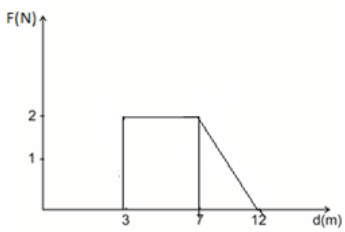
School Name:	**UDAAN**
Test Name:	**Weekly Assessment Class XI Week 10**
Total Questions:	**45**
Marks:	**45**
Duration:	**90 minutes**

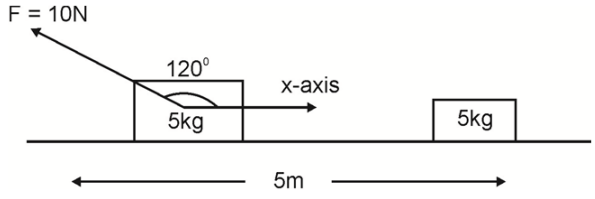
Instructions for Assessment:

- The test is of **1 1/2 hours (90 minutes) duration.**
- The test consists of **45 questions.**
- There are three parts in the question paper **A, B, C consisting of Physics, Chemistry and Mathematics** having 15 questions in each part of equal weightage.
- There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response.
- No candidate is allowed to use any textual material, printed or written, pager, mobile, any electronic device, etc

Section: Physics	
Questions: 15	**Marks: 15**

1.	Force F on a particle moving in a straight line varies with distance as shown in the figure. The work done on the particle during its displacement of 12 m is:  **a.** 9 J **b.** 13 J **c.** 18 J **d.** 12 J	**1.0**
2.	A force acts on a particle of mass 3 g, such that the position of the particle is a function of time and is given by $x = 3t - 4t^2 + t^3$, x in metres, t in seconds. Which of the following could be the magnitude of work done in four seconds? **a.** 360 mJ **b.** 570 mJ **c.** 576 mJ **d.** 912 mJ	**1.0**
3.	F = 7–2x+3x^2 N, acts on a small body of mass 2 kg and displaces it from x = 0 m to x = 5 m. The work done in joules is: **a.** 135 J **b.** 270 J **c.** 100 J **d.** 30 J	**1.0**
4.	Two bodies of masses m and 4m are moving with equal kinetic energies. The ratio of their linear momenta is: **a.** 2:1 **b.** 1:1 **c.** 1:4 **d.** 1:2	**1.0**
5.	Work done by centripetal force is:	**1.0**

	a. 0 **b.** F.S **c.** 1 **d.** $\bar{F} \times \bar{S}$	
6.	The work done in stretching of a spring of force constant k from length l_1 to l_2 is: **a.** $k\left(l_2^2 - l_1^2\right)$ **b.** $\frac{1}{2}k\left(l_2^2 - l_1^2\right)$ **c.** $\frac{1}{2}k\left(l_2 - l_1\right)$ **d.** $\frac{1}{2}k\left(l_2^2 + l_1^2\right)$	**1.0**
7.	Power can be expressed as **a.** $\vec{F}.\vec{v}$ **b.** $\frac{1}{2}\vec{F}.v^2$ **c.** $\vec{F}.\vec{t}$ **d.** $\vec{F} \times \vec{v}$	**1.0**
8.	If $\vec{F} = \left(60\hat{i} + 15\hat{j} - 3\hat{k}\right)N$ and $\vec{v} = \left(2\hat{i} - 4\hat{j} + 5\hat{k}\right)\ ms^{-1}$ then what is the magnitude of instantaneous power is **a.** 45 W **b.** 195 W **c.** 75 W **d.** 85 W	**1.0**
9.	A body of mass m accelerates uniformly from rest to v_1 in time t_1. The instantaneous power delivered to the body as a function of time t is: **a.** mav **b.** $\frac{mv_1^2 t}{t_1^2}$ **c.** $\frac{mv_1^2}{t_1}$ **d.** $mv_1 \frac{t_1}{t_2}$	**1.0**
10.	A body is moving along a straight line by a machine delivering constant power. The distance moved in time t is proportional to:	**1.0**

	a. $t^{3/2}$ **b.** $t^{-1/2}$ **c.** $t^{1/2}$ **d.** $t^{-3/2}$	
11.	A wind powered generator converts wind energy into electrical energy. For a constant wind speed v, the electrical power output is likely to be proportional to: **a.** v **b.** v^3 **c.** v^2 **d.** v^{-1}	**1.0**
12.	An elevator weighing 500 kg is to be lifted up at a constant velocity of 0.4 m/s. What should be the minimum horse power of the motor? **a.** 16.4 hP **b.** 18.2 hP **c.** 1462160 hP **d.** 2.62 hP	**1.0**
13.	A body is A body moves from point A to B to move along y-axis, under the action of force $\vec{F} = i - \hat{j} + 2\hat{k}$. It moves 2 m along y-axis, calculate the work done by the force. **a.** 2 J **b.** –2 J **c.** 1 J **d.** –1 J	**1.0**
14.	Calculate the work done if a force of 10 N is applied on a body of mass 5 kg as shown in the figure.  **a.** 25 J **b.** –25 J **c.** 50 J **d.** –202.5 J	**1.0**

15.	An object is displaced from position vector $r_1 = \left(4\hat{i} + 6\hat{j}\right)m$ to $r_2 = \left(8\hat{i} + 12\hat{j}\right)m$ under a force $F = \left(3x^2\,\hat{i} + 2y\,\hat{j}\right)N$. The work done, by this force, equals 552 J 83 J 556 J 80 J	**1.0**

Section: Chemistry	
Questions: 15	**Marks: 15**

16.	Molecular shape of SF_4, CF_4 and XeF_4 are a. The same, with 2, 0 and 1 lone pair of electron respectively b. The same, with 1, 1 and 1 lone pair of electron respectively c. Different, with 0, 1 and 2 lone pairs of electron respectively d. Different, with 1, 0 and 2 lone pairs of electron respectively	**1.0**
17.	When N_2 and O_2 are converted to monoanions N_2^- and O_2^- respectively then which of the following statements is wrong? a. In N_2, the N–N bond weakens b. In O_2^-, O–O bond length increases c. In O_2^-, bond order decreases d. N_2^- becomes diamagnetic	**1.0**
18.	The total number of lone pairs of electrons for Xe in $XeOF_4$ is a. 0 b. 1 c. 2 d. 3	**1.0**
19.	Which of the following pair of molecules will have permanent dipole moment for both members? a. NO_2 and CO_2 b. NO_2 and O_3 c. SiF_4 and CO_2 d. SiF_4 and NO_2	**1.0**
20.	Which of the following statements is true for N_3^- ? a. It has a non linear structure. b. It is called pseudohalogen. c. The formal charge of terminal N in this anion is -1. d. It is isoelectronic with NO_2.	**1.0**
21.	Which of the following oxides is expected to exhibit paramagnetic behavior? a. CO_2 b. ClO_2 c. SO_2 d. SiO_2	**1.0**

22.	Assuming that Hund's rule is violated, the bond order and magnetic nature of diatomic molecule of B_2 is: a. 0 and diamagnetic b. 1 and paramagnetic c. 0 and paramagnetic d. 1 and diamagnetic	**1.0**
23.	OF and F_2 can be compared in terms of a. OF is more stable towards dissolution into atoms b. OF is paramagnetic while F_2 is diamagnetic c. Both a & b are correct d. None of above is correct	**1.0**
24.	Which of the following diatomic molecule would be stabilised by removal of an electron? a. C_2 b. CN c. H_2 d. O_2	**1.0**
25.	The shape of XeO_2F_2 molecule is a. Square planar b. Trigonal bipyramidal c. See-saw d. Tetrahedral	**1.0**
26.	Among $KO_2, Al_2Cl_6, BaO_2 and\ NO_2^+$, unpaired electron is present in a. NO_2^+ and BaO_2 b. KO_2 and Al_2Cl_6 c. KO_2 only d. BaO_2 only	**1.0**
27.	The nodal plane in the π –bond of ethene is located in a. the molecular plane. b. a plane parallel to the molecular plane. c. a plane perpendicular to the molecular plane which bisects the carbon – carbon σ bond at right angle. d. a plane perpendicular to the molecular plane which contains the carbon-carbon σ bond.	**1.0**

28.	Number of bonding pairs (X) and lone pairs (Y) around the central atom in I_3 ion are: X Y a. 2 2 b. 2 3 c. 4 3 d. 3 2	**1.0**
29.	The nitrogen atoms in NH_3, NH_2^- and NH_4^+ are all surrounded by eight electrons. When these species are arranged in increasing order of H–N–H bond angle then correct order is: a. NH_2^-, NH_3, NH_4^+ b. NH_3, NH_2^-, NH_4^+ c. NH_4^+, NH_2^-, NH_3 d. NH_3, NH_4^+, NH_2^-	**1.0**
30.	Which pair of substances will have most similar geometry a. SO_3, SO_3^{2-} b. SO_3, SO_4^{2-} c. SO_3, CO_3^{2-} d. SO_4^{2-}, CO_3^{2-}	**1.0**

Section: Mathematics	
Questions: 15	**Marks: 15**

31.	If there are 9 A.M.'s between 5 and 45 then sum of A.M.'s will be: **a.** 175 **b.** 225 **c.** 275 **d.** 500	**1.0**
32.	If $\frac{m^{r+2}+n^{r+2}}{m^{r+1}+n^{r+1}}$ is arithmetic mean of m and n there r is equal to: **a.** –1 **b.** 0 **c.** 1 **d.** –2	**1.0**
33.	If 11 numbers are inserted between 1 and 49 such that the resulting sequence is an A.P., then sixth number is: **a.** 21 **b.** 25 **c.** 66 **d.** 91	**1.0**
34.	If the A.M. between m^{th} and n^{th} term of an A.P. be equal to the A.M. between p^{th} and q^{th} term of the A.P. then **a.** $m-n=p-q$ **b.** $(m+n)-(p+q)=-4$ **c.** $m+n=p+q$ **d.** None of these	**1.0**
35.	The sum of two numbers a and b is $\frac{25}{12}$. An even number of arithmetic means are being inserted between them and their sum exceeds their number by 2. The number of means inserted is: **a.** 24 **b.** 48 **c.** 96 **d.** 98	**1.0**
36.	n arithmetic means are inserted between two sets of numbers p, 2q and 2p, q where p, q $\in$ R. Further, if the m^{th} mean between these two sets of numbers is same, then p : q equals to **a.** $m:(n-m+1)$ **b.** $(m-1):(n-m+2)$ **c.** $(m-1):(n-m)$	**1.0**

	d. $(n-m+1):m$	
37.	Three non-zero numbers p, q, r are in A.P. If on increasing p by 1 or increasing r by 2 the numbers arrange in G.P., then q is equal to: **a.** 8 **b.** –6 **c.** 2 **d.** 12	**1.0**
38.	If A.M. of two positive numbers a and b is 5 and their G.M. is 4, then a is: **a.** 8 **b.** 8 or 2 **c.** 7 or 2 **d.** None of these	**1.0**
39.	The difference between two numbers is 120 and the difference between their A.M. and their G.M. is 50. Then, the greater of two numbers is: **a.** 11 **b.** 121 **c.** 400 **d.** None of these	**1.0**
40.	In a sequence of 17 terms, the first 9 terms ore in A.P. with common difference 3 and the last 9 terms are in G.P. with common ratio 2. If the middle term of A.P. be equal to the middle term of the G.P., then the middle term of the entire sequence is: **a.** $\frac{-4}{5}$ **b.** –20 **c.** $\frac{-12}{5}$ **d.** $\frac{116}{5}$	**1.0**
41.	If two G.M.s 'a' and 'b' and one A.M. 'm' be inserted between any two numbers x and y then the value of m in terms of a and b is: **a.** a^3+b^3 **b.** $\frac{a^2+b^2}{ab}$	**1.0**

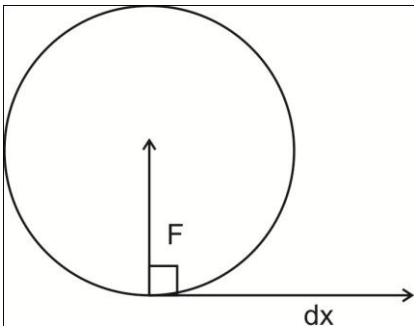
	c. $\frac{a^3+b^3}{2ab}$ **d.** $\frac{a^2+b^2}{2ab}$	
42.	If a, b, c are m^{th}, nth and p^{th} terms of an A.P. and also of G.P. then the value of $a^{b-c}.b^{c-a}.c^{a-b}$ equals **a.** 0 **b.** 1 **c.** 2 **d.** None of these	**1.0**
43.	If four numbers are in G.P. such that their third term is greater than the first by 9 and the second term is greater than the fourth by 18. Then the numbers are: **a.** 3, 6, 12, 24 **b.** 3, –6, 12, –24 **c.** 6, –12, 24, –48 **d.** None of these	**1.0**
44.	There are four numbers in G.P. whose sum is 85 and product is 4096. Then their common ratio is: **a.** $\frac{5}{2}$ **b.** $-2, \frac{-1}{2}$ **c.** 2 or $\frac{1}{2}$ **d.** 4 or $\frac{1}{4}$	**1.0**
45.	If four numbers are in A.P. such that their sum is 32 and ratio of the product of extremes to the product of mean is 7:15 then the common difference is: **a.** 2 **b.** ±2 **c.** 4 **d.** ±4	**1.0**

Key

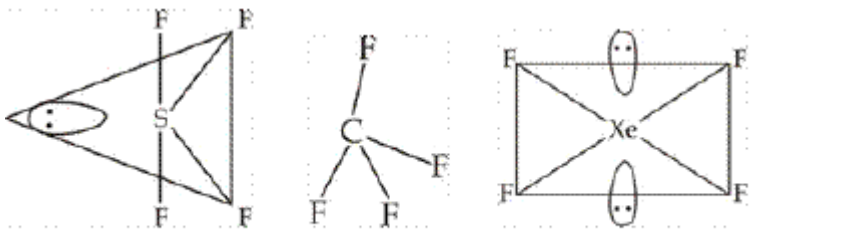
Question Number	Correct Option	Question Number	Correct Option	Question Number	Correct Option
1.	B	16.	D	31.	B
2.	C	17.	D	32.	A
3.	A	18.	B	33.	B
4.	D	19.	B	34.	C
5.	A	20.	C	35.	B
6.	B	21.	B	36.	A
7.	A	22.	D	37.	D
8.	A	23.	C	38.	B
9.	B	24.	D	39.	B
10.	A	25.	C	40.	A
11.	B	26.	C	41.	C
12.	D	27.	A	42.	B
13.	A	28.	B	43.	B
14.	B	29.	A	44.	D
15.	C	30.	C	45.	D

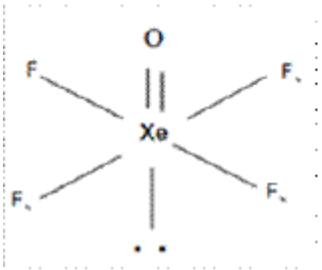
Explanation

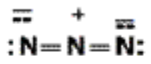
Question Number	Explanation
1.	Work done = Area under F–d graph w = area of rectangle + area of triangle $= (4 \times 2) + (\frac{1}{2} \times 5 \times 2)$ $= 8 + 5$ $= 13$ J
2.	$x = 3t - 4t^2 + t^3$ $v = \frac{dx}{dt} = 3 - 8t + 3t^2$ $a = \frac{dv}{dt} = -8 + 6t$ m = 3 g $= 3 \times 10^{-3}$ kg Acceleration at t = 4 sec $\therefore a = -8 + 6 \times 4$ $= -8 + 24$ $= 16$ m/s^2 w = F x x $= m \times a \left[3t - 4t^2 + t^3\right]$ $= 3x10^{-3}x16\ [3x4 - 4x4^2 + 4^3]$ $= 3x10^{-3}x16x12 = 576$ mJ
3.	$w = \int_0^5 F dx = \int_0^5 \left(7 - 2x + 3x^2\right) dx$ $= \left[7x - \frac{2x^2}{2} + \frac{3x^3}{3}\right]_0^5 = \left[7x - x^2 + x^3\right]_0^5$ $= 7 \times 5 - (5)^2 + (5)^3$ $= 35 - 25 + 125$ $= 135$ J
4.	E (Kinetic Energy) = $\frac{1}{2}mv^2 = \frac{1}{2}\frac{m^2v^2}{m}$

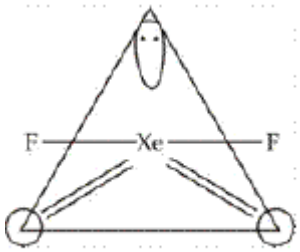
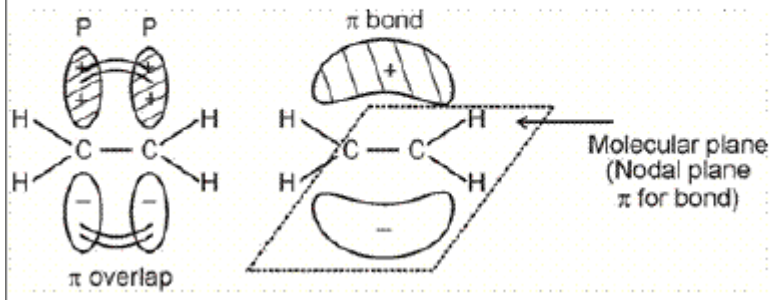
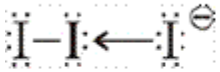
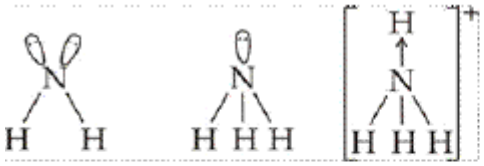
	$E = \frac{1}{2}\frac{P^2}{m}$ $\therefore P^2 = 2mE$ or $P = \sqrt{2mE}$ i.e. P α $\sqrt{m}$ $\frac{P_1}{P_2} = \sqrt{\frac{m_1}{m_2}} = \sqrt{\frac{m}{4m}} = \sqrt{\frac{1}{4}} = \frac{1}{2}$ $\therefore$ $P_1 : P_2 = 1:2$
5.	Centripetal force acts always towards the centre and displacement is tangential. Then angle between F and S is 90^0.  $w = FS\cos\theta = FS\cos 90$ = 0
6.	W= $u_2 - u_1 = \frac{1}{2}kl_2^2 - \frac{1}{2}kl_1^2$ $= \frac{1}{2}k\left(l_2^2 - l_1^2\right)$ $\therefore$ W= $\frac{1}{2}k\left(l_2^2 - l_1^2\right)$
7.	$P = \frac{\text{Work done}}{\text{Time}} = \frac{\vec{F}.\vec{ds}}{dt}$ $\frac{\vec{ds}}{dt} = \vec{v}$ $\therefore P = \vec{F}.\vec{v}$
8.	P = $\vec{F}.\vec{v}$ $= \left(60\hat{i} + 15\hat{j} - 3\hat{k}\right).\left(2\hat{i} - 4\hat{j} + 5\hat{k}\right)$ = 120 – 60 – 15 = 120 – 75 = 45 watts
9.	If a is uniform acceleration of the body,

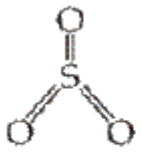
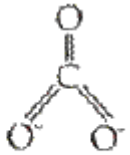
	$v_1 = u_1 + at_1$ $u_1 = 0 \Rightarrow a = \frac{v_1}{t_1}$ Velocity of body at time t sec. $v = 0 + at = \frac{v_1}{t_1} t$ Power = $\bar{F}.\bar{v}$ $= ma.v = m.\frac{v_1}{t_1}.\frac{v_1}{t_1} t$ $P = \frac{mv_1^2}{t_1^2} t$
10.	$W = P \times t = \frac{1}{2} mv^2 \quad \therefore v^2 = \frac{2Pt}{m}$ $v = \left(\frac{2Pt}{m}\right)^{1/2} = \frac{ds}{dt}$ $ds = \left(\frac{2Pt}{m}\right)^{1/2} dt$ $\therefore$ Integrating on both the sides $\int ds = \int \left(\frac{2pt}{m}\right)^{1/2} dt$ $s = \left(\frac{2P}{m}\right)^{1/2} \int t^{1/2} dt$ $= K.\frac{t^{3/2}}{3/2} \quad = K\frac{2}{3} t^{\frac{3}{2}}$ $\therefore S \alpha t^{3/2}$
11.	$P = \bar{F}.\bar{v} = \frac{d}{dt}(m\vec{v}).\vec{v} = v^2 \frac{dm}{dt} = v^2 \frac{d}{dt}(V \times \rho)$ Here V = volume and v is velocity $P = v^2 \frac{d}{dt}(A.x \times \rho) = v^2 A\rho.\frac{dx}{dt} = v^2 A\rho(v)$ $= v^3 A$ $\therefore P \alpha v^3$
12.	$P = \bar{F}.\bar{v}$ = mgv = 500 x 9.8 x 0.4 =1960 watts

	$P = \frac{1960}{746}$ hP = 2.62 hP $\because$ 1 hp = 746 watts
13.	$\vec{F} = \hat{i} - \hat{j} + 2\hat{k}$ $\vec{s} = 2\hat{j}$ (since the body moves along the y axis only) $\therefore W = \vec{F}.\vec{s}$ $= (\hat{i} - \hat{j} + 2\hat{k}).(2\hat{j}) = -2J$
14.	Work done $W = Fs\cos\theta = Fs\cos 120°$ $= -Fs\sin(30°)$ $= -10 \times 5 \times \frac{1}{2}$ = –25 J
15.	$W = \int_{r_1}^{r_2} \vec{F} \cdot \vec{dr}$ $= \int_{r_1}^{r_2} \left(3x^2\,\hat{i} + 2y\,\hat{j}\right) \cdot \left(dx\,\hat{i} + dy\hat{j} + dz\hat{k}\right)$ $= \int_{r_1}^{r_2} \left(3x^2 dx + 2ydy\right)$ $= \left[\frac{3x^3}{3} + \frac{2y^2}{2}\right]_{(4,6)}^{(8,12)}$ $= \left[(8)^3 - (4)^3\right] + \left[(12)^2 - (6)^2\right]$ = [512 − 64] + [144 − 36] = 556 J
16.	 Sea Saw Tetrahedral Square Planar

17.	$N_2 \rightarrow \sigma 1s^2\, \sigma^* 1s^2\, \sigma 2s^2\, \sigma^* 2s^2$ $\pi 2px^2$ $\pi 2py^2$ $\sigma 2p_z^2$ It is diamagnetic (No unpaired e⁻) $N_2^- \rightarrow \sigma 1s^2\, \sigma^* 1s^2\, \sigma 2s^2\, \sigma^* 2s^2$ $\pi 2px^2$ $\pi 2py^2$ $\sigma 2p_z^1$ $\pi^* 2px^1$ $\pi^* 2py$ $\sigma^* 2p_z$ One unpaired e⁻ (paramagnetic)
18.	Acc to VSEPR Theory, in $XeOF_4$, No. of electrons contributed by Xe = 8 No. of electrons contributed by O = 2 No. of electrons contributed by 4F = 4 (1 e⁻ by each F) Total number of electrons around Xe in $XeOF_4$ = 14 (7 electron pairs) Number of electrons used in 5 σ bonds (1 Xe-O and 4 Xe-F) = 10 Number of electrons used in 1 π bonds (1 Xe=O) = 2 Total Number of Bonding pairs is therefore 6. Total Number of Non Bonding (lone) pairs is therefore = 7-6 = 1. 
19.	Hybridisations of central atom, geometry and shapes of NO_2 and O_3 are NO_2 Hybridisation – sp^2 Geometry - triangular planar Shape – bent O_3 Hybridisation – sp^2 Geometry - triangular planar Shape – bent In both the molecules, individual bond moments do not cancel out each other's effects giving rise to a net permanent dipole moment in the molecule.

20.	The structure for azide ion is represented as  Formal charge on any bonded atom in a molecule (Lewis structure) is calculated as Formal charge = [Total number of valence electrons in the free atom] – [total number of non bonding electrons] – ½ [Total number of bonding electrons] Since both the terminal nitrogen atoms are identical, The formal charge on each terminal nitrogen atom = 5-4- ½ (4) = 5-4-2 = -1
21.	ClO_2 is an odd electron molecule. Total number of valence electrons in chlorine dioxide are 23 [7(Cl) + 2 x 8 (O)]. Thus one electron is always unpaired and is responsible for paramagnetism.
22.	$B_2 = \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \pi 2p_x^2$ B.O $= \frac{1}{2}(6-4) = 1$ No unpaired e^-, so diamagnetic
23.	O–F (17), Bond order = 1.5 Unpaired e^- = 1, paramagnetic F_2 (18), Bond order = 1 No unpaired e^-, diamagnetic
24.	$O_2 \rightarrow \sigma\, 1s^2\, \sigma^* 1s^2\, \sigma\, 2s^2\, \sigma^* 2s^2\, \sigma\, spz^2 \begin{matrix} \pi 2px^2 & \pi^* + 2px^1 \\ \pi 2py^2 & \pi^* + 2py^1 \end{matrix} \sigma^* 2pz$ B.O $= \frac{1}{2}(10-6) = 2$ $O_2^+ \rightarrow \sigma\, 1s^2\, \sigma^* 1s^2\, \sigma\, 2s^2\, \sigma^* 2s^2\, \sigma\, spz^2 \begin{matrix} \pi 2px^1 & \pi^* + 2px^0 \\ \pi 2py^2 & \pi^* + 2py^1 \end{matrix} \sigma^* 2pz$ B.O $= \frac{1}{2}(10-5) = 2.5$

25.	 Sea-saw
26.	In KO_2, The cation is K^+ which has noble gas core and thus has no unpaired electron. The anion is supero11de ion, O_2^-,which has MO configuration $KK\left(\sigma 2s\right)^2\left(\sigma^* 2s\right)^2\left(\sigma 2p_z\right)^2\left(\pi 2p_x^{\ 2} = \pi\ 2p_y^{\ 2}\right)\ \left(\pi^* 2p_x^{\ 2} = \pi^*\ 2p_y^{\ 1}\right)$. There is one unpaired electron present in π^* $2p_y$ orbital.
27.	The pi bond in ethene is formed by lateral overlap of unhybridised *p* orbitals, on each carbon, perpendicular to the C-C sigma bond plane. Since each of these unhybridized p orbital has a node in the molecular plane only, the nodal plane in the pi bond generated willbe same as the molecular plane of ethene. 
28.	I_3^- is formed when I^- (Lewis base) donated one lone pair to I_0 (Lewis acid)  Lone pair on central atom = 3 and bond pair = 2 Thus, X = 2, Y = 3
29.	 lp – lp >lp – bp>bp – bp L.P–L.P repulsion is maximum in NH_2^-. So decrease in bond angle is maximum in NH_2^-. Hence lowest bond angle is in case of NH_2^-. NH_3 has one lone pair. So only L.P – B.P & B.P – B.P repulsions are these whereas in NH^+_4, all B.Ps are there. Hence equal repulsions are there between B.P – B.P. So angle is maximum.

30.	  Sp^3 hybridised sulphur Sp^2 hybridised carbon Both of them have triangular planar geometry.
31.	$a = 5, l = 45$ $\because$ there are 9 A.M.'s $\therefore$ No. of terms = 9 + 2 = 11 $\therefore S_n = \frac{n}{2}(a+l)$ $= \frac{11}{2}(5+45)$ $= \frac{11}{2}\times 50 = 275$ $\therefore$ Required sum= 275 – (5 + 45) = 225
32.	$\frac{m^{r+2}+n^{r+2}}{m^{r+1}+n^{r+1}} = \frac{m+n}{2}$ $\Rightarrow 2m^{r+2}+2n^{r+2} = m^{r+2}+nm^{r+1}+mn^{r+1}+n^{r+2}$ $\Rightarrow m^{r+1}(m-n) = n^{r+1}(m-n)$ $\Rightarrow m^{r+1} = n^{r+1}$ $\Rightarrow \left(\frac{m}{n}\right)^{r+1} = 1$ $\Rightarrow \left(\frac{m}{n}\right)^{r+1} = \left(\frac{m}{n}\right)^{\circ}$ $\Rightarrow r+1 = 0$ $r = -1$
33.	$\because$ 11 numbers are inserted $\therefore$ Total no. of terms = 11 + 2 = 13 a_{13} =49 a + 12d = 49 a = 1

	$\therefore 12d = 49 - 1$ $= 48$ $\therefore d = 4$ Sixth no. is seventh term of A.P. $\therefore\ a_7 = a + 6d = = 1 + 6 \times 4 = 25$
34.	$a_m = a + (m-1)d$ $a_n = a + (n-1)d$ A.M. between m^{th} and n^{th} term $= A.M._1 = \frac{a + (m-1)d + a + (n-1)d}{2}$ $= \frac{2a + (m+n-2)d}{2}$ $a_p = a + (p-1)d$ $a_q = a + (q-1)d$ A.M. between p^{th} and q^{th} term $= A.M._2 = \frac{2a + (p+q-2)d}{2}$ $\because A.M._1 = A.M._2$ $\therefore \frac{2a + (m+n-2)}{2} = \frac{2a + (p+q-2)d}{2}$ $\Rightarrow 2a + (m+n-2)d = 2a + (p+q-2)d$ $\Rightarrow (m+n-2)d - (p+q-2)d$ $\Rightarrow m + n - 2 = p + q - 2$ $\Rightarrow m + n = p + q$
35.	$a + b = \frac{25}{12}$ (i) Let 2n A.M.s are inserted So, total number of terms = 2n+2 $S_{2n+2} = \frac{2n+2}{2}(a+b)$

	$= \frac{2(n+1)}{2} . \frac{25}{12}$ (ii) $= \frac{25(n+1)}{12}$ (ii) Sum of A.M.s = S_{2n+2} (a+b) (Using (i) and (ii) $= \frac{25(n+1)}{12} - \frac{25}{12}$ $= \frac{25(n+1-1)}{12} = \frac{25n}{12}$ (iii) According to the questions: Sum of A.M. = 2n + 2 $\Rightarrow \frac{25n}{12} = 2n + 2$ (from iii) $\Rightarrow 25n = 24n + 24$ $\Rightarrow n = 24$ $\Rightarrow 2n = 48$ i.e. No. of terms inserted = 48
36.	For first set Since n arithmetic means are inserted between p and 2q, so total number of terms = n + 2 Hence, $t_{n+2} = 2q$ $p + (n+2-1)d_1 = 2q$ $\Rightarrow p + (n+1)d_1 = 2q$ $\Rightarrow d_1 = \frac{2q-p}{n+1}$ $\therefore m^{th}$ mean = $(m+1)^{th}$ term of A.P. $= p + (m+1-1)d_1$ $= p + m\frac{2q-p}{n+1}$ (1) Similarly, For second set : $T_{n+2} = q$ $\Rightarrow 2p + (n+2-1)d_2 = q$

	$\Rightarrow d_2 = \frac{q-2p}{n+1}$ $\therefore m^{th}$ mean = $(m+1)^{th}$ term $= 2p + (m+1-1)\frac{q-2p}{n+1}$ $= 2p + \frac{m\ q-2p}{n+1}$ (2) According to the questions, $p + \frac{m(2q-p)}{n+1} = 2p + \frac{m(q-2p)}{n+1}$ $\Rightarrow \frac{pn+p+2qm-mp}{n+1} = \frac{2pn+2p+mq-2mp}{n+1}$ $\because n+1 \neq 0$ p(n+1–m) + 2qm = 2p(n+1–m) + mq $\Rightarrow qm = p(n+1-m)$ $\frac{p}{q} = \frac{m}{n+1-m}$
37.	$\because$ p, q, r are in A.P. $\therefore$ 2q = p + r (i) Also p+1, q, r are in G.P. $\therefore q^2 = (p+1)\,r$(ii) Also p, q and r + 2 are in G.P. $\therefore q^2 = p\,(r+2)$ (iii) From (ii) and (iii) pr + r = pr + 2p $\Rightarrow$ r = 2p (iv) By putting this in (i): 2q = p + 2p = 3p $\therefore q = \frac{3}{2}p$ (v) By putting values from (v) and (iv) in (ii),

	$\left(\frac{3}{2}p\right)^2 = (p+1)2p$ $\Rightarrow \frac{9}{4}p^2 = 2p^2 + 2p$ $\Rightarrow 9p^2 = 8p^2 + 8p$ $\Rightarrow p^2 = 8p$ $\Rightarrow p = 8 \qquad \because p \neq 0$ $\therefore q = \frac{3}{2} \times 8 = 12$
38.	$\frac{a+b}{2} = 5$ $a + b = 10$ (i) $\sqrt{ab} = 4$ $ab = 16$ (ii) $(a+b)^2 = 10^2$ $a^2 + b^2 + 2ab = 100$ $a^2 + b^2 = 100 - 2 \times 16$ $a^2 + b^2 = 100 - 32$ = 68 $(a-b)^2 = a^2 + b^2 - 2ab$ $= 68 - 2 \times 16$ = 68 – 32 = 36 a – b = ± 6 (iii) Adding (i) + (ii) 2a = 16 or 2a = 4 a = 8 or a = 2
39.	Let the two numbers be a and b $\therefore a - b = 120$ and $\frac{a+b}{2} - \sqrt{ab} = 50$

	$\Rightarrow (\sqrt{a})^2-(\sqrt{b})^2=120$ and $(\sqrt{a})^2+(\sqrt{b})^2-2\sqrt{ab}=100$ $\Rightarrow (\sqrt{a}+\sqrt{b})(\sqrt{a}-\sqrt{b})=120$ and $(\sqrt{a}-\sqrt{b})^2=10^2$ $\Rightarrow \sqrt{a}-\sqrt{b}=10$ (i) $\therefore (\sqrt{a}+\sqrt{b}).10=120$ $\Rightarrow \sqrt{a}+\sqrt{b}=12$ (ii) Adding (i) & (ii), $2\sqrt{a}=22$ $\Rightarrow \sqrt{a}=11$ $\therefore \sqrt{b}=12-11=1$ [from eq. (ii)] $\therefore$ a = 121, b = 1
40.	$\because d=3$ $\therefore a_9=a+8d=a+8\times3=a+24$ (1) Middle term of A.P. = $a_5=a+4d=a+4\times3$ $=a+12$ (2) Last 9 terms are in G.P. with r = 2 and first term = b = a_9 = a + 24 Using (1) Middle term of G.P. $t_5=br^4=b(2)^4$ = $(a+24)^{16}$ Now, according to the question, a+12=16 (a+24) $\Rightarrow a+12=16a+384$ $\Rightarrow 12-384=15a$ $\Rightarrow \frac{-375}{15}=a$ $\Rightarrow a=\frac{-124}{5}$ $\therefore b=a_9=\frac{-124}{5}+24=\frac{-124+120}{5}=\frac{-4}{5}$

41.	A.M. (m) $= \frac{x+y}{2}$ $\Rightarrow 2m = x+y$ (i) x, a, b, y are in G.P. as a and b are Geometric Means b/w x & y $\therefore a^2 = xb \Rightarrow x = \frac{a^2}{b}$ $b^2 = ay \Rightarrow y = \frac{b^2}{a}$ $\therefore x+y = \frac{a^2}{b} + \frac{b^2}{a}$ $\Rightarrow 2m = \frac{a^3+b^3}{ab}$ [using (i)] $\Rightarrow m = \frac{a^3+b^3}{2ab}$
42.	$T_m = a = a_1 + (m-1)d = AR^{m-1}$ $T_n = b = a_1 + (n-1)d = AR^{n-1}$ $T_p = c = a_1 + (p-1)d = AR^{p-1}$ $\therefore b-c = (n-p)d$ $c-a = (p-m)d$ $a-b = (m-n)d$ $\therefore a^{b-c}.b^{c-a}.c^{a-b} = AR^{m-1\ (n-p)d}.\ AR^{n-1\ (p-m)d}.\ AR^{p-1\ (m-n)d}$ $= A^{(n-p+p-m+m-n)d}.R^{d(mn-mp-n+p+np-nm-p+m+pm-pn-m+n)}$ $= A^{\circ}.R^{\circ} = 1$
43.	Let the four numbers be a, ar, ar^2, ar^3 So, $ar^2 - a = 9$ and $ar - ar^3 = 18$ $\Rightarrow a(r^2-1) = 9$ and $ar(1-r^2) = 18$ $\Rightarrow \frac{ar(1-r^2)}{a(r^2-1)} = \frac{18}{9}$ $\Rightarrow -r = 2 \Rightarrow r = -2$ Now, $a(r^2-1) = 9 \Rightarrow a.3 = 9 \Rightarrow a = 3$

	$\therefore$ Numbers are, 3, –6, 12 and –24.
44.	Let the four numbers in G.P. be $\frac{a}{r^3}, \frac{a}{r}, ar, ar^3$ then $\frac{a}{r^3}.\frac{a}{r}.ar.ar^3 = 4096$ $a^4 = 4096$ $a^4 = 8^4 \Rightarrow a = 8$ (i) $\frac{a}{r^3} + \frac{a}{r} + ar + ar^3 = 85$ $\Rightarrow 8\left(\frac{1}{r^3} + r^3\right) + 8\left(\frac{1}{r} + r\right) = 85$ $\Rightarrow 8\left[\left(\frac{1}{r} + r\right)^3 - 3.\frac{1}{r}r.\left(\frac{1}{r} + r\right)\right] + 8\left(\frac{1}{r} + r\right) = 85$ $\Rightarrow 8\left(\frac{1}{r} + r\right)^3 - 24\left(\frac{1}{r} + r\right) + 8\left(\frac{1}{r} + r\right) = 85$ $\Rightarrow 8\left(\frac{1}{r} + r\right)^3 - 16\left(\frac{1}{r} + r\right) - 85 = 0$ $\Rightarrow$ Let $\frac{1}{r} + r = x$ $\Rightarrow 8x^3 - 16x - 85 = 0$ $\Rightarrow (2x - 5)(4x^2 + 10x + 17) = 0$ $\Rightarrow 2x - 5 = 0$ or $4x^2 + 10x + 17 = 0$ $\Rightarrow x - \frac{-10 \pm \sqrt{100 - 16\ 17}}{8}$ $= \frac{-10 \pm \sqrt{-172}}{8} = \frac{-10 \pm \sqrt{172}\,i}{8}$ (Not possible) $\therefore x = \frac{5}{2}$ $\Rightarrow \frac{1}{r} + r = \frac{5}{2}$ $\Rightarrow \frac{1 + r^2}{r} = \frac{5}{2}$ $\Rightarrow 2r^2 + 2 = 5r$

	$\Rightarrow 2r^2 - 5r + 2 = 0$ $\Rightarrow (r-2)(2r-1) = 0$ $r = 2$ or $r = \frac{1}{2}$ $\therefore$ Common Ratio $= r^2 = 4$ or $\frac{1}{4}$
45.	Let the four numbers be (a–3d), (a–d), (a+d), (a+3d) Then, $a + 3d + a - d + a + d + a + 3d = 32$ $\Rightarrow 4a = 32$ $\Rightarrow a = 8$ (i) Further, $\frac{(a-3d)(a+3d)}{(a-d)(a+d)} = \frac{7}{15}$ $\Rightarrow \frac{a^2 - 9d^2}{a^2 - d^2} = \frac{7}{15}$ $\Rightarrow \frac{64 - 9d^2}{64 - d^2} = \frac{7}{15}$ $\Rightarrow 960 - 135d^2 = 448 - 7d^2$ $\Rightarrow 512 = 128d^2$ $\Rightarrow d^2 = 4$ $d = \pm 2$ $\therefore$ Common Difference = $2d = \pm 4$