

PHYSICS

91. One Newton is the force which produces an acceleration of
- (1) 1 m. s^{-2} on a body of mass 1 gm (2) 1 cm. s^{-2} on a body of mass 1 kg
 (3) 1 cm. s^{-2} on a body of mass 1 gm (4) 1 m. s^{-2} on a body of mass 1 kg

Sol. 4

$$F = ma$$

where

F = unbalanced force applied

m = mass of the body

a = acceleration of the body

When $m = 1 \text{ kg}$ and $F = 1 \text{ N}$

then

$$1 \text{ N} = 1 \text{ kg} \times a$$

$$a = \frac{1 \text{ N}}{1 \text{ kg}}$$

$$1 \text{ N} = 1 \text{ kg ms}^{-2}$$

$$\therefore a = \frac{1 \cancel{\text{kg}} \text{ ms}^{-2}}{1 \cancel{\text{kg}}}$$

$$\therefore a = 1 \text{ ms}^{-2}$$

92. Two objects of mass ratio 1 : 4 are dropped from the same height. The ratio between their velocities when they strike the ground is
- (1) Both objects will have the same velocity
 (2) The velocity of the first object is twice that of the second one
 (3) The velocity of the 2nd object is one fourth of that of the 1st object
 (4) The velocity of the 2nd object is 4 times that of the 1st one

Sol. 1

Let the masses of the two objects be m_1, m_2 .

Let u_1, u_2 be their initial velocities respectively. Let h be the height from where the objects are dropped.

Let v_1, v_2 be their final velocities respectively.

Let t_1, t_2 be the time taken to strike the ground

$$u_1 = u_2 = 0, \quad h_1 = h_2 = h$$

$$h = \frac{1}{2} g t_1^2 \quad \text{----(1)}$$

$$h = \frac{1}{2} g t_2^2 \quad \text{----(2)}$$

$$\therefore t_1 = t_2 = t = \sqrt{\frac{2h}{g}} \quad \text{----(3)}$$

now $v_1 = g t_1$ $v_2 = g t_2$

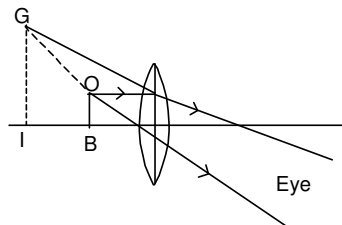
From equation (3)

$$v_1 = v_2 = g t$$

$$\therefore \frac{v_1}{v_2} = \frac{1}{1}$$

Sol. 4

In astronomical telescope 2 convex lens called eyepiece & objective lens are used and object is placed before eyepiece lens, such that final image inverted, a camera and eye also form inverted image on the screen. Whereas simple microscope gives an erect, virtual and enlarged image of the object placed between first principal focus and the optic nerve of the convex lens.



In a projector, the image formed is real, inverted magnified on the other side of the lens. This inverted image is again inverted by the film.

97. A charge of 1000 C flows through a conductor for 3 minutes and 20 seconds. Find the magnitude of current flowing through the conductor
 (1) 5A (2) 2A (3) 0.5 A (4) 10 A

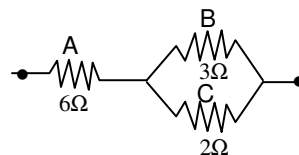
Sol. 1

Current flowing through a conductor is $I = \frac{Q}{t}$

Where Q = net charge flowing, t = time taken for net charge to flow, Q = 1000 C

$$t = 3 \text{ min } 20 \text{ sec, } 200 \text{ sec, } \therefore I = \frac{1000C}{200\text{sec}} = 5A$$

98. Three resistances A, B, C are connected as shown in the figure. Their resultant resistance is



- (1) 11Ω (2) 7.2Ω (3) 6Ω (4) 5Ω

Sol. 2

Resistors B and C are in parallel connection

\therefore Effective Resistance of B & C is

$$\frac{1}{R} = \frac{1}{B} + \frac{1}{C} = \frac{1}{3\Omega} + \frac{1}{2\Omega}$$

$$R = \frac{B \times C}{B + C} = \frac{3 \times 2}{3 + 2} = \frac{6}{5} \Omega$$

Resistor A is in series connection with B & C

$$\therefore \text{Total effective resistance} = A + R, = 6\Omega + \frac{6}{5}\Omega, = \frac{36}{5}\Omega, = 7.2\Omega$$

99. The particle with mass equal to 9.1×10^{-31} kg and charge equal to -1.6×10^{-19} C is...
 (1) β (2) α (3) γ (4) X

Sol. 1

α – particle is a doubly ionized helium atom (${}^4_2\text{He}$)

Its mass is 4 times mass of proton = 6.68×10^{-27} kg

Its charge is 2 times the charge of proton = 3.2×10^{-19} C

β – particles are electrons originating in the nucleus

Mass of an electron = 9.1×10^{-31} kg

Charge of an electron = -1.6×10^{-19} C

γ – rays are not particles but radiations

X – rays are not particles but EM radiation

100. The error and the correction to be made when the zeroth division of the head scale in a Screw gauge is above index line of the pitch scale respectively are

(1) positive, negative

(2) negative, negative

(3) negative, positive

(4) positive, negative

Sol. 3

In screw gauge

Negative zero error – If the zeroth division of the head scale is above the index line the error is said to be negative and the correction has to be positive.

Positive zero error – If the zeroth division of the head scale is below the index line of the pitch scale, the error is said to be positive and the correction is negative.

101. The isotopes that emit these radiations are used as radioactive tracers in medical science

(1) β – radiations

(2) γ – radiations

(3) α – radiations

(4) All the three

Sol. 2

γ – radiation emitted by radio isotopes are used as radioactive tracers in medical sciences.

γ – being EM radiations has more penetrating power than α and β particles and are unaffected by electric and magnetic fields.

102. The amount of heat energy required to raise the temperature of 1 kg of water through 1°C is ...

(1) Calorie

(2) Thermal capacity

(3) Specific heat

(4) Kilo calorie

Sol. 4

Calorie – The amount of heat energy required to raise the temperature of 1g of water through 1°C at a pressure of 1 atm.

Thermal capacity – The amount of heat energy required to produce a unit change of temperature in a unit mass of a substance.

Specific heat – The amount of heat energy required to raise the temperature of unit mass of a body through 1°C

Kilo calorie – The amount of heat energy required to raise the temperature of 1 kg of water through 1°C at 1 atm.

CHEMISTRY

103. Which of the following is Aromatic Hydrocarbon?

- (1) C_2H_2 (2) C_3H_8 (3) C_5H_{12} (4) C_6H_6

Sol. 4

The general formula for aromatic hydro carbons having benzene rings is C_nH_{2n-6y}

(where y: no. of benzene rings, $n \geq 6$)

If $n = 6$, $y = 1$ then C_nH_{2n-6y} become C_6H_6

So C_6H_6 is an aromatic hydrocarbon

\therefore C_2H_2 belongs to alkynes having general formula C_nH_{2n-2}

C_3H_8 belongs to alkanes having general formula C_nH_{2n+2}

C_5H_{12} belongs to alkanes having general formula C_nH_{2n+2}

104. In the Periodic Table, the Ionisation potential in a group from top to bottom.

- (1) increases (2) decreases (3) does not change (4) can not be predicted

Sol. 2

Ionisation potential is inversely proportional to atomic size

$$I.P \propto \frac{1}{\text{atomic size}}$$

In the periodic table atomic size in a group increases from top to bottom.

\therefore Ionisation potential in a group decreases from top to bottom.

105. The electronic configuration of Potassium is

- (1) $1s^2 2s^2 2p^6 3s^2 3p^3 4s^2 3d^2$ (2) $1s^2 2s^2 2p^6 3s^2 3p^5 4s^2$

- (3) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^1$ (4) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

Sol. 4

According to **Aufbau principle**, "orbitals are filled in order of their increasing energies". So orbital with lower $(n + l)$ value is filled up first.

The order of filling of various orbitals is as follow

1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f

Where $(n + l)$ for 3d is $3 + 2 = 5$

$(n + l)$ for 4s is $4 + 0 = 4$

So electronic configuration for potassium (K) whose atomic number 19 is

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

106. Most Electronegative element is

- (1) F (2) Cs (3) He (4) I

Sol. 1

Noble gases (He, Ne, Ar & Kr) have zero “electronegativities”. In the periodic table ‘**electronegativity**’ in periods increases left to right and in groups decreases top to bottom.

So halogens (F, Cl, Br, I) have high electronegativity in respective periods. Among them ‘F’ is most electronegative.

107. The amount of NaOH in 750 ml of 0.2 M solution (Molecular weight = 40) is –
 (1) 2 gm (2) 4 gm (3) 6gm (4) 8 gm

Sol. 3

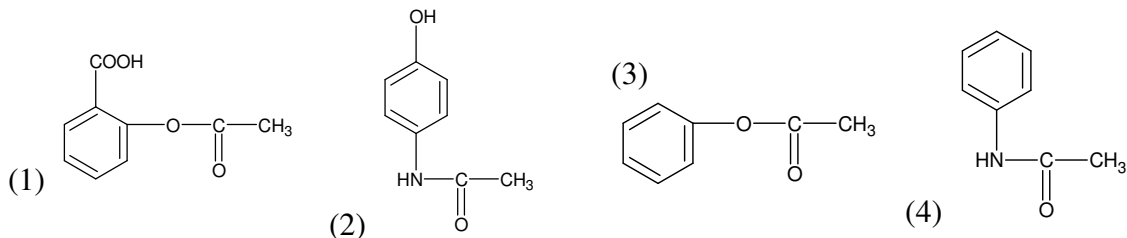
$$\text{Molarity of a solution (M)} = \frac{\text{mass of solute}}{\text{molar mass of solute}} \times \frac{1000}{\text{volume of solution in mL}}$$

Given molarity of NaOH solution = 0.2 M

Volume of NaOH solution = 750 mL

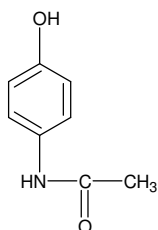
$$\begin{aligned} \text{So weight of NaOH} &= \frac{\text{molar mass of solute} \times \text{molarity} \times \text{volume of solution in mL}}{1000} \\ &= \frac{40 \times 0.2 \times 750}{1000} \\ &= 6\text{g} \end{aligned}$$

108. Structure of Paracetamol is



Sol. 2

Paracetamol is “Para acetamido phenol”



109. Molecule with double bond

(1) H₂ (2) F₂ (3) Cl₂ (4) O₂

Sol. 4

1) The electronic configuration of hydrogen is 1s¹

Diatomic molecule of hydrogen (H₂) is formed by s – s overlap leads to one σ-bond.

2) The electronic configuration of fluorine is $1s^2 2s^2 2p^5$

Diatomic molecule of fluorine (F_2) is formed by p – p overlap leads to one σ -bond.

3) The electronic configuration of Chlorine is $1s^2 2s^2 2p^6 3s^2 3p^5$

Diatomic molecule of chlorine (Cl_2) is formed by p – p overlap leads to one σ -bond.

4) The electronic configuration of oxygen is $1s^2 2s^2 2p^4$

Diatomic molecule of oxygen (O_2) is formed by one $p_z - p_z$ overlap leads to one σ -bond and side on overlap of $p_y - p_y$ leads to π -bond.

So O_2 contains a double bond.

110. Shaving soap contains excess of to slow lather drying

- (1) builders (2) Stearic acid (3) perfume (4) Glycerol

Sol. 2

Shaving soaps contain excess of stearic acid giving slow drying lather soap.

111. Acidity in the Sugarcane juice is removed by adding:

- (1) $Ca(OH)_2$ (2) CO_2 (3) SO_2 (4) H_2O

Sol. 1

The juice obtained from sugar cane is slightly acidic & contain some impurities.

$Ca(OH)_2$ is added to precipitate the impurities as well as to neutralise the juice

112. The chemical formula of Dolomite is

- (1) $Be_3Al_2(SiO_3)_6$ (2) $MgCl_2.KCl.6H_2O$ (3) $CaCO_3, MgCO_3$ (4) $MgSO_4.7H_2O$

Sol. 3

Dolomite is a double salt of calcium carbonate and magnesium carbonate i.e

$CaCO_3, MgCO_3$

113. If the pH of, a solution is 8, its $[H^+]$ is ...

- (1) $\log 10^{-8}$ (2) 10^8 (3) 10^{-8} (4) 8

Sol. 3

Given pH of solution is 8

$$pH = -\log_{10} [H^+] = 8$$

$$\log_{10} [H^+] = -8$$

$$[H^+] = 10^{-8} \text{ mol/L}$$

BIOLOGY

114. The process which helps in perpetuation of a race
(1) Nutrition (2) Photosynthesis (3) Excretion (4) Reproduction

Sol. 4
Reproduction is a life process, it maintains continuity of the species and a constant population number.

115. The product of Photosynthesis is transported from source of production to the storage organs through
(1) Palisade tissue (2) Phloem tissue (3) Spongy tissue (4) Xylem tissue

Sol. 2
The end product of photosynthesis is glucose [$C_6H_{12}O_6$] synthesized in leaves and transported to the storage organs such as Fruits, seeds and tubers through phloem tissue.

116. The cell organelle pertaining to energy release process is
(1) Lysosome (2) Chloroplast
(3) Mitochondria (4) Endoplasmic reticulum

Sol. 3
In the Aerobic respiration the complete oxidation of glucose takes place in mitochondria and energy stored in the form of ATP

117. The circulatory system in Cockroach consists of
- (1) heart, sinuses and alary muscles (2) Cardiac muscle, heart, blood vessels
(3) blood vessels, heart, atrium (4) Veins, heart and atrium

Sol. 1
Open circulatory system is seen cockroach in which blood flows through 13 chambered heart and sinuses (Body cavities). Alary muscles helps in contraction and relaxation of sinuses as well as heart chambers.

118. The major natural Auxin is
(1) IBA (2) 2, 4D (3) IAA (4) NAA

Sol. 3
IAA is a kind of Natural Auxin, 4-chloro IAA, and PAA are some other Natural Auxins. IBA, 2,4-D and NAA are the Synthetic Auxins commonly used in Horticulture industry.

119. The seat of intelligence, thinking and judgment in human brain is ----
(1) Cerebrum (2) Medulla oblongata
(3) Cerebellum (4) Mid brain

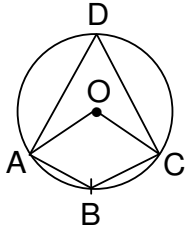
Sol. 1
Cerebrum controls several functions of the body. In cerebral cortex there are centers to receive and Analyse information. Ex :- Visual (sight) Auditory (hearing) and olfactory (smell)

120. Ramu collected epiphyllous buds from a plant. The plant from which he has collected these buds could be
(1) Murraya (2) Bryophyllum (3) Neem (4) Hibiscus

- Sol. 2
Vegetative propagation done through various vegetative parts (stem, roots and leaf) of the plant body. The leaf margins of Bryophyllum contains "Epiphyllous buds". Which can develop in to new plant under favourable conditions.
121. Identify the correct statement from below
(1) The Zygote develops into embryo-sac
(2) Synergids are situated near the chalazal end of embryosac
(3) Mature embryo-sac has eight cells
(4) Secondary nucleus in a mature embryo-sac is diploid
- Sol. 4
Embryosac in Angiosperms is commonly 7 celled and 8 nucleated condition. Two Haploid nuclei in central cell (or) polar cell together form Diploid Secondary nucleus. In mature embryosac. This will fuse with second male gamete to form triploid endosperm nucleus.
122. One of the following is a wrong combination
(1) Paramoecium - Exconjugats
(2) Clitellum – Earthworm
(3) Flies – Internal fertilization
(4) Amplexory pads – female frog
- Sol. 4
In male Frogs vocal sacs and Amplexory pads are part of the reproduction. Vocal sacs are responsible for the croaking sounds in the breeding season to attract females. Amplexory pads present on the index fingers of the fore limbs to push female frog Abdominal cavity during copulation.
123. An example for essential fatty acids is
(1) Glutamic acid (2) Aspartic acid (3) Linoleic acid (4) Tartaric acid
- Sol. 3
The major two essential fatty acids are linolic acid and linolenic acid. Which are not synthesized in our body, commonly taken through our diet.
124. The cell-division which is also known as reduction cell-division is
(1) Fission (2) Meiosis (3) Mitosis (4) Amitosis
- Sol. 2
Meiosis (or) Reduction division commonly takes place in reproductive cells. Daughter cells produce by this division are called gametes, commonly Haploid in condition.
125. In humans, disorders of nervous system are caused due to the deficiency of vitamin
(1) Pyridoxine (2) Retinol
(3) Phylloquinone (4) Ascorbic acid
- Sol. 1
Vitamin B_6 also known as Pyridoxine used in the metabolism of Amino Acids. Deficiency of B_6 results in Hypertension, Anaemia, Nausea and vomiting. In children pyridoxine deficiency causes convulsions.

MATHEMATICS

126. In the adjacent figure, if $\angle AOC = 110^\circ$, then the value of $\angle D$ and $\angle B$ respectively



- (1) $55^\circ, 125^\circ$ (2) $55^\circ, 110^\circ$ (3) $110^\circ, 25^\circ$ (4) $125^\circ, 55^\circ$

Sol. 1

Given $\angle AOC = 110^\circ$

$$\angle AOC = 2\angle ADC$$

$$\Rightarrow \angle ADC = 55^\circ$$

$$\angle B + \angle D = 180^\circ$$

$$\Rightarrow \angle B = 125^\circ$$

127. If $a = \frac{9}{\sqrt{11}-\sqrt{2}}$; $b = \frac{6}{3\sqrt{3}}$, then the relation between a and b is

- (1) $a < b$ (2) $a > b$ (3) $a + b > 1$ (4) $a \leq b$

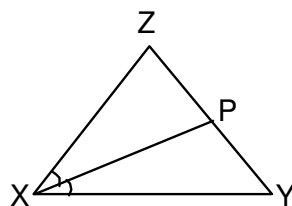
Sol. 2

$$a = \frac{9}{\sqrt{11}-\sqrt{2}} \times \frac{\sqrt{11}+\sqrt{2}}{\sqrt{11}+\sqrt{2}} = \sqrt{11} + \sqrt{2}$$

$$b = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

clearly $a > b$

128. In a $\triangle XYZ$, if the internal bisector of $\angle X$ meets YZ at 'P', then



- (1) $\frac{XY + XZ}{XZ} = \frac{YZ}{PZ}$ (2) $\frac{XY}{PZ} = \frac{XZ}{YP}$ (3) $\frac{XY}{XZ} = \frac{PZ}{YP}$ (4) $\frac{XZ}{XY} = \frac{YP}{YZ}$

Sol. 1

The internal bisector of $\angle X$ meets YZ at P

$$\frac{XY}{XZ} = \frac{YP}{PZ}$$

$$\Rightarrow \frac{XY}{XZ} + 1 = \frac{YP}{PZ} + 1$$

$$\Rightarrow \frac{XY + XZ}{XZ} = \frac{YP + PZ}{PZ} = \frac{YZ}{PZ}$$

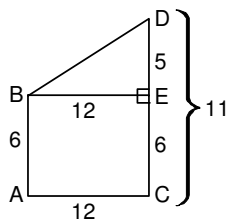
129. Two poles of height 6 m and 11 m stand vertically upright on a plane ground. If the distance between their feet is 12m, the distance between their tops is
- (1) 12 m (2) 14 m (3) 13 m (4) 11 m

Sol. 3

Let AB and CD be two poles such that AB = 6m, CD = 11m

Given AC = 12 m

ABEC is a rectangle, CE = 6m, ED = 5m and BE = 12m



$\triangle BED$ is a right angle triangle, $BD^2 = BE^2 + ED^2$

$$BD^2 = 12^2 + 5^2$$

$$BD = 13m$$

130. If 'r' and 's' are the roots of the equation $ax^2 + bx + c = 0$, then the value of $\frac{1}{r^2} + \frac{1}{s^2}$ is....

(1) $b^2 - 4ac$ (2) $\frac{b^2 - 4ac}{2a}$ (3) $\frac{b^2 - 4ac}{c^2}$ (4) $\frac{b^2 - 2ac}{c^2}$

Sol. 4

r and s are the roots of equation $ax^2 + bx + c = 0$

$$r + s = \frac{-b}{a}, \quad rs = \frac{c}{a}$$

$$\text{Now, } \frac{1}{r^2} + \frac{1}{s^2} = \frac{s^2 + r^2}{(rs)^2}$$

$$= \frac{(s+r)^2 - 2rs}{(rs)^2} = \frac{\frac{b^2}{a^2} - 2\frac{c}{a}}{\frac{c^2}{a^2}} = \frac{b^2 - 2ac}{c^2}$$

131. When the sum of the first ten terms of an A.P. is four times the sum of the first five terms. Then the k term is

(1) $a(2k+1)$ (2) $a(2k-1)$ (3) $2k+1$ (4) $2k+3$

Sol. 2

Let 'a' be the first term and 'd' be the common difference of an A.P.

Sum of first ten terms = 4 × sum of first five terms

$$\frac{10}{2}[2a + (10-1)d] = 4 \times \frac{5}{2}[2a + (5-1)d]$$

$$2a + 9d = 4a + 8d$$

$$2a = d \quad \dots(1)$$

kth term of an A.P. is $a + (k-1)d$

$$a + (k-1)2a \quad (\text{by (1)})$$

$$2ak - a = a(2k-1)$$

132. The value of $\left[\sqrt[3]{\sqrt[6]{a^9}}\right]^4 \left[\sqrt[6]{\sqrt[3]{a^9}}\right]^4$ is

(1) a^{16}

(2) a^{12}

(3) a^8

(4) a^4

Sol. 4

$$\begin{aligned} & \left[\sqrt[3]{a^{\frac{9}{6}}}\right]^4 \left[\sqrt[6]{a^{\frac{9}{3}}}\right]^4 \\ & \left[a^{\frac{9}{6} \cdot \frac{1}{3}}\right]^4 \left[a^{\frac{9}{3} \cdot \frac{1}{6}}\right]^4 \\ & a^2 \cdot a^2 = a^4 \end{aligned}$$

133. If the ratio of the legs of a right-angled triangle is 1:2, then the ratio of the corresponding segments of the hypotenuse made by a perpendicular upon it from the vertex will be

(1) 1 : 4

(2) 1 : $\sqrt{2}$

(3) 1 : 2

(4) 1 : $\sqrt{5}$

Sol. 1

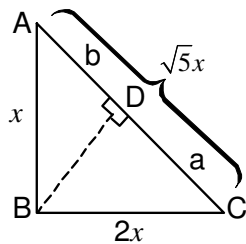
Given $\frac{AB}{BC} = \frac{1}{2}$

$AB = x, BC = 2x$

$\triangle ABC$ right angle, $AC = \sqrt{5}x$ and $BD \perp AC$,

Let $CD = a, AD = b$ and $BD = h$

$$a + b = \sqrt{5}x \quad \dots(1)$$



$\triangle BDC$ is right angle, $h^2 = 4x^2 - a^2$

$\triangle BDA$ is right angle, $h^2 = x^2 - b^2$

$$\Rightarrow 3x^2 = -a^2 + b^2$$

$$\Rightarrow 3x^2 = (b-a)(b+a)$$

$$\Rightarrow 3x^2 = (b-a)\sqrt{5}x \quad (\text{by (1)})$$

$$\frac{3}{\sqrt{5}}x = b-a \quad \dots(2)$$

from (1) & (2), $b = \frac{4x}{\sqrt{5}}, a = \frac{x}{\sqrt{5}} \Rightarrow \frac{a}{b} = \frac{1}{4}$

134. The sum of three numbers is 98. The ratio of the first to the second term is $\frac{2}{3}$ and the ratio of the second to the third is $\frac{5}{8}$. Then the second number is

(1) 15

(2) 20

(3) 30

(4) 32

Sol. 3

Let a, b, c be three numbers

Given $a + b + c = 98 \quad \dots(1)$

$$\text{and } \frac{a}{b} = \frac{2}{3}, \frac{b}{c} = \frac{5}{8}$$

$$a = \frac{2b}{3}, c = \frac{8b}{5}$$

$$\text{by (1), } \frac{2b}{3} + b + \frac{8b}{5} = 98$$

$$\frac{10b + 15b + 24b}{15} = 98$$

$$49b = 98 \times 15$$

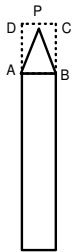
$$b = 30$$

135. A cylindrical pencil of diameter 1.2 cm has one of its ends sharpened into a conical shape of height 1.4 cm. The volume of the material removed is (in cub. cms)

- (1) 4.224 (2) 1.056 (3) 10.56 (4) 42.24

Sol. 2

Given : $h = 1.4$, $r = 0.6$



Volume of the material removed = Volume of cylinder ABCD – volume of cone APB

$$= \pi r^2 h - \frac{1}{3} \pi r^2 h$$

$$= \pi r^2 \left(\frac{2h}{3} \right)$$

$$= \pi \left(\frac{6}{10} \right)^2 \left(\frac{2}{3} \times \frac{14}{10} \right) = 1.056$$

136. If $f : R \rightarrow R$; $g : R \rightarrow R$ are functions defined by $f(x) = 3x - 1$; $g(x) = \sqrt{x + 6}$, then the value of $(g \circ f^{-1})(2009)$ is

- (1) 26 (2) 29 (3) 16 (4) 15

Sol. 1

Given $f(x) = 3x - 1$, $g(x) = \sqrt{x + 6}$

Let $y = f(x)$

$$y = 3x - 1$$

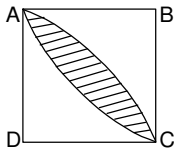
$$\Rightarrow f^{-1}(y) = x = \frac{y + 1}{3}$$

$$\Rightarrow f^{-1}(x) = \frac{x + 1}{3} \text{ and } g(x) = \sqrt{x + 6}$$

$$(g \circ f^{-1})(2009) = g(f^{-1}(2009)) = g\left(\frac{2009 + 1}{3}\right) = g\left(\frac{2010}{3}\right)$$

$$= \sqrt{\frac{2010}{3} + 6} = \sqrt{\frac{2028}{3}} = 26$$

137. In the diagram, a squared ABCD has a side with a length of 6 cm. Circular arcs of radius 6 cm are drawn with centres B and D. What is the area of the shaded region in sq. cm. ?



- (1) 18π (2) 36π (3) $18\pi - 24$ (4) $18\pi - 36$

Sol. 4

$$\begin{aligned} \text{area of sector BAC} &= 9\pi \\ \text{area of sector DAC} &= 9\pi \\ \text{required area} &= \text{sum of area of two sectors} - \text{area of square} \\ &= (9\pi + 9\pi) - 36 = 18\pi - 36 \end{aligned}$$

138. How many numbers between 3000 and 4000 can be formed from the digits 3, 4, 5, 6, 7 and 8; no digits being repeated in any number

- (1) 20 Nos. (2) 15 Nos. (3) 60 Nos. (4) 120 Nos.

Sol. 3



$$\begin{aligned} \text{The first place filled with 3} & \quad - 1 \text{ way} \\ \text{Second place} & \quad - 5 \text{ ways} \\ \text{Third place} & \quad - 4 \text{ ways} \\ \text{Fourth place} & \quad - 3 \text{ ways} \\ \text{Total numbers} & = 1 \times 5 \times 4 \times 3 = 60 \end{aligned}$$

139. If $\log_{10} 2 = 0.3010$, then the number of digits in 256^{50} is

- (1) 120 (2) 121 (3) 256 (4) 50

Sol. 2

$$\begin{aligned} \text{Let } x &= 256^{50} \\ \log x &= 50 \log_{10} 256 \\ \log x &= 50 \log_{10} 2^8 \\ &= 400 \log_{10}^2 \\ &= 400 \times (0.3010) \\ \log x &= 120.4 \end{aligned}$$

number of digits in 256^{50} is $120 + 1 = 121$.

140. If $\sin A$, $\cos A$ and $\tan A$ are in Geometric Progression, then $\cot^6 A - \cot^2 A$ is

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

Sol. 4

Given $\sin A$, $\cos A$ and $\tan A$ are in G.P.

$$\cos^2 A = \sin A \cdot \tan A$$

$$\Rightarrow \cos^3 A = \sin^2 A$$

$$\Rightarrow \cot^3 A = \operatorname{cosec} A$$

squaring on both sides

$$\cot^6 A = \operatorname{cosec}^2 A$$

$$\cot^6 A = 1 + \cot^2 A$$

$$\cot^6 A - \cot^2 A = 1$$

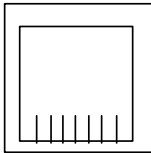
141. A chess-board contains 64 equal squares and the area of each square is 6.25 cm^2 . An inside border round the board is 2 cm. wide. The length of the chess-board is
- (1) 8 cm (2) 24 cm (3) 12 cm (d) 16 cm

Sol. 2

Area of each square is 6.25 cm^2

Let 'x' be the side of each square, $x^2 = \frac{625}{100}$

$$x = \frac{5}{2}$$



Length of the chess board = $2 \times$ border round wide + $8 \times$ each square length

$$= 2 \times 2 + 8 \times \frac{5}{2} \text{ cm}$$

$$= 4 + 20 \text{ cm}$$

$$= 24 \text{ cm}$$

142. The value of $\log_{\sqrt{2}} \cdot \sqrt{2\sqrt{2\sqrt{2\sqrt{2\sqrt{2}}}}}$ is....

(1) $\frac{31}{32}$

(2) $\frac{31}{4}$

(3) $\frac{31}{8}$

(4) None

Sol. 3

$$\sqrt{2\sqrt{2\sqrt{2\sqrt{2\sqrt{2}}}}} \dots n \text{ times} = 2^{1-\frac{1}{2^n}}$$

$$\log_{2^{1/4}} 2^{1-\frac{1}{2^5}} = \log_{2^{1/4}} 2^{\frac{31}{32}} = \frac{31}{32} \times 4 \log_2 2$$

$$= \frac{31}{8}$$

143. Equation of the line passing through $(-1, 2)$ and perpendicular to $x - y + 2 = 0$ is
- (1) $x + y = 1$ (2) $x - y = 1$ (3) $x + y = 2$ (4) $x - y + 1 = 0$

Sol. 1

Slope of given line $x - y + 2 = 0$ is 1

Slope of required line is -1

The equation of line passing through $(-1, 2)$ having slope -1 is $y - 2 = -1(x + 1)$

$$x + y = 1$$

144. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ and $A^2 - 4A - nI = 0$, then 'n' is equal to....

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

Sol. 2

$$A^2 = A \cdot A$$

$$= \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 5 & -4 \\ -4 & 5 \end{bmatrix}$$

$$A^2 - 4A = \begin{bmatrix} 5 & -4 \\ -4 & 4 \end{bmatrix} - 4 \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 5 & -4 \\ -4 & 5 \end{bmatrix} - \begin{bmatrix} 8 & -4 \\ -4 & 8 \end{bmatrix}$$

$$= \begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}$$

$$= -3I$$

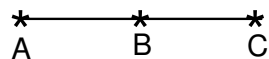
$$A^2 - 4A + 3I = 0 \Rightarrow n = -3$$

145. If $A(-2,5)$ and $B(3,2)$ are the two points on a straight line. If \overline{AB} is extended to 'C' such that $AC = 2BC$, then the co-ordinates of 'C' are

- (1) $\left(\frac{1}{2}, \frac{3}{2}\right)$ (2) $\left(\frac{7}{2}, \frac{1}{2}\right)$ (3) (8,-1) (4) (-1,8)

Sol. 3

Given $\frac{AC}{BC} = \frac{2}{1}$ where $A(-2,5)$ and $B(3,2)$



'C' divides the line \overline{AB} externally in the ratio 2 : 1

$$C \left(\frac{2(3) - 1(-2)}{2-1}, \frac{2(2) - 1(5)}{2-1} \right)$$

$$C(8,-1)$$

HISTORY

146. He was known as the father of history writing
 (1) Thucydes (2) Plutarch (3) Herodotus (4) Democritis

Sol. 3
 Herodotus was known as the father of history and the other options are incorrect.

147. "Crusader", means
 (1) A procedure adopted to propagate religion
 (2) Priests
 (3) Local Governors during Roman's period
 (4) Religious wars fought between Christians and Muslims

Sol. 4
 These are the religious wars fought between Christians and Muslims and other options are incorrect. These wars happened in medieval period.

148. The picture given below relates to



- (1) Humayuns tomb (2) Akbar's tomb
 (3) Panch Mahal (4) Diwan-a-Khas

Sol. 3
 The given picture is Panch Mahal built during Akbar period.

149. In western countries the influence of Renaissance took place between
 (1) 500 – 1500 A.D. (2) 500 – 1800 A.D.
 (3) 1300 – 1500 A.D. (4) 1300 – 1800 A.D.

Sol. 1
 Renaissance took place in western countries between 500 – 1500 AD and eastern countries between 500 – 1800 AD

150. "Boston tea party" means
 (1) A party unloading a ship containing tea at Boston
 (2) The event where the ship containing tea was unloaded on the orders of Governor of Boston duly throwing the crates of tea in sea
 (3) A tea party arranged by a group of people dressed as Red Indians at Boston
 (4) A tea party arranged by the Governor of Boston in honour of Red Indians.

Sol. 2
 It was an event held just before the American war of independence, infact its not a party, historians described it since the tea chests were thrown in sea.

151. This was not the guiding principle of Congress of Vienna
 (1) Restoration and legitimacy (2) Balance of power and compensation
 (3) Rewards and punishments (4) Principles and feelings of Nationality

Sol. 4
 Principles & feelings of Nationality was not the principle it should be compensation.

152. He entered Prussian civil service, but returned out with the remark, “deficiency in regularity and discipline”
 (1) Napoleon (2) Karl Marx (3) Bismarck (4) Louis Blanc

Sol. 3
 Bismarck was only the right option, the rest people were not form Prussia.

153. This was not one of the factors in the rise of Imperialism
 (1) Political unrest (2) Search for Raw material
 (3) Search for markets (4) National pride

Sol. 1
 Political unrest was not the factor, it must be political factor.

154. The immediate cause for the First World War
 (1) Aggressive Nationalism (2) Imperialism
 (3) Secret alliance
 (4) Murder of the crown prince of Austria

Sol. 4
 Since the asked question is was immediate cause so it must be 4th option, other options are other causes of world war I.

155. Europeans were attracted to Indonesia for this reason
 (1) It is a small country (2) It has rich spice products
 (3) Majority of the population are muslims (4) It has a large number of ethnic groups

Sol. 2
 Since the Europeans required spice products, they were available in plenty in Indonesia.

GEOGRAPHY

156. The ‘Monsoons’ provide the best example for
 (1) The trade winds (2) The westerlies
 (3) The seasonal winds (4) The local winds

Sol. 3
 Monsoon are seasonal winds, the word monsoon is derived from Arabic which means season

157. The conventional symbol used in weather reports for Thunderstorm
 (1)

Sol. 1
 R It is correct, others are incorrect

158. The largest producer of Sulphur in the World
 (1) Indonesia (2) Mexico (3) Malaysia (4) Brazil

Sol. 2
 Mexico – Sulphur, Indonesia – Rubber, Malaysia – Tin, Brazil - Coffee

159. The primitive tribe that is found in hot deserts
 (1) The Semang (2) The Pygmies (3) The Sakai (4) The Bushmen

Sol. 4
 Bushmen in Kalahari and the rest are in equatorial region

160. The grasslands of Eurasia are called as
 (1) Veldts (2) Pampas (3) Downs (4) Steppes

Sol. 4
 Steppes – Eurasia, Veldts – South Africa, Downs – Australia, Pampas – South America

161. In Indo-Gangetic plains, the older alluvium of flood plain is called as
 (1) Bhangar (2) Khadar (3) Terai (4) Babar

Sol. 1
 Older flood plain – Bhangar }
 Newer flood plain – Kadar } Jerai – Marshy track.

162. The soil that has very poor fertility status
 (1) Alluvial soils (2) Black cotton or regular soils
 (3) Laterite soils (4) Red soils

Sol. 3
 The rest soils are good in fertility

163. The multipurpose project that is administered by Madhya Pradesh and Rajasthan
 (1) Damodar valley project (2) Chambal project
 (3) Kosi project (4) Hirakund project

Sol. 2
 Chambal project – MP, Rajasthan Damodar – WB
 Kosi – Bihar Hiracud - Orissa

164. The non-metallic mineral among the following
 (1) Graphite (2) Chromite (3) Bauxite (4) Tungston

Sol. 1
 The other options are metallic

165. This is the single largest item of import
 (1) Fertilisers (2) Newsprint
 (3) Petroleum (4) Machinery equipment

Sol. 3
 The other options are small items of import

POLITICAL SCIENCE

166. The example for the subject included in the concurrent list
 (1) Health (2) Forests (3) Education (4) Protection of life

Sol. 3
 The rest are added in state list.

167. This was added in the preamble to the constitution through 42nd constitutional amendment
 (1) Socialist (2) Democratic (3) Sovereign (4) Republic

Sol. 1
 The rest ideals were in constitution from its force i.e. 26 Jan 1950.

168. The names of States and allocation of seats to each state are given below in a jumbled manner

| State | Lok Sabha seats |
|--------------------|-----------------|
| (i) Andhra Pradesh | (a) 48 |
| (ii) Bihar | (b) 39 |
| (iii) Tamil Nadu | (c) 40 |
| (iv) Maharashtra | (d) 42 |

Identify the correct match

- (1) (iii) – (b) (2) (iv) – (c) (3) (ii) – (d) (4) (i) – (a)

Sol.

1
AP – 42, TN – 39, Maharashtra – 48, Bihar – 40

169. Among the nine signals used to regulate flow of traffic, the picture given below relates to

- (1) Second signal (2) First signal (3) Fourth signal (4) Third signal

Sol.

4
It is used to stop the vehicles coming from front & behind (third no.)

170. The population of a village is between 500 to 1500. The number of members to be elected to the gram panchayat

- (1) 5 (b) 7 (c) 9 (d) 11

Sol.

3
As per electoral division, it is correct

171. Rule of laws means

- (1) Law spelt out in terms of rules and regulation
(2) Equal law related to the whole country
(3) Law related to judiciary
(4) Law that does not recognized any special privilege based on birth or wealth

Sol.

4
All are equal no special previlage based birth & wealth, all are equal

172. In India, the first general elections were held in this year

- (1) 1951 (2) 1952 (3) 1950 (4) 1947

Sol.

2
Based on the UAF, in 1952 held

173. The term ‘Third World’ represents

- (1) A large number of newly independent and developing nations
(2) A large number of developed nations
(3) A large number of socialist countries
(4) A large number of western group of nations

Sol.

1
The other options are 1st & 2nd world countries.

174. The international court of Justice is located in this place

- (1) New York (2) Paris (3) Hague (4) Yugoslavia

Sol.

3
It is located in the Hague in Netherland

