101. A bomb of mass 30 kg at rest explodes into two pieces of masses 18 kg and 12 kg. The velocity of 18 kg mass is 6 m/s. The kinetic energy of the other mass is.

(1) 324 J (2) 486 J (3) 256 J (4) 524 J

Sol. Option (2)

According to law of conservation of momentum,

Final momentum = initial momentum

$$m_1v_1 + m_2v_2 = m \times 0$$

$$18 \times 6 + 12 \times v_2 = 0$$

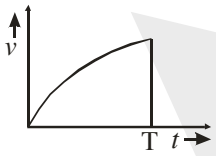
$$12 \times v_2 = -18 \times 6$$

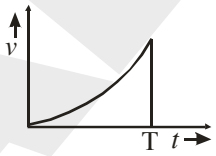
$$v_2 = 9 \text{ m/s}$$

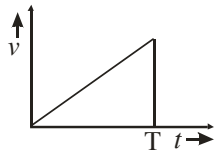
Kinetic energy of second mass $KE = \frac{1}{2}m_2v_2^2$

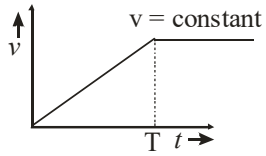
$$KE = 486\,J$$

102. A body initially at rest start moving when a constant external force F is applied on it. The force F is applied for time t = 0 to time t = T. which of the following graph represents the variation of the speed (v) of the body with time (t)

(1) 

(2) 

(3) 

(4) 

Sol. Option (4)

Force $\rightarrow$ constant

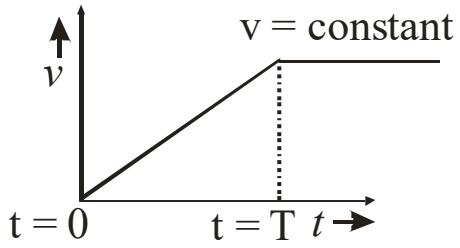
$\therefore$ acceleration $\rightarrow$ constant

Velocity is increasing at constant rate.

$\therefore$ slope of v – t graph will be constant.

After removal of force at t = T,

Acceleration becomes zero and velocity remains constant. Correct graph will be



103. A person can not clearly see objects at a distance more than 40 cm. He is advised to use lens of power

(1) -2.5 D (2) 2.5 D (3) -1.5 D (4) 1.5 D

Sol. Option (1)

The person is suffering from myopia. To correct this defect concave lens of suitable power is required.

$$P = -\frac{1}{x} \quad [x \rightarrow \text{far point of myopic eye, } x = 40 \text{ cm} = 0.4 \text{ m})$$

$$P = -\frac{1}{0.4} \qquad P = -2.5 \text{ D}$$

104. Gravitational force is essentially required for

(1) Stirring in liquid (2) Convection (3) Conduction (4) Radiation

Sol. Option (2)

Gravitational force is essential for convection. It is caused by gravity pulling heavier elements in a gas or liquid down causing lighter elements to pushed up.

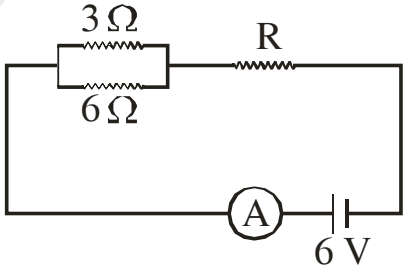
105. An observer moves towards a stationary plane mirror at a speed of 4 m/s the speed with which his image move towards him ?

(1) 2 m/s (2) 4 m/s (3) 8 m/s (4) Image will stay at rest

Sol. Option (3)

The speed of image with respect to observer will be twice the speed of object i.e. 8 m/s.

106. If the ammeter in the given circuit reads 2 A. What is the value of resistance R (the resistance of ammeter is negligible)



(1) 1 Ω (2) 2 Ω (3) 3 Ω (4) 4 Ω

Sol. Option (1)

Equivalent resistances of circuit will be

$$R_{eq} = \frac{3\times 6}{3+6} + R \qquad R_{eq} = R + 2$$

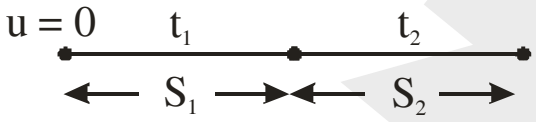
Also, $$i = \frac{V}{R_{eq}} = 2A \qquad \frac{6}{R+2} = 2$$

$$6 = 2R + 4 \qquad 2R = 2 \qquad R = 1\Omega$$

107. A particle starts its motion from rest under the action of a constant force. If the distance covered in first 10 seconds is S_1 and that covered in next 10 seconds is S_2 them

(1) $S_2 = 6\ S_1$ (2) $S_2 = 2\ S_1$ (3) $S_2 = 8\ S_1$ (4) $S_2 = 3\ S_1$

Sol. Option (4)



Apply $$S = ut + \frac{1}{2}at^2 \qquad S_1 = \frac{1}{2}at_1^2$$

$$S_1 = \frac{1}{2}\times a \times 100 \qquad S_1 = 50\ a \qquad \ldots (1)$$

$$S_1 + S_2 = \frac{1}{2}a(t_1 + t_2)^2 \qquad S_1 + S_2 = \frac{1}{2}\times a \times 400$$

$$50a + S_2 = 200a \qquad S_2 = 100a \qquad \ldots. (2)$$

$$\frac{S_2}{S_1} = 3 \qquad S_2 = 3S_1$$

108. Two planets of radii r_1 and r_2 are made from the same material having same density. The ratio of acceleration due to gravity $g_1 \mid g_2$ at the surface of the planets is

(1) $r_1 \mid r_2$ (2) $r_2 \mid r_1$ (3) $(r_1 \mid r_2)^2$ (4) $(r_2 \mid r_1)^2$

Sol. Option (1)

Acceleration due to gravity, $g = \frac{GM}{r^2}$

$$g = \frac{G}{r^2}\times \rho \times \frac{4}{3}\pi r^3 \qquad [M = \rho \times V]$$

$$g = \frac{4}{3}G\pi\rho r \qquad g \propto r \qquad \therefore \qquad \frac{g_1}{g_2} = \frac{r_1}{r_2}$$

109. A concave mirror of focal length 15 cm forms an image. The position of the object when the image is virtual and linear magnification is 2 is

(1) 22.5 cm (2) 7.5 cm (3) 30 cm (4) 45 cm

Sol. Option (2)

Concave mirror, $F = -15$ cm

$m = +2$ (virtual image)

$$m = -\frac{v}{u} = 2 \qquad V = -2u \quad \ldots. (1)$$

Mirror formula,

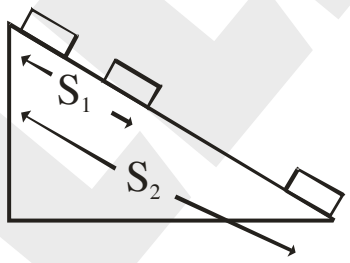
$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f} \qquad -\frac{1}{2u}+\frac{1}{u}=\frac{1}{f}$$

$$\frac{1}{2u}=-\frac{1}{15} \qquad u=-\frac{15}{2}=-7.5 \text{ cm}$$

110. A body on an inclined plane sides down $\frac{1}{4}$th of distance in 2 seconds. It will slide down the complete distance along the plane in (the inclined plane have zero friction) -

(1) 4 s (2) 5 s (3) 2 s (4) 3 s

Sol. Option (1)



$$S_1 = \frac{S}{4} \quad \& \quad S_2 = S$$

From $S = ut + \frac{1}{2}at^2$ $\qquad S \propto t^2$ $\qquad \frac{S_1}{S_2} = \frac{t_1^2}{t_2^2}$

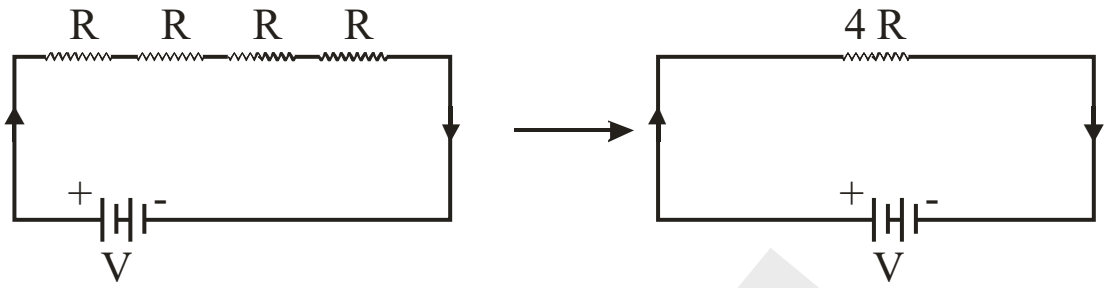
$$\frac{S/4}{S} = \frac{4}{t_2^2} \qquad t_2^2 = 16 \qquad t_2 = 4 \text{ sec.}$$

111. When four equal resistors are connected in series with a battery have dissipate a power of 10 W. The power dissipated through any of them if connected across the same battery will be

(1) 40 W (2) 10/3 W (3) 90 W (4) 10 W

Sol. Option (1)

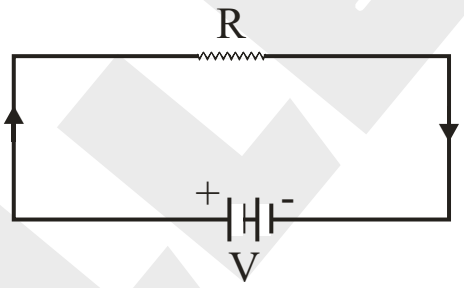
Let the resistance of each resistor be 'R' & voltage of battery be 'V'.



Total power dissipated

$$P = \frac{V^2}{4R} = 10 \text{ Watt} \quad \ldots (1)$$

Now only one of them is connected with battery,



Power dissipated, $P' = \frac{V^2}{R} = 4 \times \frac{V^2}{4R}$

$\therefore \quad P' = 4 \times 10 = 40 \text{ W}$

112. An electron move with velocity v in a uniform magnetic field B. The magnetic force experienced by the electron is

(1) Always zero (2) Never zero

(3) Zero if v is perpendicular to B (4) Zero if v is parallel to B

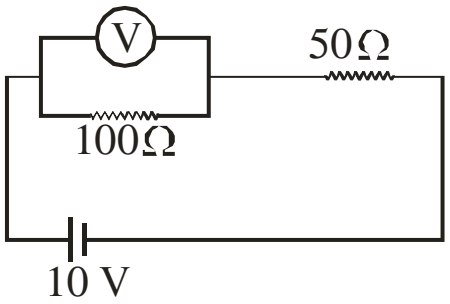
Sol. Option (4)

Magnetic force, $F = qvB\sin\theta$

If $\theta = 0°$ or 180, $F = 0$

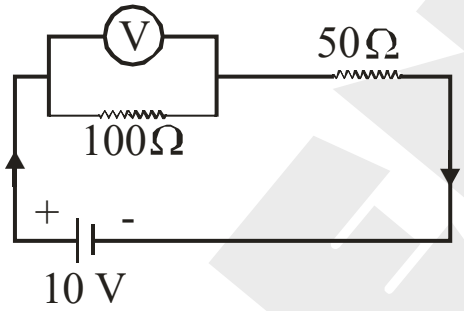
$\therefore$ Magnetic force experienced by electron will be zero if 'v' is parallel to 'B' i.e. $\theta = 0°$

113. In the given circuit the voltmeter reads 5 V. The resistance of the voltmeter in ohm is



(1) 200 (2) 100 (3) 10 (4) 50

Sol. Option (2)



Let the resistance of voltmeter be 'R'

As voltage is equal on $50\,\Omega$ resistor and voltmeter then equivalent resistance of voltmeter & $100\ \Omega$ resistor is equal to $50\,\Omega$ resistor.

$$\therefore \quad \frac{100\times R}{100+R}=50 \qquad 2R=100+R \qquad R=100\Omega$$

114. Which of the following contain seven molecule of water of crystallization ?

(1) Epsom salt (2) green vitriol (3) blue vitriol (4) white vitriol

Sol. Option (1,2,4)

(1) Epsom salt – $MgSO_4 \cdot 7H_2O$

(2) Green vitriol - $FeSO_4.7H_2O$

(4) White vitriol – $ZnSO_4 \cdot 7\ H_2O$

contains seven molecule of water of crystallization

115. Which elements are used for galvanization ?

(1) Zn and Sn (2) Na and K (3) Cu and Fe (4) Ca and Mg

Sol. Option (1)

Zinc and tin are elements used for the galvanization of Iron.

116. Ramesh dropped a metal piece 'A' in the solution of another metal 'M'. After some time a new colourless compound 'N' is formed. A, M, N respectively can be :

(1) Mg, NaCl, $MgCl_2$ (2) Fe, Zn SO_4, $FeSO_4$ (3) Zn, $CuSO_4$, $ZnSO_4$ (4) Cu, $ZnSO_4$, $CuSO_4$

Sol. Option (3)

$$Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$$

Zinc; Copper Sulphate (Blue Solution); Zinc Sulphate (Colour less solution)

117. Which fuel has highest calorific value ?

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

Sol. Option (4)

Hydrogen has highest calorific value of 150 kJ / gm

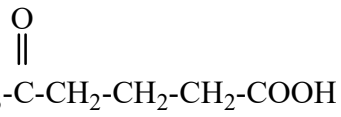
118. The pH of acid rain is

(1) Less than 5.6 (2) More than 5.6 (3) Equal to 5.6 (4) More than 6.6

Sol. Option (1)

pH of acid rain in less than 5.6

119. IUPAC name of the following compound will be



(1) 2-keto hexan-6-oic acid (2) 5-keto hexanoic acid

(3) Methyl ketone butanoic acid (4) 5-Aldo hexanoic acid

Sol. Option (2)

Carboxylic acid is given priority,

hence in IUPAC name is 5-keto hexanoic acid

120. Products obtained on electrolysis of brine are :

(1) $NaHCO_3$, H_2, Cl_2 (2) H_2, NaOH, $NaHCO_3$

(3) Cl_2, NaOH, Na_2O_2 (4) NaOH, H_2, Cl_2

Sol. Option (4)

$$NaCl + H_2O \xrightarrow{\text{electicity}} NaOH + H_2(g) + Cl_2(g)$$

121. In balanced chemical equation

$$a\ KMNO_4 + b\ H_2SO_4 + c\ K_2SO_4 + d\ MnSO_4 + e\ H_2O + f[O]$$

Which of the follow2ing alternative are correct ?

(1) a = 2, b = 3, c = 1, d = 2, *e* = 3, f = 5 (2) a = 1, b = 2, c = 1, d = 3, *e* = 2, f = 3

(3) a = 2, b = 3, c = 2, d = 3, *e* = 2, f = 5 (4) a = 3, b = 1, c = 3, d = 3, *e* = 1, f = 3

Sol. Option (1)

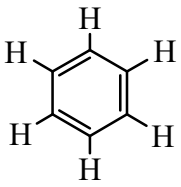
$$2KMnO_4 + 3\ H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 5H_2O$$

122. Benzene (C_6H_6) have :

(1) 12 covalent bonds (2) 15 covalent bonds (3) 18 covalent bonds (4) 9 covalent bonds

Sol. Option (2)

Benzene (C_6H_6) has 15 covalent bonds.



123. 1.0 kg of Iron (Fe), having atomic mass equal to 56 g mol^{-1} contains

(1) 2.88 10^{24} atoms (2) 6.93 10^{23} atoms (3) 6.93 10^{21} atoms (4) 1.075 10^{25} atoms

Sol. Option (4)

$$\text{No. of moles} = \frac{\text{given mass}}{\text{molar mass}}$$

Given mass = 1 kg = 1000 gm

$$\text{No. of moles} = \frac{1000}{56} = 17.85$$

No. of atoms = no. of moles Avagadro no.

$$= 17.85 \times 6.022 \times 10^{23}$$

$$= 1.075 \times 10^{25} \text{ atoms}$$

124. Aqueous solution of CsO_2 is :

(1) Basic (2) Neutral (3) Acidic (4) Amphoteric

Sol. Option (1)

Cesium oxide (CsO_2) is a metal oxide hence basic in nature

125. A student added a drop of universal indicator to 1.00 mL of given solution and found that a green colour is produced. The pH value of the solution will be.

(1) 7-9 (2) 0 - 3 (3) 10 - 12 (4) 4 - 6

Sol. Option (1)

universal indicator gives green colour for the pH range of 7 to 9

126. Elements present in any group have to same number of

(1) Valance electrons (2) Neutrons (3) Protons (4) None of the above

Sol. Option (1)

All elements of any group have the same number of valence electrons.

127. Which of the following reactions take place during break down of molecules in the respiration in our body ?

(1) Oxidation (2) Reduction

(3) Oxidation – reduction (4) Photo - oxidation

Sol. Option (1)

Glucose is broken down in the presence of oxygen during aerobic respiration. Thus, oxidation reaction is carried out.

128. Lactic acid is produced when pyruvate is broken down.

(1) In presence of oxygen in mitochondria (2) In absence of oxygen in mitochondria

(3) In presence of oxygen in muscle cells (4) In absence of oxygen in muscle cells

Sol. Option (4)

When anaerobic respiration (in absence of oxygen) takes place in muscle cells, pyruvate is broken down to produce lactic acid as a by-product.

129. Separation of oxygenated and deoxygenated blood.

I. Fulfils energy requirements of the body

II. Ensures the effective transfer of oxygen in the body

(1) Both statements are true (2) statement I is true but statement II is false

(3) statement I is false but statement II is true (4) Both the statements are false

Sol. Option (1)

Separation of oxygenated and deoxygenated blood helps to provide more oxygen to the cells so as to meet the high energy requirements of warm blooded animals to maintain constant body temperature. Also separation of chambers of heart allows more efficient supply of oxygen to body cells.

130. Root pressure is effective way transporting water in xylem. This pressure is generated

(1) In bright sunlight (2) During night

(3) At very low temperature (4) In high trees

Sol. Option (2)

The effect of root pressure in transport of water is more important at night as during the day stomata are open so transpiration pull becomes the major factor for transport of water in xylem.

131. Choose the correct option to complete 'A', 'B', 'C' and 'D' in the following table.

Hormone	Function
A	Stimulates growth in all organs
B	Stimulates pituitary to release growth hormone
C	Controls blood sugar level
D	Regulates carbohydrate metabolism

(1) A-Insulin, B-Thyroxine, C-Growth Hormone, D-Growth Hormone Release factor

(2) A- Growth Hormone, B- Insulin, C- Thyroxine, D- Growth Hormone Release factor

(3) A- Thyroxine, B- Insulin, C-Growth Hormone, D-Growth Hormone Release factor

(4) A- Growth Hormone, B- Growth Hormone Release factor, C- Insulin, D- Thyroxine

Sol. Option (4)

A-Growth hormone (released from pituitary gland) - stimulates growth in all organs

B- Growth hormone releasing factor (released from hypothalamus) - Stimulates pituitary gland to release growth hormone

C- Insulin (released from pancreas) – Controls blood sugar level

D- Thyroxin (released from thyroid gland) – Regulates carbohydrate metabolism

132. If a pea plant with wrinkled seeds and heterozygous tall plants were self pollinated, what will be the phenotypes of plants of F_2 generation.

(1) 75 % plants will be tall and have wrinkled seeds and other 25 % will be dwarf with wrinkled seeds

(2) 50 % plants will be tall and have wrinkled seeds and 50 % will be dwarf with wrinkled seeds

(3) 50 % plants will be tall and have wrinkled seeds and other 50 % will be dwarf with round seeds

(4) 25 % plants will be tall and have wrinkled seeds and other 75 % will be dwarf with wrinkled seeds

Sol. Option (1)

Wrinkled & Heterozygous tall plant: wwTt

On self-pollination : wwTt X wwTt

Gametes: wT, wt,

On crossing,

Gametes	wT	wt
wT	wwTT	wwTt
wt	wwTt	wwtt

Thus, in F_2 generation we will get the phenotypic ratio of 3 : 1 (3- wrinkled tall plant and 1- wrinkled dwarf plant).

That means 75% will be tall with wrinkled seeds and 25% will be dwarf with wrinkled seeds.

133. Two similar pea plants are growing in two different islands separated by a vast ocean. The phenomenon of geographical isolation will

(1) Not be seen as the plants get self pollinated

(2) be seen as the plants are growing in isolated regions

(3) Not be seen as the plants get pollinated by ocean water currents

(4) be seen as the plants do not get pollinated and reproduces asexually

Sol. Option (1)

When two organisms are separated by a huge physical barrier like water forms (oceans) and mountains, then it is known as geographical isolation. Here the pea plants are separated by an ocean but if they are self-pollinating then geographical isolation will not be seen as a major factor in speciation.

134. DDT is non-biodegradable chemical when it enters food chain it gets accumulated in each tropic level. This phenomenon is called as

(1) Eutrophication (2) Chemical amplification

(3) Biomagnification (4) Chemical magnification

Sol. Option (3)

Accumulation of any non- biodegradable substance (DDT) in a food chain at each trophic level is known as bio-magnification.

135. Presence of .....is an indicator of pollution level in water

(1) colour (2) Coliform bacteria (3) Rhizo bacteria (4) Spiral bacteria

Sol. Option (2)

Coliform bacteria are found in higher concentrations in polluted water bodies.

136. Leaves of tendu are the source of income of large number of people in India. These leaves are used to make

(1) Thatched roofs (2) Bidis (3) Leaf plates (4) Teeth cleaning agent

Sol. Option (2)

Tendu leaves are used to make bidis.

137. Maximum number of trophic levels supported in any ecosystem is

(1) One (2) Two (3) Three (4) Four

Sol. Option (4)

Maximum number of trophic levels supported in any ecosystem is 4 to 5 because energy levels decrease in every consecutive trophic level.

138. Correct sequence of reflex arc is

(1) Receptor $\rightarrow$Motor Neuron $\rightarrow$ Sensory Neuron $\rightarrow$ Effector Organ $\rightarrow$ Relay Neutron

(2) Receptor $\rightarrow$ Sensory Neuron $\rightarrow$ Motor Neuron $\rightarrow$ Effector Organ $\rightarrow$ Relay Neutron

(3) Receptor $\rightarrow$ Sensory Neuron $\rightarrow$ Motor Neuron $\rightarrow$ Relay Neutron $\rightarrow$ Effector Organ

(4) Receptor $\rightarrow$ Sensory Neuron $\rightarrow$ Relay Neutron $\rightarrow$ Motor Neuron $\rightarrow$ Effector Organ

Sol. Option (4)

In reflex action, the pathway from stimulus to response is known as reflex arc.

The stimulus is received by a receptor organ, which is passed on to the sensory neuron, which leads to the relay neuron (spinal cord). It gives the response impulse to the motor neuron which carries it to the effector organ (muscle or gland).

139. Tricuspid valve is present in

(1) Right atria and right ventricle (2) Left atria and left ventricle

(3) Wall of atrium (4) Wall of ventricle

Sol. Option (1)

Human heart has 2 atria and 2 ventricles (4 chambered heart). The valve present in between the right atrium and right ventricle is known as tricuspid valve.

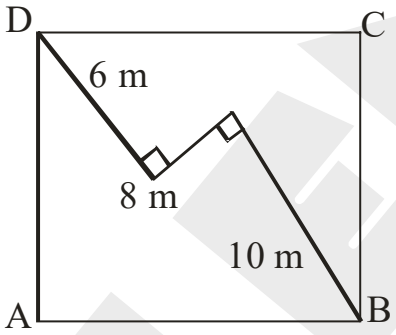
140. BCG vaccine provide protection against

(1) Measles (2) T.B. (3) Cholera (4) Small pox

Sol. Option (2)

The BCG (Bacillus calmette Guerin) is a vaccine given to provide protection against tuberculosis (T. B.).

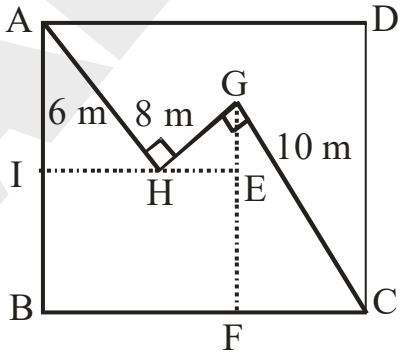
141. Find the area of the square ABCD.



(1) 160 m^2 (2) 140 m^2 (3) 125 m^2 (4) 120 m^2

Sol. Option (1)

Let a is side of square



$$a = FC + HE + IH$$

$$a = 10\cos\alpha + 8\sin\alpha + 6\cos\alpha = 16\cos\alpha + \beta\sin\alpha \quad \ldots (1)$$

$$a = GF + AI - GE$$

$$a = 10\sin\alpha + 6\sin\alpha - 8\cos\alpha$$

$$a = 10\sin\alpha - 8\cos\alpha \quad \text{... (2)}$$

Squaring both the equations and add.

$$2a^2 = 256(\sin^2\alpha + \cos^2\alpha) + 64(\sin^2\alpha + \cos^2\alpha)$$

$$2a^2 = 256 + 64$$

$$2a^2 = 320$$

$$a^2 = 160$$

Area of square = 160

142. If $(2^x - 4)^3 + (4^x - 2)^3 = (4^x + 2^x - 6)^3$, then the sum of all real values of x is

(1) 0.5 (2) 1.5 (3) 2.5 (4) 3.5

Sol. Option (4)

Let $a = 2^x - 4$

$$b = 4^y - 2$$

$$a + b = 4^x + 2^y - 6$$

$$a^3 + b^3 = (a+b)^3$$

$$a^3 + b^3 = a^3 + b^3 + 3ab(a+b)$$

$$3ab(a+b) = 0$$

$$3(2^x - 4)(4^x - 2)(4^x + 2^x - 6) = 0$$

$$2^x - 4 = 0$$

$$2^x = 4$$

$$2^x = 2^2$$

$$x = 2$$

$4^x - 2 = 0$ $4^x = 2$

$$2^{2x} = 2$$

$$x = \frac{1}{2}$$

$$4^x + 2^x - 6 = 0$$

Let $y = 2^x$

$$y^2 + y - 6 = 0$$

$$(y+3)(y-2) = 0$$

For real values $y - 2 = 0$

$$y = 2$$

$$2^x = 2$$

$$x = 1$$

So sum of real values of roots = $2 + \frac{1}{2} + 1 = 3.5$

143. If $2019^x + 2019^{-x} = 3$, then the value of $\sqrt{\frac{2019^{6x} - 2019^{-6x}}{2019^x - 2019^{-x}}}$ is :

(1) 3 (2) 6 (3) 9 (4) 12

Sol. Option (4)

Let $a = 2019^x$

$$a + \frac{1}{a} = 3$$

$$\sqrt{\frac{a^6 - \frac{1}{a^6}}{a - \frac{1}{a}}} = \sqrt{\frac{(a^2)^3 - \left(\frac{1}{a^2}\right)^3}{a - \frac{1}{a}}}$$

$$\sqrt{\frac{\left(a^2 - \frac{1}{a^2}\right)\left(a^4 + 1 + \frac{1}{a^4}\right)}{\left(a - \frac{1}{a}\right)}} \qquad \sqrt{\left(a + \frac{1}{a}\right)\left(a^4 + 1 + \frac{1}{a^4}\right)}$$

$$\sqrt{3(47+1)} = \sqrt{3 \times 48} \qquad \sqrt{3 \times 3 \times 16} = 3 \times 4 = 12$$

144. Let 'p' be a root of the equation $x^2 - 5x + 7$, then the area of circle with centre at (p, p) and passing through point (1, 4) is

(1) 3π sq. unit (2) 5π sq. unit (3) 7π sq. unit (4) None of these

Sol. Option (1)

$$P^2 - 5p + 7 = 0$$

$$r^2 = (P-1)^2 + (P-4)^2$$

$$r^2 = P^2 - 2P + 1 + P^2 - 8P + 16$$

$$r^2 = 2P^2 - 10P + 17$$

$$r^2 = 2(P^2 - 5P) + 17$$

$$r = \sqrt{3}$$

Area of circle = 3π sq. unit.

145. If $\frac{1}{x+y} = \frac{1}{x} + \frac{1}{y}$, then the value of $\left(\frac{x}{y}\right)^6 + \left(\frac{x}{y}\right)^3$ is

(1) 0 (2) $\frac{1}{2}$ (3) 1 (4) 2

Sol. Option (2)

$$\frac{1}{x+y} = \frac{x+y}{xy}$$

$$xy = x^2 + y^2 + 2xy$$

$$0 = x^2 + y^2 + xy$$

$$0 = \left(\frac{x}{y}\right)^2 + 1 + \left(\frac{x}{y}\right)$$

$$a^2 + a + 1 = 0$$

$$(a^3 - 1) = (a-1)(a^2 + a + 1)$$

$$\left(\frac{x}{y}\right)^3 = 1$$

$$\left(\frac{x}{y}\right)^6 + \left(\frac{x}{y}\right)^3 = 2$$

146. Let a, b and c are the roots of the polynomial equation $x^3 - 597x - 5236 = 0$, then the value of $(a^3 + b^3 + c^3)$ is :

(1) 597 (2) 15708 (3) 5236 (4) 10472

Sol. Option (2)

$$a^3 + b^3 + c^2 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

Since, $a + b + c = 0$

$ab + bc + ca = -597$

$abc = 5236$

$a^3 + b^3 + c^3 - 3abc = 0$

$a^3 + b^3 + c^3 = 3abc = 3 \times 5236 = 15708$

147. If $\operatorname{cosec} x + \cot x = a$, then the value of cos x is

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

Sol. Option (3)

$$2\operatorname{cosec} x = a + \frac{1}{a} \qquad \frac{2}{\sin x} = \frac{a^2+1}{a}$$

$$\sin x = \frac{2a}{a^2+1} \qquad \cos x = \sqrt{1-\sin^2 x} = \sqrt{1 - \frac{4a^2}{(a^2+1)^2}}$$

$$= \sqrt{\frac{a^2 + 2a^2 + 1 - 4a^2}{(a^2+1)^2}} \qquad = \sqrt{\frac{(a^2-1)^2}{(a^2+1)}} = \frac{a^2-1}{a^2+1}$$

148. In an AP 2, 5, 8, 11, ... 452. The mean of 15th, 16th, 136th and 137th term is

(1) 120 (2) 227 (3) 220 (4) 454

Sol. Option (2)

2, 5, 8, 11, ..., 452 $a = 2, d = 3$

$a_{15} = a + 14 = 2 + 14 \times 3 = 2 + 42$

$a_{15} = 44$, $a_{16} = 44 + 3 = 47$

$a_{136} = a + 135d = 2 + 135 \times 3 = 2 + 405 = 407$

$a_{137} = 407 + 3 = 410$

Mean = $\frac{44 + 47 + 407 + 410}{4} = 227$

149. The minimum value of $\tan^2 x + \cot^2 x$ is

(1) 1 (2) 0 (3) 2 (4) 3

Sol. Option (3)

$$(\tan x - \cot x)^2 = \tan^2 x - 2\tan x.\cot x + \cot^2 x$$

$$= \tan^2 x - 2 + \cot^2 x \text{ (min. value of } (\tan x - \cot x)^2 = 0)$$

$$\tan^2 x + \cot^2 x = 2$$

150. If $f(x) = x^4 + ax^3 + bx^2 + cx + d$ is a polynomial such that $f(1) = 5,\ f(2) = 10,\ f(3) = 15,$ $f(4) = 20$. Find the value of $\frac{f(12) + f(-8)}{100}$

(1) 198 (2) 198.4 (3) 198.6 (4) 199.2

Sol. (Bonus)

$$f(x) = x^4 + ax^3 + bx^2 + cx + d$$

$$f(1) = 5$$

$$f(2) = 10$$

$$f(3) = 15$$

$$f(4) = 20$$

$\Rightarrow$ $g(1) = f(1) - 5 = 0$

$\Rightarrow$ $g(2) = f(2) - 10 = 0$

$\Rightarrow$ $g(3) = f(3) - 15 = 0$

$\Rightarrow$ $g(4) = f(4) - 20 = 0$

$\Rightarrow$ $g(x) = f(x) - 5(x)$

$$g(x) = (x-1)(x-2)(x-3)(x-4)$$

$$f(x) = (x-1)(x-2)(x-3)(x-4) + 5x$$

$$f(12) = 11 \times 10 \times 9 \times 8 + 60$$

$$f(-8) = (-9) \times (-10)(-11)(-12) - 40$$

$$\frac{f(12) + f(-8)}{100} = \frac{9 \times 10 \times 11 - 20 + 20}{100}$$

$$= \frac{[990 + 1]}{5} = \frac{991 \times 2}{5 \times 2} \qquad = 198.2$$

151. The product of two 2 digits numbers is 2160 and their H.C.F. is 12. Then sum of the number is

(1) 72 (2) 84 (3) 96 (4) 60

Sol. Option (3)

$12x, 12y$

$12x \times 12y = 2160$

$xy = 15 = 3 \times 5$ ... (1)

Or $xy = 15 \times 1$ (IF possible then HCF can not be 12)

So, first equation is true,

Hence, $x = 3,\ y = 5$

Sum of numbers $= 12 \times 3 + 12 \times 5 = 12 \times 8 = 96$

152. The angles of a pentagon are in arithmetic profressin. The sum of the smallest and largest angle is

(1) 172 (2) 108 (3) 180 (4) 216

Sol. Option (4)

Let angle are a – 2b, a – d, a, a + d, a + 2d in A.P.

$a - 2d + a - d + a + ad + a + 2d = 540$

$5a = 540$

$a = 108$

Sum = 2a $= 2 \times 108 = 216$

153. If $\sqrt{p} - \sqrt{q} = 20,$ then the maximum value of $\left(\frac{p-5q}{100}\right)$ is

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

Sol. Option (1)

$\sqrt{p} - \sqrt{q} = 20$

$\frac{p-5q}{100}$ maximum

$\frac{p-5(p+400-40\sqrt{p})}{100}$

$f(p) = -4p - 2000 + 200\sqrt{p}$

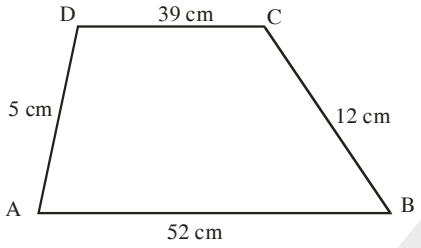
$f(p) = -4(p - 50\sqrt{p} + 500)$

$f(t) = -4(t^2 - 50t + 500)$

$$f(t) = -4((t-25)^2 - 125)$$

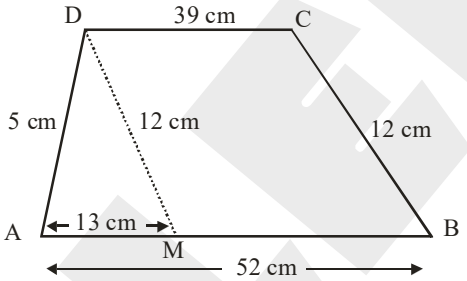
$$\frac{p-52q}{100} = \frac{500}{100} = 5 \qquad \text{[to maximum, } (t-25)^2 = 0\text{]}$$

154. The area of trapezium ABCD where AB = 52 cm, BC = 12 cm, CD = 29 cm and DA = 5 cm and AB || CD, ios



(1) 210 sq. cm (2) 234 sq. cm. (3) 260 sq. cm (4) 280 sq. cm.

Sol. Option (1)



5, 12, 13 are

Pythagorean triplet

$$\text{Ar (ADM)} = \frac{1}{2} \times AM \times 4$$

$$\frac{1}{2} \times 5 \times 6 = \frac{1}{2} \times 13 \times 4$$

$$30 = \frac{13}{2} \times 4$$

$$\frac{60}{13} = 4$$

$$\text{Area of trapezium} = \frac{1}{2} \times 4(a+b)$$

$$= \frac{1}{2} \times \frac{60}{13} \times (39+52) \qquad = 210$$

155. The difference between areas of a triangle of largest area inscribed in a circle of radius 'r' units and a triangle of largest area inscribed in a semicircle of redius 'r' unit is :

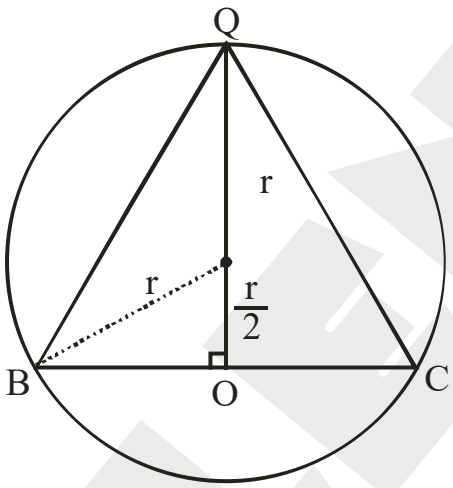
(1) $\left(\frac{2\sqrt{3}-1}{4}\right)r^2$ Sq.units

(2) $\left(\frac{4-2\sqrt{3}}{4}\right)r^2$ Sq.units

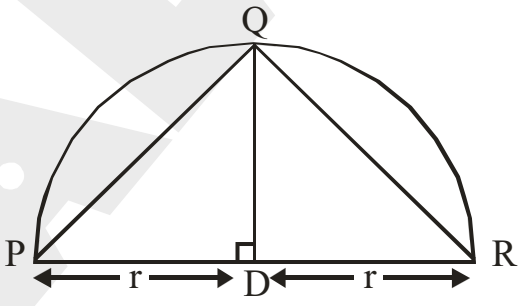
(3) $\left(\frac{3\sqrt{3}+4}{4}\right)r^2$ Sq.units

(4) $\left(\frac{3\sqrt{3}-4}{4}\right)r^2$ Sq.units

Sol. Option (4)



ΔABC should be equilateral



for area to be maximum

ΔABC $\quad a^2=\left(\frac{3r}{2}\right)^2+\left(\frac{a}{2}\right)^2$

$\frac{3a^2}{4}=\frac{9}{4}r^2$ $\qquad$ $\frac{a^2}{3}=r^2,\ a=\sqrt{3}r$

Area of $\Delta ABC = \frac{1}{2} \times \sqrt{3}r \times \frac{3r}{2}$ $= \frac{3\sqrt{3}r^2}{4}$

In figure, for area to be maximum base of triangle should be a diameter.

The triangle should be is isosceles

So, ar (PQR) = $\frac{1}{2} \times 2r \times r = r^2$

Required area $= \frac{3\sqrt{3}}{4}r^2 - r^2$ $= r^2\left(\frac{3\sqrt{3}-4}{4}\right)$

156. If p, q, r and s are distinct primer numbers such that $p+q+r=72$. $p+q+r=74$, $q+r+s=89$. The largest of these q, q, r and s is

(1) $r = 53$ (2) $q = 53$ (3) s =53 (4) s = 49

Sol. Option (1)

(sum of three prime nos is even, then one of the prime number is even)

$p = 2$

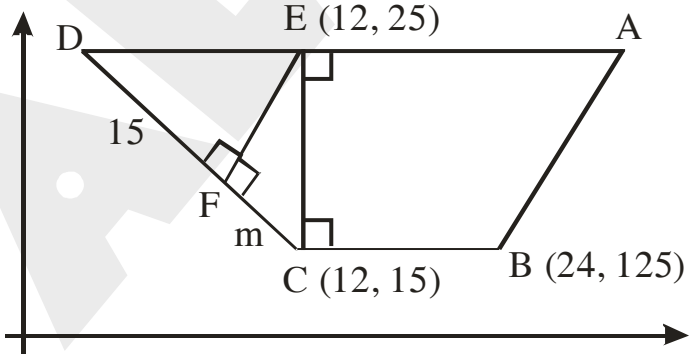
$Q + R = 70$, $r + s = 72$

$q + 72 = 9$ $q = 89 - 72$ ... (1)

$r = 70 - 17$ $r = 53$

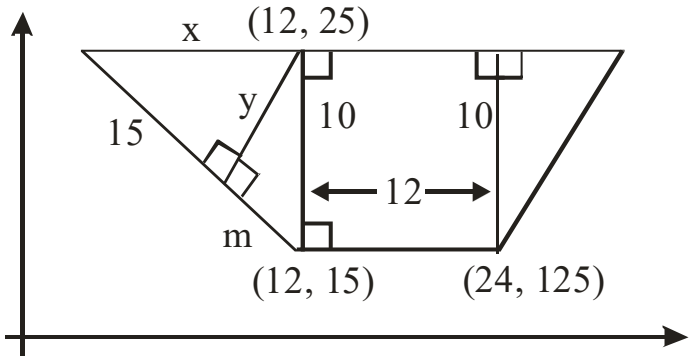
$s = 72 - 53$ $s = 19$

157. In the given figure the value of m is



(1) 5 (2) 10 (3) 7 (4) 12

Sol. Option (1)



$x^2 = y^2 + 225$ $\quad 100 = y^2 + m^2$

$(15+m)^2 = x^2 + 100$ $\quad (15+m)^2 = 2y^2 + m^2 + 225$

$30m = 2y^2$ $\quad y^2 = 15m$

$100 = 15m + m^2$ $\quad m^2 + 15m - 100 = 0$

$m = -15 + \frac{\sqrt{225} + 400}{2\times}$ $\quad = \frac{-15 \pm 25}{2}$

$= \frac{10}{2} = 5$ $\quad m = 5$

158. Find the sum of all real values of x which satisfy $\frac{1}{x^2 - 10x - 45} + \frac{1}{x^2 - 10x - 29} = \frac{2}{x^2 - 10x - 69}$

(1) 7 (2) 10 (3) 13 (4) -3

Sol. Option (2)

Let $p = x^2 - 10x$

$$\frac{1}{x^2 - 10 + 45} + \frac{1}{x - 10x - 29} = \frac{2}{x^2 - 10x - 69}$$

$$\frac{1}{p-45} + \frac{1}{p-29} = \frac{2}{p-69}$$

$$\frac{2p-74}{(p-45)(p-29)} = \frac{2}{p-69}$$

$$\frac{p-37}{(p-45)(p-29)} = \frac{1}{p-69}$$

$= (37+69)p + 37\times 69$ $= 74p + 1305$

$32p = 1248$ $p = 39$

$x^2 - 10x = 39$ $x^2 - 13x + 3x - 39 = 0$

So, $(x-13)(x+3) = 0$ $x = 13, -3$

Sum $13 - 3 = 10$

159. If $N = \sqrt[3]{4} + \sqrt[3]{2} + 1$, then the value of $\frac{1}{N^3} + \frac{3}{N^2} + \frac{3}{N}$ is

(1) 2 (2) 4 (3) 7 (4) 1

Sol. Option (1)

$N - 1 = \sqrt[3]{4} + \sqrt[3]{2}$

$(N-1)^3 = (\sqrt[3]{4} + \sqrt[3]{2})^3$

$N^3 - 1 - 3N^2 + 3N = 4 + 2 + 3\sqrt[3]{4}\sqrt[3]{2}(\sqrt[3]{4} + \sqrt[3]{2})$

$N^3 - 1 - 3N^2 + 3N = 6 + 6(N-1)$

$N^3 - 1 - 3N^2 + 3N = 6N - 6$

$\frac{N^3}{N^3} = \frac{1 + 3N^2 + 3N}{N^3}$

$1 = \frac{1}{N^3} + \frac{3}{N} + \frac{3}{N^2}$

160. In a class average height of all students is 'p' cm. Among them, average height of 10 students is 'q' cm and the average height of the remaining students is 'r' cm. The number of students in the class is :

(1) $\frac{p(q-r)}{(p-r)}$ (2) $\frac{q-r}{p-r}$ (3) $\frac{q-r}{10(p-r)}$ (4) $\frac{10(q-r)}{(p-r)}$

Sol. Option (4)

$$\text{Average} = \frac{\text{Total}}{\text{no. of observation}}$$

Let N is total no. of student

$A = \frac{T}{N}$ $P = \frac{T}{N}$ $T = PN$

$T_1 = 10a$ $T_2 = (N-10)r$ $T = T_1 + T_2$

$PN = 10q + (N - 10)\, r$

By solving $N = \dfrac{10(q-r)}{(p-r)}$

161. What are the National colours of France ?

(1) Blue – Green - Red (2) Green – White – Red

(3) Green – Yellow - Red (4) Blue – White - Red

Sol. Option (4)

Because the colour symbolizes nobility (blue), Clergy (white) and bourgeois (red)

162. Which was not included in Lenin's April theses ?

(1) Formation of Duma (2) Bank be nationalised

(3) Land be transferred to peasant (4) war be brought to a close

Sol. Option (1)

Because Duma was parliament during Czar

163. Hitler assigned the responsibility of Economic recovery to

(1) Herbert spancer (2) Hyalmar sachacht (3) W Shirer (4) Robert Lay

Sol. Option (2)

Because Germany was under economic depression.

Unemployment was the main problem.

164. Which of these had worked as indentured Labourer ?

(1) Shaukat Ali (2) Alluri Sita Ram Raju (3) Jawahar Lal Nehru (4) Baba Ramchanra

Sol. Option (4)

He worked as indentured labour for 12 years in fizi and then raised voice to end indenture system.

165. Who wrote the Book "Hind Swaraj" ?

(1) Subhash Chandra Bose (2) J. L. Nehru

(3) Kamal Nehru (4) Mahatma Gandhi

Sol. Option (4)

M. Gandhi wanted to inspire the children and spread the message of love in place of hate.

166. Which country was known as 'Siam'.

(1) England (2) Thailand (3) Holand (4) Swaziland

Sol. Option (2)

Because 'Siam' means dark and brown.

167. Which of the following Prime Minister Constituted "Simon Commission" ?

(1) Robert Walpole (2) Stanley Baldwin (3) Ramsay Mac Donald (4) Winston Churchil

Sol. Option (1)

He was appointed P.M. during that time.

168. Dr. B. R. Ambedkar formed the 'Depressed Classes Association in

(1) 1928 (2) 1929 (3) 1930 (4) 1931

Sol. Option (3)

He himself belonged to that class. He wanted upliftment of the depressed and harijans.

169. Jeevita Samaram' is the autobiography of

(1) C. Kesavan (2) Saudamini (3) Mankojee (4) R.C.Dutt

Sol. Option (1)

C Kesavan wrote his autobiography named :Jiveeta Samaram"

170. Who established the Vietnamese Communist Party ?

(1) Phu So (2) Mao Zedong (3) Ho Chi Minh (4) Phan Boi

Sol. Option (3)

Ho Chi Minh was of communist ideology.

He wanted to propogate communism in vietnam

171. "When France sneezes, the rest of Europe catches cold" who remarked this ?

(1) Mazzini (2) Metternich (3) Gottfried (4) John Lock

Sol. Option (2)

When france undergoes certain political, social changes, those changes can be felt through out Europe. i.e. it influenced whole of Europe.

172. Which one of the following is the main cause of land degradation in Punjab.

(1) Intensive Cultivation (2) Deforestation (3) Over Irrigation (4) Over Grazing

Sol. Option (3)

Due to over irrigation, green revolution. - Land degradation.

173. Traditional rain water harvesting is called in Rajasthan.

(1) Tank (2) Tanka (3) Pond (4) Lake

Sol. Option (2)

Underground tanks where water is collected at household level.

174. Which of the state has most sugar mills in India ?

(1) Haryana (2) Punjab (3) Maharastra (4) Bihar

Sol. Option (3)

Maximum sugarcane production. Co-operative sectors are established by sugarcane owners.

175. In whch industry Bauxite is used as raw material ?

(1) Steel (2) Cement (3) Aluminium (4) Jute

Sol. Option (3)

Bauxite is an ore for aluminium

176. Roof top rain water harvesting is the most common practice in which of the following cities "

(1) Shillong (2) Imphal (3) Delhi (4) Patna

Sol. Option (1)

Highest rainfall therefore shillong practice roof top rain water harvesting

177. Which of the following groups constitute the basic rock form

(1) Sandy, Igneous, Metamorphic (2) Igneous, Sedimentary, Metamorphic

(3) Lignite, Volcanic, Sedimentary (4) Sandy, Volcanic, Igneous

Sol. Option (2)

Basic rock forms are igneous, sedimentary & Metamorphic

178. Mango showers occur in which one of the following groups of two states :

(1) Bihar & West Bengal (2) Tamil Nadu & Andhra Pradesh

(3) Karnataka & Kerala (4) Maharastra & Andhra Pradesh

Sol. Option (3)

Pre monsoon showers due to thunderstorm over bay of Bengal due to which early ripening of mangoes.

179. Tropic of Cancer does not pass through

(1) Chattisgarh (2) Odisha (3) Rajasthan (4) tripura

Sol. Option (2)

Because, Odisha does not come or fall on tropic of cancer.

180. AMUL milk scheme is an example of which type of industry

(1) Basic Industry (2) Agrobased Industry (3) Joint Industry (4) Co-operative Industry

Sol. Option (4)

Amul gets milk from nearby pastoral communities thereby forming a co-operative sector.

181. Which one of the figure represents the working age groups of the population

(1) 15 – 65 years (2) 15 – 66 years (3) 15 – 59 years (4) 15 – 64 years

Sol. Option (3)

15-59 years is assumed as economically active population

182. Chemical Industries usually are located near :

(1) Iron & steel Industries (2) Thermal Power Plant

(3) Oil refineries (4) Automobile Industry

Sol. Option (3)

Because organic chemical industry get the raw material from bye product of mineral oil which is processed and refined at oil refineries

183. BAMCEF means

(1) Backward and minority community employees federation

(2) Backward and mining community employees federation

(3) Backward and majority community employees federation

(4) Backward and Malabar coastal employees federation

Sol. Option (1)

It is a federation working for backward and minority community employees.

184. General election are called as

(1) on death of any member (2) Election before specific time in whole country and states.

(3) on completing five year (4) empty seat due to any reason

Sol. Option (3)

In India, general election are called at every five years.

185. In 44^{th} amendment which fundamental right has been removed from the list of fundamental rights.

(1) Freedom to speech (2) Freedom to make groups

(3) Right to work (4) Right to property

Sol. Option (4)

The amendment made right to property only a legal right not fundamental right.

186. Which of the following statement is correct ?

(1) Union list – 66 subjects ; state – 97 subjects ; concurrent list – 47 subjects

(2) Union list – 47 subjects ; state – 97 subjects ; concurrent list – 66 subjects

(3) Union list – 97 subjects ; state – 47 subjects ; concurrent list – 66 subjects

(4) Union list – 97 subjects ; state – 66 subjects ; concurrent list – 47 subjects

Sol. Option (4)

Subjects of national interest were included in union list, subjects of state in state list where as rest of the subjects were included in concurrent list

187. A person who is not a member of any house of Parliament, if he is appointed as minister. He has to get elected to the one of the house of Parliament with in :

(1) A month (2) Six month

(3) Three month (4) Stipulated time is fixed by the president

Sol. Option (2)

Because he has to prove his worth within 6 months by getting elected

188. Why is "Power sharing" regarded as good.

(1) Reduces poverty (2) maximizes wealth

(3) Provides employment (4) Reduces social conflict

Sol. Option (4)

Because it is a true spirit of democracy and participation of people. It reduces conflicts.

189. Main feature of "Pressure Groups" is

(1) Direct control on political power (2) Try to influence the politics of Government

(3) Lax organization (4) Direct participation in political powers.

Sol. Option (2)

Pressure groups influence the policy of the government directly and indirectly and exercises lot of influence of the government it might be socially politically and economically.

190. Among the following which is the main aim of starting civil rights movements in America :

(1) Adult franchise (2) Vote to right for women

(3) Abolishing social discrimination (4) Fan direct election of congress

Sol. Option (3)

Civil rights movement was against social discrimination between whites and blacks

Blacks were treated as inferiors .

191. President can declare emergency when :

(1) Prime Minister advises him to do so

(2) Parliament advises him to declare emergency

(3) The council of minister, in writing, advises him to do so

(4) Home minister asks him to do so.

Sol. Option (3)

The council of minister feel that law and order situation is not under control.

192. Amnesty International is an international organization which works for

(1) Work peace (2) Justice

(3) Restoration of democracy (4) human Rights

Sol. Option (4)

It is an human rights organization which works at International level

193. In which year 'Universal Adult Franchise' was implemented in India ?

(1) 1947 (2) 1950 (3) 1919 (4) 1935

Sol. Option (2)

It was implemented in 1950. along with our constitution.

194. In which year, consumer protection act was enacted ?

(1) 1986 (2) 1988 (3) 1985 (4) 1987

Sol. Option (1)

In order to protect the interest of consumer and for settlement of consumers grievances.

195. Which among the following is considered to be most liquid assets ?

(1) Gold (2) Demand Deposits (3) Land (4) Money

Sol. Option (2)

Because they can be withdrawn whenever required.

196. Food security is ensured in a country only if

(1) Enough food is available for all the person

(2) All persons have the capacity to buy food of acceptable quality

(3) There is no barrier on access to food

(4) All above

Sol. Option (4)

Because food security is

1. Availability 2. Accessibility 3. Affordability

197. The headquarter of world trade organization is situated in

(1) New York (2) China (3) Japan (4) Geneva

Sol. Option (4)

Geneva is a favored destination Switzer land is world's oldest permanently neutral state.

198. Under National Rural Employment guarantee Act (2005), How many days of work are guaranteed in a year ?

(1) 80 days (2) 100 days (3) 200 days (4) 300 days

Sol. Option (2)

100 days of employment is guaranteed. It is a poverty alleviation programme initiated by the government

199. Who is the founder of Grameen Bank of Bangladesh

(1) Abdul Rehman (2) M. Yunis (3) Mujibur Rehman (4) Amartya Sen

Sol. Option (2)

He pioneered the concept of micro credit and microfinance. Loans are given to entrepreneurs who are too poor to get loans from traditional banks.

200. From the following in which state of India the use of chemical, fertilizer is highest ?

(1) Punjab (2) Haryana (3) Rajasthan (4) Himachal Pradesh

Sol. Option (1)

Because of the green revolution and over irrigation.