

STRUCTURE AND BONDING MARKING SCHEME

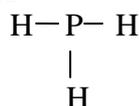
1. 1989 Q6

- (i) 105KJ
- (ii) As the bond length increases, bond energy decreases

2. 1989 Q8

Does not conduct, because ions are not mobile (immobile)

4. 1991 Q21



5. 1993 Q13

Graphite has free electrons unlike diamond which has no free electrons

6. 1993 Q23c

- (i) $\text{SiCl}_2\text{PCl}_3$ and SiCl_4

The boiling points are at room temperature and melting points at room temperature

- (ii) AlCl_3 is molecular/covalent but MgCl_2 is ionic (smaller)

- (iii) MgCl_2 has the highest temperature range or calculations on temperature ranges of all for MgCl_2

7. 1994 Q14

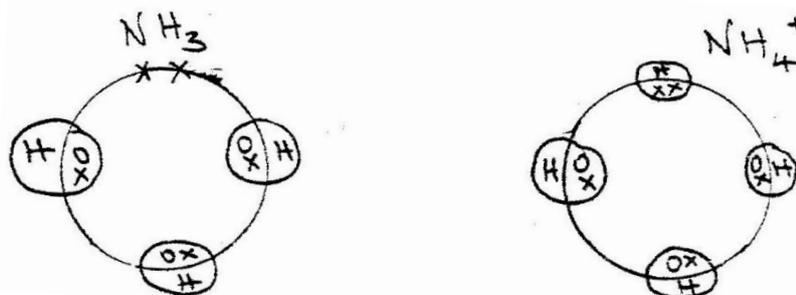
M- Metallic bonding

N- Ionic bonding

8. 1994 Q1 P2

- (a) T -2.8.2 U - 2.8.3 V - 2.8.4 W - 2.8.5 X - 2.8.6 Y - 2.8.7
- (b) Period 3, all elements have three energy levels
- (c) Atomic radius of X is smaller than that of V. X has more protons so nuclear charge is higher hence attracts outermost electrons more
- (d) UW
- (e) Ionic or electrovalent. Because T would react with Y by donating its outermost electrons to the atoms of Y
- (g) X^{2-} because it has a stable electronic arrangement 2.8.8 or X^{2+} has unstable electronic arrangement (2.8.4)
- (h) (i) $\text{XO}_3, \text{W}_2\text{O}_5, \text{VO}_2$ or $\text{XO}_2, \text{W}_2\text{O}_5$
- (ii) TO

9. 1996 Q5 P1



It has a lone pair of electrons which it uses to form a dative bond with H ions

(1 mark)

10. 1996 Q11

Number of neutrons =1

Number of electrons=1

11. 1996 Q4 P2

a) C=6, H=1, Na= 11, Ne = 20.

b) Ca^+ 2, 8, 8

P^{3-} 2, 8, 8

c) $-259 + 273 = 14\text{k}$.

d) Red phosphorus this is because it has a higher melting point.

e) The one of atomic number 24 because it is closer to the R.A.M (24.3) that means it contributes to R.A.M more than the other two (2 marks)

f) Al_4C_3

(1 mark)

g) The melting point of a magnesium is higher than of sodium because its effective nuclear charge is higher/ it contributes more electrons to the metallic bonding as compared to Na which contributes/magnesium has 2 outer electron(+2) where as sodium has only one(+1) which can be delocalized. (2 marks)

12. 1998 Q5

(a) -D

(b) -E

13. 1998 Q10

^{16}N

^{15}P

14. 1998 Q11

(a) In Diamond all the C- atoms are joined together by covalent in a three dimension (3 – D) structure/ Tetrahedral structure thus very hard

(b)The C- atoms in graphite are bonded in layers/ hexagonal strata's, those thus slide over one another easily.

15. 1998 Q7d P2

Ionic (I) T. Is a metal while U is a non- metal ($\frac{1}{2}$). Therefore T loses electrons to U. T is electropositive while U electronegative. ($\frac{1}{2}$)

16. 1999 Q6 P1

Li= 2:1 F=2:7

Ionic bond

Bond is formed between a metal and a non-metal or Lithium loses electrons while fluorine gains

17. 1999 Q25

HCL is covalent and dissolves in methylbenzene but does not ionize/dissociate. Addition of water causes HCL to ionize/dissociate⁺ ions react with the carbonate to produce carbon dioxide gas

18. 1999 Q3e p2

1 mark for labelling N and Q

0 mark for showing correct distribution of electrons

19. 2000 Q16 P1

When dissolves in water or fused / molten state

20. 2000 Q6a P2

- (a) (i) M. Graphite
N diamond
- (ii) 1. Tips of drills/drilling devices
2. Jewellery
3. Glass cutters/Cutting glass
4. Making bearings
5. Padlocks
6. Ornaments
- (iii) M/Graphite: The fourth electron of each carbon is unbounded/free /delocalized

21. 2001 Q23 P1

- (a) Copper metal M
(b) Magnesium chloride K

22. 2002 Q16 P1

Covalent bonds exist between two iodine atoms ($\frac{1}{2}$) in an iodine molecule (1) Van der Waals forces exist between two or more molecules of iodine (1) covalent bonds are stronger than Van der Waals forces

23. 2002 Q20 P1

- I Conducts (1)
II Ionic (1)
III Covalent (1)

24. 2003 Q1b P2

- i) KB/KF/KI/KA
ii) - Ionic /electrovalent bonding
- K loses an electron to form K⁺ ions
- A gains electrons to form A⁻ ions
- The ions combine to form KA

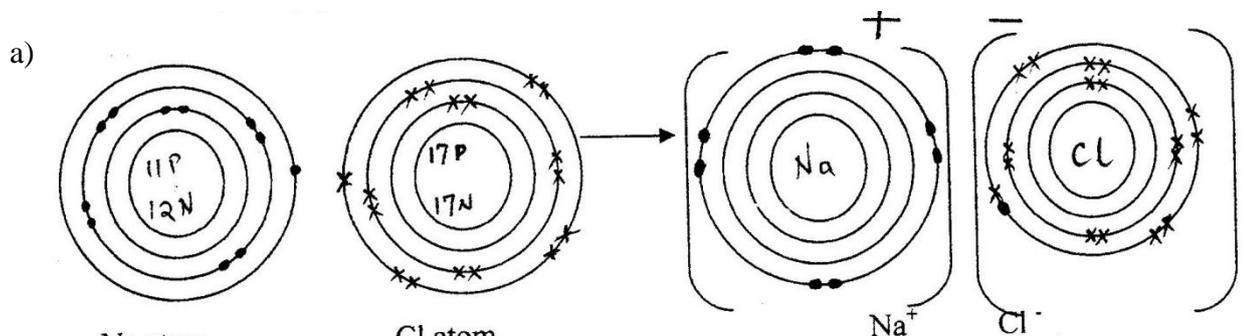
25. 2004 Q6 P1

In diamond each carbon atom is covalently bonded to four other carbon atoms in a rigid giant atomic structure (1)

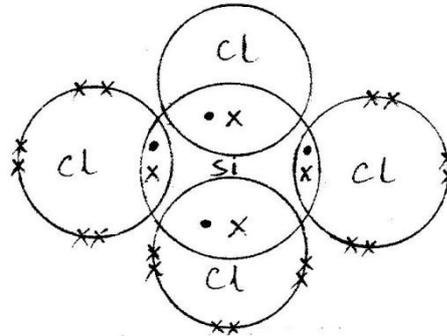
In graphite each carbon atom is covalently bonded to three other carbon atoms in layers (i) The layers are held together by weak van der Waals forces which are broken quite easily (1)

26. 2005 Q4 P1

Si = 2:8:4 Na = 2:8:1 and Cl = 2:8:7



b) Silicon (IV) Tetra Chloride

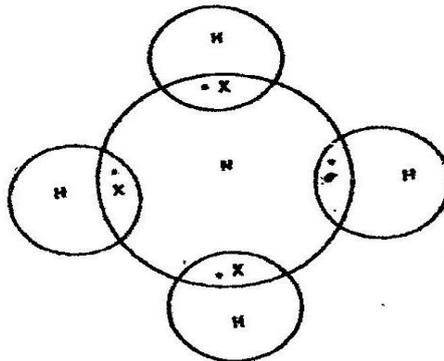


27. 2005 Q4c P2

- i) I – ionic II – Metallic
- ii) IV – sulphur has molecular bond which require less energy to break, hence low MP and Bp

28. 2006 Q20 P1

- a) Covalent bond is formed by equal contribution of the shared electrons by the atoms. Co-ordinate bond is where the shared electrons are contributed by one
- b)



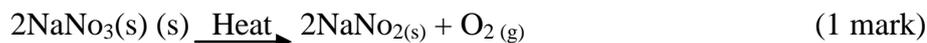
29. 2006 Q3a-b P2

- a) Isotopes are atoms with same atomic number (protons) but different mass numbers while allotropes are different forms/structure of an element in the same physical state. (2 marks)
- b) (i) Atomic radius decrease across a period/E has the highest nuclear attraction/ E has the highest no. of protons. (2 marks)
- (ii)

	A					B						
	C	D								E		
(ii)			ed in Advertising sign Lamp				F					mps

Weather/metrological/arch welding. (1 mark)





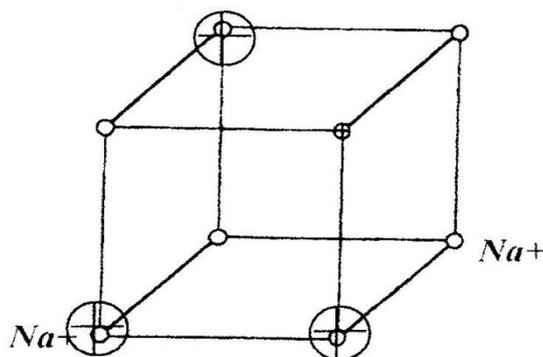
30. 2007 Q3b p2

Chlorine molecule is smaller and the strength of vanderwaals forces between molecules of chlorine is weak as compared to iodine.

31. 2007 Q29 P1

- (a) Metallic bonding
 (b) Group 1 each atom contains one electron in its outer most energy level

32. 2007 Q5a-c P2



- (ii) The ions are not free at 25°C since the salt is in solid state but between 801°C and 1413°C the ions are free since electrostatic forces between the ions is overcome
 (b) Ammonia react with water to form ammonia solution
 (c) Dative/ co-ordinate bond

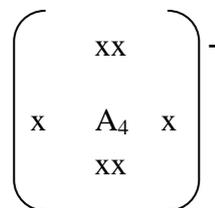
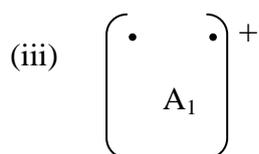
33. 2008 Q2b P2

- (i) Period 2, two energy levels
 (ii) A2 has greater atomic number than A1
 A2 has greater nucleus charge than A1
 A2 has more protons than A1

Therefore

- I Across the period from left to right nuclear charge, exert greater pull on Electrons hence reduction in size.
 II A4 gains electrons, incoming electron is repelled by existing electrons, electrons cloud increases.

(ii) A2



34. 2009 Q6a, c P2

Ion	Number of protons	Number of neutrons	Mass Number	Electron arrangement

W	17 ½ mark	20	37 ½ mark	2.8.8
X4+	14	14 ½ mark	28	2.8 ½ mark

(c) Magnesium it has a higher nuclear charge which pulls outer electrons more strongly

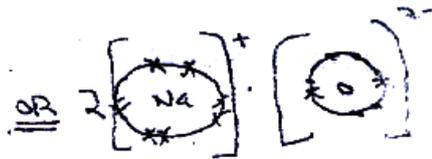
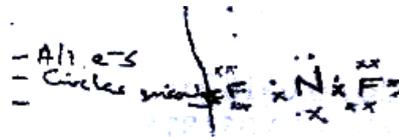
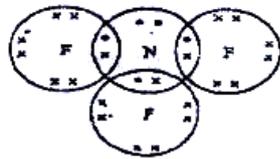
35. 2009 Q5 P1

Oxygen exists as diatomic molecules (½) / Simple Molecular

The forces of attraction between the molecules are very weak (½) therefore less energy is required to separate them. (½)

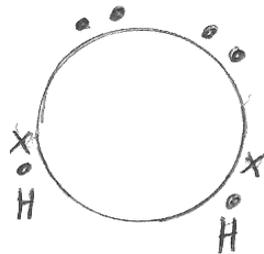
Atoms are sodium are held by strong metallic bonds (1). These require a lot of energy to break them (½)

36. 2009 Q8 P1

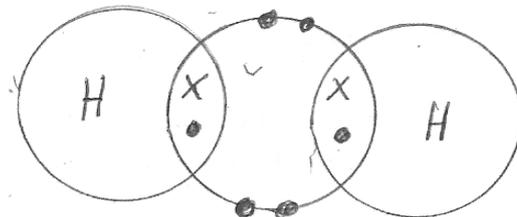


37. 2010 Q14 P1

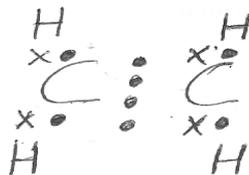
a) i) H₂O



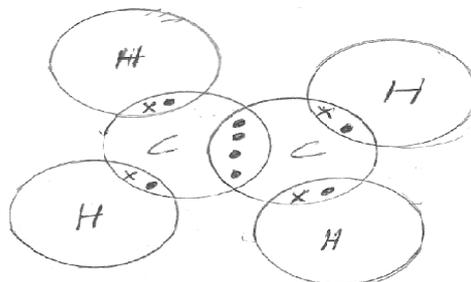
OR



ii) C₂H₄



OR



b) Dative covalent bond / dative / co-ordinate.

38. 2010 Q27 P1

a) 2,8,8 / 2.8.8

b) K⁺ < 5²⁻ < P³⁻

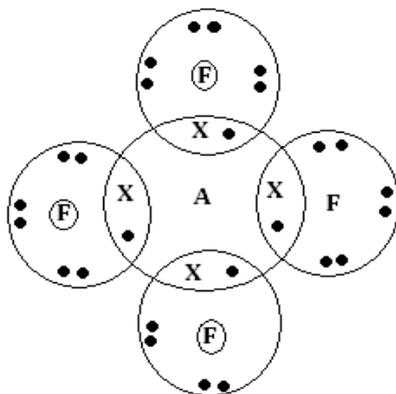
Potassium has 19 protons attracting 18e's, sulphur has 16 protons attracting 18e's and phosphorus has 15 protons attracting 18e's. therefore the electrons in potassium ions are attracted more strongly making it the smallest ion.

39. 2010 Q3 P2

- a) i) Metallic bonds in S are stronger than in R
 ii) V is monoatomic while U is diatomic
 The Van der Waals forces in v are weaker than in U
- b) W reacts more vigorously
 It is easier to lose the outer/valence electrons in W than in T
 W is more electropositive than R
 Reactivating of groups elements. Increases down the group
- c) $4T_{(s)} + 5O_{2(g)} \longrightarrow 2T_2O_{5(g)}$
 $4P_{(s)} + 5O_{2(g)} \longrightarrow 2P_2O_5$
- d) $2R_{(s)} + 2H_2O_{(l)} \longrightarrow 2ROH_{(aq)} + H_{2(g)}$
 Moles of gas = $\frac{600}{24000} = 0.025$ moles
 Moles of R = $2 \times 0.025 = 0.05$ moles
 RAM = $\frac{1.15}{0.09} = 23$
- e) Used in florescent bulbs / lamps
 Used in arc welding
 Used in fire extinguishers
 Used as a preservative in museum

40. 2011 Q5b (iii-vii) P2

- (i) E_2G_3 / A_2O_3
 (ii) Ionic bond/ electrovalent bond
 (iii)
 - E has smaller atomic radius than C or vice versa
 - E has more protons than C
 (iv)



- (v) B is inert/ has stable configuration / has octet electron in the outermost/ belong to group 8 of periodic table/ has noble gas configuration

41. 2011 Q28 P1

- a) Single covalent bonding / covalent
 - Dative / co-ordinate bonding
- b) 7 bonds x 2 = 14 electrons

42. 2012 Q7 P1

