1. In which of the following compounds does manganese have an oxidation number of 7^+?

(A) MnO
(B) MnO_2
(C) Mn_2O_3
(D) $KMnO_4$

2. Sulphur and oxygen are in the same group of the periodic table because

(A) they can react with each other
(B) the atomic number of sulphur is 16 and the relative atomic mass of oxygen 16
(C) they have the same number of electrons in their outer shell
(D) they can form covalent compounds

3. Which of the following oxides does NOT react with acids to form only a salt and water?

(A) Na_2O
(B) CaO
(C) ZnO
(D) MnO_2

4. Which two of the following statements about covalent compounds are true?

I. They are mainly solids.
II. They usually have low melting and boiling points.
III. They are usually insoluble in water.
IV. They contain only ions.

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

5. Which of the following methods may be used in the preparation of barium sulphate in the laboratory?

(A) Crystallization
(B) Distillation
(C) Evaporation
(D) Precipitation

6. Which of the following is NOT a normal salt?

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

7. Which of the following factors would NOT affect the discharge of a particular cation during electrolysis?

(A) Position of the cation in the electrochemical series
(B) Concentration of the cation in solution
(C) Inertness of the electrode
(D) Temperature of the solution

8. In the electrolysis of copper(II) sulphate solution with platinum or carbon electrodes, the blue colour of the solution fades because

(A) copper is being transferred from anode to cathode
(B) copper passes into the solution as ions
(C) copper is being deposited at the cathode
(D) both Cu^{2+} and H^+ ions migrate to the cathode

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9. In the reaction between zinc and dilute sulphuric acid

(A) water is formed
(B) an insoluble salt is formed
(C) neutralisation occurs
(D) oxidation and reduction occur

10. Which of the following exhibits allotrophy?

(A) Carbon
(B) Uranium
(C) Butane
(D) Silicon

Item 11 refers to the following table.

11. Which of the substances A, B, C or D is MOST LIKELY sodium chloride?

Substance	Boiling Point °C	Electrical Conductivity	
		in the solid state	in aqueous solution
A	1 465	no	yes
B	444	no	no
C	2 600	yes	no
D	-35	no	yes

12. Two particles have the following composition:

(i) 10 protons, 12 neutrons, 10 electrons
(ii) 10 protons, 11 neutrons, 10 electrons

They are therefore both

(A) allotropes
(B) cations
(C) isotopes
(D) metals

13. A certain base reacted with a salt, producing a gas which turned damp red litmus paper blue. Which of the following ions does the salt contain?

(A) SO_4^{2-}
(B) NO_3^-
(C) CO_3^{2-}
(D) NH_4^+

14. Which of the following can act as oxidising agents?

I. Metallic atoms
II. Non-metallic atoms
III. Metallic ions
IV. Non-metallic ions

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

15. The number of shared electron pairs in the methane molecule is

(A) 4
(B) 6
(C) 8
(D) 10

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16. A mixture of copper (II) oxide and copper (II) sulphate could BEST be separated by

(A) shaking with excess water and then filtering
(B) heating the mixture and condensing
(C) shaking with excess water followed by fractional distillation
(D) distilling the mixture

17. Two solutions are mixed in order to demonstrate endothermic change. Which of the following techniques is MOST appropriate?

(A) Taking mass readings
(B) Taking temperature readings
(C) Carefully observing colour changes
(D) Monitoring the pH of the solutions

18. An ion with a single negative charge may be converted into a neutral atom of the same element by

(A) losing an electron
(B) gaining an electron
(C) gaining a proton
(D) losing a neutron

19. Which of the following possible effects of a catalyst on a reaction is NOT correct?

(A) It has no effect on the yield of products.
(B) It is unchanged chemically on completion of the reaction.
(C) It lowers the energy of the reactants so that the reaction occurs at a faster rate.
(D) It allows equilibrium to be attained more rapidly in a reversible reaction.

20. Which of the following halogens is a liquid at room temperature?

(A) Bromine
(B) Fluorine
(C) Chlorine
(D) Iodine

21. In which of the following does hydrogen have a negative oxidation number?

(A) CH_4
(B) H_2O_2
(C) NH_3
(D) NaH

22. Which of the following elements does NOT exhibit allotropy?

(A) Carbon
(B) Phosphorus
(C) Sulphur
(D) Silicon

23. The atoms of Element X contain nineteen electrons. With which of the following elements will the chemistry of X be similar?

(A) Aluminium
(B) Bromine
(C) Lithium
(D) Magnesium

24. $RCOOH(aq) + NaOH(aq) \rightarrow RCOONa(aq) + H_2O(l)$

Which of the following processes correctly describes the reaction above?

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

25. Which of the following statements is/are true of atoms?

I. They contain three fundamental particles.
II. They are indivisible in chemical reactions.
III. Those of an element are all exactly alike.
IV. They contain particles which all carry charges.

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

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

(A) $2Pb(NO_3)_2(s) \rightarrow 2PbO(s) + 4NO_2(g) + O_2(g)$

(B) $Pb(NO_3)_2(s) \rightarrow PbO(s) + NO_2(g) + O_2(g)$

(C) $Pb(NO_3)_2(s) \rightarrow PbO(s) + 2NO_2(g) + O_2(g)$

(D) $2Pb(NO_3)_2(s) \rightarrow PbO(s) + 2NO_2(g) + O_2(g)$

Items 27 - 28 refer to the following options.

(A) A giant ionic structure
(B) A molecular crystal
(C) A macromolecule
(D) An atomic crystal

Match EACH item below with one of the options above, each of which may be used more than once, once or not at all.

27. Calcium chloride

28. Starch

29. Sodium reacts with water according to the equation

$2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$

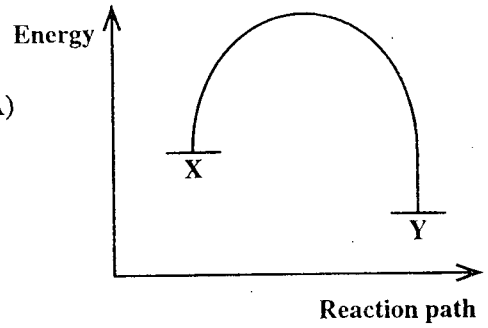
(Molar volume = 24 litres at room temperature and pressure).

The number of litres of hydrogen liberated when 0.1 mole of sodium reacts with excess water is

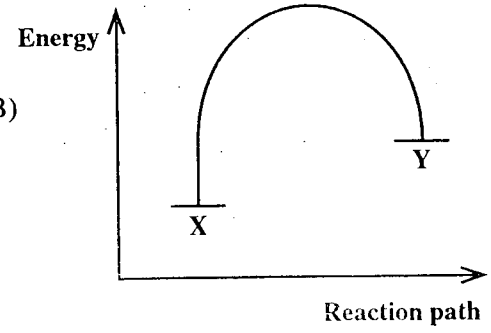
(A) 1.2
(B) 2.4
(C) 12
(D) 24

30. Which of the following diagrams BEST illustrates the course of an exothermic reaction?

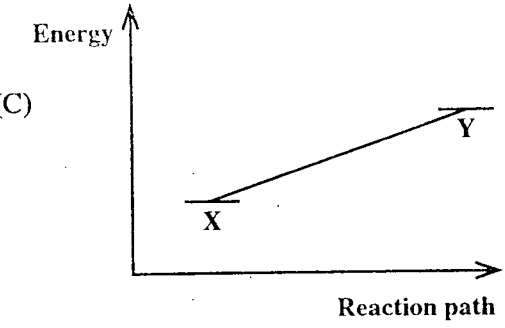
(A)



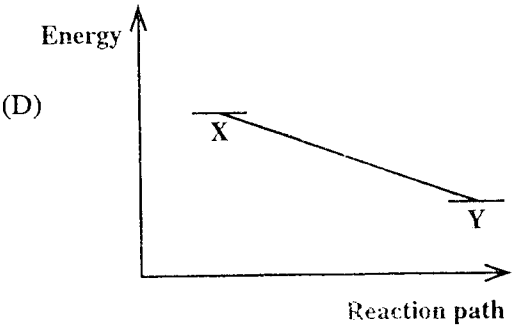
(B)



(C)

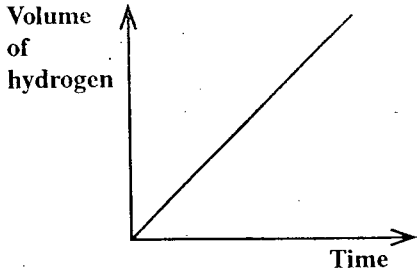


(D)

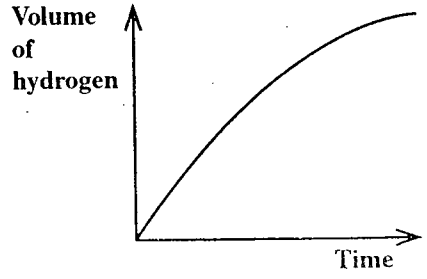


31. An excess of magnesium powder was added to 50 cm^3 of dilute sulphuric acid, and the reaction was allowed to continue until no more hydrogen evolved. Which of the following graphs BEST represents the complete reaction?

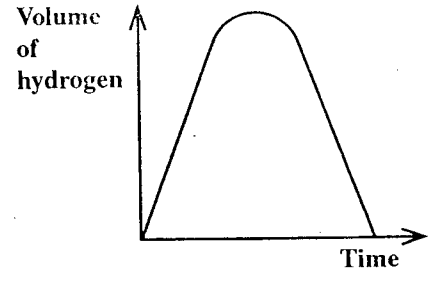
(A)



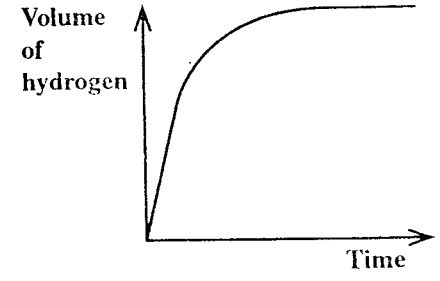
(B)



(C)



(D)



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

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

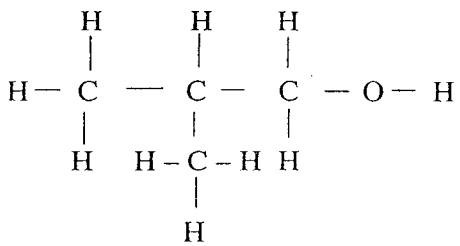
33. How many neutrons and electrons does the particle $^{24}_{12}X^{2+}$ have?

	Neutrons	Electrons
(A)	12	10
(B)	12	12
(C)	24	10
(D)	24	12

34. Which of the atoms represented below by their electronic configuration will most readily form a positive ion?

(A) 2, 8, 1
(B) 2, 8, 2
(C) 2, 8, 7
(D) 2, 8, 8

35. A compound has the following structural formula.



Which two of the following statements about the compound are correct?

I. It is an alcohol.
II. It is a branched alkane.
III. It can react with sodium.
IV. It is an unreactive substance.

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

36. Ethanol can react with concentrated sulphuric acid to produce ethene. This reaction can be referred to as

(A) dehydration
(B) esterification
(C) dehydrogenation
(D) neutralisation

37. Which of the following equations represents a condensation reaction?

(A) $nC_6H_{12}O_6 \rightarrow (C_6H_{10}O_5)n + nH_2O$

(B) $CH_3CH = CH_2 + HBr \rightarrow CH_3CH_2CH_2Br$

(C) $CH_3CH_2CH_3 + Br_2 \rightarrow CH_3CH_2CH_2Br + HBr$

(D) $CH_3CH_2COOH + NaOH \rightarrow CH_3CH_2COONa + H_2O$

38. Which of the following can be produced in one step from ethanol?

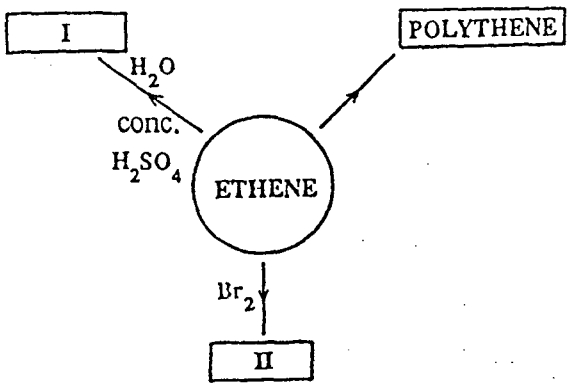
I. Ethene
II. Ethane
III. Sodium ethanoate
IV. Ethyl ethanoate

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

39. Compounds in a homologous series

(A) exist in the same state
(B) possess only carbon in straight chains
(C) possess the same molecular formula
(D) differ successively by a - CH_2 - group

Items 40 - 41 refer to the following chart.



40. The product I is

(A) ethanol
(B) ethane
(C) ethanoic acid
(D) ether

41. The product, polythene, is a

(A) monomer
(B) dimer
(C) polymer
(D) isomer

42. The number of isomers of butane C_4H_{10} is

(A) 1
(B) 2
(C) 3
(D) 4

43. Glucose is converted to starch or cellulose by

(A) addition polymerisation
(B) oxidation and reduction
(C) condensation polymerisation
(D) dehydrogenation

---

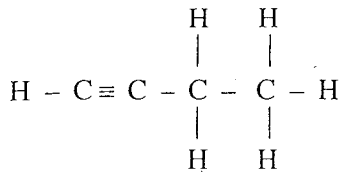
44. POLYSACCHARIDE → DISACCHARIDE → MONOSACCHARIDE

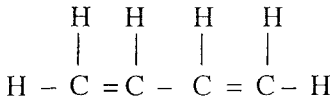
I II III

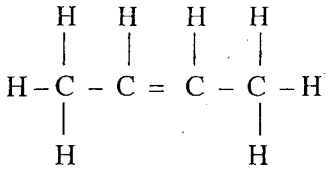
Which of the following processes BEST describes the changes from I to III?

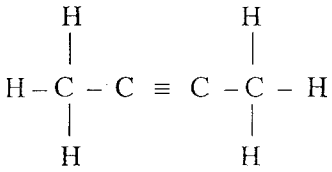
(A) Reduction
(B) Hydrolysis
(C) Oxidation
(D) Synthesis

45. A compound was found to have a molecular formula C_4H_6. Which of the following is NOT an isomer of this compound?

(A)


(B)


(C)


(D)


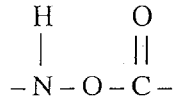
46. With which of the following substances would n-octane, an alkane, react?

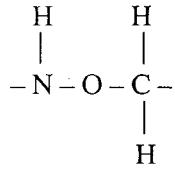
(A) Chlorine
(B) Hydrogen
(C) Hydrogen bromide
(D) Steam

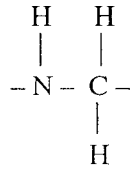
47. The following represents a portion of the nylon molecule (a polyamide).

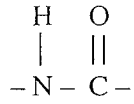
-X-Y-X-Y-

X and Y represent the monomers minus the functional groups, and - represents the linkage. The linkage could BEST be represented by

(A)


(B)


(C)


(D)


48. A polymer formed by an addition reaction has the structure

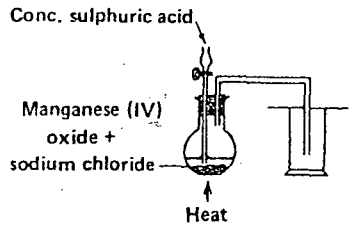
-CHX-CH_2-CHX-CH_2-CHX-CH_2-CHX-CH_2-

The formula of the monomer would be

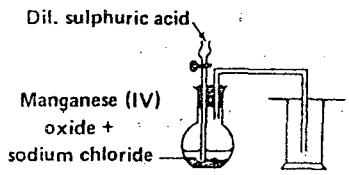
(A) $XCH_2 - CH_2X$
(B) $CH_3 = CHX$
(C) $CH_3 - CH_2X$
(D) $CH_2 = CHX$

Item 49 refers to the following diagrams.

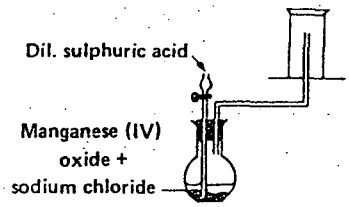
I



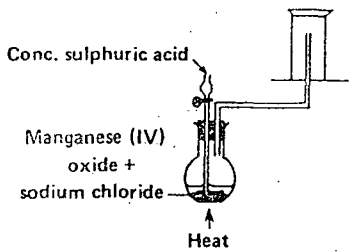
II



III



IV



49. In which of the experiments would the amount of chlorine gas collected be GREATEST?

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

50. Aluminium is more reactive than iron yet, after a while, a piece of aluminium left exposed to the atmosphere becomes corrosion resistant whilst a similar piece of iron continues to corrode. This is because the

(A) aluminium has reacted completely
(B) iron oxide formed is more reactive than the aluminium oxide formed
(C) oxide film on aluminium protects the metal from further corrosion but the oxide film on iron does not
(D) iron oxide reacts with the iron below but aluminium oxide does not react with the aluminium below

51. Which of the following elements reacts most vigorously with $H^+(aq)$ ions to give hydrogen gas?

(A) Zinc
(B) Lead
(C) Iron
(D) Copper

52. Which of the following statements about sulphur are true?

I. It is used in the manufacture of matches.
II. It is used in the vulcanisation of rubber.
III. It is used in the extraction of iron from its ore.
IV. It is used in the manufacture of explosives.

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

53. Chloride ions can be identified by using

(A) silver nitrate solution and dilute nitric acid
(B) barium chloride solution and hydrochloric acid
(C) sodium hydroxide solution and litmus
(D) concentrated sulphuric acid and copper turnings

54. Which of the following methods can be used in the extraction of aluminium?

(A) Reduction of the oxide by carbon or carbon monoxide
(B) Oxidation of the sulphide to the oxide followed by reduction of the oxide by carbon
(C) Partial oxidation of the sulphide to the oxide followed by self-reduction of the oxide by the sulphide
(D) Electrolysis of a compound of the element in the molten state

55. Which of the following metals will NOT displace hydrogen from dilute hydrochloric acid?

(A) Zinc
(B) Iron
(C) Copper
(D) Aluminium

56. Which of the following is an important constituent of chlorophyll?

(A) Iron
(B) Copper
(C) Calcium
(D) Magnesium

57. The main substance responsible for 'acid rain' is

(A) dust particles
(B) radioactive fallout
(C) carbon dioxide
(D) sulphur dioxide

58. Which of the following processes gives a different gaseous product from the others?

(A) Photosynthesis in plants
(B) Respiration in animals
(C) Oxidation of carbon monoxide
(D) Heating calcium carbonate

59. Yeast may be used in the fermentation of starch to ethanol because

(A) it is acidic
(B) it contains enzymes which act on starch
(C) yeast itself produces the ethanol
(D) it fixes the oxygen needed in the reaction from the atmosphere

60. Which of the following is/are condensation polymers?

I. Terylene
II. Nylon
III. Starch
IV. Polythene

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

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