



CAREER POINT

State Science Talent Search Examination, 2014

Time : 2 Hours

Max. Marks : 150

Instructions to candidates :

1. Answer are to be marked on the separate Answer Sheet which will be collected after the time is over.
2. Please write your Roll No. very clearly (only one digit in one block) as given on your Admission Card. Please see that no block is left unfilled and even zeros appearing in the Roll No., if any, are correctly transferred to the appropriate blocks on the booklet and on the Answer Sheet.

Example :

R	J	0	1	1	8	2
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For all subsequent purposes, your Roll No. shall remain the same as given on the Admission Card.

3. This test is in SIX parts. Each part consists of 25 questions. In all, 150 questions are to be attempted. Each question carries **one** mark.
4. Since all the questions are compulsory, do not try to read through the whole question paper before beginning to answer it.
5. Begin with the first question and keep on attempting one question after another till you finish.
6. If you do not know the answer to any question, do not spend much time on it and pass on to the next one. If time permits, you can come back to the questions which you have left in the first instance and try them again.
7. Space has been provided for rough work at the bottom of each page.
8. Answer to each question is to be indicated by blackening, with H.B. pencil, the bubble (circle) of the correct alternative in the separately given Answer Sheet from amongst the ones given for the corresponding question in the test booklet. Please also read the instructions carefully, given on the back side of the Answer Sheet.

PHYSICS

(Question Nos. 1 to 25)

1. The distance travelled by a car whose speed is 35 kmh^{-1} in 12 minutes will be
(1) 3.5 km (2) 7.0 km (3) 14 km (4) 28 km

Ans. [2]

Sol. Given : Speed = 35 kmh^{-1}

$$\text{Time taken} = 12 \text{ min} = \frac{12}{60} \text{ hr}$$

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\Rightarrow \text{Distance} = \text{speed} \times \text{time}$$

$$= 35 \text{ kmh}^{-1} \times \frac{12}{60} \text{ h}$$

$$\text{Distance} = 7.0 \text{ km}$$



2. The speed of a uniformly accelerated car changes from 18 kmh^{-1} to 36 kmh^{-1} in 5s. What is its acceleration in ms^{-2} ?

(1) 1.0 (2) 1.5 (3) 2.0 (4) 3.0

Ans. [1]

Sol. Given : -

$$\text{Initial speed} = 18 \text{ kmh}^{-1} = 5 \text{ ms}^{-1}$$

$$\text{Final speed} = 36 \text{ kmh}^{-1} = 10 \text{ ms}^{-1}$$

$$\text{Time taken} = 5 \text{ sec}$$

$$\therefore \text{Acceleration (a)} = \frac{\text{change in speed}}{\text{time taken}}$$

$$a = \frac{v - u}{t} = \frac{10 - 5}{5}$$

$$a = 1.0 \text{ ms}^{-2}$$

3. The motion of an object is said to be uniform circular motion if the object

(1) moves on a circular path with constant speed
 (2) moves on a circular path with constant velocity
 (3) moves on a circular path with variable speed
 (4) none of these

Ans. [1]

Sol. The motion of an object is said to be uniform circular motion, if the object move on a circular path with constant speed.

4. A bullet of mass 10 g is horizontally fired with a velocity 150 ms^{-1} from a pistol of mass 5 kg. The recoil velocity of the pistol will be

(1) 0.5 ms^{-1} (2) 0.4 ms^{-1} (3) 0.3 ms^{-1} (4) 0.2 ms^{-1}

Ans. [3]

Sol. Given :

$$\text{Mass of bullet (m)} = 10 \text{ gm}$$

$$= 0.01 \text{ kg}$$

$$\text{Velocity of gun (v)} = 150 \text{ m/sec}$$

$$\text{Mass of pistol of mass (M)} = 5 \text{ kg}$$

$$\therefore \text{Recoil velocity of the pistol is } \frac{mv}{M} = \frac{0.01 \times 150}{5} = \frac{1.5}{5} = 0.3 \text{ m/sec}$$

5. If A and B are two objects with masses 6 kg and 34 kg respectively then

(1) A has more inertia than B (2) B has more inertia than A
 (3) A and B have the same inertia (4) none of the two has inertia

Ans. [2]

Sol. B has more inertia than A. As inertia depends directly upon mass.



6. The mass of an object is 5 kg. Its weight on the surface of the earth will be
 (1) 490 N (2) 0.49 N (3) 4.9 N (4) 49 N

Ans. [4]

Sol. Given :

Mass of an object = 5 kg

Therefore, weight = mg

$$= 5 \times 9.8$$

$$\text{Weight} = 49 \text{ N}$$

7. SI unit of pressure is
 (1) pascal (2) newton (3) joule (4) watt

Ans. [1]

Sol. SI unit of pressure is pascal.

8. Relative density of silver is 10.8. The density of water is 1 gm cm^{-3} . Density of silver in SI unit will be
 (1) $10.8 \times 10^{-3} \text{ kg m}^{-3}$ (2) 10.8 kg m^{-3}
 (3) 10^3 kg m^{-3} (4) $10.8 \times 10^3 \text{ kg m}^{-3}$

Ans. [4]

Sol. Given :

Relative density of silver is 10.8

Density of water is $1 \text{ gm cm}^{-3} = 1000 \text{ kg m}^{-3}$

$$\therefore \text{Relative density of silver} = \frac{\text{Density of substance (silver)}}{\text{Density of water}}$$

So, Density of silver = 10.8×1000

Density of silver = $10.8 \times 10^3 \text{ kg m}^{-3}$

9. Which physical quantity has kWh as its unit ?
 (1) Force (2) Momentum (3) Energy (4) Power

Ans. [3]

Sol. Energy unit is kWh.

10. A force of 12 N displaces a body by 60 cm in its direction. The work done on the body will be
 (1) 720 J (2) 7.2 J (3) 5 J (4) 0.2 J

Ans. [2]

Sol. Given :

Displacement = 60 cm

$$= 0.6 \text{ m}$$

Force applied (F) = 12 N

Work done = Force \times displacement

$$= 12 \times 0.6$$

$$W = 7.2 \text{ J}$$

11. An object of mass 2 kg is moving with a constant velocity 2 ms^{-1} . How much work is needed to be done against the object in order to bring it to rest ?

(1) 1 J (2) 4 J (3) 8 J (4) 10 J

Ans. [2]

Sol. According to work-energy theorem

W = change in kinetic energy

$$W = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$$

$$\because v = 0 \text{ m/s, } u = 2 \text{ m/s, } m = 2 \text{ kg}$$

$$W = -\frac{1}{2} \times 2 \times (2)^2$$

$$W = -4 \text{ J}$$

Therefore, work done against the object is 4 J.

12. The minimum time interval needed between the original sound and the reflected sound for hearing a distinct echo is

(1) 0.2 s (2) 2.0 s (3) 0.1 s (4) 1.0 s

Ans. [3]

Sol. We know that the persistence of sound is $\frac{1}{10}$ th second.

This means minimum time interval needed between the original sound & the reflected sound for hearing a distinct echo is 0.1 sec.

13. The audible range of sound for human beings is

(1) 2 Hz to 20 kHz (2) 2 Hz to 2 kHz
(3) 20 Hz to 200 kHz (4) 20 Hz to 20 kHz

Ans. [4]

Sol. The audible range of sound for human beings is 20 Hz to 20 kHz.

14. A person claps his hands near a high tower and hears echo after 0.2 s. The speed of the sound is 300 ms^{-1} . The distance of the tower from the person is

(1) 30 m (2) 15 m (3) 6 m (4) 3 m

Ans. [1]

Sol. Given :

Time after echo is heard = 0.2 s

Speed of the sound (v) = 300 ms^{-1}

\therefore we know that,

$$v = \frac{2d}{t} \Rightarrow 2d = v \times t$$

$$\Rightarrow d = \frac{v \times t}{2} = \frac{300}{2} \times 0.2$$

$$d = 30 \text{ m}$$



15. The image formed by a concave mirror is of the same size, real and inverted when the object is placed
 (1) at infinity (2) between P and F (3) at F (4) at C

Ans. [4]

Sol. The image formed by a concave mirror is the same size, real & inverted when the object is placed at C.

16. The focal length of a convex lens is 50 cm. Its power in dioptrre is
 (1) -2 (2) -1 (3) + 2 (4) + 1

Ans. [3]

Sol. Power = $\frac{1}{f(m)}$

$$P = \frac{100}{f} \text{ Dioptrre}$$

For convex lens, focal length is positive

$$\therefore P = \frac{+100}{50} = +2$$

$$P = +2 \text{ Dioptrre}$$

17. The refractive index of glass is 1.5. If the speed of light in air is $3 \times 10^8 \text{ ms}^{-1}$ then its speed in glass will be
 (1) $2 \times 10^8 \text{ ms}^{-1}$ (2) $3 \times 10^8 \text{ ms}^{-1}$ (3) $4.5 \times 10^8 \text{ ms}^{-1}$ (4) $6 \times 10^8 \text{ ms}^{-1}$

Ans. [1]

Sol. Given :

Refractive index of glass = 1.5

Speed of light in air = $3 \times 10^8 \text{ ms}^{-1}$

As we know,

$${}_1\mu_2 = \frac{\mu_2}{\mu_1} = \frac{v_1}{v_2}$$

$$\Rightarrow v_2 = \frac{v_1}{\mu_2} \times \mu_1 = \frac{3 \times 10^8}{1.5} \times 1$$

speed of light in glass

$$v_2 = 2 \times 10^8 \text{ ms}^{-1}$$

18. The process of splitting white light into its seven constituent colours is called
 (1) Refraction (2) Dispersion (3) Scattering (4) Reflection

Ans. [2]

Sol. The process of splitting white light into its seven constituent colours is called dispersion.

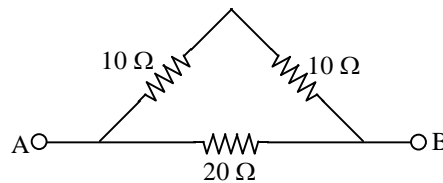
19. The danger indicators (signal) are red in colour because
- (1) scattering of red light is maximum (2) scattering of red light is minimum
- (3) the wavelength of red light is minimum (4) none of these

Ans. [2]

Sol. The danger indicators are red in colour because, scattering of red light is minimum.

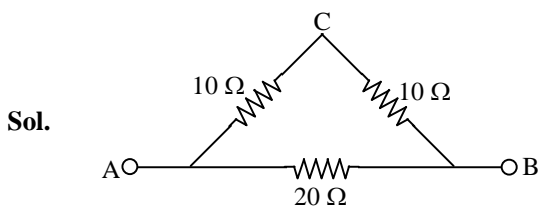
$$\text{Scattering} \propto \frac{1}{(\text{Wavelength})^4}$$

20. Equivalent resistance between points A and B in the given circuit will be



- (1) 40 Ω (2) 30 Ω (3) 20 Ω (4) 10 Ω

Ans. [4]



AC and BC branches are connected in series.

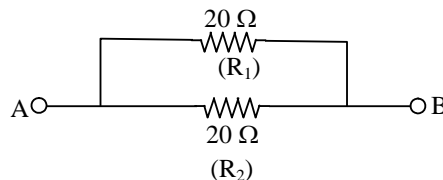
$$\begin{aligned} \text{i.e. } R_{AC} + R_{BC} \\ = 10 + 10 = 20 \Omega \end{aligned}$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$R_1 = R_2 = R = 20 \Omega$$

$$\therefore R_{eq} = \frac{R}{n}$$

$$R_{eq} = \frac{20}{2} = 10 \Omega$$



21. Which of the following terms represents electrical power in a circuit ?

- (1) $I^2 Rt$ (2) $VI t$ (3) $I^2 R$ (4) $\frac{V^2}{R} t$

Ans. [3]

Sol. $\because \text{Power} = VI \Rightarrow P = I^2 R$ [$\because V = IR$]

22. The electrical energy dissipated per second in a resistance of 4Ω is 100 J. The current flowing through the resistance will be

- (1) 25 A (2) 15 A (3) 10 A (4) 5 A

Ans. [4]

Sol. Given :

Time, $t = 1$ sec

Resistance, $R = 4 \Omega$

Energy, $E = 100$ J

As we know that

$$E = I^2 R t$$

$$\Rightarrow I^2 = \frac{E}{R \cdot t} = \frac{100}{4 \times 1}$$

$$I^2 = 25 \text{ A}$$

$$\Rightarrow I = 5 \text{ A}$$

23. The frequency of an alternating current is 50 Hz. In how much time does it reverse its direction ?

- (1) $\frac{1}{10}$ second (2) $\frac{1}{100}$ second (3) 10 second (4) 100 second

Ans. [2]

Sol. Given :

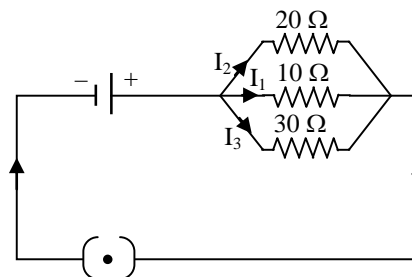
Frequency of an alternating current is 50 Hz.

\Rightarrow time taken to reverse its direction

$$\Rightarrow t = \frac{1}{2f}$$

$$t = \frac{1}{100} \text{ sec}$$

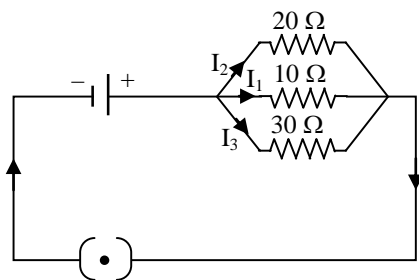
24. Which of the following statements is true on the basis of the given circuit diagram ?



- (1) I_1 is maximum (2) I_2 is maximum (3) I_3 is maximum (4) $I_1 + I_2 + I_3 = 0$

Ans. [1]

Sol.



I_1 is maximum, because resistance is minimum and they all are connected in parallel.
i.e. voltage remains constant.

$$\left(I \propto \frac{1}{R} \right)$$

25. The magnetic effect of current was discovered by
 (1) Faraday (2) Millikan (3) Oersted (4) Thomson

Ans. [3]

Sol. The magnetic effect of current was discovered by Oersted.

CHEMISTRY

(Question Nos. 1 to 25)

1. The nuclei, which are not identical but have the same number of nucleons, are called -
 (1) isotopes (2) isotones (3) isobars (4) isoelectronic

Ans. [3]

Sol. Isobars

Nucleons include both neutron & proton.

2. Aqueous solution of which of the following compounds turns red litmus to blue ?
 (1) CO_2 (2) SO_2 (3) MgO (4) SO_3

Ans. [3]

Sol. MgO on reaction with water forms basic solution, which turns red litmus blue.

3. The colloidal solution in which both dispersed phase and dispersion medium are liquids, is called -
 (1) Gel (2) Sol (3) Aerosol (4) Emulsion

Ans. [4]

4. Aqueous solution of copper sulphate can be stored in metal vessel -
 (1) Al (2) Zn (3) Fe (4) Ag

Ans. [4]

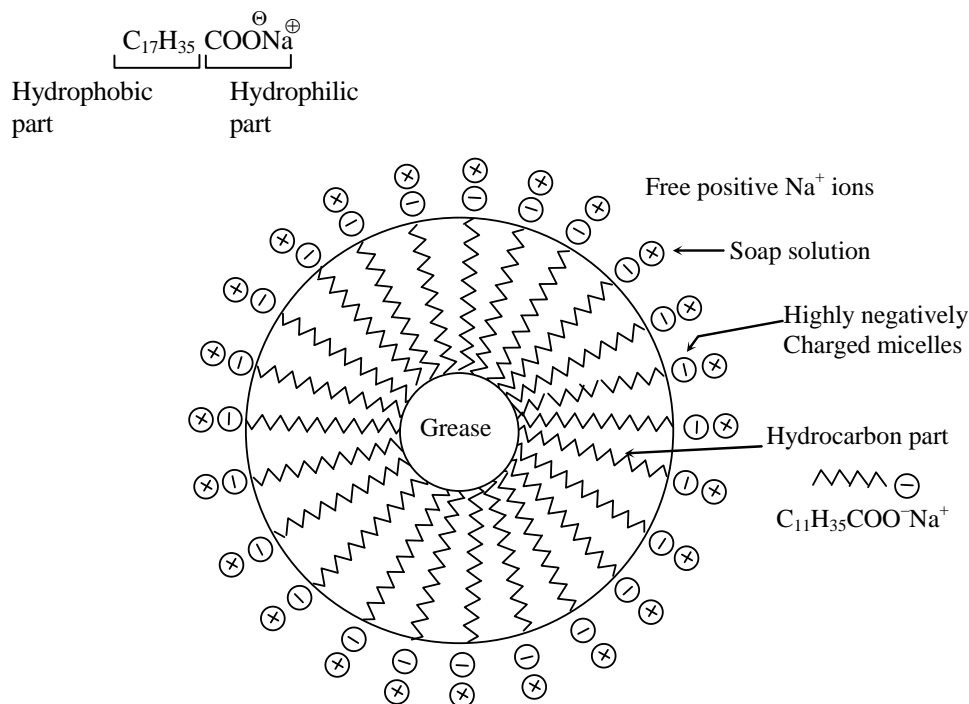
Sol. Because Ag is less reactive than Cu, whereas Al, Zn & Fe are more reactive, So displacement reaction will take place.

10. The action of soaps and detergents to remove the oily dirt by emulsification is due to -

- (1) presence of hydrophilic group
- (2) presence of hydrophobic group
- (3) presence of both hydrophilic and hydrophobic groups
- (4) presence of hardness in water

Ans. [3]

Sol. These part orient themselves to form micelle, which causes emulsification.



Cleansing action of soap. Soap micelle entraps the oily dirt particle

11. Which functional group cannot be situated at terminal position ?

- (1) carboxylic acid
- (2) aldehyde
- (3) alcohol
- (4) ketone

Ans. [4]

Sol. Ketone ($-\text{CO}-$) is an intermediate group $\text{R}-\text{CO}-\text{R}$

Whereas carboxylic acids ($\text{R}-\text{COOH}$), Aldehyde ($\text{R}-\text{CHO}$) & Alcohol ($\text{R}-\text{OH}$) are terminal function groups.

12. Natural indicator is -

- (1) methyl orange
- (2) phenolphthalein
- (3) litmus
- (4) methyl red

Ans. [3]

Sol. Litmus obtained from Lichen.



13. pH of soda water is-

- (1) 7 (2) between 7 - 9 (3) between 4 – 7 (4) 14

Ans. [3]

Sol. Because soda water is made by dissolving CO_2 in water & it is acidic by nature (H_2CO_3).

14. Number of atoms in 40 grams of He is -

- (1) 6.022×10^{22} (2) 6.022×10^{23} (3) 6.022×10^{24} (4) 6.022×10^{25}

Ans. [3]

Sol. $4\text{g He} = 1 \text{ mole} = 6.022 \times 10^{23}$ atoms

So $40 \text{ g He} = 10 \text{ mole} = 6.022 \times 10^{23} \times 10 = 6.022 \times 10^{24}$ atom

15. Which metal cannot be extracted from its ore by reduction using carbon ?

- (1) Mg (2) Zn (3) Cu (4) Fe

Ans. [1]

Sol. Zn, Cu & Fe are metals of medium reactivity, So they can be reduced by using C, where as Mg is a highly reactive metal so it can only be reduced by electrolysis method.

16. The substance that gives Bleaching powder on reaction with chlorine is -

- (1) CaO (2) CaCO_3 (3) Ca(OH)_2 (4) CaCl_2

Ans. [3]

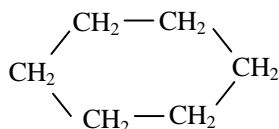
Sol. $\text{Ca(OH)}_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$

17. Number of covalent bonds in cyclohexane is -

- (1) 14 (2) 16 (3) 18 (4) 20

Ans. [3]

Sol.



18. The substance made up of only one type of element is -

- (1) Common salt (2) Diamond (3) Water (4) Air

Ans. [2]

Sol. Common salt \rightarrow compound

Water \rightarrow compound

Air \rightarrow Mixture

Diamond \rightarrow Made of C only.



BIOLOGY

(Question Nos. 1 to 25)

1. The name of the scientist presenting cell theory is
(1) Robert Brown (2) Leeuwenhoek (3) Virchow (4) Schleiden and Schwann

Ans. [4]

Sol. Schleiden and Schwann

2. The growth in the girth of stem or root is due to which tissue ?
(1) Lateral meristem (2) Apical meristem (3) Intercalary meristem (4) Parenchyma

Ans. [1]

Sol. Lateral meristem

3. Which tissue is responsible for movement in our body ?
(1) Epithelial tissue (2) Connective tissue (3) Muscular tissue (4) Nervous tissue

Ans. [3]

Sol. Muscular tissue

4. The example of gymnosperm plant is -
(1) Marchantia (2) Pinus (3) Marsilea (4) Chara

Ans. [2]

Sol. Pinus

5. Which animal has an open circulatory system and kidney like organ for excretion ?
(1) Palaemon (2) Planaria (3) Ascaris (4) Pila

Ans. [4]

Sol. Pila

6. Animals of which class have hairs on the skin, sweat glands and oil glands ?
(1) Mammalia (2) Aves (3) Amphibia (4) Reptilia

Ans. [1]

Sol. Mammalia

7. Diseases caused by bacteria are
(1) Influenza and dengue fever (2) AIDS and cholera
(3) Cholera and tuberculosis (4) Malaria and kala-azar

Ans. [3]

Sol. Cholera and tuberculosis



8. The gas responsible for depletion of the ozone layer is
(1) Chlorofluorocarbon (2) Methane (3) Carbon dioxide (4) Sulphur dioxide
Ans. [1]
Sol. Chlorofluorocarbon
9. Kharif crop is
(1) Gram (2) Wheat (3) Pea (4) Maize
Ans. [4]
Sol. Maize
10. Which animal is used for preparing vermicompost ?
(1) Hydra (2) Earthworm (3) Ascaris (4) Frog
Ans. [2]
Sol. Earthworm
11. Which animal is cultivated for the production of pearl ?
(1) Oysters (2) Mussels (3) Prawn (4) Mulletts
Ans. [1]
Sol. Oysters
12. The variety of honeybee used in the commercial production of honey is
(1) Apis cerana indica (2) Apis dorsata (3) Apis florae (4) Apis mellifera
Ans. [4]
Sol. Apis mellifera
13. Pepsin acts as digestive enzyme in which organ ?
(1) Intestine (2) Stomach (3) Liver (4) Mouth
Ans. [2]
Sol. Stomach
14. Breaking down of pyruvate takes place in which cell organism ?
(1) Ribosome (2) Golgi bodies (3) Lysosome (4) Mitochondria
Ans. [4]
Sol. Mitochondria



15. The function of platelets is -

- (1) Transportation of O₂ (2) Storage of food material
(3) Controlling blood pressure (4) Clotting of blood

Ans. [4]

Sol. Clotting of blood

16. The plant tissue responsible for movement of water and minerals obtained from the soil is

- (1) Parenchyma (2) Phloem (3) Xylem (4) Collenchyma

Ans. [3]

Sol. Xylem

17. The organ that removes nitrogenous waste product from blood is

- (1) Kidney (2) Liver (3) Lungs (4) Heart

Ans. [1]

Sol. Kidney

18. The thinking part of the brain is

- (1) Mid-brain (2) Hindbrain (3) Forebrain (4) Spinal cord

Ans. [3]

Sol. Forebrain

19. 'The growth of pollen tube towards ovules' shows which phenomenon ?

- (1) Geotropism (2) Chemotropism (3) Phototropism (4) Hydrotropism

Ans. [2]

Sol. Chemotropism

20. Presence of swollen neck is the symptom of which disease ?

- (1) Goitre (2) Diabetes (3) Pellagra (4) Albinism

Ans. [1]

Sol. Goitre

21. Multiple fission type of reproduction is found in

- (1) Earthworm (2) Yeast (3) Hydra (4) Plasmodium

Ans. [4]

Sol. Plasmodium



22. The example of unisexual flower is
 (1) Hibiscus (2) Papaya (3) Mustard (4) Pea
Ans. [2]
Sol. Papaya
23. The method of reproduction by which 'Leaf of Bryophyllum develops into new plant' is called
 (1) Budding (2) Binary fission (3) Multiple fission (4) Vegetative reproduction
Ans. [4]
Sol. Vegetative reproduction
24. Genotypic ratio in monohybrid cross is
 (1) 2 : 1 : 1 (2) 3 : 1 (3) 1 : 2 : 1 (4) 1 : 3
Ans. [3]
Sol. 1 : 2 : 1
25. In evolution, the wings of birds and bats are evidences of
 (1) Homologous organ (2) Analogous organ (3) Fossils (4) Embryo
Ans. [2]
Sol. Analogous organ

MATHEMATICS

(Question Nos. 1 to 25)

1. Which one is the largest number among the following ?
 (1) $0.37\bar{5}$ (2) $\overline{0.375}$ (3) $0.\overline{375}$ (4) 0.375
Ans. [3]
Sol. (i) = $0.3755\bar{5}$
 (ii) $0.375375\overline{375}$
 (iii) $0.3757\overline{575}$
 (iv) 0.37500
2. If $x = \sqrt[3]{2\frac{93}{125}}$, then value of x is -
 (1) $1\frac{1}{5}$ (2) $2\frac{1}{5}$ (3) $1\frac{2}{5}$ (4) $\frac{2}{5}$
Ans. [3]
Sol. $\sqrt[3]{2\frac{93}{125}}$
 $\Rightarrow x = \sqrt[3]{\frac{343}{125}} = x = \sqrt[3]{\left(\frac{7}{5}\right)^3} \Rightarrow x = \frac{7}{5} = 1\frac{2}{5}$

6. If $\frac{2}{3}$, k and $\frac{5}{8}k$ are three consecutive terms of an arithmetic progression, then the value of k is -

(1) $\frac{16}{33}$

(2) $\frac{7}{11}$

(3) $\frac{33}{16}$

(4) $-\frac{16}{33}$

Ans. [1]

Sol. $\frac{2}{3}, k, \frac{5}{8}k$

By using A.P. Property

$$k - \frac{2}{3} = \frac{5}{8}k - k$$

$$\frac{3k - 2}{3} = \frac{5k - 8k}{8} \Rightarrow \frac{3k - 2}{3} = \frac{-3k}{8}$$

$$\Rightarrow 24k - 16 = -9k$$

$$\Rightarrow 33k = 16 \Rightarrow k = \frac{16}{33}$$

7. The sum of first n terms of an arithmetic progression is $3n + n^2$, then common difference of this arithmetic progression is -

(1) $n + 1$

(2) n

(3) 2

(4) $2n + 1$

Ans. [3]

Sol. $S_n = 3n + n^2$ (i)

$$S_{(n-1)} = 3(n-1) + (n-1)^2 = n^2 + n - 2$$
 ... (ii)

$$S_{(n-2)} = 3(n-2) + (n-2)^2 = n^2 - n - 2$$
 ... (iii)

$$n \text{ term of AP} = S_n - S_{n-1} = 2n + 2$$

$$(n-1) \text{ term of AP} = S_{n-1} - S_{n-2} = 2n$$

So common difference $\Rightarrow n \text{ term} - (n-1) \text{ term}$

$$\Rightarrow 2n + 2 - 2n = 2$$

8. If $\cos 2x = \sin(x - 39^\circ)$ and $3x$ is acute angle then value of x is

(1) 40°

(2) 29°

(3) 43°

(4) 90°

Ans. [3]

Sol. $\cos 2x = \sin(x - 39^\circ)$ and $3x$ is acute angle

$$\cos 2x = \cos(90 - x + 39^\circ)$$

$$2x = 90 - x + 39$$

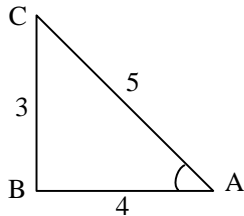
$$3x = 129^\circ \Rightarrow x = 43^\circ$$

9. If $5 \sin A = 3$ and $0 < A < 90^\circ$ then value of $(\sec A + \tan A)(1 - \sin A)$ is
 (1) $3/4$ (2) $4/5$ (3) $3/5$ (4) $2/5$

Ans. [2]

Sol. $5 \sin A = 3$

$$\sin A = \frac{3}{5} = \frac{P}{H}$$



$$\Rightarrow \sec A = \frac{1}{\cos A} = \frac{H}{B} = \frac{5}{4}$$

$$\tan A = \frac{3}{4}$$

Put in $(\sec A + \tan A)(1 - \sin A)$

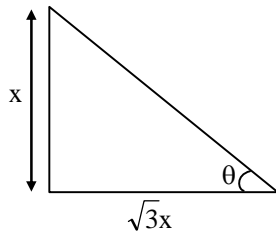
$$\Rightarrow \left(\frac{5}{4} + \frac{3}{4} \right) \left(1 - \frac{3}{5} \right)$$

$$\Rightarrow \frac{8}{4} \times \frac{2}{5} = \frac{8}{10} = \frac{4}{5}$$

10. Length of shadow of a pole is $\sqrt{3}$ times the height of a pole. Angle of elevation of sun is =
 (1) 30° (2) 60° (3) 45° (4) 75°

Ans. [1]

Sol.



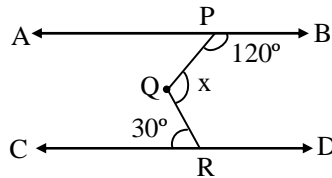
$$\text{Shadow} = \sqrt{3} \text{ Height} = \sqrt{3} x$$

$$\text{Angle of elevation of sun} = \theta \Rightarrow \tan \theta = \frac{x}{\sqrt{3}x}$$

$$\Rightarrow \tan \theta = \frac{1}{\sqrt{3}}$$

$$\Rightarrow \theta = 30^\circ$$

11. In the following figure, $AB \parallel CD$; $\angle BPQ = 120^\circ$ and $\angle CRQ = 30^\circ$. The value of x is -

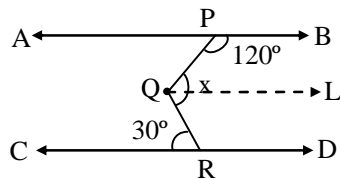


- (1) 150° (2) 60° (3) 45° (4) 90°

Ans. [4]

Sol. Cons : - Draw $LQ \parallel BA$

Now, $LQ \parallel BA \parallel CD$



$$\Rightarrow \angle BPQ + \angle PQL = 180^\circ \text{ (Co-interior angles sum)}$$

$$\Rightarrow \angle PQL = 180^\circ - 120^\circ = 60^\circ$$

Similarly, $\angle RQL = \angle QRC = 30^\circ$ (alternate angles)

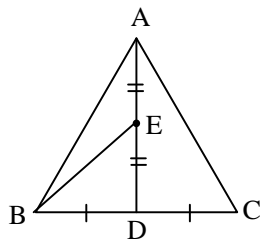
$$\therefore \angle PQR = x^\circ = 60^\circ + 30^\circ = 90^\circ$$

12. In triangle ABC, E is the mid-point of median AD. The correct statement among the following is -

- (1) $\text{Area}(\triangle BED) = \frac{1}{4} \text{Area}(\triangle ABC)$ (2) $\text{Area}(\triangle BED) = \frac{1}{4} \text{Area}(\triangle ABD)$
 (3) $\frac{3}{4} \text{Area}(\triangle ABC) = \text{Area}(\triangle BED)$ (4) $\text{Area}(\triangle ABC) = 2 \text{Area}(\triangle BED)$

Ans. [1]

Sol. In $\triangle ABC$,



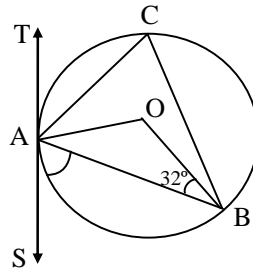
E is mid point of AD

\therefore BE is median of $\triangle ABD$

$$\therefore \text{Area of } \triangle BED = \frac{1}{2} \text{Area of } \triangle ABD$$

$$\therefore \text{Area of } \triangle BED = \frac{1}{4} \text{Area of } \triangle ABC$$

13. In the given figure, TAS is a tangent to a circle with centre O. If $\angle OBA = 32^\circ$ then value of $\angle BAS$ is -



- (1) 48° (2) 32° (3) 58° (4) 90°

Ans. [3]

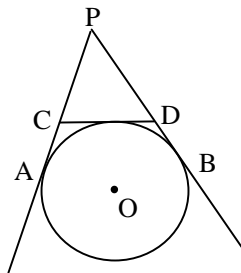
Sol. $\angle BAS = \angle ACB$ (angle made by tangent & chord in one segment is equal to angle made by same chord on another segment)

$$\angle OBA = \angle OAB = 32^\circ \quad (\because OA = OB)$$

$$\begin{aligned} \angle AOB &= 180^\circ - 2 \times 32^\circ \\ &= 180^\circ - 64^\circ \\ &= 116^\circ \end{aligned}$$

$$\angle ACB = \frac{1}{2} \angle AOB = \frac{1}{2} \times 116^\circ = 58^\circ$$

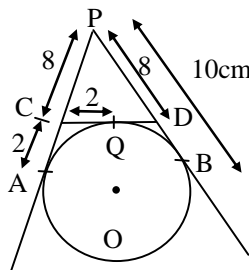
14. In the given figure, two tangents PA and PB are drawn to a circle with centre O from an external point P. CD is the third tangent touching the circle at Q. If $PB = 10$ cm and $CQ = 2$ cm, then length of PC is -



- (1) 6 cm (2) 5 cm (3) 2 cm (4) 8 cm

Ans. [4]

Sol.



Length of $PB = PA = 10$ cm (Tangents drawn from an external Point are equal)

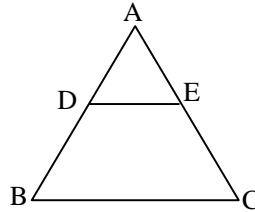
$$AC = CQ = 2 \text{ cm}$$

$$\text{So, } PC = PA - AC$$

$$= 10 - 2$$

$$= 8 \text{ cm}$$

15. In the given figure,, $DE \parallel BC$ and $AD : DB = 2 : 3$, then
Area ($\triangle ADE$) : Area ($\triangle ABC$) is -



- (1) 4 : 25 (2) 4 : 9 (3) 9 : 4 (4) 25 : 4

Ans. [1]

Sol. $\frac{AD}{DB} = \frac{2}{3}$

$\triangle ADE \sim \triangle ABC$ (By AA Similarity)

$\angle DAE = \angle BAC$ (common)

$\angle ADE = \angle ABC$ (Corresponding angles)

$$\text{Area } (\triangle ADE) : \text{Area } (\triangle ABC) = \frac{(AD)^2}{(AB)^2} = \frac{(2)^2}{(5)^2} = \frac{4}{25}$$

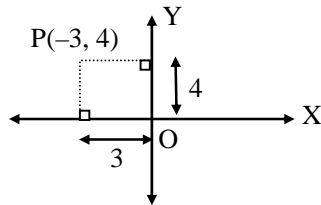
$$\Rightarrow 4 : 25$$

16. A point $P(-3, 4)$ lies in XY -plane. Perpendicular distance of the point P from Y -axis is -

- (1) -3 (2) 4 (3) -4 (4) 3

Ans. [4]

Sol.



Perpendicular distance of point P from y - axis = 3 (Distance is +ve)

17. The coordinate of the point on Y -axis which is equidistant from the points $(6, 5)$ and $(-4, 3)$ is -

- (1) $(0, 0)$ (2) $(0, 9)$ (3) $(9, 0)$ (4) $(1, 4)$

Ans. [2]

Sol. Let point be $(0, b)$

$$\sqrt{(6)^2 + (b-5)^2} = \sqrt{(4)^2 + (b-3)^2}$$

$$\Rightarrow 36 + b^2 + 25 - 10b = 16 + b^2 + 9 - 6b$$

$$\Rightarrow 36 - 10b + 6b = 0$$

$$\Rightarrow 36 - 4b = 0$$

$$\Rightarrow b = 9$$

point $(0, 9)$



18. Rain water from a roof of dimension 22 m × 20 m drains into a cylindrical vessel having diameter of base 2 m and height 3.5 cm. If the vessel is just full, then the total rainfall in cm is -

(1) 3.5 (2) 2.5 (3) 2 (4) 1.5

Ans. [Bonus]

Sol. Let total rainfall in cm be h cm

Then, diameter of base = 2 m = 200 cm

Radius = 100 cm

$$\Rightarrow l \times b \times h = \pi r^2 h_{\text{cy. vessel}}$$

$$\Rightarrow 2200 \times 20 \times 100 \times h = \frac{22}{7} \times (100 \times 100) \times 3.5$$

$$\Rightarrow h = \frac{22}{7} \times \frac{3.5}{22 \times 20}$$

$$= \frac{0.5}{20} = \frac{1}{40} = 0.025 \text{ cm}$$

19. The perimeter of a sector of a circle of radius 5.2 cm is 16.4 cm. Then area of the sector is -

(1) 80 cm² (2) 21.6 cm (3) 15.6 cm² (4) 156 cm²

Ans. [3]

Sol. Perimeter of sector = $\frac{\theta}{360^\circ} \times 2\pi r + 2r$

$$\Rightarrow 16.4 = \frac{\theta}{360^\circ} \times 2\pi r + 2r$$

$$\Rightarrow \frac{16.4 - 2r}{2\pi r} = \frac{\theta}{360^\circ}$$

$$\text{Area of sector} = \frac{\theta}{360^\circ} \times \pi r^2$$

$$\Rightarrow \frac{16.4 - 2r}{2\pi r} \times \pi r^2$$

$$\Rightarrow \frac{8.2 - r}{r} \times r^2$$

$$\Rightarrow (8.2 - r) \times r$$

$$\Rightarrow (8.2 - 5.2) \times 5.2$$

$$\Rightarrow 3 \times 5.2$$

$$\Rightarrow 15.6 \text{ cm}^2$$

20. Three metallic spheres of radii 3 cm, 4 cm and 5 cm respectively are melted to form a cone of radius 6 cm. Then the height of this cone is -
- (1) 24 cm (2) 42 cm (3) 60 cm (4) 18 cm

Ans. [1]

Sol. Volume of three spheres = Volume of cone

$$\frac{4}{3}\pi r_1^3 + \frac{4}{3}\pi r_2^3 + \frac{4}{3}\pi r_3^3 = \frac{1}{3}\pi r_{\text{cone}}^2 h$$

$$\Rightarrow \frac{4}{3}\pi(r_1^3 + r_2^3 + r_3^3) = \frac{1}{3}\pi r_{\text{cone}}^2 \times h$$

$$\Rightarrow \frac{4}{3}(3^3 + 4^3 + 5^3) = \frac{1}{3} \times 6^2 \times h$$

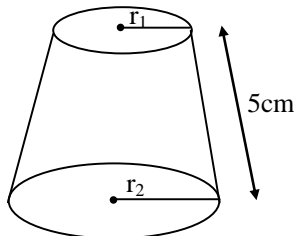
$$\Rightarrow 4(27 + 64 + 125) = 36 h$$

$$\Rightarrow h = \frac{216}{9} = 24 \text{ cm}$$

21. The slant height of a frustum of a cone is 5 cm and the circumferences of its circular ends are 12π cm and 6π cm. Height of this frustum of cone is
- (1) 3 cm (2) 4 cm (3) 5 cm (4) 6 cm

Ans. [2]

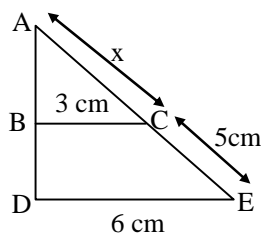
Sol.



Given $2\pi r_1 = 6\pi$

$r_1 = 3$ cm

given $2\pi r_2 = 12\pi \Rightarrow r_2 = 6$ cm





$$\Rightarrow \frac{x}{3} = \frac{x+5}{6}$$

$$\Rightarrow x = 5 \text{ cm}$$

Pythagoras in $\triangle ABC$

$$\Rightarrow AB = 4 \text{ cm}$$

Pythagoras in $\triangle ADE$

$$AD = 8 \text{ cm}$$

So height = $AD - AB$

$$= (8 - 4) \text{ cm} = 4 \text{ cm}$$

22. The mean of the following data is 3.2. Then the value of x is -

X	1 - 3	3 - 5	5 - 7	7 - 9	9 - 11
Frequency	7	8	x	2	1

(1) 6

(2) 3

(3) 2

(4) 4

Ans. [Bonus]

Sol.

x_i	f	Mid value (x)	f(x)
1 - 3	7	2	14
3 - 5	8	4	32
5 - 7	x	6	6x
7 - 9	2	8	16
9 - 11	1	10	10
	$\Sigma f = 18 + x$		$\Sigma f(x) = 72 + 6x$

$$\text{Mean}(\bar{x}) = \frac{\Sigma fx}{\Sigma f} = 3.2 \text{ (given)}$$

$$\frac{72 + 6x}{18 + x} = \frac{32}{10}$$

$$\Rightarrow 720 + 60x = 576 + 32x$$

$$\Rightarrow 28x = 576 - 720$$

$$\Rightarrow x = \frac{-144}{28} = -5.1$$

23. If the median of the following data written in ascending order is 16, then value of x is -

6, 7, $x - 2$, x, 17, 20

(1) 16

(2) 18

(3) 17

(4) 15

Ans. [3]

Sol. Median = $\frac{x - 2 + x}{2} = 16$ (given)

$$\frac{2x - 2}{2} = 16 \Rightarrow x - 1 = 16 \Rightarrow x = 17$$



24. A box contains 20 cards which are numbered from 1 to 20. A card is drawn at random from the box. Then the probability that it is a perfect square number is -

- (1) $\frac{2}{5}$ (2) $\frac{1}{20}$ (3) $\frac{1}{5}$ (4) $\frac{4}{5}$

Ans. [3]

Sol. Perfect square from 1 to 20

= 1, 4, 9, 16 = m

$$\text{Probability} = \frac{m}{n} = \frac{4}{20} = \frac{1}{5}$$

25. Two dice are thrown at the same time. The probability that the sum of the numbers appearing on the top of the two dice is 9, is -

- (1) $\frac{9}{36}$ (2) $\frac{1}{6}$ (3) $\frac{2}{9}$ (4) $\frac{1}{9}$

Ans. [4]

Sol. Favorable cases = (3, 6), (4, 5), (5, 4), (6, 3) = m = 4

sample space \Rightarrow n = (36)

$$\text{Probability} = \frac{m}{n} = \frac{4}{36} = \frac{1}{9}$$

DAY TO DAY SCIENCE (Question Nos. 1 to 25)

1. In which of the following speed of sound is maximum ?

- (1) Steel (2) Water (3) Hydrogen (4) Air

Ans. [1]

Sol. Speed of sound is maximum in steel.

2. Which is known as the 'Country of winds' ?

- (1) Germany (2) India (3) Denmark (4) Nepal

Ans. [3]

Sol. The 'country of winds' is Denmark.

3. The conventional unit for domestic electrical consumption is

- (1) kWh (2) kW s (3) W s (4) J

Ans. [1]

Sol. The conventional unit for domestic electrical consumption is kWh



4. The speed of sound on increasing the temperature of the medium
(1) Decreases (2) Increases (3) remains unchanged (4) None of these

Ans. [2]

Sol. The speed of sound on increasing the temperature of the medium increases.

5. The acceleration of a freely falling body is
(1) $+9.8 \text{ ms}^{-2}$ (2) -9.8 ms^{-2} (3) Not fixed (4) 0 ms^{-2}

Ans. [1]

Sol. The acceleration of a freely falling body is $+g = +9.8 \text{ m/sec}$

6. Thermosetting polymer is
(1) Terylene (2) PVC (3) Bakelite (4) Nylon 6.6

Ans. [3]

Sol. Bakelite

7. Which medicine is not antacid ?
(1) Sodium hydrogen carbonate (2) Aluminium hydroxide
(3) Milk of magnesia (4) Aspirin

Ans. [4]

Sol. All other are basic by nature so they can be used as antacid.

8. Natural rubber is
(1) Polyisoprin (2) Neoprin (3) Buna-S (4) Buna-N

Ans. [1]

Sol. Polyisoprin is prepared by isoprene (2-methyl-1,3-butadiene). Which is found in latex, obtained from rubber trees.

9. The factor responsible for acid rain is -
(1) Vaporisation of polluted water (2) Presence of freons in atmosphere
(3) Presence of oxides of C, N, S in atmosphere (4) Greenhouse effect.

Ans. [3]

Sol. Air pollution from burning of fossil fuels, which have C, N & S, forms oxides of these elements, are the major sources of acid rain (CO_2 , NO_2 & SO_2)

10. The particles bombarded to cause nuclear fission are
(1) Neutron (2) Deuteron (3) Alpha particle (4) Beta particle

Ans. [1]

Sol. Slow speed neutrons are bombarded on uranium 235 in nuclear fission

11. Which is not a natural fibre ?
 (1) Cotton (2) Silk (3) Wool (4) Dacron

Ans. [4]

Sol. Dacron

Cotton obtained from plant, silk & wool obtained from animals.

12. Consider the following statements :
 If p is a prime number such that $p + 2$ is also a prime number, then

I. $p(p + 2) + 1$ is a perfect square number.

II. 12 is a divisor of $p + (p + 2)$, if $p > 3$

Which of the above statement (s) is / are correct ?

- (1) Only I (2) Only II (3) Both I and II (4) Neither I nor II

Ans. [3]

13. The ratio of A to B is $x : 8$ and the ratio of B to C is $12 : y$. If the ratio of A to C is $2 : 1$, then the ratio of x to y is -

- (1) 3 : 4 (2) 4 : 3 (3) 1 : 6 (4) 1 : 12

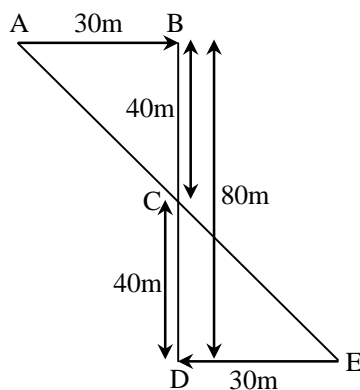
Ans. [2]

14. Amit walked 30 m towards east, took a right turn and walked 80m, then he took a left turn and walked 30 m. The shortest distance between his starting position and present position is

- (1) 30 m (2) 60 m (3) 90 m (4) 100 m

Ans. [4]

Sol.



The shortest distance will be from point A (starting point) to point E (final point)

As $\triangle ABC$ is right angled triangle

$$\begin{aligned} \therefore AC &= \sqrt{AB^2 + BC^2} \\ &= \sqrt{(30)^2 + (80)^2} \\ &= \sqrt{2500} \end{aligned}$$

$$AC = 50 \text{ m}$$

Similarly, $CE = 50 \text{ m}$

\therefore Total distance of A to E = 100 m



15. From your pocket money, you have to save Re 1 on first day, Rs. 2 on second day, Rs 3 on third day and so on. Total money that will be saved in the month of October, 2014 is
 (1) Rs. 496 (2) Rs. 500 (3) Rs. 992 (4) Rs. 31
Ans. [1]
16. A is twice as good a workman as B and together they finish a piece of work in 14 days. In how many days can A alone finish the work ?
 (1) 7 days (2) 18 days (3) 21 days (4) 28 days
Ans. [3]
17. In binary system number 101101 is written in decimal system as
 (1) 35 (2) 45 (3) 40 (4) 50
Ans. [2]
18. The scientist who prepared sheep's clone was
 (1) Dr. Ian Wilmut (2) S.Cohen (3) H.Boyer (4) Watson and Crick
Ans. [1]
Sol. Dr. Ian Wilmut
19. In which marine algae maximum quantity of iodine is found ?
 (1) Dillisk (2) Spirogyra (3) Kelp (4) Ulothrix
Ans. [3]
Sol. Kelp
20. Example of totipotent cells in a living being is
 (1) Nerve cells (2) Blastomeres (3) Epithelial cell (4) Muscle cells
Ans. [2]
Sol. Blastomeres
21. Which bacteria is used to obtain human insulin ?
 (1) E.coli (2) Vibrio cholerae (3) Salmonella typhi (4) Mycobacterium leprae
Ans. [1]
Sol. E.coli
22. The technique used for removal of brain tumor is
 (1) Biotechnology (2) Tissue culture (3) Laser rays (4) Brachy therapy
Ans. [3]
Sol. Laser rays
23. Highest amount of which organic compound is found in Soyabean ?
 (1) Carbohydrate (2) Protein (3) Fat (4) Vitamin
Ans. [2]
Sol. Protein
24. The structure that transfers DNA from one animal to another is known as
 (1) Cloning (2) Explant (3) Interferon (4) Vector
Ans. [4]
Sol. Vector
25. The technique applied for testing position and activities of different structures in human body is
 (1) Chemotherapy (2) CT scan (3) X-ray (4) Biopsy
Ans. [2]
Sol. CT scan

General Knowledge Regarding Science (Question Nos. 1 to 25)

1. Weight of an object when we move it from pole to the equator -
 (1) increases (2) decreases (3) remains constant (4) none of these

Ans. [2]

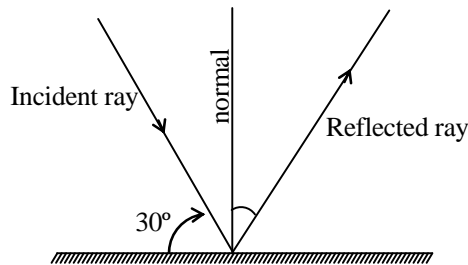
Sol. Weight of an object which we move it from pole to the equator is decreases.

2. The orbit of each planet of the solar system is -
 (1) circular (2) parabolic (3) elliptical (4) rectangular

Ans. [3]

Sol. The orbit of each planet of the solar system is elliptical.

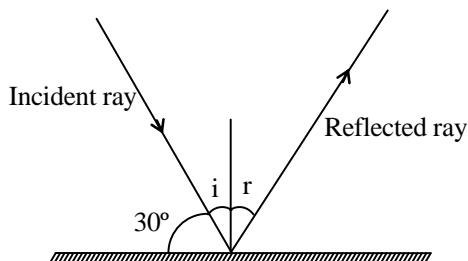
3. The angle of reflection in the figure is -



- (1) 60° (2) 90° (3) 30° (4) None of these

Ans. [1]

Sol. The angle of reflection is 60°



$$\angle i + 30^\circ = 90^\circ$$

$$\angle i = 60^\circ$$

$$\angle i = \angle r \text{ (law of reflection).}$$

$$\boxed{\angle r = 60^\circ}$$

4. Which lens is used to remove near-sightedness ?
 (1) Convex (2) Planoconvex (3) Planoconcave (4) Concave

Ans. [4]

Sol. Concave lens is used to remove near sightedness.

5. Household electrical appliances are connected in parallel so that -
- (1) uniform current flows (2) uniform voltage is received
 (3) energy consumption is high (4) none of these

Ans. [2]

Sol. Household electrical appliances are connected in parallel so that uniform voltage is received

6. The process on which the energy produced in the sun is based, is -
- (1) Nuclear fusion (2) Nuclear fission (3) Pair production (4) None of these

Ans. [1]

Sol. The process on which the energy produced in the sun is based, is nuclear fusion.

7. When an object is dipped in a liquid the force of buoyancy on the object is -
- (1) equal to the weight of the object
 (2) equal to the weight of the displaced liquid
 (3) equal to the twice the weight of the displaced liquid
 (4) none of these

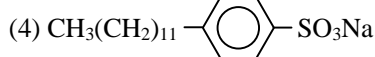
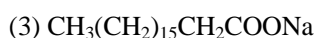
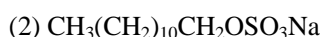
Ans. [2]

Sol. When an object is dipped in a liquid the force of buoyancy on the object is equal to the weight of the displaced liquid.

8. Hydrocarbon having highest octane number is -
- (1) Isohexane (2) n-hexane (3) Iso-octane (4) n-octane

Ans. [3]

9. The chemical formula related to soap is -
- (1) C_2H_5COONa



Ans. [3]

Sol. $CH_3(CH_2)_{15}CH_2COONa$

OR





10. The organic compound used as fire extinguisher is -

- (1) CO₂ (2) C₆H₆ (3) COCl₂ (4) CCl₄

Ans. [4]

11. The role of added gypsum during manufacture of cement is to -

- (1) facilitate gel formation (2) decrease rate of setting
(3) increase the weight of product (4) make the cement impervious

Ans. [2]

Sol. If Gypsum is not added, the cement will set immediately leaving no time for concrete placing.

12. A fuel having highest thermal value is -

- (1) Hydrogen (2) Petrol (3) LPG (4) CNG

Ans. [1]

Sol. Out of Petrol, LPG & CNG, H₂ is having highest calorific value around 150 kcal/kg.

13. The property not present in chlorofluorocarbon compound is -

- (1) non-toxic (2) non-corrosive (3) Volatility (4) inflammatory

Ans. [4]

14. A child was born on Friday, 1st October in a certain year. His age on Wednesday, 1st October, 2014 was -

- (1) 2 years (2) 5 years (3) 4 years (4) 6 years

Ans. [3]

15. If the bacteria of a laboratory jar doubles everyday and the whole jar is filled with bacteria in 30 days, then

number of days required to fill $\frac{1}{4}$ th of the jar is-

- (1) 14 days (2) 28 days (3) 30 days (4) 20 days

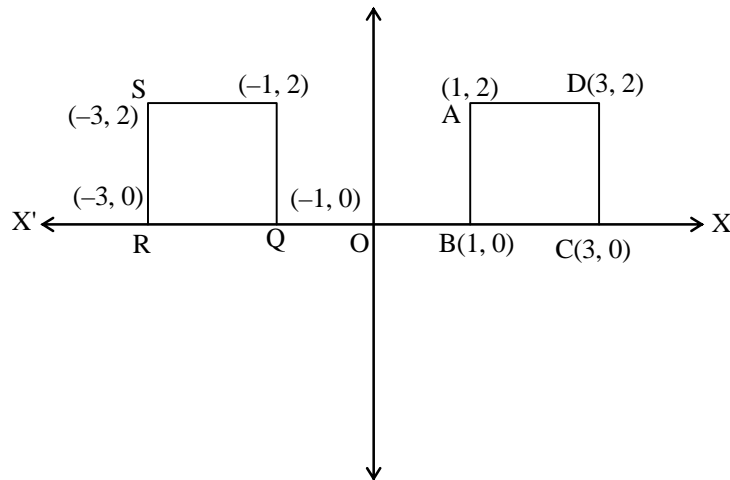
Ans. [2]

16. A motor boat goes upstream on a river and covers the distance between two towns on the river bank in 6 hours. It covers this distance downstream in 5 hours. If the speed of the stream is 2 km/hour, then the speed of motor boat in still water will be -

- (1) 20 km/hour (2) 22 km/hour (3) 29 km/hour (4) 25 km/hour

Ans. [2]

17. If in the given figure Y-axis works as a plane mirror then the image of point S(-3, 2) is –



- (1) A(1, 2) (2) B(1, 0) (3) D(3, 2) (4) C(3, 0)

Ans. [3]

18. Producers in food chain are -

- (1) Human (2) Plant (3) Frog (4) Insect

Ans. [2]

Sol. Plant

19. Mutation borne disease is -

- (1) Cancer (2) Haemophilia (3) AIDS (4) Colour blindness

Ans. [1]

Sol. Cancer

20. Disease caused by the deficiency of protein is -

- (1) Beri-beri (2) Scurvy (3) Kwashiorkor (4) Rickets

Ans. [3]

Sol. Kwashiorkor

21. World AIDS Day is celebrated on -

- (1) 7th July (2) 1st December (3) 7th April (4) 5th May

Ans. [2]

Sol. 1st December



22. The method used for preservation of liquid foodstuff is -

- (1) canning (2) dehydration (3) pasteurization (4) salt solution

Ans. [3]

Sol. Pasteurization

23. 'Grey revolution' is related to which production area ?

- (1) Fertilizer (2) Milk (3) Potato (4) Fish

Ans. [1]

Sol. Fertilizer

24. The field related with Amrita Devi Bishnoi National Award is -

- (1) Human conservation (2) Energy conservation
(3) Water conservation (4) Forest and wild life conservation

Ans. [4]

25. In India the largest wind energy farm is established at -

- (1) Mumbai (2) Bengaluru (3) Kanyakumari (4) Ahmedabad

Ans. [3]

Sol. Kanyakumari