Statement II: It was a leap year.

    (A) Statement I alone is sufficient, but statement II alone is not sufficient

    (B) Statement II alone is sufficient, but statement I alone is not sufficient

    (C) Both statements together are sufficient, but neither statement alone is sufficient

    (D) Statements I and II together are not sufficient

NATIONAL LEVEL SCIENCE TALENT SEARCH EXAMINATION

Solutions for Class : 10

MATHEMATICS

1. **(A)** $2y^2 + 9y = 0$

   $\Rightarrow y(2y + 9) = 0$

   $\Rightarrow y = 0 \;\; or \;\; 2y + 9 = 0$

   $\Rightarrow y = \dfrac{-9}{2}$

2. **(B)** $14 + 11 - 19 = 25 - 19 = 6$

3. **(B)** In $\triangle$ MNG $\angle$ M = 90 $\Rightarrow$ MG^2 = NG^2 − MN^2

   $\therefore$ MG = 4cm

   $\therefore$ EG = 2 GM = 8cm

   $GF = \sqrt{GE^2 + EF^2} = 10cm$

   $\therefore COS\theta = \dfrac{GE}{GF} = \dfrac{8\,cm}{10\,cm} = 0.8$

4. **(A)** The perpendicular from A to BC bisects BC at D.

   $\therefore$ The length of

   $AD = \sqrt{AB^2 - BD^2} = \sqrt{6^2 - (2.5)^2}$

   $= \sqrt{36 - 6.25}$

   $= \sqrt{29.75} = 5.45$

5. **(B)** Base side of triangle part = 6cm − 3cm = 3cm.

   Height of triangle part = 5cm − 2cm = 3cm

   Volume of the solide = volume of cuboid + volume of triangular prism

   = 6 × 4 × 2 cm3 + $\dfrac{1}{2}$ × 3 × 3 × 4 cm^3

   = 48 cm^3 + 18 cm^3

   = 66 cm^3

PHYSICS

6. **(D)** Radioactive wastes remain radioactive for thousands of years which is a major disadvantage of nuclear power

   Option (A) : Nuclear power stations have very good safety records. There is no high risk of explosion as they are extremely safety conscious.

   Option (B) : It is an advantage that nuclear power stations produce vast amounts of energy.

   Option (C) : It is an advantage that nuclear power stations are sustainable.

7. **(C)** n_i sin i = n_r sin r

   (where n_i is the refractive index of the incident medium, n_r is the refractive index of the refracted medium, 'i' is the angle of incidence and 'r' is the angle of refraction)

   (1) sin 60° = (1.5) sin(r)

   sin r = 0.0577

   r = 35.3°

8. **(D)** For a concave lens, the image distance is always negative as all images formed are virtual and on the same side as the object.

9. **(B)** Velocity of light in water = 2.25×10⁸ m/s

   Velocity of light in glass = 2 × 10⁸ m/s

   Velocity of light in vacuum = 3×10⁸m/s

   So, velocity of light in water is greater

than glass but velocity of light in water is less than the velocity of light in vacuum.

10. **(A)** The light coming from the object, enters our eye through the cornea (X). The lens (Y) lies behind the pupil (Y). X is cornea and Y is lens.

CHEMISTRY

11. **(C)** Highly reactive metals (like potassium, sodium, calcium, magnesium and aluminium) are very stable and cannot be reduced by the most common reducing agent 'carbon' to obtain free metals. This is because these metals have more affinity (more attraction) for oxygen than carbon. So, carbon is unable to remove oxygen from these metal oxides and hence cannot convert them into free metals. Thus, the highly reactive metals cannot be extracted by reducing their oxides with carbon. Magnesium metal is extracted by electrolysis. In this method the metal compound is melted and then broken down by electricity to obtain pure metal.

12. **(C)** As ethanoic acid is a weak acid and is only partially dissociated, more acid molecules need to undergo dissociation in order to form the hydrogen ions for complete neutralisation. The dissociation process is endothermic and requires energy. Hence, a less exothermic reaction results.

13. **(C)** Sodium sulfate and water are the products of the neutralisation of sodium hydroxide and sulfuric acid.

Options (A) and (D) : Sodium sulfate and water (not hydrogen) are the products of neutralisation of sodium hydroxide and sulfuric acid.

Option (B): Sodium sulfate (not chloride) and water would be the products of neutralisation of sodium hydroxide and sulfuric acid.

14. **(D)** An unbalanced chemical equation has an unequal number of atoms of one or more elements in the reactants and products.

15. **(D)** Elements like calcium, strontium and barium form a triad based on the given characteristics.

BIOLOGY

16. **(D)** When we see an object that is near or far, an image is formed on the retina of the eye. It plays an important role in sensing the images of various objects in the surroundings.

17. **(D)** Plants take in carbon dioxide during photo-synthesis to synthesis their food and give out oxygen. Animals take in oxygen and give out carbon dioxide during respiration.

18. **(B)** Pollen grains germinate on stigma by absorbing water and nutrients.

19. **(A)** 'R' represents Medulla oblongata. Medulla oblongata controls heart beating, respiration swallowing, coughing and sneezing.

20. **(C)** The digested food in the small intestine passes through the walls of the small intestine and blood vessels to get into the bloodstream. The blood in the blood vessels carries the digested food to different parts of the body.

CRITICAL THINKING

21. **(D)**
22. **(B)**
23. **(C)**
24. **(A)**
25. **(A)**