

**GENERAL INSTRUCTIONS FOR NATIONAL STANDARD  
EXAMINATION IN JUNIOR SCIENCE (NSEJS) TEST PAPER  
YEAR : 2014-15 (STAGE-I)**

Time : 2 Hr.

Code : JS 524

Max. Marks : 240

1. In addition to this question paper, you are given a separate answer sheet.
2. On the answer sheet fill up all the entries carefully in the space provided, **ONLY IN BLOCK CAPITALS.**  
**Incomplete/incorrect/carelessly filled information may disqualify your candidature.**
3. On the answer sheet, use only **BLUE or BLACK BALL PEN** for making entries and marking answers.
4. The question paper contains 80 multiple-choice questions. Each question has 4 options, out of which only one is correct. Choose the correct answer and mark a cross (**X**) in the corresponding box on the answer sheet below.

For Example

Q.NO.	A	B	C	D
22		X		

5. Any rough work should be done only on the sheet provided at the end of question paper.
6. A correct answer carries **3 marks** and **1 mark** will be deducted for each wrong answer.
7. Use of nonprogrammable calculator is allowed.
8. Top 300 (or so) students are called for the next examination-Indian National Junior Science Olympiad (INJSO). Individual letters are sent to these students **ONLY**.

**IJSO - 2014-15 STAGE-I**

1. Three identical vessels carrying equal amount of water are placed in three lifts. Lift A is accelerating upwards, lift B is accelerating downwards while lift C is moving up with constant velocity. The pressure at a depth  $h$  from free surface in the three vessel is measured as  $p_A$ ,  $p_B$  and  $p_C$  then which of the following is true

(a)  $p_A = p_C > p_B$                       (b)  $p_A > p_C > p_B$                       (c)  $p_A = p_C = p_B$                       (d)  $p_A > p_C = p_B$

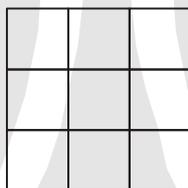
2. In the reaction,



What is the volume of oxygen released under NTP conditions when 36.75g of  $\text{KClO}_3$  is heated ?

(a) 3.6 litres                      (b) 7.2 litres                      (c) 18 litres                      (d) 10 litres

3. Figure shows a square grid of order 3, which of the following is correct formula for the total number of squares in a similar grid of order  $n$ .



(a)  $\frac{n(n+1)}{2}$                       (b)  $\frac{n^2(n+1)^2}{4}$                       (c)  $\frac{n(n+1)(2n+1)}{6}$                       (d)  $\frac{n(n+1)(n+2)}{6}$

4. If the distance between genes - W, X, Y, and Z on a chromosome are as follows : from W-Y is 18 units, W-X is 26 units, W-Z is 40 units, X-Y is 8 units and X-Z is 14 units, the sequence of W, X, Y, Z genes on the chromosome would be :

(a) W, Y, X, Z                      (b) X, Y, W, Z                      (c) Y, W, X, Z                      (d) W, X, Y, Z

5. In a plant, 30 megaspore mother cells are generated. If all the ovules are fertilised, how many sees are expected to be formed ?

(a) 60                      (b) 30                      (c) 90                      (d) 120

6. A water filter advertisement claims to provide 8 litres of water per hour. How much time does it take to fill four bottles of 1.5 litres each ?

(a) 2 hr                      (b) 1 hr                      (c) 30 min                      (d) 45 min

7. Which among the following salts will not change the pH of water on addition

(a) Sodium cyanide                      (b) Sodium chloride                      (c) Sodium bicarbonate                      (d) Sodium carbonate

8. A particle starting from rest is moving with uniform acceleration in a straight line. The percentage increase of the displacement of the particle in 9<sup>th</sup> second compared to that in the immediate previous second is about

(a) 8.3%                      (b) 20.6%                      (c) 13.3%                      (d) 24.5%

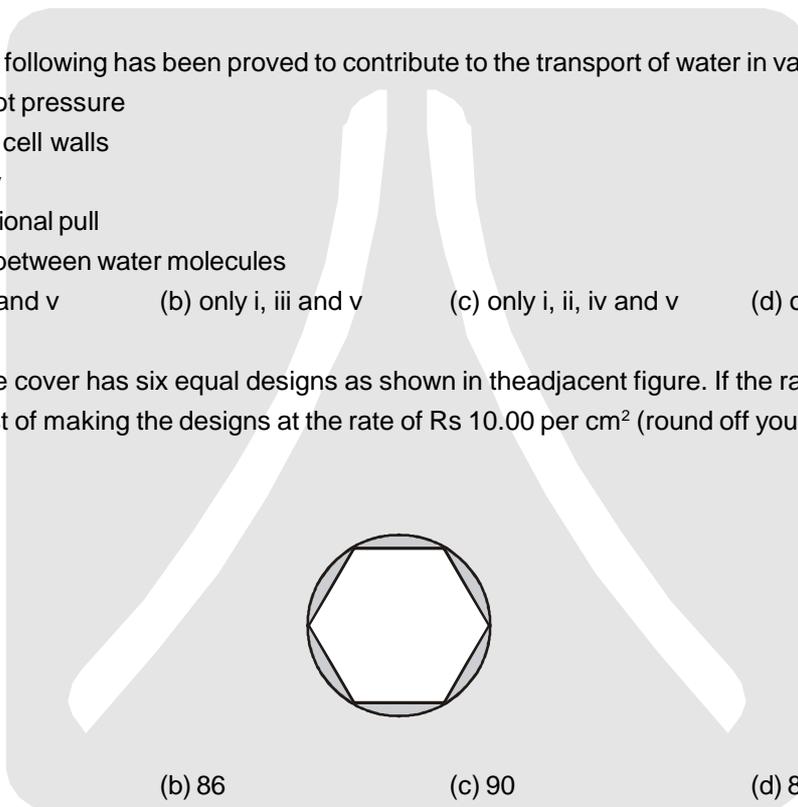
9. An inflated balloon with a heavy rock tied to it submerges in water. As the balloon sinks deeper and deeper, the buoyant force acting it

(a) increases                      (b) remains nearly unchanged  
(c) decreases                      (d) Initially increases and then decreases

10. For a first order reaction, the ratio of the times taken for completion of 99.9% and 50% of the reaction is  
 (a) 8 (b) 9 (c) 12 (d) 10
11. If set of marbles, of radius 5 cm, is poured into a cube of side 1 m. The maximum number of marbles that can be filled into the box are  
 (a) 2000 (b) 1000 (c) 1500 (d) 3000
12. Most of the insects have egg, larva, pupa and adult stages in the life cycle. This is primarily due to ;  
 (A) relatively short adult phase (b) terrestrial habitat they have adapted to  
 (c) flying mode of locomotion majority have (d) eggs storing little reserved food.

13. Which of the following has been proved to contribute to the transport of water in vascular plants ?  
 i. Positive root pressure  
 ii. Hydrophilic cell walls  
 iii. Capillarity  
 iv. Transpirational pull  
 v. Cohesion between water molecules  
 (a) i, ii, iii, iv and v (b) only i, iii and v (c) only i, ii, iv and v (d) only ii, iv and v

14. A round table cover has six equal designs as shown in the adjacent figure. If the radius of the cover is 4 cm, then cost of making the designs at the rate of Rs 10.00 per  $\text{cm}^2$  (round off your answer to a nearest rupee) is



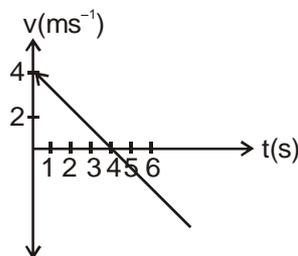
- (a) Rs 85 (b) 86 (c) 90 (d) 87

15. Which of the following series of elements have nearly the same stomic radii ?  
 (a) Fe, Co, Ni, Cu (b) Na, K, Rb, Cs (c) Li, Be, B, C (d) F, Cl, Br, I

16. A particle is moving along a straight line. Its velocity time graph is as shown in the adjacent figure. Then Match the following

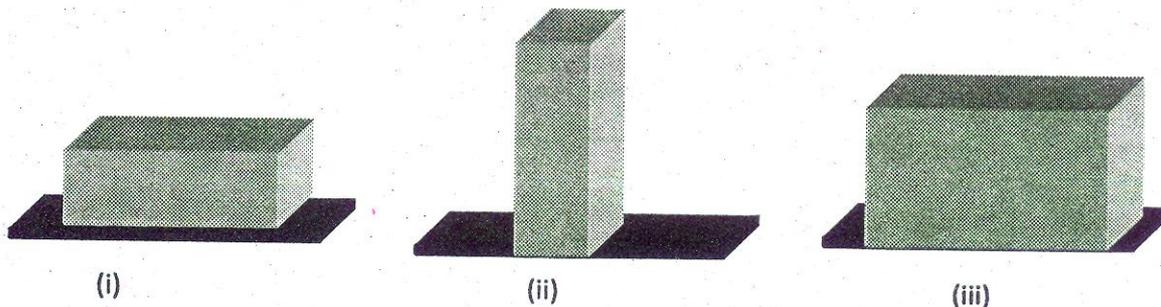
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Physical quantity	Remarks
(i) Acceleration at 4 second	(p) Positive
(ii) Velocity at 4 second	(q) Negative
(iii) Direction of motion at 2 second	(r) Zero



- (a) (i, is (p); (ii) is (q) and (iii) is (r) (b) (i) is (r) ; (ii) is (r) and (iii) is (p)  
 (c) (i) is (q) ; (ii) is (r) and (iii) is (p) (d) (i) is (q), (ii) is (p) and (iii) is (r)

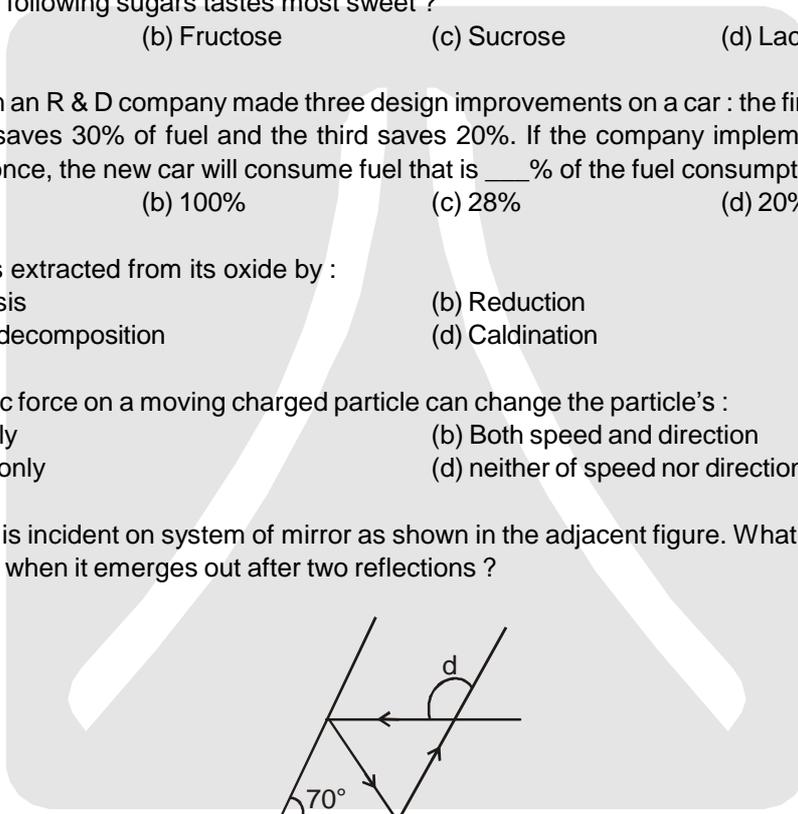
17. A rectangular parallelepiped with sides  $a$ ,  $b$  and  $c$  in the ratio  $3 : 2 : 1$  is kept on a uniformly rough horizontal surface as shown in the figures below. The value of limiting friction is



- (a) Same in all cases      (b) Minimum in (ii)      (c) Minimum in (iii)      (d) Minimum (i)
18. Which of the following has the maximum number of unpaired electrons ?  
 (a)  $Ti^{3+}$       (b)  $V^{3+}$       (c)  $Fe^{2+}$       (d)  $Fe^{3+}$
19. The houses of a row are numbered consecutively from 1 to 49. Find the value of  $x$  such that the sum of the numbers of houses preceding the house numbered  $x$  is equal to the sum of the numbers of the houses following it.  
 (a) 25      (b) 35      (c) 37      (d) No such value exists
20. Urea is the principle excretory waste in larval as well as adult phases of :  
 (a) Cockroach      (b) Crab      (c) Frog      (d) Starfish
21. Use of excessive NKP fertilizers has resulted in :  
 i. Reduction in number as well as species of nitrogen fixing bacteria  
 ii. Increase in number as well as types of denitrifying bacteria  
 iii. Increase in the proportion of coarse particles in soil.  
 iv. Increase in number as well as types of ammonifying microbes  
 v. Increase in number as well as types of nitrifying bacteria  
 (a) only i, ii and iii      (b) only ii, iv and v      (c) only i and ii      (d) i, ii, iii, iv and v
22. Along a road lie an odd number of stones placed at intervals of 10 metre. These stones have to be assembled around the middle stone. A person can carry only one stone at a time. If a man starts from one of the end stones, and by carrying them in succession he covers 3 km to pile all stones at the centre. The number of stones is then :  
 (a) 12      (b) 15      (c) 30      (d) 25
23. The following variation of properties is generally seen in the periodic table.  
 (a) Atomic radius and ionization energy both increase across a period.  
 (b) Atomic radius increases and ionization energy decreases across a period  
 (c) Atomic radius and ionization energy both decreases across a period  
 (d) Atomic radius decreases and ionization energy increases across a period



30. In which of the following series of transition metal ions, all metal ions have  $3d^2$  electronic configuration  
 (a)  $Ti^+$ ,  $V^{4+}$ ,  $Cr^{6+}$ ,  $Mn^{7+}$  (b)  $Ti^{3+}$ ,  $V^{2+}$ ,  $Cr^{3+}$ ,  $Mn^{4+}$  (c)  $Ti^{2+}$ ,  $V^{3+}$ ,  $Cr^{4+}$ ,  $Mn^{5+}$  (d)  $Ti^{4+}$ ,  $V^{3+}$ ,  $Cr^{2+}$ ,  $Mn^{3+}$
31. A piece of wire 60 cm long is cut into two parts, one of them being 24 cm long. Each part is then bent to form a square. The ratio of the area of the larger to the smaller square is :  
 (a)  $9/4$  (b)  $7/4$  (c)  $3/2$  (d)  $11/3$
32. In the cells of oil seeds which of the cell organelles have to more active :  
 (a) Mitochondria (b) Rough endoplasmic Reticulum  
 (c) Smooth endoplasmic Rectilum (d) Nucleoli
33. Which of the following sugars tastes most sweet ?  
 (a) Ribose (b) Fructose (c) Sucrose (d) Lactose
34. Scientists in an R & D company made three design improvements on a car : the first saves 50% of fuel, the second saves 30% of fuel and the third saves 20%. If the company implements all three design changes at once, the new car will consume fuel that is \_\_\_% of the fuel consumption of normal car  
 (a) 50% (b) 100% (c) 28% (d) 20%
35. Aluminium is extracted from its oxide by :  
 (a) Electrolysis (b) Reduction  
 (c) Thermal decomposition (d) Caldination
36. The magnetic force on a moving charged particle can change the particle's :  
 (a) speed only (b) Both speed and direction  
 (c) direction only (d) neither of speed nor direction
37. A ray of light is incident on system of mirror as shown in the adjacent figure. What is the total deflection (d) of the ray when it emerges out after two reflections ?



- (a)  $220^\circ$  (b)  $180^\circ$  (c)  $120^\circ$  (d)  $140^\circ$

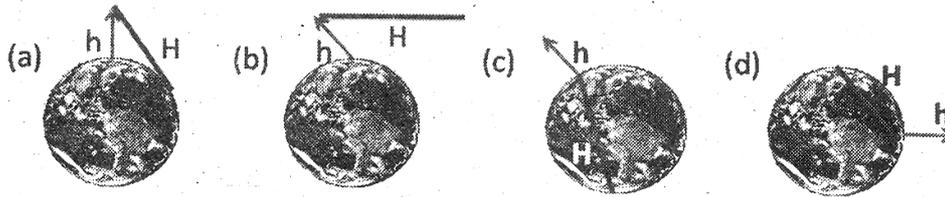
38. The oxidation number of sulphur thiosulphate ( $Na_2S_2O_3$ ) is :  
 (a) +1 (b) +3 (c) +2 (d) +4
39. The adjacent figure is a modification of the Switzerland flag to suit the problem ! Five identical small squares from the central cross. The length of each side of the big square is 10 m. If the area of the white cross is 20% of the area of the flag, then the length of the side of the small square is :



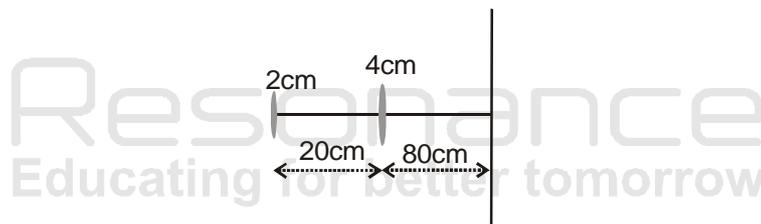
- (a) 2m (b) 2.25 (c) 1.6 m (d) 1.75 m

40. The algae belonging to which group can sustain normal growth at the greater depth of ocean ?  
 (a) Red algae (b) Blue-green algae (c) Brown algae (d) Green algae
41. Snakes, the cold blooded animals, flick their bifid tongue often to :  
 (a) sense vibration in earth (b) sample air for chemoreceptors  
 (c) sense the nature of substratum (d) sense the temperature of air

42. We all know that the sky appears to touch the ground at a distance. The distance at which we perceive the sky to touch the ground is called horizon. The reason for the perception is due to the fact that the Earth is a sphere (almost) and not a flat surface. Which of these pictures below accurately depict the horizon for a person standing on a high rise building like Burj Khelifa in Dubai ? (Here, 'h' represents the height of the building while line 'H' represents the horizon) :

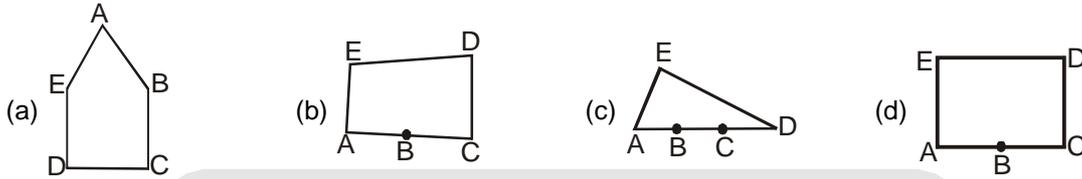


43. Sulphuric acid is manufactured by the contact process in which sulphur dioxide reacts with oxygen in presence of a catalyst. If 5.6 moles of  $\text{SO}_2$  reacts with 4.8 moles of  $\text{O}_2$  and a large excess of water, the maximum number of moles of  $\text{H}_2\text{SO}_4$  that can be obtained is :  
 (a) 11.2 (b) 5.6 (c) 4.8 (d) 1.4
44. The element essential for determining the three dimensional structure of proteins is :  
 (a) sulphur (b) hydrogen (c) nitrogen (d) carbon
45. The general indigestion experienced by a patient suffering from obstructive jaundice is due to :  
 (a) the lack of emulsification of lipids  
 (b) the acceleration of intestinal peristalsis reducing the retention time for food  
 (c) the low pH in the intestine not supporting optimal activity of enzymes.  
 (d) the diffusion of bile pigments in blood suppressing secretion of digestive juices
46. A number is said to be triangular number if it is the sum of consecutive numbers beginning with 1. Which one of the following is not a triangular number :  
 (a) 1431 (b) 190 (c) 28 (d) 506
47. The equivalent weight of  $\text{MnSO}_4$  is half its molecular weight when it is converted to :  
 (a)  $\text{Mn}_2\text{O}_3$  (b)  $\text{MnO}_4^-$  (c)  $\text{MnO}_2$  (d)  $\text{MnO}_4^{2-}$
48. A light source of diameter 2 cm is placed 20 cm behind a circular opaque disc of diameter 4 cm. Shadow is formed on a screen at a distance of 80 cm. the ratio of the area of umbra and penumbra shadow region is equal to :



- (a) 0.58 (b) 0.22 (c) 0.18 (d) 0.11
49. Consider the following two statements.  
 Statement-1 : The direction of acceleration of a particle must be always same as that of velocity.  
 Statement-2 : Acceleration is the rate of change of velocity.  
 Choose the correct option  
 (a) Statement-1 is correct while statement -2 is wrong  
 (b) Statement-1 and 2 are correct.  
 (c) Statement-1 and 2 are wrong .  
 (d) Statement-1 is wrong while statement (2) is correct.

50. Rust is a mixture of :  
 (a)  $\text{FeO} + \text{Fe(OH)}_2$       (b)  $\text{FeO} + \text{Fe(OH)}_3$       (c)  $\text{FeO}_4 + \text{Fe(OH)}_3$       (d)  $\text{Fe}_2\text{O}_3 + \text{Fe(OH)}_3$
51. If the distance between A and B is 230 km, B and C is 120 km, C and A is 350 km. Also, if the distance between C and D is 200 km, distance between D and B is 330 km and distance from A to E is 100 km and distance between D and E is 570 km. The diagram (not drawn to scale) that represents this graphically is:



52. Which of the following contains the same number of atoms as 13.5 grams of aluminium ?  
 (a) 20 g of calcium      (b) 10g of magnesium      (c) 20 g of potassium      (d) 10 of sodium
53. Consider the following two statements. Statement 1 is an assertion of a concept while Statement-2 is the reason.  
 Statement-1 : When red light travels from air to water, for observer in water it appears to be still red.  
 Statement-2 : Colour of light is associated with frequency and frequency does not change when it travels in different medium.  
 Choose the correct option  
 (a) Statement-1 is correct while statement -2 is wrong  
 (b) Statement-1 is wrong while statement (2) is correct.  
 (c) Statement-1 and 2 are correct.  
 (d) Statement-1 and 2 are wrong
54. A spring constant  $7600 \text{ Nm}^{-1}$  is attached to a block of mass 0.25 kg as shown in figure. Frequency of oscillation on frictionless surface is :



- (a) 39.26 Hz      (b) 27.76 Hz      (c) 9681.5 Hz      (d) 98.39 Hz
55. The following data was recorded for the reaction  $\text{A} + \text{B} \rightarrow \text{Product}$  at 298 K.

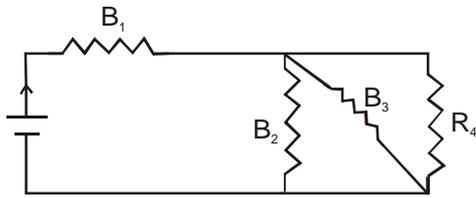
ExperimentNo.	[A]	[B]	Rate of reaction
1	1.00M	0.15M	$4.20 \times 10^{-3}$
2	2.00M	0.15M	$8.40 \times 10^{-3}$
3	1.00M	0.30M	$8.40 \times 10^{-3}$

From the above data one can conclude that

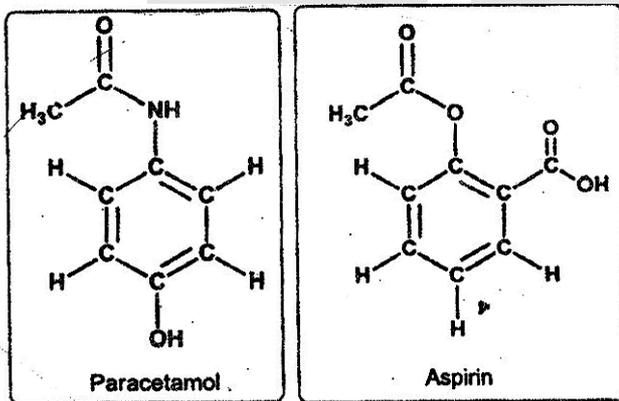
- (a)  $\text{Rate} \propto [\text{A}]^2[\text{B}]$       (b)  $\text{Rate} \propto [\text{A}][\text{B}]^2$       (c)  $\text{Rate} \propto [\text{A}]^2[\text{B}]^2$       (d)  $\text{Rate} \propto [\text{A}][\text{B}]$
56. The sum of 2 digits x and y is divisible by 7. What can one say about a 3 digit number formed by these two digits.  
 (a) xxy is divisible by 7      (b) xyx is divisible by 7      (c) yxx is divisible by  $7^2$       (d) yyx is divisible by 7
57. Most of the microbes employed is commercial fermentation for producing antibodies are:  
 (a) yeast      (b) thread bacteria      (c) eubacteria      (d) ascomycete fungi
58. Most of the cellular RNA is synthesised and stored respectively in :  
 (a) cytoplasm and ribosomes.      (b) ribosomes and cytoplasm.  
 (c) ribosomes and nucleus      (d) nucleus and ribosomes

59. A number of bacteria are placed in a glass. 1 second later each bacterium divides in three, the next second each of the resulting bacteria divides in three again, and so on. After one minute the glass is full. When was  $\frac{1}{9}$ th of the glass full ?  
 (a) 15 sec (b) 45 sec (c) 58 sec (d) 38 sec
60. A number  $x$  is a rational number if there exist integers  $p$  and  $q$  such that  $x = \frac{p}{q}$ . This is definition of rational numbers in which,  
 (a) both  $p$  &  $q$  can be zero (b) both  $p$  &  $q$  should not be zero (c)  $q$  can be zero but not  $p$  (d)  $p$  can be zero but not  $q$
61. There is a solution of 1 litre HCl of pH 5. When 9 L of water is added to this solution, the pH turns out to be :  
 (a) pH 6 (b) pH 10 (c) pH 4 (d) pH 5 itself
62. A wave is sent along a string by oscillating at one end. If the tension in the string is increased then speed of the wave and wavelength of the wave.  
 (A) speed increases, wavelength decreases (B) both increase  
 (C) both decrease (D) wavelength increases, speed decreases
63. Clock A based on oscillations of spring and clock B is based on pendulum motion. Both the clocks keep the same time on earth. If they are taken to a planet having half the density of earth and twice the radius  
 (A) then A runs faster than B (B) B runs faster than A  
 (C) both will run at equal faster rate than earth (D) both will run at same rate as earth
64. Assuming ideal gas behavior, which among the following gases will have the least density under room temperature and pressure.  
 (A) Oxygen (B) Nitrogen (C) Ozone (D) Fluorine
65. The least positive integer,  $n$ , such that 2 divides  $n$ , 3 divides  $n + 1$ , 4 divides  $n + 2$ , 5 divides  $n + 3$  and 6 divides  $n + 4$  is  
 (A) 62 (B) 120 (C) 720 (D) 52
66. Which of the following places having same number of species is considered most biodiverse ?  
 (A) species belonging to more taxa  
 (B) many of the species economically important  
 (C) many of the species endemic  
 (D) species adapted to greater number of habitats
67. Axolotl, the Mexican salamander, shows 'neoteny' or larva becoming sexually mature (adult). Which of the following characters indicate larval features in it ?  
 i. Naked skin  
 ii. External gills  
 iii. Lidless eyes  
 iv. Laterally compressed tail  
 v. Clawless digits  
 (A) Only ii and iv (B) Only i, ii, iv and v (C) only ii, iii, iv and v (D) i, ii, iii, iv and v
68. The solution set of the inequality  $0 < \frac{x}{x+1} < 1$ ,  $x \in \mathbb{R}$  is  
 (A) Set of all positive real numbers (B) set of all real numbers except  $-1$   
 (C) set of all non-negative real numbers (D) set of all numbers satisfying  $0 \leq x \leq 1$ ,  $x \in \mathbb{R}$
69. Which among the following organic compounds is likely to have more than one possible structure ?  
 (A)  $C_3H_6$  (B)  $C_3H_8$  (C)  $C_2H_4$  (D)  $CH_4$

70. In the circuit  $B_1$ ,  $B_2$  and  $B_3$  represent identical bulbs. Consider the case  
 (i) With resistance  $R_4$  (ii) without the resistance  $R_4$   
 ( $R_4$  comparable with resistance of bulb)

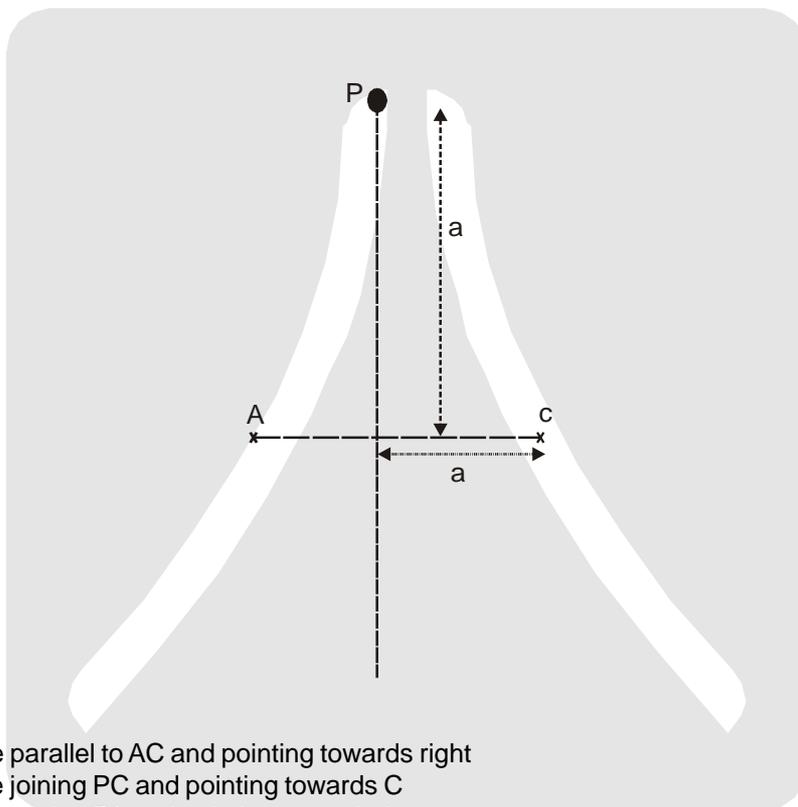


- (A)  $B_1$ ,  $B_2$  and  $B_3$  glow with equal brightness in both cases  
 (B)  $B_2$ ,  $B_3$  brightest in case (i) and  $B_1$  becomes brighter in (ii)  
 (C)  $B_1$  brightest in (i) and in (ii)  $B_2$  and  $B_3$  become brighter and  $B_2$  dimmer compared to case (i)  
 (D)  $B_1$  brighter in (i) and  $B_2$  becomes brighter in comparison to  $B_3$  in (ii)
71. Three identical resistors each of resistance  $R$  are connected in the following four configurations. Rank the arrangement in the order of their equivalent resistors from highest to lowest.
- (i) (ii) (iii) (iv)
- (A) i, ii, iii & iv (B) iv, iii, ii & i (C) ii, iv, iii, & i (D) i, iii, iv & ii
72. Given below are the structures of the famous molecules called Aspirin and Paracetamol. Which among the listed functional groups do the two molecules put together NOT contain ?



- (A) Ester (B) Ketone (C) Alcohol (D) Carboxylic acid
73. Number plate of a vehicle consists of 4 digits. The first digit is the square of second. The third digit is thrice the second and the fourth digit is twice the second. The sum of all 4 digits is thrice the first. The number is  
 (A) 1132 (B) 4264 (C) 1642 (D) 9396
74. The pteridophytic that is considered to have led to the evolution of gymnosperms is :  
 (A) homosporous (B) furcate venation  
 (C) heterosporous (D) sporophylls distinct from vegetative leaves.
75. Seeds trapped in crevices of rocks soak in water, swell and cause fragmentation of rock. The process involved is termed.  
 (a) osmosis (b) imbibition (c) tyndall effect (d) water potential
76. If the highest common factor of  $a, b$  and  $c$  is 1, where  $a, b$  and  $c$  belong to the set of natural numbers, then the highest common factor of  $(a \times b)$  and  $c$  is :  
 (a)  $c$  (b)  $a \times b$  (c) 1 (d) insufficient data

77. If a firecracker burns with emission of red colour light, which cation is it likely to contain ?  
 (a) Lithium (b) Copper (c) Iron (d) Sodium
78. A positively charged Insulator is brought in contact with an uncharged conductor then  
 (a) conductor acquires positive charge due to conduction  
 (b) conductor acquires positive charge due to induction  
 (c) conductor acquires negative charge due to induction  
 (d) conductor cannot acquire any charge
79. Two infinite wires carrying identical current are placed at position A and C normal to plane of the paper as shown in the adjacent figure. The resultant magnetic field (B) at a point P on the perpendicular bisector is :



- (a) Along line parallel to AC and pointing towards right  
 (b) Along line joining PC and pointing towards C  
 (c) Along line joining PA and pointing towards A  
 (d) Along perpendicular bisector pointing towards line AC
80. When an incandescent bulb is switched on and the outer glass bulb also gets heated up. This is due to  
 (a) Convection of heat from filament of the bulb by the medium inside the bulb at all temperatures  
 (b) Conduction and convection of heat from filament to the bulb by the medium inside the bulb at lower temperatures and by radiation of heat at higher temperature.  
 (c) radiation of heat from filament to the bulb at all temperatures  
 (d) Conduction of heat from filament to the bulb by the medium inside the bulb at higher temperatures and by radiation of heat at lower temperature.