

IIT ASHRAM BRINGS...

IIT ASHRAM

JEE MAINS || JEE ADVANCED || MEDICAL || FOUNDATION

SCIENCE APTITUDE
TEST (2016-17)

CLASS **8th**



SAMPLE PAPER

SOLUTIONS & ANSWER KEY

for

Part - I : Mental Ability

Part - II : Mathematics

Part - III : Physics/ Chemistry

Part - IV : Biology

MENTAL ABILITY

1.

Sol. (a) (41 is the next prime number in ascending order)

2.

Sol. (c) (the sequence has two alternating series progressing as +3, and +2 \Rightarrow $12+3 = 15$, $15+3 = 18$ and therefore $18+3 = 21$.)

3.

Sol. (b) (the simplified sequence is: 15^2 , 14^2 , 13^2 , 12^2 , 11^2 , 10^2 , 9^2)

4.

Sol. (d) (the number in the lower box is nothing but the addition of individual numbers of box 1 and box 2 in reverse order. Clarification: 15 and 12 \rightarrow add $5 + 2$ and $1 + 1 = 72$. Similarly, $9+1$ and $3+1$ give 104. Thus $8+6$ and $1+1$ will give 142 as the answer)

5.

Sol. (b) (Numbers outside the inner triangle are divisible by the opposite numbers. Meaning, $252/6 = 42$; $150/5 = 30$; $576/8 = 72$. Therefore, $1452/11 = 132$)

6.

Sol. (b) (All the other alphabets are vowels)

7.

Sol. (c) (skipped E after D and the I after H. Hence, we will skip O after N and start again with P)

8.

Sol. (d) (The distance between the first terms of each new group is reducing by 2 – T-R is 24, R-O is 22, O-J is 20 and thus we move 18 alphabets from J to arrive at C. Similarly Difference between C-A is 24, A-X is 22, X-S is 20 and so on.)

9.

Sol. (b) (Like above, the distance between S-L is 18, U-P is 22, W-T is 24 and Y-X is 25. Similarly, maintaining the same distances, we get $P+18 = I$, $R+22 = N$, $T+24 = Q$, and $V+25 = U$)

10.

Sol. (a) (Pattern is $\times 2$, $+ 3$, $\times 2$, $+ 3$; B is the second letter $\times 2 = 4^{\text{th}}$ letter D; $C + 3 = F$; Similarly, F is the 6th alphabet, so $F \times 2 = 12^{\text{th}}$ letter which is L and next will be $G + 3 = J$ and so on.)

11.

Sol. (c) (Should be KNL and not M – look at the other options, the last alphabet is the first skipped alphabet.)

12.

Sol. (c) (Wear socks on the feet like we wear gloves on our hands)

13.

Sol. (b) (Clearly, $112 \times 4 = 448$; but we multiplied 112 by 4 because that is the sum of the numbers $\rightarrow 1+1+2 = 4$. Similarly, $2+4+1 = 7$. So, we multiply 241×7 to get 1687)

14.

Sol. (c) (Misprint 72. Answer is 62 \Rightarrow 66-4 like 45-4 = 41)

15.

Sol. (c) (T is between S and U, A is between Z and B and P is between O and Q. Similarly, R is between Q and S, E is between D and F and D is between C and E)

16.

Sol. (b) (Grandmother's only child is my mother. And My father's mother is my grandmother)

17.

Sol. (c) (Ramu's mother-in-law is his wife's mother. Therefore, his wife's son is his son.)

18.

Sol. (c) (Since the dates are the same and 1994 was not a leap year, we subtract 1 odd day from Wednesday to get Tuesday.)

19.

Sol. (d) (from both pics, we can see that a, b and e are adjacent \Rightarrow e is at the opposite end of a and f is at the opposite end of b. Therefore, the remaining side, d, is opposite b)

20.

Sol. (a) (No edges in a circle!)

MATHEMATICS

1.

Sol.

We have,

$$\begin{aligned} & \left(\frac{-2}{7}\right)^{-4} \times \left(\frac{-7}{5}\right)^2 \\ &= \frac{1}{\left(\frac{-2}{7}\right)^4} \times \left(\frac{-7}{5}\right)^2 = \frac{1}{\frac{(-2)^4}{7^4}} \times \frac{(-7)^2}{5^2} \\ &= \frac{7^4}{(-2)^4} \times \frac{(-7)^2}{5^2} = \frac{7 \times 7 \times 7 \times 7}{16} \times \frac{-7 \times -7}{25} \\ &= \frac{7^6}{16 \times 25} = \frac{7^6}{16 \times 25} = \frac{7^6}{400} = \frac{117649}{400} \end{aligned}$$

2.

Sol. Let $\sqrt{86.49} + \sqrt{5+x^2} = 12.3$.

$$\begin{aligned} \text{Then, } 9.3 + \sqrt{5+x^2} &= 12.3 \Leftrightarrow \sqrt{5+x^2} \\ &= 12.3 - 9.3 = 3 \\ \Leftrightarrow 5+x^2 &= 9 \Leftrightarrow x^2 = 9 - 5 = 4 \Leftrightarrow x = \sqrt{4} = 2. \end{aligned}$$

3.

Sol. Given exp.

$$\begin{aligned} &= \sqrt{\frac{(12.1+8.1)(12.1-8.1)}{(0.25)(0.25+19.95)}} = \sqrt{\frac{20.2 \times 4}{0.25 \times 20.2}} \\ &= \sqrt{\frac{4}{0.25}} = \sqrt{\frac{400}{25}} = \sqrt{16} = 4. \end{aligned}$$

4.

Sol. Clearly, $4320 = 2^3 \times 3^3 \times 2^2 \times 5$.

To make it a perfect cube, it must be multiplied by 2×5^2 i.e., 50.

5.

Sol. We have,

$$\begin{aligned} & \left(\frac{4}{9}a^5b^2\right) \times (10a^3b) \times (6) \\ &= \left(\frac{4}{9} \times 10 \times 6\right) \times (a^5 \times a^3 \times b^2 \times b) \\ &= \frac{80}{3}a^{5+3}b^{2+1} = \frac{80}{3}a^8b^3 \end{aligned}$$

6.

Sol. We have,

$$\begin{aligned} & \left(\frac{3}{4}x^2yz^2\right) \times (0.5xy^2z^2) \times (1.16x^2yz^3) \times (2xyz) \\ &= \left(\frac{3}{4} \times 0.5 \times 1.16 \times 2\right) \times (x^2 \times x \times x^2 \times x \times y \times y^2 \\ & \quad \times y \times y \times z^2 \times z^2 \times z^3 \times z) \\ &= \left(\frac{3}{4} \times \frac{5}{10} \times \frac{116}{100} \times 2\right) \times (x^{2+1+2+1} \times y^{1+2+1+1} \\ & \quad \times z^{2+2+3+1}) \\ &= \frac{87}{100} x^6 y^5 z^8 \end{aligned}$$

7.

Sol. We have,

$$\begin{aligned} & (5a^6) \times (-10ab^2) \times (-2.1a^2b^3) \\ &= (5 \times -10 \times -2.1) \times (a^6 \times a \times a^2 \times b^2 \times b^3) \\ &= \left(5 \times -10 \times -\frac{21}{10}\right) \times (a^6 \times a \times a^2 \times b^2 \times b^3) \\ &= 105 a^{6+1+2} b^{2+3} = 105a^9b^5 \end{aligned}$$

Putting $a = 1$ and $b = \frac{1}{2}$, we have

$$\begin{aligned} 105a^9b^5 &= 105 \times (1)^9 \times \left(\frac{1}{2}\right)^5 \\ &= 105 \times 1 \times \frac{1}{32} = \frac{105}{32} \end{aligned}$$

8.

Sol. We have, $\frac{17(2-x)-5(x+12)}{1-7x} = 8$

$$\Rightarrow \frac{34-17x-5x-60}{1-7x} = \frac{8}{1}$$

$$\Rightarrow \frac{-22x-26}{1-7x} = \frac{8}{1}$$

$$\Rightarrow 1 \times (-22x - 26) = 8 \times (1 - 7x)$$

[By cross-multiplication]

$$\Rightarrow -22x - 26 = 8 - 56x$$

$$\Rightarrow -22x + 56x = 8 + 26$$

$$\Rightarrow 34x = 34$$

$$\Rightarrow \frac{34x}{34} = \frac{34}{34}$$

Hence, $x = 1$ is the solution of the given equation.

9.

Sol. We have, $\frac{1}{x+1} + \frac{1}{x+2} = \frac{2}{x+10}$

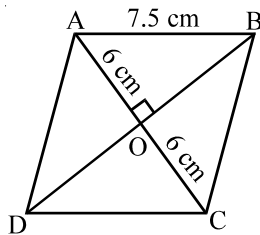
Multiplying both sides by $(x+1)(x+2)(x+10)$
i.e., the LCM of $x+1$, $x+2$ and $x+10$, we get

$$\begin{aligned} \frac{(x+1)(x+2)(x+10)}{x+1} + \frac{(x+1)(x+2)(x+10)}{x+2} &= \frac{2(x+1)(x+2)(x+10)}{x+10} \\ \Rightarrow (x+2)(x+10) + (x+1)(x+10) &= 2(x+1)(x+2) \\ \Rightarrow x^2 + 2x + 10x + 20 + x^2 + 10x + x + 10 &= 2(x^2 + 3x + 2) \\ \Rightarrow 2x^2 + 23x + 30 &= 2x^2 + 6x + 4 \\ \Rightarrow 2x^2 + 23x - 2x^2 - 6x &= 4 - 30 \\ \Rightarrow 17x &= -26 \\ \Rightarrow x &= -\frac{26}{17} \end{aligned}$$

Hence, $x = -\frac{26}{17}$ is the solution of the given equation.

10.

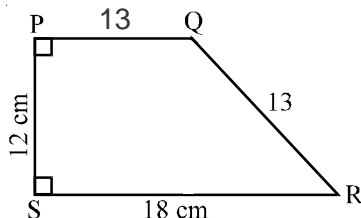
Sol. : In $\triangle ABO$, $\angle AOB = 90^\circ$, $AO = \frac{1}{2} AC = 6$ cm,
 $AB = 7.5$ cm



$$\begin{aligned} \therefore OB^2 &= AB^2 - OA^2 \\ &= (7.5)^2 - 6^2 = 56.25 - 36 = 20.25 \\ \therefore OB &= \sqrt{20.25} = 4.5 \text{ cm} \\ \therefore BD &= 2 \times OB = 9 \text{ cm} \\ \text{Area of rhombus} &= \frac{1}{2} d_1 \times d_2 = \frac{1}{2} \times 9 \times 12 \text{ cm}^2 = 54 \text{ cm}^2 \end{aligned}$$

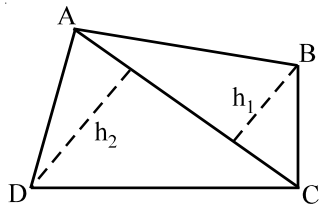
11.

Sol. : The parallel sides are PQ and SR, and the distance between them is PS,
since $\angle P = \angle S = 90^\circ$



$$\begin{aligned} \therefore \text{Area} &= \frac{1}{2} \times \text{sum of parallel sides} \times \text{heights} \\ &= \frac{1}{2} \times (13 + 18) \times 12 \text{ cm}^2 \\ &= 186 \text{ cm}^2 \end{aligned}$$

12.
Sol. :



$$\begin{aligned} \text{Area of quadrilateral} &= \frac{1}{2} d (h_1 + h_2) \\ &= \frac{1}{2} \times 15 \times (8.2 + 9.1) \text{ cm}^2 \\ &= \frac{1}{2} \times 15 \times 17.3 \text{ cm}^2 \\ &= 129.75 \text{ cm}^2 \end{aligned}$$

13.
Sol. $x\% \text{ of } 2650 = \text{Rs. } 1987.50$

$$\frac{x}{100} \times 2650 = 1987.50$$

$$\Rightarrow x = \frac{1987.50 \times 100}{2650} = \frac{198750}{2650} = 75\%$$

14.

Sol. Actual price = Rs. $(25 + 2.50) = \text{Rs. } 27.50$.

$$\begin{aligned} \therefore \text{Saving} &= \left(\frac{2.50}{27.50} \times 100 \right) \% = \frac{100}{11} \% = 9\frac{1}{11} \% \\ &= \approx 9\% \end{aligned}$$

15.

$$\begin{aligned} \text{Sol. } \frac{5}{100} \times \left(\frac{25}{100} \times 1600 \right) &= \frac{5}{100} \times (25 \times 16) \\ &= \frac{5}{100} \times 25 \times 16 \\ &= \frac{5}{4} \times 16 = 5 \times 4 = 20 \end{aligned}$$

16.

Sol. S.P. = Rs. 34.80
C.P. = Rs. x

$$\text{loss} = 20\% \text{ of } x = \frac{x}{5}$$

Now, S.P. = C.P. - Loss

$$\Rightarrow 34.80 = x - \frac{x}{5}$$

$$\Rightarrow \frac{4x}{5} = 34.80 \quad \Rightarrow x = 34.80 \times \frac{5}{4}$$

$$\Rightarrow x = 43.50$$

Hence C.P. = Rs. 43.50

17.

Sol. Let C.P. = Rs. x . Then, S.P. = Rs. $\frac{4x}{3}$.

$$\text{Gain} = \text{Rs. } \left(\frac{4x}{3} - x \right) = \text{Rs. } \frac{x}{3}$$

$$\therefore \text{Gain}\% = \left(\frac{x}{3} \times \frac{1}{x} \times 100 \right) \% = 33\frac{1}{3}\%$$

18.

Sol.

$$C : D = 6 : 7$$

$$B : C = 4 : 5$$

$$\Rightarrow B : C = 24 : 30$$

$$A : B = 2 : 3$$

$$\Rightarrow A : B = 16 : 24$$

and $C : D = 6 : 7$

$$\Rightarrow C : D = 30 : 35$$

$$\text{thus } A : B : C : D = 16 : 24 : 30 : 35$$

19.

Sol.

$$\text{A's salary} = 2x,$$

$$\text{B's salary} = 3x$$

$$\text{C's salary} = 5x.$$

$$\text{A's salary after increment} = 2x + \frac{15}{100} \times 2x$$

$$= 2x \left(\frac{115}{100} \right) = \frac{230}{100} x$$

$$\text{B's salary after increment} = 3x + \frac{10}{100} \times 3x$$

$$= 3x \left(\frac{110}{100} \right) = \frac{330x}{100}$$

$$\text{C's salary after increment} = 5x \left(\frac{120}{100} \right) = \frac{600}{100} x$$

Thus new ratio of their salaries is

$$\frac{230}{100} x : \frac{330}{100} x : \frac{600}{100} x$$

$$\Rightarrow 23 : 33 : 60$$

20.

Sol.

1 day's work of the three persons

$$= \left(\frac{1}{15} + \frac{1}{20} + \frac{1}{25} \right) = \frac{47}{300}$$

So, all the three together will complete the work in $\frac{300}{47} \approx 6.4$ days.

21.

Sol.

$$\text{Mean proportional} = \sqrt{234 \times 104}$$

$$= \sqrt{2 \times 117 \times 13 \times 2 \times 2 \times 2}$$

$$= \sqrt{13 \times 13 \times 3 \times 3 \times 2 \times 2 \times 2 \times 2}$$

$$= 13 \times 3 \times 2 \times 2$$

$$= 156$$

22.

Sol.

$$(A + B + C)\text{'s 1 day's work} = \frac{1}{4},$$

$$\text{A's 1 day's work} = \frac{1}{16}, \text{ B's 1 day's work} = \frac{1}{12}.$$

$$\therefore \text{C's 1 day's work} = \frac{1}{4} - \left(\frac{1}{16} + \frac{1}{12} \right) = \left(\frac{1}{4} - \frac{7}{48} \right)$$

$$= \frac{5}{48}$$

So, C alone can do the work in $\frac{48}{5} = 9\frac{3}{5}$ days.

23.

Sol. Required average = $\frac{7(1+2+3+\dots+20)}{20}$
 $= \left(\frac{7 \times 20 \times 21}{20 \times 2}\right) = \left(\frac{147}{2}\right) = 73.5$

24.

Sol. Clearly, Thirteenth result
 $= (\text{sum of 25 results}) - (\text{sum of 24 results})$
 $= (18 \times 25) - [(14 \times 12) + (17 \times 12)]$
 $= 450 - (168 + 204) = 450 - 372 = 78$

25.

Sol. Total age of 39 persons = (39×15) years = 585 years

Average age of 40 persons

$$= 15 \text{ years } 3 \text{ months} = \frac{61}{4} \text{ years}$$

Total age of 40 persons

$$= \left(\frac{61}{4} \times 40\right) \text{ years} = 610 \text{ years}$$

\therefore Age of the teacher = $(610 - 585)$ years = 25 years

26.

Sol. Let the original average expenditure be Rs. x then,

$$42(x - 1) - 35x = 42 \Leftrightarrow 7x = 84 \Rightarrow x = 12$$

\therefore Original expenditure = Rs (35×12) = Rs. 420

27.

Sol. $l \times b = 460 \text{ m}^2$

New length = $l = b + 15\%$ of $b = \frac{115}{100}b$

$$\Rightarrow \frac{115b}{100} \times b = 460$$

$$b^2 = \frac{460 \times 100}{115} = \frac{92 \times 100}{23}$$

$$b^2 = 4 \times 100$$

$$\therefore b = 20 \text{ m}$$

28.

Sol. Let the two part area be x and $700 - x$,

then $x - (700 - x) = \frac{1}{5} \left(\frac{700}{2} \right)$

$$\Rightarrow 2x - 700 = \frac{700}{10}$$

$$\Rightarrow 2x = 770 \Rightarrow x = 385$$

Hence the smaller area = $700 - 385 = 315$

29.

Sol. $d = 70 \text{ cm}$, $r = \frac{70}{2} = 35 \text{ cm}$

distance travelled in 1 revolution = $2\pi r$

$$= 2 \times \frac{22}{7} \times 35$$

$$= 44 \times 5 = 220 \text{ cm}$$

$$= \frac{220}{100} \text{ m} = 2.20 \text{ m}$$

\therefore distance travelled in 40 revolution

$$= 40 \times 2.20 \text{ m}$$

$$= 88 \text{ m}$$

time taken = 10 seconds

\therefore speed = $\frac{88}{10} = 8.8 \text{ m/s}$.

$$= 8.8 \times \frac{18}{5} \text{ km/hr}$$

$$= \frac{158.4}{5} \text{ km/hr}$$

$$= 31.68 \text{ km/hr}$$

30.

Sol. Ratio of area of two circular fields = $\pi r^2 : \pi R^2$

$$\Rightarrow 16 : 49 = \pi r^2 : \pi (14)^2$$

$$\Rightarrow \frac{16}{49} = \frac{\pi r^2}{\pi (14)^2}$$

$$\Rightarrow \frac{16}{49} = \frac{r^2}{(14)^2}$$

$$\Rightarrow \left(\frac{4}{7} \right)^2 = \left(\frac{r}{14} \right)^2$$

$$\Rightarrow r = \frac{4}{7} \times 14$$

$$r = 4 \times 2 = 8 \text{ m}$$

PHYSICS & CHEMISTRY

1.

Sol. On a fahrenheit scale

→ boiling point of water is 212°F .

→ The upper fixed point and the lower fixed point is 212°F and 32°F respectively.

The range is divided is 180 equal parts as a unit degree Fahrenheit.

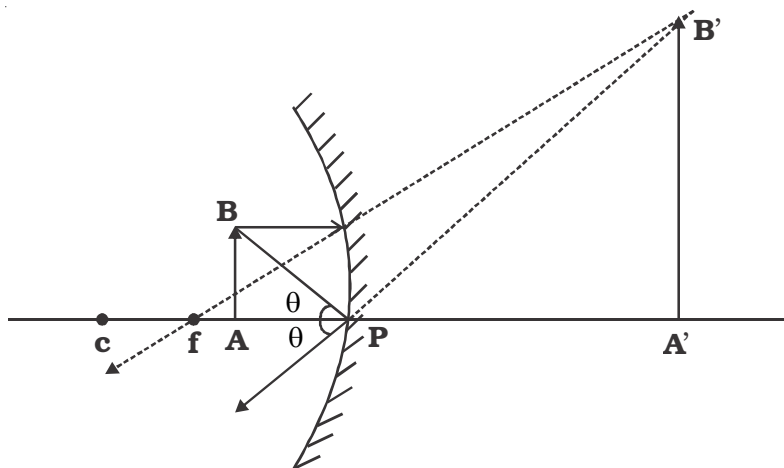
2. infinite number of images will form.

3. Copper is a metal and hydrogen, chlorine and neon are gases.

4. The transfer of thermal energy between materials due to collision of partides is a process know as conduction.

5. The amount of electricity that is flowing around a circuit is measured by Ammeter. Ammeter measures the magnitude of current flowing accross its two ends in a circuit.

6. Virtual image is formed by concave mirror when object is placed between the focus and the pole.



7. When a cell is connected in an electric circuit, then

→ Current flows from positive electrode to negative electrode outside the cell, and

→ from negative electrode to positive electrode inside the cell.

8. Speed and time is given

i.e. speed = 7.5 m/ sec

time in which distance travelled = 40 sec .

as we know:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\therefore \text{Distance} = \text{Speed} \times \text{Time}$$

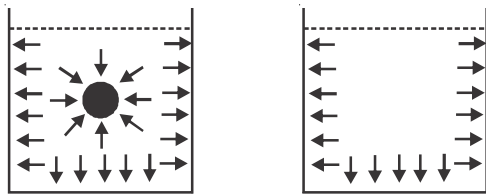
$$\therefore \text{Distance} = 7.5 \times 40$$

$$\text{Distance} = 300 \text{ meter}$$

9. If Q switch is open the current will flow through switch S and when S is open, it will from Q to the Bulb.

As we can see P is the main switch which will not allow current to flow from it. Thus P is the swich which will cause the light bulb to stop glowing.

10. → Joule is the unit of work
→ Joule persecond is the unit for rate of workdone.
→ Newton is the unit of force
→ Watt is the unit of power.
11. Fluid exert pressure on a object in all the direction even when fluids are kept solely in a container then it will exert prassure on the surface of container in all direction.



12. Electricity is a flow of electrons from negative tarminal of a battery to positive terminal and current flow is opposite direction of flow of electrons i.e. from positive termianls to negative teminal.
13. Friction is the force which helps us to keep our foot at a certain position while we walk, if friction will not act our foot will slip on the path as slips on ice or wet surfaces.
14. The pressure exerted by air or atmosphere is called atmospheric pressure. Its unit is ATM.
15. The smallest time measure by the wrist watch is second.
16. Sound of 80 dB (decible) or above are painful and irritating.
17. The order of colour of rainbow is

Red, Orange, Yellow, Green, Blue, Indigo, Violet

(This order is from top to Bottom when we see it from ground.)

BIOLOGY

1. Muscle cramps are due to accumulation of excess lactic acid.
2. Diaphragm is a muscular sheet which separates abdomen from chest cavity
3. Water spider can trap air with their body parts for breathing.
4. (b) the long lashes protect the eyes from the sand. because hump store fat. bristles are not present and the skin of knee don't allow from escaping the heat.
5. Rubber latex is the waste product of plants.
6. Colostomy is a process in which by the surgical process to divert one end of the large intestine (colon) through an opening in the abdomen wall.
7. It's a tRNA
8. Common cold is not a vector-borne disease it takes place by direct contact.
9. Pitcher plant, sundew plants and Venus flytrap are insectivorous plants but protozoan is an animal.
10. As mitochondria is a power house of cell so maximum power consumption required in muscle cell because in muscle cell. so much power is required.
11. All statements are correct
12. The Culex mosquito are the vector of filarial worm.
13. Algal scum floats on the surface of water because oxygen accumulates in body of it. that makes their body floatation.
14. The outer shell of cockroach is made up of chitin which is very hard and shiny but their body is soft from inside.
15. Alveoli are small sac-like structures which are present in lungs to help in the exchange of gas.
16. All are the most common grown cereal crops.