

also have antibodies that fight anything alien. In case of invasion from the trunk of a tree, the sapwood acts as a shield and secretes enzymes to fight pathogens. But when attacked and conquered, there are tell-tale signs in the form of knotty growths of fruit bodies that are extensions of the fungi in the tree.

93. Which of the following is the author most likely to agree with?

- 1) The ministry responsible should take a more serious view towards research in forest diseases.
- 2) There is a likelihood of another forest disease epidemic, similar to the Sal Borer epidemic, spreading in the country.
- 3) There needs to be a more coordinated effort towards dealing with forest diseases in India.
- 4) All of these

94. Which of these incidents discourages the government to formulate any kind of concrete plans?

- 1) India lacks specialists in this area of forestry.
- 2) The government is not able to work in concomitance with specialists, like entomologists and pathogenists.
- 3) The prevalence of malpractices, such as the alleged nexus of politicians with some of the forest officials.
- 4) None of these

95. Which of these statements cannot be inferred from the passage?

- 1) With the variation of different climatic conditions, pests responsible for forest tree degradation, disappear.
- 2) There are hardly any committed institutions in India, for the promotion of research in forest diseases in India.
- 3) It is possible that the timber mafias could spread their network with help from vested interests in the political and bureaucratic brass.
- 4) None of these.

96. The discussion on the present condition of forest diseases proves that

- 1) there must be a cooperative endeavour by scientists, government officials and politicians to weed out the possibilities of forest diseases.
- 2) a lot more needs to be done by the government for sustaining the ecological balance.
- 3) hitherto forestry has been a neglected area of research.
- 4) None of these

#### Passage V

For years, the contents of a child's sandbox have confounded some of the nation's top physicists. Sand and other granular materials, such as powders, seeds, nuts, soils, and detergent, behave in ways that seem to undermine natural laws and cost industries rang-

ing from pharmaceuticals to agri-business and mining, billions of dollars.

Just shaking a can of mixed nuts can show you how problematic granular material can be. The nuts do not 'mix'; they 'unmix' and sort themselves out, with the larger Brazil nuts on top and the smaller peanuts at the bottom. In this activity and others, granular matter's behaviour apparently goes counter to the second law of thermodynamics, which states that entropy, or disorder, tends to increase in any natural system.

Mimicking the mixed-nut conundrum with a jar containing many small beads and one large bead, one group of physicists claimed that vibrations causing the beads to percolate open up small gaps rather than larger ones. Thus, when a Brazil nut becomes slightly airborne, the peanuts rush in underneath and gradually nudge it to the top. Another group of physicists colour coded layers of beads to track their circulation in a container and achieved a different result. Vibrations, they found, drive the beads in circles up the centre and down the sides of the container. Yet downward currents, similar to convection currents in air or water, are too narrow to accommodate the larger bead, stranding it on top.

One industrial engineer who has studied the problem says that both the 'percolation' and 'convection current' theories can be right, depending upon the material, and that percolation is the major factor with nuts. Given the inability of scientists to come up with a single equation explaining unmixing, you can see why industrial engineers who must manage granular materials go a little, well, 'nuts'. Take Pharmaceuticals, for instance. There may be six types of powders with different-sized grains in a single medicine tablet. Mixing them at some speeds might sort them, while mixing at other speeds will make them thoroughly amalgamated. One aspirin company still relies on an experienced employee wearing a latex glove who pinches some powder in the giant mixing drum to see if it 'feels right'.

Granular material at rest can be equally frustrating to physicists and engineers. Take a tall cylinder of sand. Unlike a liquid, in which pressure exerted at the bottom increases in direct proportion to the liquid's height, pressure at the base of the sand cylinder doesn't increase indefinitely. Instead, it reaches a maximum value and stays there. This quality allows sand to trickle at a nearly constant rate through the narrow opening separating the two glass bulbs of an hourglass, thus measuring the passage of time.

Physicists have also found that forces are not distributed evenly throughout granular material. It is this characteristic that may account for the frequent rupturing of silos in which grain is stored. In a silo, for instance, the column's weight is carried from grain to grain along jagged chains. As a result the container's walls carry more of the weight than its base, and the

force is significantly larger at some points of contact than at others. Coming up with equations to explain, much less predict, the distribution of these force chains is extremely difficult.

Again, using beads, physicists developed a simple theoretical model in which they assume that a given bead transmits the load it bears unequally and randomly onto the three beads on which it rests. While the model agrees well with experimental results, it does not take into account all of the mechanisms of force transmission between grains of sand or wheat.

In the struggle to understand granular materials, sand-studying physicists have at least one thing in their favour. Unlike particle physicists who must secure billions of dollars in government funding for the building of super-colliders in which to accelerate and view infinitesimal particles, they can conduct experiments using such low-cost, low-tech materials as sand, beads, marbles, and seeds. It is hoped that more low-tech experiments and computer simulations will lead to equations that explain the unwieldy stuff and reduce some of the wastage, guesswork, and accidents that occur in the various industries that handle it.

97. The percolation theory of unmixing is best illustrated by which of the following examples?
- 1) Contents settling in a bag of potato chips so that the package appears less full after handling
  - 2) Currents of small beads blocking the upward movement of large beads in a shaken container
  - 3) Larger rocks rising to the surface in a garden after a period of frost
  - 4) Large nuts blocking the upward movement of small nuts in a shaken container
98. In saying that the percolation and convection current theories may both be right, the industrial engineer means that
- 1) though the theories have different names, they describe same physical mechanism.
  - 2) both theories are still unproven, as they have not been tested on a variety of materials.
  - 3) neither theory is supported by an adequate mathematical basis.
  - 4) the mechanism causing unmixing varies depending upon the type of granular material.
99. Which of the following appears to be the best solution for combating the 'unmixing' problem faced by pharmaceutical manufacturers that must prepare large quantities of powders?
- 1) To mix all the powders together at the same speed
  - 2) To craft powders in which every grain weighs the same amount
  - 3) To craft powders so that all the grains have similar sizes and shapes
  - 4) To hire engineers who have years of experi-

ence in powder mixing

100. The passage implies that if the top bulb of an hourglass were filled with water instead of sand the pressure pushing the water through the opening would

- 1) remain constant as water trickles through the opening.
- 2) decrease as water trickles through the opening.
- 3) increase as water trickles through the opening.
- 4) be directed at the walls of the container rather than the base.

101. The ratio between the number of passengers travelling by I and II class between the two railway stations is

1 : 50, whereas the ratio of I and II class fares between the same stations is 3 : 1. If on a particular day, Rs 1325 was collected from the passengers travelling between these stations, then what was the amount collected from the II class passengers?

- 1) Rs 1000
- 2) Rs 850
- 3) Rs 750
- 4) Rs 1250

102. A and B enter into a partnership with Rs 50,000 and Rs 60,000 respectively. C joins them after x months, contributing Rs 70,000, and B leaves x months before the end of the year. If they share the profit in the ratio of 20 : 18 : 21, then find the value of x.

- 1) 6
- 2) 3
- 3) 9
- 4) 8

103. Rahul started a business with a capital of Rs 8,000. After six months, Sanjay joined him with an investment of some capital. If at the end of the year each of them gets equal amount as profit, how much did Sanjay invest in the business?

- 1) Rs 16,000
- 2) Rs 17,500
- 3) Rs 18,000
- 4) Rs 16,500

104. A manufacturer of a certain item can sell all he can produce at the selling price of Rs 60 each. It costs him Rs 40 in materials and labour to produce each item and he has overhead expenses of Rs 3000 per week in order to operate that plant. The number of units he should produce and sell in order to make a profit of at least Rs 1000 per week is

- 1) 250
- 2) 300
- 3) 400
- 4) 200

105. If the selling price of a product is increased by Rs 162, then the business would make a profit of 17% instead of a loss of 19%. What is the cost price of the product?

- 1) Rs 540
- 2) Rs 450
- 3) Rs 360
- 4) Rs 600

106. Two men undertake to do a piece of work for Rs

- 1,400. The first man alone can do this work in 7 days while the second man alone can do this work in 8 days. If they working together complete this work in 3 days with the help of a boy, how should the money be divided?
- Rs 600, Rs 550, Rs 250
  - Rs 600, Rs 525, Rs 275
  - Rs 600, Rs 500, Rs 300
  - Rs 500, Rs 525, Rs 375
107. Two men undertake to do a piece of work for Rs 600. One alone could do it in 6 days and the other in 8 days. With the assistance of a boy they finish it in 3 days. The boy's share should be
- Rs 75
  - Rs 225
  - Rs 300
  - Rs 100
108. 15 men can complete a work in 210 days. They started the work but at the end of 10 days 15 additional men, with double efficiency, were inducted. How many days in all did they take to finish the work?
- $72\frac{1}{2}$  days
  - $84\frac{3}{4}$  days
  - $76\frac{2}{3}$  days
  - 70 days
109. There are two taps to fill a tank and a third to empty it. When the third tap is closed, they can fill the tank in 10 minutes and 12 minutes, respectively. If all the three taps be opened, the tank is filled in 15 minutes. If the first two taps are closed, in what time can the third tap empty the tank when it is full?
- 8 min and 34 sec
  - 9 min and 32 sec
  - 7 min
  - 6 min
110. A cistern has two taps which fill it in 12 minutes and 15 minutes respectively. There is also a waste pipe in the cistern. When all the pipes are opened, the empty cistern is full in 20 minutes. How long will the waste pipe take to empty a full cistern?
- 12 minutes
  - 10 minutes
  - 8 minutes
  - 16 minutes
111. Two taps can fill a tank in 20 minutes and 30 minutes respectively. There is an outlet tap at exactly half level of that rectangular tank which can pump out 100 litres of water per minute. If the outlet tap is open, then it takes 24 minutes to fill an empty tank. What is the volume of the tank?
- 1800 litres
  - 1500 litres
  - 1200 litres
  - 2400 litres
112. Excluding stoppages, the speed of a bus is 54 km/hr and including stoppages, it is 45 km/hr. For how many minutes does the bus stop per hour?
- 12
  - 10
  - 9
  - 20
113. Rampur is 100 km from Sitapur. At 3 pm Bharat Express leaves Rampur for Sitapur and travels at a constant speed of 30 kmph. One hour later, Laxman Mail leaves Sitapur for Rampur and travels at a constant speed of 40 kmph. Each train makes one stop only at a station 10 km from its starting point and remains there for 15 min. Which train is nearer to Rampur when they meet?
- Both are equidistant
  - Laxman Mail
  - Bharat Express
  - None of these
114. A car starts running with the initial speed of 40 kmph, with its speed increasing every hour by 5 kmph. How many hours will it take to cover a distance of 385 km?
- 9 hrs
  - $9\frac{1}{2}$  hrs
  - $8\frac{1}{2}$  hrs
  - 7 hrs
115. How many kg of tea worth Rs 25 per kg must be blended with 30 kg of tea worth Rs 30 per kg so that by selling the blended variety at Rs 30 per kg there should be a gain of 10%?
- 32 kg
  - 40 kg
  - 36 kg
  - 42 kg
116. How many kg of sugar costing Rs 5.75 per kg should be mixed with 75 kg of cheaper sugar costing Rs 4.50 per kg so that the mixture is worth Rs 5.50 per kg?
- 350 kg
  - 300 kg
  - 250 kg
  - 325 kg
117. The average monthly salary of employees, consisting of officers and workers of an organisation, is Rs 3000. The average salary of an officer is Rs 10,000 while that of a worker is Rs 2,000 per month. If there are total 400 employees in the organisation, find the number of officers and workers separately.
- 50, 350
  - 350, 450
  - 50, 275
  - 325, 350
118. A person travels 285 km in 6 hrs in two stages. In the first part of the journey, he travels by bus at the speed of 40 km per hr. In the second part of the journey, he travels by train at the speed of 55 km per hr. How much distance does he travel by train?
- 165 km
  - 145 km
  - 205 km
  - 185 km
119. How many kg of pure salt must be added to 30 kg of a 2% solution of salt and water to increase it to a 10% solution?
- $2\frac{2}{3}$  kg
  - 15 kg



3) 14 kg

4)  $14\frac{1}{5}$  kg

120. Two persons are walking in the same direction at rates 3 km/hr and 6 km/hr. A train comes running from behind and passes them in 9 and 10 seconds. The speed of the train is

1) 22 km/hr

2) 40 km/hr

3) 33 km/hr

4) 35 km/hr

**Directions (Q. 121-124): Each of the questions below is followed by two statements labelled (A) and (B). Decide whether the data given in the statements is sufficient for answering the question.**

**Mark answer as**

- 1) if both statements (A) and (B) together are sufficient to answer the question asked, but neither statement alone is sufficient.
  - 2) if statement (B) alone is sufficient but statement (A) alone is not sufficient to answer the question asked.
  - 3) if statement (A) alone is sufficient but statement (B) alone is not sufficient to answer the question asked.
  - 4) if each statement is sufficient by itself to answer the question asked.
121. How much did the salesman earn from the sale of 3 cars?
- (A) Each car sold for Rs 3,40,000  
(B) He received a 2% commission on each sale.
122. What does WXY equal?
- (A)  $W = X + Y$   
(B)  $WXYZ = 6Z$  where  $Z \neq 0$

123. Which number is the greatest, C, D or E?

(A)  $2D > 2E > 2C$ (B)  $C + 2 = D \geq E$ 

124. If Sanjay can paint a house in 15 hours working alone, how long will it take to paint the house if Mohit helps him?

(A) Mohit can paint the house in 20 hours working alone.

(B) Working together with Sanjay, Mohit does  $\frac{3}{7}$  of the total work.

**Directions (Q. 125-128): In each of these questions two quantities are given, one in column A and one in column B. Compare the two quantities.**

**Mark answer as**

- 1) if the two quantities are equal.
- 2) if the quantity in column B is greater.
- 3) if the quantity in column A is greater.
- 4) if the relationship cannot be determined from the information given.

**Given**

**Column A**

**Column B**

**Information**

125.  $x = -2$  $3x^2 + 2x - 1$  $x^3 + 2x^2 + 1$ 

126.  $\frac{a}{a+b} = \frac{c}{c+d}$

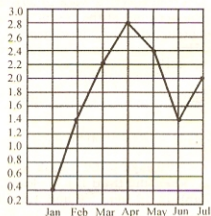
cb

ad

127. An audio cassette priced at Rs 47.25 includes a 5% mark-up.
- Rs 44.89      The original price before mark-up

128. 25% of the 300 girls in our school wear spectacles.
- The ratio of girls wearing spectacles to those who do not      1 : 3

**Directions (Q. 129-132): Refer to the following line graph which represents the rainfall in inches during the months of January through July in a particular year in a certain city.**



In each of these questions two quantities are given, one in column A and one in column B. Compare the two quantities.

**Mark answer as**

- 1) if the two quantities are equal.
- 2) if the quantity in column B is greater.
- 3) if the quantity in column A is greater.
- 4) if the relationship cannot be determined from the information given.

**Column A**

**Column B**

129. The ratio of rainfall between the months February and July      2 : 3
130. The average monthly rainfall recorded for the 7 months      1.9 inches
131.  $12\frac{1}{2}\%$  of all the rain that fell during the 7-month period      The amount of rainfall during the month of February
132. The ratio between the average rainfall in      The ratio between the average rainfall

May and January

in April and February

**Directions (Q. 133-136):** Study the table to answer these questions.

**Table — Number of Cancer Cases over Two Years for Selected Countries**

Country	2006 (Cases in '00)	2006 (Rate per 10,000)	2007 (Cases in '00)
A	53	0.1	46
B	345	2.1	145
C	87	1.1	39
D	81	33.9	26
E	84	0.8	23
F	1365	0.9	209
G	661	13.0	239
H	516	1.9	236
J	36	0.2	16
K	95	1.8	23
L	262	3.9	156
M	19	0.0	18
N	1862	3.3	563
P	47	56.2	11
Q	49	0.5	18
R	337	5.0	235
S	61	1.2	35
T	17	0.3	12
U	896	1.5	235
V	39	1.4	14
W	31	0.0	5
X	501	0.6	12
Y	217	1.4	73
Z	31	0.9	22
AA	39	0.8	13
AB	46	0.4	35
AC	48	0.1	21
AD	71	0.8	32
AE	162	2.4	83
AF	655	1.1	241
AG	21,861	8.9	6445
AH	869	1.4	219
AJ	19	0.0	13

All countries that have reported more than five hundred cancer cases to the WHO in 2007 are listed

here. The left column gives the total number of cases reported by each country for 2006, the middle column gives the 2006 rate (cancer cases per 10,000 population) and the last column shows the number of cases reported in early 2007.

Most of the 2007 reports were for only the first quarter of the year. Owing to reporting delays of six months or more, cases reported in 2007 actually were diagnosed in 2006.

133. What is the population of AD on the basis of the reported cases of cancer in 2006 (in thousands)?

- 1) 825,000                      2) 812,500  
3) 810,000                      4) None of these

134. Which country has reported the second highest number of cancer cases to WHO during 2006?

- 1) N 2) AG                      3) F 4) U

135. The countries which have reported less than 2000 cases both in 2006 and early 2007 are

- 1) M, J and P                      2) V, AJ and W  
3) W, M and T                      4) M, T and AJ

136. Which of the following are true from the table?

- I. The reported cancer cases of M, W and AJ as compared to their population are negligible.  
II. The 2006 rate is highest for P though the reported cases are only 4700.  
III. The population of R is 664,000 in 2006.  
IV. P reported more than 20,000 cases of cancer in early 2007.

- 1) I, II and III                      2) II and III  
3) I and II                      4) I, II and IV

**Directions (Q. 137-140) :** Refer to the following Tables (A) and (B) to answer these questions.

**Table (A): Production of Inorganic Chemicals**

Description	Production (tonnes)	
	2002-03	2003-04
Bleaching Powder	60,043	51,434
Aluminium Chloride	31,908	31,176
Sodium Tripoly Phosphate	60,639	60,041
Sodium Bicarbonate	61,615	72,895
Calcium Carbonate	143,980	142,125
Chlorine and Liquid Chlorine	717,220	718,530
Calcium Carbide	83,445	83,388
Titanium Oxide	30,422	19,624