# FIITJEE Solutions to 

NTSE - 2012 - Stage I (Andhra Pradesh State) (For class X Students)

## Paper - 1 SAT

DATE OF EXAM: 18-11-2012

Time : 90 Minutes
Max marks: 90

## INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you answer the question. Answers are to be SHADED on a SEPARATE OMR Answer sheet given, with HB pencil. Read the Instructions printed on the OMR 2 sheet carefully before answering the questions.
(i) Subjects Questions SI. No. and Marks allotted:-

| (1) Physics | 91 to 102 Questions | 12 Marks |
| :--- | :--- | :--- |
| (2 Chemistry | 103 to 113 Questions | 11 Marks |
| (3) Biology | 114 to 125 Questions | 12 Marks |
| (4) Mathematics | 126 to 145 Questions | 20 Marks |
| (5) History | 146 to 155 Questions | 10 Marks |
| (6) Geography | 56 to 165 Questions | 10 Marks |
| (7) Political Science | 166 to 175 Questions | 10 Marks |
| (8) Economics | 176 to 180 Questions | 05 Marks |

(ii) SHADE the circle having the correct alternative in the OMR sheet provided, from among the ones given against the corresponding question in the Question Paper Booklet. For shading the circles, use HE pencil.

## PHYSICS

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

Sol. 4
$\mathrm{F}=\mathrm{ma}$
where $\quad \mathrm{F}=$ unbalanced force applied
$\mathrm{m}=$ mass of the body
$\mathrm{a}=$ acceleration of the body
When $\mathrm{m}=1 \mathrm{~kg}$ and $\mathrm{F}=1 \mathrm{~N}$
then
$1 \mathrm{~N}=1 \mathrm{~kg} \mathrm{xa}$
$\mathrm{a}=\frac{1 \mathrm{~N}}{1 \mathrm{~kg}}$
$1 \mathrm{~N}=1 \mathrm{~kg} \mathrm{~ms}^{-2}$
$\therefore a=\frac{1 \mathrm{~kg} \mathrm{~ms}}{} \mathrm{~m}^{-2}$
$\therefore a=1 \mathrm{~ms}^{-2}$
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 $2^{\text {nd }}$ object is one fourth of that of the $1^{\text {st }}$ object
(4) The velocity of the $2^{\text {nd }}$ object is 4 times that of the $1^{\text {st }}$ 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 the their final velocities respectively.
Let $t_{1}, t_{2}$ be the time taken to strike the ground
$u_{1}=u_{2}=0, h_{1}=h_{2}=h$
$h=\frac{1}{2} g t_{1}^{2}$
$h=\frac{1}{2} g t_{2}^{2}$
$\therefore \quad t_{1}=t_{2}=t=\sqrt{\frac{2 h}{g}}$
now $v_{1}=g t_{1} \quad v_{2}=g t_{2}$
From equation (3)
$v_{1}=v_{2}=g t$
$\therefore \frac{v_{1}}{v_{2}}=\frac{1}{1}$
93. The electromagnetic radiations used for taking photographs of objects in dark
(1) X-rays
(2) Infra-red rays
(3) $\gamma$-rays
(4) UV rays

Sol. 2
Infrared radiations find applications in physio - therapy and are used to take photographs of objects in darkenss.
94. The work done by a force on a body will be positive if the body
(1) moves perpendicular to the direction of applied force
(2) does not move
(3) moves along the direction of applied force
(4) moves opposite to the direction of applied force

Sol. 3
Work done by a force on a body $=F s \cos \theta$
where $\quad \mathrm{F}=$ Force acting on the body
$\mathrm{s}=$ Displacement due to the force applied
$\theta=$ Angle between F and s
Work done will be positive if $\cos \theta$ is positive i.e. $0 \leq \theta<90^{\circ}$
When the body moves along the direction of applied force $\theta=0^{\circ}$

$$
\therefore \quad \cos 0^{\circ}=1
$$

Work done $=$ Fs
$\therefore$ Work done here is positive.
95. Identify the energy changes in the following two cases -

A : A car moving up a hill
B : Photographic film is exposed to sun-light
(1) In 'A' mechanical energy in moving car is converted to potential energy and in ' $B$ ' potential energy is converted to chemical energy
(2) In ' $A$ ' potential energy in moving car is converted to kinetic energy and in ' $B$ ' chemical energy is converted to light energy
(3) In ' $A$ ' kinetic energy in moving car is converted to potential energy and in ' $B$ ' potential energy is converted to light energy
(4) In ' $A$ ' kinetic energy in moving car is converted to potential energy and in ' $B$ ' light energy is converted to chemical energy

Sol. 4
A : A car moving up a hill
Moving car has kinetic energy, kinetic energy gets converted to potential energy
B : Photographic film is exposed to sun - light
When photographic film is exposed to sun the silver bromide present in it decomposes such that the film cannot be developed.
$\therefore$ Light energy gets converted to chemical energy.
96. The instrument that is based on the principle that when an object is placed between first principal focus and the optic centre of convex lens, an upright, virtual and enlarged image on the same side of the object is formed, is
(1) Telescope
(2) Projector
(3) Camera
(4) Simple microscope

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) 5 A
(2) 2 A
(3) 0.5 A
(4) 10 A

Sol. 1
Current flowing through a conductor is $I=\frac{Q}{t}$
Where $\mathrm{Q}=$ net charge flowing, $\mathrm{t}=$ time taken for net charge to flow, $\mathrm{Q}=1000 \mathrm{C}$
$\mathrm{t}=3 \mathrm{~min} 20 \mathrm{sec}, 200 \mathrm{sec}, \therefore \therefore I=\frac{1000 \mathrm{C}}{200 \mathrm{sec}}=5 \mathrm{~A}$
98. Three resistances A, B, C are connected as shown in the figure. Their resultant resistance is

(1) $11 \Omega$
(2) $7.2 \Omega$
(3) $6 \Omega$
(4) $5 \Omega$

Sol. 2
Resistors B and C are in parallel connection
$\therefore$ Effective Resistance of $\mathrm{B} \& \mathrm{C}$ 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 $\mathrm{B} \& \mathrm{C}$
$\therefore$ Total effective resistance $=\mathrm{A}+\mathrm{R},=6 \Omega+\frac{6}{5} \Omega,=\frac{36}{5} \Omega,=7.2 \Omega$
99. The particle with mass equal to $9.1 \times 10^{-31} \mathrm{~kg}$ and charge equal to $-1.6 \times 10^{-19} \mathrm{C}$ is...
(1) $\beta$
(2) $\alpha$
(3) $\gamma$
(4) X

Sol. 1
$\alpha$ - particle is a doubly ionized helium atom $\left({ }_{2}^{4} \mathrm{He}\right)$
Its mass is 4 times mass of proton $=6.68 \times 10^{-27} \mathrm{~kg}$
Its charge is 2 times the charge of proton $=3.2 \times 10^{-19} \mathrm{C}$
$\beta$ - particles are electrons originating in the nucleus
Mass of an electron $=9.1 \times 10^{-31} \mathrm{~kg}$
Charge of an electron $=-1.6 \times 10^{-19} \mathrm{C}$
$\gamma$-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) $\beta$ - radiations
(2) $\gamma$-radiations
(3) $\alpha$ - radiations
(4) All the three

Sol. 2
$\gamma$ - radiation emitted by radio isotopes are used as radioactive tracers in medical sciences.
$\gamma$ - being EM radiations has more penetrating power than $\alpha$ and $\beta$ 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 $1^{\circ} \mathrm{C}$ 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 1 g of water through $1^{\circ} \mathrm{C}$ 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 $1^{\circ} \mathrm{C}$
Kilo calorie - The amount of heat energy required to raise the temperature of 1 kg of water through $1^{\circ} \mathrm{C}$ at 1 atm .

## CHEMISTRY

103. Which of the following is Aromatic Hydrocarbon?
(1) $\mathrm{C}_{2} \mathrm{H}_{2}$
(2) $\mathrm{C}_{3} \mathrm{H}_{8}$
(3) $\mathrm{C}_{5} \mathrm{H}_{12}$
(4) $\mathrm{C}_{6} \mathrm{H}_{6}$

Sol. 4
The general formula for aromatic hydro carbons having benzene rings is $C_{n} H_{2 n-6 y}$
(where y: no. of benzene rings, $n \geq 6$ )
If $\mathrm{n}=6, \quad \mathrm{y}=1$ then $C_{n} H_{2 n-6 y}$ become $\mathrm{C}_{6} \mathrm{H}_{6}$
So $\mathrm{C}_{6} \mathrm{H}_{6}$ is an aromatic hydrocarbon
$\because \quad \mathrm{C}_{2} \mathrm{H}_{6}$ belongs to alkynes having general formula $\mathrm{C}_{\mathrm{n}} \mathrm{H}_{2 \mathrm{n}-2}$
$\mathrm{C}_{3} \mathrm{H}_{8}$ belongs to alkanes having general formula $\mathrm{C}_{\mathrm{n}} \mathrm{H}_{2 \mathrm{n}+2}$
$\mathrm{C}_{5} \mathrm{H}_{12}$ belongs to alkanes having general formula $\mathrm{C}_{\mathrm{n}} \mathrm{H}_{2 \mathrm{n}+2}$
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 $\qquad$
(l) $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{3} 4 s^{2} 3 d^{2}$
(2) $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{5} 4 s^{2}$
(3) $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 3 d^{1}$
(4) $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 4 s^{1}$

Sol. 4
According to Aufbau principle, "orbitals are filled in order of their increasing energies". So orbital with lower $(\mathrm{n}+l)$ value is filled up first.
The order of filling of various orbitals is as follow
$1 \mathrm{~s}, 2 \mathrm{~s}, 2 \mathrm{p}, 3 \mathrm{~s}, 3 \mathrm{p}, 4 \mathrm{~s}, 3 \mathrm{~d}, 4 \mathrm{p}, 5 \mathrm{~s}, 4 \mathrm{~d}, 5 \mathrm{p}, 6 \mathrm{~s}, 4 \mathrm{f}$ $\qquad$
Where $(\mathrm{n}+l)$ for 3 d is $3+2=5$
$(\mathrm{n}+l)$ for 4 s is $4+0=4$
So electronic configuration for potassium (K) whose atomic number 19 is $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{6} 4 s^{1}$
106. Most Electronegative element is
(1) F
(2) Cs
(3) He
(4) I

Sol. 1

Noble gases ( $\mathrm{He}, \mathrm{Ne}, \mathrm{Ar} \& \mathrm{Kr}$ ) have zero "electronegativities". In the periodic table 'electronegativity' in periods increases left to right and in groups decreases top to bottom.

So halogens ( $\mathrm{F}, \mathrm{Cl}, \mathrm{Br}, \mathrm{I}$ ) 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) 6 gm
(4) 8 gm

Sol. 3
Molarity of a solution $(M)=\frac{\text { mass of solute }}{\text { molar mass of solute }} \times \frac{1000}{\text { volume of solution in } m L}$
Given molarity of NaOH solution $=0.2 \mathrm{M}$
Volume of NaOH solution $=750 \mathrm{~mL}$
So weight of $\mathrm{NaOH}=\frac{\text { molar mass of solute } \times \text { molarity } \times \text { volume of solution in } m L}{1000}$

$$
\begin{aligned}
& =\frac{40 \times 0.2 \times 750}{1000} \\
& =6 \mathrm{~g}
\end{aligned}
$$

108. Structure of Paracetamol is
(1)

(2)


(4)


Sol. 2
Paracetamol is "Para acetamido phenol"

109. Molecule with double bond
(1) $\mathrm{H}_{2}$
(2) $F_{2}$
(3) $\mathrm{Cl}_{2}$
(4) $\mathrm{O}_{2}$

Sol. 4

1) The electronic configuration of hydrogen is $1 \mathrm{~s}^{1}$

Diatomic molecule of hydrogen $\left(\mathrm{H}_{2}\right)$ is formed by $\mathrm{s}-\mathrm{s}$ overlap leads to one $\sigma$-bond.
2) The electronic configuration of fluorine is $1 s^{2} 2 s^{2} 2 p^{5}$

Diatomic molecule of fluorine $\left(\mathrm{F}_{2}\right)$ is formed by p - p overlap leads to one $\sigma$-bond.
3) The electronic configuration of Chlorine is $1 s^{2} 2 s^{2} 2 p^{6} 3 s^{2} 3 p^{5}$

Diatomic molecule of chlorine $\left(\mathrm{Cl}_{2}\right)$ is formed by p - p overlap leads to one $\sigma$-bond.
4) The electronic configuration of oxygen is $1 s^{2} 2 s^{2} 2 p^{4}$

Diatomic molecule of oxygen $\left(\mathrm{O}_{2}\right)$ is formed by one $\mathrm{p}_{\mathrm{z}}-\mathrm{p}_{\mathrm{z}}$ overlap leads to one $\sigma$-bond and side on overlap of $p_{y}-p_{y}$ leads to $\pi$-bond.

So $\mathrm{O}_{2}$ 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) $\mathrm{Ca}(\mathrm{OH})_{2}$
(2) $\mathrm{CO}_{2}$
(3) $\mathrm{SO}_{2}$
(4) $\mathrm{H}_{2} \mathrm{O}$

Sol. 1
The juice obtained from sugar cane is slightly acidic \& contain some impurities. $\mathrm{Ca}(\mathrm{OH})_{2}$ is added to precipitate the impurities as well as to neutralise the juice
112. The chemical formula of Dolomite is $\qquad$
(1) $\mathrm{Be}_{3} \mathrm{Al}_{2}\left(\mathrm{SiO}_{3}\right)_{6}$
(2) $\mathrm{MgCI}_{2} \cdot \mathrm{KCl} \cdot 6 \mathrm{H}_{2} \mathrm{O}$
(3) $\mathrm{CaCO}_{3}, \mathrm{MgCO}_{3}$
(4) $\mathrm{MgSO}_{4} \cdot 7 \mathrm{H}_{2} \mathrm{O}$

Sol. 3
Dolomite is a double salt of calcium carbonate and magnesium carbonate i.e $\mathrm{CaCO}_{3}, \mathrm{MgCO}_{3}$
113. If the pH of, a solution is 8 , .its $\left[\mathrm{H}^{+}\right]$is ...
(1) $\log 10^{-8}$
(2) $10^{8}$
(3) $10^{-8}$
(4) 8

Sol. 3
Given pH of solution is 8
$\mathrm{pH}=-\log _{10}\left[H^{+}\right]=8$
$\log _{10}\left[H^{+}\right]=-8$
$\left[\mathrm{H}^{+}\right]=10^{-8} \mathrm{~mol} / \mathrm{L}$

## 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 $\left[\mathrm{C}_{6} \mathrm{H}_{12} \mathrm{O}_{6}\right]$ 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) $2,4 \mathrm{D}$
(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) Hibuscus

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) Ampluxory pads - female frog

Sol. 4
In male Frogs vocal sacs and Ampluxory pads are part of the reproduction. Vocal sacs are responsible for the croaking sounds in the breeding season to attract females. Ampluxory 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 $\angle A O C=110^{\circ}$, 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 $\left\lfloor A O C=110^{\circ}\right.$
$\lfloor A O C=2\lfloor A D C$
$\Rightarrow \mid A D C=55^{\circ}$
$\underline{B}+\mid D=180^{\circ}$
$\Rightarrow \mid B=125^{\circ}$
127. If $a=\frac{9}{\sqrt{11}-\sqrt{2}} ; b=\frac{6}{3 \sqrt{3}}$, then the relation between $a$ and $b$ is $\ldots$.
(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 $\triangle X Y Z$, if the internal bisector of $\angle X$ meets YZ at ' P ', then $\ldots$.

(1) $\frac{X Y+X Z}{X Z}=\frac{Y Z}{P Z}$
(2) $\frac{X Y}{P Z}=\frac{X Z}{Y P}$
(3) $\frac{X Y}{X Z}=\frac{P Z}{Y P}$
(4) $\frac{X Z}{X Y}=\frac{Y P}{Y Z}$

Sol. 1
The internal bisector of $\lfloor X$ meets YZ at P
$\frac{X Y}{X Z}=\frac{Y P}{P Z}$
$\Rightarrow \frac{X Y}{X Z}+1=\frac{Y P}{P Z}+1$
$\Rightarrow \frac{X Y+X Z}{X Z}=\frac{Y P+P Z}{P Z}=\frac{Y Z}{P Z}$
129. Two poles of height 6 m and 11 m stand vertically upright on a plane ground. If the distance between their feet is 12 m , the distance between their tops is
(1) 12 m
(2) 14 m
(3) 13 m
(4) 11 m

Sol. 3
Let $A B$ and $C D$ be two poles such that $A B=6 m, C D=11 \mathrm{~m}$
Given $\mathrm{AC}=12 \mathrm{~m}$
ABEC is a rectangle, $\mathrm{CE}=6 \mathrm{~m}, \mathrm{ED}=5 \mathrm{~m}$ and $\mathrm{BE}=12 \mathrm{~m}$

$\triangle B E D$ is a right angle triangle, $B D^{2}=B E^{2}+E D^{2}$

$$
\begin{aligned}
& B D^{2}=12^{2}+5^{2} \\
& B D=13 m
\end{aligned}
$$

130. If ' $r$ ' and ' $s$ ' are the roots of the equation $a x^{2}+b x+c=0$, then the value of $\frac{1}{r^{2}}+\frac{1}{s^{2}}$ is....
(1) $b^{2}-4 a c$
(2) $\frac{b^{2}-4 a c}{2 a}$
(3) $\frac{b^{2}-4 a c}{c^{2}}$
(4) $\frac{b^{2}-2 a c}{c^{2}}$

Sol. 4
r and s are the roots of equation $a x^{2}+b x+c=0$
$r+s=\frac{-b}{a}, \quad r s=\frac{c}{a}$
Now, $\frac{1}{r^{2}}+\frac{1}{s^{2}}=\frac{s^{2}+r^{2}}{(r s)^{2}}$

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

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

Sol. 2
Let ' $a$ ' be the first term and ' $d$ ' be the common difference of an A.P.
Sum of first ten terms $=4 \times$ sum of first five terms
(by (1))

$$
\begin{align*}
& \frac{10}{2}[2 a+(10-1) d]=4 \times \frac{5}{2}[2 a+(5-1) d] \\
& 2 a+9 d=4 a+8 d \\
& 2 a=d  \tag{1}\\
& \mathrm{k}^{\text {th }} \text { term of an A.P. is } a+(k-1) d \\
& a+(k-1) 2 a
\end{align*}
$$

132. The value of $\left[\sqrt[3]{\sqrt[6]{a^{9}}}\right]^{4}\left[\sqrt[6]{\sqrt[3]{a^{9}}}\right]^{4}$ is $\ldots$.
(1) $a^{16}$
(2) $a^{12}$
(3) $a^{8}$
(4) $a^{4}$

Sol. 4
$\left[\sqrt[3]{a^{9 / 6}}\right]^{4}\left[\sqrt[6]{a^{9 / 3}}\right]^{4}$
$\left[a^{9 / 61 / 3}\right]^{4}\left[a^{9 / 3 / 6}\right]^{4}$
$a^{2} \cdot a^{2}=a^{4}$
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 $\frac{A B}{B C}=\frac{1}{2}$
$A B=x, B C=2 x$
$\triangle A B C$ right angle, $A C=\sqrt{5} x$ and $B D \perp A C$,
Let $C D=a, A D=b$ and $B D=h$

$$
\begin{equation*}
a+b=\sqrt{5} x \tag{1}
\end{equation*}
$$


$\triangle B D C$ is right angle, $h^{2}=4 x^{2}-a^{2}$
$\triangle B D A$ is right angle, $h^{2}=x^{2}-b^{2}$

$$
\begin{align*}
& \Rightarrow 3 x^{2}=-a^{2}+b^{2} \\
& \Rightarrow 3 x^{2}=(b-a)(b+a) \\
& \Rightarrow 3 x^{2}=(b-a) \sqrt{5} x \\
& \frac{3}{\sqrt{5}} x=b-a \tag{2}
\end{align*}
$$

from (1) \& (2), $\quad b=\frac{4 x}{\sqrt{5}}, a=\frac{x}{\sqrt{5}} \Rightarrow \frac{a}{b}=\frac{1}{4}$
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 $\mathrm{a}, \mathrm{b}, \mathrm{c}$ be three numbers
Given $\quad a+b+c=98$
and $\frac{a}{b}=\frac{2}{3}, \frac{b}{c}=\frac{5}{8}$

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

by (1), $\frac{2 b}{3}+b+\frac{8 b}{5}=98$
$\frac{10 b+15 b+24 b}{15}=98$
$49 b=98 \times 15$
$b=30$
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 $\mathrm{ABCD}-$ volume of cone
APB

$$
\begin{aligned}
& =\pi r^{2} h-\frac{1}{3} \pi r^{2} h \\
& =\pi r^{2}\left(\frac{2 h}{3}\right) \\
& =\pi\left(\frac{6}{10}\right)^{2}\left(\frac{2}{3} \times \frac{14}{10}\right)=1.056
\end{aligned}
$$

136. If $f: R \rightarrow R ; g: R \rightarrow R$ are functions defined by $f(x)=3 x-1 ; g(x) \sqrt{x+6}$, then the value of $\left(g o f^{-1}\right)(2009)$ is
(1) 26
(2) 29
(3) 16
(4) 15

Sol. 1
Given $f(x)=3 x-1, \quad g(x)=\sqrt{x+6}$
Let $\quad y=f(x)$

$$
y=3 x-1
$$

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

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

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

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

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

Sol. 4
area of sector BAC $=9 \pi$
area of sector DAC $=9 \pi$
required area $\quad=$ sum of area of two sectors - area of square
$=(9 \pi+9 \pi)-36=18 \pi-36$
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


The first place filled with $3 \quad-1$ way
Second place

- 5 ways

Third place

- 4 ways

Fourth place

- 3 ways

Total numbers $\quad=1 \times 5 \times 4 \times 3=60$
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
Let

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

number of digits in $256^{50}$ is $120+1=121$.
140. If $\sin \mathrm{A}, \cos \mathrm{A}$ and $\tan \mathrm{A}$ are in Geometric Progression, then $\cot ^{6} A-\cot ^{2} A$ is
(1) 2
(2) 4
(3) 3
(4) 1

Sol. 4
Given $\sin \mathrm{A}, \cos \mathrm{A}$ and $\tan \mathrm{A}$ 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 $6.25 \mathrm{~cm}^{2}$. 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 $6.25 \mathrm{~cm}^{2}$
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

$$
\begin{aligned}
& =2 \times 2+8 \times \frac{5}{2} \mathrm{~cm} \\
& =4+20 \mathrm{~cm} \\
& =24 \mathrm{~cm}
\end{aligned}
$$

142. The value of $\log _{\sqrt{\sqrt{2}}} \cdot \sqrt{2 \sqrt{2 \sqrt{2 \sqrt{2 \sqrt{2}}}}}$ is....
(1) $\frac{31}{32}$
(2) $\frac{31}{4}$
(3) $\frac{31}{8}$
(4) None

Sol. 3
$\sqrt{2 \sqrt{2 \sqrt{2 \ldots \ldots . . n \text { times }}}}=2^{1-\frac{1}{2^{n}}}$
$\log _{2^{1 / 4}}{ }^{1-1 /)^{5}}=\log _{2^{1 / 4}}^{\frac{31}{212}}=\frac{31}{32} \times 4 \log _{2}^{2}$
$=\frac{31}{8}$
143. Equation of the line passing through $(-1,2)$ and perpendicular to $x-y+2=0$ is $\ldots$.
(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 $A=\left[\begin{array}{cc}2 & -1 \\ -1 & 2\end{array}\right]$ and $A^{2}-4 A-n I=0$, then ' $n$ ' is equal to....
(1) 3
(2) -3
(3) $\frac{1}{3}$
(4) $\frac{-1}{3}$

Sol. 2
$A^{2}=A \cdot A$
$=\left[\begin{array}{cc}2 & -1 \\ -1 & 2\end{array}\right]\left[\begin{array}{cc}2 & -1 \\ -1 & 2\end{array}\right]$
$=\left[\begin{array}{cc}5 & -4 \\ -4 & 5\end{array}\right]$
$A^{2}-4 A=\left[\begin{array}{cc}5 & -4 \\ -4 & 4\end{array}\right]-4\left[\begin{array}{cc}2 & -1 \\ -1 & 2\end{array}\right]$
$=\left[\begin{array}{cc}5 & -4 \\ -4 & 5\end{array}\right]-\left[\begin{array}{cc}8 & -4 \\ -4 & 8\end{array}\right]$
$=\left[\begin{array}{cc}-3 & 0 \\ 0 & -3\end{array}\right]$
$=-3 I$
$A^{2}-4 A+3 I=0 \Rightarrow n=-3$
145. If $A(-2,5)$ and $B(3,2)$ are the two points on a straight line. If $\overline{A B}$ is extended to ' C ' such that $\mathrm{AC}=2 \mathrm{BC}$, then the co-ordinates of ' C ' are $\ldots$..
(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 $\frac{A C}{B C}=\frac{2}{1}$ where $A(-2,5)$ and $B(3,2)$

' C ' divides the line $\overline{A B}$ 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) Thucidydes
(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 $4^{\text {th }}$ 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 $\qquad$
(1) Bhanger
(2) Khadar
(3) Terai
(4) Babar

Sol. 1

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
Chambar 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 $42^{\text {nd }}$ 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 previlige 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 $1^{\text {st }} \& 2^{\text {nd }}$ 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
175. This was not the reason for Indo-China war in 1962
(1) Border dispute between two countries
(2) Chineese regarded India as their main rival in Asia
(3) Growing friendship between India and former Soviet Union
(4) Growing friendship between India and U.S.A.

Sol. 4
It is not a reason at all

## ECONOMICS

176. Micro Economics is also known as
(1) Income theory
(2) Price theory theory
(3) Expenditure theory
(4) Savings

Sol. 2
Micro Eco - price theory, Macro - Income theory
177. This is not a social and demographic indicator under Economic development
(1) Literacy rate
(2) Urbanisation
(3) Increase in employment
(4) Life expectancy

Sol. 3
It is economic indicator
178. This is an example for direct taxation
(1) Customs - Imports
(2) Wealth - Profits
(3) Excise - Manufacturing
(4) Turn-over - Sale

Sol. 2
The rest are indirect taxes
179. This economist termed continuous exploitation of economic resources as "Economic drain"
(1) Kautilya
(2) Amartya Sen
(3) Dadabhai Naoroji
(4) D.R.Gadgil

Sol. 4
Dadabhai - Plunder of economic wealth.
180. Under this system, the land belonged to a small group of family who are usually powerful in the region
(1) Mahalwari
(2) Rayatwari
(3) Zamindari
(4) Kouldari

Sol. 1
The rest are incorrect because under Zamindari - Landlord, under Rayatwari, directly by the peasant.

