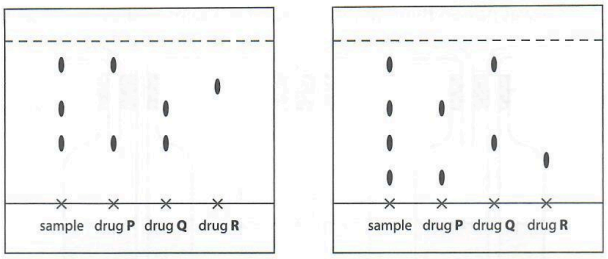
O Trial Examination 1

20

Duration: 30 minutes

For each question, choose the most suitable option and write the letter (**A**, **B**, **C** or **D**) in the brackets provided. Each correct answer will score one mark.

1. Figure 1 shows the chromatograms of a urine sample using two different solvents.



chloroform solvent used **propanol solvent used**

Figure 1

Based on the two chromatograms, which drugs are **present** in the urine sample?

A Drug **P** only

B Drug **Q** only

C Drugs **P** and **Q** only

D Drugs **P**, **Q** and **R** ( )

2. Several tests were carried out on substance **X**.

Which of the following shows that substance **X** is **not** a pure compound?

A It dissolved in water.

B It formed a black solid and released a colourless gas on burning.

C It melted over the range of 135 °C to 141 °C.

D It reacted vigorously with hydrochloric acid. ( )

3. Chlorine exists as two different isotopes, chlorine-35 and chlorine-37.

   Which of the following statements about chlorine and its isotopes is **not** true?

   A 1 mol of chlorine-35 has the same mass as 1 mol of chlorine-37.

   B It is possible for one molecule of chlorine to have a molecular mass of 74.

   C The ion of chlorine-35 has the same electronic configuration as the ion of chlorine-37.

   D The total number of sub-atomic particles in chlorine-35 is 52, while the total number of sub-atomic particles in chlorine-37 is 54. ( )

4. Steel is an alloy that is made up of iron and carbon.

   Which of the following **correctly** explains why steel can conduct electricity?

   A Carbon has valence electrons that move freely in its structure.

   B Iron and carbon atoms contain many electrons.

   C Iron has valence electrons that move freely in its structure.

   D Steel has mobile ions which act as charge carriers. ( )

5. Carbon disulfide has a low boiling point and exists as a volatile liquid at room temperature because _____.

   A it evaporates easily when exposed to air

   B it exists as simple covalent molecules

   C weak covalent bonds exist between its atoms

   D weak forces of attraction exist between its molecules ( )

6. Ammonia has a very low boiling point while ammonium chloride has a very high boiling point.

   Which of the following **best** describes the particles of ammonia and ammonium chloride at room temperature?

	Ammonia	Ammonium Chloride
A	Atoms are far apart.	Atoms vibrate in fixed positions.
B	Atoms slide over one another.	Ions vibrate in fixed positions.
C	Molecules are far apart.	Molecules slide over one another.
D	Molecules are far apart.	Ions vibrate in fixed positions.

( )

7. 25 cm^3 of 0.5 mol/dm^3 dilute sulfuric acid is required to completely neutralise a 20 cm^3 solution of ammonia.

What is the concentration of the ammonia solution?

A 0.000833 mol/dm^3

B 0.400 mol/dm^3

C 0.625 mol/dm^3

D 1.25 mol/dm^3 ( )

8. Some gases are given below.

Ammonia	Carbon dioxide	Carbon monoxide
Hydrogen bromide	Nitrogen monoxide	Sulfur dioxide

How many gases above can change the colour of damp litmus papers?

A 2

B 3

C 4

D 5 ( )

9. When solution **J** was added to dilute nitric acid, effervescence of a gas was observed.
Aqueous sodium hydroxide was added dropwise into the resultant mixture until it was in excess.
When the mixture was subsequently warmed, no visible change was observed.

Which of the following ions could be present in solution **J**?

A Al^{3+}, CO_3^{2-}, NO_3^-

B Ca^{2+}, Cl^-, SO_4^{2-}

C CO_3^{2-}, K^+, NO_3^-

D CO_3^{2-}, Na^+, NH_4^+ ( )

10. In which of the following reactions does the underlined substance act as an oxidising agent?

A $2C + \underline{O_2} \longrightarrow 2CO$

B $2NaCl + \underline{Pb(NO_3)_2} \longrightarrow PbCl_2 + 2NaNO_3$

C $NaOH + \underline{HCl} \longrightarrow NaCl + H_2O$

D $\underline{Mg} + ZnCl_2 \longrightarrow MgCl_2 + Zn$ ( )

11. Table 1 shows the electronic configuration of some elements, **W**, **X**, **Y** and **Z**.

Table 1

Element	Electronic Configuration
W	2, 8, 7
X	2, 8, 1
Y	2, 7
Z	2, 8, 8, 1

Which of the elements **W** to **Z** would react **most** vigorously with each other?

A **W** and **X**

B **W** and **Z**

C **X** and **Y**

D **Y** and **Z** ( )

12. A student investigated the reactivity of four metals, copper, iron, nickel and vanadium. He wrote down his observations as shown below.

- When copper was added into nickel(II) sulfate solution, the solution remained green.
- When vanadium was added into iron(III) sulfate solution, the yellow solution turned purple.
- When vanadium was added into copper(II) sulfate solution, a red-brown solid formed.

Which of the following observations would allow the student to arrange the metals in order of reactivity?

A When iron was added to copper(II) sulfate, the blue solution turned yellow.

B When iron was added to nickel(II) sulfate, the green solution turned yellow.

C When vanadium was added to nickel(II) sulfate, the green solution turned purple.

D When copper was added to iron(III) chloride, the solution remained yellow. ( )

13. A student carried out two experiments as described below.

Experiment 1: Aqueous potassium hydroxide was added into sulfuric acid until it was in excess.

Experiment 2: Aqueous ammonia was added dropwise into sulfuric acid until it was in excess.

Which of the following do **not** describe the results of the two experiments?

	Experiment 1	Experiment 2
A	When a drop of copper(II) sulfate was added into the resultant solution, a blue precipitate was formed.	The temperature of the reaction mixture increased.
B	The pH of the resultant solution was lower than that in experiment 2.	The pH of the resultant solution was higher than that in experiment 1.
C	The resultant solution turned red litmus paper blue.	When a drop of copper(II) sulfate was added into the resultant solution, a blue solution was formed.
D	The temperature of the resultant solution increased.	The resultant solution turned red litmus paper blue.

( )

14. Figure 2 shows the results obtained from three experiments involving nitric acid and excess zinc.

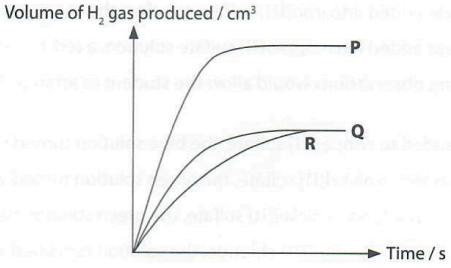


Figure 2

Which of the following statements about the three experiments is/are **true**?

1 All three experiments were carried out at different temperatures.

2 Graphs **P** and **Q** were obtained when different volumes of nitric acid were used.

3 If 50 cm^3 of 1.0 mol/dm^3 nitric acid used in the experiment produced graph **R**, 50 cm^3 of 2.0 mol/dm^3 of nitric acid used would produce graph **P**.

4 The particle size of zinc is the only variable that was changed in the three experiments.

A 1 and 2 only

B 1 and 4 only

C 2 and 3 only

D 3 only

( )

15. Different concentrations of compounds **D** and **E** are mixed together and the rate of reaction is monitored. The rate of reaction is determined by monitoring the time taken for the colourless solution to turn brown due to the formation of compound **F**.

$$D + E \longrightarrow 2F$$

Table 2 shows the data obtained.

Table 2

Experiment	Concentration of D / mol/dm³	Concentration of E / mol/dm³	Time Taken to Produce F / s
1	0.100	0.100	68
2	0.200	0.100	34
3	0.200	0.200	17
4	0.400	?	17

Which of the following statements about the reaction is **not** true?

A The concentration of **E** in experiment 4 is likely to be 0.100 mol/dm³.

B When the concentration of **D** is doubled, the rate of reaction is doubled.

C When the concentration of **E** is doubled, the rate of reaction remains unchanged.

D When the concentrations of **D** and **E** are doubled, the rate of reaction increases by four times.

( )

16. The naphtha fraction that is obtained from the fractional distillation of petroleum contains a mixture of hydrocarbons with 7 to 14 carbon atoms. Naphtha can be used as a raw material for making plastics.

Which of the following statements are **correct**?

1 Ethene is a raw material that can be obtained from naphtha.

2 One of the hydrocarbons in the naphtha fraction could have a chemical formula of C_8H_{18}.

3 Plastics produced from naphtha are biodegradable.

4 The hydrocarbon with 14 carbon atoms has a lower boiling point than the hydrocarbon with 7 carbon atoms.

A 1 and 2 only

B 1, 2 and 4 only

C 3 and 4 only

D All of the above

( )

17. When gas **J** was bubbled into colourless solution **K**, the solution turned red-brown. When hexene was added to the resultant solution, the red-brown solution was decolourised.

Which of the following is **correct**?

	Gas J	Solution K	Type of Reaction That Took Place When Hexene Was Added
A	Chlorine	Potassium bromide	Displacement
B	Chlorine	Sodium bromide	Addition
C	Ethene	Bromine	Substitution
D	Hydrogen	Propene	Addition

( )

18. The structure of compound **Q** is shown in Figure 3.

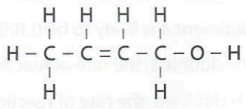


Figure 3

Which of the following statements about compound **Q** is **not** true?

A It can decolourise aqueous bromine.

B It can decolourise acidified potassium manganate(VII).

C It can react with chlorine gas in the presence of ultraviolet (UV) light.

D The next member of the same homologous series as compound **Q** has a molecular formula of $C_5H_{11}OH$.

( )

19. Alkynes are unsaturated compounds that have similar chemical properties as alkenes. An example of an alkyne, ethyne, is shown in Figure 4.

H – C ≡ C – H

Figure 4

Which of the following statements about ethyne is **not** true?

A 1 mol of ethyne reacts with 2 mol of hydrogen gas to form ethane.

B Ethyne burns in excess oxygen to form carbon dioxide and water.

C Ethyne undergoes addition polymerisation to form a polymer that is saturated.

D Propyne has the molecular formula of C_3H_4. ( )

20. Nitrogen is an inert gas because _____.

A it contains a fully filled electron shell

B it contains very strong nitrogen–nitrogen triple bonds

C it does not react with oxygen

D it has a small relative molecular mass ( )