Section A: Multiple Choice. Answer all questions. (1 mark each)

For each question, select the best answer and shade the letter corresponding to this answer on the answer sheet provided.

1) An isotope of the element rubidium, symbol Rb, has 37 protons and 48 neutrons in the nucleus. The symbol for this isotope may be written:

a) $^{37}Rb^{48}$

b) Rb

c) $_{48}^{37}Rb$

d) $_{37}^{85}Rb$

e) $^{85}Rb^{37}$

2) If a neutral atom has a mass number of 40 and an atomic number of 19, how many electrons surround the nucleus?

a) 40
b) 19
c) 59
d) 60
e) 21

3) The formula S_8 represents:

a) An element.
b) A compound.
c) A mixture.
d) A solution.
e) An atom.

4) Which one of the following statements regarding a liquid being cooled is NOT true?

a) Molecular motion gets slower.
b) The molecules get further apart.
c) The liquid gets denser.
d) The temperature decreases.
e) The forces between molecules get stronger.

5) 1 dm^3 is the same as:

a) 10000 cm^3
b) 10 cm^3
c) 100 cm^3
d) 0.001 cm^3
e) 1000 cm^3

6) A single covalent bond between two atoms involves:

a) One electron.
b) Two electrons.
c) Three electrons.
d) Four electrons.
e) No electrons.

7) The outer shell of the least reactive atoms generally contains:

a) 4 electrons.
b) 8 electrons.
c) 6 electrons.
d) 1 electron.
e) No fixed number of electrons.

8) When a drop of bromine is placed in the bottom of a gas jar, the colour of the gas gradually spreads throughout the jar. This process is known as

a) Brownian motion
b) Chemical reaction
c) Evaporation
d) Osmosis
e) Diffusion

9) A gas at STP has a temperature and pressure respectively, of

a) 1°C and 1 atm
b) 273°C and 1 atm
c) 0 K and 1 atm
d) 273K and 1 atm
e) 0°C and 273 atm

Question 10 to 12 involves the following information about certain chlorides. In each case the real symbol for one of the elements has been replaced by one of the letters A to G.

Chloride	**Melting Point/°C**	**Boiling Point/°C**
ACl	810	1350
BCl_3	-29	71
CCl	-154	-101
$DC1_4$	-68	70
ECl_2	-81	59
FCl_2	640	1940
GCl	590	968

10) Which one of the following substances would normally be liquid at room temperature?

a) CCl
b) ACl
c) DCl_4
d) FCI_2
e) GCl

11) Which one of the following substances would normally be expected to be a solid at room temperature?

a) $BC1_3$
b) $DC1_4$
c) ECl_2
d) CCI
e) FCl_2

12) Which one of the following substances is most likely to be ionic?

a) BCl_3
b) GCl
c) CCl
d) DCl_4
e) ECl_2

13) Which of the following acids has a proticity of 3?

a) HNO_3
b) H_3PO_4
c) CH_3COOH
d) H_2SO_4
e) HCl

14) A base is a substance that

a) Turns blue litmus red.
b) Reacts with an acid to form a salt.
c) Gives off hydrogen gas when mixed with water.
d) Contains only a few basic atoms.
e) Provides a good foundation for a chemical reaction.

15) The pH of a solution of HCl chloride would most likely be about:

a) 7
b) 13
c) 6.5
d) 1
e) 3

16) Which one of the following equations is not balanced correctly?

a) $3O_2 \rightarrow 2O_3$
b) $3Fe + 2O_2 \rightarrow Fe_3O_4$
c) $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$
d) $Na_2O_2 + H_2O \rightarrow 2NaOH + O_2$
e) $3H_2 + N_2 \rightarrow 2NH_3$

17) Analysis of a sample of magnesium oxide shows that it contains 1.52 g of magnesium for each gram of oxygen. If a second sample of the same oxide contains 13.91 g of magnesium, how much oxygen does this second sample contain?

1.39

a) 0.109g
b) 1.00g
c) 9.15g
d) 21.lg
e) 0.0915g

18) The ratio of the number of bismuth atoms to the number of oxygen atoms in $Bi_2(S0_4)_3$ is

a) 2:1
b) 2:3
c) 2:7
d) 1:2
e) 1:6

19) Which of the following atoms forms an anion in ionic compounds?

a) Ba
b) Be
c) Br
d) K
e) C

20) Sulfur and hydrogen are both substances which consist of molecules. Sulfur melts at 115°C and hydrogen melts at -259°C. The forces of attraction between the molecules must therefore be:

a) Much weaker in sulfur than in hydrogen
b) A little stronger in sulfur than in hydrogen.
c) Almost equally strong in both hydrogen and sulfur.
d) Almost equally weak in both hydrogen and sulfur.
e) Much stronger in sulfur than in hydrogen.

21) At 300K a certain sample of gas occupies1dm^3 At 600K and the same pressure the same mass of gas would occupy:

a) 0.5 dm^3
b) 600 dm^3
c) 2dm^3
d) 300 dm^3
e) 301 dm^3

22) 300° C is the same as

a) 573K
b) 273K
c) 27K
d) 0K
e) -300K

23) The valency of an element X is 3 and of element Y is 4. A compound of X and Y would be expected to have the formula:

a) XY
b) X_2Y
c) X_3Y_4
d) X_4Y_3
e) X_3Y

24) Copper (II) Sulfate is so-called because

a) It contains two copper atoms.
b) The valency of copper is 2.
c) It contains twice as much cooper as sulfate.
d) The relative atomic mass of copper is 2.
e) The sulfate ion has a charge of 2.

25) The term iodide is used in preference to iodine when:

a) Iodine is in the free form.
b) Iodine is mixed with salt.
c) Iodine has been sublimed.
d) Iodine is used as an antiseptic.
e) Iodine is combined with another element.

26) The diatomic gases H_2 , O_2 and N_2 are considered to be

a) elements
b) compounds
c) atoms
d) mixtures
e) alloys

27) Most of the mass of an atom is occupied by the.

a) Nucleus
b) Protons
c) Neutrons
d) Electrons
e) Ions

28) Element X is a group II metal in period 3. What would the electron configuration of this element be?

a) 2,8,1
b) 2,8,2
c) 2,8,8,2
d) 2,8,3
e) 2,3

29) Which of the following properties most likely indicates an ionically bonded compound?

a) solid, with a high melting point
b) colorless liquid
c) boils at -61 °C
d) no conducting aqueous solution
e) reacts slowly in water

30) The correct statement about salts are compounds that:

a) Are all soluble in water.
b) Are all insoluble in water.
c) Contains H^t ions in solution.
d) Contain metal ions or metallic groups and negative non-metal ions.
e) Are acidic in content.

SECTION B: SHORT ANSWER QUESTIONS (63 MARKS)

Answer each of the following questions in the spaces provided.

1)

a) Write the chemical names for each of the following substances. (5 MARKS)

i) $Mg(OH)_2$ _____

ii) $NaNO_3$ _____

iii) $FeSO_4$ _____

iv) H_2SO_4 _____

v) Al_2O_3 _____

b) Write formulae for the following substances. (5 MARKS)

i) lead (II) nitrate _____

ii) Nitrogen dioxide gas _____

iii) Potassium hydrogen carbonate _____

iv) Ammonium sulphate _____

v) Copper (I) oxide _____

c) Write balanced chemical equations, including state symbols, to illustrate what happens when

(i) A piece of sodium metal is dropped into cold water. (2 Marks)

_____

(ii) Magnesium ribbon burns in air. (2 Marks)

_____

(iii) Sodium hydroxide, NaOH (aq) is added to aqueous copper (II) sulphate, $CuSO_4$ to form sodium sulphate and copper II hydroxide (3 Marks)

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2) Fill in the following table: (7 marks)

Symbol of atom or ion	Name of element	Mass number	Number of protons	Number of neutrons	Number of electrons	Electronic config'n
$^{34}_{16}S^{-2}$						
		2	1			0
	sodium	23	11			

3) Glycin is a crystalline solid which melts at 246°C. Trimethylene glycol is a clear colourless solution which melts at -30°C and boils at 215°C.

(i) Why would trimethylene glycol not be suitable for a melting point determination of glycin? (2 MARKS)

Name	Melting point °C	Boiling point (°C)
A. decyl alcohol	6	228
B. ethylene glycol	-12.6	197
C. glycerol	18	290
D. propylene	-59	187

From the table, choose a letter for a liquid which would be suitable for a heating bath to determine the melting point of glycin. Explain your reasoning. (2 MARKS)

(iii) Is it advisable to use a thermometer with a scale ranging from 0 -100°C in this experiment? Why? (2 MARK)

(iv) Three tubes (labeled A, B and C) each contain a white crystalline solid. The three solids all melt at 149°C. A 50/50 mixture of the solids A and C melts at 149°C, but a 50/50 mixture of the solids from tubes A and B melts over the range 130 to 139°C. (3 MARKS)

a) What can you say about the identities of the solids in tubes A and B? _____

b) What can you say about the identities of the solids in tubes A and C? _____

c) What can you say about the identities of the solids in tubes B and C? _____

4) Define each of the following using a named example of each. (8 Marks)

a) Acid

b) Base

c) Indicator

_____

_____

_____

d) Neutralization

_____

_____

_____

5) A sample of nitrogen gas occupied a volume of 2 dm^3 at a temperature of 4°C and a pressure of one atm.the gas was transferred to a larger container and the temperature raised to 25°C the pressure of the gas raised to 2 atm

a) List the following:

Initial temperature_____

Initial pressure_____

Initial volume_____

Final temperature_____

Final pressure _____

b) What law must be applied to calculate the final volume_____

c) Show working and calculate the final volume of the nitrogen gas (5MARKS)

_____

END OF EXAMINATION