

1. 'Mass number' is the number of

- (A) neutrons plus protons
- (B) neutrons minus protons
- (C) electrons plus neutrons
- (D) electrons plus protons

2. Which TWO of the following features are true about the arrangement of electrons, protons and neutrons in an atom?

- I. Protons and neutrons are found in the nucleus.
- II. Electrons can be found anywhere outside the nucleus.
- III. The number of protons always equals the number of neutrons.
- IV. The number of protons always equals the number of electrons.

- (A) I and III only
- (B) I and IV only
- (C) II and III only
- (D) II and IV only

Items 3–5 refer to the following types of substances.

- (A) Salt
- (B) Base
- (C) Alkali
- (D) Acid

Match EACH item below with ONE of the options above. Each option may be used more than once, once or not at all.

Which of the substances above

- 3. can be described as the oxide of a metal?
- 4. supplies protons as the ONLY positive ions in aqueous solutions?
- 5. is one of the products in a neutralization reaction?

6. The atomic number of Element Z is 13. In which group of the periodic table should Element Z be placed?

- (A) 2
- (B) 3
- (C) 4
- (D) 5

7. The arrangement of elements in the periodic table is based on

- (A) atomic number
- (B) mass number
- (C) relative atomic mass
- (D) relative molecular mass

Item 8 refers to the following quantities of atoms.

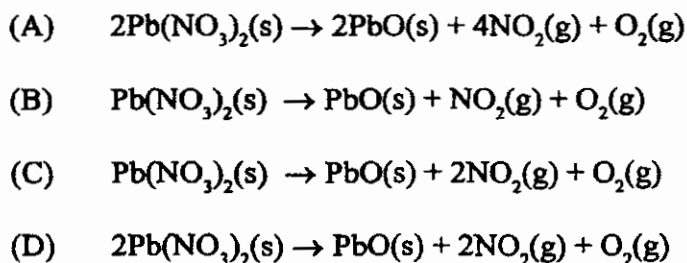
- I. 12 g of carbon
- II. 16 g of sulfur
- III. 23 g of sodium
- IV. 12 g of magnesium

(Relative mass number: C = 12; S = 32; Mg = 24; Na = 23)

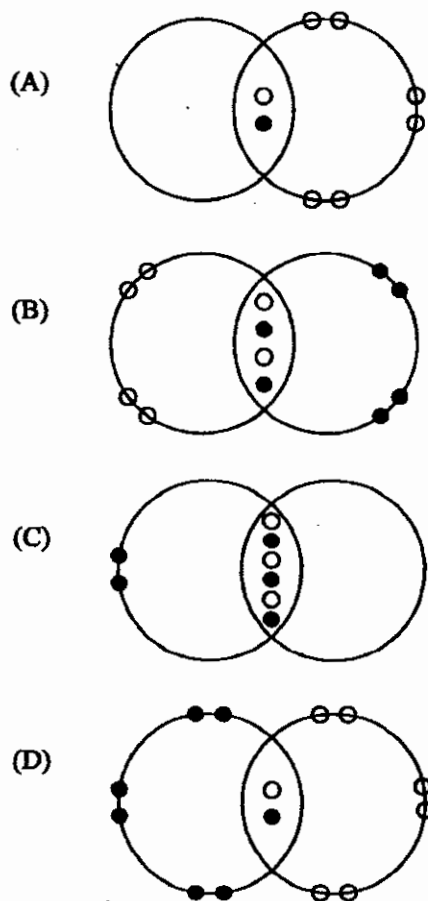
8. Which of the following pairs represents equal quantities of atoms?

- (A) I and II only
- (B) I and IV only
- (C) II and III only
- (D) II and IV only

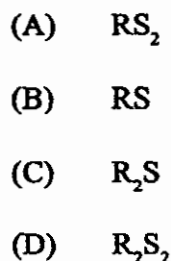
9. When solid lead nitrate is heated, it decomposes giving off nitrogen(IV) oxide and oxygen. The BALANCED equation for this reaction is



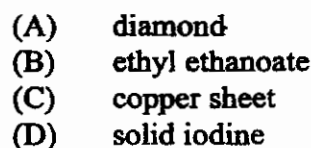
10. Which of the following diagrams illustrates bonding in chlorine?



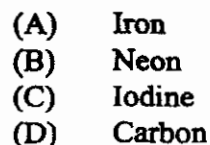
11. A new element R shows chemical properties similar to the element sodium. What is the correct formula of a compound formed with R and sulfur?



12. An example of a substance with a giant molecular structure is



13. Which of the following elements can exist in more than one form in the SAME state?



**Item 14** refers to the following information.

Element	Atomic Number
I	3
II	6
III	17
IV	18

14. Which TWO of the elements above when combined with each other form MAINLY ionic compounds?

(A) I and II only  
(B) I and III only  
(C) II and IV only  
(D) III and IV only

15. Which of the following features are usually true of covalent compounds?

I. Insoluble in water  
II. Existing in the solid state  
III. Easily boiled and melted

(A) I and II only  
(B) I and III only  
(C) II and III only  
(D) I, II and III

16. From which of the following mixtures can a solid be obtained by the process of sedimentation?

(A) Gels  
(B) Emulsions  
(C) Foams  
(D) Suspensions

17. A separating funnel can be used to separate a mixture of

(A) water and ethanol  
(B) water and kerosene  
(C) water and solid sodium chloride  
(D) kerosene and solid sodium chloride

18. One of the ways in which hydrogen resembles the Group 7 elements is that hydrogen

(A) has atoms that are held together by electrovalent bonds  
(B) donates its one electron very easily and forms an  $H^+$  ion  
(C) is one electron short of a rare gas structure  
(D) is a colourless gas like the halogens

19. The pH of fresh sugar cane juice which is usually 5.0–5.5 can be changed to 7.5–8.0 for more efficient processing by adding

(A) acetic (ethanoic) acid,  $CH_3CO_2H$   
(B) limestone,  $CaCO_3$   
(C) slaked lime,  $Ca(OH)_2$   
(D) sodium chloride,  $NaCl$

20. Which of the following salts is prepared by precipitation?

(A) Barium sulfate  
(B) Calcium chloride  
(C) Magnesium nitrate  
(D) Potassium carbonate

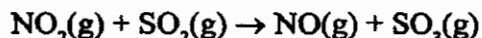
21. Which of the following compounds is NOT a normal salt?

(A) Sodium nitrate  
(B) Sodium carbonate  
(C) Potassium carbonate  
(D) Sodium hydrogen carbonate

22. A 'weak acid' is BEST described as one that yields a

- (A) low reading on the pH meter
- (B) low concentration of acid in aqueous solution
- (C) high concentration of hydrogen ions in solution
- (D) low concentration of hydrogen ions in aqueous solution

Item 23 refers to the following equation.



23. Which of the following compounds is reduced?

- (A)  $\text{NO}_2$
- (B)  $\text{SO}_2$
- (C)  $\text{NO}$
- (D)  $\text{SO}_3$

24. Which of the following salts are soluble in water?

- I. Ammonium carbonate
- II. Calcium sulfate
- III. Lead nitrate

- (A) I and II only
- (B) I and III only
- (C) II and III only
- (D) I, II and III

25. Which of the following substances is a weak electrolyte?

- (A) Aqueous ethanoic acid
- (B) Dilute hydrochloric acid
- (C) Molten lead
- (D) Molten lead bromide

26. Which of the following changes to a metal atom happens when it becomes an ion?

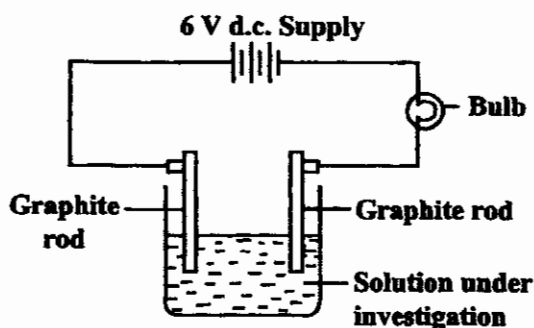
- (A) Gains electrons and is oxidized.
- (B) Gains electrons and is reduced.
- (C) Loses electrons and is oxidized.
- (D) Loses electrons and is reduced.

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27. In which of the following reactions is sulfur dioxide acting as an oxidizing agent?

- (A)  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$
- (B)  $\text{SO}_2(\text{g}) + 2\text{H}_2\text{S}(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + 3\text{S}(\text{s})$
- (C)  $\text{SO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{SO}_3(\text{aq})$
- (D)  $\text{SO}_2(\text{g}) + 2\text{HNO}_3(\text{aq}) \rightarrow \text{H}_2\text{SO}_4(\text{aq}) + 2\text{NO}_2(\text{g})$

**Item 28** refers to the following apparatus which is used to investigate the relative conductivity of various substances.



28. If solutions containing 1 mole of solute per  $\text{dm}^3$  of aqueous solution are investigated, which of the following solutions would cause the bulb to glow **BRIGHTEST**?

(A) Ammonia  
(B) Ethanoic acid  
(C) Sulfuric acid  
(D) Hydrochloric acid

29. Which of the following substances does **NOT** conduct electricity?

(A) Solid calcium  
(B) Solid calcium chloride  
(C) Molten calcium chloride  
(D) Aqueous calcium chloride

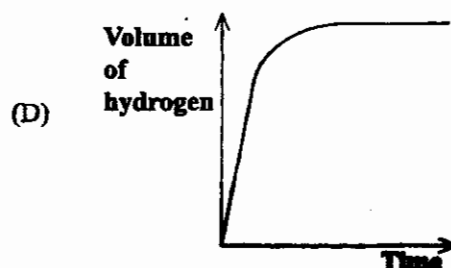
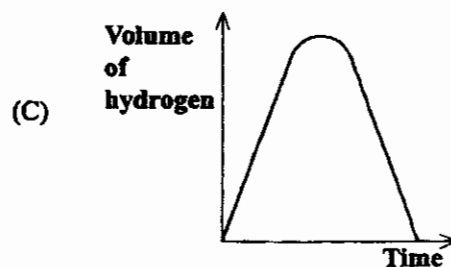
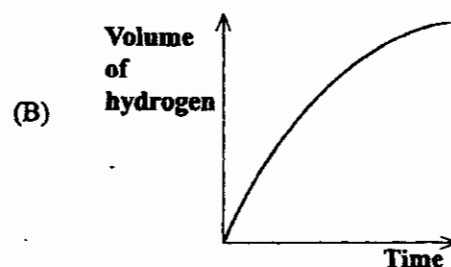
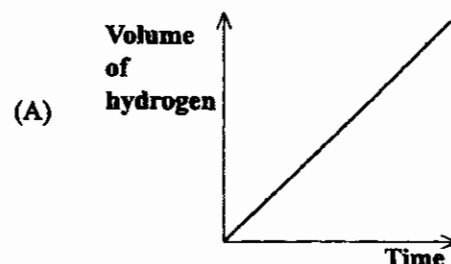
30. Which of the following observations is expected with the electrolysis of concentrated sodium chloride solution using graphite electrodes?

(A) Chlorine is evolved at the anode.  
(B) The pH of the solution decreases.  
(C) Oxygen is evolved at the anode.  
(D) Sodium is discharged at the cathode.

31. Which of the following statements **BEST** describes a catalyst?

(A) It increases the activation energy of a chemical reaction.  
(B) It alters the quantity of the products formed.  
(C) It is unchanged physically at the end of a reaction.  
(D) It is unchanged chemically at the end of a reaction.

32. An excess of magnesium powder was added to  $50 \text{ cm}^3$  of dilute sulfuric acid, and the reaction was allowed to continue until no more hydrogen evolved. Which of the following graphs **BEST** represents the complete reaction?

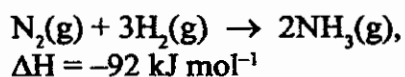


33. The condensation of steam is an exothermic reaction. Which of the following statements are true for this reaction?

I. Heat is absorbed.  
 II. Heat is evolved.  
 III.  $\Delta H$  is negative.

- (A) I and II only  
 (B) I and III only  
 (C) II and III only  
 (D) I, II and III

**Item 34** refers to the Haber process for the production of ammonia, according to the equation



34. The notation  $\Delta H = -92 \text{ kJ mol}^{-1}$  means that 92 kJ of energy are

- (A) released during the reaction  
 (B) required to form the bonds in  $\text{NH}_3$   
 (C) required for the reaction to proceed  
 (D) required to break the bonds in  $\text{N}_2$  and  $\text{H}_2$

35. Which of the following substances conducts an electric current and remains chemically unchanged?

- (A) Aqueous copper(II) sulfate  
 (B) Copper  
 (C) Sulfur  
 (D) Sodium chloride

36. When heated, which of the following nitrates decomposes to produce the metal oxide, oxygen and nitrogen dioxide?

- (A) Ammonium nitrate  
 (B) Copper nitrate  
 (C) Potassium nitrate  
 (D) Sodium nitrate

37. A recently discovered element is thought to be a metal. Which of the following physical properties would BEST confirm this?

- (A) Density  
 (B) Hardness  
 (C) Melting point  
 (D) Electrical conductivity

38. An element that is a non-metal

- (A) can act as a reducing agent  
 (B) conducts electricity  
 (C) forms an acidic oxide  
 (D) is a solid at room temperature

39. Which of the following elements can be extracted by chemical reduction?

- (A) K  
 (B) Ca  
 (C) Fe  
 (D) Mg

40. Which of the following elements would NOT form an acidic oxide when burnt in air?

- (A) Carbon  
 (B) Sulfur  
 (C) Nitrogen  
 (D) Magnesium

41. Which of the following observations is expected when aqueous silver nitrate is added to aqueous potassium chloride?

- (A) A pungent gas is evolved.  
 (B) A blue precipitate appears.  
 (C) A white precipitate appears.  
 (D) A brown precipitate appears.

42. Which of the following gases is alkaline?

- (A) Ammonia
- (B) Carbon dioxide
- (C) Nitrogen dioxide
- (D) Sulfur dioxide

43. Ammonia may be produced in the laboratory by heating a mixture of ammonium chloride and

- (A) copper
- (B) calcium hydroxide
- (C) ammonium sulfate
- (D) calcium chloride

44. Which of the aqueous solutions below produces a yellow precipitate with aqueous potassium iodide?

- (A) Calcium chloride
- (B) Lead nitrate
- (C) Zinc sulfate
- (D) Sodium carbonate

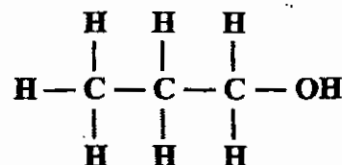
45. Which of the following elements is the MOST electropositive?

- (A) Aluminium
- (B) Copper
- (C) Magnesium
- (D) Zinc

46. ALL members of a homologous series have similar

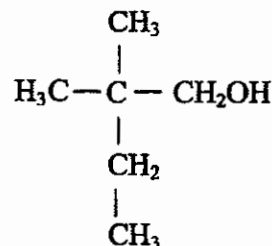
- (A) densities
- (B) boiling points
- (C) chemical properties
- (D) physical properties

47. To which homologous series does the following structure belong?



- (A) Acids
- (B) Alkenes
- (C) Alkanes
- (D) Alcohols

Item 48 refers to the compound shown below.



48. Which TWO of the following terms correctly describe the compound shown?

- I. An alcohol
- II. A branched alkane
- III. Reactive with sodium
- IV. Not reactive with acidified potassium dichromate

- (A) I and III only
- (B) I and IV only
- (C) II and III only
- (D) II and IV only

49. The compound which has the formula  $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{CH}_3$  is

- (A) an alkene
- (B) an unsaturated acid
- (C) a carboxylic acid
- (D) a polymer

50. Ethyl ethanoate and fats are classified as esters. From this information it can be deduced that BOTH

(A) are soluble in water  
(B) burn with a blue flame  
(C) contain the  $\text{—COOR}$  group  
(D) have a pleasant odour

51. Which of the following reactions occurs between propene and bromine?

(A) Addition  
(B) Condensation  
(C) Substitution  
(D) Precipitation

52. Which of the following compounds would increase in mass when treated with hydrogen in the presence of nickel?

(A)  $\text{C}_3\text{H}_8$   
(B)  $\text{C}_4\text{H}_8$   
(C)  $\text{C}_2\text{H}_5\text{OH}$   
(D)  $\text{C}_3\text{H}_7\text{Cl}$

Items 53–54 refer to the following options.

(A) Addition  
(B) Isomerism  
(C) Esterification  
(D) Polymerisation

Each option may be used once, more than once or not at all to answer the items below.

53. What is the name of the process in which an alcohol and a carboxylic acid react using a catalyst?

54. What is the name of the process in which proteins are formed from amino acids?



Which of the following processes CORRECTLY describes the reaction above?

(A) Precipitation  
(B) Neutralization  
(C) Reduction  
(D) Decomposition

56. When large alkane molecules are cracked, the products are a mixture of

(A) small alkane molecules  
(B) small alkene molecules  
(C) large and small alkane molecules  
(D) small alkane and alkene molecules



57. The MAJOR natural source of alkanes and alkenes is
- (A) petroleum
  - (B) natural gas
  - (C) the earth's crust
  - (D) the atmosphere
58. The fermentation of sugars, using glucose as the substrate, can be represented by the equation
- (A)  $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
  - (B)  $C_6H_{12}O_6 + C_6H_{12}O_6 \rightarrow C_{12}H_{22}O_{11} + H_2O$
  - (C)  $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$
  - (D)  $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
59. A protein, X, is hydrolysed using a dilute acid. The BEST method of separating and identifying the products is by
- (A) chromatography
  - (B) crystallization
  - (C) distillation
  - (D) fractional distillation
60. A polymer has the structure
- $$-CHX-CH_2-CHX-CH_2-CHX-CH_2-CHX-CH_2-$$
- The formula of the monomer is
- (A)  $XCH_2-CH_2X$
  - (B)  $CH_3=CHX$
  - (C)  $CH_3-CH_2X$
  - (D)  $CH_2=CHX$

END OF TEST

**IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.**