

# IIT ASHRAM BRINGS...

## SCIENCE APTITUDE TEST (2016-17)

### PHASE - II

CLASS

**10**

**KH J**



A Hunt for  
Young Scientists..!

Time : 3 Hours

M.M. : 300

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

#### IMPORTANT INSTRUCTIONS

**A. General:**

1. This booklet consists of 100 questions.
2. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, and electronic gadgets in any form are not allowed to be carried inside the examination hall.
3. The answer sheet, a machine-readable Objective Response Sheet (OMR), is provided separately.
4. DO NOT TAMPER WITH / MUTILATE THE OMR OR THE BOOKLET.
5. Write Name and Address in capital letters of OMR sheet.
6. **Submit the OMR Sheet back to Invigilator after examination before leaving the examination hall.**

**B. Question paper format:**

7. The question paper consists of **4 Sections**.
  - (I) **Mental Ability (20 Questions)**
  - (II) **Mathematics (30 Questions)**
  - (III) **Physics & Chemistry (34 Questions)**
  - (IV) **Biology (16 Questions)**

**C. Marking Scheme :**

8. For each question in **Section I, II, III and IV** you will be **awarded 3 marks** if you have darkened only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases where the answer marked is not correct, **minus one (-1) mark** will be awarded.

Name of the Candidate

Class

Roll Number

I have read all the instructions and shall abide by them

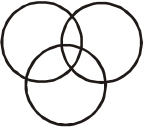
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*Signature of the Candidate*

I have verified all the informations filled by the candidate.

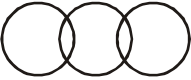
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## MENTAL ABILITY


- I start from my home and go two kilometres straight. Then I turn towards my right and go one kilometre. I turn again towards my right and go one kilometre again. If I am North-west from my house then in which direction did I go in the beginning ?  
 (a) North (b) South  
 (c) East (d) West
- A rabbit runs 30' towards East and turns to right, runs 20' and turns to right; runs 19' and again turns to left, runs 15' and then turns to left, runs 22' and finally turns to left and runs 16'. Now, which direction is the rabbit facing ?  
 (a) East (b) West  
 (c) North (d) South
- Which of the following diagrams correctly represents the relationship among Tennis fans, Cricket players and Students.  
 Give the symbols for three group  




(a)



(b)

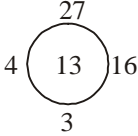


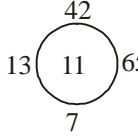
(c)

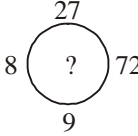


(d)
- Introducing Asha to guests, Bhaskar said, "Her father is the only son of my father." How is Asha related to Bhaskar ?  
 (a) Daughter (b) Mother  
 (c) Sister (d) Niece
- How many times do the hands of a clock coincide in a day ?  
 (a) 24 (b) 22  
 (c) 21 (d) 20
- 'Sailor' is related to 'Ship' in the same way as 'Lawyer' is related to-  
 (a) Legal (b) Law  
 (c) Court (d) Ruling

- Find missing number in the following sequence.  
 5, 9, 17, 29, 45, (...)  
 (a) 60 (b) 65  
 (c) 68 (d) 70
- This questions is based on numerical calculations. Usually these are circles, the first two of which have four numbers at four points on the circle and one inside the circle. These numbers are placed according to some rules or sequence. The third circle has any four numbers with fifth missing. You are required to find this number from the given choice, according to the same rule that holds good for other two circles.  







 (a) 9 (b) 12  
 (c) 15 (d) 18
- Choose the numeral pair/group which is different from others.  
 (a) 42 - 4 (b) 36 - 6  
 (c) 32 - 2 (d) 15 - 5
- Which terms will fill the blank spaces ?  
 Z, X, V, T, R (...), (...)  
 (a) O, K (b) N, M  
 (c) K, S (d) P, N
- In a code language if TEARS is coded as VWXYZ and MAN is coded as 123 then how would you code RESENTMENT in that language ?  
 (a) YWZW3V1W3Y (b) YWZ3WV1W3Y  
 (c) YWZW3V1WY3 (d) YWZW3V1W3V
- If MOBILITY is coded as 46293927, then EXAMINATION is coded as  
 (a) 45038401854 (b) 56149512965  
 (c) 57159413955 (d) 67250623076
- In a certain code, 15789 is written as EGKPT and 2346 is written in ALUR. How is 23549 written in that code ?  
 (a) ALEUT (b) ALGTU  
 (c) ALGUT (d) ALGRT

14. If '+' means 'divided by', '-' means 'multiplied by', 'x' means 'minus' and '÷' means 'plus', which of the following will be the value of the expression  $16 \div 8 - 4 + 2 \times 4$  ?

- (a) 16 (b) 28 (c) 32 (d) 44

15. If A means 'plus', B means 'minus', C means 'divided by' and D means 'multiplied by', then  $18 A 12 C 6 D 2 B 5 = ?$

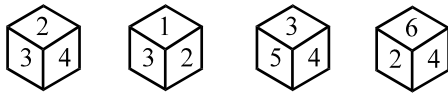
- (a) 15 (b) 25 (c) 27 (d) None

16. Which of the following two signs need to be interchanged to make the given equation correct?

$$10 + 10 \div 10 - 10 \times 10 = 10$$

- (a) + and - (b) + and ÷  
(c) + and × (d) ÷ and +

17. A dice is thrown four times and its four different positions are given below. Find the number on the face opposite the face showing 2.

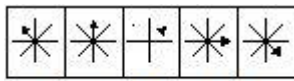


- (i) (ii) (iii) (iv)

- (a) 3 (b) 4  
(c) 5 (d) 6

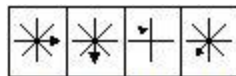
18. In this question find the figure from the answer set (i.e. figs. A, B, C and D) that will continue the series given in the problem set (i.e. figs. 1, 2, 3, 4 and 5).

**Problem Figures**



1 2 3 4 5

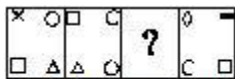
**Answer Figures**



A B C D

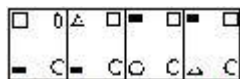
19. You are given a set of four or five figures (labelled 1,2,3 and 4) following a certain sequence and hence forming a series. However, the figure at 3 is missing. The candidate is required to choose this figure from the alternatives A,B,C and D.

**Problem Figures**



1 2 3 4

**Answer Figures**



A B C D

20. In a certain code, '13' means 'IT'; '456748' means 'ASHRAM'. Then which of the following represents 113456748?

- (a) IITASHRAM (b) ASHRAMIIT  
(c) IIT (d) ASHRAM

## MATHEMATICS

1. If  $x = \frac{\sqrt{a} + \frac{1}{\sqrt{a}}}{2}$ , then the value of  $\frac{\sqrt{x^2 - 1}}{x - \sqrt{x^2 - 1}}$  is

- (a)  $a - \frac{1}{a}$  (b)  $2(a - 1)$   
(c)  $\frac{1}{2}(a - 1)$  (d) None of these

2. If  $x = \frac{111110}{111111}$ ,  $y = \frac{222221}{222223}$ ,

$z = \frac{333331}{333334}$ , then the descending order of x, y

and z is

- (a) x, z, y (b) y, x, z  
(c) x, y, z (d) y, z, x

3. If  $x = 3 + 3^{\frac{1}{3}} + 3^{\frac{2}{3}}$ , then  $x^3 - 9x^2 + 18x - 12$  is

- (a) 6 (b) 8  
(c) 0 (d) 4

4. In a trapezium ABCD,  $\overline{AB}$  is parallel to  $\overline{CD}$ .

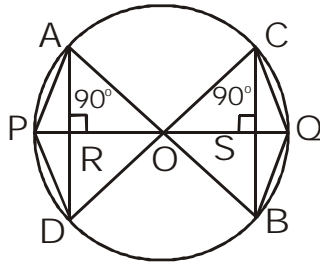
$\overline{BD}$  is perpendicular to  $\overline{AD}$ .  $\overline{AC}$  is

perpendicular to  $\overline{BC}$ . If  $AD = BC = 15$  cm and

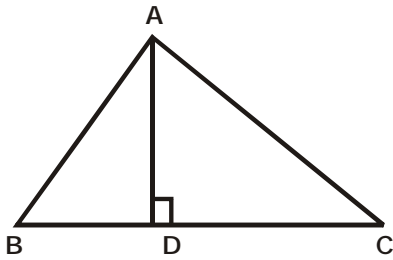
$AB = 25$  cm, then the area of the trapezium is

- (a)  $192 \text{ cm}^2$  (b)  $232 \text{ cm}^2$   
(c)  $172 \text{ cm}^2$  (d) none of these

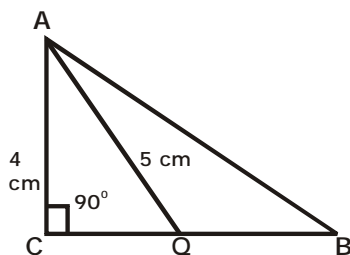
5. In the adjoining figure 'O' is the centre of the circle  $\angle AOD = 120^\circ$ . If the radius of the circle is 'r', then the sum of the areas of quadrilateral AODP and OBQC is



- (a)  $\frac{\sqrt{3}}{\sqrt{2}}r^2$  (b)  $3\sqrt{3}r^2$   
 (c)  $\sqrt{3}r^2$  (d) none of these
6. If  $BD = \frac{1}{3} \overline{CD}$ ,  $\overline{AD} \perp \overline{BC}$ , then  $2AB^2 + BC^2 =$



- (a)  $2AC^2$  (b)  $4AD^2$   
 (c)  $4BD^2$  (d)  $2CD^2$
7. The semiperimeter of a right angled triangle is 126 cm and the shortest median is 53 cm. Then the area of a triangle which has the largest median as its longest side is
- (a)  $1560 \text{ cm}^2$  (b)  $1260 \text{ cm}^2$   
 (c)  $1060 \text{ cm}^2$  (d) none of these
8. In  $\triangle ABC$ ,  $\angle C = 90^\circ$ . If Q is the midpoint of the side  $\overline{BC}$ ,  $AC = 4 \text{ cm}$ ,  $AQ = 5 \text{ cm}$ , then  $(AB)^2$  is



- (a)  $54 \text{ cm}^2$  (b)  $50 \text{ cm}^2$   
 (c)  $52 \text{ cm}^2$  (d)  $56 \text{ cm}^2$

9. If  $f(x) = x^4 - 12x^3 + 17x^2 - 9x + 7$ , then  $f(x + 3)$  is
- (a)  $x^4 - 37x^2 - 123x - 110$   
 (b)  $x^4 + 37x^2 - 123x + 110$   
 (c)  $x^4 + 37x^2 - 2x - 110$   
 (d)  $x^4 - 37x^2 + 123x + 110$

10. In the following  $(x - y)$ ,  $(y - z)$  and  $(z - x)$  are the factors of
- (a)  $x^2(y - z) + y^2(z - x) + z^2(x - y)$   
 (b)  $x^3(y - z) + y^3(z - x) + z^3(x - y)$   
 (c)  $x(y^2 - z^2) + y(z^2 - x^2) + z(x^2 - y^2)$   
 (d) All the above

11. The value

$$\frac{3}{2} \text{ of } \left( \frac{4}{3} \div \frac{5}{7} \right) + \frac{1}{2} \div \left[ 3\frac{4}{5} - \left\{ \frac{2}{5} \div \left( \frac{1}{3} + \frac{1}{2} + \frac{1}{4} - \frac{1}{6} \right) \right\} \right]$$

is

- (a)  $\frac{351}{370}$  (b)  $2\frac{351}{370}$   
 (c)  $3\frac{351}{370}$  (d) none of these
12. A drum of kerosene oil is  $\frac{3}{4}$  full. When 15 litres

of oil is drawn from it, it is  $\frac{7}{12}$  full. The capacity of the drum is

- (a) 45  
 (b) 90  
 (c) 60  
 (d) can't be determined
13. The value of the expression

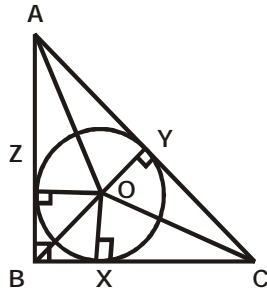
$$\frac{4^n \times 20^{m-1} \times 12^{m-n} \times 15^{m+n-2}}{16^m \times 5^{2m+n} \times 9^{m-1}}$$
 is

- (a) 500 (b) 1  
 (c) 200 (d)  $\frac{1}{500}$
14. If  $2s = a + b + c$ , then the value of  $(s - a)^2 + (s - b)^2 + (s - c)^2 + s^2 - a^2 - b^2 - c^2$  will be:
- (a) -1 (b) 1  
 (c) 2 (d) 0

15. If  $\left(x^4 + \frac{1}{x^4}\right) = 34$ , then the value of  $\left(x - \frac{1}{x}\right)$  is

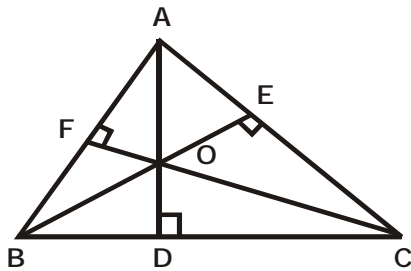
- (a) 1      (b) 2      (c) 3      (d) 4

16. If in  $\Delta ABC$ ,  $\angle B = 90^\circ$ ,  $AB = 6$  cm,  $BC = 8$  cm,  $\overline{OX} \perp \overline{BC}$ ,  $\overline{OY} \perp \overline{AC}$ ,  $\overline{OZ} \perp \overline{AB}$ ,  $OX = OY = OZ$ , then the radius of circle is



- (a) 3 cm      (b) 4 cm  
(c) 2 cm      (d) 1 cm

17. If in  $\Delta ABC$ ,  $\overline{OD} \perp \overline{BC}$ ,  $\overline{OF} \perp \overline{AB}$ ,  $\overline{OE} \perp \overline{AC}$ , then  $AF^2 + BD^2 + CE^2 =$



- (a)  $AE^2 + CD^2 + BF^2$       (b)  $AE^2 - CD^2 + BF^2$   
(c)  $AE^2 - CD^2 + BF^2$       (d)  $AE^2 + CD^2 \times BF^2$

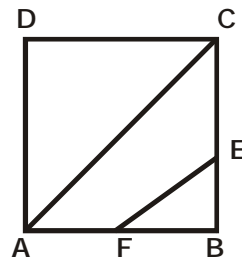
18. If  $\sin^4 \theta + \cos^4 \theta = \frac{1}{2}$ , then  $\sin \theta \cdot \cos \theta$  is.

- (a)  $\pm \frac{1}{8}$       (b)  $\pm \frac{1}{4}$       (c)  $\pm 1$       (d)  $\pm \frac{1}{2}$

19. The number of negative roots of the equation  $x^4 - 9x^3 + 27x^2 - 29x + 6 = 0$

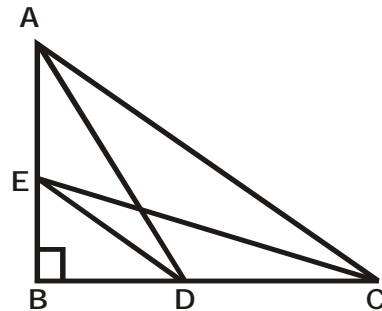
- (a) 0      (b) 1  
(c) 2      (d) 3

20. ABCD is a square. F is the midpoint of  $\overline{AB}$ .  $BE = \frac{1}{3} BC$ . If the area of  $\Delta FBE$  is  $108 \text{ cm}^2$ , then the length of  $\overline{AC}$  is



- (a)  $72\sqrt{2}$  cm      (b)  $6\sqrt{2}$  cm  
(c)  $36\sqrt{2}$  cm      (d)  $48\sqrt{2}$  cm

21.  $\Delta ABC$  is right angled at B.  $\overline{AD}$  and  $\overline{CE}$  are the two medians drawn from A and C respectively. If  $AC = 5$  cm and  $AD = \frac{3\sqrt{5}}{2}$  cm, then CE is

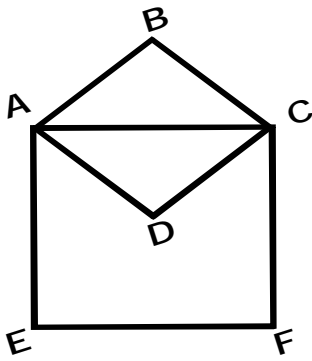


- (a)  $4\sqrt{2}$  cm      (b)  $4\sqrt{5}$  cm  
(c)  $4\sqrt{6}$  cm      (d)  $2\sqrt{5}$  cm

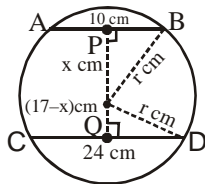
22. The perimeter of a right angled triangle is 5 times the length of its shortest side. If the numerical value of area of the triangle is 15 times the numerical value of the length of the shortest side, then the lengths of 3 sides are

- (a) 16 cm, 30 cm, 36 cm  
(b) 16 cm, 30 cm, 32 cm  
(c) 16 cm, 30 cm, 34 cm  
(d) 16 cm, 30 cm, 38 cm

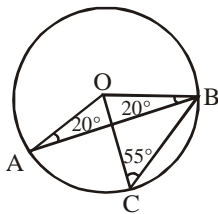
23. ABCD is a rectangle whose area is  $108\text{m}^2$  and length is  $12\text{m}$ . Then the area of the square AEFC is



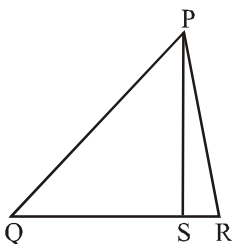
- (a)  $15\text{ m}^2$  (b)  $225\text{ m}^2$   
 (c)  $125\text{ m}^2$  (d) None
24.  $\overline{AB}$  and  $\overline{CD}$  are two parallel chords of a circle, which are on opposite sides of the centre, such that  $AB = 10\text{ cm}$ ,  $CD = 24\text{ cm}$  and the distance between  $AB$  and  $CD$  is  $17\text{ cm}$ . The radius of the circle is



- (a) 20 (b) 13  
 (c) 18 (d) 144
25. O is the centre of the circle.  $\angle OAB = 20^\circ$ ,  $\angle OCB = 55^\circ$ . Then  $\angle BOC$  is



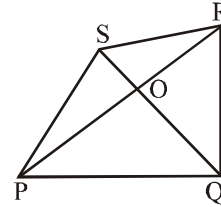
- (a)  $40^\circ$  (b)  $30^\circ$   
 (c)  $20^\circ$  (d)  $70^\circ$
26. In  $\triangle PQR$  S is any point on the side QR. which of the following is true?



- (a)  $PQ + QR + RP > 2 PS$   
 (b)  $PQ + QR + RP < 2 PS$

- (c)  $PQ + QR + RP = 2 PS$   
 (d)  $PQ + QR + RP - 3 PS = 0$

27. Fig. PQRS is a quadrilateral in which diagonals  $\overline{PR}$  and  $\overline{QS}$  intersect in O. which of the following is true?



- (a)  $PQ + QR + RS + SP > PR + QS$   
 (b)  $PQ + QR + RS + SP < 2 (PR + QS)$   
 (c) (a) and (b)  
 (d) None of these
28. The cost of 4 chairs and 3 tables is Rs. 1800. The cost of 5 chairs and 4 tables is Rs. 2300. The cost of each chair is
- (a) 300 (b) 400  
 (c) 500 (d) 600
29. Three numbers are in the ratio 3 : 4 : 5. The sum of the largest and the smallest equals 24. The sum of all the numbers is
- (a) 36 (b) 63  
 (c) 93 (d) 39
30. The positive number that replaces both the question marks in the following equation

$$\text{is } \frac{?}{3996} = \frac{111}{?}$$

- (a) 666 (b) 777  
 (c) 8888 (d) 999

## PHYSICS & CHEMISTRY

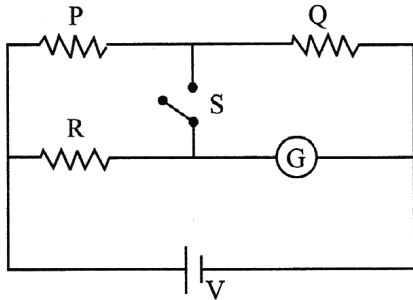
1. An aeroplane flies 400 m north and 300 m south and then flies 1200 m upwards then net displacement is
  - (a) 1204 m
  - (b) 1300 m
  - (c) 1400 m
  - (d) 1500 m
2. A body travels for 15 sec starting from rest with constant acceleration. If it travels distances  $S_1$ ,  $S_2$  and  $S_3$  in the first five seconds, second five seconds and next five seconds respectively, the relation between  $S_1$ ,  $S_2$  and  $S_3$  is
  - (a)  $S_1 = S_2 = S_3$
  - (b)  $5S_1 = 3S_2 = S_3$
  - (c)  $S_1 = \frac{1}{3}S_2 = \frac{1}{5}S_3$
  - (d)  $S_1 = \frac{1}{5}S_2 = \frac{1}{3}S_3$
3. A stone is dropped from a certain height which can reach the ground in 5 seconds. If the stone is stopped after 3 seconds of its fall and then allowed to fall again, then the time taken by the stone to reach the ground for the remaining distance is
  - (a) 2 sec
  - (b) 3 sec
  - (c) 4 sec
  - (d) 8 sec
4. A body of mass 2 kg moving on a horizontal surface with an initial velocity of 4 m/sec comes to rest after 2 sec. If one wants to keep this body moving on the same surface with a velocity of 4 m/sec, the force required is
  - (a) 8 N
  - (b) 4 N
  - (c) 2 N
  - (d) Zero
5. In making an alloy, a substance of relative density  $s_1$  and mass  $m_1$  is mixed with another substance of relative density  $s_2$  and mass  $m_2$ ; then the relative density of the alloy is
  - (a)  $\left(\frac{m_1 + m_2}{s_1 + s_2}\right)$
  - (b)  $\left(\frac{s_1 s_2}{m_1 + m_2}\right)$
  - (c)  $\frac{m_1 + m_2}{\left(\frac{m_1}{s_1} + \frac{m_2}{s_2}\right)}$
  - (d)  $\frac{\left(\frac{m_1}{s_1} + \frac{m_2}{s_2}\right)}{m_1 + m_2}$
6. The radii of two planets are respectively  $R_1$  and  $R_2$  and their densities are respectively  $\rho_1$  and  $\rho_2$ . The ratio of the accelerations due to gravity at their surfaces is
  - (a)  $g_1 : g_2 = \frac{\rho_1}{R_1^2} : \frac{\rho_2}{R_2^2}$
  - (b)  $g_1 : g_2 = R_1 R_2 : \rho_1 \rho_2$
  - (c)  $g_1 : g_2 = R_1 \rho_2 : R_2 \rho_1$
  - (d)  $g_1 : g_2 = R_1 \rho_1 : R_2 \rho_2$
7. The depth  $d$  at which the value of acceleration due to gravity becomes  $\frac{1}{n}$  times the value at the surface, is [ $R$  = radius of the earth]
  - (a)  $\frac{R}{n}$
  - (b)  $R\left(\frac{n-1}{n}\right)$
  - (c)  $\frac{R}{n^2}$
  - (d)  $R\left(\frac{n}{n+1}\right)$
8. A running man has half the kinetic energy of that of a boy of half of his mass. The man speeds up by 1m/s so as to have same K.E. as that of the boy. The original speed of the man will be
  - (a)  $\sqrt{2}$  m/s
  - (b)  $(\sqrt{2} - 1)$  m/s
  - (c)  $\frac{1}{(\sqrt{2} - 1)}$  m/s
  - (d)  $\frac{1}{\sqrt{2}}$  m/s
9. An open knife edge of mass 'm' is dropped from a height 'h' on a wooden floor. If the blade penetrates upto the depth 'd' into the wood, the average resistance offered by the wood to the knife edge is
  - (a) mg
  - (b)  $mg\left(1 - \frac{h}{d}\right)$
  - (c)  $mg\left(1 + \frac{h}{d}\right)$
  - (d)  $mg\left(1 + \frac{h}{d}\right)^2$
10. A man sets his watch by a siren that is 1.98 km away. How much will his watch be in error. (speed of sound in air 330 m/sec)
  - (a) 3 seconds fast
  - (b) 3 seconds slow
  - (c) 6 seconds fast
  - (d) 6 seconds slow

11. A man stands in between two cliffs and fires a gun. He hears two successive echoes after 3 seconds and 5 seconds. What is the distance between two cliffs?

[Speed to sound =  $330\text{m s}^{-1}$ ]

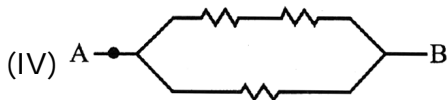
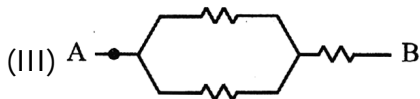
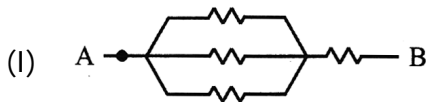
- (a) 1320m (b) 1220m  
(c) 1333m (d) 1230m

12. In the circuit shown here,  $P = R$  and the reading of the galvanometer is same whether the switch S is open or closed. Then.



- (a)  $I_R = I_G$  (b)  $I_P = I_G$   
(c)  $I_Q = I_G$  (d)  $I_Q = I_R$

13. Arrange in order of power dissipated in the given circuits, if the same current is passing through all circuits and each resistor is ' $r$ '

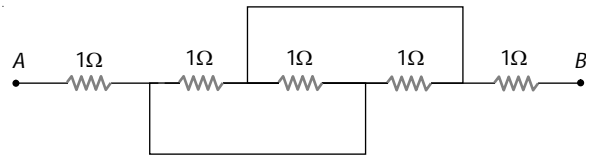


- (a)  $P_2 > P_3 > P_1 > P_4$  (b)  $P_3 > P_2 > P_4 > P_1$   
(c)  $P_4 > P_3 > P_2 > P_1$  (d)  $P_1 > P_2 > P_3 > P_4$

14. A certain piece of silver of given mass is to be made like a wire. Which of the following combination of length ( $L$ ) and the area of cross-sectional ( $A$ ) will lead to the smallest resistance?

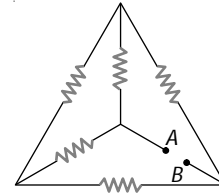
- (a)  $L$  and  $A$  (b)  $2L$  and  $A/2$   
(c)  $L/2$  and  $2A$   
(d) Any of the above, because volume of silver remains same

15. Equivalent resistance between the points A and B is (in  $\Omega$ )



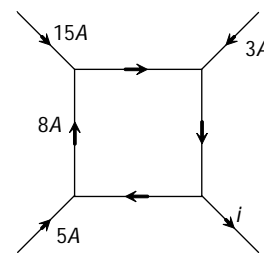
- (a)  $\frac{1}{5}$  (b)  $1\frac{1}{4}$   
(c)  $2\frac{1}{3}$  (d)  $3\frac{1}{2}$

16. In the network shown in the figure, each of the resistance is equal to  $2\Omega$ . The resistance between the points A and B is



- (a)  $1\Omega$  (b)  $4\Omega$   
(c)  $3\Omega$  (d)  $2\Omega$

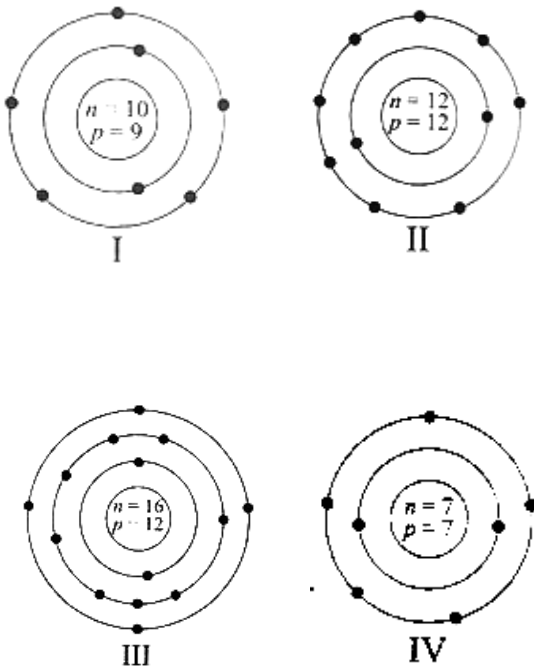
17. The figure shows a network of currents. The magnitude of currents is shown here. The current  $i$  will be



- (a) 3 A (b) 13 A  
(c) 23 A (d) -3 A

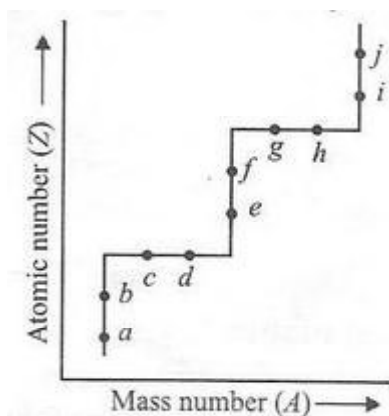


18. Schematic atomic structures of four different elements  ${}_{9}^{19}\text{P}$ ,  ${}_{12}^{24}\text{Q}^{2+}$ ,  ${}_{14}^{28}\text{R}$  and  ${}_{7}^{14}\text{S}^{3-}$  are I, II, III and IV respectively.



The incorrect representation are:

- (a) I, II and IV                      (b) I, III and IV  
(c) III and IV                        (d) I and III
19. Study the given graph carefully.



- I. c and d contains same number of protons  
II. Pairs (a, b), (f, g) and (i, j) are isobars

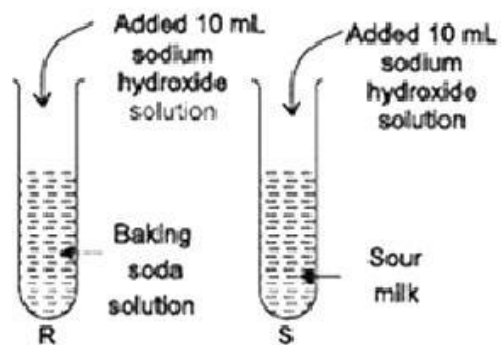
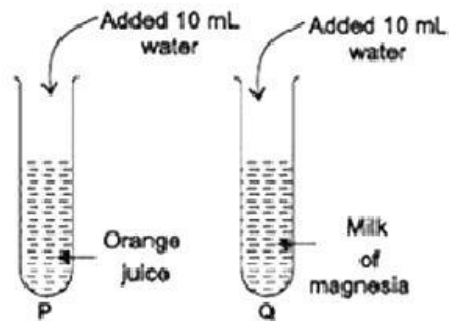
- III. Pairs (c, d) and (g, h) are isotopes  
iv. e and f have different number of neutrons

The correct statements are

- (a) I, II and IV                      (b) I, III and IV  
(c) I and III                         (d) All of these
20. Ashish took 4 test tubes P, Q, R and S. each containing 10 mL of different solutions as shown in figure

Few drops of methyl orange are added to each tube.

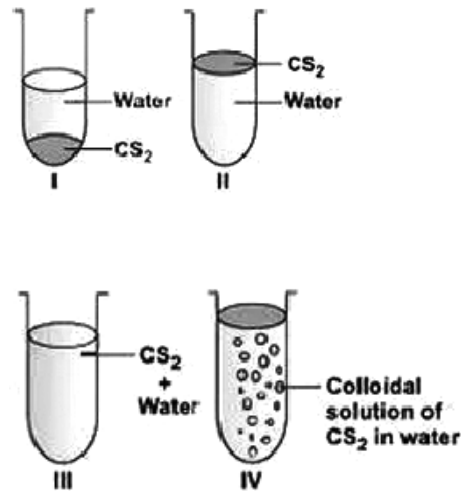
The solution in which tube will turn methyl orange to red?



- (a) P                                      (b) Q  
(c) R                                      (d) S
21. An ion  $\text{M}^{3+}$  contains 10 electrons and 14 neutrons. Element M has valency equal to the valency of another element X which has three electrons less than Ne in its outermost shell. Identify the elements M and X.
- (a) Element M is Al and X is N.  
(b) Element M is N and X is Al

- (c) Element M is Ne and X is B.  
 (d) Both elements M and X are Al
22. Naturally occurring argon (Ar) consists of three isotopes, the atoms of which occur in the abundances as given in the table. The atomic weight of argon is
- | Isotopes         | Abundance |
|------------------|-----------|
| $^{36}\text{Ar}$ | 0.34%     |
| $^{38}\text{Ar}$ | 0.07%     |
| $^{40}\text{Ar}$ | 99.59%    |
- (a) 38.45 u                      (b) 37.20 u  
 (c) 39.98 u                      (d) 40.98 u
23. Aqua-regia is\_\_\_\_
- (a)  $\text{HNO}_3 + \text{HCl}$       (b)  $\text{HNO}_3 + 3\text{HCl}$   
 (c)  $3\text{HNO}_3 + \text{HCl}$       (d)  $\text{H}_2\text{SO}_4 + 3\text{HCl}$
24. As compared to the pure metal, the electrical conductivity and melting point of an alloy is\_\_\_\_
- (a) More                      (b) Less  
 (c) Equal                      (d) Can't generalise
25. Acetic acid was added to a solid X taken in a test tube. A colourless and odourless gas was evolved. The gas was passed through lime water which did not turn milky. However the gas burnt with a pop sound. It was concluded that\_\_\_\_
- (a) solid X is sodium and the gas evolved is  $\text{CO}_2$   
 (b) Solid X is sodium and the gas evolved is  $\text{H}_2$   
 (c) Solid X is sodium acetate and the gas evolved is  $\text{CO}_2$   
 (d) Solid X is sodium chloride and the gas evolved is  $\text{H}_2$

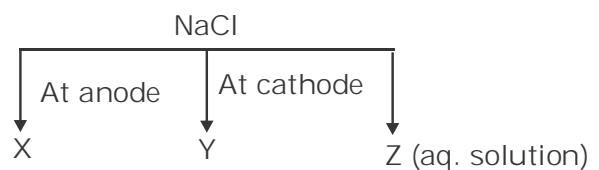
26. When liquid carbon disulphide ( $\text{CS}_2$ ) is added to water taken in a tube, which is the correct observation?



- (a) I                              (b) II  
 (c) III                            (d) IV
27. Given below are the melting points and the atomic radii of four elements P, Q, R and S each having n electrons in the outermost shell of their atoms. Which element will have the highest atomic number?

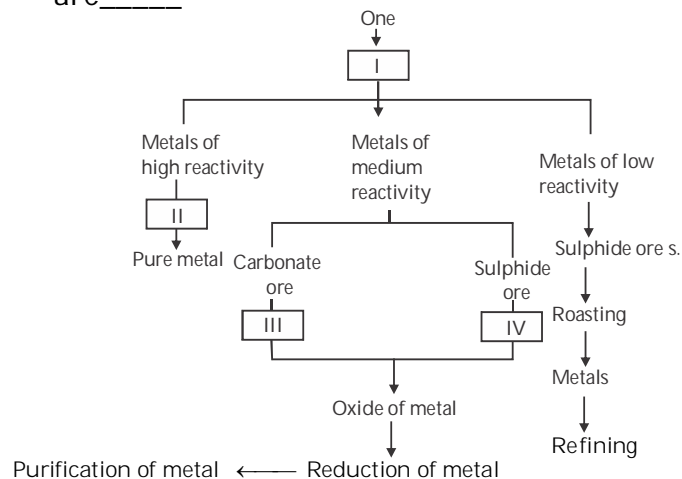
Element	P	Q	R	S
Melting point ( $^{\circ}\text{C}$ )	134	154	196	205
Atomic radius ( $\text{\AA}$ )	120	131	136	142

- (a) P                              (b) Q  
 (c) R                              (d) S
28. The given figure shows important products of chloro-alkali process. What are X, Y and Z respectively?



- (a)  $\text{NaOH}$ ,  $\text{Cl}_2$ ,  $\text{H}_2$   
 (b)  $\text{H}_2$ ,  $\text{Cl}_2$ ,  $\text{NaOH}$   
 (c)  $\text{Cl}_2$ ,  $\text{H}_2$ ,  $\text{NaOH}$   
 (d)  $\text{Cl}_2$ ,  $\text{NaOH}$ ,  $\text{H}_2$

29. In the given flow chart I, II, III and IV are \_\_\_\_\_



- (a) Electrolysis, Concentration, Roasting, Calcination  
 (b) Concentration, Electrolysis, Calcination, Roasting  
 (c) Calcination, Concentration, Electrolysis, Roasting  
 (d) Concentration, Electrolysis, Roasting, Calcination

30. The following table shows solutions X, Y and Z with their respective pH values

Solutions	X	Y	Z
pH	3	7	12

Based on the given information which of the following statement is false?

- (a) Solution X reacts with metals to liberate  $H_2$  gas.  
 (b) Solution Y is formic acid  
 (c) Solution Z reacts with solution X to form salt and water  
 (d) Solution X reacts with calcium carbonate to give off  $CO_2$  gas.
31. Which among the following solutions has the lowest pH value?
- (a) 0.001M  $CH_3COOH$   
 (b) 0.001M HCl  
 (c) 0.001M  $H_2SO_4$   
 (d) Equal pH values for all the above solutions

32. How many moles of water are decomposed if the electrolysis of acidulated water results in the evolution of 2 moles of gaseous products?

- (a) 2 mol (b)  $\frac{1}{3}$  mol  
 (c)  $\frac{4}{3}$  mol (d)  $\frac{2}{3}$  mol

33. The aqueous solution of a salt is found to have a pH value of 5 at  $25^\circ C$ . The salt may contain the following radicals.

- (a)  $Na^+$ ,  $C_2O_4^{2-}$  (b)  $NH_4^+$ ,  $C_2O_4^{2-}$   
 (c)  $SO_4^{2-}$ ,  $K^+$  (d)  $SO_4^{2-}$ ,  $Zn^{+2}$

34. Calculate the mass of nitrogen supplied to the soil by 5 kg of urea.

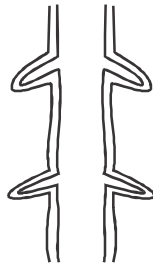
$[CO(NH_2)_2]$  [N = 14, C = 12, O = 16, H = 1]

- (a) 3033.3 g (b) 4330.3 g  
 (c) 1303.3 g (d) 2333.3 g

## BIOLOGY

- About 50% energy in milk comes from
  - Lactose
  - Lacto proteins
  - Proteins
  - Fats
- Fruits are often shipped in containers with higher  $CO_2$  to prevent.
  - Infection of fruits by fungi
  - Overripping of fruit
  - Fermentation of fruits
  - Insects and pests protection
- A student wants to test the presence of starch in a leaf. Select the required steps and arrange them in order.
  - boiling the leaf in ethanol (90%)
  - keeping the plant in dark.
  - rinsing the leaf with hot water
  - addition of Iodine solution.
  - (ii)  $\rightarrow$  (i)  $\rightarrow$  (iii)  $\rightarrow$  (iv)
  - (iv)  $\rightarrow$  (i)  $\rightarrow$  (iii)  $\rightarrow$  (ii)
  - (iii)  $\rightarrow$  (iv)  $\rightarrow$  (ii)  $\rightarrow$  (i)
  - (ii)  $\rightarrow$  (iv)  $\rightarrow$  (i)  $\rightarrow$  (iii)
- Lack of true coelom is a character shared by all the following animals except :
  - Leech
  - Planaria
  - Hydra
  - Roundworms

5. The group of animals exhibit dual intracellular as well as extracellular digestion :
- (a) Ciliates (b) Porifera  
(c) Nidaria (d) Nematodes
6. The cell becomes turgid in solution which is :
- (a) Hypertonic (b) Isotonic  
(c) Hypotonic (d) None of the above
7. Identify the longitudinal section of plant.



- (a) Shoot meristem  
(b) Root meristem  
(c) Midrib of leaf  
(d) Flower
8. Involuntary muscles are not found in :
- (a) Eyelids (b) Bronchi of lungs  
(c) Tongue (d) Heart
9. Considering size, which of the following is the most appropriate?
- (a) Bacteria > Viruses > yeast  
(b) Hornworts > Mosses > Liverworts  
(c) Smooth muscle > Striated muscle < Cardiac Muscle  
(d) Platelets < Human erythrocytes < human eosinophils

10. A cell when viewed under a microscope clearly revealed nucleus, glycogen granules and cell wall. The cell most likely belongs to :
- (a) Bacterium (b) Plant cell  
(c) Fungal cell (d) A protist
11. Which of the following statements about fungi is/are true ?
- (i) Some fungi are parasitic  
(ii) Some fungi are saprophytic  
(iii) Some fungi are mutualistic  
(iv) Some fungi are autotrophic
- (a) (i) and (ii) only (b) (ii) and (iii) only  
(c) Only (i) (d) (i), (ii) and (iii)
12. Which of the following animals has exoskeleton but no endoskeleton ?
- (a) Lizard (b) Frog  
(c) Sponge (d) Cockroach
13. If the sequence of DNA strand is given as GCTAAGTCGAC the complementary strand will be :
- (a) CGATTCAGCTG  
(b) CGATTCAGCTC  
(c) AGATTCAGCTG  
(d) ACTGAACAATG
14. Liver secretes bile which has :
- (a) heparin (b) amylase  
(c) lipase (d) no enzyme
15. The pH of blood :
- (a) 8.2 (b) 8.0  
(c) 7.4 (d) 7
16. Fish gills are :
- (a) only respiratory in function  
(b) only excretory in function  
(c) osmoregulatory in functions  
(d) all are correct

# ANSWER KEY

MENTAL ABILITY		MATHEMATICS		PHYSICS & CHEMISTRY		BIOLOGY	
1.	D	1.	C	21.	D	1.	D
2.	C	2.	D	22.	C	2.	D
3.	A	3.	C	23.	B	3.	A
4.	A	4.	A	24.	B	4.	C
5.	B	5.	C	25.	D	5.	D
6.	C	6.	A	26.	A	6.	C
7.	B	7.	B	27.	C	7.	B
8.	B	8.	C	28.	A	8.	C
9.	A	9.	A	29.	A	9.	D
10.	D	10.	D	30.	A	10.	C
11.	D	11.	B			11.	D
12.	B	12.	B			12.	D
13.	C	13.	D			13.	A
14.	B	14.	D			14.	D
15.	D	15.	B			15.	C
16.	C	16.	C			16.	D
17.	C	17.	A				
18.	B	18.	D				
19.	C	19.	A				
20.	A	20.	C				

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