CHEMISTRY MCQs

1. Match List-I with List-II and select the correct answer from the codes given below:

	List-I		List-II
A.	Morphine	1.	Antiseptic
B.	Sodium	2.	Alloy
C.	Boric acid	3.	Analgesic
D.	German silver	4.	Kerosene oil

Codes:

	A	B	C	D
(a)	4	3	1	2
(b)	2	4	3	1
(c)	3	1	4	2
(d)	3	4	1	2

2. Match List-I with List-II and select the correct answer given below:

	List-I		List-II
A.	Electron	1.	Goldstein
B.	Proton	2.	J.J. Thomson
C.	Neutron	3.	Chadwick
D.	Positron	4.	Anderson

Codes:

	A	B	C	D
(a)	2	1	3	4
(b)	4	3	1	2
(c)	2	1	4	3
(d)	4	3	2	1

3. Match List-I with List-II

	List-I		List-II
A.	Thomson model	1.	Dual nature of electron
B.	Rutherford model	2.	Nuclear theory
C.	Bohr's model	3.	Plum pudding model
D.	de-Broglie theory	4.	Concept of quantization of energy

Codes:

	A	B	C	D
(a)	3	4	2	1
(b)	2	4	1	2
(c)	2	1	3	4
(d)	3	2	4	1

4. Consider the following parts of spectra:
   1. Visible 2. Infrared
   3. Ultraviolet 4. Microwave

   Which of the following is the correct sequence in which the wavelengths increase?
   (a) 4, 3, 1, 2 (b) 4, 1, 2, 3
   (c) 3, 2, 1, 4 (d) 3, 1, 2, 4

5. Match List-I with List-II and select the correct answer from the codes given below:

	List-I		List-II
A.	Moderator	1.	Uranium
B.	Control rod	2.	Graphite
C.	Fuel rods	3.	Boron
D.	Coolant	4.	Lead
		5.	Sodium

Codes:

	A	B	C	D
(a)	2	1	3	5
(b)	2	3	1	5
(c)	3	2	1	5
(d)	3	4	1	2

6. The difference between a nuclear reactor and atomic bomb is that
   (a) no chain reaction takes place in nuclear reactor while in the atomic bomb there is a chain reaction.
   (b) the chain reaction in nuclear reactor is controlled.
   (c) the chain reaction in nuclear reactor is not controlled.
   (d) no chain reaction takes place in atomic bomb while it takes place in nuclear reactor.

7. Match List-I with List-II and select the correct answer from the codes given below

	List-I		List-II
A.	Zero mass	1.	Positron
B.	Fractional charge	2.	Neutrino
C.	Fractional spin	3.	Quark
D.	Integral spin	4.	Photon

Codes:

	A	B	C	D
(a)	4	3	1	2
(b)	3	2	4	1
(c)	2	3	4	1
(d)	3	2	1	4

8. H_2O is liquid and H_2S is a gas because
   (a) oxygen forms stronger hydrogen level than sulphur.
   (b) oxygen is less electronegative than sulphur.
   (c) atomic radius of oxygen is less than that of sulphur.
   (d) atomic radius of oxygen is greater than that of sulphur.

9. Consider the following statements and select the correct code.
   Assertion (A): A chemical reaction becomes faster at higher temperature.
   Reason (R): At higher temperature, molecular motion becomes more rapid.

Codes:
   (a) Both A and R are true and R is the correct explanation of A.
   (b) Both A and R are true, but R is not correct explanation of A.
   (c) A is true, but R is false.
   (d) A is false, but R is true.

10. The order of appearance of the following with increasing temperature during the refining of crude oil is _____
   (a) Kerosene, gasoline, diesel
   (b) Diesel, gasoline, kerosene
   (c) Gasoline, kerosene, diesel
   (d) Gasoline, diesel, kerosene

11. Consider the following statements:
   If there were no phenomenon of capillarity
   1. It would be difficult to use a kerosene lamp.
   2. One would not be able to use a straw to consume a soft drink.
   3. the blotting paper would fail to function.
   4. the big trees that we see around would not have grown on the earth.

   Which of the statements given above is/are correct?
   (a) 1, 2 and 3 only (b) 1, 3 and 4 only
   (c) 2 and 4 only (d) 1, 2, 3 and 4

12. The blue colour of water in the sea. What is the reason behind the phenomenon?
   (a) Refraction of the blue light by the impurities in sea water.
   (b) Scattering of blue light by water molecules.
   (c) Refraction of blue sky by sea water.
   (d) Absorption of other colours except the blue colour by water molecules.

13. What is " Kiss of death" ?
   (a) A flower whose smell was the basis of a discovery on smell that led to award of 2004 Nobel Prize in Medicine.
   (b) A chemical whose discovery ultimately won the scientists the 2004 Nobel Prize in Chemistry.
   (c) A good wine flavour working on which scientist won the 2004 Nobel Prize in Chemistry.
   (d) A network in brain associated with smell whose discovery led the scientists win the 2004 Nobel Prize in Physiology and Medicine.

14. Hydrogen bomb is based on the principle of
   (a) controlled fusion reaction
   (b) uncontrolled fusion reaction
   (c) controlled fission reaction
   (d) uncontrolled fission reaction

15. Which of the following substances is/are ozone depleting?
   Select the correct answer from the codes given below:
   1. Chlorofluorocarbons
   2. Halons
   3. Carbon tetrachloride

Codes:
   (a) 1 only
   (b) 1 and 2 only
   (c) 2 and 3 only
   (d) 1, 2 and 3

16. Helium is preferred to hydrogen in air balloons because it
    (a) is cheaper
    (b) is less dense
    (c) has greater lifting power
    (d) does not form an explosive mixture with air
17. Which one of the following pairs is correctly matched?
    (a) Silver iodide — Horn silver
    (b) Silver chloride — Artificial rain
    (c) Zinc phosphide — Rat poison
    (d) Zinc sulphide — Philosopher's wool
18. While tinning of brass utensils, the ammonium chloride powder used to clean the hot utensil produces fumes of
    (a) ammonia
    (b) carbon monoxide
    (c) hydrochloric acid
    (d) ammonia and hydrochloric acid
19. Hydrofluoric acid is not kept in glass bottles because it reacts with
    (a) visible light
    (b) sodium oxide of glass
    (c) aluminium oxide of glass
    (d) silicon dioxide of glass
20. In the process of electroplating a utensil with zinc,
    (a) the utensil is made the cathode
    (b) pure zinc is made the anode
    (c) the utensil is made the cathode and pure zinc is made the anode
    (d) the utensil is made the anode and pure zinc is made the cathode
21. Match List-I with List-II and select the correct answer from the codes given below:

	List-I		List-II
A.	Silicon carbide	1.	Photosynthesis
B.	Carbon fibre	2.	Refrigerant
C.	Carbon dioxide	3.	Artificial diamond
D.	Dichloro-difluro-methane	4.	Aircraft

Codes:

	A	B	C	D
(a)	4	3	1	2
(b)	3	4	1	2
(c)	2	3	1	4
(d)	3	2	1	4

22. Match List-I with List-II and select the correct answer from the codes given below:

	List-I		List-II
A.	Sour milk	1.	Malic acid
B.	Vinegar and pickle	2.	Carbonic acid
C.	Soda water	3.	Acetic acid
D.	Apple	4.	Lactic acid

Codes:

	A	B	C	D
(a)	1	2	3	4
(b)	4	3	1	2
(c)	4	3	2	1
(d)	3	4	2	1

23. Enriched uranium is
    (a) Uranium rods kept under special shield
    (b) Natural uranium in which the component of radioactive isotope U^{235} is artificial increased
    (c) Natural uranium mixed with thorium
    (d) Uranium rods coated with chromium
24. The inexhaustible source of energy of the stars is due to
    (a) conversion of hydrogen to helium
    (b) conversion of helium to hydrogen
    (c) decay of radioactive elements
    (d) excess of oxygen that helps burning and release of energy
25. When soggy biscuits are kept inside the fridge for sometime they become crisp because
    (a) cooling releases extra moisture
    (b) humidity inside the fridge is low and extra moisture is absorbed
    (c) humidity inside the fridge is high and extra moisture is absorbed
    (d) pressure inside the fridge is high and helps in releasing extra moisture
26. Which one of the following statements is not true about cosmic rays?
    (a) They are electromagnetic waves
    (b) They have very short wavelength
    (c) They are made of highly energetic charged particles
    (d) They originated from the sun
27. In cold weather, aquatic animals survive even when water to the top layer of the lake freezes into ice because

(a) they can breathe in ice
(b) they have enough of accumulated oxygen inside them
(c) their body structure is such that they can survive without oxygen.
(d) water has highest density of 4°C so underneath the top layer of ice there is layer of water

28. Which one of the following is NOT correct?
(a) Theory of evolution was propounded by Charles Darwin.
(b) The breaking apart of the nucleus of an atom is called fusion.
(c) Dry ice is nothing but solid carbon dioxide.
(d) Telephone was invented by Graham Bell.

29. Consider the following statements:
Assertion (A): LPG is a pollution free vehicular fuel.
Reason (R): Plying of CNG fuelled-buses is recommended for metropolitan cities in India.
Codes:
(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

30. Biogas mainly consists of
(a) Carbon dioxide and hydrogen
(b) Hydrogen and methane
(c) Carbon dioxide and methane
(d) Hydrogen and oxygen

31. Match List-I with List-II and select the correct answer from the codes given below:

	List-I		List-II
A.	Potassium bromide	1.	Fertiliser
B.	Potassium nitrate	2.	Photography
C.	Potassium sulphate	3.	Bakery
D.	Monopotassium tartarate	4.	Gunpowder

Codes:

	A	B	C	D
(a)	2	4	1	3
(b)	2	4	3	1
(c)	4	2	3	1
(d)	4	2	1	3

32. Match List-I with List-II and select the correct answer from the codes given below:

	List-I		List-II
A.	German silver	1.	Tin
B.	Solder	2.	Nickel
C.	Bleaching powder	3.	Sodium
D.	Hypo	4.	Chlorine

Codes:

	A	B	C	D
(a)	1	2	4	3
(b)	2	1	3	4
(c)	1	2	3	4
(d)	2	1	4	3

33. Living in the atmosphere of CO is dangerous because it
(a) Reduces organic matter of tissues
(b) Dries up the blood
(c) Combined with O_2 present inside to form CO_2
(d) Combines with haemoglobin and makes it incapable of absorbing oxygen

34. Consider the following statements:
Hard water is not suitable for
1. Drinking
2. Washing clothes with soap
3. Use in boilers
4. Irrigating crops
Which of these statements are correct?
(a) 1 and 3 (b) 2 and 3
(c) 1, 2 and 4 (d) 1, 2, 3 and 4

35. Domestic cooking gas consists of mostly
(a) Methane and ethane
(b) Liquified butane and isobutane
(c) Ethylene and carbon monoxide
(d) Hydrogen and acetylene

36. Match List-I with List-II and select the correct answer from the codes given below:

	List-I		List-II
A.	CNG	1.	Carbon monoxide, hydrogen
B.	Coal gas	2.	Butane, propane
C.	LPG	3.	Butane, ethane
D.	Water gas	4.	Hydrogen, methane, CO

Codes:

	A	B	C	D
(a)	2	1	3	4
(b)	3	4	2	1
(c)	2	4	3	1
(d)	3	1	2	4

37. What is the role of ultraviolet (UV) radiation in the water purification system?
    1. It inactivates / kills the harmful micro-organisms in water.
    2. It removes all the undesirable odours from the water.
    3. It quickens the sedimentation of solid particles and improves the clarity of water.

    Which of the statements given above is/are correct?
    (a) 1 only (b) 2 and 3 only
    (c) 1 and 3 only (d) 1, 2 and 3

38. Which one of the following sets of elements was primarily responsible for the origin of life on the Earth?
    (a) Hydrogen, oxygen, sodium
    (b) Carbon, hydrogen, nitrogen
    (c) Oxygen, calcium, phosphorus
    (d) Carbon, hydrogen, potassium

39. Acid rains is caused due to emission of which of the following into the atmosphere?
    (a) Oxides of nitrogen and sulphur
    (b) Carbon dioxide and carbon monoxide
    (c) Ozone and carbon dioxide
    (d) Carbon monoxide and nitrogen

40. A sample of chloroform before using as an anaesthetic, is tested by
    (a) Fehling's solution
    (b) Ammonical cuprous chloride
    (c) Ammonical silver nitrate solution
    (d) Silver nitrate solution after boiling with alcoholic KOH

41. Match List-I with List-II and select the correct answer from the codes given below:

	List-I		**List-II**
A.	Bleaching powder	1.	Calcium oxychloride
B.	Gypsum	2.	Calcium sulphate
C.	Marble	3.	Calcium carbonate

Codes:

	A	B	C
(a)	1	2	3
(b)	2	3	1
(c)	1	3	2
(d)	2	1	3

42. Match List-I with List-II and select the correct answer from the codes given below:

	List-I		**List-II**
A.	Limestone	1.	Cement
B.	Copper	2.	Electrical goods
C.	Bauxite	3.	Manufacture of aeroplanes
D.	Manganese	4.	Steel

Codes:

	A	B	C	D
(a)	1	2	3	4
(b)	2	3	1	4
(c)	4	3	2	1
(d)	3	4	1	2

43. Which one of the following pairs is not correctly matched?
    (a) Dry ice : Solid carbon dioxide
    (b) Mustard gas : Poisonous liquid used in chemical warfare
    (c) Teflon : Polymer containing fluorine
    (d) Fullerene : Organic compounds containing fluorine

44. Match List-I with List-II and select the correct answer from the codes given below:

	List-I		**List-II**
A.	Diamond	1.	Calcium
B.	Marble	2.	Silicon
C.	Sand	3.	Aluminium
D.	Ruby	4.	Carbon

Codes:

	A	B	C	D
(a)	1	2	3	4
(b)	4	1	2	3
(c)	3	1	2	4
(d)	4	2	1	3

45. Consider the following statements and select the correct code.
Assertion (A): The main constituent of the liquefied petroleum gas is methane.
Reason (R): Methane can be used directly for burning in homes and factories where it can be supplied through pipelines.
Codes:
(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

46. Which one among the following statements regarding the properties of mixtures and compounds is not correct?
(a) A mixture shows the properties of its constituents but the properties of a compound are entirely different from its constituents
(b) A mixture may be homogeneous or heterogeneous but a compound is a homogeneous substance
(c) The constituents of a mixture can be separated by physical methods but those of a compound cannot be separated by physical methods
(d) Energy is either absorbed or evolved during the preparation of a mixture but not in the preparation of a compound

47. Which of the following pairs is/are correctly matched?
1. **Isotopes :** Atoms with same atomic number but different atomic mass.
2. **Isobars :** Atoms with same number of neutrons but different atomic number.
3. **Isotones :** Atoms with same mass number but different atomic number.

Select the correct answer using the codes given below :
(a) 1, 2 and 3 (b) 1 only
(c) 1 and 2 only (d) 2 only

48. Match List–I with List–II and select the correct answer using the code given below:

List-I (Scientist)	**List-II (Discovery)**
A. Goldstein	1. Atomic theory
B. Chadwick	2. Proton
C. JJ Thomson	3. Neutron
D. John Dalton	4. Electron

Codes:

	A	B	C	D
(a)	2	3	4	1
(b)	2	4	3	1
(c)	1	4	3	2
(d)	1	3	4	2

49. Consider the following statements regarding diamond:
1. It is an allotrope of silicon.
2. It is a bad conductor of heat and electricity.
3. It is the hardest substance.
4. It burns to produce carbon dioxide.

Which of the statements given above are correct?
(a) 1, 2, 3 and 4 (b) 2, 3, and 4
(c) 1 and 2 (d) 1, 3 and 4

50. Following statements are made in connection with carbon dioxide (CO_2)
1. CO_2 is a poisonous gas.
2. CO_2 is an acidic oxide.
3. CO_2 turns limewater milky.

Which of the statements given above is/are correct?
(a) 1 and 2 (b) 2 and 3
(c) 3 only (d) 1 and 3

51. Which of the following statements about diamond are correct?
1. It is used as a gem in jewellery because of its ability to reflect light.
2. It is good conductor of electricity.
3. It is used for cutting glass, marble stones and other hard materials.
4. It is used for drilling of rocks.

Select the correct answer using the codes given below :
(a) 1, 3 and 4 (b) 2, 3 and 4
(c) 1, 2 and 3 (d) 2 and 4

52. Consider the following statements :
1. Diamond is hard and graphite is soft.
2. Diamond is soft and graphite is hard.
3. Diamond is a bad conductor but graphite is a good conductor.

4. Diamond is a good conductor but graphite is a bad conductor.

Which of the statements given above is/are correct ?

(a) 1 and 3 (b) 1 only
(c) 2 and 3 (d) 1 and 4

53. Consider the following statements:
Nitrogen is an essential constituent of
1. soils 2. animals
3. plants

Which of the statements given above is/are correct ?

(a) 3 only (b) 1 and 3 only
(c) 1 and 2 only (d) 1, 2 and 3

54. When iron is left exposed in open air, it gets rusted. Which constituent(s) of air is /are responsible for rusting iron?
1. Oxygen gas present in air
2. Moisture present in air
3. Carbon dioxide gas present in air

Select the correct answer using the codes given below :

(a) 1 only (b) 2 only
(c) 1 and 2 (d) 2 and 3

55. Which of the statements given below is/are correct?
Permanent hardness of water is due to the presence of soluble.
1. chloride of calcium
2. bicarbonate of calcium
3. sulphate of magnesium
4. bicarbonate of magnesium

Select the correct answer using the codes given below.

(a) 1 only (b) 1 and 3
(c) 2 and 4 (d) 1, 2 and 3

56. Consider the following statements :
1. An alloy is a mixture of two or more metals.
2. An alloy is a mixture of a metal or metals with a non-metal.

Which of the statements given above is/are correct ?

(a) 1 only (b) 2 only
(c) Both 1 and 2 (d) Neither 1 nor 2

57. Consider the following:
Crude oil is a direct source of
1. Asphalt 2. Paraffin wax
3. Fatty acids 4. Gas oil

Which of the above are correct?

(a) 1 and 2 only (b) 2 and 3
(c) 1 and 4 only (d) 1, 2 and 4

58. Match List–I with List–II and select the correct answer using the codes given below :

	List–I (Compound)		**List–II (Use)**
A.	Cellulose nitrate	1.	Soft soap
B.	Potassium sulphate	2.	Gun powder
C.	Potassium salt of fatty acids	3.	Fertilizer
D.	Calcium oxide	4.	Glass

Codes:

	A	B	C	D
(a)	2	3	1	4
(b)	3	2	1	4
(c)	4	1	2	3
(d)	3	1	2	4

59. What are the elements which are liquids at room temperature and standard pressure?
1. Helium 2. Mercury
3. Chlorine 4. Bromine

Select the correct answer using the codes given below:

(a) 2 and 3 only (b) 2, 3 and 4
(c) 2 and 4 only (d) 1 and 3 only

60. The correct order of these fuels in terms of their calorific value in increasing order is
1. Hydrogen gas 2. Kerosine oil
3. Charcoal 4. Wood
(a) 4, 3, 2, 1 (b) 4, 2, 3, 1
(c) 1, 2, 3, 4 (d) 1, 3, 2, 4

61. Consider the following about non-metals
1. Non-metals are malleable
2. Non-metals are ductile
3. Non-metals are brittle

The correct answer is
(a) 1 and 2 are correct
(b) 1 and 3 are correct
(c) 2 and 3 are correct
(d) Only 3 is correct

62. Consider the following statements
1. Most of the metal oxides are insoluble in water.
2. Sodium oxide and potassium oxide are metal oxides and hence insoluble in water.

The correct answer is
(a) Only 1 is true
(b) Only 2 is true
(c) 1 and 2 both are true
(d) Neither of the two is true

63. If by mistake some radioactive substance get into human body, than from the point of view radiation damage, the most harmful will be one that emits -
(a) γ - rays (b) Neutrons
(c) β - rays (d) α - rays

64. Match List - I (oxidation number) with List - II (The element) and select the correct answer using the code given below the list :

List - I (Oxidation number)	**List - II** (The element)
A. 2	1. Oxidation number of Mn in MnO_2
B. 3	2. Oxidation number of S in $H_2S_2O_7$
C. 4	3. Oxidation number of Ca in CaO
D. 6	4. Oxidation number of Al in $NaAlH_4$

Code :

	A	B	C	D
(a)	3	4	1	2
(b)	4	3	1	2
(c)	3	4	2	1
(d)	4	3	2	1

65. The pH of water at 25°C is 7. When it is heated to 100°C, the pH of water
(a) Increases
(b) Decreases
(c) Remains same
(d) Decreases up to 50°C and then increases

66. Consider the following statements and select the correct code.
Assertion (A) : In the periodic table of chemical elements, electron affinity is always found to increase from top to bottom in a group
Reason (R) : In a group, the atomic radii generally increase from top to bottom.
(a) Both A and R are individually true and R is correct explanation of A
(b) Both A and R are individually true and R is not the correct explanation of A
(c) A is true but R is false
(d) A is false but R is true

67. What happened when a hard boiled egg after shelling is immersed in saturated brine?
(a) It shrinks
(b) It grows in size
(c) Its size remains unchanged
(d) it initially grows in size and then shrinks.

68. Consider the following statements : The purpose of adding sodium sulphate and sodium silicate to washing powder is -
1. To keep washing powder dry
2. To maintain the alkalinity of the powder
which of these statements is/are correct ?
(a) Only 1 (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

69. In the hooch tragedy (casualty occurring due to the wine poisoning) sometimes the incidents of blindness occurs due to the poisonous substance:
(a) ethyl alcohol (b) methyl alcohol
(c) amyl alcohol (d) benzyl alcohol

70. It is suggested by the doctors that the person suffering from prostrates in the kidney or gallbladder should not consume excessively the food stuffs like tomatoes, eggs, milk etc which are the major causes of the crystal formation as the prostrates, which is made of :
(a) Calcium phosphate (b) Calcium Oxalate
(c) Calcium chloride (d) Calcium sulphate

71. Match column-I (acid) with column-II (use) and select the correct answer using the code given below the columns :

	Column I (Acid)		**Column II (Use)**
A.	Oxalic acid	(p)	As an eye-wash, antiseptic and grain preservation
B.	Nitric acid	(q)	For making explosives
C.	Boric acid	(r)	In food preservation
D.	Benzoic acid	(s)	As a constituent of ink stain remover

(a) A – (s), B – (q), C – (r), D – (p)
(b) A – (q), B – (s), C – (p), D – (r)
(c) A – (r), B – (q), C – (p), D – (s)
(d) A – (s), B – (q), C – (p), D – (r)

72. Match column-I with column-II and select the correct answer using the code given below the columns.

	Column I		Column II
A.	Fertilizer	(p)	King of chemicals
B.	Sulphuric acid	(q)	Basic
C.	Lime water	(r)	Magnesium hydroxide
D.	Milk of magnesia	(s)	Potassium nitrate

(a) A – (s), B – (p), C – (q), D – (r)
(b) A – (r), B – (p), C – (q), D – (s)
(c) A – (s), B – (q), C – (p), D – (r)
(d) A – (s), B – (p), C – (r), D – (q)

73. The compound that has the least value for octane number is -
(a) *n*-heptane (b) 2-methyl heptane
(c) Iso-octane (d) 2, 2-dimethyl hexane

74. The credit of construction of first nuclear reactor goes to -
(a) Niels Bohr (b) Fermi
(c) Einstein (d) Oppenheimer

75. Which of the following is/are not correctly matched?
(I) Absolute alcohol – 100% ethanol
(II) Power alcohol – 90 – 95% ethanol
(III) Rectified spirit – 5% ethanol
(a) I only (b) II only
(c) III only (d) II and III

76. Which of the following can be used for removal of stains of rust on clothes?
1. H_2O_2 2. Oxalic acid
3. Petrol 4. Alcohol
(a) 1 and 2 (b) 2 only
(c) 3 and 4 (d) 1, 2, 3 and 4

77. From which mineral is radium obtained -
(a) Limestone (b) Haematitie
(c) Pitchblende (d) Rutile

78. Why ethylene dibromide is added to petrol -
1. It increases the octane number of fuel
2. It helps in elimination of lead oxide
3. It removes the sulphur compound in petrol
4. It serves as a substitute of tetraethyl lead
(a) 1 and 2 (b) 2 and 3
(c) 1 only (d) 2 only

79. Which of the following is/are not caused due to Nitric oxide pollution -
1. leaf spotting in plants
2. bronchitis-related respiratory problems in human
3. production of corrosive gases through photochemical reaction
4. silicosis in human
(a) 1 and 3 (b) only 1
(c) 1, 2 and 4 (d) only 4

80. Sodium stearate is a salt and is used
(a) in gunpowder
(b) in Paint
(c) to make Soap
(d) to make fertilizer

81. Which of the following atmospheric gases constitute greenhouse gases?
1. Carbon dioxide 2. Nitrogen
3. Nitrous oxide 4. Water vapour
Select the correct answer using the codes given below:
(a) 1 and 4 (b) 1 and 3
(c) 1, 2 and 4 (d) 1, 3 and 4

82. Which of the following do not contain nitrogen element?
1. Superphosphate of lime
2. Urea
3. Indian saltpeter
4. Chille saltpeter
(a) 1, 3 and 4 (b) 1 and 3
(c) 1 only (d) 3 only

83. Which of the following copper alloys is used for the manufacture of springs and suspension filaments in electrical instruments?
(a) Bronze
(b) Aluminium bronze
(c) German silver
(d) Phosphor bronze

84. Which of the following is correctly matched?
(a) Aluminium-Haematite
(b) Lead-Galena
(c) Iron-Bauxite
(d) Magnesium-Malachite

85. Which of the following is/are not use(s) of glycerol. Glycerol is used.
1. as a sweetening agent in beverages and confectionery
2. as an antifreeze in automobile radiators
3. as a lubricant for heavy machinery
4. for preparation of better quality of soaps and cosmetics

(a) 1 and 2 (b) only 3
(c) 3 and 4 (d) only 2

86. What does the airbag, used for safety of car driver, contain?
(a) Sodium bicarbonate
(b) Sodium azide
(c) Sodium nitrite
(d) Sodium peroxide

87. Which one among the following elements/ions is essential in small quantities for development of healthy teeth but causes mottling of the teeth if consumed in higher quantities?
(a) Fluoride (b) Iron
(c) Chloride (d) Potassium

88. Match List-I with List-II and select the correct answer using the code given below the lists-

	List-I		List-II
(A)	Formic acid	1.	Tamarind
(B)	Tartaric acid	2.	Orange
(C)	Oxalic acid	3.	Spinach
(D)	Citric acid	4.	Ant's sting

Codes:

	(A)	(B)	(C)	(D)
(a)	2	3	1	4
(b)	2	1	3	4
(c)	4	3	1	2
(d)	4	1	3	2

89. Which of the following is likely to reach our body via the food chain in the event of an atomic bomb explosion?
(a) U-235 (b) Sr-90
(c) K-40 (d) H-3

90. Until the nineteenth Century, aluminium was almost as expensive as gold. The invention of an inexpensive way to extract this metal by a 22-year-old American made this metal inexpensive subsequently. The inventor was
(a) Goldschmidt
(b) Mond
(c) Charles-Martin Hall
(d) Parkes

91. Which one of the following pairs is mismatched
(a) Fossil fuel burning - release of CO_2
(b) Nuclear power - radioactive wastes
(c) Solar energy - Greenhouse effect
(d) Biomass burning - release of CO_2

92. Which one of the following pairs is correctly matched ?
(a) Mass Spectrograph : Chadwick
(b) Atomic number : Moseley
(c) Neutron : Millikan
(d) Measurement of charge of an electron : Aston

93. While performing cathode ray experiments, it was observed that there was no passage of electric current under normal conditions. Which of the following can account for this observation ?
(a) Dust particles are present in air
(b) Carbon dioxide is present in air
(c) Air is a poor conductor of electricity under normal conditions
(d) None of the above

94. Consider the following statements :
In $^{90}_{38}Sr^{2+}$:
(i) atomic number is 36
(ii) number of electrons is 38
(iii) number of neutrons is 52
(iv) number of protons is 38
Which of these are correct ?
(a) (i) and (ii) (b) (ii) and (iii)
(c) (iii) and (iv) (d) (i) and (iv)

95. Solid calcium oxide reacts vigorously with water to form calcium hydroxide accompanied by liberation of heat. This process is called slaking of lime. Calcium hydroxide dissolves in water to form its solution called lime water. Which among the following is (are) true about slaking of lime and the solution formed?
(i) It is an endothermic reaction
(ii) It is an exothermic reaction
(iii) The pH of the resulting solution will be more than seven

(iv) The pH of the resulting solution will be less than seven

(a) (i) and (ii) (b) (ii) and (iii)
(c) (i) and (iv) (d) (iii) and (iv)

96. Consider the following statements :
(i) Washing soda on strong heating gives sodium oxide and carbon dioxide.
(ii) Plaster of Paris is obtained by heating gypsum at 373 K.
(iii) Bleaching powder is used for disinfecting drinking water.

Which of these statement(s) is/are correct ?
(a) (i) and (ii) (b) (ii) and (iii)
(c) (i) and (iii) (d) All are correct

97. Consider the following statements
(a) A molecule of sulphur contains 4 sulphur atoms.
(b) Metals placed below hydrogen in activity series lose electrons to H^+ ions of acids.
(c) Silver acquires a blackish tinge when exposed to air for a long time.

Which of these statement(s) is/are correct ?
(a) (a) and (b) (b) (a) and (c)
(c) (b) and (c) (d) Only (c)

98. In a sample of ethyl ethanoate ($CH_3COOC_2H_5$) the two oxygen atoms have the same number of electrons but different number of neutrons. Which of the following is the correct reason for it?
(a) One of the oxygen atoms has gained electrons
(b) One of the oxygen atoms has gained two neutrons
(c) The two oxygen atoms are isotopes
(d) The two oxygen atoms are isobars.

99. Which of the following is/are the hazardous pollutant(s) present in automobile exhaust gases?
(i) N_2 (ii) CO
(iii) CH_4 (iv) Oxides of nitrogen
(a) (ii) and (iii) (b) (i) and (ii)
(c) (ii) and (iv) (d) (i) and (iii)

100. Match column-I with column-II and choose the correct code given below the columns.

	Column I		**Column II**
(A)	Electron	(p)	1.00867 u
(B)	Proton	(q)	9.1×10^{-31} kg
(C)	Neutron	(r)	1.00728 u

(a) A – (q); B – (r); C – (p)
(b) A – (p); B – (q); C – (r)
(c) A – (r); B – (q); C – (p)
(d) A – (q); B – (p); C – (r)

ANSWER KEY															
1.	(d)	**14.**	(b)	**27.**	(d)	**40.**	(c)	**53.**	(c)	**66.**	(d)	**79.**	(d)	**92.**	(b)
2.	(a)	**15.**	(d)	**28.**	(b)	**41.**	(a)	**54.**	(c)	**67.**	(c)	**80.**	(c)	**93.**	(c)
3.	(d)	**16.**	(d)	**29.**	(d)	**42.**	(a)	**55.**	(b)	**68.**	(a)	**81.**	(d)	**94.**	(c)
4.	(d)	**17.**	(c)	**30.**	(c)	**43.**	(d)	**56.**	(a)	**69.**	(b)	**82.**	(c)	**95.**	(b)
5.	(b)	**18.**	(d)	**31.**	(a)	**44.**	(b)	**57.**	(d)	**70.**	(b)	**83.**	(d)	**96.**	(b)
6.	(b)	**19.**	(d)	**32.**	(d)	**45.**	(d)	**58.**	(a)	**71.**	(d)	**84.**	(b)	**97.**	(d)
7.	(a)	**20.**	(c)	**33.**	(d)	**46.**	(d)	**59.**	(c)	**72.**	(a)	**85.**	(d)	**98.**	(c)
8.	(a)	**21.**	(b)	**34.**	(b)	**47.**	(b)	**60.**	(a)	**73.**	(a)	**86.**	(b)	**99.**	(c)
9.	(a)	**22.**	(c)	**35.**	(b)	**48.**	(a)	**61.**	(d)	**74.**	(b)	**87.**	(a)	**100.**	(a)
10	(c)	**23.**	(b)	**36.**	(b)	**49.**	(b)	**62.**	(a)	**75.**	(d)	**88.**	(d)		
11.	(b)	**24.**	(a)	**37.**	(a)	**50.**	(b)	**63.**	(a)	**76.**	(b)	**89.**	(b)		
12.	(b)	**25.**	(b)	**38.**	(b)	**51.**	(a)	**64.**	(a)	**77.**	(c)	**90.**	(c)		
13.	(b)	**26.**	(b)	**39.**	(a)	**52.**	(a)	**65.**	(b)	**78.**	(d)	**91.**	(c)		

Hints & Solutions

1. (d) Morphine is an analgesic drug that is used to relieve severe pain. It was first isolated in 1804 by Friedrich Serturner, which is generally believed to be the first ever isolation of a natural plant alkaloid in history.
Boric acid, also called orthoboric acid, is a weak acid of boron often used as an antiseptic or insecticide.
Nickel silver, also known as German silver, is a copper alloy with nickel and often zinc. The usual formulation is 60% copper, 20% nickel and 20% zinc.
Sodium is an extremely reactive metal and a powerful reducing agent. When exposed to air, it very quickly oxidizes. It also reacts violently to water. We store sodium under kerosene because kerosene is already highly reduced and won't react with sodium metal.

2. (a) The electron was discovered in 1896, by the British physicist J. J. Thomson, using cathode rays while doing discharge tube experiments.
In 1886, Eugen Goldstein discovered the existence of a new type of rays in discharge tube and named as anode rays or canal rays. Canal or anode rays travel in straight line and are deflected by electric field towards cathode which proves that they are composed of positively charged particles. These lightest positively charged particles were named and characterised as protons by Ernest Rutherford in 1919 who purposed Rutherford model for atom to explain the atomic structure.
Anti-electron or in other words the positron was discovered in 1932 by Anderson, a physicists and he found that the bombardment of boron with an alpha particle resulted in the emission of this particle.
In 1932, James Chadwick, an English physicist who had worked with Rutherford, detected neutrons.

3. (d) The "plum pudding model" was put forward by J.J. Thomson in 1904. In this model, the atom is made up of negative electrons that float in a "soup" of positive charge, much like plums in a pudding or raisins in a fruit cake. In 1906, Thomson was awarded the Nobel Prize for his work in this field.
Louise de Broglie suggested that electron exhibits a dual nature. Broglie also got Physics Noble Prize for his theory.
In 1913, Bohr proposed his quantized shell model of the atom to explain how electrons can have stable orbits around the nucleus.

Ernest Rutherford published his atomic theory describing the atom as having a central positive nucleus surrounded by negative orbiting electrons. This model suggested that most of the mass of the atom was contained in the small nucleus, and that the rest of the atom was mostly empty space.

4. (d) Ultra-violet rays < visible light < infrared radiation < microwaves
(0.1 micrometres) (0.7 micrometres) (0.01 mm)
(less than 10 cm)

5. (b) A nuclear reactor coolant — usually water but sometimes a gas or a liquid metal (like liquid sodium) or molten salt — is circulated past the reactor core to absorb the heat that it generates. The heat is carried away from the reactor and is then used to generate steam.
Control rods that are made of a neutron poison are used to absorb neutrons. Absorbing more neutrons in a control rod means that there are fewer neutrons available to cause fission, so pushing the control rod deeper into the reactor will reduce its power output, and extracting the control rod will increase it.
A neutron moderator is a medium that reduces the speed of fast neutrons, thereby turning them into thermal neutrons capable of sustaining a nuclear chain reaction involving uranium-235. Commonly used moderators include regular (light) water (roughly 75% of the world's reactors), solid graphite (20% of reactors) and heavy water (5% of reactors).
Nuclear fuel is a material that can be 'burned' by nuclear fission or fusion to derive nuclear energy. Nuclear fuel can refer to the fuel itself, or to physical objects (for example, bundles composed of fuel rods) composed of the fuel material, mixed with structural, neutron moderating, or neutron reflecting materials. The most common fissile nuclear fuels are uranium-235 (^{235}U) and plutonium-239 (^{239}Pu).

6. (b) There are two main fundamental differences between the design of an atomic bomb, and the design of a nuclear reactor. One difference is the way the fission reactions are controlled and the second difference stems from the enrichment of the fuel.

7. (a) Quarks have fractional electric charge values– either 1⁄3 or 2⁄3 times the elementary charge.
The positron has an electric charge of +1e, a spin of 1/2, and has the same mass as an electron.
A neutrino is an electrically neutral, weakly interacting elementary subatomic particle with half-integer spin. All evidence suggest that neutrinos have mass but that their mass is tiny even by the standards of subatomic particles. Their mass has never been measured accurately.
Photon has zero mass and rest energy.

8. (a) H_2O has intermolecular hydrogen bond between its molecules (H—O—H------H—O—H) while H_2S has weak Van der Waals forces between its molecules. Hence the molecules of H_2O are strongly packed than H_2S, thus water is at liquid state at room temperature.

9. (a) The rates of most reactions increase with a rise in temperature. Raising the temperature increases the fraction of molecules having very high kinetic energies. These are the ones most likely to react when they collide. The higher the temperature, the larger the fraction of molecules that can provide the activation energy needed for reaction.

10. (c) Petroleum products are usually grouped into three categories: light distillates (LPG, gasoline, naphtha), middle distillates (kerosene, diesel), heavy distillates and residuum (heavy fuel oil, lubricating oils, wax, asphalt). Hence, the correct option would be: Gasoline, kerosene, diesel.

11. (b) Except option (2), all are applications of capillary action. One would not be able to consume soft drink, if there is no atmospheric pressure, i.e., in vacuum.

12. (b) Water molecules scatter blue wavelengths by absorbing the light waves, and then rapidly remitting the light waves in different directions. That is why there are mostly blue wavelengths that are reflected back to our eyes.

13. (b) Aaron Ciechanover, Avram Hershko and Irwin Rose have been awarded the Nobel Prize in Chemistry 2004 for "...helping to understand how the human body gives the 'kiss of death' to rogue proteins to defend itself from diseases like cancer" (Reuters, 6 October 2004). These scientists—the former two from Israel, the latter from the US — discovered ubiquitin-mediated protein degradation. Knowledge of ubiquitin-mediated protein degradation offers an opportunity to develop drugs against cervical cancer, cystic fibrosis and other diseases.

14. (b) Thermonuclear fusion, or hydrogen bombs explode with enormous power using uncontrolled

self-sustaining chain fusion reactions. Deuterium and tritium, under extremely high temperatures, form helium providing the energy.

$$D + T \rightarrow {}^{4}He + n$$

In principle, a mixture of D, T and ^{6}Li heated to very high temperature and confined to a high density will start a chain fusion reaction, liberating an enormous amount of energy.

15. (d) All the three substances are responsible for ozone layer depletion in different ways. Which are:
CFC—mostly used in refrigeration, air conditioning and heat pump systems.
Halons—used historically as fire suppression agents and fire fighting, but now only allowed in very limited situations.
Carbon tetrachloride (tetrachloromethane)—limited solvent used in laboratories and chemical and pharmaceutical industries.

16. (d) Hydrogen combines with oxygen with explosive force in the presence of a spark.Helium is an inert gas that will not burn or explode, so is much safer to use in balloons instead of hydrogen.

17. (c) Cerargyrite, also called Horn Silver, gray, very heavy halide mineral composed of silver chloride (AgCl); it is an ore of silver.
Tiny particles of silver iodide are sprayed on a cloud from an aeroplane. The particles attract water drops from the cloud. When they form a drop that is large enough, it starts raining.
Zinc phosphide is an inorganic compound that is used in pesticide products as a rodenticide..
Zinc oxide is also known as philosopher's wool.

18. (d) It produces fumes of ammonia and hydrochloric acid.

19. (d) Hydrofluoric acid is one of the most dangerous acids known. It needs to be treated differently then even strong acids like sulphuric and hydrochloric. HF reacts with many materials, therefore, avoid contact with glass, concrete, metals, water, other acids, oxidizers, reducers, alkalis, combustibles, organics and ceramics.

20. (c) The zinc serves as a sacrificial anode, so that it cathodically protects exposed steel.

21. (b) As a gemstone used in jewellery, silicon carbide is called "synthetic moissanite" or just "moissanite". Moissanite is similar to diamond in several important respects it is transparent and hard . Moissanite has become popular as a diamond substitute, and may be misidentified as diamond, since its thermal conductivity is close to that of diamond, more than any other diamond substitute.
The properties of carbon fibres, such as high stiffness, high tensile strength, low weight, high chemical resistance, high temperature tolerance and low thermal expansion, make them very popular in aerospace, civil engineering, military, and motor sports.
Dichlorodifluoromethane (R-12) is a colourless gas, and usually sold under the brand nameFreon-12, is a chlorofluorocarbon halo-methane (CFC), used as a refrigerant and aerosol spray propellant.
In photosynthesis, solar energy is converted to chemical energy. The chemical energy is stored in the form of glucose (sugar). Carbon dioxide, water, and sunlight are used to produce glucose, oxygen, and water.

22. (c)

Sour milk	–	Lactic acid
Vinegar and pickel	–	Acetic acid
Soda water	–	Carbonic acid
Apple	–	Malic acid

23. (b) Enriched uranium is a type of uranium in which the percent composition of uranium-235 has been increased through the process of isotope separation.
Enriched uranium is a critical component for both civil nuclear power generation and military nuclear weapons. The International Atomic Energy Agency attempts to monitor and control enriched uranium supplies and processes in its efforts to ensure nuclear power generation safety and curb nuclear weapons proliferation.

24. (a) The energy released from the collapse of the gas into a star causes the centre of the star to become extremely hot. When the core is hot enough, nuclear fusion commences. Fusion is the process where two hydrogen atoms combine to form a helium atom, releasing energy.
The fusion reaction is a very efficient process, releasing a huge amount of energy. This is because a single helium atom contains less mass than two hydrogen atoms. The excess mass is released as energy.

25. (b) Because the humidity inside the fridge is low and extra moisture is absorbed.

26. (b) Cosmic waves have very high wavelength. cosmic rays are high-energy charged particles that travel through space at nearly the speed of light. Their extremely high energies are comparable

to those of gamma rays at the upper end of the electromagnetic spectrum.

27. (d) In cold countries, when the temperature of fresh water reaches 4°C, the layers of water near the top in contact with cold air continue to lose heat energy and their temperature falls below 4°C. On cooling below 4°C, these layers do not sink but may rise up as fresh water has a maximum density at 4°C. Due to this, the layer of water at 4°C remains at the bottom and above this layers of water 3°C, 2°C, 1°C and 0°C are formed. Because ice is a poor conductor of heat, it does not absorb heat energy from the water beneath the layer of ice which prevents the water freezing. Thus, aquatic creatures survive in such places.

28. (b) Nuclear fusion is a nuclear reaction in which two or more atomic nuclei collide at a very high speed and join to form a new type of atomic nucleus.

29. (d) Two recent studies have examined LPG-fuel-oil fuel mixes and found that smoke emissions and fuel consumption are reduced but hydrocarbon emissions are increased.

30. (c) Bio gas is primarily methane (CH_4) and carbon dioxide (CO_2) and may have small amounts of hydrogen sulphide (H_2S), moisture and siloxanes.

31. (a) Potassium bromide is a salt used to make photographic papers and plates and for process engraving.
Gunpowder, also known since the late 19th century as black powder, is a mixture of sulphur, charcoal, and potassium nitrate (saltpeter)—with the sulphur and charcoal acting as fuels, while the saltpeter works as an oxidizer.
The principal use of potassium sulphate is as a fertilizer. K_2SO_4 does not contain chloride, which can be harmful to some crops. Potassium sulphate is preferred for these crops, which include tobacco and some fruits and vegetables.
A white, acid, crystalline solid or powder, $KHC_4H_4O_6$, used in baking powder, in the tinning of metals, and as a component of laxatives. Also called cream of tartar.

32. (d) Nickel silver, also known as German silver, is a copper alloy with nickel and often zinc.
Solders are typically made from tin or lead or a combination of both in the ratio of 63:37 respectively.
Calcium hypochlorite, also known as bleaching powder, is a chemical compound with formula $Ca(ClO)_2$. It is widely used for water treatment and as a bleaching agent. This chemical is considered to be relatively stable and has greater available chlorine than sodium hypochlorite (liquid bleach).
Hypo solution is the abbreviation for sodium thiosulphate or sodium hyposulphite, a chemical used to fix the image on photographic film after it has been developed.

33. (d) When CO is not ventilated it binds to haemoglobin, which is the principal oxygen-carrying compound in blood; this produces a compound known as carboxyhaemoglobin. The traditional belief is that carbon monoxide toxicity arises from the formation of carboxyhaemoglobin, which decreases the oxygen-carrying capacity of the blood and inhibits the transport, delivery, and utilization of oxygen by the body.

34. (b) Hard water is not suitable for washing clothes with soap and use in boilers.

35. (b) Cooking gas consists of mostly liquified butane and isobutane.

36. (b) CNG – Butane, ethane
Coal gas – Hydrogen, methane, CO
LPG – Butane, propane
Water gas – CO, hydrogen

37. (a) It inactivates/kills the harmful micro-organisms in water.

38. (b) Carbon, hydrogen and nitrogen were primarily responsible for the origin of life on the earth.

39 (a) Acid rain is caused by emissions of sulphur dioxide and nitrogen oxide, which react with the water molecules in the atmosphere to produce acids.

40. (c) It is tested by ammonical silver nitrate solution.

41. (a) Bleaching powder or calcium hypochlorite is a chemical compound with formula $Ca(ClO)_2$.
The chemical formula for marble is $CaCO_3$. It is calcium carbonate. Marble is used in various applications, including home design.
Gypsum is a very soft sulphate mineral composed of calcium sulphate dihydrate, with the chemical formula $CaSO_4 \cdot 2H_2O$. It can be used as a fertilizer, is the main constituent in many forms of plaster and is widely mined.

42. (a) Manganese is essential to iron and steel production. At present, steel making accounts 85 to 90% of the total demand, most of the total demand. Manganese is a key component of low-cost stainless steel formulations and certain widely used aluminium alloys.

Limestone can be used in constructing buildings. It can be used for making cement and mortar. Limestone is used to make glass and even used to make roads.

Bauxite is the mineral ore of aluminium which is used in the manufacture of cans, airplanes, sporting and electronic equipment and home appliances.

The Wright Brother's first airplane to fly in 1903 only was able to get off the ground because they modified its engine with aluminium in order to reduce its weight. Without the ability of the strong aluminium, alloys to withstand the huge pressures and stresses involved, high altitude flying would not be conceivable. In fact, aluminium comprises about 80% of an aircraft's unladen weight.

The element copper is used extensively as an electrical conductor, for the making of electrical wire.

43. (d) Fullerene is a pure carbon molecule composed of at least 60 atoms of carbon.

44. (b) Diamond is a metastable allotrope of carbon, where the carbon atoms are arranged in a variation of the face-centred cubic crystal structure called a diamond lattice.

The most common constituent of sand is silica (silicon dioxide, or SiO_2), usually in the form of quartz, which, because of its chemical inertness and considerable hardness, is the most common mineral resistant to weathering.

Marble is composed of recrystallized carbonate minerals, most commonly calcite or dolomite. Calcite is a carbonate mineral and the most stable polymorph of calcium carbonate ($CaCO_3$).

A ruby is a pink to blood-red-coloured gemstone, a variety of the mineral corundum (aluminium oxide).

45. (d) The main components of LPG are butane and propane.

46. (d) The compound is always formed by absorption or evolution of energy but no energy is released or absorbed during the formation of mixture.

47. (b) Isotopes are variants of a particular chemical element: while all isotopes of a given element share the same number of protons and electrons, each isotope differs from the others in its number of neutrons. For example, carbon-12, carbon-13 and carbon-14 are three isotopes of the element carbon with mass numbers 12, 13 and 14 respectively. The atomic number of carbon is 6, which means that every carbon atom has 6 protons, so that the neutron numbers of these isotopes are 6, 7 and 8 respectively.

48. (a) Goldstein discovered proton, Chadwick- Neutron, J. J. Thomson- Electron and John Dalton- Atomic Theory.

49. (b) Diamond is an allotrope of carbon not silicon.

50. (b) (i) CO_2 is an acidic oxide. It dissolve in water formic unstable carbonic acid.

$$H_2O + CO_2 \rightleftharpoons H_2CO_3$$

(ii) Limewater $Ca(OH)_2$ is turned milky on passing CO_2

$$Ca(OH)_2 + CO_2 \longrightarrow \underset{\text{insohible}}{CaCO_3} + H_2O$$

51. (a) Diamond, an allotrope of carbon, has very high refractive because of which it is used as a gem in jewellery. It is used for cutting glass, marble stones and other hard materials and for drilling of rocks. It is a bad conductor of electricity. It is the hardest material known.

52. (a) Diamond is hard and bad conductor but Graphite is soft and good conductor.

53. (c) Nitrogen is a essential constituent of all vegetables and animal proteins. Soil contains nitrogen as ammonium salts.

54. (c) Both oxygen and moisture present in air cause rusting of iron.

55. (b) Chlorides and sulphates of calcium and magnesium are responsible for permanent hardness of water.

Note: Bicarbonates are responsible for temporary hardness of water.

56. (a) A homogeneous mixture of two or more metals is known as alloys.

58. (a) These compounds are used in the manufacture of the following products. Cellulose nitrate- Gun powder, Potassium Sulphate- Fertiliser, Potassium salts of fatty acids- Soft soap, Calcium oxide- Glass.

63. (a) γ - rays has highest frequency range and hence highest penetrating power. These are able to travel many feet in air and many inches in human tissue. These readily penetrate most materials and are sometimes called "penetrating" radiation.

64. (a)

(i) MnO_2

Oxidation of Mn in MnO_2 :

$x + 2(-2) = 0$

$x = 4$

(ii) $H_2S_2O_7$
$2(+1) + 2(x) + 7(-2) = 0$
$2 + 2x - 14 = 0$
$x = 6$

(iii) CaO
$x + 1(-2) = 0$
$x = 2$

(iv) $NaAlH_4$
$1(+1) + x + 4(-1) = 0$
(H is hydride in this compound)
$1 + x - 4 = 0$
$x = 3$

65. (b) Dissociation of water is temperature dependent

$$H_2O \rightleftharpoons H^+ + OH^-$$

Dissociation constant = $K_w = [OH^-][H^+]$
Water at 100°C will have more of the molecules dissociated to ions then at 25°C i.e., K_w increase with increase in temperature.
∴ pH of water decreases on increasing temperature.
At 100°C pH of water becomes 6.14.

66. (d) Electron affinity generally decreases from top to bottom in a group.
Atomic radii increases from top to bottom as energy levels increases because as we move down a group number of electrons increases.

67. (c) When hard boiled egg after shelling is immersed in saturated brine, its size remains same. Due to coagulation of inner liquid there is no flow of solvent molecules across the membrane.

68. (a) Sodium sulphate and sodium silicate are added to keep the washing powder dry.
Sodium triphosphate or sodium carbonate is added to washing powder to maintain the alkalinity.

69. (b) In most of the hooch tragedies methyl alcohol was used as the chief adulterant in liquor. Toxicity of methyl alcohol manifests as permanent blindness or ultimately death due to respiratory failure.
The main reasons for its use as adulterant are being similarity in appearance and taste with ethyl alcohol and easy availability.

70. (b) Prostrate in kidney or gallbladder is composed of calcium oxalate.

73. (a) *n*-heptane has octane number of 0.0
2-methyl heptane → 21.7
Iso-octane → 100.00
2, 2-dimethyl hexane → 72.5

74. (b) The credit of construction of first nuclear reactor goes to Fermi. On December 2, 1942 Fermi reported having produced the first self sustaining chain reaction.

75. (d) Rectified spirit is a mixture with composition of 95% ethanol and 5% water. Absolute alcohol is 100% concentrated ethanol. Power alcohol is a mixture of 75-80% petrol, 20-25% ethanol and minute amount of aromatic compounds.

76. (b) Oxalic acid is used as rust removal agent because it forms a stable water soluble salt with ferric iron i.e., ferrioxalate ion.

77. (c) Radium was discovered in 1898 by Madame Curie from pitchblende a material that contains uranium.

78. (d) Lead oxide deposit is harmful to engine life. Thus a small amount of ethylene dibromide is added to petrol for simultaneously removal of lead oxide.

79. (d) Silicosis is a chronic lung disease caused by breathing in tiny bits of silica dust.

80. (c) Sodium stearate is a typical example of detergent or soap. It contains a long hydrocarbon tail and a carboxylic acid head group.

81. (d) The primary greenhouse gases in Earth's atmosphere are water vapour, carbon dioxide, methane, nitrous oxide and ozone.

82. (c) Superphosphate of lime – $Ca(H_2PO_4)_2$
Urea – $CO(NH_2)_2$
Indian saltpeter – KNO_3
Chille saltpeter – $NaNO_3$

83. (d) Phosphor bronze is used for manufacture of springs and suspension filaments in electrical instruments.

84. (b) Haematite – Iron (Fe_2O_3)
Galena – Lead (PbS)
Bauxite – Aluminum ($Al(OH)_3$)
Malachite – Copper ($Cu_2CO_3(OH)_2$)

85. (d) Glycerol is used as softening agent in baked goods, stabilizers in ice cream. As a lubricant for heavy machinery and for preparation of soaps. At one time its largest single use was as automotive antifreeze. Methanol and ethylene glycol have replaced, it for this

86. (b) Sodium azide is used in airbag, used for safety of car driver. Under room temperature, sodium azide is a stable compound. However when heated by an impulse it disintegrates to produce sodium and nitrogen. It only takes about 50-100 grams sodium

azide to produce enough nitrogen gas to fill a normal air bag for driver.

87. (a) Consumption of high concentration of fluoride causes mottling of teeth or fluorosis.

88. (d)

Formic acid	–	Ant's sting
Tartaric acid	–	Tamarind
Oxalic acid	–	Spinach
Citric acid	–	Orange

90. (c) Charles Martin Hall was an American inventor, businessman and chemist. He is best known for his invention in 1886 of an inexpensive method for producing aluminium which became the first metal to attain wide spread use since the prehistoric discovery of iron.

91. (c) Solar energy is not responsible for green house effect instead it is a source of energy for the plants and animals.

92. (b)

Scientist		**Discovery**
Moseley	–	Atomic number
Chadwick	–	Neutron
Millikan	–	Measurement of charge of an electron.
Aston	–	Mass spectrograph

94. (c) In $^{90}_{38}Sr^{2+}$,
Atomic number = no. of protons = 38
Since it has lost $2e^-$ so no. of electrons = 38 – 2 = 36
Atomic mass = no. of protons + no. of neutrons
90 = 38 + no. of neutrons
90 – 38 = no. of neutrons
52 = no. of neutrons
Hence, no. of neutrons = 52, no. of protons = 38.

95. (b) $CaO + H_2O \longrightarrow Ca(OH)_2 + \text{heat}$
$Ca(OH)_2$ formed will be basic thus pH > 7.

96. (b) Washing soda is sodium salt of carbonic acid. It occurs as a crystalline heptahydrate, which on heating looses its water to form a white powder monohydrate. This process is called efflorescence.

$$Na_2CO_3 \cdot 7H_2O \xrightarrow{\text{heat}} Na_2CO_3 \cdot H_2O + 6H_2O$$

97. (d) Silver forms a black thin layer of silver sulphide on reaction with hydrogen sulphide which is present in trace amount in the atmosphere.

98. (c) Isotopes have same atomic number (number of protons) but different mass number (number of neutron + number of protons).

99. (c) CO and oxides of nitrogen are poisonous gases present in automobile exhaust gases.

100. (a)

Electron	–	9.1×10^{-31} kg
Proton	–	1.00728 u
Neutron	–	1.00867 u