

Talent Search Exam. 2017

TEST
CODE **1111**

for class XI

BOOKLET **A**

Duration : 2 Hours

Max. Marks : 360

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

INSTRUCTIONS

A. General :

1. This booklet is your question paper containing **120 Questions**. Attempt any one of the **Biology OR Mathematics**. The booklet has **18 Pages**.
2. The question paper contains blank space for your rough work. No additional sheets will be provided for rough work.
3. It is mandatory to use **Blue or Black Ball Point Pen** to darken to appropriate circle in the answer sheet.
4. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
5. Fill in the boxes provided below on this page and also write your Name and Roll Number in the space provided.
6. Do not use white-fluid or any other rubbing material on answer sheet. Before handing over the answer sheet to the invigilator, candidate should check that **Roll No, Test code and Book Code** have been filled and marked correctly. Immediately after the prescribed examination time is over, the **Answer sheet is to be returned to the invigilator**.

B. Filling the Answer Sheet :

7. On **Side-1** of Answer Sheet write your name, Enrollment Number and Name of the centre in the respective boxes. **Do not write anything on Side-2**.
8. Put your signature space provided on the Answer Sheet affirming that you have verified this.
9. All question carry **+4 Marks** for Right Answer and **-1** for Wrong Answer.

PROCEDURE OF FILLING UP THE ANSWERS IN ANSWER SHEET

Wrong Filling

- A B C D Tick mark
- A B C D Cross mark
- A B C D Half filled or semi dark
- A B C D Light filled

Right Filling

- B C D Fully darken with Pen
- B C D Fully darken with Pen
- B C D Fully darken with Pen
- B C D Fully darken with Pen

Name of the candidate (In Capital Letters)

Enrollment Number

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I have read all the instruction and shall abide by them.

.....

(Signature of the candidate)

I have verified all the information filled in by the candidate.

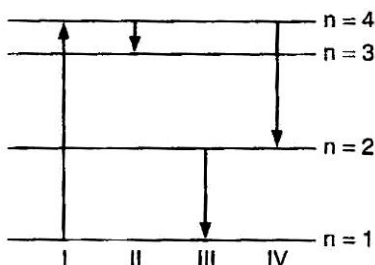
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(Signature of the Invigilator)

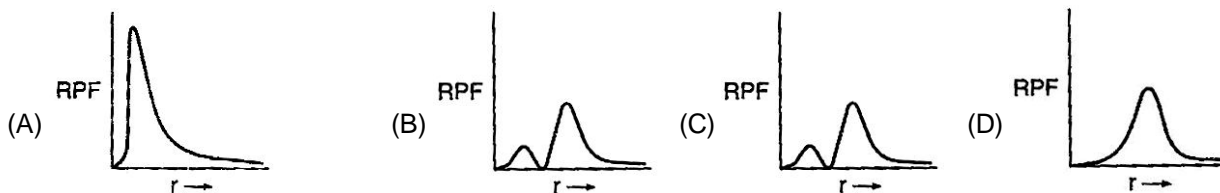
IF YOU REALLY WANT TO BE WORLD CLASS – TO BE THE BEST YOU CAN BE –
IT COMES DOWN TO PREPARATION AND PRACTICE.

CHEMISTRY

1. The diagram shows the energy levels for an electron in a certain atom. Which transition represents the emission of a photon with the maximum energy?



- (A) III (B) IV (C) I (D) II
2. Which one among the following represents schematically the radial probability function (RPF) $4\pi r^2 R^2(r)$ for a 2p orbital?



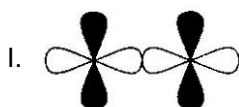
3. The time period for revolution of Bohr electron in an orbit of ground state (n_1) is T_1 , of time period for revolution of electron in higher orbit (n_2) is T_2 . Which values of n_1 and n_2 are not correct if $\frac{T_1}{T_2} = \frac{1}{8}$?
- (A) $n_1 = 1, n_2 = 2$ (B) $n_1 = 2, n_2 = 4$ (C) $n_1 = 2, n_2 = 3$ (D) $n_1 = 3, n_2 = 6$
4. The geometry of a complex species can be understood from the knowledge of type of hybridisation of orbitals of central atom. The hybridisation of orbitals of central atom in $[\text{B}(\text{OH})_4]^-$ and the geometry of the complex are respectively:
- (A) sp^3 , tetrahedral (B) sp^3 , square planar (C) sp^3d^2 , octahedral (D) dsp^2 , square planar
5. Hydrogen bonding does not play a central role in the following phenomena:
- (A) Ice floats in water
 (B) Higher Lewis basicity of primary amines than tertiary amines in aqueous solution
 (C) Formic acid is more acidic than acetic acid
 (D) Dimerisation of acetic acid in benzene

6. Assuming $2s-2p$ mixing is **NOT** operative, the paramagnetic species among the following is:
- (A) Be_2 (B) B_2 (C) C_2 (D) N_2

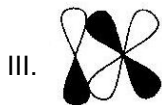
7. Match the following and select the correct option given below:

List-A

List B



(P) $p-d\pi$ antibonding

(Q) $d-d\sigma$ bonding(R) $p-d\pi$ bonding(S) $d-d\sigma$ antibonding

(A) I \rightarrow R, II \rightarrow S, III \rightarrow Q, IV \rightarrow P
 (C) I \rightarrow Q, II \rightarrow R, III \rightarrow P, IV \rightarrow S

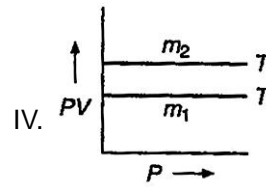
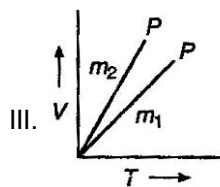
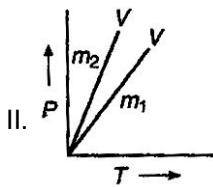
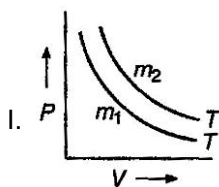
(B) I \rightarrow Q, II \rightarrow R, III \rightarrow S, IV \rightarrow P
 (D) I \rightarrow R, II \rightarrow Q, III \rightarrow P, IV \rightarrow S

8. Match the following and select the correct option given below:

List-A	List-B	List-C
I. PCl_5	(a) sp^3d	(P) Linear
II. BeCl_2	(b) sp	(Q) Trigonal bipyramid
III. NH_3	(c) sp^3	(R) Pyramidal
IV. XeF_4	(d) sp^3d^2	(S) Square planar
V. XeF_6	(e) sp^3d^2	(T) Pentagonal pyramidal

(A) I - a - Q, II - b - P, III - c - R, IV - d - S, V - e - T
 (B) I - a - P, II - b - Q, III - c - R, IV - d - S, V - e - T
 (C) I - a - S, II - b - Q, III - c - R, IV - d - P, V - e - T
 (D) I - a - R, II - b - T, III - c - Q, IV - d - P, V - e - S

9. If m_1, m_2 are masses of an ideal gas, then which of the graph represents $m_2 > m_1$:



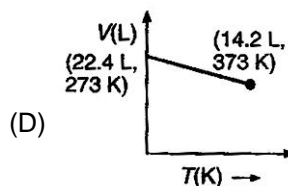
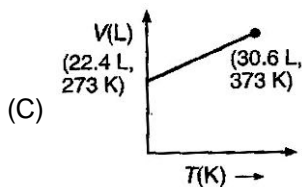
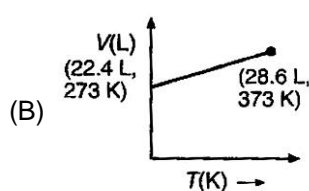
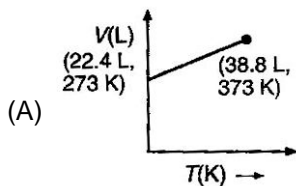
(A) I, II only

(B) I, III only

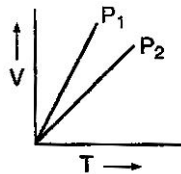
(C) I, IV only

(D) I, II, III, IV

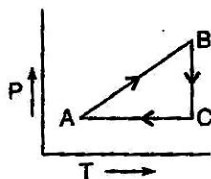
10. Which of the following volume (V), temperature (T) plots represents the behaviour of one mole of an ideal gas at one atmosphere?



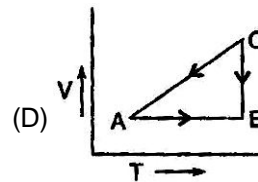
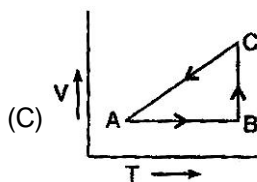
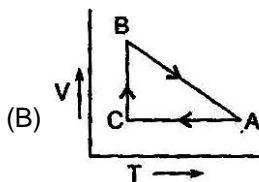
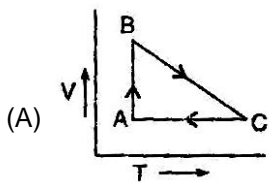
11. V versus T curves at constant pressure P_1 and P_2 for an ideal gas are shown in the fig. Which is correct?



- (A) $P_1 > P_2$ (B) $P_1 < P_2$ (C) $P_1 = P_2$ (D) All of the these
12. The temperature of an ideal gas is increased from 120 K to 480 K. If rms speed of gas at 120 K is u , then at 480 K, it becomes:
 (A) u (B) $2u$ (C) $u/2$ (D) $u/4$
13. Two thermally insulated vessels 1 and 2 are filled with air at temperatures (T_1, T_2), volume (V_1, V_2) and pressure (P_1, P_2) respectively. If the valve joining the two vessels is opened, the temperature inside the vessel at equilibrium will be:
 (A) $T_1 + T_2$ (B) $\frac{T_1 + T_2}{2}$ (C) $\frac{T_1 T_2 (P_1 V_1 + P_2 V_2)}{P_1 V_1 T_2 + P_2 V_2 T_1}$ (D) $\frac{T_1 T_2 (P_1 V_1 + P_2 V_2)}{P_1 V_1 T_1 + P_2 V_2 T_2}$
14. Which process is isothermal and adiabatic both?
 (A) Free expansion of ideal gas (B) Work done by gas at constant temperature
 (C) Work done on gas at constant pressure (D) Cyclic process
15. A cyclic process for P-T diagram is shown in fig. given below:



Which of the following shows the same process on V-T diagram.



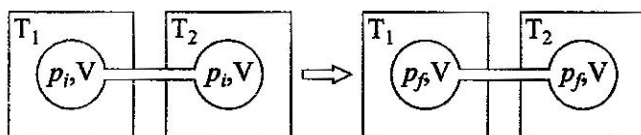
16. On the basis of thermochemical equations (i), (ii) and (iii), find out which of the algebraic relationships given in options (A) to (D) is correct.
- (i) $C_{(\text{graphite})} + O_{2(g)} \longrightarrow CO_{2(g)}$; $\Delta_r H = x \text{ kJ mol}^{-1}$
- (ii) $C_{(\text{graphite})} + \frac{1}{2} O_{2(g)} \longrightarrow CO_{(g)}$; $\Delta_r H = y \text{ kJ mol}^{-1}$
- (iii) $CO_{(g)} + \frac{1}{2} O_{2(g)} \longrightarrow CO_{2(g)}$; $\Delta_r H = z \text{ kJ mol}^{-1}$
- (A) $z = x + y$ (B) $x = y - z$ (C) $x = y + z$ (D) $y = 2z - x$

Paragraph Based Questions (17 to 20)

Chemical reactions are usually exothermic or endothermic. A balanced thermochemical equation involving physical states of reactants and products expresses the chemical changes as well as heat of reaction. Heat

changes are usually expressed in terms of ΔH (at constant P) or ΔU (at constant V). The heats of reactions varies with physical state of reactants and products, conditions of constant pressure or volume and temperature. Heats of combustion and heat of neutralization, heat of condensation are always exothermic. Standard heat enthalpy of a compound is its heat of formation at 1 atm P and 25°C.

17. The heat energy released during neutralization of 1 equivalent of HF with 1 equivalent of NaOH and with 1 equivalent of CH_3COOH and 1 equivalent of NaOH are respectively:
 (A) -16.4 kcal, -12.0 kcal (B) -12.0 kcal, -10 kcal
 (C) -13.7 kcal in both (D) -12.0 kcal, -16.4 kcal
18. In which case of mixing a strong acid and a base each of 1 N concentration, temperature rise is highest?
 (A) 20 mL acid + 30 mL alkali (B) 10 mL acid + 40 mL alkali
 (C) 25 mL acid + 25 mL alkali (D) 30 mL acid + 20 mL alkali
19. Heat of combustion of CH_4 , C_2H_4 , C_2H_2 and C_2H_6 are -890 , -1411 , -1300 and -1561 kJ mol^{-1} . The best fuel is:
 (A) CH_4 (B) C_2H_4 (C) C_2H_6 (D) C_2H_2
20. The enthalpy of which form of carbon has been supposed to be zero at 25°C and 1 atm?
 (A) Graphite (B) Diamond (C) Coke (D) Charcol
21. Two closed bulbs of equal volume (V) containing an ideal gas initially at pressure p_i and temperature T_1 are connected through a narrow tube of negligible volume as shown in the fig. below. The temperature of one of the bulb is then raised to T_2 . The final pressure p_f is:



- (A) $2p_i \left(\frac{T_1}{T_1 + T_2} \right)$ (B) $2p_i \left(\frac{T_2}{T_1 + T_2} \right)$ (C) $2p_i \left(\frac{T_1 T_2}{T_1 + T_2} \right)$ (D) $p_i \left(\frac{T_1 T_2}{T_1 + T_2} \right)$

22. van der Waal's equation for

Column A

I. High pressure

II. Low pressure

III. $P \rightarrow 0$

IV. Neither a nor b is negligible

(A) I \rightarrow P, II \rightarrow S, III \rightarrow P, IV \rightarrow Q

(C) I \rightarrow S, II \rightarrow R, III \rightarrow Q, IV \rightarrow P

Column B

P. $PV = RT + Pb$

Q. $PV = RT - \frac{a}{V}$

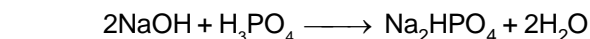
R. $PV = RT$

S. $\left(P + \frac{a}{V^2} \right) (V - b) = RT$

(B) I \rightarrow P, II \rightarrow Q, III \rightarrow R, IV \rightarrow S

(D) I \rightarrow S, II \rightarrow Q, III \rightarrow R, IV \rightarrow P

23. The equivalent mass of H_3PO_4 and NaH_2PO_4 in the reaction are respectively:



(A) 49, 142

(B) 49, 71

(C) 98, 71

(D) 98, 142

24. 10^{24} molecules of solute are dissolved in 10^{25} molecules of solvent, the mole fraction of solute in solution are:

(A) 0.09

(B) 0.08

(C) 0.07

(D) 0.9

25. Volume of H_2SO_4 acid (98% by mass, $d = 1.80$ g/mL) required to prepare 1 litre of 0.1 M H_2SO_4 solution is:

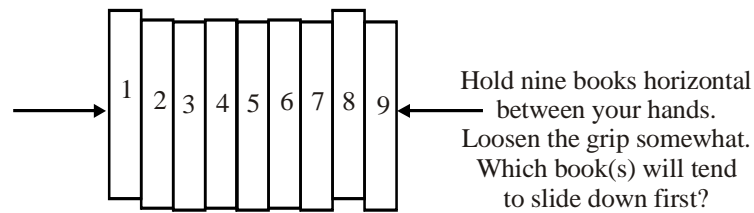
(A) 16.65 mL

(B) 22.20 mL

(C) 5.55 mL

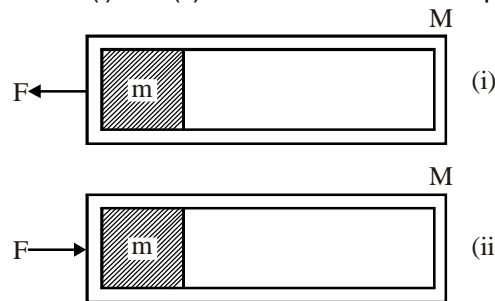
(D) 11.10 mL

34. Take a stack of nine identical books and hold them horizontally by pressing them together with your hands (figure). Then decrease the pressure slowly until the books are just about to start falling down. Which book(s) will start to slide first ? Assume that friction coefficient between books is greater than that between books and hands.



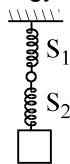
- (A) 5
 (B) 4,5 and 6 together
 (C) 2,3,4,5,6,7,8 together
 (D) all 9 books slide together

35. A block of mass m is placed in contact with one end of a smooth tube of mass M (see figure). A horizontal force F acts on the tube in each case (i) and (ii). Then mark **incorrect** option:



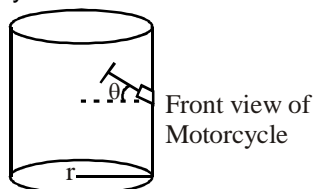
- (A) $a_m = 0$ and $a_M = \frac{F}{M}$ in (i)
 (B) $a_m = a_M = \frac{F}{M + m}$ in (i)
 (C) $a_m = a_M = \frac{F}{M + m}$ in (ii)
 (D) Force on m is $\frac{mF}{M + m}$ in (ii)

36. Two springs, S_1 and S_2 , have negligible masses and the spring constant of S_1 is $1/3$ that of S_2 . When a block is being hanged from the springs as shown above and the springs slowly come to equilibrium again, the ratio of the potential energy stored in S_1 to the S_2 is :



- (A) $1/9$
 (B) $1/3$
 (C) 1
 (D) 3

37. A trick cyclist rides his bike around a well of death in the form of a vertical cylinder (see figure). The maximum frictional force parallel to the surface of the cylinder is equal to a fraction μ of the normal force exerted by the wall. At what minimum constant speed must the cyclist go to avoid slipping down ? (Assume that size of motorcycle is very small as compared to cylinder.)



$$(A) \left[\frac{2gr \cos \theta}{\mu} \right]^{1/2} \quad (B) \left[\frac{gr \sin \theta}{2\mu} \right]^{1/2} \quad (C) \left(\frac{gr}{\mu} \right)^{1/2} \quad (D) \left(\frac{2gr}{\mu} \right)^{1/2}$$

38. A piece of string of length ℓ which can support a maximum tension T , is used to whirl a particle of mass m in a circular path as a conical pendulum. What is maximum speed with which the particle may be whirled as a conical pendulum.

$$(A) u = \left(\frac{T\ell}{2m} \right) \left[1 - \left(\frac{mg}{T} \right)^2 \right]^{1/2} \quad (B) u = \left(\frac{T\ell}{m} \right)^{1/2} \left[1 - \left(\frac{2mg}{T} \right)^2 \right]^{1/2}$$

$$(C) u = \left(\frac{T\ell}{m} \right)^{1/2} \left[1 - \left(\frac{mg}{T} \right)^2 \right]^{1/2} \quad (D) u = \left(\frac{2T\ell}{m} \right)^{1/2} \left[1 - \left(\frac{2mg}{T} \right)^2 \right]^{1/2}$$

Paragraph Based Questions (39 to 41)

A model rocket rests on a frictionless horizontal surface and is joined by a string of length ℓ to a fixed point so that the rocket moves in a horizontal circular path of radius ℓ . The string will break if its tension exceeds a value T . The rocket engine provides a thrust F of constant magnitude along the rocket's direction of motion. The rocket has a mass m that does not change appreciably with time. Answer following questions based on above passage.

39. Starting from rest at $t = 0$ at what later time t_1 is the rocket travelling so fast that the string breaks? Ignore any air resistance.

$$(A) \left(\frac{2m\ell T}{F^2} \right)^{1/2} \quad (B) \left(\frac{m\ell T}{F^2} \right)^{1/2} \quad (C) \left(\frac{m\ell T}{2F^2} \right)^{1/2} \quad (D) \left(\frac{m\ell F}{T^2} \right)^{1/2}$$

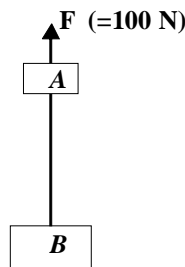
40. What was the magnitude of instantaneous net acceleration at time $\frac{t_1}{2}$? Obtain answer in terms of F , T and m .

$$(A) \frac{[T^2 + 8F^2]^{1/2}}{m} \quad (B) \frac{[T^2 + 4F^2]^{1/2}}{2m} \quad (C) \frac{[T^2 + 16F^2]^{1/2}}{4m} \quad (D) \text{None of these}$$

41. What distance does the rocket travel between the time t_1 when the string breaks and the time $2t_1$? The rocket engine continues to operate after the string breaks.

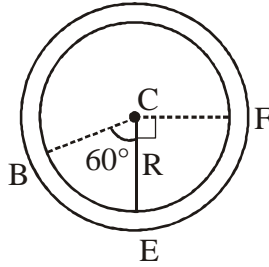
$$(A) \frac{3\ell T}{2F} \quad (B) \frac{2\ell T}{3F} \quad (C) \frac{\ell T}{2F} \quad (D) \frac{2\ell T}{F}$$

42. Consider the shown arrangement where the blocks A and B connected by means of a uniform string is being moved vertically up by the force F . Each block weighs 2 kg while the mass of string is 1000 gm. The tension at bottom of the string equals.

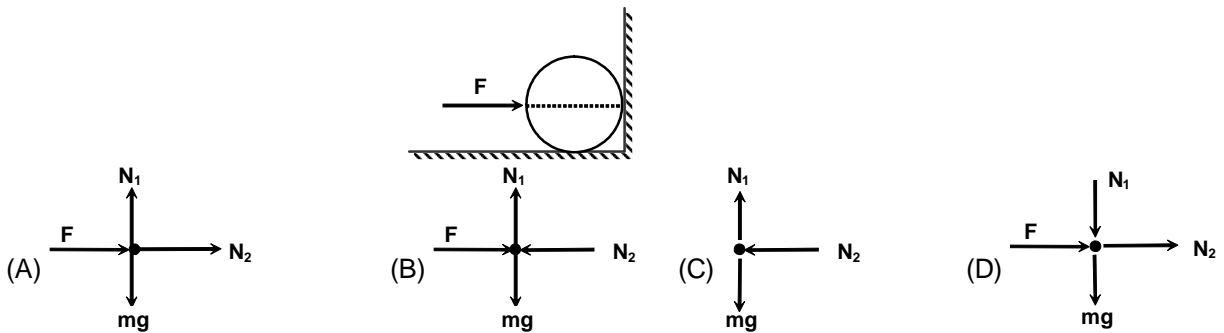


- (A) 20 N (B) 40 N (C) 10 N (D) 270 N

43. As shown in figure BEF is a fixed vertical circular tube. A block of mass m starts moving in the tube at point B with velocity V towards E. It is just able to complete the vertical circle, then select the incorrect option:



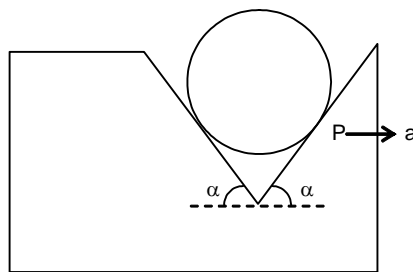
- (A) Velocity at B must be $\sqrt{3Rg}$ (B) Velocity at F must be $\sqrt{2Rg}$
 (C) Normal reaction at point F is $2mg$ (D) The normal reaction at point E is $6mg$
44. A ball of mass m is kept at the corner as shown in the figure, is acted by a horizontal force F . The correct free body diagram of ball is



45. Two cars having masses m_1 and m_2 move in circles of radii r_1 and r_2 respectively. If they complete the circles in equal time, the ratio of the their angular speeds $\frac{\omega_1}{\omega_2}$ is

- (A) $\frac{m_1}{m_2}$ (B) $\frac{r_1}{r_2}$ (C) $\frac{m_1 r_1}{m_2 r_2}$ (D) 1

46. Assuming all surfaces to be smooth. Minimum value of horizontal acceleration 'a' so that sphere loses contact at P is



- (A) $g \sin \alpha$ (B) $g \tan \alpha$ (C) $g \cot \alpha$ (D) $g \operatorname{cosec} \alpha$

47. A uniform rod of mass M and length L lies flat on a frictionless horizontal surface. Two forces F and $2F$ are applied along the length of the rod as shown. The tension in the rod at point P is



- (A) F (B) $3F$ (C) $\frac{5F}{4}$ (D) $\frac{7F}{4}$

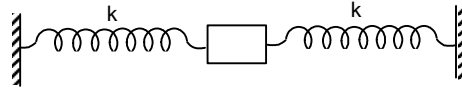
48. A particle moves along the arc, of a circle of radius R according to the equation $l = a \sin \omega t$, where l is the length of path, and a and ω are constants. Then the magnitude of the total acceleration of the particle at the point $l = 0$ will be:

(A) $\frac{a^2 \omega^2}{R}$ (B) $\frac{a^2 \omega^2}{2R}$ (C) $2a^2 \omega^2$ (D) None of these

Paragraph Based Questions (49 & 50)

A block is tied within two springs, each having spring constant equal to k . Initially the springs are in their natural length and horizontal as shown in the figure, the block is released from rest.

The springs are ideal, acceleration due to gravity is g downwards. Air resistance is to be neglect. The natural length of spring is l_0 .



49. If the decrease in height of the block till it reaches equilibrium is $\sqrt{3} l_0$ then the mass of the block is
- (A) $\frac{2kl_0}{g}$ (B) $\frac{\sqrt{2}kl_0}{g}$ (C) $\frac{\sqrt{3}kl_0}{g}$ (D) None of these
50. If the decrease in height of the block till its speed becomes zero is $\sqrt{8} l_0$ then the mass of the block is
- (A) $\frac{2kl_0}{g}$ (B) $\frac{\sqrt{2}kl_0}{g}$ (C) $\frac{\sqrt{3}kl_0}{g}$ (D) None of these

REASONING

51. Leela, Neela and Sheela are asked to do a piece of work. The three girls divide the work equally amongst themselves and start working at the same time. Leela completes her work in 4 hours and then helps Neela to complete her work in another one hour. Then Neela and Leela both help Sheela to complete her work in another one hour. If all the three girls work with Sheela's efficiency, in how much more time will they complete the work?
- (A) 8 hours (B) 8.33 hours
(C) 4 hours (D) 10 hours
52. A milkman has two cans A and B of 18 litres each. Can A contains 12 litres of milk and 6 litres of water, can B contains 7 litres of milk and 5 litres of water. The milkman delivers milk on his bicycle. He always carries the cans on the bicycle in such a way that they have equal volumes of mixture in them. If not, he pours mixture from the can containing a larger volume into the can containing a smaller volume. He rides his bicycle to a building and distributes 12 litres of mixture from can A. Then he rides to the second building after adjusting volumes and distributes 4.5 litres of mixture from can A again. Till now the milkman has sold _____ litres of pure milk
- (A) 8.25 (B) 10.8
(C) 12.75 (D) 11.5
53. All the chapters of a book have an equal number of sections such that the number of chapters and the number of sections in each chapter differ by 10. If Ram reads four sections per day he can finish reading the book on the 14th day. If he reads 2 sections per day, he can finish reading the book on the 28th day and if he reads 3 sections per day, he can finish reading the book on the 19th day. If Ram reads 3 sections per day, and no two sections of two different chapters on the same day, then find the minimum number of days he requires to finish reading the book.
- (A) 19 (B) 21
(C) 22 (D) 20
54. Tom left his house for Pat's house and, after an hour, met Jerry who was also going to Pat's house. None of them stopped on the way. Tom reached Pat's house 4 hours after he started and stayed there for 2 hours. On his way back, Tom again met Jerry who was still going towards Pat's house. If the ratio of Tom's and Jerry's speed is 7 : 2, how many hours after Tom left home did he meet Jerry for the second time?
- (A) $\frac{19}{3}$ hours (B) $\frac{11}{3}$ hours

- (C) $\frac{44}{7}$ hours (D) $\frac{65}{9}$ hours

Directions for Q.No. 55

Answer the question on the basis of the information given below.

- (a) Seeta, Rajinder and Surinder are children of Mr. and Mrs. Maudgil.
 (b) Renu, Raja and Sunil are children of Mr. and Mrs. Bhaskar.
 (c) Sunil and Seeta are married and Ashok and Sanjay are their children.
 (d) Geeta and Rakesh are children of Mr. and Mrs. Jain.
 (e) Geeta is married to Surinder and has three children named Rita, Sonu and Raju.
55. How is Rajinder related to Raju?

- (A) Brother (B) Uncle
 (C) Brother-in-law (D) Cousin

Directions for Q. No. 56 to 60

Dubey and Yadva are gamblers Both of them gamble in a group of players for a week from Monday to Saturday. Each player bets Rs. 10 in a game and the winner gets all the money at the end of the game. There are 8 players on Monday. The number of players either increases or decreases by 2 everyday. There are 10 players on Saturday.

- * Dubey wins only when the number of players decreases over the previous day.
 * Yadav wins only when the number of payers increases for two or more consecutive days. e.g., if the number of people on Tuesday is 10 and on Wednesday is 12, then yadav wins on Wednesday.

Again if the number of people on Thursday become 14, he wins on Thursday also and so on.

Dubey and Yadav both start gambling on Monday with the same amount in hand and both of them lose on Monday.

56. Yadav has exactly Rs. 60 less than Dubey at the end of the week. Find the number of players on Tuesday.
 (A) 4 (B) 6
 (C) 8 (D) 10
57. If Yadav loses some amount at the end of the week. What could be the maximum prize amount on any day in that week?
 (A) Rs. 70 (B) Rs. 90
 (C) Rs. 110 (D) Rs. 70 or Rs. 90
58. If there were 4 players on Wednesday, what was the difference in Dubey's and Yadav's winnings at the end of the week?
 (A) Rs. 70 (B) Rs. 40
 (C) Rs. 60 (D) Rs. 80
59. What is the maximum amount that Yadav and Dubey together could won at the end of the week?
 (A) Rs 420 (B) Rs. 360
 (C) Rs. 200 (D) Rs. 160
60. Yadav wins on two consecutive days. Then which of the following statements cannot be true?
 (A) Yadav has more cash than Dubey at the and of the week
 (B) The maximum amount that yadav wins on is Rs. 130
 (C) The difference in their winnings at the end of the week is Rs. 100.
 (D) There are 12 players on Friday

IMPORTANT INSTRUCTION :-

Attempt any one in Biology OR Mathematics by following the same question number given in test booklet. Leave blank circle against non-attempting subject. You are not allowed to change any question number.

MATHEMATICS

61. The arithmetic mean of $2\sin 2^\circ, 4\sin 4^\circ, 6\sin 6^\circ, \dots, 180\sin 180^\circ$ is equal to
 (A) $\operatorname{cosec} 1^\circ$ (B) $\sec 1^\circ$ (C) $\cot 1^\circ$ (D) None of these
62. The range of $y = \sin^3 x - 6\sin^2 x + 11\sin x - 6$ is
 (A) $[-24, 2]$ (B) $[-24, 0]$ (C) $[0, 24]$ (D) None of these
63. If $\theta = \frac{2\pi}{2009}$, then $\cos \theta \cos 2\theta \cos 3\theta \dots \cos 1004\theta$ is equal to

- (A) 0 (B) $\frac{1}{2^{2008}}$ (C) $\frac{1}{2^{1004}}$ (D) $-\frac{1}{2^{1004}}$
64. AB is a line segment of length 24 cm and C is its middle point. On AB, AC and CB semi-circles are described. The radius of circle which touches all these semi-circles is
(A) 3 cm (B) 6 cm (C) 4 cm (D) 8 cm
65. The least positive values of x satisfy the equation $8^{1+|\cos x| + \cos^2 x + |\cos^3 x| + \dots} = 4^3$ will be (where $|\cos x| < 1$)
(A) $\frac{\pi}{3}$ (B) $\frac{2\pi}{3}$ (C) $\frac{\pi}{4}$ (D) None of these
66. Value of $\frac{3 + \cot 80^\circ \cot 20^\circ}{\cot 80^\circ + \cot 20^\circ}$ is equal to
(A) $\cot 20^\circ$ (B) $\tan 50^\circ$ (C) $\cot 50^\circ$ (D) $\cot \sqrt{20^\circ}$
67. If $\sin x + \cos x = \sqrt{2} \cos x$, then $\cos x - \sin x$ is equal to
(A) $\sqrt{2} \cos x$ (B) $-\sqrt{2} \cos x$ (C) $\sqrt{2} \sin x$ (D) None of these
68. a, b, c are positive integers forming an increasing G.P. whose common ratio is a natural number $b - a$ is cube of a natural number and $\log_6 a + \log_6 b + \log_6 c = 6$, then $a + b + c =$
(A) 100 (B) 111 (C) 122 (D) 189
69. If S, P and R are thr sum, product and sum of the reciprocals of n terms of an increasing G.P. and $S^n = R^n, P^k$, then k is equal to
(A) 1 (B) 2 (C) 3 (D) None of these
70. Sum of first hundred numbers common to the A.P.'s 12, 15, 18,... and 17, 21, 25.....
(A) 56100 (B) 65100 (C) 61500 (D) None of these
71. If 11 A.M. are inserted between 28 and 10, then number of integral A.M's is
(A) 5 (B) 6 (C) 7 (D) 8
72. If the sum of the infinity of the series, $1 + 4x + 7x^2 + 10x^3 + \dots$, is $\frac{35}{16}$, where $|x| < 1$, then 'x' equatls to:
(A) 19/7 (B) 1/5 (C) 1/4 (D) None of these
73. If a, b, c and d are four positive real numbers such that $abcd = 1$, the minimum value of $(1 + a)(1 + b)(1 + c)(1 + d)$ is:
(A) 4 (B) 1 (C) 16 (D) 18
74. The principal argument of the complex number $\frac{(1+i)^5(1+\sqrt{3}i)^2}{-2i(-\sqrt{3}+i)}$ is
(A) $\frac{19\pi}{12}$ (B) $-\frac{7\pi}{12}$ (C) $-\frac{5\pi}{12}$ (D) $\frac{5\pi}{12}$
75. Sum of common roots of the equations $z^3 + 2z^2 + 2z + 1 = 0$ and $z^{97} + z^{29} + 1 = 0$ is equal to
(A) 0 (B) -1 (C) 1 (D) None
76. If $A = \{1, 3, 5, 7, 9, 11, 13, 15, 17\}$, $B = \{2, 4, \dots, 18\}$ and N is the universal set, then $A' \cup ((A \cup B) \cap B')$ is
(A) A (B) N (C) B (D) None of these

77. If $X = \{8^n - 7n - 1 \mid n \in \mathbb{N}\}$ and $Y = \{49(n-1) \mid n \in \mathbb{N}\}$, then
 (A) $x \subset Y$ (B) $Y \subset X$ (C) $X = Y$ (D) None of these
78. If X and Y are two sets, then $x \cap (Y \cup X)'$ equals
 (A) X (B) Y (C) ϕ (D) None of these
79. Which of the following is the empty set?
 (A) $\{x \mid x \text{ is a real number and } x^2 - 1 = 0\}$ (B) $\{x \mid x \text{ is a real number and } x^2 + 1 = 0\}$
 (C) $\{x \mid x \text{ is a real number and } x^2 - 9 = 0\}$ (D) $\{x \mid x \text{ is a real number and } x^2 = x+2\}$
80. Two finite sets have m and n elements. The total number of subsets of the first set is 56 more than the total number of subsets of second set. The values of m and n are
 (A) 7, 6 (B) 6, 3 (C) 5, 1 (D) 8, 7
81. If $A = \left\{x : \cos x > -\frac{1}{2} \text{ and } 0 \leq x \leq \pi\right\}$, $B = \left\{x : \sin x > \frac{1}{2} \text{ and } \frac{\pi}{3} \leq x \leq \pi\right\}$, Then $A \cap B =$
 (A) $\frac{5}{6}$ (B) $\frac{7}{6}$ (C) $\left[\frac{\pi}{3}, \frac{2\pi}{3}\right)$ (D) $\left[0, \frac{5\pi}{6}\right)$
82. If $A = \{\phi, \{\phi\}\}$, then the power set of A is
 (A) A (B) $\{\phi, \{\phi\}, A\}$ (C) $\{\phi, \{\phi\}, \{\{\phi\}\}, A\}$ (D) None of these
83. Let $S(k) = 1 + 3 + 5 + \dots + (2k - 1) = 3 + k^2$. Then which of the following is true?
 (A) $S(1)$ is correct
 (B) $S(k) \Rightarrow S(k + 1)$
 (C) $S(k) \not\Rightarrow S(k + 1)$
 (D) Principle of mathematical induction can be used to prove the formula
84. Number of integers satisfying $\sqrt{8 - 2x - x^2} \geq 3x$ is
 (A) 0 (B) 2 (C) 3 (D) 4
85. Which of the following does not satisfy $\frac{(2x - 1)(x - 1)(x - 2)^2}{(x - 3)(x - 4)^3} = 0$?
 (A) $(- , -3)$ (B) $(-1, 1/2)$ (C) $(4,)$ (D) $(-3, -1)$
86. Number of integers satisfying $(x^2 - 4) \sqrt{x^2 - 1} = 0$ is
 (A) 1 (B) 2 (C) 3 (D) 0
87. The number of integral values of x satisfying the equation $|x - |x - 4|| = 4$ is
 (A) 5 (B) 7 (C) 9 (D) Infinite
88. If $|x^2 - 2x - 8| + |x^2 + x - 2| = 3|x + 2|$, then the set of all real values of x is
 (A) $[1, 4] \cup \{-2\}$ (B) $[1, 4]$ (C) $[2, 1] \cup [4,)$ (D) $(, -2] \cup [1, 4]$
89. The number of integers satisfying the equation $|x| + \left|\frac{4 - x^2}{x}\right| = \left|\frac{4}{x}\right|$ is
 (A) 5 (B) 4 (C) 6 (D) 7
90. If $\log x$, $\log \sqrt{6 - 2x}$ and $\log(x - 1)$ are in A.P., then the number of possible values of x is
 (A) 0 (B) 1 (C) 2 (D) 3

BIOLOGY

91. Which of the following characteristics is not shared by birds and mammals?
- (A) Viviparity
(B) Warm blooded nature
(C) Ossified endoskeleton
(D) Breathing using lungs
92. Which of the following features is not present in the Phylum Arthropoda?
- (A) Parapodia
(B) Jointed appendages
(C) Chitinous exoskeleton
(D) Metameric segmentation
93. Which among these is the correct combination of aquatic mammals?
- (A) Dolphins, Seals, Trygon
(B) Whales, Dolphins, Seals
(C) Trygon, Whales, Seals
(D) Seals, Dolphins, Sharks
94. Which one of the following groups of three animals each is correctly matched with their one characteristic morphological feature?
- | Animals | - | Morphological features |
|--|---|--------------------------------------|
| (A) Scorpion, spider, cockroach | - | Ventral solid central nervous system |
| (B) Cockroach, locust, Taenia | - | Metameric segmentation |
| (C) Liver-fluke, sea naemone, sea cucumber | - | Bilateral symmetry |
| (D) Centipede, Prawn, Sea urchin | - | Jointed appendages |
95. The function of the gap junction is to
- (A) Separate two cells from each other
(B) Stop substance from leaking across a tissue
(C) Performing cementing to keep neighbouring cells together
(D) Facilitate communication between adjoining cells by connecting the cytoplasm for rapid transfer of ions, small molecules and some large molecules
96. Which type of tissue correctly matched with its location?
- | Tissue | - | Location |
|-----------------------------|---|-------------|
| (A) Transitional epithelium | - | Tip of nose |
- (B) Cuboidal epithelium Lining of stomach
(C) Smooth muscle Wall of intestine
(D) Areolar tissue Tendons
97. Choose the correctly matched pair.
- (A) Tendon-Specialised connective tissue
(B) Adipose tissue-Dense connective tissue
(C) Areolar tissue-Loose connective tissue
(D) Cartilage-Losse connective tissue
98. The most active phagocytic white blood cells are
- (A) Eosinophils and lymphocytes
(B) Neutrophils and monocytes
(C) Neutrophils and eosinophils
(D) Lymphocytes and maccophages
99. Which one of the following is correct pairing of a body part and the kind of muscle tissue that moves it?
- (A) Biceps of upper arm - Smooth muscle fibres
(B) Abdominal wall - Involuntary smooth muscle
(C) Iris - Involuntary smooth muscle
(D) Heart wall - Involuntaty unstriated muscle
100. The Golgi complex plays a major role
- (A) As energy transferring organelles
(B) In post translational modification of proteins and glycosylation of lipids
(C) In trapping the light and transforming it into chemical energy
(D) In digesting proteins and carbohydrates
101. Which of the following structure is not associated with with male reproductive system in cockroach?
- (A) Phallic gland (B) Mushroom gland
(C) Equalatory gland (D) Colleterial gland
102. Which of the following enzyme is not reported in succus entericus?
- (A) Dipeptidase (B) Nucleosidase
(C) Rennin (D) Maltase
103. Salivary amylase works at pH-
- (A) 2 (B) 7.8
(C) 7 (D) 6.8
104. Volume of air that will remain in the lungs after normal expiration is

- (A) RV (B) ERV-RV
(C) FRC (D) TLC
105. PO₂ and PCO₂ in arterial blood near the cell/Tissue respectively is - (in mmhg)
(A) 96, 40 (B) 40, 45
(C) 40, 96 (D) 45, 40
106. Archaeobacteria differ from other bacteria in having 'X' feature, which is responsible for their survival in extreme conditions. Here 'X' stands for
(A) Nuclear Membrane
(B) Cell wall structure
(C) Photosynthetic pigments
(D) Mucilagenous sheath as glycocalyx
107. Consider the given statements and choose the correct option.
I : Properties of tissues are present in the constituent cell and arise as a result of interactions among them.
II : Properties of cellular organelles are present in the molecular constituents of the organelles and arise as a result of interactions among them.
III : Living organisms are self-replicating interactive system capable of responding to external stimuli
(A) I, II and III are correct
(B) I and II are correct
(C) Only II is correct
(D) Only III is correct
108. How many of the following statement(s) are correct?
(1) Genus comprises a group of related species which has more characters in common in comparison to species.
(2) *pardus* and *leo* are two different species but both belong to the genus *Felis*.
(3) Each genus may have one or more than one specific epithets representing different organisms.
(4) Species is a group of individuals with highest fundamental similarities and maximum number of organisms.
(A) 4 (B) 3
(C) 2 (D) 1
109. Which of the following statement is incorrect?
(A) Family is represented by group of related genera
(B) Number of individual keeps on decreasing as we move from kingdom to genus
(C) As we move form species to kingdom number of common characters keeps on decreasing
(D) Convolvulaceae, Solanaceae are included in the family Polymoniales mainly based on the floral characters
110. Consider the statements regarding herbarium and select the correct option.
(i) Plant specimens are dried pressed and preserved on sheets.
(ii) Specimens along with their descriptions on herbarium sheets become a repository for future use.
(iii) The largest herbarium of the world is in India.
(iv) Plant and animal specimens are always preserved as dry specimens, using preservative solutions
- | | (i) | (ii) | (iii) | (iv) |
|-----|-------|-------|-------|-------|
| (A) | FALSE | TRUE | FALSE | FALSE |
| (B) | TRUE | TRUE | FALSE | FALSE |
| (C) | TRUE | TRUE | TRUE | FALSE |
| (D) | TRUE | FALSE | TRUE | TRUE |
111. Select the correct combinations or statements w.r.t. characteristics of certain organisms.
(a) Methanogens are archaeobacteria which produce methane in marshy areas.
(b) *Nostoc* is a filamentous green algae which fixes atmospheric nitrogen.
(c) Chemosynthetic autotrophic bacteria synthesize cellulose from glucose.
(d) *Mycoplasma* lacks a cell wall and pathogenic to plant as well as animal.
(A) a, b, c and d (B) a, b and d
(C) c and d (D) a and d
112. How many statements are correct w.r.t. crysophytes?
(1) They are found in marine environment, fresh water organisms are very rare.
(2) In diatoms, the cell walls form two thick overlapping shells which fit together as in a soap box.
(3) The cell membranes of diatoms are embedded with silica and accumulation of them over billions of years is referred to as "diatomaceous earth".
(4) Being brittle and slippery diatomaceous soil is used in polishing, filtration of oils and syrups.
(5) Diatoms are the chief "Producers" in the oceans.
(A) 1 (B) 2
(C) 3 (D) All of the above

113. Find the incorrect match

	Characteristic	Organism
(A)	Decomposers of litter and help in mineral cycling	<i>Colletotrichum</i>
(B)	Smut and rust fungi, respectively	<i>Ustilago and Puccinia</i>
(C)	Extensively used in biochemical and genetic work	<i>Neurospora</i>
(D)	Parasitic fungi on mustard	<i>Rhizopus</i>

114. Find out the incorrect statement.

- (A) In phycmycetes, Asexual reproduction is through motile as well as nonmotile spores
 (B) In ascomycetes, asexual spores are formed exogenously and called canidia
 (C) In basidiomycetes, basidiospores are produced endogenously, unlike ascomycetes, where ascospores are produced exogenously
 (D) All are correct

115. Prothallus is

- (A) Inconspicuous, small but multicellular, free-living, mostly photosynthetic thalloid gametophyte
 (B) Conspicuous, large, free-living, mostly photosynthetic thalloid gametophyte
 (C) Conspicuous, small but multicellular, free-living, mostly photosynthetic thalloid sporophyte
 (D) Inconspicuous, large, not free-living but attached to photosynthetic gametophyte

116. Consider the following statements and mark them as true or false

- (a) Asexual reproduction in liverworts takes place by fragmentation or by formation of gemmae
 (b) Unlike bryophytes and pteridophytes, in gymnosperms the male and female gametophytes do not have an independent free-living existence.
 (c) The mosses have an elaborate mechanism of spore dispersal.
 (A) a, b, c are true
 (B) a is true but b, c are false

(C) a, b are true but c is false

(D) A, C are true but B is false

117. Which of the following is incorrect for green algae?

- (A) Most of the members have storage bodies called pyrenoids
 (B) Cell wall made of an inner layer of pectose and outer layer of cellulose
 (C) Some algae may store food in the form of oil droplets
 (D) Plant body may be unicellular, colonial or filamentous

118. The alga with haplo diplontic life cycle is

- (A) *Volvox* (B) *Fucus*
 (C) *Ectocarpus* (D) *Spirogyra*

119. Which of the following are correct for numerical taxonomy?

- (i) Based on all observable characteristics.
 (ii) Uses chemical constituents of the plant to resolved confusions.
 (iii) Based on cytological information like chromosome number, structure and behaviour.
 (iv) Numbers and codes assigned to few characters.
 (v) At the same time hundreds of characters can be considered.
 (vi) Carried out using computers.
 (A) i, v, vi (B) iii, iv, v
 (C) i, iv, v, vi (D) ii, iii, v, vi

120. Fill up the blanks :

- i. Earlier classification systems were based mainly on vegetative characters or on the _____ structure.
 ii. *Ulothrix* belongs to _____.
 iii. The main plant body of the bryophyte is _____.

	i	ii	iii
(A)	Androecium	Chlorophyceae	Haploid
(B)	Androecium	Phaeophyceae	Diploid
(C)	Gynoecium	Phaeophyceae	Haploid
(D)	Gynoecium	Chlorophyceae	Diploid

