

SCHOLASTIC APTITUDE TEST**NTSE Stage 1 - 2020****TOTAL QUESTIONS: 100****TOTAL MARKS: 100****DURATION: 120 MIN****DATE: 25.01.2021**1. **Ans (B)**

$$P = \frac{F}{A}$$

By increasing the area of contact, the force gets spread out and results in decreasing the overall pressure.

2. **Ans (A)**

$$d_1 = 260 \text{ m}, t_1 = 20 \text{ s}$$

$$d_2 = 300 \text{ m}, t_2 = 20 \text{ s}$$

$$v_{\text{avg}} = \frac{d_1 + d_2}{t_1 + t_2} = \frac{260 + 300}{20 + 20} = \frac{560}{40} = 14 \text{ ms}^{-1}$$

3. **Ans (D)**

The law of gravitation explains why moon revolves around the earth, and formation of tides. It also explains as to why we are attracted to the earth.

4. **Ans (B)**

The given ray diagram is that of an object kept at $2F$ in front of a convex lens.

Clearly, $u = 20 \text{ cm}$

Here, u is at $2F$

$$\therefore u = 2f$$

$$\Rightarrow f = \frac{u}{2} = \frac{20 \text{ cm}}{2} = 10 \text{ cm}$$

5. **Ans (D)**

The given defect corresponds to hypermetropia (far sightedness). The image of the object is formed behind the retina.

Hence a converging lens (convex lens) must be used to correct this eye defect.

6. **Ans (C)**

For three lenses in contact, the effective power P is given by

$$P = P_1 + P_2 + P_3$$

$$P_1 = +3.5 \text{ D}$$

$$P_2 = +2.5 \text{ D}$$

$$P_3 = +1 \text{ D}$$

$$P = 3.5 + 2.5 + 1$$

$$P = 7 \text{ D}$$

7. **Ans (C)**

$$m = 20 \text{ kg}, u = 6 \text{ ms}^{-1}, v = 3 \text{ ms}^{-1}, W = ?$$

$$W = F \cdot s = mas$$

$$v^2 = u^2 + 2as$$

$$3^2 = 6^2 + 2as$$

$$9 - 36 = 2as$$

$$-\frac{27}{2} = as$$

$$\therefore W = 20 \left(-\frac{27}{2} \right) = -270 \text{ J}$$

Since the force is reducing the velocity, the workdone is negative.

8. **Ans (D)**9. **Ans (B)**

In waterfalls, the potential energy of the water gets converted into kinetic energy as the water falls. This kinetic energy gets converted to heat energy as the water hits the ground and hence increases the temperature of water at the bottom.

10. **Ans (B)**

The statement given assertion (a) is true and that in reason (r) is false.

The correct explanation for (a) is :

When the supplied voltage exceeds the rated voltage of the appliance, it burns out.

11. **Ans (D)**

A DC voltmeter is used to measure the potential difference across the ends of a dry cell.

12. **Ans (A)**

momenetum, $p = mv$

$$p_A = 8 \times 6 = 48 \text{ kg ms}^{-1}$$

$$p_B = 4 \times 11 = 44 \text{ kg ms}^{-1}$$

$$p_C = 10 \times 4 = 40 \text{ kg ms}^{-1}$$

$$p_D = 45 \times 1 = 45 \text{ kg ms}^{-1}$$

$$\therefore p_A > p_D > p_B > p_C$$

13. **Ans (B)**

Pole star is situated along the imaginary axis of the earth. Hence pole star appears to be stationary when observed from the earth.

14. **Ans (B)**

Evaporation causes cooling effect. Heat energy required to convert liquid to gas is absorbed from the body and thus causes cooling effect. Hence statement and reason both are correct.

15. **Ans (*)**

No options applicable

Mass of solute – 60 g

Mass of solvent – 480 g

$$\text{Mass of solution} = 60 + 480 = 540$$

$$\text{Mass percentage of solution} = \frac{60}{540} \times 100$$

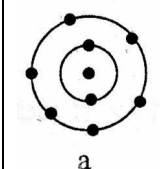
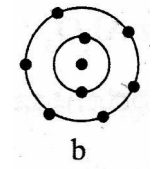
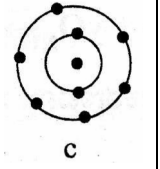
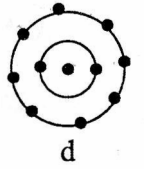
$$= 11.1\%$$

NOTE

None of the options given, match with the correct answer.

$$\text{Mass percentage of solution} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

16. **Ans (B)**

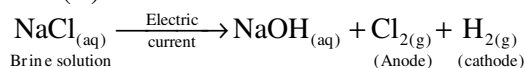
| | | | |
|---|---|---|--|
|  |  |  |  |
| (2, 6) | (2, 6) | (2, 6) | (2, 8) |
| At no - 08 | At no - 08 | At no - 08 | At no = 10 |
| Oxygen | Oxygen | Oxygen | Neon |

The correct statement is 'a' is the schematic atomic structure of oxygen.

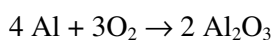
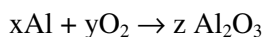
17. **Ans (D)**

Alcohol is not an electrolyte, due to which it does not dissociate into ions. Hence alcohol does not conduct electricity.

18. **Ans (C)**



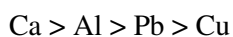
19. **Ans (A)**



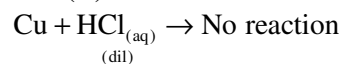
$$\therefore z = 2$$

20. **Ans (C)**

Based on metal reactivity series the decreasing order of resistivity of the given metals is

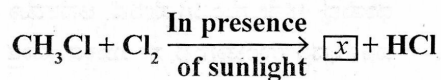


21. **Ans (B)**



Copper is less reactive than hydrogen and cannot displace hydrogen from dil HCl. Hence neither formation of bubbles nor rising of temperature occurs.

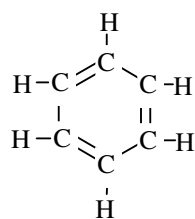
22. **Ans (C)**



This is a substitution reaction, x is CH_2Cl_2

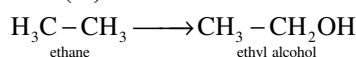
23. **Ans (D)**

Benzene



Benzene

The number of covalent bonds in benzene is 15.

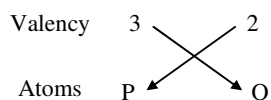
24. **Ans (A)**

To convert ethane to ethanol, one hydrogen is removed and – OH group is added.

25. **Ans (D)**Element 'P' – 13th groupElement Q – 16th group

Valency – 3

Valency – 2



By applying intervalence rule, we get formula P₂Q₃

26. **Ans (B)**₇A – (2, 5)₁₅B – (2, 8, 5)₃₃C – (2, 8, 18, 5)₅₁D – (2, 8, 18, 18, 5)

Based on the electronic configuration, these elements have same number of valence electrons. Hence they belong to same (group 15).

27. **Ans (C)**

Movement of water molecules from the region of their higher water concentration to the region of their lower water concentration through a semipermeable membrane is called osmosis. Water is hypotonic to the raisins and hence results in swelling of raisins through endosmosis. When the swollen raisins are placed in salt solution (hypertonic) they will shrink due to exosmosis.

28. **Ans (A)**

Collenchyma is a simple permanent tissue made of living cells whose cell wall thickenings are made of cellulose, hemicellulose and pectin. They are compactly arranged with less or no intercellular space. This tissue provides flexibility to plant parts.

29. **Ans (B)**

Crocodile belonging to Class Reptilia possess incompletely four chambered heart. Frog belonging to Class Amphibia possess three chambered heart. Human belongs to Class Mammalia and possess completely four chambered heart. Fish belongs to Class Pisces and possess two chambered heart.

30. **Ans (D)**

The innermost lining of the small intestine is raised into a number of tiny finger-like projections called villi that increase the surface area and aid in mixing, secretion and absorption.

31. **Ans (A)**

Pyruvate which is a product of glycolysis is converted to lactic acid in muscle cells when consumption of oxygen is faster than its supply as during vigorous exercise. Build up of lactic acid in muscles during prolonged activity causes fatigue and results in cramps.

32. **Ans (C)**

Veins are the blood vessels carrying deoxygenated blood (except pulmonary vein carrying oxygenated blood) from all parts of the body towards heart. They are thin walled with valves to prevent back flow of blood.

33. **Ans (B)**

The correct pathway of conduction of impulses through a neuron is
Dendrites → cell body → axon → nerve ending

34. **Ans (C)**

Insulin is the hormone secreted by the endocrine part of the pancreas i.e., islets of Langerhans. Insulin helps in maintaining blood glucose level.

35. **Ans (B)**

Bryophyllum reproduces asexually through vegetative propagation of leaves.

Amoeba reproduces asexually by binary fission.

Yeast reproduces asexually through budding.

Leishmania reproduces through binary fission.

36. **Ans (A)**

A flower with only one of these reproductive parts i.e. only stamens or only the carpels is said to be an unisexual or imperfect flowers. Unisexual flowers perform cross pollination.

37. **Ans (C)**

- **Prostrate gland:** A large pyramidal gland that encloses a part of urethra including its junction with the ejaculatory duct. It contains 30 - 40 alveoli which open separately into urethra by fine ducts. Secretion is thick, milky and alkaline which continue 20 - 30% semen.
- **Seminal vesicle:** Paired and present between urinary bladder and rectum. Its secretion from a major part of semen (60-70%). It is thick, viscous, alkaline having proteins, fructose.

38. **Ans (A)**

Exhaustible natural resources were formed from the dead remains of living organisms (fossils); therefore, these **natural resources** are also known as fossil fuels. Eg. **coal, petroleum** and **natural gas**. Combustion of fossil fuels results in release of CO₂, sulphur oxides, nitrogen oxides.

39. **Ans (D)**

Parents: RRyy x rrYY

F1 gen: RrYy (Round yellow)

40. **Ans (A)**

The chromosomes that bear genes for sexual characters are called **sex chromosomes or allosomes** which are designated as X and Y chromosomes while those that possess genes for the vegetative

characters are called **autosomes**. The XX pair with similar patterns is found in females whereas the XY pair with dissimilar patterns is found in males.

41. **Ans** (B)
42. **Ans** (B)
43. **Ans** (D)
44. **Ans** (C)
45. **Ans** (B)
46. **Ans** (B)
47. **Ans** (C)
48. **Ans** (D)
49. **Ans** (A)
50. **Ans** (B)
51. **Ans** (B)
52. **Ans** (A)
53. **Ans** (A)
54. **Ans** (D)
55. **Ans** (C)
56. **Ans** (B)
57. **Ans** (C)
58. **Ans** (D)
59. **Ans** (C)
60. **Ans** (C)
61. **Ans** (D)
62. **Ans** (D)
63. **Ans** (A)
64. **Ans** (C)
65. **Ans** (C)
66. **Ans** (D)
67. **Ans** (A)
68. **Ans** (B)
69. **Ans** (C)
70. **Ans** (A)
71. **Ans** (D)
72. **Ans** (D)
73. **Ans** (C)
74. **Ans** (A)
75. **Ans** (A)
76. **Ans** (D)
77. **Ans** (B)
78. **Ans** (B)
79. **Ans** (C)
80. **Ans** (D)



81. **Ans (A)**

Let the numbers are $4x$ and $5x$

$$\therefore \frac{4x - 24}{5x - 24} = \frac{2}{3}$$

$$12x - 72 = 10x - 48$$

$$2x = 24 \Rightarrow x = 12$$

$$4 \times 12 = 48, 5 \times 12 = 60$$

82. **Ans (D)**

By Pythagoras theorem

$$AC^2 = AB^2 + BC^2$$

$$= 16^2 + 32^2$$

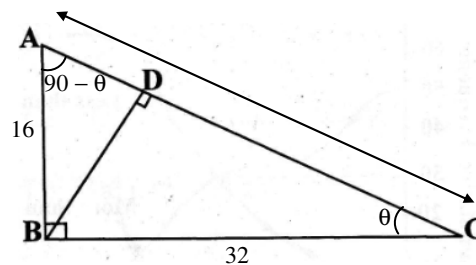
$$AC = \sqrt{16^2(1+2^2)} = 16\sqrt{5}$$

$\triangle ABC \sim \triangle ADB$ (AA - similarity)

$$\frac{AB}{AD} = \frac{AC}{AB}$$

$$\Rightarrow AD = \frac{AB^2}{AC} = \frac{16 \times 16}{16\sqrt{5}} = \frac{16}{\sqrt{5}}$$

$$\therefore \frac{AD}{AC} = \frac{\frac{16}{\sqrt{5}}}{16\sqrt{5}} = \frac{1}{5}$$



83. **Ans (B)**

$$\sin A + \sin^2 A = 1$$

$$\Rightarrow \sin A = 1 - \sin^2 A = \cos^2 A$$

$$\therefore \cos^2 A + \cos^4 A$$

$$\cos^2 A + (\cos^2 A)^2$$

$$\cos^2 A + (\sin A)^2$$

$$\cos^2 A + \sin^2 A = 1$$

84. **Ans (A)**

Speed of X \rightarrow 'x' kmph

Speed of Y \rightarrow 'y' kmph

$$\therefore x > y$$

$$\therefore x + y = 7 \quad \dots (1)$$

$$\frac{24}{x} + \frac{24}{y} = 14$$

$$\frac{24(x+y)}{xy} = 14$$

$$\frac{x+y}{xy} = \frac{14}{24}$$

$$\frac{7}{xy} = \frac{14}{24}$$

$$\therefore xy = 12 \quad \dots (2)$$

Solving (1) and (2) $x = 4$ kmph, $y = 3$ kmph

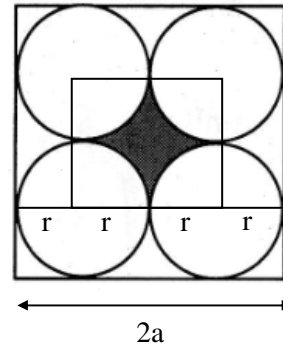
85. **Ans (C)**

Median = 40 kg (By observation)

86. **Ans (B)**

$$\begin{aligned} \text{Required area} &= (2r)^2 - 4 \times \frac{1}{4} \pi r^2 \\ &= 4r^2 - \pi r^2 \\ &= 4 \left(\frac{a}{2} \right)^2 - \pi \left(\frac{a}{2} \right)^2 \\ &= 4 \times \frac{a^2}{4} - \pi \frac{a^2}{4} \\ &= \frac{a^2}{4} (4 - \pi) \end{aligned}$$

$$4r = 2a \Rightarrow r = \frac{a}{2}$$



87. **Ans (A)**

3 Median = Mode + 2 Mean

88. **Ans (D)**

$$\begin{aligned} \frac{1}{2} \times BD \times AC &= \text{ar}(\Delta ABC) \\ \frac{1}{2} \times BD \times \sqrt{8^2 + 2^2} &= \left| \frac{1}{2} [8(-3-0) + 5(0-2) + 0(2+3)] \right| \\ BD \times \sqrt{68} &= |(-24-10)| \\ BD \times 2\sqrt{17} &= 34 \\ BD &= \frac{34}{2\sqrt{17}} = \sqrt{17} \end{aligned}$$



89. **Ans (D)**

$$\begin{aligned} \frac{p}{12} = \frac{3}{p} &= \frac{p-3}{p} \\ p^2 = 36 & \quad 3p = p^2 - 3p \\ p = \pm 6 & \quad p^2 - 6p = 0 \\ & \quad p(p-6) = 0 \\ & \quad p = 0, 6 \end{aligned}$$

$$\Rightarrow p = 6$$

90. **Ans (A)**

$$\text{Centroid} = x = \frac{7+1+1}{3}, y = \frac{1+5+6}{3} = \frac{12}{3} = 4$$

Centroid = (3, 4)

Origin = (0, 0)

Centroid = (3, 4)

$$\begin{aligned} \text{distance} &= \sqrt{(3+0)^2 + (4+0)^2} \\ &= \sqrt{9+16} \\ &= \sqrt{25} = 5 \text{ units} \end{aligned}$$

91. **Ans (C)**

Standard result

$$5BC^2 = 4(BD^2 + CE^2)$$

$$5BC^2 = 4(6^2 + 8^2)$$

$$5BC^2 = 4(36 + 64)$$

$$BC^2 = \frac{4 \times 100}{5}$$

$$BC^2 = 4 \times 20$$

$$BC = \sqrt{4 \times 4 \times 5}$$

$$BC = 4\sqrt{5}$$

92. **Ans (D)**

$$8R + 7B + 6G = 21 \text{ Balls.}$$

$$P(\text{neither blue nor green}) = \frac{8}{21}$$

93. **Ans (B)**

$$a_{10} = 16 \text{ and } a_{16} = 10 \text{ } a_{26} = ? \text{ } d = ?$$

$$d = \frac{T_p - t_q}{P - q}$$

$$d = \frac{a_{16} - a_{10}}{16 - 10} = \frac{10 - 16}{6} = \frac{-6}{6} = -1$$

$$\therefore d = -1$$

$$a_{10} = a + 9d$$

$$16 = a + 9(-1)$$

$$16 + 9 = a$$

$$25 = a$$

$$a_{26} = a + 25d$$

$$= 25 + 25(-1)$$

$$= 25 - 25$$

$$a_{26} = 0$$

$$\therefore -1 \text{ and } 0$$

94. **Ans (D)**

$$OT^2 = OP^2 + PT^2$$

$$10^2 = 6^2 + PT^2$$

$$PT^2 = 100 - 36$$

$$PT^2 = 64$$

$$PT = \sqrt{64}$$

$$PT = 8$$

$$\text{Let } AP = x$$

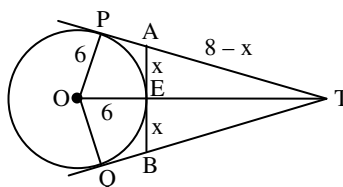
$$PT = 8$$

$$AT = 8 - x$$

$$OT = 10 \text{ cm}$$

$$OE = 6 \text{ cm}$$

$$TE = 4 \text{ cm}$$



In ΔAET

$$AT^2 = AE^2 + ET^2$$

$$(8 - x)^2 = x^2 + 4^2$$

$$64 + x^2 - 16x = x^2 + 16$$

$$-16x = 16 - 64$$

$$-16x = -48$$

$$x = 3 \text{ cm}$$

$$\therefore AE = 2x$$

$$2 \times 3 = 6 \text{ cm}$$

95. Ans (B)

$$\angle PTQ = 32^\circ$$

$$\angle POQ = 180^\circ - 32^\circ$$

$$\angle POQ = 148^\circ$$

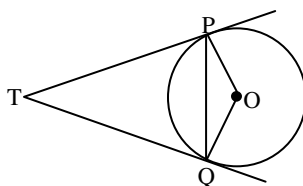
$$\angle OPQ = \angle OQP = x$$

$$148^\circ + 2x = 180^\circ$$

$$2x = 180^\circ - 148^\circ$$

$$2x = 32^\circ$$

$$x = 16^\circ$$



96. Ans (C)

| | |
|--|--------------------------|
| (i) $\tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \dots \tan 89^\circ$ | (a) 0 |
| (ii) $\operatorname{cosec} 31^\circ - \sec 59^\circ$ | (b) $\frac{\sqrt{3}}{2}$ |
| (iii) $\sin^2 45^\circ + \cos^2 60^\circ$ | (c) $\frac{3}{4}$ |
| (iv) $\frac{2 \tan 30^\circ}{1 + \tan^2 30^\circ}$ | (d) 1 |

$$(i) \tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \dots \tan 89^\circ$$

$$= \tan 1^\circ \cdot \tan 89^\circ \cdot \tan 2^\circ \cdot \tan 88^\circ \cdot \tan 3^\circ \cdot \tan 87^\circ \dots \tan 45^\circ$$

$$= \tan 1^\circ \cdot \cot 1^\circ \cdot \tan 2^\circ \cdot \cot 2^\circ \cdot \tan 3^\circ \cdot \cot 3^\circ \dots$$

$$= 1$$

$$(i) \rightarrow (d)$$

$$(ii) \operatorname{cosec} 31^\circ - \sec 59^\circ$$

$$\sec 59^\circ = \sec [90^\circ - 31^\circ]$$

$$= \operatorname{cosec} 31^\circ$$

$$\operatorname{cosec} 31^\circ - \operatorname{cosec} 31^\circ = 0$$

$$(ii) \rightarrow (a)$$

$$(iii) \sin^2 45^\circ + \cos^2 60^\circ = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{2}\right)^2$$

$$= \frac{1}{2} + \frac{1}{4} = \frac{3}{4}$$

$$(iii) \rightarrow (c)$$

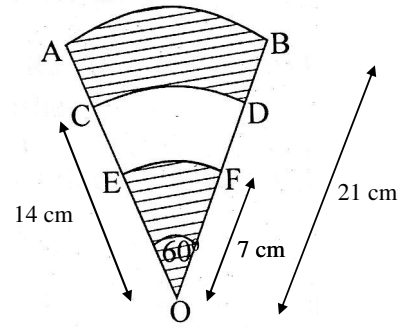
$$(iv) \frac{2 \tan 30^\circ}{1 + \tan^2 30^\circ} = \frac{2 \times \frac{1}{\sqrt{3}}}{1 + \left(\frac{1}{\sqrt{3}}\right)^2} = \frac{\frac{2}{\sqrt{3}}}{1 + \frac{1}{3}} = \frac{\frac{2}{\sqrt{3}}}{\frac{4}{3}} = \frac{\sqrt{3}}{2}$$

(iv) → (b)

97. **Ans (A)**

Area of OEF

$$\begin{aligned} & \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times 7 \times 7 + \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times 21 \times 21 - \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times 14 \times 14 \\ &= \frac{1}{6} \times 22 \times 7 + \frac{1}{6} \times 22 \times 3 \times 21 - \frac{1}{6} \times 22 \times 2 \times 14 \\ &= \frac{1}{6} [154 + 1386 - 616] \\ &= \frac{1}{6} \times 924 = 154 \text{ cm}^2 \end{aligned}$$



98. **Ans (C)**

Let the roots be α and β

Given that $\alpha = 2\beta$

Q.E = $ax^2 + bx + c$

$$\alpha + \beta = \frac{-b}{a} \quad \alpha\beta = \frac{c}{a}$$

$$\Rightarrow 3\beta = \frac{-b}{a} \quad \dots (1)$$

$$2\beta \cdot \beta = \frac{c}{a}$$

$$2\beta^2 = \frac{c}{a} \quad \dots (2)$$

$$\text{From (1), } \beta = \frac{-b}{3a}$$

From (1) and (2),

$$2 \left(\frac{-b}{3a} \right)^2 = \frac{c}{a}$$

$$\frac{2b^2}{9a^2} = \frac{c}{a}$$

$$\Rightarrow 2b^2 = 9ac$$

99. **Ans (B)**

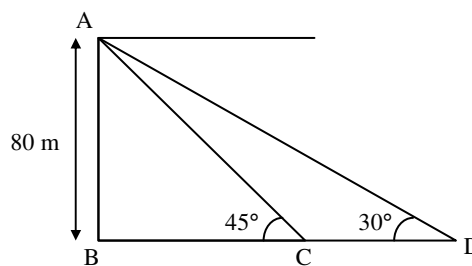
$$\text{In } \triangle ABC, \tan 45^\circ = \frac{AB}{BC}$$

$$\Rightarrow AB = BC = 80 \text{ m}$$

Let $CD = x$

$$\text{In } \triangle ABD, \tan 30^\circ = \frac{AB}{BD}$$

$$\frac{1}{\sqrt{3}} = \frac{80}{80 + x}$$



$$\begin{aligned} \Rightarrow 80 + x &= 80\sqrt{3} \\ \Rightarrow x &= 80\sqrt{3} - 80 \\ \Rightarrow x &= 80(\sqrt{3} - 1)\text{m} \end{aligned}$$

100. **Ans (C)**

Ratio of total surface areas of cylinder to that of sphere

$$\frac{S_c}{S_s} = \frac{2\pi r(r+h)}{4\pi r^2}$$

Here $h = 2r$

$$\Rightarrow \frac{2\pi r(r+2r)}{4\pi r^2}$$

$$= \frac{2\pi r(3r)}{4\pi r^2}$$

$$\frac{6\pi r^2}{4\pi r^2} = \frac{3}{2}$$

Ratio of volumes:

$$\frac{V_c}{V_s} = \frac{\pi r^2 h}{\frac{4}{3}\pi r^3}$$

Here $h = 2r$

$$\Rightarrow \frac{V_c}{V_s} = \frac{\pi r^2 \times 2r}{\frac{4}{3}\pi r^3}$$

$$= \frac{2\pi r^3}{\frac{4}{3}\pi r^3}$$

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

\therefore Option (C) is true



* * *