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**NATIONAL  
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### IMPORTANT INFORMATION

- You are allowed additional 10 minutes to fill the required details in the **RESPONSE SHEET**.
- The question paper is made as per syllabus guidelines & pattern given in the information Booklet. The Question Paper for Classes 1 to 6 contains 25 Questions each to be answered in 40 minutes. The Question paper for classes 7 to 12 contains 50 Questions each to be answered in 60 minutes. All questions are compulsory. Further instructions are given in the instruction letter to the coordinator teacher.
- Use the response sheet to mark your responses by darkening the required circle. The response sheet has to be returned to the foundation, duly filled in. The student can retain the Question Paper.

### SECTION-A : GENERAL I. Q.

- $A$  bought 4 bottles of milk and  $B$  bought one bottle of honey, honey per bottle costing twice that of the milk.  $C$  bought nothing but paid Rs. 50 for his share of the drink which they mixed together and shared equally. If  $C$ 's Rs. 50 covered his share, then what is the cost of the honey?  
 (1) 50 (2) 75 (3) 30 (4) None of these
- Two rockets approach each other, one at 42,000 mph and the other at 18,000 mph. They start 3256 miles apart. How far are they apart in miles, 1 minute before impact?  
 (1) 1628 (2) 1000 (3) 826 (4) None of these
- What is the value of  $\frac{P+Q}{P-Q}$  if  $\frac{P}{Q} = 7$ ?  
 (1)  $\frac{4}{3}$  (2)  $\frac{2}{3}$  (3)  $\frac{2}{6}$  (4) None of these
- Cube root of 658503 is  
 (1) 83 (2) 77 (3) 87 (4) None of these
- $A$  travels from  $B$  to  $C$  a distance of 250 miles in 5.5 hours. He returns to  $B$  in 4 hours 40 minutes. His average speed is  
 (1) 44 (2) 46 (3) 48 (4) None of these
- What is the value of  $x$  in the expression below?  

$$\frac{16}{7} \times \frac{16}{7} - \frac{x}{7} \times \frac{9}{7} \times \frac{9}{7} \times \frac{9}{7} = 1$$
 (1) 1 (2) 7 (3) 4.57 (4) None of these

- The surface area of a cube is 150 sq. cm. What is the length of its diagonal in cm?  
 (1) 5 (2)  $5\sqrt{3}/2$  (3)  $5\sqrt{3}$  (4) None of these
- In a survey, it was found that 65% of the people watched news on TV, 40% read in newspaper, 25% read newspaper and TV. What percentage of people neither watched TV nor read newspaper?  
 (1) 0% (2) 5% (3) 10% (4) None of these
- A right-angled triangle has a hypotenuse of 13 cm and one side of 12 cm. Its area is  
 (1) 30 (2) 39 (3) 80 (4) None of these
- $X$  is what percent of  $4/5$ th of  $X$ ?  
 (1) 75 (2) 80 (3) 120 (4) None of these

### SECTION-B : PHYSICS & CHEMISTRY

- The presence or absence of hydroxy group on which carbon atom of sugar differentiates RNA and DNA.  
 (1) 1<sup>st</sup> (2) 2<sup>nd</sup>  
 (3) 3<sup>rd</sup> (4) None of these
- Among the following the maximum covalent character is shown by the compound :  
 (1)  $\text{FeCl}_2$  (2)  $\text{SnCl}_2$   
 (3)  $\text{AlCl}_3$  (4) None of these

13. Which of the following statement is wrong ?  
 (1) The stability of hydrides increase from  $\text{NH}_3$  to  $\text{BiH}_3$  in group 15 of the periodic table :  
 (2) Nitrogen cannot form  $d\pi-p\pi$  bond.  
 (3) Single N – N bond is weaker than the single P – P bond.  
 (4) None of these
14. Phenol is heated with a solution of mixture of KBr and  $\text{KBrO}_3$ . The major product obtained in the above reaction is :  
 (1) 2-Bromophenol  
 (2) 3-Bromophenol  
 (3) 4-Bromophenol  
 (4) None of these
15. A 5.2 molal aqueous solution of methyl alcohol,  $\text{CH}_3\text{OH}$ , is supplied. What is the mole fraction of methyl alcohol in the solution ?  
 (1) 0.100 (2) 0.190 (3) 0.086 (4) None of these
16. The hybridisation of orbitals of N atom in  $\text{NO}_3^-$ ,  $\text{NO}_2^+$ , and  $\text{NH}_4^+$  are respectively :  
 (1) sp,  $sp^2$ ,  $sp^3$  (2)  $sp^2$ , sp,  $sp^3$   
 (3) sp,  $sp^3$ ,  $sp^2$  (4) None of these
17. Ethylene glycol is used as an antifreeze in a cold climate. Mass of ethylene glycol which should be added to 4 kg of water to prevent it from freezing at  $-6^\circ\text{C}$  will be : ( $K_f$  for water =  $1.86\text{ K kg mol}^{-1}$ , and molar mass of ethylene glycol =  $62\text{ g mol}^{-1}$ ):  
 (1) 804.32 g (2) 204.30 g  
 (3) 400.00 g (4) None of these
18. The reduction potential of hydrogen half-cell will be negative if:  
 (1)  $p(\text{H}_2) = 1\text{ atm}$  and  $[\text{H}^+] = 2.0\text{ M}$   
 (2)  $p(\text{H}_2) = 1\text{ atm}$  and  $[\text{H}^+] = 1.0\text{ M}$   
 (3)  $p(\text{H}_2) = 2\text{ atm}$  and  $[\text{H}^+] = 1.0\text{ M}$   
 (4) None of these
19. Which of the following reagents may be used to distinguish between phenol and benzoic acid ?  
 (1) Aqueous NaOH (2) Tollen's reagent  
 (3) Molisch reagent (4) None of these
20. Trichloroacetaldehyde was subjected to Cannizzaro's reaction by using NaOH. The mixture of the products contains sodium trichlor acetate ion and another compound. The other compound is :  
 (1) 2, 2, 2 – Trichloroethanol  
 (2) Trichloromethanol  
 (3) 2, 2, 2 – Trichloropropanol  
 (4) None of these
21. 100g of water is heated from  $30^\circ\text{C}$  to  $50^\circ\text{C}$  ignoring the slight expansion of the water, the change in its internal energy is (specific heat of water is  $4184\text{ J/Kg/K}$ ):  
 (1) 4.2 kJ (2) 8.4 kJ  
 (3) 84 kJ (4) None of these
22. The half life of a radioactive substance is 20minutes. The approximate time interval ( $t_2 - t_1$ ) between the time  $t_2$  when  $\frac{2}{3}$  of it has decayed and time  $t_1$  when  $\frac{1}{3}$  of it had decayed is :  
 (1) 7 min (2) 14 min  
 (3) 20 min (4) None of these
23. A mass M, attached to a horizontal spring, executes SHM with a amplitude  $A_1$ . When the mass M passes through its mean position then a smaller mass m is placed over it and both of them move together with amplitude  $A_2$ . The ratio of  $\left(\frac{A_1}{A_2}\right)$  is :  
 (1)  $\frac{M}{M+m}$  (2)  $\frac{M+m}{M}$   
 (3)  $\left(\frac{M}{M+m}\right)^{1/2}$  (4) None of these
24. Energy required for the electron excitation in  $\text{Li}^{++}$  from the first to the third Bohr orbit is :  
 (1) 12.1 eV (2) 36.3 eV  
 (3) 108.8 eV (4) None of these
25. The transverse displacement  $y(x,t)$  of a wave on a string is given by  $y(x,t) = e^{-(ax^2 + bt^2 + 2\sqrt{ab}xt)}$   
 This represents a:  
 (1) wave moving in +x-direction with speed  $\sqrt{\frac{a}{b}}$   
 (2) wave moving in -x-direction with speed  $\sqrt{\frac{b}{a}}$   
 (3) standing wave of frequency  $\sqrt{b}$   
 (4) None of these
26. A resistor 'R' and  $2\mu\text{F}$  capacitor in series is connected through a switch to 200 V direct supply. Across the capacitor is a neon bulb that lights up at 120 V. Calculate the value of R to make the bulb light up 5s after the switch has been closed. ( $\log_{10} 2.5 = 0.4$ )  
 (1)  $1.3 \times 10^4\Omega$  (2)  $1.7 \times 10^5\Omega$   
 (3)  $2.7 \times 10^6\Omega$  (4) None of these
27. A current I flows in an infinitely long wire with cross-section in the form of a semicircular ring of radius R. The magnitude of the magnetic induction along its axis is :  
 (1)  $\frac{\mu_0 I}{\pi^2 R}$  (2)  $\frac{\mu_0 I}{2\pi^2 R}$   
 (3)  $\frac{\mu_0 I}{2\pi R}$  (4) None of these

28. A Carnot engine operating between temperatures  $T_1$  and  $T_2$  has efficiency  $\frac{1}{6}$ . When  $T_2$  is lowered by 62 K, its efficiency increases to  $\frac{1}{3}$ . Then  $T_1$  and  $T_2$  are, respectively:

- (1) 372 K and 310 K      (2) 372 K and 330 K  
 (3) 330 K and 268 K      (4) None of these

29. An object moving with a speed of 6.25 m/s, is decelerated at a rate given by :

$$\frac{dv}{dt} = -2.5\sqrt{v}$$

where  $v$  is the instantaneous speed. The time taken by the object, to come to rest, would be :

- (1) 1 s                      (2) 2 s  
 (3) 4 s                      (4) None of these

30. The electrostatic potential inside a charged spherical ball is given by  $\phi = ar^2 + b$  where  $r$  is the distance from the centre;  $a, b$  are constants. Then the charge density inside the ball is :

- (1)  $-24\pi a\epsilon_0 r$               (2)  $-6\pi a\epsilon_0 r$   
 (3)  $-24\pi a\epsilon_0$               (4) None of these

### SECTION-C : MATHEMATICS

31. If  $P(x, y, z)$  is a point on the line segment joining  $Q(2, 2, 4)$  and  $R(3, 5, 6)$  such that the projections of  $OP$  on the axis are  $\frac{13}{5}, \frac{19}{5}$  and  $\frac{26}{5}$  respectively, then  $P$  divides  $QR$  in the ratio :

- (1) 1 : 2                      (2) 3 : 2  
 (3) 2 : 3                      (4) None of these

32. The orthocenter of the triangle formed by the lines  $xy = 0$  and  $x + y = 1$  is :

- (1)  $\left(\frac{1}{2}, \frac{1}{2}\right)$               (2)  $\left(\frac{1}{3}, \frac{1}{3}\right)$   
 (3)  $\left(\frac{1}{4}, \frac{1}{4}\right)$               (4) None of these

33. If the sum of the distances from two perpendicular lines in a plane is 1, then its locus is :

- (1) a square                  (2) a circle  
 (3) a straight line          (4) None of these

34. Point  $Q$  is symmetric to  $P(4, -1)$  with respect to the bisector of the first quadrant. The length of  $PQ$  is :

- (1)  $3\sqrt{2}$       (2)  $5\sqrt{2}$       (3)  $7\sqrt{2}$       (4) None of these

35. The radius of the circle, which is touched by the line  $y = x$  and has its centre on the positive direction of  $x$ -axis and also cuts-off a chord of length 2 units along the line  $\sqrt{3}y - x = 0$ , is :

- (1)  $\sqrt{5}$       (2)  $\sqrt{3}$       (3)  $\sqrt{2}$       (4) None of these

36. Tangents drawn from the point  $(4, 3)$  to the circle  $x^2 + y^2 - 2x - 4y = 0$  are inclined at an angle :

- (1)  $\frac{\pi}{6}$       (2)  $\frac{\pi}{4}$       (3)  $\frac{\pi}{3}$       (4) None of these

37. If  $l$  denotes the semi-latus rectum of the parabola  $y^2 = 4ax$  and  $SP$  and  $SQ$  denote the segments of any focal chord  $PQ$ ,  $S$  being focus, then  $SP, l$  and  $SQ$  are in the relation :

- (1) A.P.                      (2) G.P.  
 (3) H.P.                      (4) None of these

38. The eccentricity of the ellipse

$$x^2 + 4y^2 + 8y - 2x + 1 = 0$$
 is :

- (1)  $\frac{\sqrt{3}}{2}$                       (2)  $\frac{\sqrt{5}}{2}$   
 (3)  $\frac{1}{2}$                           (4) None of these

39. The equation of the tangent parallel to

$$y = x$$
 drawn to  $\frac{x^2}{3} - \frac{y^2}{2} = 1$  is :

- (1)  $x - y + 1 = 0$           (2)  $x - y + 2 = 0$   
 (3)  $x - y + 3 = 0$           (4) None of these

40. A can beat B by 60 m in a 1760 m race. B can beat C by 20 m in a 1760 m race. If A and C run 1760 m, then by how much will A win over C?

- (1) 79.4 m      (2) 85 m      (3) 77.1 m      (4) None of these

### SECTION-C : BIOLOGY

31. The most important factor which determined the increase in human population in India during the 20th century:

- (1) Mortality                  (2) Natalty  
 (3) Immigration              (4) None of these

32. Vascular bundles in monocotyledons are considered closed because:

- (1) Xylem is surrounded all around by phloem  
 (2) There are no vessels with perforations  
 (3) A bundle sheath surrounds each bundle  
 (4) None of these

33. When there are two haploid nuclei per cell in some fungi before the formation of diploid, this stage is called:

- (1) Dikaryophase              (2) Diplophase  
 (3) Diplotene                  (4) None of these

34. In blood group typing in human, if an allele contributed by one parent is IA and an allele contributed by the other parent is i, the resulting blood group of the offspring will be:

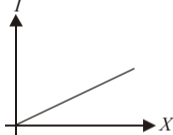
- (1) B                              (2) A  
 (3) AB                            (4) None of these

35. A population growing in a habitat with limited resources shows four phases of growth in the following sequence:

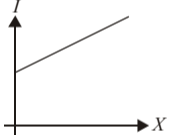
- (1) Acceleration - deceleration - lag phase  
     - asymptote  
 (2) Asymptote - acceleration - deceleration  
     - lag phase  
 (3) Lag phase - acceleration - deceleration  
     - asymptote  
 (4) None of these

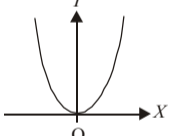
36. Necrosis in crops is due to the deficiency of:  
 (1) Ca, K, S and Mo (2) N, K, S and Mo  
 (3) N, S, Fe and Zn (4) None of these
37. Presence of bundle sheath is a characteristic of:  
 (1) Xerophytic plants (2) C<sub>4</sub> plants  
 (3) Members of the grass family (4) None of these
38. Which one of the following would not lead to formation of clones?  
 (1) Double fertilization (2) Apomixis  
 (3) Vegetative reproduction (4) None of these
39. A plant species which has been exploited for the production of Hirudin is:  
 (1) *Brassica napus* (2) *Zea mays*  
 (3) *Solanun nigrum* (4) None of these
40. The variation/difference in the offsprings of a species from their parents constitutes an important component of:  
 (1) Species fixation (2) Speciation  
 (3) Genetics (4) None of these

### EtG INTERACTIVE SECTION

41. The rotational K.E. of a body is  $E$  and its moment of inertia is  $I$ . The angular momentum is  
 (1)  $EI$  (2)  $2\sqrt{EI}$   
 (3)  $\sqrt{2EI}$  (4) None of these
42.  $I$  represents the M.I. of the solid sphere about an axis parallel to the diameter of the solid sphere and at a distance  $x$  from it. Which one of the following represents the variations of  $I$  with  $x$ ?
- 

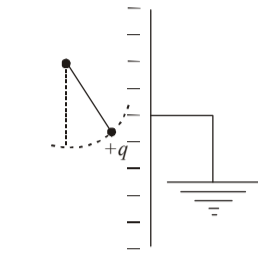
(1)



(2)
- 

(3)

(4) None of these
43. A cord is wound round the circumference of wheel of radius  $r$ . The axis of the wheel is horizontal and moment of inertia about it is  $I$ . A weight  $mg$  is attached to the end of the cord and falls from rest. After falling through a distance  $h$ , the angular velocity of the wheel will be  
 (1)  $\sqrt{\frac{2gh}{I + mr}}$  (2)  $\left[\frac{2mgh}{I + mR^2}\right]^{1/2}$   
 (3)  $\left[\frac{2mgh}{I + 2mr^2}\right]^{1/2}$  (4) None of these

44. A simple pendulum has a length  $l$  cm. Mass of the bob is  $m$  gm. The bob is given a charge of  $+q$  statcoulomb. The pendulum is suspended between the plates of a charged parallel plate capacitor. If  $E$  is the electric intensity between the plates as shown in the adjoining figure, then the time period  $T$  is given by
- 

- (1)  $T = 2\pi\sqrt{\frac{l}{g}}$   
 (2)  $T = 2\pi\sqrt{\frac{l}{g + (Eq/m)}}$   
 (3)  $T = 2\pi\sqrt{\frac{l}{g - (Eq/m)}}$   
 (4) None of these

45. A barometer reads 0.76 m. Its Torricellian space is 0.09 m long. The volume of air measured at atmospheric pressure to be introduced into the space to cause the mercury column to drop to 0.57 m is (The cross-section of the barometer tube is  $10^{-4}$  sq m)  
 (1)  $1.7 \times 10^{-6}$  cu.m. (2)  $0.7 \times 10^{-6}$  cu.m.  
 (3)  $7 \times 10^{-6}$  cu.m. (4) None of these
46. Which one is an amphoteric?  
 (1)  $\text{HCO}_3^-$  (2)  $\text{H}_2\text{O}$   
 (3) both (a) and (b) (4) none of these.
47. Urea on treatment with fuming sulphuric acid gives  
 (1) sulphamic acid (2) salt  
 (3) cyanamide (4) None of these
48. Vapour pressure and temperature relationship is shown as,  $\log P = \frac{-500(K)}{T} + 15$ . Heat of vapourisation will be  
 (1) 2.303 K.cal. (2) 4.606 K. cal.  
 (3) 500 K. cal (4) None of these
49. Euchlorine is  
 (1)  $\text{Cl}$  (2)  $\text{Cl}_2 + \text{ClO}_2$   
 (3)  $\text{Cl}_2 + [\text{Cl}]$  (4) none of these.
50. Pure  $\text{HNO}_3$  undergoes auto-ionisation and gives  
 (1)  $\text{NO}_2^+$  (2)  $\text{NO}_3^-$   
 (3) both (a) and (b) (4) None of these

😊 END OF THE EXAM 😊