5. Atomic Structure

1. The chemical symbol of copper is
   A C.
   B Co.
   C Cu.
   D Cp.

2. The chemical symbol of bromine is
   A B.
   B Br.
   C Bo.
   D Bm.

3.

Element	Melting point (°C)	Boiling point (°C)
W	760	1 210
X	-58	37
Y	-189	-186
Z	45	96

Which element is a gas at room temperature and pressure?
   A W
   B X
   C Y
   D Z

4. Which of the following substances is NOT an element?
   A Diamond
   B Glucose
   C Oxygen
   D Sodium

5. The table shows the melting points and boiling points of four substances at 1 atm pressure.

Substance	Melting point (°C)	Boiling point (°C)
W	–60	–5
X	–189	–55
Y	–40	60
Z	5	58

Which substance exists as a liquid at –50°C and 1 atm pressure?
   A W
   B X
   C Y
   D Z

6. Which of the following elements is a metal?
   A Phosphorus
   B Chlorine
   C Barium
   D Sulphur

7. Which of the following elements has the *highest* melting point?
   A Potassium
   B Mercury
   C Oxygen
   D Helium

8. Which of the following elements has the *lowest* boiling point?
   A Bromine
   B Magnesium
   C Nitrogen
   D Sulphur

9. Which of the following elements is a metalloid?
   A S
   B Ne
   C Br
   D Si

10. Which of the following elements is a non-metal?
   A Be
   B B
   C P
   D Ag

11. Which of the following elements is a solid at room temperature and pressure?
   A Carbon
   B Chlorine
   C Helium
   D Mercury

12. Which of the following combinations is correct?

	Element	State at room temperature and pressure
A	Aluminium	solid
B	Sodium	liquid
C	Iodine	gas
D	Neon	solid

13. Which of the following elements does NOT conduct electricity?
    A Bromine
    B Graphite
    C Mercury
    D Gold

14. Which of the following elements is the *best* conductor of heat?
    A Magnesium
    B Hydrogen
    C Nitrogen
    D Sulphur

15. Which of the following statements concerning copper is correct?
    A It is a poor conductor of heat.
    B It has a shiny appearance.
    C It is brittle.
    D It has a low boiling point.

16. Which of the following statements concerning silicon is INCORRECT?
    A Its properties are in between metals and non-metals.
    B It is brittle.
    C Its crystalline form can conduct electricity.
    D Its melting point is quite low.

17. An element with the chemical symbol Fe
    A is a non-metal.
    B is a solid at room temperature and pressure.
    C has a low melting point.
    D is a metalloid.

18. Consider the following properties of four elements, W, X, Y and Z.

Property	W	X	Y	Z
Melting point (°C)	–9	63	114	–39
Boiling point (°C)	59	860	184	357
Electrical conductivity	Non-conductor	Good conductor	Non-conductor	Good conductor

Which of the following elements could be mercury?

A W
B X
C Y
D Z

19. Consider the following properties of four elements, W, X, Y and Z.

Property	W	X	Y	Z
Melting point (°C)	–189	972	119	98
Boiling point (°C)	–186	2 212	445	883
Electrical conductivity	Non-conductor	Good conductor	Non-conductor	Good conductor

Which of the following elements could be sulphur?

A W
B X
C Y
D Z

20. Which of the following statements concerning elements are correct?

(1) Elements can be classified as metals, non-metals and metalloids.
(2) An element is a substance which cannot be broken down into anything simpler by chemical methods.
(3) Ammonia is an element.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

21. Which of the following are metals?

(1) Ag
(2) K
(3) Na

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

22. Which of the following are non-metals?

(1) Ar
(2) Cl
(3) Si

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

23. Which of the following statements concerning metals are correct?

(1) Metals are usually shiny.
(2) Metals are good conductors of electricity.
(3) All metals have high melting points.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

24. Which of the following are liquid elements?

(1) Mercury
(2) Water
(3) Bromine

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

25. Which of the following elements is / are gas(es) at room temperature and pressure?

(1) Chromium
(2) Fluorine
(3) Helium

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

26. Which of the following substances are good conductors of electricity?

(1) Solid aluminium
(2) Graphite
(3) Molten sodium

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

27. Which of the following statements concerning metalloids is / are correct?

(1) Germanium is a metalloid.
(2) Metalloids cannot conduct electricity at room temperature.
(3) Some metalloids are gases.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

28. The symbol of an element is Al. Which of the following statements concerning the element are correct?

(1) It is a good conductor of electricity.
(2) It can be hammered into shape.
(3) It has a shiny appearance.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

29. Which of the following statements concerning phosphorus is / are correct?

(1) It is a liquid at room temperature and pressure.
(2) It is a non-conductor of electricity.
(3) It is a metal.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

30. Which of the following statements concerning oxygen are correct?
    (1) It is a colourless gas.
    (2) It is a non-metal.
    (3) The following hazard warning symbol should be displayed on a metal cylinder containing it.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

31. Which of the following statements concerning bromine and mercury are correct?
    (1) Both are liquids at room temperature and pressure.
    (2) They are good conductors of heat.
    (3) Mercury is a metal while bromine is a non-metal.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

32. Consider the following properties of three elements, X, Y and Z.

Element	**Melting point (°C)**	**Boiling point (°C)**	**Electrical conductivity**
X	959	2 850	good conductor
Y	–7	58	non-conductor
Z	–210	–196	non-conductor

Which of the following statements are correct?
    (1) Element X is a metal.
    (2) Element Y is a non-metal.
    (3) Element Z is a gas at room temperature and pressure.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

33. Atoms are electrically neutral because
A neutrons are neutral.
B they have the same number of neutrons and protons.
C they have the same number of protons and electrons.
D all subatomic particles are neutral.

34. Atoms of the same element must have
    A the same number of neutrons.
    B the same number of electrons.
    C the same number of protons and neutrons.
    D different number of neutrons.

35. Which of the following statements concerning an atom is INCORRECT?
    A The number of protons equals the number of electrons.
    B The number of electrons equals the number of neutrons.
    C The atomic number equals the number of protons.
    D The mass number equals the number of protons plus the number of neutrons.

36. The atomic number and mass number of an atom of an element is 9 and 19 respectively. The atom contains
    A 9 electrons and 10 neutrons.
    B 9 neutrons and 10 electrons.
    C 9 protons and 10 electrons.
    D 9 protons and 19 neutrons.

37. Which of the following combinations is correct?

	Element	Atomic number
A	Boron	6
B	Fluorine	8
C	Neon	10
D	Silicon	12

38. An atom has 23 electrons and 28 neutrons. Which of the following combinations concerning the atom is correct?

	Atomic number	Mass number
A	23	28
B	23	51
C	28	51
D	28	56

39. Which of the following combinations represents an atom with a mass number 40?

	Number of protons	Number of neutrons	Number of electrons
A	18	22	18
B	19	21	18
C	20	20	18
D	20	21	20

40. Which of the following combinations concerning an atom $^{85}_{37}X$ is correct?

	Number of electrons	Number of neutrons	Number of protons
A	48	48	37
B	37	37	48
C	37	48	37
D	48	37	48

41. Which of the following atoms has the *smallest* number of electrons?

A $^{127}_{53}W$
B $^{84}_{36}X$
C $^{195}_{78}Y$
D $^{80}_{37}Z$

42. An atom of element X contains 57 protons and 139 neutrons. This atom can be represented as

A $^{139}_{57}X$
B $^{196}_{139}X$
C $^{196}_{57}X$
D $^{57}_{139}X$

43. The atomic number and mass number of an atom of element X are 11 and 23 respectively. Which of the following statements concerning X is correct?

A An atom of X has 12 electrons.
B X is a solid at room temperature and pressure.
C X can be represented by the symbol $^{12}_{11}X$.
D X is stored in water in the laboratory.

44. The atomic number and mass number of an atom of element X are 7 and 14 respectively. Which of the following statements concerning X is correct?

A X can relight a glowing splint.
B There are 21% by volume of X in air.
C X is a colourless gas at room temperature and pressure.
D There are 14 neutrons in an atom of X.

45. Which of the following species contains the same number of neutrons as $^{27}_{13}Al$?

A $^{25}_{12}Mg$
B $^{20}_{10}Ne$
C $^{32}_{16}S$
D $^{28}_{14}Si$

46. M is an element. An atom of M possesses 44 neutrons and 36 electrons. What is M?

A Br
B Kr
C Sr
D Ru

47. Which of the following statements concerning the zinc atom $^{64}_{30}Zn$ is correct?

A It has 30 protons.
B Its mass number is 34.
C It has 64 neutrons.
D Its atomic number is 94.

48. Which of the following statements concerning an atom are correct?

(1) Most of the mass of an atom is in its nucleus.
(2) Electron is the lightest subatomic particle in an atom.
(3) Electrons occupy most of the space of an atom.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

49. Which of the following statements are correct?

(1) The mass of a hydrogen atom is nearly the same as that of a proton.
(2) The mass of an electron is negligible when compared to the mass of a proton.
(3) The nuclei of atoms of all elements must contain proton(s).

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

50. Which of the following statements is / are correct?

(1) The number of neutrons in an atom of an element is determined by its atomic number.
(2) The atomic number of an element is equal to the number of electrons in its atom.
(3) The mass number of an atom is equal to the total number of protons and electrons in the atom.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

51. Which of the following statements concerning the atom $^{63}_{29}Cu$ is / are correct?

(1) It possesses 29 protons.
(2) It possesses 63 neutrons.
(3) Its mass number is 34.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

52. Consider the information of three atoms given in the table below:

	Atom		
	X	**Y**	**Z**
Number of protons	6	6	7
Number of electrons	6	6	7
Number of neutrons	7	8	7

Which of the following statements about the atoms is / are correct?

(1) X and Y have the same atomic number.
(2) Y and Z are atoms of the same element.
(3) X and Z have the same mass.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

53. Which of the following statements concerning the atom $^{31}_{15}X$ is / are correct?

(1) X is a non-metal.
(2) There are 16 electrons in an atom of X.
(3) There are 15 neutrons in an atom of X.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

54. Which of the following statements concerning potassium are correct?

(1) Its atomic number is 19.
(2) Its atom contains 20 electrons.
(3) It can be obtained by electrolysis of its molten ore.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

55. Which of the following statements concerning hydrogen are correct?

(1) Its atom contains only 1 electron.
(2) It gives a 'pop' sound with a glowing splint.
(3) It can be obtained from electrolysis of water.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

56. The atomic number and mass number of an atom of element X are 17 and 35 respectively. Which of the following statements concerning X is / are correct?

(1) An atom of X contains 17 neutrons.
(2) X is a gas at room temperature and pressure.
(3) X is used as a sterilizing agent.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

57. Different isotopes of an element have
A similar chemical properties.
B the same mass number.
C the same physical properties.
D the same number of electrons.

58. The species $^{238}_{92}U$ and $^{235}_{92}U$
A have different chemical properties.
B have the same physical properties.
C have different number of protons.
D have different number of neutrons.

59. Consider the following atoms:

Atom	Atomic number	Mass number	Number of electrons
W	20	46	
X	22	46	
Y		48	22
Z		94	42

Which of the following pairs are isotopes?
A W and X
B W and Z
C X and Y
D Y and Z

60. Which of the following is most likely to represent an isotope of $^{52}_{24}X$?

A $^{52}_{23}X$
B $^{52}_{24}X$
C $^{53}_{24}X$
D $^{72}_{25}X$

61. The following table shows the relative abundance of the isotopes of strontium (Sr):

Isotope	Relative abundance (%)
^{86}Sr	16.5
^{87}Sr	7.00
^{88}Sr	76.5

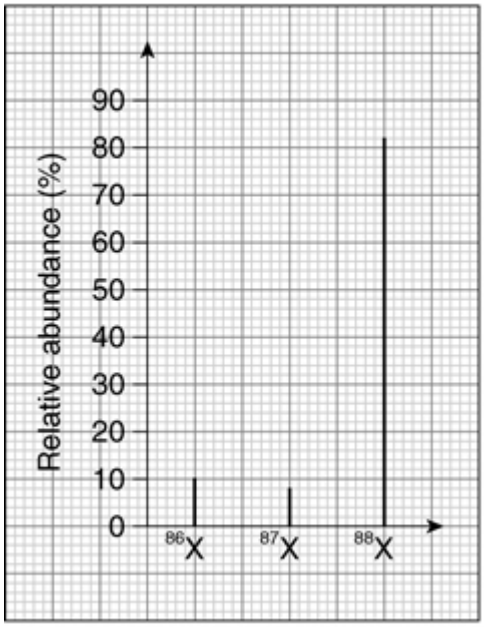
The relative atomic mass of strontium is
A 87.2.
B 87.6.
C 87.2 g.
D 87.6 g.

62. A sample of element X consists of 93.2% of ^{39}X and 6.8% of ^{41}X. The relative atomic mass of X is
    A 39.1.
    B 39.3.
    C 39.7.
    D 40.1.

63. The relative atomic mass of rubidium (Rb) is 85.5. Rubidium has two isotopes: ^{85}Rb and ^{87}Rb. What is the percentage abundance of ^{85}Rb in rubidium?
    A 24.0%
    B 36.0%
    C 66.0%
    D 74.0%

64. The atomic mass of element X is 114.8. X has two isotopes, ^{113}X and ^{a}X, and the relative abundance of ^{113}X is 10.0%. What is the value of a?
    A 112
    B 114
    C 115
    D 116

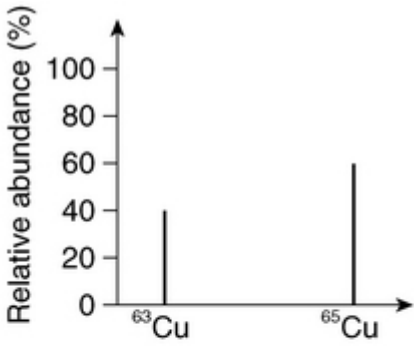
65. Element X has three isotopes, ^{86}X, ^{87}X and ^{88}X. The graph below shows the relative abundance of the isotopes.



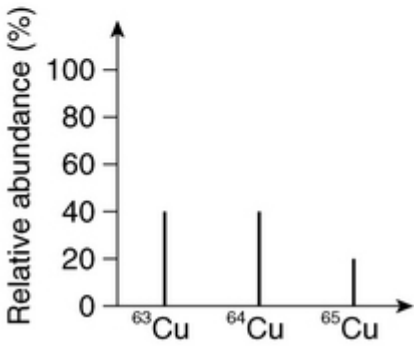
What is the relative atomic mass of X?
    A 86.7
    B 87.1
    C 87.7
    D 88.1

66. The relative atomic mass of a sample of copper is 63.6. Which of the following graphs shows the relative abundance of the isotopes?

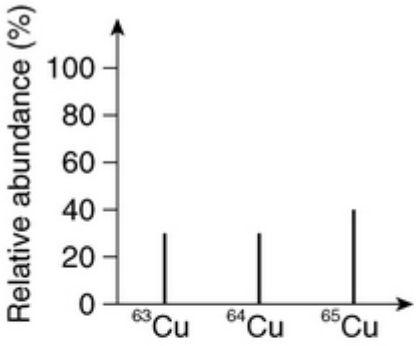
A



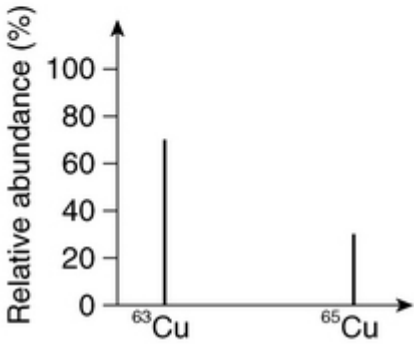
B



C



D



67. Which of the following statements concerning the iodine isotope $^{127}_{53}\mathrm{I}$ is INCORRECT?

A Its mass number is 127.

B It has 53 protons.

C It has 74 neutrons.

D It has a different number of electrons from other iodine isotopes.

68. Which of the following statements concerning $^{107}_{47}Ag$ and $^{109}_{47}Ag$ are correct?

(1) They are isotopes.
(2) They have the same chemical properties.
(3) They have the same number of electrons.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

69. Oxygen has three isotopes. Their mass numbers are 16, 17 and 18 respectively. Which of the following statements concerning the three isotopes is / are correct?

(1) The isotope O-16 has 16 electrons.
(2) The isotope O-17 has 9 neutrons.
(3) The isotope O-18 has 10 protons.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

70. Consider the information of four atoms given in the table below.

	Atom			
	W	**X**	**Y**	**Z**
Number of protons	12	14	12	13
Number of electrons	12	14	12	13
Number of neutrons	13	14	14	14

Which of the following statements about the atoms is / are correct?

(1) W and X have the same mass.
(2) W and Y are isotopes.
(3) Y and Z have the same atomic number.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

71. What is the maximum number of electrons that the fourth electron shell of an atom can hold?

A 8
B 18
C 32
D 50

72. The number of electrons in the first two shells of a chlorine atom adds up to
    A 8.
    B 10.
    C 15.
    D 17.

73. The atomic number of an element is 19. The electronic arrangement of an atom of this element is
    A 2,8,9.
    B 2,8,8,1.
    C 2,10,7.
    D 9,8,2.

74. An atom of an element has an electronic arrangement 2,8,18,5. The atomic number of the element is
    A 5.
    B 10.
    C 28.
    D 33.

75. The following is an electron diagram of an atom of element Y:

    (Only electrons in the *outermost shell* are shown.)
    The atomic number of Y could be
    A 5.
    B 7.
    C 11.
    D 13.

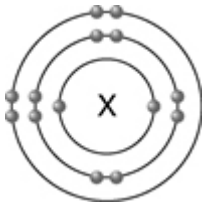
76. The atom of an element X contains 35 neutrons. The electronic arrangement of the atom is 2,8,18,2. Which of the following combinations concerning the atom is correct?

	Atomic number	Mass number
A	30	35
B	30	65
C	35	30
D	35	65

77. The electronic arrangement of an atom $^{9}_{4}X$ is

A 9.
B 2,2.
C 2,7.
D 4,9.

78. The following is an electron diagram of an atom of element X:



Which of the following statements concerning X is / are correct?

(1) An atom of X contains 14 protons.
(2) The mass number of X is 14.
(3) X is a metal.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

79. The atomic numbers of two elements, X and Y, are x and $(x+1)$ respectively. Which of the following deductions is / are correct?

(1) An atom of X has one electron less than an atom of Y.
(2) An atom of Y has one more occupied electron shell than an atom of X.
(3) The mass of an atom of Y is greater than that of X.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

80. An isotope of chlorine has 20 neutrons. Which of the following statements concerning the chlorine isotope are correct?

(1) There are three occupied electron shells in the isotope.
(2) Its mass number is 20.
(3) It possesses 20 protons.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

81. An atom of element X has an electronic arrangement 2,8,8,2. Which of the following statements concerning X is / are correct?

(1) X is a metal.
(2) X is stored in paraffin oil in the laboratory.
(3) A compound of X gives a brick-red flame in flame test.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

82. Consider the information of three atoms given in the table below.

	Atom		
	X	**Y**	**Z**
Number of protons	16	16	18
Number of electrons	16	16	18
Number of neutrons	20	18	18

Which of the following statements about the atoms are correct?

(1) X and Y have the same electronic arrangement.
(2) Y and Z are isotopes.
(3) X and Z have the same mass number.

A (1) and (2) only
B (1) and (3) only
C (2) and (3) only
D (1), (2) and (3)

83. Element X has two isotopes: ^{39}X and ^{41}X. Which of the following statements is / are correct?

(1) The isotopes have the same physical properties.
(2) The isotopes have the same electronic arrangement.
(3) The relative atomic mass of X is between 39 and 41.

A (1) only
B (2) only
C (1) and (3) only
D (2) and (3) only

Multiple choice questions

1	C	2	B	3	C	4	B	5	A
6	C	7	A	8	C	9	D	10	C
11	A	12	A	13	A	14	A	15	B
16	D	17	B	18	D	19	C	20	A
21	D	22	A	23	A	24	B	25	D
26	D	27	A	28	D	29	B	30	A
31	B	32	D	33	C	34	B	35	B
36	A	37	C	38	B	39	A	40	C
41	B	42	C	43	B	44	C	45	D
46	B	47	A	48	D	49	D	50	B
51	A	52	A	53	A	54	B	55	B
56	D	57	D	58	D	59	C	60	C
61	B	62	A	63	D	64	C	65	C
66	D	67	D	68	D	69	B	70	B
71	C	72	B	73	B	74	D	75	B
76	B	77	B	78	A	79	A	80	A
81	C	82	B	83	D				