

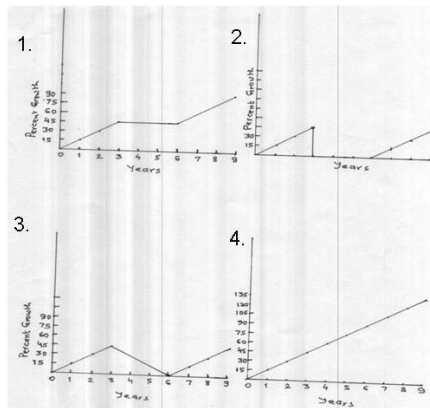
# GENERAL SCIENCES

## MODEL QUESTION PAPER

### PART A

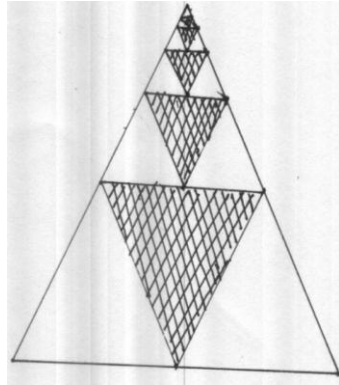
#### ANSWER ANY 15 QUESTIONS

1. Profit of a firm grows at a rate of 15% per year for the first three consecutive years. For the next three years, the profit level remains stagnant. From the 6<sup>th</sup> year till the 9<sup>th</sup> year, it again grows at a rate of 15% per year. Which of the following graphs depicts these facts?



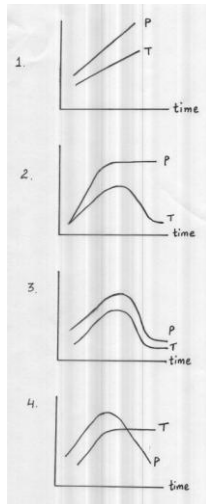
2. A pond is deepest at its centre and becomes shallow uniformly towards the edge. If the depth of water at the centre in May is half its value in August, the water contained in the pond
- (1) in May is greater than half that in August
  - (2) in August is equal to twice that in May
  - (3) in May is less than half that in August
  - (4) in August is less than twice that in May

3. The series representing the sum of the areas of the shaded equilateral triangles in the figure below is



1.  $3+2+1+1$
  2.  $\frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \frac{1}{3^4} \dots$
  3.  $\frac{1}{4} + \frac{1}{4^2} + \frac{1}{4^3} + \frac{1}{4^4} \dots$
  4.  $\frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} \dots$
4. Which of the following vitamins will not be synthesized in a person confined to a dark cell for a long time ?
1. A
  2. B
  3. C
  4. D
5. Flowering in some plants is strongly influenced by the photo period. A farmer was growing two species of plants, A and B near a sea coast where a light house was located. He observed that species A flowered profusely while species B did not. Which of the following is correct ?
1. Species A requires long duration of day while species B needs a shorter day
  2. Species B requires longer duration of day while species A needs a shorter duration
  3. Both species require short duration of day
  4. Both species require long duration of day

6. Pneumatophores are modified roots in some plants like *Rhizophora* growing in swampy areas that come out of the ground and grow vertically upwards. The main function of such roots is to
- (1) help obtain oxygen for respiration
  - (2) provide support
  - (3) adsorb and conduct water and minerals
  - (4) store food
7. A cube of side 1 cm is painted by putting a lacquer of thickness  $\delta$ , negligible compared to the side of the cube. The volume of the painted cube is approximately
- (1)  $1 + \delta \text{ cm}^3$
  - (2)  $1 + \delta^3 \text{ cm}^3$
  - (3)  $1 + 3\delta^3 \text{ cm}^3$
  - (4)  $1 + 3\delta \text{ cm}^3$
8. A candle is burning inside a sealed glass jar. The pressure and temperature of the air within the jar are plotted as a function of time. Which of the following graphs represents this process correctly?



9. The result of taking 1's complement of the sum of the binary numbers 110 and 101 will be
- (1) 1011
  - (2) 0011
  - (3) 0100
  - (4) 0110
10. Which of the following straight lines passes through the point (1,1)?
- (1)  $y = 2x + 3$

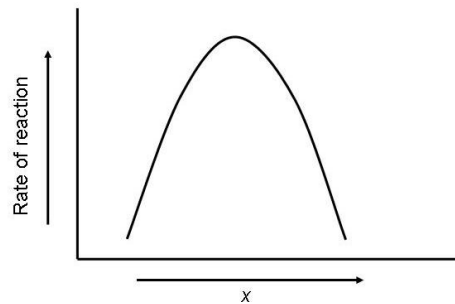
- (2)  $2y = x - 6$   
(3)  $x = 1$   
(4)  $x = y + 1$
11. Which of the following 1 molar (aqueous) solution has the highest number density of ions?
- (1) Glucose  
(2)  $\text{CaCl}_2$   
(3)  $\text{NaNO}_3$   
(4)  $\text{KCl}$
12. How many two-digit even numbers can be composed from nine digits 1, 2, 3 ... 9?
- (1) 50  
(2) 81  
(3) 45  
(4) 36
13. Complete combustion of cyclohexane ( $\text{C}_6\text{H}_{12}$ ) is represented by the equation
- $$\text{C}_6\text{H}_{12} + x \text{O}_2 \rightarrow y \text{CO}_2 + z \text{H}_2\text{O}$$
- The values of  $x$ ,  $y$  and  $z$ , respectively, are
- (1) 9, 6, 6  
(2) 10, 6, 4  
(3) 6, 12, 10  
(4) 4, 8, 12
14. How many distinct trichlorobenzenes ( $\text{C}_6\text{H}_3\text{Cl}_3$ ) should exist, given that benzene ( $\text{C}_6\text{H}_6$ ) has a regular hexagonal geometry?
- (1) 6  
(2) 1  
(3) 2  
(4) 3
15. Mercury is closer to the Sun than Venus. Yet Venus is hotter because it has
- (1) a dominant  $\text{CO}_2$  atmosphere  
(2) a dominant methane atmosphere  
(3) sulphuric acid clouds  
(4) an atmosphere devoid of oxygen

16. In a simple pendulum experiment, a student records the following readings. If the true period of the pendulum is 10 s, then the percent error is the largest for the observation with serial number

Serial Number	Number of Oscillations	Time
1	10	100.2
2	20	200.3
3	50	500.5
4	100	1000.8

- (1) 1  
(2) 2  
(3) 3  
(4) 4
17. A container holding normal air (1 bar pressure, room temperature) is being evacuated. The normal composition of air is approximately 78% N<sub>2</sub>, 21% O<sub>2</sub>, 0.9% Ar and traces of CO<sub>2</sub> (0.04%) and water vapour (0.02%). After the pressure in the container falls to about 10<sup>-3</sup> mbar, the relative fractions of the components will be
1. N<sub>2</sub> and O<sub>2</sub> approximately equal and greater than H<sub>2</sub>O
  2. N<sub>2</sub>, O<sub>2</sub>, Ar approximately equal and greater than H<sub>2</sub>O
  3. N<sub>2</sub>, O<sub>2</sub>, Ar in the original proportion, but N<sub>2</sub> less than H<sub>2</sub>O
  4. N<sub>2</sub>, O<sub>2</sub>, Ar in the original proportion, and N<sub>2</sub> greater than H<sub>2</sub>O
18. An endoscope is a device for observing internal organs, using a combination of a lamp and an optical fibre. The image seen is due to
- (1) light reflected by the organ and transmitted by internal reflection through the fibre
  - (2) light refracted by the organ and transmitted by refraction through the fibre.
  - (3) light refracted by the organ and transmitted by internal reflection through the fibre.
  - (4) light emitted by the organ and transmitted by refraction through the fibre.
19. How many times in a day is the angle between the minute and hour hands of a clock equal to an angle  $\theta$ , where  $0^\circ < \theta < 180^\circ$
- (1) 24
  - (2) 12
  - (3) 36
  - (4) 48

20. A typical enzyme catalyzed reaction is shown below



What do you think the component  $x$  might be?

1. Substrate concentration or temperature
2. Substrate concentration or enzyme concentration
3. Substrate concentration or pH
4. pH or temperature