



## University of Worcester Science Equivalency Test – information for candidates.

The Science Equivalency Test is comprised of a series of GCSE level questions which are used to sample candidates' recall, knowledge and understanding of the Biology, Chemistry and Physics topics listed in Section B below. The test also assesses candidates' knowledge, understanding and application of 'working scientifically' (the development of scientific thinking; experimental skills and strategies; analysis and evaluation; scientific vocabulary, quantities, units, symbols and nomenclature).

Approximately 25% of the test is

- Prokaryotic and eukaryotic cells
- Cell metabolism
- Importance of photosynthesis
- Levels of organisation within an ecosystem
- Human circulatory system
- Transport systems in plants
- Health and disease
- Communicable diseases
- Treating, curing and preventing disease
- Nervous coordination and control in humans
- Hormonal coordination and control in humans
- Homeostasis in humans

## Chemistry

- A simple model of the atom, relative atomic mass, electronic charge and isotopes
- The modern Periodic Table
- Properties of transition metals
- Structure, bonding and the properties of matter
- Different kinds of chemical bonds: ionic, covalent and metallic bonding
- Structure and bonding of carbon
- Bulk and surface properties of matter including nanoparticles
- Chemical symbols, formulae and equations
- Chemical changes
- Identification of common gases
- Chemistry of acids
- A reactivity series of metals as the tendency of a metal to form its positive ion
- Electrolysis of various molten ionic liquids and aqueous ionic solutions
- Redox reactions (reduction and oxidation)
- Exothermic and endothermic reactions, including reaction profiles
- Carbon compounds both as fuels and feedstock
- Chemical cells and fuel cells
- Factors that influence the rate of reaction, including catalysts
- Reversible reactions and the concept of dynamic equilibrium
- Homologous series, including alkanes, alkenes, alcohols and carboxylic acids
- Simple reactions of alkanes, alkenes and alcohols
- Synthetic and naturally occurring polymers, including DNA
- Assessing purity and separating mixtures
- Conservation of mass and the quantitative interpretation of balanced equations
- Use of amount of substance in relation to masses of pure substances

Physics

C. Sample questions and answers

Question				
<p>The drawings below show pigs from two different breeds.</p> <p>(i) From the drawings above, give <b>two</b> ways in which the pigs are different.</p> <p>1. ....1 mark</p> <p>2. ....1 mark</p> <p>(ii) What are these differences called? Tick the correct box.</p> <table data-bbox="276 840 941 1008"><tr><td>adaptations</td><td>classification</td></tr><tr><td>fertilisation</td><td>variations</td></tr></table> <p style="text-align: right;">1 mark</p>	adaptations	classification	fertilisation	variations
adaptations	classification			
fertilisation	variations			
Mark Scheme				
<p>(i) any <b>two</b> answers from</p> <p>one has spots (accept 'the spots' or 'it has different markings')</p> <p>one has upright <b>or</b> floppy <b>or</b> pointy ears (accept 'the ears')</p> <p>one has a straight <b>or</b> curvy or bent snout (accept '(longer) nose or snout or face' accept 'shape of head')</p> <p>different shaped body (accept 'fatter' or 'thinner' BUT 'different shaped' or 'bigger' are insufficient)</p> <p>one is darker <b>or</b> lighter (accept 'they are different colours' BUT 'skin' is insufficient)</p> <p>accept 'length of legs'</p> <p>(ii) • variations (if more than one box is ticked, award no mark)</p>				

Question

**Figure 1** shows a woman filling her bathroom sink with hot water.

## Question

The figure opposite shows a power station.

Fossil fuels are burnt at some power stations.

- (a) tick the correct answer to complete the sentence.

Fossil fuels release energy by

**Combustion**

**Decomposition**

**D**

Question

The information below comes from a newspaper report.

Scientists measured the oxygen levels in the water upstream and downstream from Pine Bridge. The results are shown below.

(a) (i) What was the oxygen level in the river at Pine Bridge?

..... ppm (1 mark)

(ii) Describe what happens to the oxygen level in the river as you travel **downstream** from Pine Bridge.

..... (1 mark)

(b) Trout only live in water with oxygen levels higher than 20 ppm. How far **downstream** from Pine Bridge would you be likely to find trout? Write the unit.

..... (1 mark)

The scientists collected samples of the river animals found at different places.

animals collected	distance from Pine Bridge (km)								
	-2.0	-1.5	-1.0	-0.5	0	0.5	1.0	1.5	2.0
stonefly nymphs	✓	✓	✓	✓					
mayfly nymphs	✓	✓	✓	✓					
freshwater shrimps	✓	✓	✓	✓					✓
caddis fly larvae	✓	✓	✓	✓					
rat-tailed maggots					✓	✓			
sludge worms					✓	✓	✓		
water lice							✓	✓	✓
bloodworms							✓		

(c) Trout only live in water with oxygen levels higher than 20 ppm.  
 Give the name of one **other** animal that **only** lives in oxygen levels above 20 ppm.  
 Use the table and the information above to help you.

..... (1 mark)

(d) Use the information from the table and the graph.  
 Name **two** animals that are **only** found when the oxygen level is below 10 ppm.

1. .... 2. .... (2 marks)

(e) In the river, trout are predators. Near Pine Bridge, the number of trout decreased.  
 Suggest **one** reason why pollution may cause the trout population to decrease.

.....  
 ..... (1 mark)



## Answer

- (a) (i) • 5 ppm  
(ii) • it increased

accept 'it went up'

OR 'it goes from 5 (ppm) at Pine Bridge to 20 (ppm) at 2.5 km'

**BUT** 'It went from 5 (ppm) to 24 (ppm)' is insufficient

- (b) any **one** from

- further than 2.5 km (accept 'at 2.5 km')
- beyond 2.5 km (accept a single distance from 2.5 km to 3 km (inclusive))

the unit is required for the mark

- (c) any **one** from

- stonefly nymphs (accept 'nymphs')
- mayfly nymphs (accept 'stonefly' ; accept 'mayfly')
- caddis fly larvae (accept 'caddis fly' ; accept 'larvae')  
'fly' is insufficient

do not accept 'freshwater shrimps' ; 'trout' is insufficient

- (d) any **two** from

- rat-tailed maggots (accept 'rat-tailed' or 'maggots')  
'rat' or 'sludge' or 'blood' are insufficient
- sludge worms
- bloodworms

if the type of worm is not specified, accept 'worms' for one mark (e.g. 'bloodworm' and 'worm'); award two marks for 'rat-tailed maggots' and 'worm'. Responses may be given in any order

- (e) any **one** from

- less food available for the trout (accept 'they die of starvation')

