# CHEMISTRY MULTIPLE CHOICE QUESTIONS

## Organic Chemistry

Polymerization

2002 -2014

1.

Polymerisation of chloroethene gives pvc.

How does the carbon-carbon bond in pvc compare with that in chloroethene?

| | | |
|---|---|---|
| **A** | longer | stronger |
| **B** | longer | weaker |
| **C** | shorter | stronger |
| **D** | shorter | weaker |

[2002 M/J (22)]

2.

Chloroethene, $CH_2=CHCl$, is the monomer of pvc.

What are the C–C–C bond angles along the polymeric chain in pvc?

**A** They are all 109 °.

**B** Half are 109 ° and half are 120 °.

**C** They are all 120 °.

**D** They are all 180 °.

[2002 O/N (23)]

3.

Which properties of poly(alkenes) and of pvc can cause their disposal to be difficult?

**1** Poly(alkenes) are highly flammable.

**2** Poly(alkenes) are non–biodegradable.

**3** pvc produces harmful combustion products.

[2004 M/J (40)]

4.

In many countries plastic waste is collected separately and sorted. Some of this is incinerated to provide heat for power stations.

Why is pvc, polyvinylchloride, removed from any waste that is to be incinerated?

**A** It can be melted down and re-used.

**B** Its combustion products are harmful.

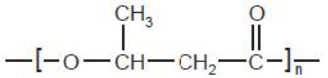
**C** It destroys the ozone layer.

**D** It does not burn easily.

[2005 M/J (30)]

5.

PHB (polyhydroxybutyric acid) is a natural polymer produced by a range of micro-organisms. It can also be manufactured from sugar. PHB is readily biodegradable.



PHB (polyhydroxybutyric acid)

What type of reaction will cause PHB to break down?

**A** addition

**B** hydrolysis

**C** reduction

**D** substitution

[2005 O/N (30)]

6.

Which equation or statement describes what happens when poly(propene) is burned in an excess of air?

**A** $(C_3H_6)_n + 1\frac{1}{2}nO_2 \rightarrow 3nC + 3nH_2O$

**B** $(C_3H_6)_n + 4\frac{1}{2}nO_2 \rightarrow 3nCO_2 + 3nH_2O$

**C** $(C_3H_6)_n + 6nO_2 \rightarrow 3nCO_2 + 3nH_2O$

**D** Poly(propene) does not burn.

[2006 O/N (25)]

7.

Polymerisation of chloroethene gives PVC.

How does the carbon-carbon bond in PVC compare with that in chloroethene?

**A** longer and stronger

**B** longer and weaker

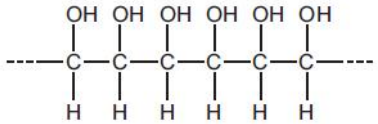
**C** shorter and stronger

**D** shorter and weaker

[2009 M/J (23)]

8.

The following diagram represents the structure of a possible polymer.



By which method might this polymer be made?

**A** polymerise ethene followed by hydration

**B** polymerise ethene followed by oxidation with cold acidified $KMnO_4$

**C** polymerise 1,2-dichloroethene followed by hydrolysis

**D** polymerise 1,2-dichloroethene followed by oxidation with cold acidified $KMnO_4$

[2009 O/N-11 (23)]

9.

A monomer undergoes addition polymerisation. A 1 mol sample of the monomer is completely polymerised.

How many moles of polymer might, theoretically, be formed?

**1** 1

**2** $10^{-6}$

**3** $\frac{1}{6.02 \times 10^{23}}$

[2009 O/N-11 (31)]

10.

In many countries plastic waste is collected separately and sorted. Some of this is incinerated to provide heat for power stations.

Why is pvc, polyvinylchloride, removed from any waste that is to be incinerated?

**A** It destroys the ozone layer.

**B** It does not burn easily.

**C** It is easily biodegradable.

**D** Its combustion products are harmful.

[2010 M/J-11 (26)]

11.

Polymerisation of 1,1-dichloroethene produces a dense, high melting point substance that does not allow gases to pass through. It is used as cling wrapping.

Which sequence appears in a short length of the polymer chain?

**A** $\dagger CH_2CCl_2CH_2CCl_2CH_2CCl_2\dagger$

**B** $\dagger CHClCHClCHClCHClCHClCHCl\dagger$

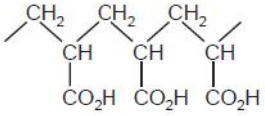
**C** $\dagger CCl_2CCl_2CCl_2CCl_2CCl_2CCl_2\dagger$

**D** $\dagger CH_2CCl_2CHClCHClCH_2CCl_2\dagger$

[2010 M/J-11 (27)]

12.

One of the characteristics of addition polymerisation is that the empirical formulae of the polymer and of its monomer are the same. The absorbent material in babies' disposable nappies is made from the addition polymer shown.



From which monomer could this addition polymer be obtained?

**A** $CH_3CH(OH)CO_2H$

**B** $HOCH_2CH_2CO_2H$

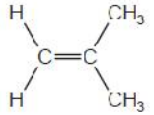
**C** $H_2C{=}CHCO_2H$

**D** $HO_2CCH{=}CHCO_2H$

[2010 O/N-11 (20)]

13.

The compound 2-methylpropene, $C_4H_8$, is a monomer used in the production of synthetic rubber.



In addition to 2-methylpropene there are x other isomers of $C_4H_8$, structural or otherwise, which contain a double bond.

What is the value of x?

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

[2010 O/N-11 (29)]

14.

Which statement does **not** correctly describe the polymer PVC?

**A** Combustion of PVC waste produces a highly acidic gas.

**B** PVC molecules are saturated.

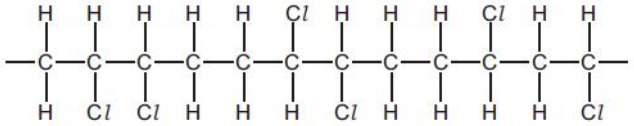
**C** The empirical formula of PVC is the same as the empirical formula of its monomer.

**D** The repeat unit of PVC is –(CHC*l*CHC*l*)–.

[2012 M/J-11 (30)]

15.

A molecule of a polymer contained the sequence shown.



Which monomer could produce this polymer by addition polymerisation?

**A** CHC*l*=CHC*l*

**B** $CH_2$=CHC*l*

**C** $CH_3$CC*l*=CHC*l*

**D** $CH_3$CC*l*=$CH_2$

[2012 O/N-13 (22)]

16.

Synthetic resins, plasticisers and many other chemicals can be made by polymerisation of a variety of monomers including prop-2-en-1-ol, $CH_2$=$CHCH_2OH$.

Which structure represents the repeat unit in poly(prop-2-en-1-ol)?

**A** —$CH_2$—CH—$CH_2$—OH—

**B** —$CH_2$—CH—
$CH_2OH$

**C** —CH=C—
$CH_2OH$

**D** —$CH_2$—CH—$CH_2$—
OH

[2013 M/J-11 (29)]

17.

Which fragment could appear in the chain produced by polymerising 1,1-dichloroethene?

**A** –$CH_2$–$CH_2$–C$Cl_2$–C$Cl_2$–$CH_2$–$CH_2$–

**B** –CHC*l*–CHC*l*–CHC*l*–CHC*l*–CHC*l*–CHC*l*–

**C** –$CH_2$–C$Cl_2$–$CH_2$–$CH_2$–$CH_2$–C$Cl_2$–

**D** –C$Cl_2$–C$Cl_2$–$CH_2$–$CH_2$–$CH_2$–C$Cl_2$–

[2013 O/N-13 (30)]

18.

Which statement does **not** correctly describe a problem related to the disposal of PVC?

**A** PVC is slowly degraded in the environment by bacteria and fungi.

**B** PVC is slowly degraded in the environment by sunlight.

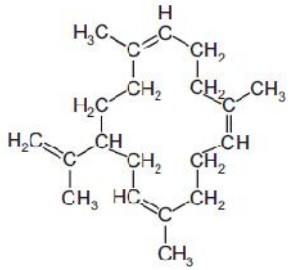
**C** When PVC is burnt, a significant amount of ethene gas is present in the products.

**D** When PVC is burnt, a significant amount of HC*l* gas is present in the products.

[2014 M/J-12 (25)]

19.

The naturally-occurring molecule shown below can be made by the addition of four identical monomer molecules.



What could be the structural formula of the monomer?

**A** $CH_3CH_2CH_2CH=CH_2$

**B** $CH_3CH=CHCH=CH_2$

**C** $CH_2=C(CH_3)CH_2CH_3$

**D** $CH_2=C(CH_3)CH=CH_2$

[2014 M/J-13 (27)]

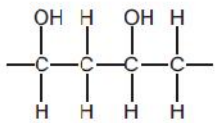
20.

Poly(ethenol) can be used to make plastic bags that dissolve in water.

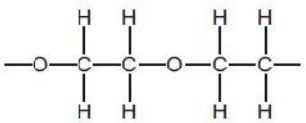
It may be considered to be made by addition polymerisation of $CH_2=CH(OH)$.

Which structure represents a length of the polymer chain consisting of two monomer residues?

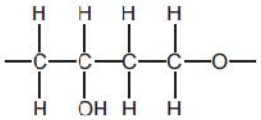
**A**



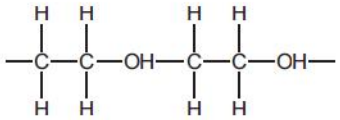
**B**



**C**



**D**



[2014 O/N-13 (28)]