Cambright Solved Paper

Tags	2023 CIE IGCSE Chemistry May/June P2 V1
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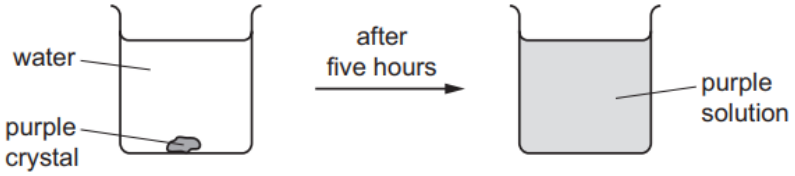
Status	Done

1 The diagram shows the result of dropping a purple crystal into water.



Which processes take place in this experiment?

	chemical reaction	diffusing	dissolving
A	✓	✓	✗
B	✓	✗	✗
C	✗	✗	✓
D	✗	✓	✓

2 Which row about elements, mixtures and compounds is correct?

	metallic element	non-metallic element	mixture	compound
A	copper	methane	brass	sulfur
B	brass	sulfur	copper	methane
C	copper	sulfur	brass	methane
D	brass	methane	copper	sulfur

3 The atomic structures of four particles, W, X, Y and Z, are shown.

	electrons	neutrons	protons
W	2	2	2
X	2	2	3
Y	2	3	2
Z	3	2	3

Which particles are isotopes of the same element?

A W and X **B** W and Y **C** X and Y **D** X and Z

W and Y are isotopes of the same element because they have the same number of electrons, but different number of neutrons.

4 Which statement explains why isotopes of the same element have the same chemical properties?

A They have the same number of outer shell electrons.

B They have the same number of neutrons.

C They have different numbers of protons.

D They have different mass numbers.

5 Nitrogen forms a nitride ion with the formula N^{3-}.

Which particle does **not** have the same electronic configuration as the nitride ion?

A Al^{3+} **B** Cl^{-} **C** Na^{+} **D** O^{2-}

6 Which row describes the formation of single covalent bonds in methane?

A	atoms share a pair of electrons	both atoms gain a noble gas electronic structure
B	atoms share a pair of electrons	both atoms have the same number of electrons in their outer shell
C	electrons are transferred from one atom to another	both atoms gain a noble gas electronic structure
D	electrons are transferred from one atom to another	both atoms have the same number of electrons in their outer shell

7 Which formula is an empirical formula?

A C_2H_4O

B $C_4H_8O_2$

C C_3H_7COOH

D $CH_3CH_2CH_2COOH$

It is an empirical formula because you cannot further simplify the elements

8 Heating iron sulfide, FeS_2, in air produces sulfur dioxide.

$$4FeS_2 + 11O_2 \rightarrow 2Fe_2O_3 + 8SO_2$$

What is the maximum mass of sulfur dioxide produced from 120 kg of iron sulfide?

A 64 kg **B** 128 kg **C** 240 kg **D** 512 kg

9 Which substance produces hydrogen and bromine when electrolysed?

A concentrated aqueous copper(II) bromide

B concentrated aqueous sodium bromide

C dilute aqueous potassium bromide

D molten lead(II) bromide

10 Which statements about hydrogen fuel cells are correct?

1 Water is formed as the only waste product.

2 Both water and carbon dioxide are formed as waste products.

3 The overall reaction is $2H_2 + O_2 \rightarrow 2H_2O$.

4 The overall reaction is endothermic.

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

11 Ethene gas, C_2H_4, is completely burned in excess oxygen to form carbon dioxide and water.

The equation for this exothermic reaction is shown.

$$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$$

The table shows the bond energies involved in the reaction.

bond	bond energy in kJ/mol
C=C	614
C–H	413
O=O	495
C=O	799
O–H	467

What is the total energy change in this reaction?

A –954 kJ/mol

B –1010 kJ/mol

C –1313 kJ/mol

D –1369 kJ/mol

C_2H_4 has a bond energy of 614 (C_2) and 4×413 (CH) for a total of 2266

$3O_2$ has a bond energy of $3 \times 495 = 1485$

Total energy to break bonds is $2266 + 1485 = 3751$

$2CO_2$ has a bond energy of $2 \times 2 \times 799 = 3196$

$2H_2O$ has a bond energy of $2 \times 2 \times 467 = 1868$

Total energy to create bonds is $3196 + 1868 = 5064$

$3751 - 5064 = -1313$

12 Which row describes the effect on the activation energy and the frequency of particle collisions when the temperature of a chemical reaction is increased?

	activation energy	frequency of collisions
A	increases	increases
B	no change	increases
C	increases	no change
D	no change	no change

13 Solid copper(II) sulfate exists in two different forms, anhydrous and hydrated.

One of these forms is blue and the other is white.

The change between these two forms is reversible.

$$\text{blue form} \rightleftharpoons \text{white form}$$

What is the blue form and how is the change from the blue form to the white form brought about?

	blue form	change to white form
A	anhydrous	add water
B	anhydrous	heat
C	hydrated	add water
D	hydrated	heat

14 Sodium ions, Na^+, and oxygen ions, O^{2-}, combine with chromium ions to form a salt.

The salt sodium dichromate has the formula $Na_2Cr_2O_7$.

What is the oxidation state of chromium in this salt?

A +2 **B** +3 **C** +6 **D** +12

All oxidation states in $Na_2Cr_2O_7$ is 0

$$2(+1) + Cr_2 + 7(-2) = 0$$

$$2 + 2Cr - 14 = 0$$

$$2Cr = +12$$

$$Cr = +6$$

15 The concentration of hydrogen ions in 100 cm^3 of 0.1 mol/dm^3 hydrochloric acid is higher than the concentration of hydrogen ions in 100 cm^3 of 0.1 mol/dm^3 ethanoic acid.

Which statement explains the difference in hydrogen ion concentration?

A Ethanoic acid is an organic acid.

B Ethanoic acid has a lower pH than hydrochloric acid.

C Ethanoic acid is partially dissociated.

D Ethanoic acid is a strong acid.

16 Which oxide is classified as an amphoteric oxide?

A aluminium oxide

B calcium oxide

C copper(II) oxide

D nitrogen oxide

17 Which method produces the salt copper(II) carbonate?

A Add copper(II) oxide to water, then add excess aqueous sodium carbonate. Filter off the precipitate.

B Add copper(II) oxide to dilute sulfuric acid, then add excess aqueous sodium carbonate. Filter off the precipitate.

C Add copper to dilute hydrochloric acid, then add aqueous sodium carbonate. Filter off the precipitate.

D Add copper(II) oxide to excess aqueous sodium carbonate. Filter off the precipitate.

18 Which statements about the trends across a period of the Periodic Table are correct?

1 Aluminium is more metallic than sodium.

2 Beryllium is more metallic than carbon.

3 Boron is more metallic than lithium.

4 Magnesium is more metallic than silicon.

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

1. Sodium is to the left of aluminium, so it is more metallic than aluminium.
2. Beryllium is to the left of carbon, so it is more metallic than carbon.
3. Boron is to the right of lithium, so lithium is more metallic.
4. Silicon is a metalloid while magnesium is a metal.

19 Some information about elements in Group II of the Periodic Table is shown.

element	time taken to make 10 cm^3 of hydrogen gas when 1 g of metal is added to cold water	density in g/cm^3	melting point / °C
beryllium	no reaction	1.85	1280
magnesium	>300 seconds	1.74	650
calcium	60 seconds	1.54	850
strontium	30 seconds	2.62	768
barium	10 seconds	3.51	714

Which row shows the correct trends in reactivity, density and melting point of the elements going down Group II of the Periodic Table?

	reactivity	density	melting point
A	decreases down group	increases down group	decreases down group
B	decreases down group	decreases down group	no clear trend
C	increases down group	no clear trend	increases down group
D	increases down group	no clear trend	no clear trend

20 A new element oxfordium, Ox, was discovered with the following properties.

solubility	electrical conduction	formula of element	bonding in a molecule of Ox_2
insoluble in water	does not conduct	Ox_2	Ox≡Ox

In which group of the Periodic Table should the new element be placed?

A Group III

B Group V

C Group VII

D Group VIII

Since it does not conduct electricity, it is not a metal. The molecule is also a triple bonding molecule, so the element is in Group V.

21 Which row describes a similarity and a difference between chlorine and bromine?

	similarity	difference
A	both are gases at room temperature and pressure	chlorine and bromine have different colours
B	both exist as diatomic molecules	chlorine is more dense than bromine
C	both have atoms with seven outer-shell electrons	only bromine will react with aqueous sodium chloride
D	both react with aqueous potassium iodide	chlorine is more reactive than bromine

22 Which statement describes transition elements?

A They have high densities and high melting points.

B They have high densities and low melting points.

C They have low densities and high melting points.

D They have low densities and low melting points.

23 Which gas is made when powdered zinc is added to dilute hydrochloric acid?

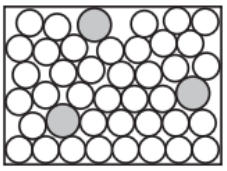
A carbon dioxide

B chlorine

C hydrogen

D oxygen

24 The diagram represents the structure of a solid.



Which solids does the diagram represent?

	brass	graphite	sodium chloride
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

It has different elements in a random uneven arrangement, so it is brass.

25 Steel is an alloy of iron.

Which statement explains why steel is stronger than iron?

A Steel contains carbon which is a very hard substance.

B The carbon atoms in steel bond together very strongly.

C The carbon atoms in steel make the iron atoms bond together very strongly.

D The carbon atoms prevent layers of iron atoms from sliding over each other.

26 Three students, X, Y and Z, are told that solid P reacts with dilute acids and also conducts electricity.

The table shows the students' suggestions about the identity of P.

X	Y	Z
copper	iron	graphite

Which students are correct?

A X, Y and Z **B** X only **C** Y only **D** Z only

Copper and graphite do not react with dilute acids so the answer is Y

27 Which statement explains why aluminium appears to be unreactive?

A It is coated in an oxide layer.

B It has a low density.

C It is low in the reactivity series.

D It is solid at room temperature.

28 During the electrolysis of aluminium oxide, the mass of the carbon anode changes.

Which row describes the change and gives a reason for this change?

	mass change of the anode	reason
A	decreases	carbon reacts to form carbon dioxide
B	decreases	carbon dissolves in molten cryolite
C	increases	electrodes become coated with cryolite
D	increases	electrodes become coated with aluminium

29 Several processes are used to treat domestic water.

Which row identifies a reason for the given process?

	process	reason
A	chlorination	removes impurities
B	filtration	removes insoluble solids
C	sedimentation	removes soluble solids
D	use of carbon	kills bacteria

30 What is the equation for photosynthesis?

A $CO_2 + 3H_2 \rightarrow CH_3OH + H_2O$

B $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

C $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

D $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

Photosynthesis involves reacting carbon dioxide and water to produce glucose and oxygen.

31 Which statement describes how the C–H bonds in methane gas in the atmosphere contribute to global warming?

A They absorb thermal energy from the Sun and emit some of this energy into space.

B They absorb thermal energy from the Sun and emit all of this energy towards the Earth.

C They absorb thermal energy from the Earth and emit all of this energy towards the Earth.

D They absorb thermal energy from the Earth and emit some of this energy towards the Earth.

32 The structural formulae of two hydrocarbons are shown.

$CH_3CH_2CH_2CH_3$ $CH_3CH(CH_3)CH_3$

Which statement about the hydrocarbons is correct?

A They are both alkenes.

B They decolourise aqueous bromine.

C They are structural isomers.

D They undergo addition reactions.

They are structural isomers because they have the same molecular formulas but different structural formulas

33 The structural formula of compound Q is given.

$CH_3CH_2CH_2COOCH_2CH_2CH_3$

What is compound Q?

A butyl butanoate

B butyl propanoate

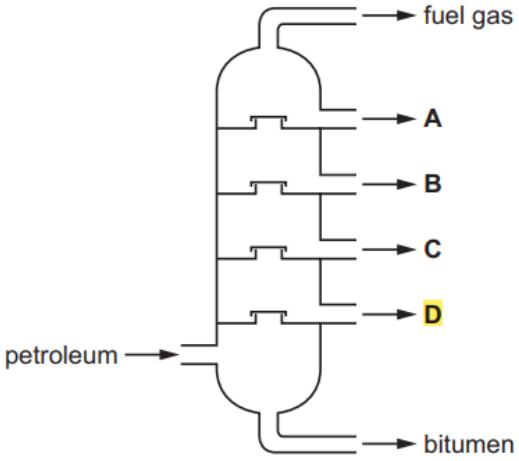
C propyl butanoate

D propyl propanoate

The first half has 3 carbons and the second half has 4 carbons. It is an ester so the name is propyl butanoate.

34 The fractional distillation of petroleum is shown.

Which fraction contains hydrocarbons with the longest chain length?



The longer the chain length, the more viscous the hydrocarbon becomes, so it is D

35 Which equation represents the cracking of an alkane?

A $3C_2H_4 \rightarrow C_6H_{12}$

B $C_6H_{12} + H_2 \rightarrow C_6H_{14}$

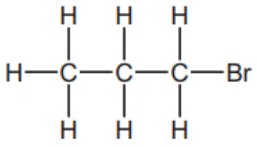
C $C_6H_{14} \rightarrow 6C + 7H_2$

D $C_6H_{14} \rightarrow C_2H_4 + C_4H_{10}$

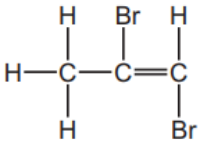
Cracking an alkane results in a smaller alkane and an alkene

36 What is the structure of the product of the reaction of propene with bromine?

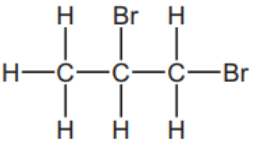
A



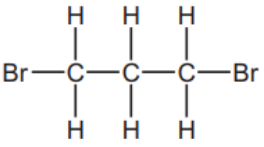
B



C



D



The double carbon bond of the propene will break and bromine $(Br)_2$ will take its place

37 In reaction R, 2000 molecules of $CH_2{=}CH_2$ react to form a single molecule X only.

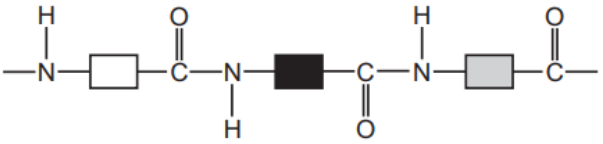
$$2000\ CH_2{=}CH_2 \rightarrow X$$

Which terms describe reaction R, $CH_2{=}CH_2$ and X?

	reaction R	$CH_2{=}CH_2$	X
A	addition	monomer	polymer
B	addition	polymer	monomer
C	substitution	monomer	polymer
D	substitution	polymer	monomer

Combining many small monomers into a single larger polymer is an addition reaction, where the monomer is $CH_2{=}CH_2$ and the polymer is X

38 Part of the structure of a polymer is shown.



Which statements about the polymer are correct?

1 The polymer is nylon.

2 The polymer is formed by condensation polymerisation.

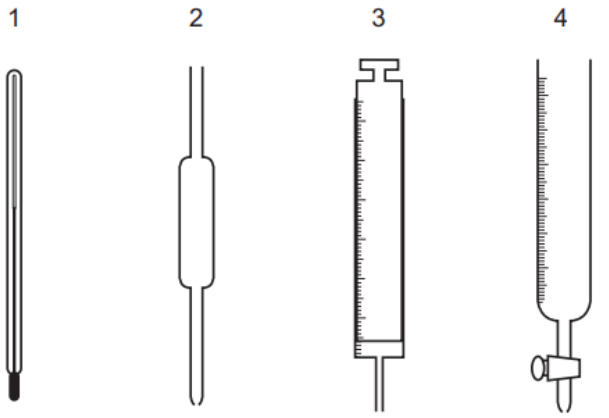
3 There are ester linkages between the monomers.

A 1 and 2 **B** 2 and 3 **C** 2 only **D** 3 only

1. The polymer is not nylon because in nylon, the NH bonds are connected. Here, the NH bonds are connected with the CO bonds
2. NH is an amino acid monomer and CO is an alcohol monomer, so the reaction has a water byproduct
3. Ester linkages are COOC bonds, there is no such bond here

39 The concentration of acids and alkalis can be determined by titration.

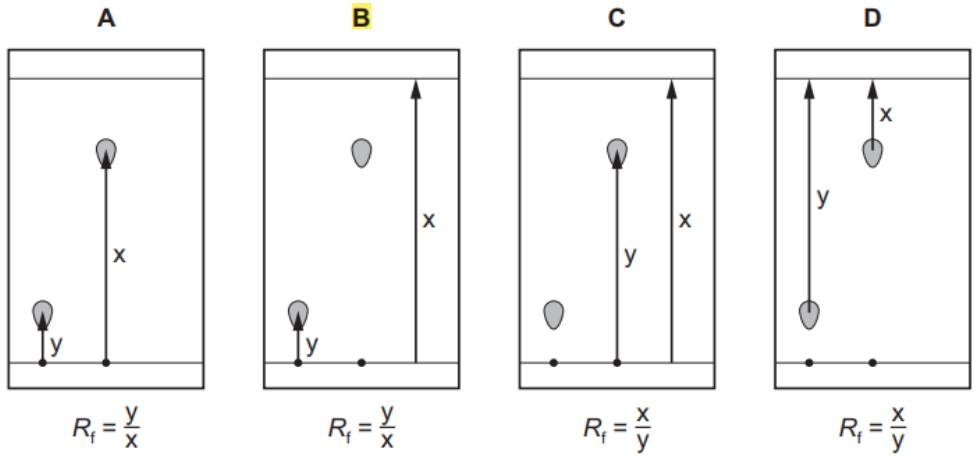
Which pieces of equipment are needed to perform a titration?



A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 2 and 4

A thermometer and gas syringe are not used in titration.

40 Which chromatogram shows how the R_f value of a substance is calculated?



$$R_f = \frac{\text{Distance travelled by substance}}{\text{Distance travelled by solvent}}$$

So B is correct

Additional notes

If you find any errors or mistakes within this paper, please contact us and we will fix them as soon as possible.