

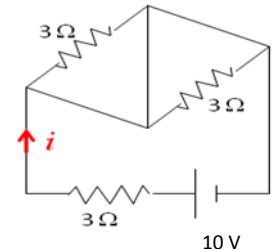
Physics Paper-II

SECTION I

STRAIGHT OBJECTIVE TYPE

This section contains 9 multiple choice questions. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer.

1. Current i as shown in the circuit will be
 a) 10 A b) $10/3$ A c) zero d) infinite

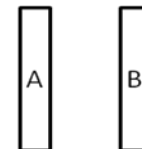


2. The equation of the state of a gas is given by $PV = nRT + Pb$. If two moles of a gas is isothermally expanded from volume V to $2V$, the work done during the process is
 a) $2RT \ln\left(\frac{2V-b}{V-b}\right)$ b) $2RT \ln 2$ c) $RT \ln\left(\frac{2V}{2V-b}\right)$ d) $2RT \ln\left(\frac{V-b}{2V-b}\right)$

3. A gas is found to obey the law $P^2V = \text{constant}$. The initial temperature and volume are T_0 and V_0 . If the gas expands to a volume $3V_0$, its final temperature become
 a) $\sqrt{3} T_0$ b) $T_0/\sqrt{3}$ c) $3T_0$ d) $T_0/3$

4. Two conducting plates A and B each having large surface area S (on one side) are placed parallel to each other. The plate A is given a charge q , while the plate B is neutral. Then the electric field at a point in between the plates is

- a) $\frac{q}{2S\epsilon_0}$ b) $\frac{q}{S\epsilon_0}$ c) $\frac{2q}{S\epsilon_0}$ d) zero



5. Two identical charged spheres are suspended by strings of equal length. The string makes an angle of 30° with each other. When suspended in a liquid of density 800 kg/m^3 , the angle remains the same. Density of material of sphere is 1600 kg/m^3 . Then the dielectric constant of the liquid is
 a) 1.5 b) 2 c) 2.5 d) 3

SPACE FOR ROUGH WORK

6. An ideal gas goes through a cycle consisting of isochoric, adiabatic and isothermal lines with the isothermal process proceeding at the minimum temperature of the whole cycle. The efficiency of whole cycle if the absolute temperature varies n -fold within the cycle is

a) $\frac{n(\gamma-1)\ln n}{n-1}$ b) $\frac{n(\gamma-1)}{n-1}$ c) $1 - \frac{n(\gamma-1)\ln n}{n-1}$ d) $1 - \frac{n(\gamma-1)}{n-1}$

7. A source of emf $E = 10\text{ V}$ and having negligible resistance is connected to a variable resistance. The resistance varies as shown in figure. The total charge that has passed through the resistor R during the time interval from time t_1 to t_2 is

a) $40 \ln 4$ b) $30 \ln 3$ c) $20 \ln 2$ d) $10 \ln 2$

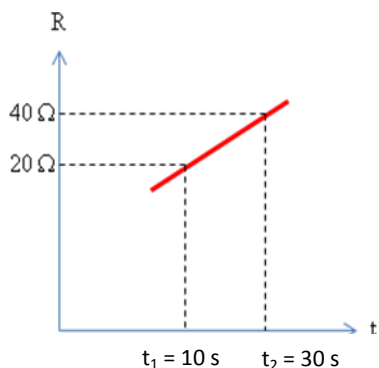


Figure for Qs 7

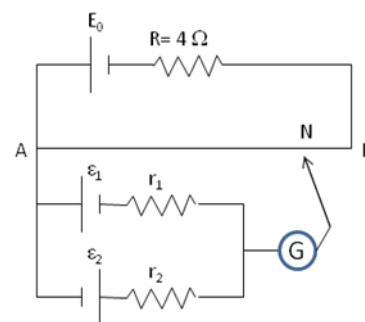
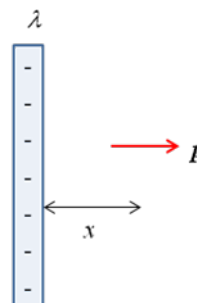


Figure for Qs 8

8. A battery of emf $E_0 = 12\text{ V}$ is connected across a 4 m long uniform wire having resistance $4\ \Omega/\text{m}$. The cell of small emfs $\varepsilon_1 = 2\text{ V}$ and $\varepsilon_2 = 4\text{ V}$ having internal resistance $2\ \Omega$ and $6\ \Omega$ respectively are connected as shown in figure. If galvanometer shows no deflection at the point N , the distance of point N from the point A is equal to
- a) $1/6\text{ m}$ b) $1/3\text{ m}$ c) $3/2\text{ m}$ d) $4/3\text{ m}$
9. An electric dipole is placed perpendicular to an infinite line of charge at a distance x , as shown in figure. Identify the correct statement

- a) The dipole is attracted towards the line charge
 b) The dipole is repelled away from the line charge
 c) The dipole does not experience a force
 d) The dipole experiences a force as well as a torque



SECTION II**ASSERTION-REASON TYPE**

This question contains 4 reasoning type questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

Each question contains STATEMENT-1 and STATEMENT-2. Follow these options to bubble appropriate option.

- (a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
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- (c) STATEMENT-1 is True, STATEMENT-2 is False
- (d) STATEMENT-1 is False, STATEMENT-2 is true
-

Paragraph for next two questions (Qs. 10 and Qs. 11):

A quantity of air is kept in a container having walls which are slightly conducting. The initial temperature and volume are 27 °C (equal to the temperature of the surrounding) and 800 cm³ respectively. Take $\gamma = 1.4$. Next two assertion-reason questions are based over this paragraph.

10. **STATEMENT 1:** The increase in temperature is 222 K if the gas is compressed to 200 cm³ in a short time.
STATEMENT 2: The process is adiabatic.
11. **STATEMENT 1:** The increase in temperature is 222 K if the gas is compressed to 200 cm³ in a long time.
STATEMENT 2: The process is adiabatic.
12. **STATEMENT 1:** An uncharged capacitor is connected to the battery. Half the energy is lost as heat while charging the capacitor.
STATEMENT 2: Half the total energy supplied by the battery is stored in the capacitor.
13. **STATEMENT 1:** An uncharged capacitor of capacitance C is charged by connecting it to a battery of emf ϵ . The capacitor is now disconnected and reconnected to the battery with the polarity reversed. The heat developed in the conducting wires is $2Ce^2$.
STATEMENT 2: The work done by the battery appears as the heat in the conducting wires.
-

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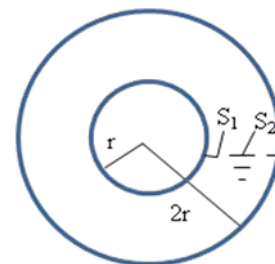
SECTION III**LINKED COMPREHENSION TYPE**

This section contains 2 paragraphs. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 4 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

Paragraph for Questions numbers 14 to 16

There are two concentric spherical shells of radii r and $2r$. Initially a charge Q is given to the inner shell and both the switches are open.

Answer the following questions based on this paragraph.

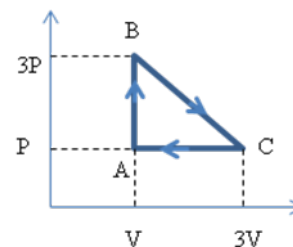


14. If switch S_1 is closed and then opened, charge on the outer shell will be
 a) Q b) $Q/2$ c) $-Q$ d) $-Q/2$
15. Now switch S_2 is closed and then opened. The charge flowing through S_2 in this process is
 a) Q b) $Q/4$ c) $Q/2$ d) $2Q/3$
16. If the process of above two steps is repeated n times, the potential difference between the shells will be
 a) $\frac{1}{2^{n+1}} \left[\frac{Q}{4\pi\epsilon_0 r} \right]$ b) $\frac{1}{2^n} \left[\frac{Q}{4\pi\epsilon_0 r} \right]$ c) $\frac{1}{2^n} \left[\frac{2Q}{4\pi\epsilon_0 r} \right]$ d) $\frac{1}{2^n - 1} \left[\frac{2Q}{4\pi\epsilon_0 r} \right]$

Paragraph for Questions numbers 17 to 19

One mole of an ideal monatomic gas is taken round the cyclic process ABCA as shown in the figure. Answer the following questions based on this passage.

17. The work done by the gas is
 a) $\frac{1}{2} PV$ b) PV c) $2PV$ d) zero
18. The net heat absorbed by the gas in the path BC is
 a) $-5 PV/2$ b) $\frac{1}{2} PV$ c) $2PV$ d) $3 PV$
19. The maximum temperature attained by the gas during the cycle is
 a) PV/R b) $3PV/8R$ c) $25PV/8R$ d) $PV/2R$

**SPACE FOR ROUGH WORK**

SECTION-IV**Matrix Match Type**

This section contains 3 questions. Each question contains statements given in two columns which have to be matched. Statements in **Column I** are labeled as A, B, C and D whereas statements in **Column II** are labeled as p, q, r and s. The answers to these questions have to be appropriately bubbled as illustrated in the following example.

If the correct matches are A-q, A-r, B-p, B-s, C-r, C-s and D-q, then the correctly bubbled matrix will look like the following :

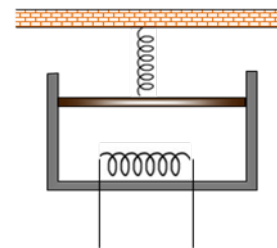
	p	q	r	s
A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

For each question in this section, you will be awarded 6 marks if you darken ALL the bubbles corresponding ONLY to the correct answer or awarded 1 mark each for correct bubbling of answer in any row. No negative mark will be awarded for an incorrectly bubbled answer.

20. 2.00 moles of a monatomic ideal gas ($U = 1.5 nRT$) is enclosed in an adiabatic vertical cylinder fitted with a smooth, light adiabatic piston. The piston is connected to a vertical spring of spring constant 200 N/m as shown in figure. The area of cross section of the cylinder is 20.0 cm². Initially, the spring is at its natural length and the temperature of the gas is 300 K. The atmospheric pressure is 100 kPa. The gas is heated slowly for some time by means of an electric heater so to move the piston up through 10 cm.

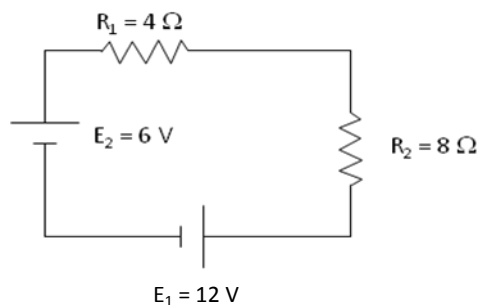
Match column I with the column II. Figures in column II are in SI units.

Column I		Column II (in S.I. units)	
a	The work done by the gas	p	21
b	The final temperature of the gas	q	331
c	The change in internal energy	r	772
d	Heat supplied by the heater	s	793



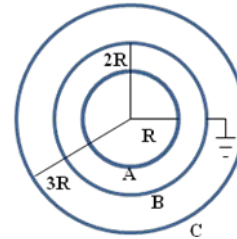
21. Assume that the batteries in figure have negligible internal resistance. Match column I with the column II (power absorbed or dissipated or supplied).

Column I		Column II (Power)	
a	Battery E_1	p	Absorbed
b	Battery E_2	q	Dissipated or supplied
c	Resistance R_1	r	6 W
d	Resistance R_2	s	3 W



22. Figure shows three concentric spherical shells A, B and C of radii R , $2R$ and $3R$. The shell B is earthed and A and C are given charges q and $2q$ respectively. Match column I with column II (absolute value of charge appearing).

Column I		Column II (Power)	
a	Inner surface of A	p	Q
b	Outer surface of A	q	$4q/3$
c	Inner surface of B	r	$2q/3$
d	Outer surface of C	s	0



SPACE FOR ROUGH WORK

Chemistry Paper-II

SECTION I

STRAIGHT OBJECTIVE TYPE

This section contains 9 multiple choice questions. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer.

1. Which of the following option is having maximum number of unpaired electrons ?

- (a) A tetrahedral d^6 ion
- (b) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
- (c) A square planar d^7 ion
- (d) A co-ordination compound with magnetic moment of 5.92 B.M

2. Which of the following product is formed when sulphurdioxide gas is passed through sodium chlorate in strongly acidic solution?

- (a) NaClO_4
- (b) ClO_2
- (c) Na_2SO_3
- (d) SO_3

3. Which is the incorrect statement ?

(a) Ore bauxite is purified by alkaline treatment, the bayer process and then dissolve in molten cryolite and reduced electrolytically in the fused salt system to get metal.

(b) Sulphide ores of some of the less electropositive metals like Hg, Cu, Pb etc are heated in air, a part of these is changed into oxide or sulphide then that reacts with remaining part of the sulphide ore to give its metal and SO_2 .

(c) Metallic silver is dissolved from its ore in dilute NaCN solution in presence of air and the solution so obtained is treated with scrap zinc when silver metal is precipitated.

(d) Magnesium is precipitated as $\text{Mg}(\text{OH})_2$ from sea water by treatment with lime and then it dissolved in dilute HCl and reduced electrically in aqueous medium to get magnesium metal

4. Which one of the following is true for the complex prepared by adding NH_4OH to a solution of $[\text{PtCl}_4]^{2-}$ ions ?

- (a) complex will be square planer
- (b) complex will have dipole moment
- (c) complex will be diamagnetic
- (d) all of these

5. Which of the following is incorrect?

(a) In d-block elements, the d-orbitals of the penultimate energy level of their atoms receive electrons and thus give rise to three complete and one incomplete rows of the transition metals

(b) Copper glance or chalcocite and argentite both are sulphide ores.

(c) Iron is extracted from its oxide ores, siderite by reduction with carbon monoxide and coke in blast furnace

(d) High melting and boiling points of transition elements are attributed to the involvement of $(n-1)d$ electrons in addition to the ns electrons.

6. A metal nitrate on reaction with excess sodium hydroxide solution gives a white precipitate but it rapidly turns brown on adding bromine water . Aqueous solution of metal nitrate produces a pink precipitate with disodium phosphate solution in the presence of ammonia . The cation is :

- (a) Cu^{2+}
 - (b) Mn^{2+}
 - (c) Mg^{2+}
 - (d) Zn^{2+}
-

7. Which of the following statement is correct ?
- (a) Zinc (II) ion has zero CFSE value for any geometry
(b) A solution of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is green as the value of Δ for the H_2O complex is in the visible region .
(c) A solution of $[\text{Fe}(\text{CN})_6]^{2-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ appears colourless in dilute solution
(d) All of these
8. Which of the following compound on reaction with NaOH and Na_2O_2 gives yellow colour?
- (a) $\text{Cr}(\text{OH})_3$ (b) $\text{Zn}(\text{OH})_2$ (c) $\text{Al}(\text{OH})_3$ (d) None of these
9. The process by which lighter earthy particles are freed from heavier particles by using water , does not include
- (a) Gravity separation (b) Levigation
(c) Leaching (d) Hydraulic washing

SECTION II

ASSERTION-REASON TYPE

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d) STATEMENT-1 is False, STATEMENT-2 is true

10. Statement 1: The geometrical isomers of the complex $[\text{M}(\text{NH}_3)_4\text{Cl}_2]$ are optically inactive.

Statement 2: Both the isomers of the given complex possess axis of symmetry.

11. Statement 1 : $\text{Zn}(\text{OH})_2$ dissolves in an excess of NaOH solution .

Statement 2: $\text{Zn}(\text{OH})_2$ forms the soluble complex , $\text{Na}_2[\text{Zn}(\text{OH})_4]$ with NaOH

12 Statement 1: Van Arkel method is used to obtain ultra pure samples of some metals.

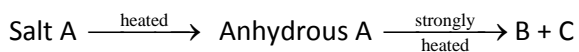
Statement 2: It involves reaction of CO with metals to form volatile carbonyls , which decomposes on heating to give pure metals

13. Statement 1: NO_2 is paramagnetic at room temperature and diamagnetic at lower temperature.

Statement 2: when electrons are odd molecules are paramagnetic or else diamagnetic.

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Paragraph for Questions numbers 14 to 16

Aqueous solution of C + Hg(NO₃)₂ solution \longrightarrow D↓ (yellow precipate)

Aqueous solution of A + KCN \longrightarrow [colourless solution] $\xrightarrow[\text{solution}]{\text{FeCl}_3}$ Blood red colouration

14. The ppt. D is

- (a) HgO (b) HgO.HgSO₄ (c) HgSO₄.2HgO (d) CdS

15. The structure of anionic part of B is

- (a) Linear (b) ZigZag chain (C) Planar ring (d) Nonplanar ring

16. The number of water of crystallisation in A is

- (a) 4 (b) 3 (c) 2 (d) 5
-

SPACE FOR ROUGH WORK

Paragraph for Questions numbers 17 to 19

Among the various ores of a metal (M) two ore [X] and [Y] show the following reactivity.

- (A) [X] in calcination gives a black solid (S), carbon dioxide and water
- (B) [X] dissolve in dil. HCl on reaction with KI gives a white ppt. (P) and iodine
- (C) [Y] on roasting gives metal M and a gas G1 which turns acidified $K_2Cr_2O_7$ solution green
- (D) [Y] on reaction with dil. HCl gives a white ppt. (MS) and another gas (G2) which turns lead acetate solution black, and also reacts with G1 to precipitate colloidal sulphur in presence of moisture

17. The metal ores [X] and [Y] are respectively

- (a) carbonate and sulphide ores
- (b) Sulphide and carbonate ores
- (c) carbonate and hydroxide ores
- (d) carbonate and oxide ores

18. which of the following statement is correct about [Y] ?

- (a) [Y] is converted to metal (M) by self reduction
- (b) carbonate extract of [y] gives yellow ppt. with suspension of $CdCO_3$
- (c) [Y] is chalcocites or chalcopyrites
- (d) All of these

19. Which of the following is true about gas G1 and ppt. (P) :

- (a) G1: oxidising agent (P): Cu_2I_2
- (b) G1 : reducing agent (p): CuI_2
- (c) G1 : oxidising and reducing agent (p): Cu_2I_2
- (d) G1 : fluxing agent (p): $K_2[CuI_4]$

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	p	q	r	s
A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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20. Match the following

Column I	Column II
(a) Haematite	(p) Slag formation during roasting/smelting and bessemerisation
(b) Copper pyrites	(q) Reduction by carbon monoxide(mainly) as well as carbon at different temperature
(c) Carnallite	(r) Electrolytic reduction
(d) Bauxite	(s) Calcinations

21. Match column I with column II

Column I (pair of complexes)		Column II (property which is similar in given pair)
a $[\text{Fe}(\text{CN})_6]^{3-}$ & $[\text{Co}(\text{NH}_3)_6]^{2+}$	P	Magnetic moment
b $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ & $[\text{Fe}(\text{CN})_6]^{4-}$	Q	Geometry
c $[\text{Ni}(\text{CN})_4]^{2-}$ & $[\text{Ni}(\text{CO})_4]$	R	Hybridisation
d $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ & $[\text{NiCl}_4]^{2-}$	S	Number of unpaired electrons

22. Match the following

Column I	Column II
(a) $\text{HgI}_2 \downarrow + \text{I}^- (\text{excess}) \rightarrow$	(p) One of the product is a colourless soluble complex
(b) $\text{Cr}(\text{OH})_3 \downarrow + \text{NaOH} (\text{excess}) \rightarrow$	(q) One of the product is a coloured soluble complex
(c) $\text{PbCrO}_4 \downarrow + \text{NaOH} \rightarrow$	(r) In one of the product the central atom or ion is sp^3 hybridised
(d) $\text{CuSO}_4 + \text{NH}_3 (\text{excess}) \rightarrow$	(s) One of the product is a paramagnetic complex

SPACE FOR ROUGH WORK

Mathematics Paper-II**SECTION I****STRAIGHT OBJECTIVE TYPE**

This section contains 9 multiple choice questions. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer.

1. The value of $\lim_{x \rightarrow -\infty} \left(\frac{x^4 \sin(1/x) + x^2}{1 + |x|^3} \right) =$
- a) 1 b) -1 c) 0 d) ∞
2. Points A and B are selected on the curve $x^2 + 2y = 0$ so that the triangle ABO is equilateral. The length of the side of the triangle is (O is origin)
- a) $4\sqrt{3}$ b) $4/3$ c) $4/\sqrt{3}$ d) $2\sqrt{3}$
3. The domain of $f(x) = \sqrt{x^{14} - x^{11} + x^6 - x^3 + x^2 + 1}$ is
- a) $[0, \infty)$ b) $(-\infty, 0]$ c) $[-1, 1]$ d) R
4. Is the function $f(x) = \cos(2\pi\{x\}) + \cos(2\pi\{x\})$ a periodic? If so the period of $f(x)$ is ($\{x\}$ denotes the integral part of x)
- a) $\frac{1}{4}$ b) $\frac{1}{2}$ c) 1 d) not a periodic function
5. The number of points (y, z, t) ($y < z < t$) such that $(x + y\sqrt{2})^2 + (z + t\sqrt{2})^2 = 1999 + 1428\sqrt{2}$ where x is a fixed integer is
- a) 2661 b) 2596 c) 2448 d) 0
-

SPACE FOR ROUGH WORK

6. The term independent of x in $\left(\frac{x+1}{x^{2/3}-x^{1/3}+1}-\frac{x-1}{x-x^{1/2}}\right)^{10}$
- a) $10 C_5$ b) $10 C_7$ c) $10 C_6$ d) does not exist
7. $\lim_{n \rightarrow \infty} \left(\frac{1^6 + 2^6 + \dots + n^6}{(1^2 + 2^2 + \dots + n^2)(1^3 + 2^3 + \dots + n^3)} \right) =$
- a) $4/7$ b) $12/7$ c) $7/4$ d) $7/12$
8. If $n \in \mathbb{N}$ then $\lim_{n \rightarrow \infty} \frac{x^n}{e^x} = 0$
- a) when n is even only b) for no value of n c) for all values of n d) when n is odd only
9. Consider a real valued function $f(x)$ satisfying
- $$2f(xy) = (f(x))^y + (f(y))^x \quad \forall x, y \in \mathbb{R} \text{ and } f(1) = p; p \neq 1 \text{ then } (p-1) \sum_{r=1}^n f(r) =$$
- a) 0 b) p^{n+1} c) $p^{n+1} - p$ d) $p^{n+1} + p$

SPACE FOR ROUGH WORK

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- STATEMENT-1 is True, STATEMENT-2 is False
- STATEMENT-1 is False, STATEMENT-2 is true

10. **Statement 1:** if $y^2 = 4 + 3x - x^2$, then at $(4, 0)$ & $(-1, 0)$ tangent is perpendicular to x-axis.

Statement 2: At $(4, 0)$ & $(-1, 0)$ slope of the curve is not defined.

11. **Statement 1:** If the coefficient of the 5th, 6th, 7th terms of the expansion $(1 + x)^n$ are in A.P. then $n = 10$.

Statement 2: If the coefficients of the r^{th} , $(r + 1)^{\text{th}}$, $(r + 2)^{\text{th}}$ terms of $(1 + x)^n$ are in A.P. then $n^2 - (4r + 1)n + 4r^2 - 2 = 0$

12. **Statement 1:** If $S(3, 4)$ and $S'(9, 12)$ are the foci of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ ($a > b$) and $(1, -4)$ is the foot of the perpendicular drawn from S to a tangent then the eccentricity of the ellipse is $5/13$.

Statement 2: the locus of the foot of the perpendicular drawn from the focus to the tangent at any point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ ($a > b$) is the auxiliary circle of $x^2 + y^2 = a^2$ which is concentric of with the ellipse.

13. **Statement 1:** The equation $(x - 1)^5 = m(x^5 - 1)$ has 3 real roots if $0 < m < 16$

Statement 2: The range of $f(x) = \frac{(x-1)^5}{x^2-1}$ is $[0, 16]$

SPACE FOR ROUGH WORK

SECTION III**LINKED COMPREHENSION TYPE**

This section contains 2 paragraphs. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 4 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

Paragraph for Questions numbers 14 to 16

The infinite series may be used to find the number of ways of distributing identical objects into distinct boxes. For example, the number of ways in which 5 identical balls can be distributed in 3 different boxes must be equal to the coefficient of x^5 in the infinite product $(x^0 + x^1 + x^2 + \dots)(x^0 + x^1 + x^2 + \dots)(x^0 + x^1 + x^2 + \dots)$. For any ways in which x^5 is obtained is one of the ways in which 5 identical balls can be distributed in 3 distinct boxes. While finding the number of ways the conditions $|x| < 1$ may be insignificant. Answer the following questions based on this paragraph.

14. The coefficient of x^n in the expansion of $(1 - x)^{-3}$ must be
 a) $\frac{n(n+1)}{2}$ b) $\frac{n(n-1)}{2}$ c) $\frac{(n+1)(n+2)}{2}$ d) none of these
15. The number of ways of distributing 10 identical objects in three distinct boxes must be
 a) 36 b) 48 c) 66 d) 1000
16. The number of ways in which we can get a total of 10 while throwing 3 dice must be

Paragraph for Questions numbers 17 to 19

Two curves $y = f(x)$ and $y = g(x)$ are such that the tangents drawn to them at points with the same abscissa, meet on y-axis and the normals at these points meet on x-axis. Let $f(1) = 2$, $g(1) = 1$ and $h(x) = 2f(x) - x$. tangent is drawn at a point P on the curve $y = h(x)$ to meet the coordinate axis at A and B. Locus of the circumcentre of triangle OAB, where O is origin, is a curve C. Answer the following questions based on this paragraph.

17. $h(x)$ represents
 a) parabola b) ellipse c) hyperbola d) none of these
18. Equation of curve C is
 a) $xy = 3$ b) $y^2 = 6x$ c) $\frac{1}{2}x^2 + y^2 = 1$ d) $x^2 - y^2 = 1$
19. Area bounded by curve C, $x = 1$, $x = 3$ and $y = 3$ is equal to
 a) $6 - 2 \ln 3$ b) $6 - \ln 3$ c) $6 + 2 \ln 3$ d) $6 - 3 \ln 3$

SPACE FOR ROUGH WORK

SECTION-IV**Matrix Match Type**

This section contains 3 questions. Each question contains statements given in two columns which have to be matched. Statements in **Column I** are labeled as A, B, C and D whereas statements in **Column II** are labeled as p, q, r and s. The answers to these questions have to be appropriately bubbled as illustrated in the following example.

If the correct matches are A-q, A-r, B-p, B-s, C-r, C-s and D-q, then the correctly bubbled matrix will look like the following :

	p	q	r	s
A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

For each question in this section, you will be awarded 6 marks if you darken ALL the bubbles corresponding ONLY to the correct answer or awarded 1 mark each for correct bubbling of answer in any row. No negative mark will be awarded for an incorrectly bubbled answer.

20. Match the following

Column I	Column II
a The tangent and normal at any point P of $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ whose eccentric angle is θ , meets the major axis at K and L such that $KL = a$, then $e^2 \cos^2 \theta + \cos \theta$ is equal to	p 2
b P and Q are two points on $\frac{x^2}{4} - \frac{y^2}{9} = 1$ whose centre is C and CP is perpendicular to CQ, then $\frac{1}{CP^2} + \frac{1}{CQ^2}$ is	q 24/13
c The area of the triangle formed by the tangents from (2, 3) to $x^2 + y^2 = 9$ with the chord of contact is	r 5/36
d The locus of the point of intersection of the lines $\sqrt{3}x - y - 4\sqrt{3}k = 0$ and $\sqrt{3}kx + ky - 4\sqrt{3} = 0$ is a hyperbola of eccentricity equal to	s 1

21. Match the following

Column I	Column II	
a	If from point P (4, 4) perpendicular to the straight lines $3x + 4y + 5 = 0$ and $y = mx + 7$ meet at Q and R and area of ΔPQR is maximum, then	p 2
b	If two distinct chords of a parabola $y^2 = 4ax$ passes through (a, 2a) are bisected on the line $x + y = 1$, then length of latus rectum can be	q 1
c	$\lim_{x \rightarrow \infty} \sqrt{\frac{x - \sin x}{x + \cos^2 x}}$	r 4/3
d	If period of $\sin^{2m}(\sqrt{k}x)$; $m \in N$ is π , then $\lim_{n \rightarrow \infty} k^n =$	s 0

22. Match the following

Column I	Column II	
a	$\lim_{x \rightarrow 0} \frac{(1+x)^x - e}{x} =$	p 3/2
b	If $f(x) = \sum_{r=1}^n \tan^{-1}\left(\frac{1}{x^2 + (2r-1)x + (r^2 - r + 1)}\right)$ then $\lim_{n \rightarrow \infty} (f'(0)) =$	q -e/2
c	$\lim_{x \rightarrow 0} \left(\frac{e^{\tan x} - e^x + \log(\sec x + \tan x) - x}{\tan x - x} \right) =$	r e
d	$\lim_{n \rightarrow \infty} \left(\frac{x^2 + 5x + 3}{x^2 + x + 2} \right)^{x/4} =$	s -1

SPACE FOR ROUGH WORK