

IIT ASHRAM BRINGS...

IIT ASHRAM

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

SCIENCE APTITUDE
TEST (2016-17)

CLASS **7th**



SAMPLE PAPER

SOLUTIONS & ANSWER KEY

for

Part - I : Mental Ability

Part - II : Mathematics

Part - III : Physics/ Chemistry

Part - IV : Biology

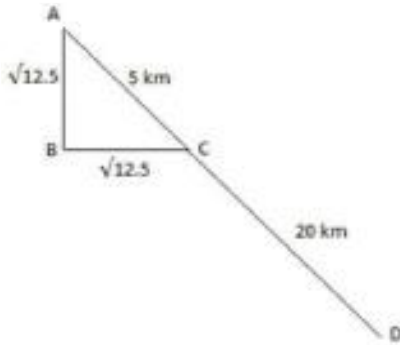
MENTAL ABILITY

1.

Sol. (d) (since the date remains the same and the year is increasing by 1, we shall count the increase in odd days from 2008-2009. Now, since the year 2008 is a leap year, the number of odd days = 2. Therefore, adding 2 to Friday, we arrive at Sunday. Hence, Jan 4, 2009 will be a Sunday.)

2.

Sol. (b) (Using the information given, we make the following diagram.



Using Pythagoras' theorem we know $AC^2 = AB^2 + BC^2$. Therefore, we get AC

= 5 km. Since AD = 25 km, and C is the starting point, $CD = AD - AC \Rightarrow CD = 25 - 5$. Therefore, CD or the distance from the starting point = 20 km.)

3. (c)

(Follow BODMAS and rearrange the equation based on the given information. It becomes: $\{18 + (4 \times 3)\} - [2/2] = \{18 + 12\} - 1 = 30 - 1 = 29$.)

4.

Sol. (a) (there are 2 alternating series in the given sequence $\rightarrow 4, 5, 7, 10, 14$ and the other one is: 2, 4, 6, 8. The first series is increasing in increments +1, +2, +3, +4. The other series is increasing at a constant interval of +2. Therefore, the next number in the sequence will be in sync with the second series and increase by +2 from the last digit - '8' $\Rightarrow 8 + 2 = 10$.)

5.

Sol. (b) (Based on the given info, we get: $A < B > C = D > A$. As can be seen clearly, B is greater than A, C and D. Therefore, it is the brightest.)

6.

Sol. (b) (In the given pattern, the second - smaller figure becomes the next bigger - first figure.)

7.

Sol. (d) (Since the first figure rotates anti-clockwise, the other structure will rotate likewise.)

8.

Sol. (a) (The information given in the question clearly describes the population as 50% working in the field and the remaining 50% working in the factories.)

9.

Sol. (d) (The distance between J and Q is 7 - the same between B and I)

10.

Sol. (b) (Since R and P are opposite on the dice)

11.

Sol. (d) (We don't know D's gender and as described in the family tree, D is A's niece/nephew – depending on his/her gender. Since neither option is given in the answer choices, we select option D: $A = B = C \rightarrow (D)$)

12.

Sol. (c) (Look at the hints carefully – apple is common between the first two sentences and the number 8 is also common. Bring and the number 6 are common between sentence 1 and 3. The only number left in the first sentence is 7 – and thus it represents the word 'me'.)

13.

Sol. (c) (When we use dice representations 1 and 3, we can safely deduce that 5 and 6 are opposite, since the die is rotated vertically. We also note that 1 and 5 are adjacent and on the same surface – side to side. Also, from representation from die 4, we know 3 and 2 are adjacent – top to side. Therefore, the only number that can be opposite 3 is 4.)

14.

Sol. (c) (Animals is the universal set, of which elephants are the larger subset and lions are the smaller subset – represented as individual non-intersecting triangles.)

15.

Sol. (c) (The series is increasing in +1, +2, +3 pattern. Therefore, $28 + 8 = 36$ – the answer doesn't match the given value of 37)

16.

Sol. (c) (False is the opposite of True, like Sink is the opposite of Float.)

17.

Sol. (c) ($8+5=13$; $13+8=21$; $21+13=34$; $34+21=55$; $55+34=89$)

18.

Sol. (a) (5 men working for 12 days = $5 \times 12 = 60$ days of work. Dividing 60 days of work by 10 days = 6 people.)

19.

Sol. (d) (Bowl – like basket, pail and pan, has space to keep food/other things in it. Spoon is too small.)

20.

Sol. (a) (Prime number, Neither of the rest are prime nos.)

MATHEMATICS

1.

Sol. $|7| + |5| - |-3| = 7 + 5 - 3 = 9$

2.

Sol. height covered in every 2 seconds = 3 cm

$$\Rightarrow 3 \text{ cm} \quad \rightarrow \quad 2 \text{ seconds}$$

$$\Rightarrow 3 \text{ cm} \times 19 \quad \rightarrow \quad 2 \text{ seconds}$$

$$\Rightarrow 57 \text{ cm} \quad \rightarrow \quad 38 \text{ seconds.}$$

In last 1 seconds it crawls 3 cm.

\therefore It takes $(38 + 1) = 39$ seconds to climb the rod.

3.

Sol. Volume of water in the tank = 500 litres

The quantity of water decreased in 1 hours = 9 litres

\therefore The quantity decreased in 10 hours = 9 litres \times 10 = 90 litres

Quantity of water left left in 10 hours = 500 - 90 = 410 litres

4.

Sol. $\frac{4}{7} = \frac{36}{63}, \frac{1}{3} = \frac{21}{63}, \frac{2}{3} = \frac{42}{63}, \frac{5}{9} = \frac{35}{63}$

Thus, $\frac{21}{63} < \frac{35}{63} < \frac{36}{63} < \frac{42}{63}$

$$\Rightarrow \frac{1}{3} < \frac{5}{9} < \frac{4}{7} < \frac{2}{3}$$

$$\therefore \text{Average} = \frac{\frac{4}{7} + \frac{5}{9}}{2} = \frac{\frac{36 + 35}{63}}{2} = \frac{71}{63} \times \frac{1}{2} = \frac{71}{126}$$

5.

Sol. $[(-4) \times (-9) \times (-25)] \div [(-2) \times (-3) \times (-5)]$

$$= (-900) \div (-30) = 30$$

6.

Sol. If the denominator of a fraction contain only 2 and 5 as prime factors, then the fraction is a terminating decimal.

7.

$$\begin{aligned} \text{Sol. } 3\frac{4}{5} + 2 + \frac{7}{10} + 4\frac{8}{15} &= 3 + 2 + 4 + \frac{4}{5} + \frac{7}{10} + \frac{8}{15} \\ &= 9 + \frac{24 + 21 + 16}{30} = 9\frac{61}{30} \\ &= \frac{331}{30} \end{aligned}$$

8.

Sol. Point 'M' represents 1.2 = $\frac{12}{10} = \frac{6}{5}$

9.

Sol. Shaded portion = 12
Total portions = 32

∴ the fraction is $\frac{12}{32} = \frac{4 \times 3}{4 \times 8} = \frac{3}{8}$

10.

Sol. $[2 - 3(2 - 3)^{-1}]^{-1} = [2 - 3(-1)^{-1}]^{-1} (2 + 3)^{-1} = 5^{-1} = \frac{1}{5}$

11.

Sol. $9\frac{1}{3} - 5\frac{3}{4} = \frac{28}{3} - \frac{23}{4} = \frac{112 - 69}{12} = \frac{43}{12} = 3\frac{7}{12}$

12.

Sol. $1 + \frac{1}{1 + \frac{1}{1 - \frac{1}{6}}} = 1 + \frac{1}{1 + \frac{1}{\frac{5}{6}}} = 1 + \frac{1}{1 + \frac{6}{5}}$

$$= 1 + \frac{1}{\frac{11}{5}} = 1 + \frac{5}{11} = \frac{16}{11}$$

13.

Sol. $4\frac{5}{2} - 2\frac{3}{8} + 3\frac{7}{8} = \frac{13}{2} - \frac{19}{8} + \frac{31}{8} = \frac{52 - 19 + 31}{8} = \frac{64}{8} = 8$

14.

Sol. Here D = C, B = 125 + c, and A = B + C

$$\Rightarrow A = 125 + C + C = 125 + 2C$$

Now A + B + C + D = 750

$$125 + 2C + 125 + C + C + C = 750$$

$$5C + 250 = 750$$

$$5C = 500 \Rightarrow C = 100$$

$$\therefore A\text{'s share} = 125 + 2C = 125 + 2 \times 100 = \text{Rs. } 325$$

15.

Sol. Let the value of 1st prize = x

$$\text{value of 2nd prize} = \frac{3}{4}x$$

$$\text{Now, } x + \frac{3}{4}x + \frac{3}{8}x = 2550$$

$$\Rightarrow \frac{8x + 6x + 3x}{8} = 2550$$

$$\Rightarrow \frac{17x}{8} = 2550$$

$$\Rightarrow x = 2550 \times \frac{8}{17} = 150 \times 8 = \text{Rs.1200}$$

16.

Sol. Let the number of other members = n

then the part of cake father had = $\frac{1}{4}$

and part of cake each of the other member had = $\frac{1}{12}$

$$\text{Now, } n \times \frac{1}{12} + \frac{1}{4} = 1$$

$$\Rightarrow \frac{n+3}{12} = 1$$

$$\Rightarrow n+3 = 12 \quad \Rightarrow \quad n = 9$$

Hence total number of family members = $9 + 1 = 10$

17.

Sol. Let B's present age = x

then A' present age = 2x

after = 30 years

B's age = x + 30

A's age = 2x + 30

$$\text{Now, } 2x + 30 = \frac{3}{2}(x + 30)$$

$$\Rightarrow 4x + 60 = 3x + 90$$

$$\Rightarrow 4x - 3x = 90 - 60$$

$$x = 30$$

Hence present ages of A and B are 60 and 30.

18.

Sol. Let the congruent complementary angles be x and x.

then $x + x = 90$

$$2x = 90$$

$$x = \frac{90}{2} = 45$$

19.

Sol. In 1 minutes the minute hand's covers 6°

\therefore in 30 minutes its covers $6^\circ \times 30 = 180^\circ$

In 1 hours, hour hand covers 30°

\therefore In 30 minutes $\left(\frac{1}{2} \text{ hour}\right)$, its covers = $\frac{1}{2} \times 30^\circ$

$$= 15^\circ$$

At 4 pm the angle between hour hand and min. hand was 120°

At 4.30 pm the angle covered by hour hand = $120^\circ + 15^\circ = 135^\circ$

\therefore The angle between hour hand and minute hand is $180^\circ - 135^\circ = 45^\circ$

20.

Sol. The triangle is not possible because sum of two sides of a triangle should be greater than third side
but $3 + 4 < 8$
 $7 < 8$

21.

Sol. Total number of coins = 36
let number of 10 p coins = x
then number of 20 p coins = $36 - x$
Now, $10 \times x + 20(36 - x) = 660$
 $10x + 720 - 20x = 660$
 $-10x = -60$
 $x = 6$
 \therefore The number of 20 p coins = $36 - 6 = 30$.

22.

Sol. SP. of 10 eggs = Rs. 5
gain % = 20%

$$\begin{aligned} \text{cp, of 10 eggs} &= 5 \times \frac{100}{120} \\ &= \text{Rs. } \frac{25}{6} \end{aligned}$$

For Rs. $\frac{25}{6}$, he buys 10 eggs

$$\begin{aligned} \therefore \text{for Rs. 5 he buys } &10 \times \frac{6}{25} \times 5 \text{ eggs} \\ &= 12 \text{ eggs} \end{aligned}$$

23.

Sol. Let the two numbers be x and 2x

$$\text{then, } \frac{x+7}{2x+7} = \frac{3}{5}$$

$$\Rightarrow 5(x+7) = 3(2x+7)$$

$$\Rightarrow 5x + 35 = 6x + 21$$

$$\Rightarrow -x = -14 \Rightarrow x = 14$$

\therefore the greater number is $2x = 28$

24.

Sol. $(a^4 + 4a^2b^2 + b^4) - (a^4 - 8a^2b^2 + b^4)$
 $= a^4 + 4a^2b^2 + b^4 - a^4 + 8a^2b^2 - b^4 = 12a^2b^2$
 \therefore It is $12a^2b^2$ more than $a^4 - 8a^2b^2 + b^4$

25.

Sol. $4l^2 + 9m^2 = (2l)^2 + (3m)^2 = (2l - 3m)^2 + 2(2l)(3m)$
 $= (2l - 3m)^2 + 12lm$
 $= (-1)^2 + 12(20)$
 $= 1 + 240 = 241$

26.

$$\begin{aligned}\text{Sol. } 2.3a^5b^2 \times 1.2a^2b^4 &= 2.76 a^7b^6 \\ &= 2.76 (1)^7 (0.5)^6 = 2.76 \times \left(\frac{1}{2}\right)^6 \\ &= 2.76 \times \frac{1}{64} \\ &= 0.043125\end{aligned}$$

27.

$$\begin{aligned}\text{Sol. } \left\{6^{-1} + \left(\frac{3}{2}\right)^{-1}\right\}^{-1} &= \left(\frac{1}{6} + \frac{2}{3}\right)^{-1} = \left(\frac{1}{6} + \frac{4}{6}\right)^{-1} \\ &= \left(\frac{5}{6}\right)^{-1} = \frac{6}{5}\end{aligned}$$

28.

$$\begin{aligned}\text{Sol. } \left(\frac{125}{8}\right)^5 \times \left(\frac{125}{8}\right)^x &= \left(\frac{5}{2}\right)^{18} \\ \left[\left(\frac{5}{2}\right)^3\right]^5 \times \left[\left(\frac{5}{2}\right)^3\right]^x &= \left(\frac{5}{2}\right)^{18} \\ \left(\frac{5}{2}\right)^{15+3x} &= \left(\frac{5}{2}\right)^{18} \\ \Rightarrow 15 + 3x &= 18 \\ 3x &= 3 \\ x &= 1\end{aligned}$$

29.

$$\begin{aligned}\text{Sol. } \frac{\left(-\frac{1}{2}\right)^5}{\left(-\frac{1}{2}\right)^4} \div \frac{\left(-\frac{1}{8}\right)}{\left(-\frac{1}{4}\right)} &= \left(-\frac{1}{2}\right)^{5-4} \div \left(-\frac{1}{8} \times -\frac{4}{1}\right) \\ &= -\frac{1}{2} \div \frac{1}{2} = \frac{-1}{2} \times \frac{2}{1} = -1\end{aligned}$$

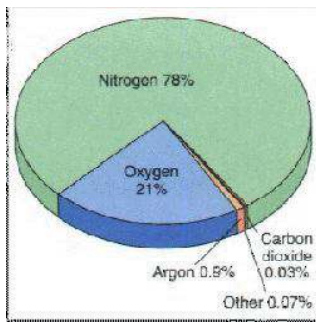
30.

$$\begin{aligned}\text{Sol. } l &= 30 \text{ cm, } b = 20 \text{ cm} \\ \text{Area of rect. ABCD} &= 30 \times 20 = 600 \text{ cm}^2 \\ \text{ar}(\triangle GDF) &= \text{ar}(\triangle GAE) = \frac{1}{2} \times 15 \times 10 \\ &= 15 \times 5 = 75 \text{ cm}^2 \\ \therefore \text{Total area of triangles} &= 2 \times 75 = 150 \text{ cm}^2 \\ \text{Hence area of shaded region} &= 600 - 150 \\ &= 450 \text{ cm}^2\end{aligned}$$

PHYSICS & CHEMISTRY

- 1 kilometer = 1000 meters
∴ 5 kilometer can be written as
 $5 \times 1000 \text{ meters} = 5000 \text{ meters}$
- Force is a push as pull applied by one object on other.
- Copper, water and aluminium are good conductor of electricity but rubber is a bad conductor.
- Electricity is a flow of electrons from negative terminal to positive terminal.
- Fire give heat energy which is also called thermal energy.
- As electrical cell uses chemical energy to produce electrical energy.
- Thermal insulators are the substances which reduces or prevents the transfer of heat energy.
- Copper penny is made up of copper metal though it a best conductor and glass rod, Plastic tubling, cotton string are bad conductor of electricity.
- Average speed = $\frac{\text{Total Dis tance}}{\text{Total Time}} = \frac{24 \text{ km}}{2 \text{ hr}} = 12 \text{ km / hr}$
- Gravity i.e. the result of the pull of the earth on an object.
- At sea level, water boils at 100°C temperature according to Celsius temperature scale
In kelvin it is
 $K = ^\circ\text{C} + 273$
 $K = 100 + 273$
 $K = 373$
∴ Water boils at 373 kelvin according to kelvin scale.
- Freezing points in,
Fahrenheit scale → 32 °F
Celsius scale → 0 °C
kelvin → 273 K
- Light from the sun has a range of wavelengths that includes visible spectrum infrared rays, ultra violet light, etc.
- Opaque objects do not allow light energy to pass through it.
→ Translucent are those object which allow light energy to pass through it partially
→ transparent object allow almost all the light energy to pass through it.
- When the light is blue
(Sky appears blue due to scattering of sun light in the atmosphere blue above scatters more in the sky thus it appears blue.
- People should not swim in water during lightening storm because if in case lightening strike in the water, it'll becomes very hot and people can burn in a very short time.
- Conduction is the process which takes place in solids to transfer heat energy from one end to another without actual movement of particles or atoms.

BIOLOGY



1.

So 78% Nitrogen present in Atmosphere.

2. Each food chain must have a producer, herbivores and carnivores

3. Normal and adult human respire slower than a child so breathing rate must be between 15-18

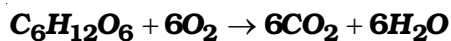
4. Food synthesis in plant known as photosynthesis, In photosynthesis the required material is :



So O_2 is the product of this process not a required material.

5. Voice box also known as larynx.

6. The energy which we get it comes from respiration process of glucose.



7. Diagram explain the nature of plant

A - Mushroom - its saprophytic organism

B - Pitcher plant - its insectivorous plant

C - Amar bel - Parasitic plant

8. Chlorophyll will dissolve in Alcohol because both are nonpolar, means both product have same nature so they mixed easily.

9. Gastric juice present in stomach it contains pepsin enzyme.

10. The role of large intestine is only absorbed the water.

11. Assimilation takes place in cell in this process the food is broken down in cell

12. The sericulture (rearing of silk from silk worm) is done on the tree of mulberry

13. Pulse have good protein value, they are good source of protein

14. Scientific name of human is homo sapiens

15. HCl found in stomach which kills the bacteria of food

16. Mosquito-female anopheles is the carrier of malaria.