NATIONAL TALENT SEARCH EXAMINATION (NTSE-2018) STAGE -1
STATE : WEST BENGAL PAPER : SAT

Date: 05/11/2017

Max. Marks: 100 **SOLUTIONS** **Time allowed: 90 mins**

1. If $ax^2 + bx + c = (x - p)^2$, the relation among a, b and c is

(a) $abc = 1$ (b) $2b = a + c$ (c) $b^2 = ac$ (d) $b^2 = 4ac$

Ans. (d)

Sol. $ax^2 + bx + c = a(x - p)^2$

$= ax^2 - 2apx + ap^2$

$\Rightarrow b = -2ap$ ..... (1)

$c = ap^2$ ..... (2)

From equation (1) & (2)

$b^2 = 4a^2p^2$

$= 4a^2(c/a)$

$b^2 = 4ac$

2. The identity $\sqrt{(x+4)^2} = x + 4$ is possible, when

(a) $x \le -4$ (b) $x \ge -4$ (c) $x \le -16$ (d) Not possible

Ans. (b)

Sol. $\sqrt{(x+4)^2} = (x + 4)$

$x + 4 > 0$

$x \ge -4$

3. The number of real roots of the quadratic equation $3x^2 + 4 = 0$ is

(a) 0 (b) 2 (c) 1 (d) 4

Ans. (a)

Sol. $3x^2 + 4 = 0$

$x^2 = -4/3$

No real roots because x^2 is negative.

4. The solution of the equation $9^x + 6^x = 2.4^x$ is

(a) 0 (b) 1 (c) ± 2 (d) -1

Ans. (a)

Sol. $9^x + 6^x = 2.4^x$

$$\frac{9^x + 6^x}{4^x} = 2$$

$$\left(\frac{9}{4}\right)^x + \left(\frac{6}{4}\right)^x = 2$$

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

$$t = \left(\frac{3}{2}\right)^{x}$$

$t^2 + t - 2 = 0$

$t^2 + 2t - t - 2 = 0$

$(t + 2)(t - 1) = 0$

$$t = -\frac{2}{1}$$

$$\left(\frac{3}{2}\right)^{x} = 1$$

$$\left(\frac{3}{2}\right)^{x} = \left(\frac{3}{2}\right)^{0}$$

$n = 0$

5. If $f(x) = 2x^3 - 3x + 4$, the value of $f(x) + f(-x)$ is

(a) 4 (2) 6 (c) 0 (d) 8

Ans. (d)

Sol. $f(x) = 2x^3 + 3x + 4$

$f(x) + f(-x)$

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

$= 8$

6. If $\frac{x^2}{by + cz} + \frac{y^2}{cz + ax} = \frac{z^2}{ax + by} = 2$, then value of $\frac{c}{2c + z} + \frac{b}{2b + y} + \frac{a}{2a + x}$ is

(a) 2 (b) $\frac{1}{2}$ (c) 4 (d) $\frac{1}{4}$

Ans. (b)

Sol. $$\frac{x^2}{by + cz} = \frac{y^2}{cz + ax} = \frac{z^2}{ax + by} = 2$$

$$\Rightarrow \frac{ax^2}{by + cz} = 2a$$

$$\Rightarrow \frac{by + cz}{ax} = \frac{x}{2a}$$

$$\Rightarrow \frac{by + cz + ax}{ax} = \frac{x + 2a}{2a} \qquad \Rightarrow \frac{ax}{ax + by + cz} = \frac{2a}{x + 2a}$$

$$\Rightarrow \frac{ax/2}{ax+by+cz} = \frac{a}{2a+x} \quad \ldots (1)$$

Similarly

$$\Rightarrow \frac{b}{2b+y} = \frac{by/2}{ax+by+cz} \quad \ldots (2)$$

$$\frac{c}{2c+z} = \frac{cz/2}{ax+by+cz} \quad \ldots (3)$$

by adding equation (1), (2) and (3)

$$\frac{a}{2a+x} + \frac{b}{2b+y} + \frac{c}{2c+z} = \frac{\frac{1}{2}(ax+by+cz)}{ax+by+cz}$$

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

7. If $\log_4[\lg o_4\{\log_4(\log_4 x)\}] = 0$, 'x' is equal to

(a) 256 (b) 4^{16} (c) 2^{512} (d) 256^4

Ans. (c)

Sol. $\log_4\log_4\log_4\log_4 x = 0$

$\Rightarrow \log_4\log_4\log_4 x = 4^0 = 1$

$\Rightarrow \log_4\log_4 x = 4^1 = 4$

$\Rightarrow \log_4 x = 4^4 = 256$

$\Rightarrow x = 4^{256}$

$\Rightarrow x = (2^2)^{256}$

$\Rightarrow x = (2^2)^{256}$

$\Rightarrow x = 2^{512}$

8. If $x^2 + y^2 = z^2$, the value of $\frac{1}{\log_{z-y} x} + \frac{1}{\log_{z+y} x}$ is

(a) x (b) y (c) x + y (d) 2

Ans. (d)

Sol. $x^2 + y^2 = z^2$

$$\frac{1}{\log_{z-y} x} + \frac{1}{\log_{z+y} x}$$

$= \log_x (z-y) + \log_x(z+y)$

$= \log_x (z^2 - y^2)$

$= \log_x(x^2)$

$= 2\log_x x$

$= 2$

9. If (x + 2) and (2x – 1) are factors of $(2x^3 + ax^2 + bx + 10)$, then value of $(a^2 + b^2)$ is

(a) 338 (b) 218 (c) 74 (d) 198

Ans. (a)

Sol. $p(x) = 2x^3 + ax^2 + bx + 10$

(x + 2) is a factor

$\Rightarrow p(-2) = 0$

$-16 + 4a - 2b + 10 = 0$

$4a - 2b = 6$

$2a - b = 3$ ... (1)

(2x – 1) is a factor

$\Rightarrow p\left(\frac{1}{2}\right) = 0$

$2\left(\frac{1}{2}\right)^3 + a\left(\frac{1}{2}\right)^2 + b\left(\frac{1}{2}\right) + 10 = 0$

$\frac{1}{4} + \frac{a}{4} + \frac{b}{2} + 10 = 0$

$1 + a + 2b + 40 = 0$

$a + 2b = -41$ ... (2)

From (1) & (2)

$2a - b = 3$

$2a + 4b = -82$

$-5b = 85$

$\boxed{b = -17}$

$\therefore 2a = b + 3$

$29 = -17 + 3$

$2a = -14$

$\boxed{a = -7}$

$\therefore a^2 + b^2 = (-7)^2 + (-17)^2$

$= 49 + 289$

$= 338$

10. If $a + b = 2c$, the value of $\frac{a}{a-c} + \frac{b}{b-c}$ is

(a) 0 (b) 1 (c) 2 (d) –1

Ans. (c)

Sol. Then $\frac{a}{a-c} + \frac{b}{b-c}$

$= \frac{a}{a - \frac{a+b}{2}} + \frac{b}{b - \frac{a+b}{2}}$

$= \frac{2a}{a-b} + \frac{2b}{b-a}$

$= 2\left(\frac{a-b}{a-b}\right)$

$= 2$

11. The compound interest for two years of the amount Rs. 7,500 at the rate of 8% per annum would be

(a) Rs. 1,248 (b) Rs. 1,260 (c) Rs. 1,300 (d) Rs. 1,352

Ans. (a)

Sol. Amount after 2 years = $P\left(1+\frac{R}{100}\right)^2$

$\Rightarrow A = 7500\left(1+\frac{8}{100}\right)^2$

$= 7500 \times \frac{108\times108}{100\times100}$

= Rs. 8748

$\therefore$ C.I = A – P

= 8748 – 7500

= Rs. 1248

12. A businessman fixed the selling price of an article after increasing the cost price by 40%. Then he allowed his customer a discount of 20% and gained Rs. 48. The cost price of the article is

(a) Rs. 200 (b) Rs.248 (c) Rs.400 (d) Rs. 448

Ans. (c)

Sol. Let the cost price of an article be Rs. x

Then marked price = $\frac{140}{100}x$

So, selling price after distcount = $\frac{80}{100}\left(\frac{140x}{100}\right)$

then, profit = $\frac{140\times80x}{100\times100} - x = 48$

$= 1.12x - x = 48$

$\Rightarrow \boxed{x = 400}$

Hence, then cost price = Rs. 400

13. The curved surface area of a right circular cylinder and that of a sphere are equal. If their radii are equal, the ratio of their volume is .

(a) 3:2 (b) 2:3 (c) 3:4 (d) 4:3

Ans. (a)

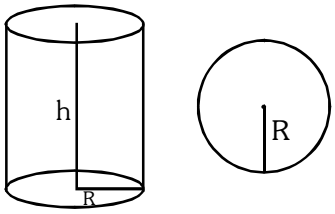
Sol. ATO,

C.S.A of cylinder = C.S.A of sphere

$\Rightarrow 2\pi RH = 4\pi R^2$

$\Rightarrow \boxed{H = 2R}$

$\therefore \quad \dfrac{\text{Volume of cylinder}}{\text{Volume of sphere}} = \dfrac{\pi R^2 H}{\frac{4}{3}\pi R^3} = \dfrac{3}{2}$



14. The sum of the length, breadth and height of a rectangular parallelopiped is 25 cm and its whole surface area is 264 sq. cm. The area of the square whose sides are equal to the length of the diagonal of that parallelopiped is

(a) 256 sq.cm. (b) 361 sq. cm. (c) 225 sq. cm. (d) 324 sq.cm.

Ans. (b)

Sol. Here,

$\Rightarrow \ell + b + h = 25$

and $2(\ell b + bh + h\ell) = 264$

$\Rightarrow \ell b + bh + h\ell = 132$

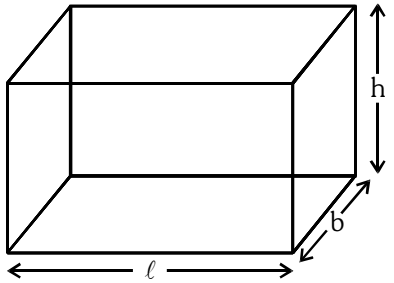
$\therefore \quad (\ell + b + h)^2 = \ell^2 + b^2 + h^2 + 2(\ell b + bh + h\ell)$

$\Rightarrow (25)^2 = \ell^2 + b^2 + h^2 + 264$

$\Rightarrow \sqrt{\ell^2 + b^2 + h^2} = \sqrt{361}$ = length of the diagonal of a parallelpipea.

So. area of a square $= \left(\sqrt{361}\right)^2$

$= 361 \text{ cm}^2$



15. The radii of two circles with centre at A and B are 11 cm and 6 cm respectively. If PQ is the common tangent of the circles and AB =13 cm, length of PQ is

(a) 13 cm (b) 12 cm (c) 17 cm (d) 8.5 cm

Ans. (b)

Sol. Here,

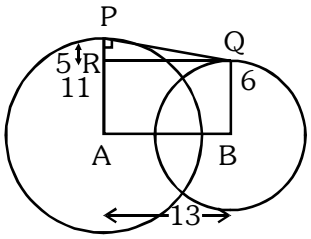
PR = 5 and RQ = 13

$\therefore \quad PQ = \sqrt{13^2 - 5^2}$

$= \sqrt{169 - 25}$

$= \sqrt{144}$

$= 12$ cm



16. The chords PQ and RS of a circle are extended to meet at the point O. If PQ = 6cm, OQ = 8cm, OS = 7cm, then RS =

(a) 12 cm (b) 9 cm (c) 10 cm (d) 16 cm

Ans. (b)

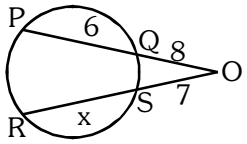
Sol. By therorem,

$OQ \times OP = OS \times OR$

$\Rightarrow 8 \times 14 = 7 \times (7 + x)$

$\Rightarrow 7 + x = 16$

$\boxed{x = 9cm}$



17. ABC is a right angled triangle and AD is perpendicular to the hypotenuse BC. If AC = 2AB, then BC =

(a) 2BD (b) BD (c) 5BD (d) 4BD

Ans. (c)

Sol. AC = 2AB

Let AB = x

AC = 2x

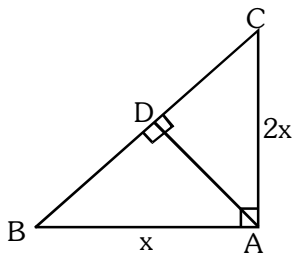
$BC^2 = x^2 + 4x^2$ (In ΔABC)]

$\boxed{BC^2 = 5x^2}$

$\therefore \quad \frac{1}{AD^2} = \frac{1}{AB^2} + \frac{1}{AC^2}$

$\frac{1}{AD^2} = \frac{1}{x^2} + \frac{1}{4x^2}$

$\frac{1}{AD^2} = \frac{5}{4x^2} \Rightarrow \boxed{AD^2 = \frac{4x^2}{5}}$



In ΔADB

$BD^2 = AB^2 - AD^2$

$= x^2 - \frac{4x^2}{5} = \frac{x^2}{5}$

$\boxed{BD^2 = \frac{x^2}{5}}$

So that $BC^2 = 5.x^2$

$= 5 \times 5\ (BD^2)$

$\boxed{BC = 5.BD}$

18. (x + 2), x and (x – 1) are the frequencies of the numbers 12, 15 and 20 respectively. If the mean of the distribution is 14.5, the value of x is

(a) 2 (b) 3 (c) 4 (d) 5

Ans. (b)

Sol. $\frac{12(x+2)+15(x)+20(x-1)}{(x+2)+(x)+(x-1)} = 14.5$

$$\Rightarrow \quad \frac{12x+24+15x+20x-20}{3x+1}=\frac{29}{2}$$

$\Rightarrow$ 2(47x + 4) = 29(3x + 1)

$\Rightarrow$ 94x + 8 = 87 x + 29

$\Rightarrow$ 7x = 21 $\Rightarrow$ $\boxed{x = 3}$

19. If two angles of a triangle are 87°24'54" and 32°31'6", the third angle is

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{4}$

Ans. (c)

Sol. $\angle A = 87° 24' 54"$

$\angle B = 32° 31' 6"$

third angle = 180 – (87° 24'54" + 32°31'6")

= 180 – (119°56')

= 60°4' ~ $\frac{\pi}{3}$

20. If $x \sin^3 \alpha + y \cos^3 \alpha = \sin \alpha \cos \alpha$ and $x \sin \alpha - y \cos \alpha = 0$, the value of $x^2 + y^2$ is

(a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $\frac{1}{3}$

Ans. (b)

Sol. $x\sin^3\alpha + y\cos^3\alpha = \sin\alpha\cos\alpha$ ..... (1)

and $x\sin\alpha - y\cos\alpha = 0$

$\Rightarrow$ $x\sin\alpha = y\cos\alpha$ ..... (2)

$\therefore$ from (1) and (2)

$\Rightarrow$ $y\cos\alpha(\sin^2\alpha + \cos^2\alpha) = \sin\alpha\cos\alpha$

$\Rightarrow$ $y = \sin\alpha$

and $x = \cos\alpha$

So, $x^2 + y^2$

$\Rightarrow$ $\cos^2\alpha + \sin^2\alpha$

= 1

21. Two particles of masses m_1 and m_2 are allowed to fall freely from height h_1 and h_2. They reach the ground at time t_1 and t_2 respectively. Then,

(a) $\frac{t_1}{t_2} = \sqrt{\frac{h_1}{h_2}}$ (b) $\frac{t_1}{t_2} = \sqrt{\frac{h_2}{h_1}}$ (c) $\frac{t_2}{t_1} = \sqrt{\frac{h_2}{h_1}}$ (d) $\frac{t_2}{t_1} = \frac{h_1}{h_2}$

Ans. (a)

Sol. $h_1 = ut + \frac{1}{2}gt_1^2$; $h_2 = ut + \frac{1}{2}gt_2^2$

$\frac{h_1}{h_2} = \frac{1/2gt_1^2}{1/2gt_2^2}$ [As particles freely fall, u = 0]

$\frac{h_1}{h_2} = \frac{t_1^2}{t_2^2}$ $\Rightarrow \frac{t_1}{t_2} = \sqrt{\frac{h_1}{h_2}}$

22. Position of a particle moving along x-axis is given by $x = 3t - 4t^2 + t^3$, where x is in metre and t is in second. Find the average velocity of the particle in the time interval from t = 2 second to t = 4 second.

(a) 7 m/s (b) 1 m/s (c) 13 m/s (d) 5 m/s

Ans. (a)

Sol. $x = 3t - 4t^2 + t^3$

$t_1 = 2$ sec.

$t_2 = 4$ sec.

$x(t_2) = 3 \times 4 - 4 \times 16 + 64 = 12 - 64 + 64$

$x(t_2) = 12$ m

$x(t_1) = 3 \times 2 - 4 \times 4 + 8 = 6 - 16 + 8$

$x(t_1) = -2$m

$V_{avg} = \frac{\Delta x}{\Delta t} = \frac{12-(-2)}{4-2}$

$V_{avg} = \frac{12+2}{2} = \frac{14}{2} = 7$ m/s

23. A lightwave of certain frequency moves from air to glass, then, its

(a) wavelength does not change.

(b) frequency does not change but wavelength changes.

(c) frequency changes.

(d) frequency and wavelength both change.

Ans. (b)

Sol. Frequency does not change during refraction, wavelength changes during refraction.

24. In an atomic reactor, which of the following is used as fuel?

(a) H^1 (b) H^2 (c) D_2O (d) U^{235}

Ans. (d)

Sol. U^{235} (uranium) is a radioactive material which is used in atomic reactor.

25. The linear momentum p of a body having mass m is given by

(a) $p = \sqrt{2mE}$ (b) $p = \sqrt{\frac{E}{2m}}$ (c) $p = \sqrt{\frac{2m}{E}}$ (d) $p = \frac{E^2}{2m}$

Ans. (a)

Sol. $E = \frac{1}{2}mv^2$

$E = \frac{m^2v^2}{2m}$

$E = \frac{(mv)^2}{2m}$ $P = mv$

$E = \frac{P^2}{2m}$

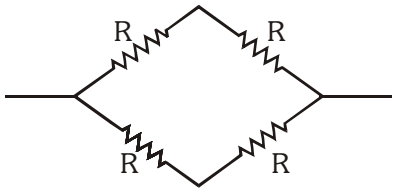
$P = \sqrt{2mE}$

26. What is the equivalent resistance between any two opposite corner points of a quadrilateral, if the sides of the quadrilateral are of equal resistance R?

(a) 3 R (b) 2 R (c) R (d) $\frac{2R}{3}$

Ans. (c)

Sol.



$R_1 = 2R$

$R_2 = 2R$

$R_{eq} = \frac{2R \times 2R}{2R + 2R} = \frac{4R^2}{4R}$

$R_{eq} = R$

27. Two electrodes are maintained at a potential difference of 50 V. An electron moving from cathode to anode gains kinetic energy equal to

(a) 50×10^{-19} erg (b) 50 Joule (c) 80×10^{-19} Joule (d) 80 erg

Ans. (c)

Sol. $V = 50$ V

$V = \frac{W}{Q}$

$W = E = V \times Q$

$E = 50 \times 1.6 \times 10^{-19}$

$E = 80 \times 10^{-19}$ J

28. What will be the power consumed by a 50 Ω wire if it is kept across a potential difference of 200 V?

(a) 0.8 kW (b) 80 kW (c) 400 W (d) 0.4 kW

Ans. (a)

Sol. R = 50 Ω

V = 200 V

$$P = \frac{V^2}{R}$$

$$P = \frac{(200)^2}{50}$$

P = 800 W

P = 0.8 kw

29. The Th_{90}^{232} atom undergoes successive α and β decays to the end product Pb_{82}^{208}. The number of α and β particles emitted in the process respectively are

(a) 4, 6 (b) 4, 4 (c) 6, 6 (d) 6, 4

Ans. (d)

Sol. $Th_{90}^{232} + \alpha + \beta \rightarrow Pb_{82}^{208}$

$Th_{90}^{232} + x_2He^4 + y_{-1}\beta^0 \rightarrow Pb_{82}^{208}$

90 + 2x – y = 82

232 + 4x = 208

x = 6

y = 4

α particle = 6

β particle = 4

30. A particle is executing simple harmonic motion. If its amplitude of vibration increases by 20%, what will be the increase of its total mechanical energy?

(a) 44% (b) 21% (c) 20% (d) 10%

Ans. (a)

Sol. $E\alpha\ \omega^2a^2$

If a is increased by 20% a become 1.2 times.

Square is 1.44

So $\Delta E = \frac{1.44-1}{1} \times 100$

ΔE = 44V

31. When a body is orbiting near the surface of the earth, what will be the ratio of its orbital velocity to the escape velocity from earth?

(a) 1 : $\sqrt{2}$ (b) $\sqrt{2}$: 1 (c) 2 : 1 (d) 1 : 2

Ans. (a)

Sol. Orbital velocity $V_O = \sqrt{9R}$

escape velocity $V_e = \sqrt{2gR}$

$$\frac{V_O}{V_e} = \frac{\sqrt{gR}}{\sqrt{2gR}} \quad \frac{V_O}{V_e} = \frac{1}{\sqrt{2}}$$

$1 : \sqrt{2}$

32. How many times is the root mean square velocity of hydrogen gas molecules compared to the root mean square velocity of oxygen molecules? [Conditions remaining same]

(a) 16 (b) 8 (c) 4 (d) 2

Ans. (c)

Sol. $V_H = \sqrt{\frac{3RT}{M_H}}$ $V_O = \sqrt{\frac{3RT}{M_{O_2}}}$

$$\frac{V_H}{V_O} = \frac{\sqrt{\frac{3RT}{1}}}{\sqrt{\frac{3RT}{16}}} \quad \frac{V_H}{V_O} = \sqrt{\frac{16}{1}}$$

$V_H = 4V_O$

33. For a definite colour of light, absolute refractive index of water is 4/3 and absolute refractive index of glass is 3/2, then what will be the refractive index of glass with respect to water?

(a) 1.125 (b) 1.33 (c) 1.56 (d) 2

Ans. (a)

Sol. Refractive index of glass with respect to water.

$$\mu = \frac{3/2}{4/3} \quad \mu = \frac{9}{8}$$

u = 1.125

34. Chlorine atom does not differ from the Chloride ion in which of the following context?

(a) Electron (b) Volume (c) Proton (d) Chemical reactivity

Ans. (c)

Sol. Cl = Z = 17 Cl^- = Z = 17

p+ = 17 p+ = 17

e^-= 17 p+ = 16

35. Which one of the following statements is applicable regarding the number of bonds and the nature of bonds between two carbon atoms in CaC_2 compound?

(a) One Sigma (σ) bond and one Pi (π) bond (b) One Sigma (σ) bond and two Pi (π) bond

(c) One Sigma (σ) bond and one and half Pi (π) bonds. (d) One Sigma bond.

Ans. (b)

Sol. Ca^{+2} $[C^- \equiv C^-]$ There are one sigma and two π bonds present between two carbon atom in CaC_2.

36. 10^{-3} mole of KOH is added to 10 litres of pure water at 25°C. The pH will change by (assume no change in volume occurs)

(a) 3 (b) 4 (c) 7 (d) 11

Ans. (a)

Sol. mole = 10^{-3}

volume = 10 litres

$$= [OH^-] = \frac{n}{v} = \frac{10^{-3}}{10} = 10^{-4}$$

$= [OH] = 10^{-4} \quad \therefore pOH = 4$

pH + pOH = 14

pH = 14 – 4 = 10 $\Rightarrow$ pH = 10

So change in pH = 10 – 7 = 3

37. Formula of a metallic oxide is M_2O_3. Upon reduction with hydrogen the metallic oxide gives pure metal and water. 0.112 gm metal is produced by 6 mg of hydrogen after complete reduction. Atomic mass of the metal is

(a) 28 (b) 160 (c) 56 (d) 8

Ans. (c)

Sol. As per given in question

$$M_2O_3 + 3H_2 \longrightarrow 2M + 3H_2O$$

6mg 0.112 gm

$$\text{mole of } H_2 \text{ gas} = \frac{6\times10^{-3}}{2} = 0.003 \text{ mol}$$

$\because$ 3 mole of H_2 will produce = 2 mol of metal

$$\therefore \text{ 0.003 mol of } H_2 \text{ will produce} = \frac{2}{3}\times0.003 = 0.002 \text{ mol of metal}$$

$$\text{mole} = \frac{\text{Given mass}}{\text{Gram atomic mass}}$$

$$0.002 = \frac{0.112}{\text{Atomic mass}}$$

$$\text{Atomic mass} = \frac{0.112}{0.002} = 56$$

38. Which of the following group below represents a set of isoelectronic species?

(a) N^{3-}, F^-, Na^+ (b) Na^+, Ca^{2+}, Mg^{2+} (c) Be, Al^{3+}, Cl^- (d) K^+, Na^+, Al^{3+}

Ans. (a)

Sol. N^{3-} = 2, 8 = 10 e^-

F^- = 2, 8 = 10 e^-

Na^+ = 2, 8 = 10 e^-

39. Concentrated aqueous solution of sodium hydroxide is used for separation of pairs of radicals

(a) Al^{3+} and Sn^{2+} (b) Al^{3+} and Fe^{3+} (c) Al^{3+} and Zn^{2+} (d) Mg^{2+} and Pb^{2+}

Ans. (b)

Sol. Bayer's process for alumina enrichment involves separation with conc. NaOH.

40. 10 ml of an aqueous solution contains 222 mg dissolved $CaCl_2$ (molecular weight = 111). What will be the concentration of chloride ion in the resulting solution when it is diluted to 100 ml?

(a) 0.02 Mole/Lit (b) 0.01 Mole/Lit (c) 0.04 Mole/Lit (d) 2.0 Mole/Lit

Ans. (c)

Sol. $M = \frac{222 \times 2}{111 \times 100 \times 1000} \times 1000 = 0.04\ M$

41. Among Ethanol, Dimethyl ether, Methanol and Propanal the isomers are

(a) Ethanol, Dimethyl ether, Methanol and Propanal

(b) Ethanol and Methanol

(c) Ethanol and Dimethyl ether

(d) Ethanol and Propanal

Ans. (c)

Sol. Ethanol (CH_3CH_2OH) and Dimethyl ether ($CH_3—O—CH_3$) are functional isomer.

42. Which molecule of the following compounds contain formyl radical?

(a) Acetone (b) Acetaldehyde (c) Acetic Acid (d) Acetic anhydride

Ans. (b)

Sol. HCHO (Acetaldehyde) contains formyl radical (CHO).

43. The quantity of oxygen required for complete combustion of 1 mole of an organic compound $C_XH_YO_Z$ is

(a) $\left(X + \frac{Y}{2}\right)$ moles (b) $\left(X + \frac{Y}{4}\right)$ moles (c) $\left(X + \frac{Y}{4} - \frac{Z}{2}\right)$ moles (d) (X + Y + Z) moles

Ans. (c)

Sol. Let the moles of oxygen is M. Combustion reaction will be

$$C_XH_YO_Z + 'M'\ O_2 \longrightarrow X\ CO_2 + \frac{Y}{2} H_2O$$

Now balance the oxygen atom

$$Z + 2M = 2X + \frac{Y}{2}$$

$$2M = 2X + \frac{Y}{2} - Z$$

$$M = X + \frac{Y}{4} - \frac{Z}{2}$$

44. Which of the following pairs have identical values of e/m?

(a) A proton and a neutron (b) A deuterium and an α particle

(c) An electron and γ rays (d) A proton and a deuterium

Ans. (b)

Sol. e/m ratio of alpha particle is 4.82245111×10^7 c/kg

e/m ratio of both deuterium and an alpha particle is same.

45. $CH \equiv CH + H_2 \xrightarrow{A} CH_2 = CH_2$ 'A' in this reaction is

(a) Ni/250°C (b) Raney Ni/Normal temperature

(c) $Pd/BaSO_4$ Quinoline (d) Pd/Normal temperature

Ans. (c)

Sol. In many cases highly empirical modifications involve selective poisons. Some functional groups without affecting others, Such as hydrogenation of alkynes to alkenes using lindlar's catalyst (Pd/ $BaSO_4$ quinolin). The resulting catalyst reduces alkynes only as far alkenes.

$$CH \equiv CH + H_2 \xrightarrow{Pd/BaSO_4\ Quinoline} CH_2 = CH_2.$$

46. Container made of Copper metal on exposure to air for longtime turns green. The green layer is due to

(a) CuO (b) $CuCO_3$, $Cu(OH)_2$

(c) $CuSO_4$, $3Cu(OH)_2$ (d) All of the above

Ans. (d)

Sol. The green colour you are seeing is called patina. Bare Cu metal atoms react with air to form Cu_2O which gradually oxidises further to black oxide, CuO. The black sulfide CuS also somtimes forms. In the presence of moisture the blackish layer slowly reacts with sulfur dioxide and carbon dioxide from the air to eventually form the patina, which is a mixture of 3 minerals.

brochantite – $CuSO_4$, $3Cu(OH)_2$

(green)

Malachite – $CuCO_3$, $Cu(OH)_2$

(green)

47. During ventricular systole

(a) Atrial systole occur (b) The atrio-ventricular valves are closed

(c) The pressure inside the ventricles is less than atria (d) The mitral valve is closed

Ans. (b)

Sol. The atrioventricular valves are closed during ventricular systole to prevent backflow of blood in atrium.

48. Match the words in column I with those which are most appropriate in column II.

	Column I		Column II
(A)	Karyokinesis	(1)	Meiocytes
(B)	Cytokinesis	(2)	Plant cell
(C)	Meiosis	(3)	Nuclear division
(D)	Cell plate	(4)	Cytoplasmic division

(a) A = 1, B = 2, C = 3, D = 4 (b) A = 2, B = 1, C = 4, D = 3

(c) A = 3, B = 4, C = 1, D = 2 (d) A = 4, B = 3, C = 2, D = 1

Ans. (c)

Sol. Karyokinesis is nuclear division.

Cytokinesis is division of cytoplasm.

A meiocyte is a type of cell that differentiates into a gamete through the process of meiosis.

Cytokinesis in plant cells take place by cell plate formation.

49. Exine and intine are the parts of

(a) Stigma (b) Seed (c) Embryo sac (d) Pollen grain

Ans. (d)

Sol. Exine and intine are the parts of pollen grains.

50. Transpiration will be fastest when the day is

(a) cool, windy and humid (b) hot, humid and windy

(c) hot, dry and windy (d) hot, humid and still wind

Ans. (c)

Sol. Transpiration will be fastest when the day is hot, dry and windy.

51. A basket of vegetables contains carrot, potato, tomato and radish. Which of them represent the correct homologous structures?

(a) carrot and radish (b) carrot and tomato

(c) tomato and radish (d) potato and tomato

Ans. (a)

Sol. Carrot and radish both are modification of roots thus have the same origin and are homologous structures.

52. What type of teeth are absent in case of baby?

(a) Incisor (b) Canine (c) Pre-molar (d) Molar

Ans. (c)

Sol. Pre-molars are absent in case of babies.

53. When ATP is converted into ADP, it releases

(a) Hormone (b) Secretion (c) Enzyme (d) Energy

Ans. (d)

Sol. When ATP is converted into ADP, energy is released.

54. Which stage of Plasmodium is present in the salivary gland of female mosquito?

(a) Sporozoite (b) Merozoite (c) Gametocyte (d) Ookinete

Ans. (a)

Sol. Stage of plasmodium present in salivary gland of female mosquito are sporozoites.

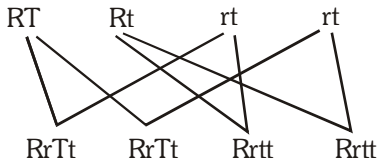
55. In a plant, red fruit (R) is dominant over yellow fruit (r) and tallness (T) is dominant over dwarf (t). If a plant with RRTt is crossed with a plant with rrtt, then

(a) 75% will be tall with red fruit (b) 100% will be tall with red fruit

(c) 25% will be tall with red fruit (d) 50% will be tall with red fruit

Ans. (d)

Sol. RRTt ×rrtt



50% will be tall with red fruit.

56. Match the words in column I with those which are most appropriate in column II.

	Column I		Column II
(A)	Hydra	(1)	Binary fission
(B)	Amoeba	(2)	Spore
(C)	Mucor	(3)	Budding
(D)	Planaria	(4)	Regeneration

(a) A = 4, B = 1, C = 3, D = 2 (b) A = 3, B = 1, C = 2, D = 4

(c) A = 2, B = 3, C = 4, D = 1 (d) A=1, B=4, C = 3, D = 2

Ans. (b)

Sol. Hydra asexually reproduces by budding.

Amoeba asexually reproduces by binary fission.

Mucor asexually reproduces by spores.

Planaria asexually reproduces by regeneration.

57. A person has damaged central nervous system due to continuous intake of metal contaminated water, the metal is

(a) Mercury (b) Calcium (c) Sodium (d) Lead

Ans. (d)

Sol. Central nervous system is damaged by intake of lead contaminated water.

58. Difference between DNA and RNA by

(a) Nitrogen base and sugar (b) Nitrogen base and phosphate group

(c) Number of carbon atom in sugar (d) Sugar and Phosphate

Ans. (a)

Sol. DNA and RNA differ in nitrogen bases and sugar.

DNA - deoxyribose sugar.

Nitrogen base $\rightarrow$ Adenine, Guanine, Cytosine, Thiamine

RNA - Ribose sugar

Nitrogen base - Adenine, Guanine, Cytosine, Uracil

59. The middle layer of three layers of meninges is

(a) Dura matter (b) Pia matter

(c) Arachnoid membrane (d) Sub-arachnoid space

Ans. (c)

Sol. Middle layer of three layers of meninges is arachnoid membrane.

60. Which one of the following hormones is not produced from anterior lobe of pituitary gland?

(a) GH (b) ADH (c) ACTH (d) TSH

Ans. (b)

Sol. ADH is secreted by posterior lobe of pituitary gland.

61. "Imperialism: The Highest Stage of Capitalism" was written by

(a) Lenin (b) Stalin (c) Karl Marx (d) Rousseau

Ans. (a)

Sol. Lenin is the author of "Imperialism : The Highest Stage of Capitalism."

62. 24th October, 1929 was marked as "Black Thursday" in U. S. A. because

(a) Terrorist Attack (b) Natural Calamity (c) Great Depression (d) Change in Political aspect

Ans. (c)

Sol. The day 24th October, 1929 was marked as 'Black Thursday' in the US history because of the Great Depression.

63. During the period of Russian Revolution the Russian ruler was

(a) Czar Alexander-I (b) Czar Alexander-II (c) Czar Nicholas-I (d) Czar Nicholas-II

Ans. (d)

Sol. Czar Nicholas II was the ruler of Russia during the period of Russian Revolution.

64. "Flying Shuttle" was invented by

(a) James Hargraves (b) Edmund Cartwright (c) James Watt (d) John Kay

Ans. (d)

Sol. John Kay invented the Flying Shuttle.

65. "Mein Kampf" was writen by

(a) Hitler (b) Mussolini (c) Lenin (d) Stalin

Ans. (a)

Sol. "Mein Kampf" was written by Hitler.

66. The country which did not join The League of Nations:

(a) America (b) France (c) Italy (d) Japan

Ans. (a)

Sol. America was not the member of The League of Nations.

67. Present name of General Assembly's Institution is

(a) Hindu School (b) Scottish Church College

(c) Loreto House (d) St. Xavier's College

Ans. (b)

Sol. Scottish Church College is the present name of General Assembly's Institution.

68. The first Chancellor of Calcutta University was

(a) Lord Canning (b) Lord Dalhousie (c) James William Colvile (d) Sir Ashutosh Mukherjee

Ans. (a)

Sol. Lord Canning was the first Chancellor of Calcutta University.

69. Sardar Ballavbhai Patel was known as

(a) Saviour of India (b) Modern Man of India (c) Iron Man of India (d) Mechiavelli of India

Ans. (c)

Sol. Sardar Vallabh Bhai Patel was known as 'Iron Man of India'.

70. 'Communal Awards' (1932) in India was declared by

(a) Lord Irwin (b) Ramsay Macdonald (c) Md.Ali Zinnah (d) Lord Mountbatten

Ans. (b)

Sol. 'Communal Awards' 1932 in India was first declared by Ramsay MacDonald.

71. Pahartali European Club was attacked in 1932 by

(a) Kalpona Dutta (b) Bina Das (c) Pritilata Waddedar (d) Lila Nag

Ans. (c)

Sol. Priti Lata Waddedar attacked Paharthali European Club in 1932.

72. "All India Trade Union Congress" (AITUC) was formed in

(a) 1915 AD (b) 1920 AD (c) 1922 AD (d) 1928 AD

Ans. (b)

Sol. " All India Trade Union Congress" (AITUC) was formed in 1920 AD.

73. Augite metamorphosed to

(a) Hornblande (b) Pyroclastic (c) Brecia (d) Pegmatite

Ans. (a)

Sol. Augite metamorphosed to Hornblande

74. 'Busket of Egg topography' is a common feature of

(a) River deposition (b) Wind deposition (c) Glacial erosion (d) Glacial deposition

Ans. (d)

Sol. 'Busket of Egg Topography' is a common feature of Glacial deposition Drumlins are foremd by glencial dpeposition and graoup of drumlins is termed as "Busket of Egg".

75. Widest waterfall of world is

(a) Khone waterfall of Laos (b) Salto Angel of Veneguela

(c) Niagra of U.S.A. (d) Stanley waterfall of Congo

Ans. (a)

Sol. Khone waterfall of Laos is the widest waterfall of the world.

76. 'Cyclone' or 'Anti-cyclone' is

(a) Trade wind (b) Periodical wind (c) Sudden wind (d) Local wind

Ans. (c)

Sol. Cyclone or Anti-cyclone is a type of sudden wind.

77. Benguela Current flows along the coast of

(a) California (b) South-West Africa (c) Peru (d) East Greenland

Ans. (b)

Sol. Benguala Current flows along the coast of South West Africa.

78. Coromandel coastal plain is located at

(a) Kerala state (b) Karnataka state (c) Tamilnadu state (d) Maharashtra state

Ans. (c)

Sol. Coromandel coastal plain is located at Tamil Nadu state.

79. Among these regions _____ is under Tropical Monsoon climate.

(a) Canada (b) India (c) Guinea (d) Argentina

Ans. (b)

Sol. India comes under Tropical Monsoon climate.

80. UNESCO has registered Sundarban as 'World Heritage Site' in the year

(a) 1978 (b) 1979 (c) 1986 (d) 1987

Ans. (d)

Sol. Sunderban has been registered as 'World Heritage Site' by UNESCO in the year 1987.

81. In which state of India ranks first as per hectre rice production?

(a) Punjab (b) West Bengal (c) Uttar Pradesh (d) Andhra Pradesh

Ans. (a)

Sol. Punjab : 3,741

Andhra Pradesh : 3,146

West Bengal : 2,688

Uttar Pradesh : 2,358

82. 'White Revolution' is related with

(a) Milk production (b) Paper production

(c) Egg production (d) Non-Conventional energy sources.

Ans. (a)

Sol. White Revolution is related with Milk production.

83. In India the Metro Rail starts for the first time in

(a) Delhi (b) Mumbai (c) Kolkata (d) Bengaluru

Ans. (c)

Sol. Metro Rail was started firstly at Kolkata in India.

84. Which of the following satellites are launched from India?

(a) LANDSAT (b) SPOT (c) GOMs (d) IRS

Ans. (d)

Sol. Indian Remote Sensing Satellites are launched from India.

85. "Political Science begins and ends with the State," is stated by

(a) Gettel (b) Garner (c) Seeley (d) Aristotle

Ans. (b)

Sol. 'Political Science begins and ends with the State,' is stated by Garner.

86. How many members in the Lok Sabha can be nominated by the President of India?

(a) 2 (b) 3 (c) 4 (d) 5

Ans. (a)

Sol. The President of India can nominate maximum of 2 members in the Lok Sabha.

87. Joint Session of the Indian Parliament is presided over by the

(a) Vice-President (b) Speaker (c) Governor (d) President

Ans. (b)

Sol. The Speaker of Lok Sabha presides over the joint session of the Indian Parliament.

88. In Indian Parliamentary system of government the Council of Ministers is responsible to

(a) President (b) Prime Minister (c) Parliament (d) Supreme Court

Ans. (c)

Sol. In Indian Parliamentary system the Council of Ministers is responsible to the Parliament.

89. In modern times Direct Democracy existed in

(a) India (b) Britain (c) France (d) Switzerland

Ans. (d)

Sol. In modern times Direct Democracy exists in Switzerland.

90. The World Trade Organisation was established in the year

(a) 1990 (b) 1991 (c) 1994 (d) 1995

Ans. (d)

Sol. WTO was established in 1995.

91. The number of permanent members of the Security Council of United Nations are

(a) 5 (b) 7 (c) 8 (d) 10

Ans. (a)

Sol. The Security Council of UN has 5 permanent members.

92. The United Nations Organisation was established in

(a) 1945 (b) 1941 (c) 1947 (d) 1950

Ans. (a)

Sol. UNO was established in 1945.

93. If national income increases at a higher rate than population the per capita income

(a) increases (b) decreases

(c) remains same (d) may increase or decrease

Ans. (a)

Sol. If National Income increases at higher rate than population, then the Per Capita Income increases.

94. To control the situation of deflation it is necessary to

(a) increase the demand for bank loan. (b) decrease the demand for bank loan,

(c) decrease the purchasing power of the people. (d) increase national saving.

Ans. (a)

Sol. To control the situation of Deflation, it is necessary to increase the demand for bank loans.

95. Economic rent is the price paid for the use of

(a) land only (b) scarce resources (c) machinery only (d) building only

Ans. (b)

Sol. Economic Rent is the price paid for the use of scarce resources.

96. Which of the following is not a factor of production ?

(a) Money (b) Land (c) Labour (d) Capital

Ans. (a)

Sol. Money is not a factor of production.

97. The main aim of _____ programme was to provide employment of 100 days per year to one member of a rural family.

(a) TRYSEM (b) IRDP (c) NREGS (d) JGSY

Ans. (c)

Sol. The main aim of NREGA programme is to provide 100 days employment in rural areas.

98. The expenditure of government for payment of government employees is expenditure on _____ account.

(a) revenue (b) capital (c) development (d) investment

Ans. (b)

Sol. The expenditure of government for payment of government employees is expenditure on Capital account.

99. Which of the following is not a public goods?

(a) Roads and bridges (b) Administration (c) Food products (d) Defence

Ans. (c)

Sol. Food products do not come under the Public goods.

100. If the value of domestic currency falls in terms of foreign currency then

(a) import payment will increase and export earnings will also increase.

(b) import payment will fall and export earnings will also fall.

(c) import payment will increase and export earnings will fall.

(d) import payment will fall and export earnings will increase.

Ans. (a)

Sol. It says import payment will increase which means import will be costlier.