MATHEMATICS

1.	If a and b are any two real numbers with opposite signs, which of the following is the greatest ?							
	(A) (a–b) ²	(B) (a – b) ²	(C) $ a^2 - b^2 $	(D) a ² + b ²				
2.	The sum of the infinite s	eries :		65				
	$\frac{1}{10} + \frac{2}{10^2} + \frac{3}{10^3} + \dots + \frac{1}{10^3}$	n D ⁿ +						
	(A) $\frac{1}{9}$	(B) <u>10</u> <u>81</u>	$(C)\frac{1}{8}$	(D) <u>17</u> 22				
3.	The number (1024) ¹⁰²⁴ i	s obtained by raising (16)	¹⁶ to the power n. What is	the value of n ?				
	(A) 64	(B) 64 ²	(C) 64 ⁶⁴	(D) 160				
4.	The smallest value the	expression x ² + 6x+ 8 att	ains on the set { $x \in R \mid x^2$	$x^2 - 2x - 8 \le 0$ is				
	(A) 0	(B) –1	(C) 8	(D) 3				
5.	Let P_1 be the set of all p of all prime multiples of	prime numbers, i.e., $P_1 =$ n. Then which of the follo	{2, 3, 5, 7,11,}, Let Pr wing sets is non empty ?	$n = \{np \mid p \in P_1\}, i.e., the set$				
	(A) P ₁ ∩ P ₂₃	(B) P ₇ ∩ P ₂₁	(C) P ₁₂ ∩ P ₂₀	(D) P ₂₀ ∩ P ₂₄				
6.	The number of integers	a such that $1 \le a \le 100$	and a ^a is a perfect squar	e is :				
	(A) 50	(B) 53	(C) 55	(D) 56				
7. 7	On a card, the following three statements are found :							
5	(1) On this card exactly one statement is false.							
1	(2) On this card exactly two statements arc false.							
	(3) On this card exactly three statements are false.							
	The number of false statements on the card is exactly							
	(A) 0	(B) 1	(C) 2	(D) 3				
0	In triangle ADO with (A	00° the bisseters of th	o ongloo D ond C most st	D The distance from D to the				
0.			e angles o and C meet at	r. The distance from P to the				
	hypotenuse is $4\sqrt{2}$. The	e distance AP is :						

(A) 8 (B) 4 (C) $8\sqrt{2}$ (D) $4\sqrt{2}$

9. In a rhombus one of the diagonals is twice the other diagonal. Let A be the area of the rhombus in square units. Then each side of the rhombus is :

(A)
$$\sqrt{A}$$
 (B) $\frac{1}{2}\sqrt{2A}$ (C) $\frac{1}{2}\sqrt{5A}$ (D) $\frac{1}{4}\sqrt{4A}$

10. In the following figure, AE = EB, BD = 2DC What is the ratio of the areas of PED and ABC?



11. A ball is thrown vertically upwards with a certain initial velocity. Assume that there is no resistance due to air. Among the graphs below, the graph that is not an appropriate representation of the motion of the ball is :



12. An electron of mass m_e initially at rest takes time t_1 to move a distance s in a uniform electric field in the same field environment, a proton of mass m_p initially at rest takes time t_2 to move the same distance (in the opposite direction). Ignoring gravity, the ratio t_2/t_1 is :



- A simple camera with a converging lens of 60 mm focal length is focused on very far objects. To focus the camera on a nearby object 1.5 m away, the distance between the film and lens will have to be:
 (A) decreased by 2.5 mm
 - (B) increased by 2.5 mm
 - (C) kept fixed as before. but aperture increased by a factor of 2.5
 - (D) kept fixed as before, hut aperture decreased by a factor of 2.5

14. A molecule of gas in a container hits one wall (1) normally and rebounds back. It suffers no collision and hits the opposite wall (2) which is at an angle of 30° with wall 1.





(B) F₁ < F

(A) $F_1 > F_2$

(C) $F_1 = F_2$, both non-zero

- (D) $F_1 = F_2 = 0$ A stone dropped from the window of a stationary train hits the ground and comes to rest. An identical 15. stone is dropped from the window when the same train is moving with speed v and it comes to rest on the ground. Assume that in each case, the entire energy lost in impact goes into heating the stone. Then
 - (A) The first stone is is slightly more heated than the second.
 - (B) The second stone is slightly more heated than the first.
 - (C) Both the stones will be raised to the same slightly higher) temperature.
 - (D) The second stone will be slightly more heated than the first only if its horizontal speed during fall is more than the final vertical speed.
- A negatively charged particle initially at rest is placed in an electric field that varies from point to point. 16. There are no other fields. Then :
 - (A) the particle moves along the electric line of force passing through it.
 - (B) the particle moves opposite to the electric line of force passing through it.
 - (C) the direction of acceleration of the particle is tangential to the electric line of force at every instant.

(C) $\frac{1}{4}$

- (D) the direction of acceleration of the particle is normal to the electric line of force at every instant.
- 17. There is a steady water flow in a horizontal tube in which one part has cross sectional area A, and the other part has cross sectional area A₂. Assume that water is incompressible.

If $A_1/A_2 = 16$, the ratio of the speed u₁ in part 1 and the speed u₂ in part 2, i.e. u₁/u₂ is :

(D) 1

18. Positive point charges of magnitude are placed at all the twelve 'hour' positions of a clock of radius r. The clock is mounted on a wall in the normal way. The charge at the position '6' is removed. The resulting electric field at the centre of the clock is :

(C)
$$\frac{1}{4\pi\epsilon_o} \frac{q}{r^2}$$
 vertically upward. (D) $\frac{1}{4\pi\epsilon_o} \frac{q}{r^2}$ vertically downward

19.	The pair of quantities that do not have the same dimensions is :
-----	--

- (A) Latent heat, specific heat
- (B) Gravitational force, Coulomb force
- (C) Kinetic energy pf a freely falling body, potential energy of a compressed spring
- (D) Coefficient of friction, number of molecules in a container.

A block of wood is floating on oil with half of its volume submerged. If the density of oil 840 kg m⁻³, the relative density of wood (relative to water) is :
(A) 0.84
(B) 0.42
(C) 0.21
(D) 1.00

CHEMISTRY

21.The volume of 0.5 M aqueous NaOH solution required to neutralize 10 ml of 2 M aqueous HCl solution is:
(A) 20ml(B) 40ml(C) 80ml(D) 120ml

(B) Emil Fisher (D) van't Hoff

 22.
 The compound that can be purified by sublimation is :

 (A) Ammonium Sulphate
 (B) Calcium Carbonate

 (C) Calcium Oxide
 (D) Aluminium Chloride

23. Penicillin was discovered by : (A) Alexander G. Fleming (C) Robert B. Woodward

24. Among butane,1-butene,1-butanol and butanal, the compound which is most polar is (A) butane (B) 1-butene (C) 1-butanol (D) butanal

- 25. Among ethanol, dimethyl ether, methanol, and propanal, the isomers are :
 (A) ethanol, dimethyl ether, methanol and propanal
 (B) ethanol and methanol
 - (C) ethanol, dimethyl ether, and methanol
 - (D) ethanol and dimethyl ether
- 26. Among Li, Be, N and F, the element having the largest atomic radius, is : (A) Li
 (B) Be
 (C) N
 (D) F

27. The proof of oxidizing action of hydrogen peroxide in acid solution is in the formation of : (A) O_2 (B) H_2O (C) both H_2O and O_2 (D) both H_3O^+ and O_2

28. A gel toothpaste is a mixture of a :
(A) liquid in a solid (B) solid in a gas (C) liquid in a liquid (D) gas in a solid

29. 3.01×10^{23} molecules of elemental Sulphur will react with 0.5 mole of oxygen gas completely to produce
(A) 6.02×10^{23} molecules of SO3
(C) 3.01×10^{23} molecules of SO3
(D) 3.01×10^{23} molecules of SO2

30.The pair of metals which will produce hydrogen gas in reaction with acid is :
(A) Mg, Cu(B) Mg, Ag(C) Zn, Pb(D) Cu, Zn

BIOLOGY

31.	A cancer which is not a tumor is :								
	(A) Lymphoma	(B) Leukemia	(C) Prostate cancer	(D) Oral cancer					
32.	The phase of the cell c	e phase of the cell cycle in which DNA synthesis takes place is :							
	(A) G1 phase	(B) S phase	(C) G2 phase	(D) G0 phase					
33.	You have a tube contain	ning 10² bacteria. You hav	ve taken out 10² bacteria.	How many bacteria are left in					
	the tube ?			-24					
	(A) approximately 10 ⁷	(B) approximately 10 ⁶	(C) approximately 10 ⁵	(D) approximately 10 ⁹					
34.	Association in which bo	oth the organisms get ber	nefited is :	40 40					
	(A) Commensalism	(B) Mutualism	(C) Ammensalism	(D) Parasitism					
35.	You are part of a scienti	fic expedition that has ver	ntured deep into the Ama:	zon rain forest. You spot a tree					
	with branches spread c	over a large area. What ca	an you conclude about the	e root structure of the tree?					
	(A) It is dicotyledonous		ALX 3	191					
	(B) It is monocotyledon	ous	011						
	(C) It may be either mo	nocotyledonous or dicoty	ledonous	J.					
	(D) There is no correlat	ion between foliage and r	oot structure						
36.	Alleles are :		1.						
	(A) Different forms of the same protein (B) Two different genes								
	(C) Different forms of th	e same gene	(D) Two different proteir	IS					
37.	If a person's spinal core	d is injured which of the fo	llowing functions might b	e affected ?					
	(A) Talking	(B) Seeing	(C) Sneezing	(D) Hearing					
38.	The amount of $\rm CO_2$ plant is greater at night than during the day because :								
	(A) The rate of respiration is higher at night.								
	(B) More CO ₂ is produc	ed because it is colder d	uring the night.						
	(C) Photosynthesis dur	ing the day uses up some	e of the CO ₂ produced by	respiration.					
	ט) iviore glucose is available for respiration during the hight								
39.	Osmosis takes place between two solutions separated by a semipermeable membrane because.								
- C	(A) Water molecules m	ove from the more dilute	solution to the less dilute	solution					
1	(B) Solute molecules m	nove from the less dilute s	solution to the more dilute	solution					
- 2	(C) Water molecules move from the less dilute solution to the more dilute solution								
	(D) Solute molecules m	nove from the more dilute	solution to the less dilute	solution					
40.	Arteries do not have va	lves but veins do, becaus	e:						
	(A) Arteries have a narr	ower lumen than veins							
	(B) Arteries have thicke	er walls than veins							
	(C) Arteries carry oxyge	enated blood whereas vei	ns carry deoxygenated bl	ood					
	(\mathbf{D}) Values provent head	flare of blace discussions							

MATHEMATICS

- 1. ab and cd are two 2 digit natural numbers and 4b + a = $13k_1$ and $5d c = 17k_2$, where k_1 and k_2 are natural numbers. Then find the largest number that will always divide product of ab and cd.
- 2. An operation defind as the product of non zero digits of x. e.g. An operation X defined as the product

of non zero digits of x. e.g. $x = 2 \times 5 = 10$, then find the sum of all the possible where n is a two digit number formed by the digits 1, 2, 3, 4, 5, 6,7, 8, and 9.

3. A ray of light originating at the vertex A of a square ABCD passes through the vertex B after getting reflected by BC, CD and DA in that order. If θ is the angle of the initial position of the ray with AB then find the value of sin θ .

PHYSICS

- 4. A fish looking up through the water sees the outside world contained in a circular horizon. If the refractive index of water is 4/3 and the fish is 12 cm below the surface, then find the radius of the circle.
- 5. Figure shows the position-time graph of particle of mass 4 kg. What is the



(a) force on the particle for t < 0, t < 4 s, 0 < t < 4 s?

(b) Impulse at t = 0 and t = 4 s ? (Consider one dimensional motion only)

6. Any two ends of a circular conducting wire are connected by a cell. Find the magnetic field at the centre O.



CHEMISTRY

- 7. The electronic configuration of some elments are given below :
 - (i) 1s², 2s², 2p⁶, 3s¹
 - (ii) 1s², 2s², 2p⁶, 3s², 3p⁶, 3d¹, 4s²
 - (iii) 1s², 2s², 2p⁴
 - (iv) 1s², 2s², 2p⁶, 3s², 3p⁶, 4s²
 - (v) 1s², 2s², 2p⁶, 3s², 3p⁵
 - (vi) 1s², 2s², 2p⁶, 3s², 3p⁶
 - (vii) 1s², 2s², 2p⁶, 3s², 3p³
 - out of these
 - (a) which is an alkaline earth metal?
 - (b) which has the lowest chemical reactivity?
 - (c) which belogs to group 15 of the periodic table ?
 - (d) which is a transition element ?
 - (e) which is a halogen ?
 - (f) which belongs to second period ?
 - (g) which forms unipositive ion in its compounds ?
- 8. What is meant by the term bond order ? Calculate the bond order of : N_2 , O_2 , O_2^+ and O_2^- .
- 9. The enthalpy of combustion of graphite is 393.3. kJ. Calculate
 - (a) the amount of graphite needed to produce 196.7 kJ of heat.
 - (b) the number of moles of CO₂ formed when 196.7 kJ of heat is produced.
 - (c) the volume of oxygen required as S.T.P. to burn 24.0 g of graphite in this process.

BIOLOGY

- **10.** (A) Give the reasons for the following :
 - (i) The wall of trachea is supported by cartilagenous rings.
 - (ii) The lung alveoli are covered with blood capillaries.
 - (iii) The glottis is guarded by epiglottis.
 - (B) Write the technical term for the following :
 - (i) An organism whose cells don't have well organised muscles.
 - (ii) Sum total of chemical processes taking place in cell
- 11. Answer the following question :

(i) If one ripened fruit is kept in a basket of raw fruits which causes ripening of raw fruits also. Name the hormone responsible for it.

(ii) Which nitrogenous waste product is most toxic & which one is least toxic in animals ?

(iii) Which type of cell is found in bacteria and blue green algae?

(iv) Which chemical molecule carries hereditary inform

(v) Which substance is used to remove chlorophyll from a green leaf during photosynthesis experiments?

12. Answer the following questions -

(i) Name the hormone responsible for inducing rooting in callus or stem cuttings_____.

- (ii) Name the hormone which induces cell division in plants_____
- (iii) Name the plant hormone which promotes closing of stomata during water scarcity ______.
- (iv) Name the animal hormone that stimulates maturation of lymphocytes_
- (v) Name the hormone that stimulates reabsorption of water from collecting tubules of nephron_____

HINTS & SOLUTIONS (PRACTICE PAPER-1)

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	А	В	D	Α	С	С	С	Α	С	D	D	D	А	А	В
Ques.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	С	Α	D	Α	В	В	Α	А	С	D	А	С	А	D	С
Ques.	31	32	33	34	35	36	37	38	39	40					
Ans.	В	В	В	В	A	С	С	С	A	D					

MATHEMATICS

<u> </u>	6.5
	MATHEMATICS
1.	Obvious (A) is greatest
2.	$S = \frac{1}{10} + \frac{2}{10^2} + \frac{3}{10^3} + \dots + \frac{n}{10^n} + \dots \infty$
	$\frac{S}{10} = \frac{1}{10^2} + \frac{2}{10^3} + \dots \infty$
	Subtracting,
	$\frac{9S}{10} = \frac{1}{10} + \frac{1}{10^2} + \frac{1}{10^3} + \dots \infty$
	$\frac{9S}{10} = \frac{\frac{1}{10}}{1 - \frac{1}{10}}$
	$\frac{9S}{10} = \frac{1}{9}$
	$S = \frac{10}{81}$
3.	$(1024)^{1024} = (16)^{16n}$ $(2^{10})^{1024} = (2^4)^{16n}$ $10 \times 1024 = 4 \times 16n$
2	$n = \frac{10 \times 1024}{4 \times 16}$ $n = 160$
4.	$x^2 + 6x + 8$ $x \in R$ $x^2 - 2x - 8 < 0$
	$x^{2}-2x-8 = x^{2}+2x-4x-8 = x(x+2) - 4(x+2) \le 0$



 $x \in [-2,\,4]$ clearly min value of expression is 0 at x = -2

- 5. Check by option $P_{12} = \{24, 36, 60, 84,\}$ $P_{20} = \{40, 60, 100,\}$ $P_{12} \cap P_{20} \text{ has common element}$
- 6. All even values of a i.e. 50 and 1, 9, 25, 49, 81, total 55
- 7. If any statement is true then remaining 2 are false.



Incircle is formed whose radius = $4\sqrt{2}$ Angle bisector *.*..

 $PE = r = 4\sqrt{2}$

PF = r =
$$4\sqrt{2}$$
 also PF = AE
∴ ΔAPE , $(AP)^2 = (AE)^2 + (PE)^2$
 $= (4\sqrt{2})^2 + (4\sqrt{2})^2 = 64$
∴ $AP = 8$

9. Area of rhombus = 2 Let one diagonal =

$$\frac{1}{2} \times (\mathbf{x})(2\mathbf{x}) = \mathbf{x}^2$$



 $A = X^2$ Let side of rhombus = y & height = h $\Delta BFC \text{ side } BF = \sqrt{y^2 - h^2}$ In $\triangle AFC$, $(y + \sqrt{y^2 - h^2})^2 + h^2 = (AC)^2 = 4x^2$

$$\Delta DEB (y - \sqrt{y^2 - h^2})^2 + h^2 = (BD)^2 = x^2$$

Adding

$$4y^2 = 5x^2$$

$$y = \sqrt{\frac{5x^2}{4}} = \frac{\sqrt{5A}}{2}$$



Let B is origin and the position vector of A and C are $2\vec{a}$ and $3\vec{b}$

Then P.V. of E = \vec{a} and P.V. of D = $2\vec{b}$ Now, let P divides AD in λ : 1 ratio and P divides EC in μ : 1

$$\therefore \qquad \frac{2\vec{b}\lambda + 2\vec{a}}{\lambda + 1} = \frac{3\vec{b}\mu + \vec{a}}{\mu + 1}$$

 $2\vec{b}\lambda\mu + 2\vec{b}\lambda + 2\vec{a}\mu + 2\vec{a} = 3\vec{b}\lambda\mu + \vec{a}\lambda + 3\vec{b}\mu + \vec{a}$

$$\vec{a} (2\mu + 2 - \lambda - 1) = \vec{b} (3\lambda\mu + 3\mu - 2\lambda\mu - 2\lambda)$$

But \vec{a} and \vec{b} are not collinear.

 $2\mu - \lambda + 1 = 0$ and $\lambda\mu + 3\mu - 2\lambda = 0$ We get $\mu = 1$

Now, P.V. of P is =
$$\frac{\ddot{a} + 3b}{2}$$

$$\frac{\operatorname{ar} \Delta \mathsf{PED}}{\operatorname{ar} \Delta \mathsf{ABC}} = \frac{\frac{1}{2} \left(\vec{a} - \frac{\vec{a} + 3\vec{b}}{2} \right) \times \left(2\vec{b} - \frac{\vec{a} + 3\vec{b}}{2} \right)}{\frac{1}{2} \left| 2\vec{a} \times 3\vec{b} \right|}$$

$$=\frac{\frac{1}{4}\left|\left(\vec{a}-3\vec{b}\right)\times\left(\vec{b}-\vec{a}\right)\right|}{6\left|\vec{a}\times\vec{b}\right|}=$$

Now,

2

PHYSICS

11. speed will not decrease, so answer is (D)

12. For electron,
$$t_1 = \sqrt{\frac{2s}{a_e}}$$

For protion, $t_2 = \sqrt{\frac{2s}{a_p}}$
or $\frac{t_2}{t_1} = \sqrt{\frac{a_e}{a_p}} = \sqrt{\frac{eE}{m_e} \times \frac{m_p}{eE}}$
 $= \sqrt{\frac{m_p}{m_e}}$

13. Focal length, f = 6 cm u = 1.5m = 150 cm v = ? $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ $\frac{1}{6} = \frac{1}{v} + \frac{1}{150}$ $\frac{1}{v} = \frac{1}{6} - \frac{1}{150} = \frac{25 - 1}{150}$ $v = \frac{150}{24} = \frac{75}{12} = \frac{25}{4} = 6.25$ change in distance = 6.25 - 6 = 0.25 cm = 0.25cm = 2.5 mm decreased

14. Initial momentum, $P_1 = mvcos30$ and final momentum, $P_2 = mvcos30$ change in momentum $\Delta P = -2mv cos30$

 $\Delta P = -\sqrt{3} mv$

Force on wall-1

$$F_1 = \frac{2mv}{\Delta t}$$

Force on wall-2

$$F_2 = \frac{\sqrt{3}mv}{\Delta t}$$
, so $F_1 > F_2$

17.
$$A_1 u_1 = A_2 u_2$$

 $\frac{u_1}{u_2} = \frac{A_2}{A_1} = \frac{1}{16}$

18. resultant force at centre is zero. On removing the charge from the position 6, the resultant force at centre

will be $\frac{kq}{r^2}$ downward.

20.
$$\frac{v}{V} = \frac{d_w}{d_L}$$
$$\frac{1}{2} = \frac{d_w}{840} \implies d_w = 420 \text{ kg/m}^3$$
$$\text{R.D.} = \frac{420}{10^3} = 0.42$$

CHEMISTRY

- **21.** NaOH HCI $N_1V_1 = N_2V_2$ $0.5 \times V = 2 \times 10$ V = 40 mL
- **25.** Ethanol (C_2H_5OH) and dimethyl ether ($CH_3 O CH_3$) have same molecular formula but different functional groups, so they are isomers.
- **26.** For the elements belonging to one period, increase in atomic number results in decrease in atomic radius. So Li has the largest atomic radius.
- $27. \qquad 2H_2O_2 \longrightarrow 2H_2O + O_2$
- **29.** S + $O_2 \longrightarrow SO_2$ 1 mole 1 mole 1 mole $\frac{1}{2}$ mole $\frac{1}{2}$ mole $\frac{1}{2}$ mole $\frac{1}{2}$ mole 3.01 × 10²³ 0.5 mole ? \therefore 3.01 × 10²³ molecules of SO₂ will be formed.
- **30.** Zn and Pb are placed above hydrogen in the metal activity series, so they will produce hydrogen gas with dilute acids.





MATHEMATICS

PHYSICS



(a) For t < 0 and t > 4 s, the particle is at rest as the position does not change with respect to time Evidently no force acts on the particle during these intervals.
 x(m) ↑



Further, for 0 < t < 4 s, the position of the particle continuously changes with respect to time. As the position-time graph is a straight line, it represents uniform motion and there is no acceleration. Hence, it is also clear that no force acts on the paticle during this interval.

(b) Becuase the velocity is uniform O to A hence velocity at O

= velocity at A = Slope of the graph OA = (3/4) m/s

Impulse (at t = 4s) = change in momentum = final momentum – initial momentum = $0 - mv = -4 \times (3/4) = -3 kg m/s$



Let the length ℓ_1 and ℓ_2 Then the resistance will be in the ratio of the ℓ_1 and ℓ_2

$$\frac{\mathsf{R}_1}{\mathsf{R}_2} = \frac{\ell_1}{\ell_2} \text{ but } \mathsf{I} \propto \frac{\mathsf{1}}{\mathsf{R}} \text{ so } \frac{\mathsf{I}_1}{\mathsf{I}_2} = \frac{\ell_2}{\ell_1}$$

 $\Rightarrow I_1 \ell_1 = I_2 \ell_2 \qquad ...(i)$ Magnetic field at centre due to current I_1

$$B_{2} = \frac{\mu_{0}I_{1}}{2r} \times \frac{\ell_{1}}{2\pi r} \odot (\text{ here } N = \frac{\ell_{1}}{2\pi r})$$

Magnetic field due to current I₂

$$B_2 = \frac{\mu_0 I_2}{2r} \times \frac{\ell_2}{2\pi r} \otimes$$

Net magnetic field at centre

$$B = B_{1} - B_{2} = \frac{\mu_{0}I_{1}\ell_{1}}{2r \times 2\pi r} - \frac{\mu_{0}I_{2}}{2r} \times \frac{\ell_{2}}{2\pi r}$$
$$B = \frac{\mu_{0}}{4\pi r^{2}} (I_{1}\ell_{1} - I_{2}\ell_{2}) = 0$$

<u>CHEMISTRY</u>

- 7. (a) (iv) is alkaline earth metal as it contains two electrons in the outermost s-orbital
 - (b) : (vi) has the lowest chemical reactivity as it is a noble gas element.

(c) (vii) contains three electrons in the p-subshell and group number for p-subshell is 15 (10 + no. of valence electrons).

(d) (ii) is a transition element as the last electron enters into d-subshell.

- (f) (iii) belongs to second period as the maximum principal quantum number (n) is 2.
- (g) (i) contains only one electron in the outermost s-orbital so it forms unipositive ions in its compound.
- 8. Bond order is defined as half of the difference between the number of electrons present in bonding (N_b) and anti bonding (N_a) orbitals.

Bond order = $\frac{N_b - N_a}{2}$

Bond orders of (i) nitrogen (N₂) molecule The electronic configuration of N₂ is [KK $\sigma(2s)^2 \sigma^* (2s)^2 \pi (2p_x)^2 = \pi (2p_y)^2 \sigma (2p_z)^2$] As N_b = 8, N_a = 2, therefore. bond order = 1/2 (N_b - N_a) = 1/2 (8 - 2) = 3

(ii) Oxygen (O₂) molecule. The electronic configuration of O₂ molecule is $KK\sigma(2s)^2 \sigma^* (2s)^2 \sigma(2p_z)^2 \pi(2p_x)^2 = \pi(2p_y)^2 \pi^*(2p_y)^1 = \pi^*(2p_x)^1$ As N_b = 8 and N_a = 4, therefore bond order 1/2 (N_b - N_a) = 1/2 (8 - 4) = 2

(iii) Oxygen molecular positive ion (O₂⁺). The electronic configuration of O₂⁺ is $KK\sigma(2s)^2 \sigma^* (2s)^2 \sigma (2p_z)^2 \pi (2p_x)^2 = \pi (2p_y)^2 \pi^* (2p_y)^1 = \pi^* (2p_x)$ As N_b = 8 and N_a = 3, therefore

bond order = $\frac{1}{2}(N_{b} - N_{a}) = \frac{1}{2}(8 - 3) = 2.5$

(iv) oxygen molecular negative ion (O₂⁻). The electronic configuration of O₂⁻ is $KK\sigma(2s)^2 \sigma^* (2s)^2 \sigma (2p_z)^2 \pi (2p_x)^2 = \pi (2p_y)^2 \pi^* (2p_y)^2 = \pi^* (2p_x)^1$ As N_b = 8, and N_a = 5, therefore Bond order = 1/2 (N_b - N_a) = 1/2 (8 - 5) = 1.5

9. We are given

(i) C (graphite) + $O_2(g) \longrightarrow CO_2(g)$; $\Delta H = -393.4 \text{ kJ}$ (a) From the above equation, we known that 393.4 kJ of heat is produced by 12 g of graphite. \therefore 196.7 kJ of heat is produced by

 $\frac{12}{393.4} \times 196.7 = 6 \text{ grams of graphite.}$

(b) From equation (i), we can say that

production of 393.4 kJ of heat is accompanied by the formation of 1 mole of CO₂.

- ... Production of 196.7 kJ of heat will be accompanied by the formation of 0.5 mole of CO
- (c) volume of oxygen required at S.T.P. to burn 12 g of graphite = 22.4 litres.
- :. Volume of oxygen required at S.T.P. to burn 24g of graphite = 22.4 × 2 = 44.8 litres.

BIOLOGY

- 10. (A) (i) Cartilagenous rings prevent it from collapse when air pressure is low in respiratory tract.
 - (ii) Alveoli sac are covered with blood capillaries for the exchange of gases.
 - (iii) To prevent entry of food into trachea.
 - (B) (i) Prokaryotic (ii) Metabolism

11. (i) Ethylene hormone

(ii) Ammonia and uric acid respectively

- (iii) Prokaryotic
- (iv) DNA

(v) Alchohol with boiling water is used to remove chlorophyll from a green leaf during photosynthesis experiments.

12. (i) Auxins (ii) Cytokinins (iii) Abscisic acid (iv) Thymosin (v) Anti diuretic hormone

